

12dModel

Reference Manual

Version 8

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This book is the reference manual for the software product 12d Model.

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Preface

Introduction

12d Model is an interactive graphics program designed to process survey data, quickly build terrain, conceptual and detail design models.

Data is easily read in, triangulated and contoured to build an initial terrain model. Roads, platforms, channels or other design features can be added interactively and a merged model containing the initial terrain and the new design features formed to produce conceptual design models.

All Models can be examined in plan, section or perspective views. The number and type of views displayed on the screen is totally user defined.

By using a mouse and flexible on-screen menus, **12d** Model is easy to use and requires a minimum of training.

This document is the *12d Model Reference* manual.

Reference Manual in PDF Form

12d Model V8.0 has an on-line help available for all panels and menus.

However, because Microsoft's Help system only allows individual topics to be printed, the entire 12d Model Reference manual has also been supplied as a PDF file. The PDF file can be used to print out large sections of the manual. Adobe's PDF format can be read by Adobe Acrobat or the free Acrobat Reader

The PDF file for the 12d Model Reference manual is called

12dm_8.0_ref.pdf

and is in the folder on the 12d Model CD called

Documentation\Reference_Manual

If you do not have an Acrobat Reader installed, it is available on the 12d Model CD under **Install**.

Training Manuals in PDF Form

12d Model is supplied with a very comprehensive on -line Reference manual which describes the function of each menu option in detail. It is a Reference manual however and makes no attempt to describe how to use 12d for production surveying and civil engineering work.

The 12d Model installation CD also contains two (2) Training manuals:

Getting Started for Design manual

Getting Started for Surveying manual

The *Getting Started for Design* manual is available as a printed manual and as a PDF file on the 12d

Model Installation CD.

The *Getting Started for Surveying* has the first seven chapters in common with the *Getting Started for Design* manual (installing 12d Model, on-line help and basic modelling) but then diverts to cover topics from the direction of a Surveying whereas the *Getting Started for Design* manual continues on with alignment design techniques.

The *Getting Started for Surveying* manual is available as a printed manual and as a PDF file on the 12d Model Installation CD. It is common to all 12d Model users.

Training Material

The training tutorials assumes that a series of files are already on your hard disk. These tutorial files are automatically installed from the CD during installation of the 12d Model software.

Using the Practise and Small Versions of 12d Model

The Practise version of 12d Model is limited to a maximum of 5,000 points. Following the procedures as stated in the training manuals may create projects with more than 5,000 points.

Where appropriate, the text will suggest how to vary the input for each instruction so that the example feature can be completed within the limits of the 12d Model Practise version.

The number of points used at any time in the Practise and small release versions can be displayed by the option

Projects => Check points

The easiest way to reduce the current point count is to delete any unwanted models with

Models => Delete

The installed icon on your desktop for running the practise version of 12d with these training files is labelled '12d v8.00 Practise Training'.

Please Note: Projects created by Practise versions of 12d Model cannot be accessed by Release versions of 12d Model and vice-versa.

1 Installation of 12d Model 8 Release Version

The *12d Model 8 Installation CD* can be used to install the *Release* and *Practise* versions of 12d Model 8.

The *Practise* version is limited to a maximum of 5,000 points and creates projects that cannot be accessed by the *Release* versions of 12d Model and vice-versa. However the *Practise* version can be used free of charge by 12D Solutions customers and registered *Practise* Users.

These notes are for installing the *Release version* of 12d Model 8. There are separate notes for installing the *Practise* version.

For a **new** installation of the **Release** version of 12d Model 8, the user is provided with

- one dongle
- one *12d Model 8 Installation CD*
- an email or a floppy with the file *nodes.4d* on it

Please check that you have all three items before commencing the installation.

For **existing** 12d Model 7.0 users, the user is provided with

- one *12d Model 8 Installation CD*
- an email or a floppy with the file *nodes.4d* on it

For existing users, the dongle you already have for *12d Model 7* will work with the new version of *12d Model 8*. If *12d Model 8* is **already** running on your computer, please **uninstall** it before installing a new version of *12d Model 8*.

Important Note on *Nodes.4d*

Because most new computers do not have a floppy disk drive, the *12d Model 8 nodes.4d* file will normally be emailed to you rather than sent on a floppy disk. Before installing *12d Model 8*, you must copy the *12d Model 8 nodes.4d* into a folder that can be accessed during the installation.

During the installation of *12d Model 8*, you will be asked to browse to the folder containing the *nodes.4d* file.

Please **do not change** the **name** of the *nodes.4d* file. The installation and 12d Model will only search for a file called *nodes.4d*.

Extra Notes for All Installations

1. A three-button mouse is essential.
2. The Installation CD contains extra information other than just the installation version of 12d Model. For example, documentation, source to macros and plot parameter files.

The extra data can be copied from the Installation CD but the copied files may only have a “read only” attribute set. This means that the files can not be edited or modified in any way.

To change the attribute so that a file can be modified, select the file in Explorer, bring up the Properties sheet and under the General tab sheet change the “read only” box so that it is not ticked on.

Selecting **OK** or **Apply** will then modify the attribute of the file.

Installing the Release Version of 12d Model 8

These notes are for installing the **Release** version of 12d Model 8. There are separate notes for installing the **Practise** version.

A. Disk Space required for installing 12d Model 8

Approximately 400 megabytes of disc space will be required for the installation to succeed. After installation this can be reduced to a minimum of 60 megabytes.

B. Before installing from the CD

For Windows 2000, XP:

Reboot the PC **before** installing 12d Model from the CD.

Your login must have Administrator privileges.

C. Do not attach the dongle before installing dongle drivers

USB dongles must not be attached to the computer before the dongle drivers are installed.

D. Using the email and/or floppy with the *nodes.4d* on it

If you have a *nodes.4d* floppy disk, it should be inserted into the floppy drive before 12d Model is installed. The 12d Model 8 installation program will copy the *nodes.4d* file from the floppy disk.

The *nodes.4d* file does not have to be on a floppy disk- it can be in any folder. This may be the case if you do not have a floppy drive or if the *nodes.4d* file was emailed to you.

If you don't have the *nodes.4d* file on a floppy disk but in a folder instead, then during the installation of 12d Model you will be asked to Browse to the folder containing the *nodes.4d* file. The *12d Model 8* installation program will copy the *nodes.4d* file from the selected folder.

E. Starting the Installation of 12d Model 8

Insert the *12d Model 8 Installation CD* into the CD drive.

On inserting the CD, the *12d Model Installation* program automatically begins.

If it doesn't, simply double click on the program "setup.exe" from the CD.

F. Installing

The *12d Model Release* screen will appear.



The Steps on the *12d Release* tab of the Installation CD will lead you through the installation of the Release version of 12d Model.

NOTE - If the dongle drivers and the Camtasia codec are already installed on your computer then you can proceed to **Install 12d Model 8 Release**.

Step 1. Install the Hardlock and Wibu Dongle Drivers

You need to have System Administrator rights to install the dongle drivers.

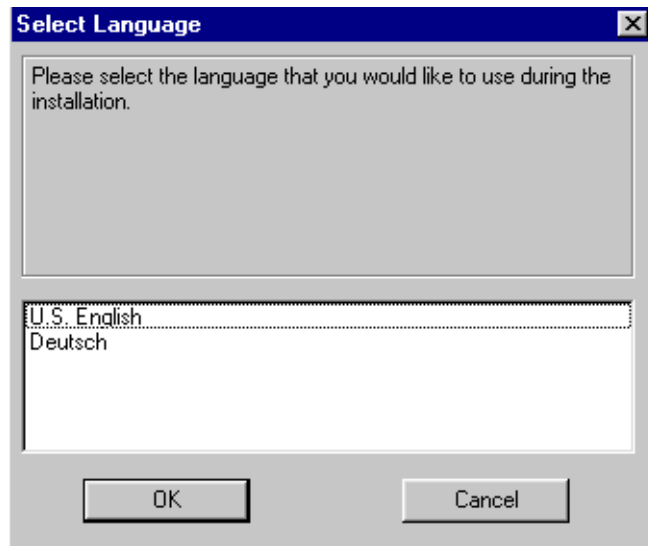
Both the *Hardlock* and the *Wibu* dongle drivers should be installed even if you only have one type of dongle.

On the **12d Model Release** screen, click on *Hardlock driver*.

The script to install the hardlock dongle drivers begins.

Select language

Language for hardlock installation



select **US English** and then **OK** to continue

Hardlock Device Driver Installation

Installing dongle drivers



select **Next** to continue

Hardlock Device Driver Installation

Finish installing dongle drivers



select **Finish** to continue

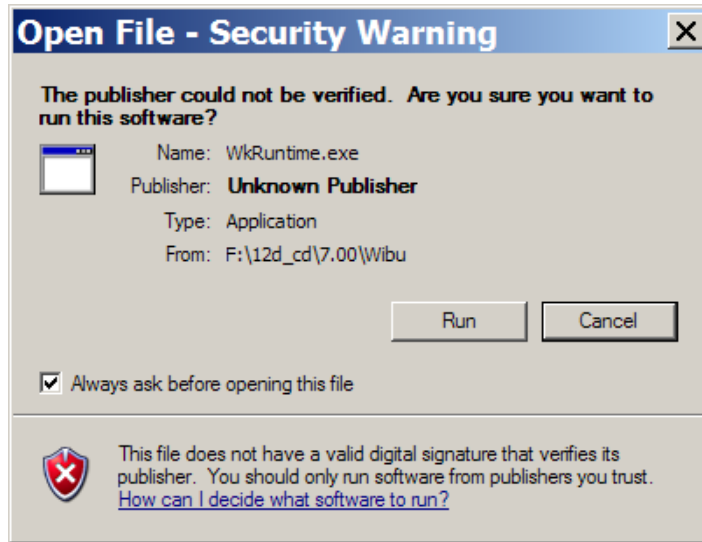
The Hardlock dongle drivers have now been installed.

The *12d Model Release* screen will then appear.

On the **12d Model Release** screen, click on *Wibu driver*.

The script to install the Wibu dongle drivers begins.

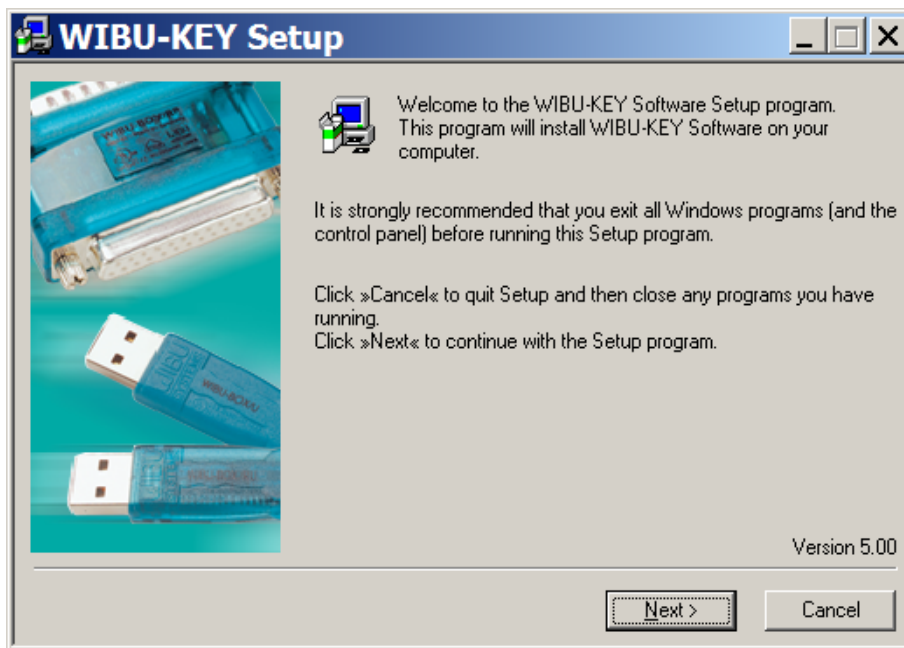
Under Windows XP you may get an *Open File - Security Warning*



select **Run** to continue

WIBU-KEY Setup

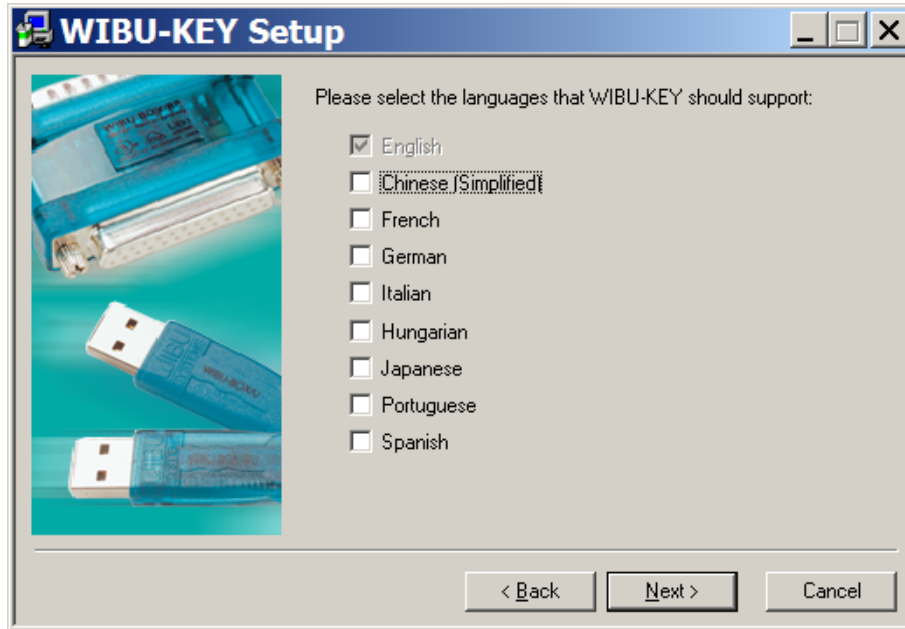
Welcome to WIBU-KEY Software Setup



select **Next** to continue

WIBU-KEY Setup

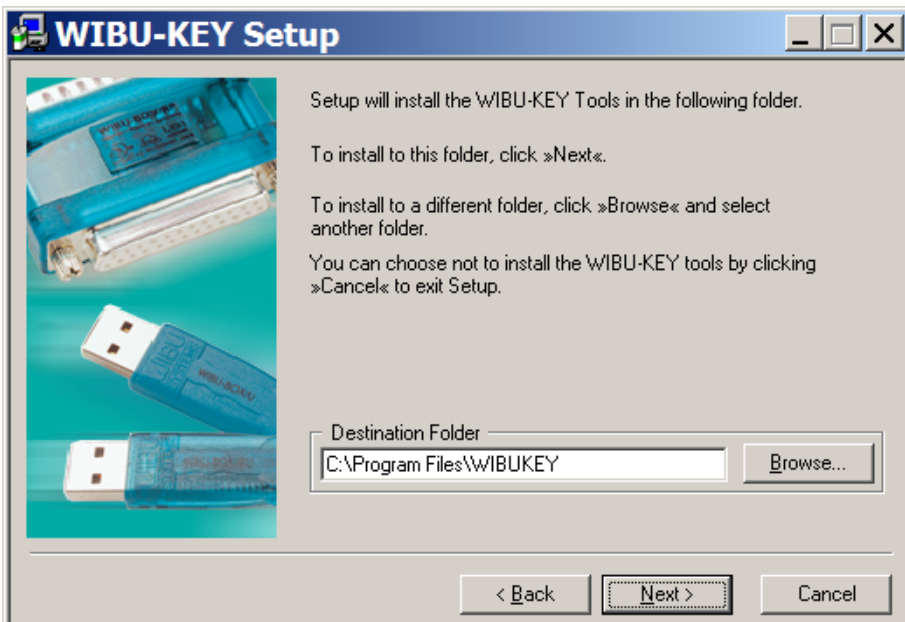
Language Selection



tick language and then select **Next** to continue

WIBU-KEY Setup

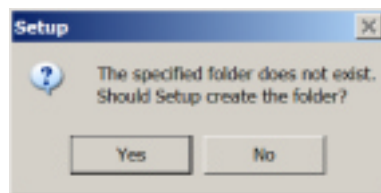
Installation folder



select **Next** to continue

WIBU-KEY Setup

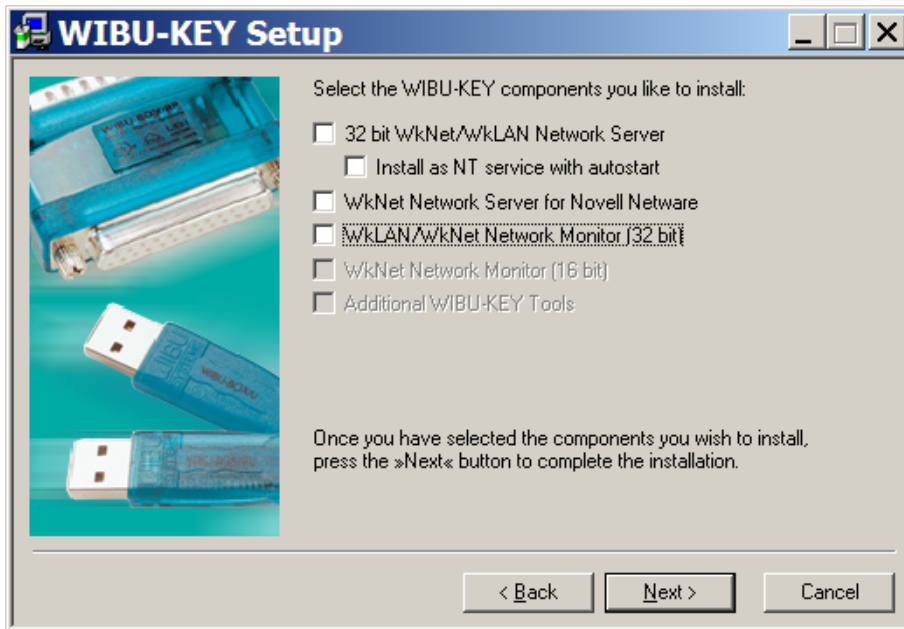
Installation folder doesn't exist



click **Yes** to continue

WIBU-KEY Setup

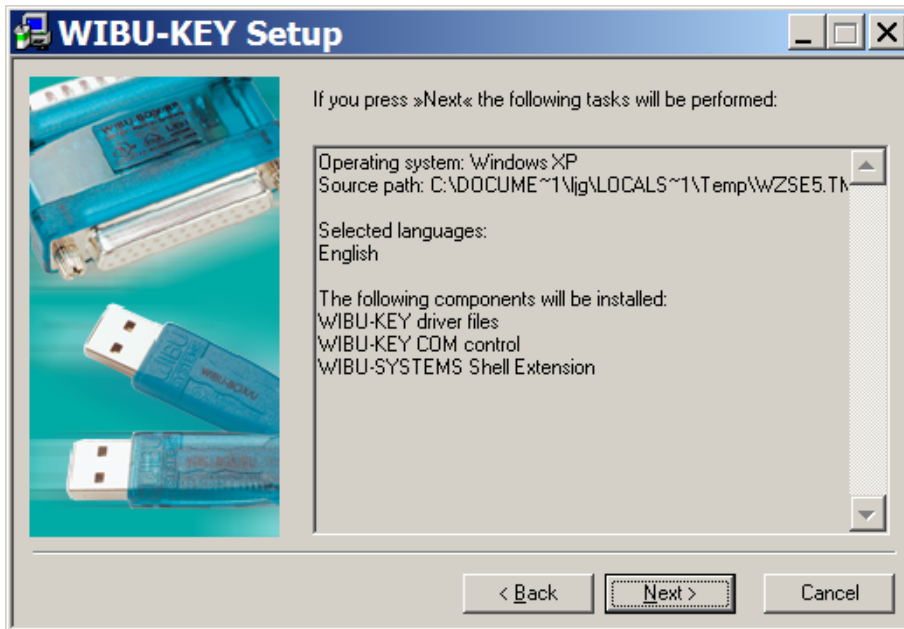
Component Selection



make sure nothing is ticked and then select **Next** to continue

WIBU-KEY Setup

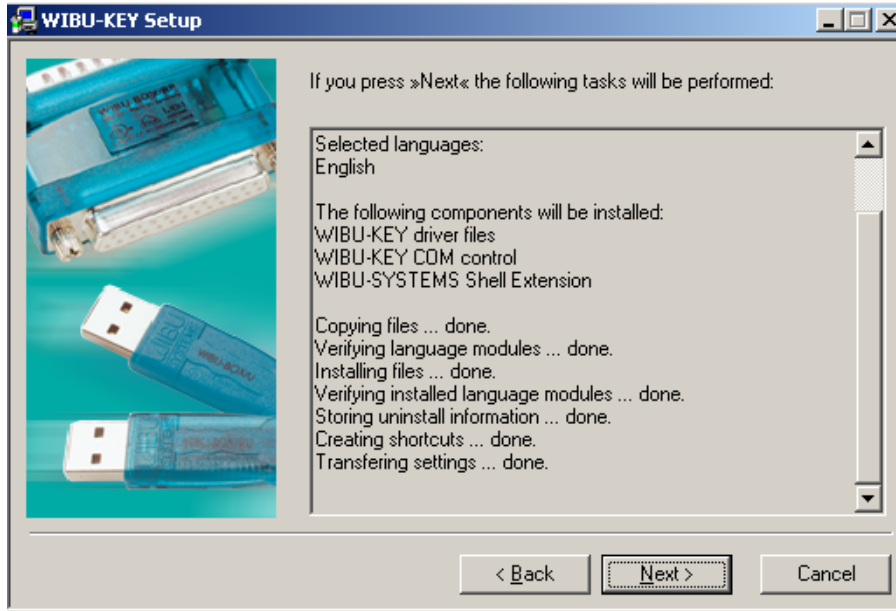
Tasks to be Performed



select **Next** to continue

WIBU-KEY Setup

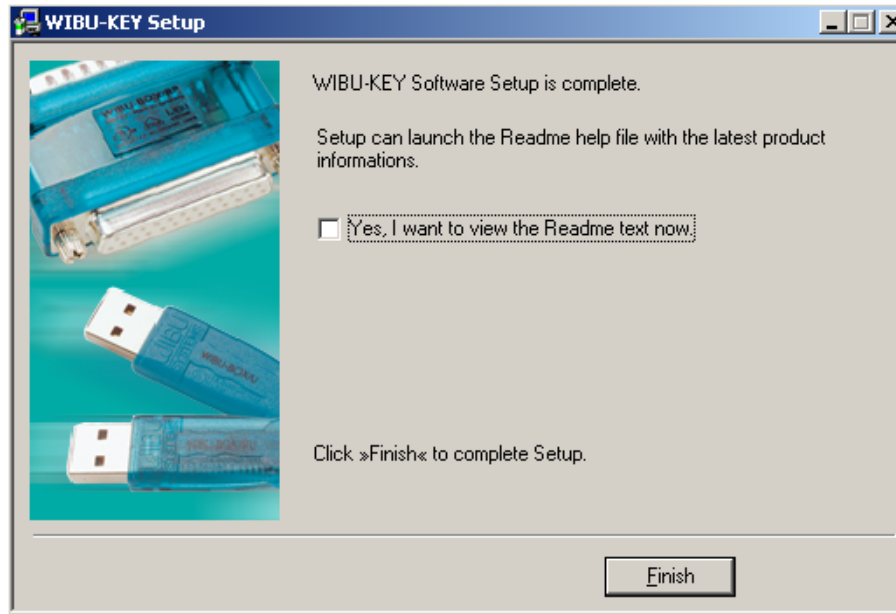
Tasks done



select **Next** to continue

WIBU-KEY Setup

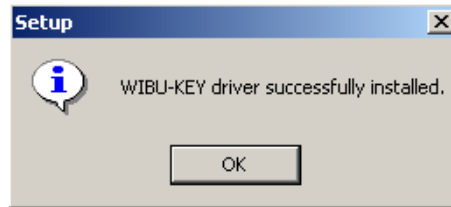
Setup Complete



select **Finish** (leave "Yes, I want to view the Readme text now" unticked)

Setup OK

Setup OK



click **OK**

The WIBU dongle drivers have now been installed.

The *12d Model Release* screen will then appear.

Step 2. Check the dongle

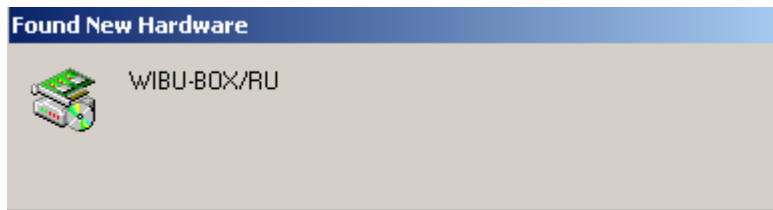
The 12d Model dongle (Hardlock or Wibu) can now be attached to the computer.

For USB dongles:

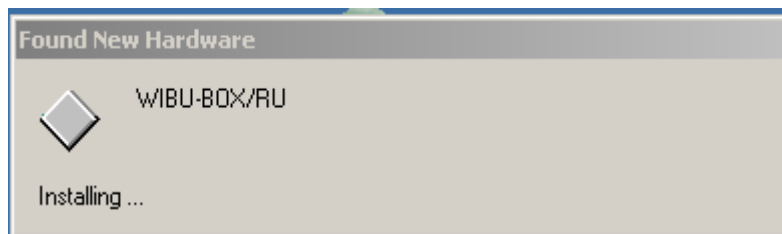
Warning: you must have System Administrations rights the first time you attach a USB dongle to any USB port:

When a USB dongle is attached for the first time to any USB port, Windows will detect that it is new hardware and needs to load the dongle drivers for that USB port - this will require System Administration rights.

Since the dongle drivers have already been loaded onto your computer, when the USB dongle is attached to a new USB port, it will be recognised as new hardware



and Windows should automatically install the correct dongle driver.



IMPORTANT NOTE IF THE WIBU DONGLE IS NOT RECOGNISED:

If the WIBU dongle is not recognised and you get the "Found New Hardware" screen



please go to the section “Wibu XP SP2 Problems” on how to find the Wibu drivers

NOTE - even though your dongle is working on one USB port and then you no longer need System Administration rights to attach the dongle to that USB port, if you try and attach the dongle to a new USB port, you will need System Administration rights to install the dongle drivers on the new USB port.

The dongle must be attached to the USB port at all times, otherwise 12d Model will stop running.

For Parallel dongles:

Attach the dongle to the printer port. The dongle must be attached to the printer port at all times, otherwise 12d Model will stop running.

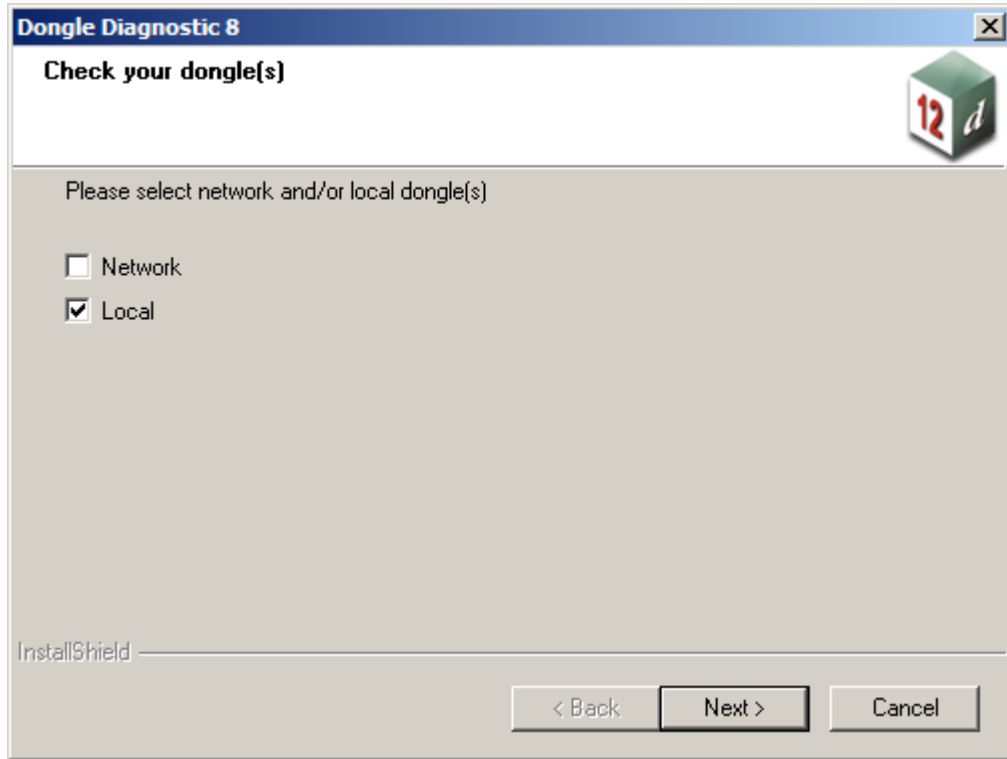
Important Note - the 12d parallel dongle must be **before** any Rainbow dongles (e.g. AutoCad).

On the **12d Model Release** screen, click on **Check**:

The dongle checking program begins.

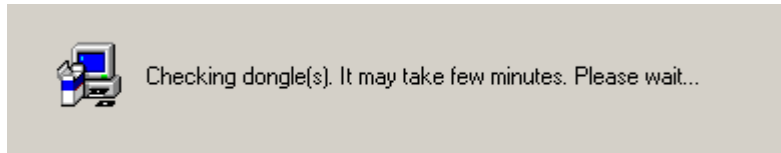
Installation

Installation message

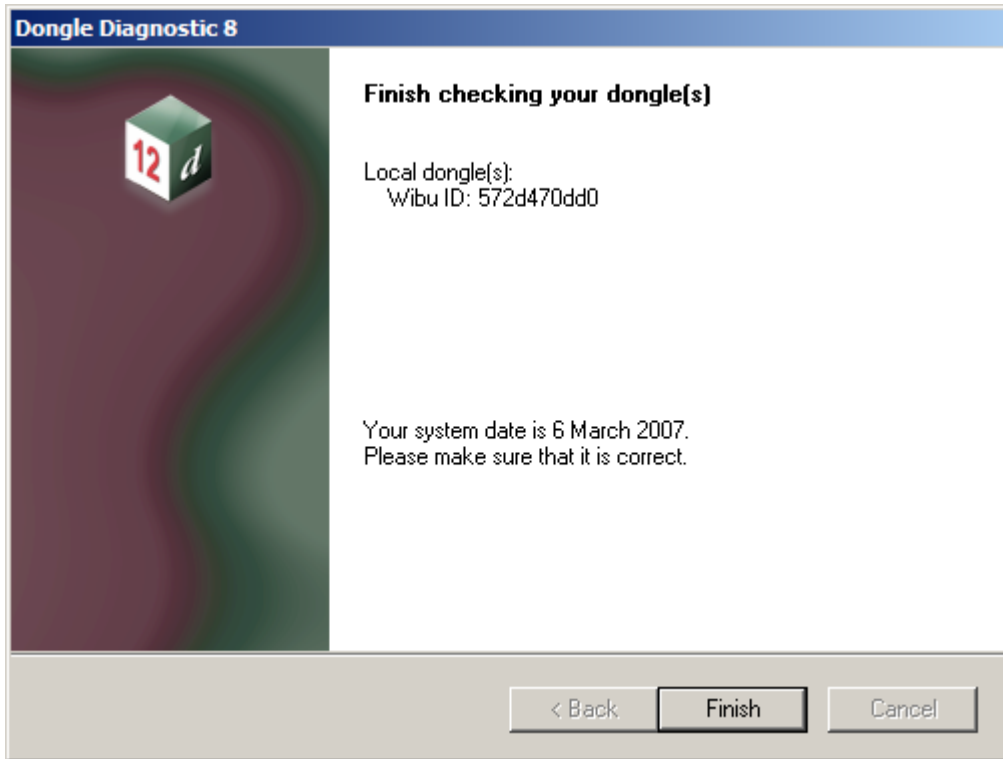


Tick "Local" and select **Next**

The computer/network will be checked for dongles.



Check Report



The correct dongle number should be displayed and also a check on the date in the computer is correct.

select **Finish**

This completes the dongle *Check*.

The *12d Model Release* screen will then appear.

Step 3. Install Camtasia Codec

You need to have System Administrator rights to install the dongle drivers.

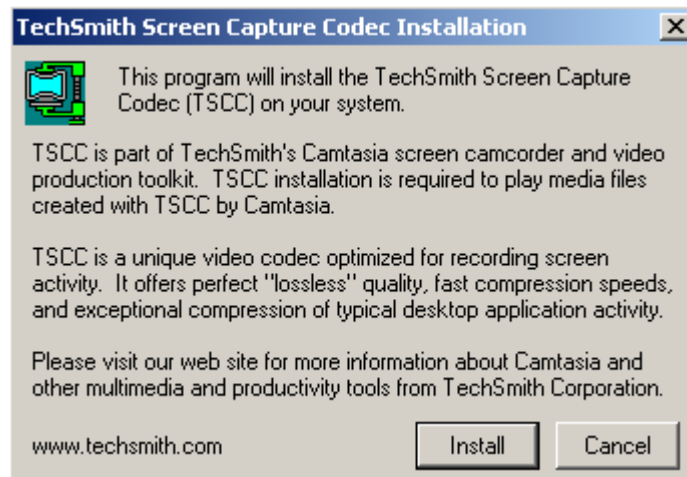
The Camtasia Codec is used for displaying the images on the *12d Model Training* CDs and DVDs.

On the *12d Model Release* screen, click on *Camtasia Codec*:

The Camtasia Codec installation begins.

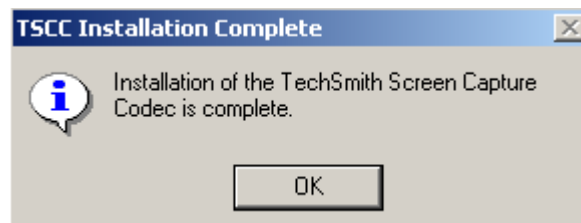
Installation

Installation message



Select **Install** to continue with the installation

Installation Complete



Select **OK**.

This completes the installation of the *Camtasia Codec*.

The *12d Model Release* screen will then appear.

Step 4. Installing 12d Model 8 Release Program files

Insert the floppy disk with the *nodes.4d* file on it into the floppy drive.

During the installation, the *nodes.4d* file will be copied from the floppy disk, or if you do not have a floppy disk, from the folder on your computer containing the *nodes.4d* file.

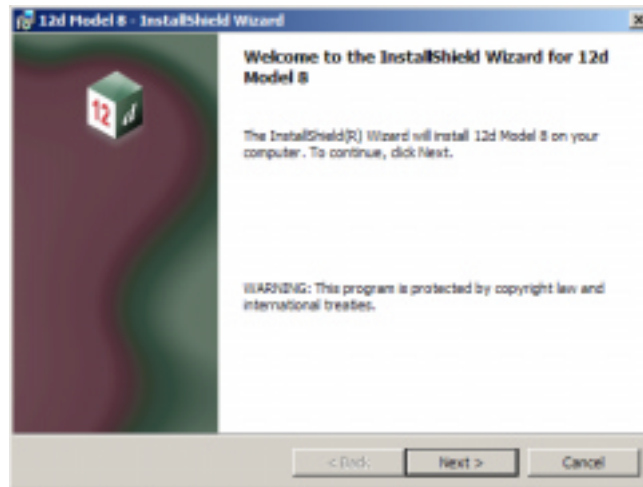
Note that if you do not have a *nodes.4d* file, you can use a *Custom* install but you will need a *nodes.4d* file before 12d Model can be used.

On the **12d Model Release** screen, click on *Install 12d Model 8 Release*:

The 12d Model 8 installation begins.

Welcome

Welcome message



Select **Next** to continue with the installation

Software License Agreement

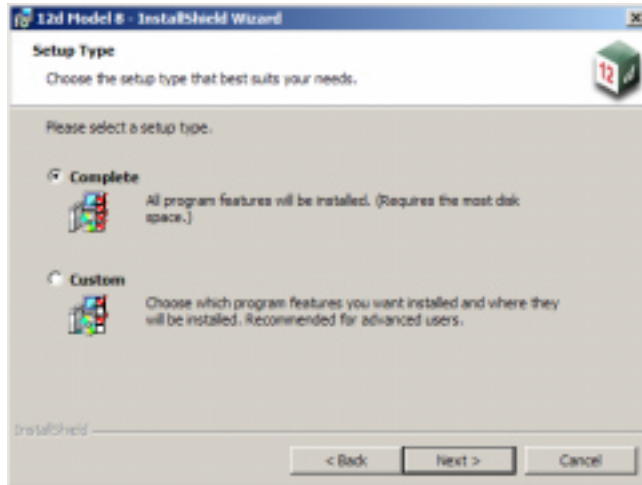
12D Solutions license agreement



If you agree with the License conditions, click on *I accept the terms in the license agreement*.

Select **Next** to continue with the installation

Setup Type

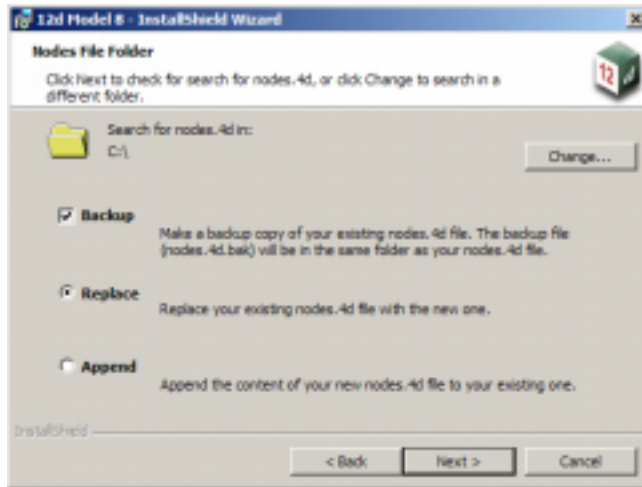


select **Complete**

select **Next** to continue with the installation

Authorisation file

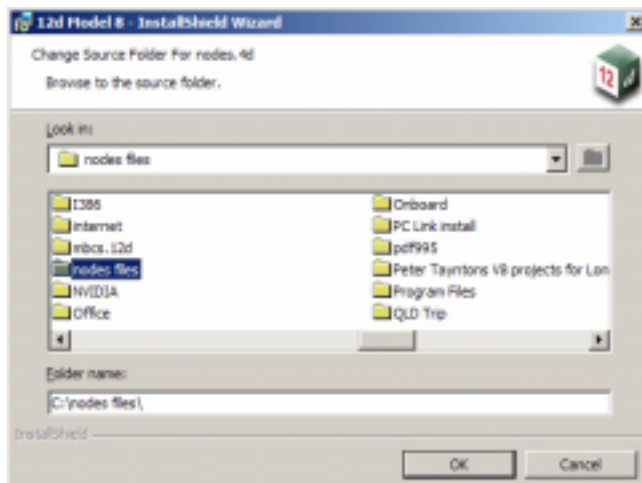
Folder containing the authorisation file nodes.4d



select **Change**

Authorisation file

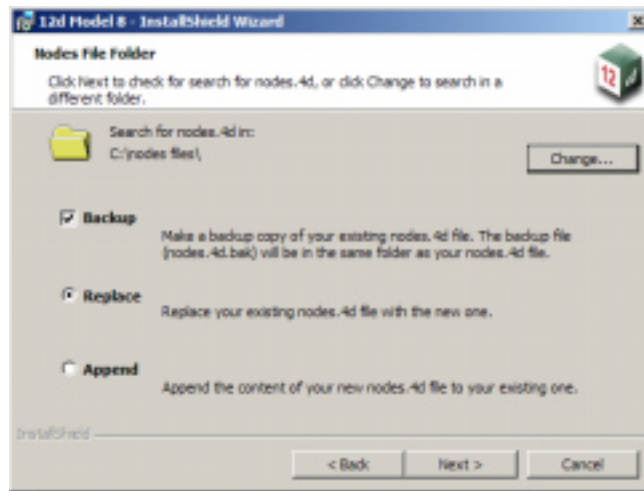
Browse to the Folder containing the file nodes.4d



select the folder containing the nodes.4d file and then select **OK**

Authorisation file

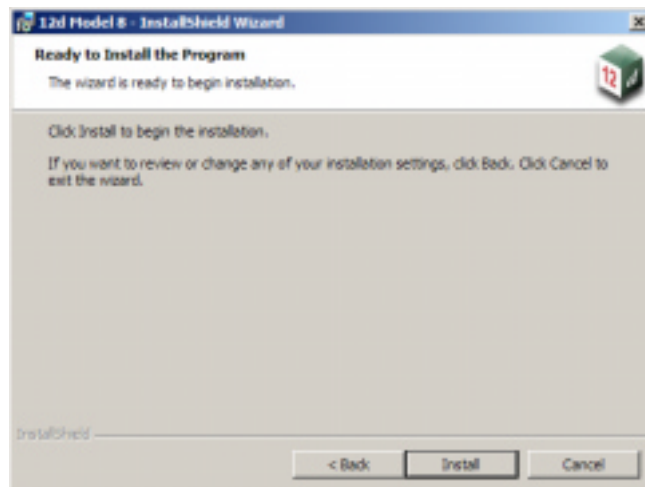
*Folder containing the authorisation file **nodes.4d***



select **Next** to continue with the installation

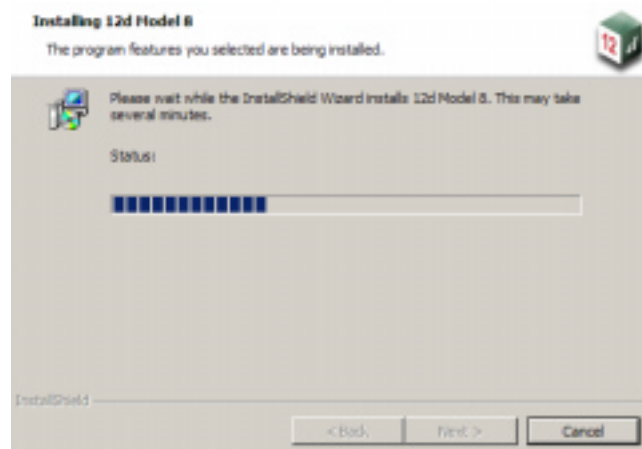
Start Copying Files

Begin the installation



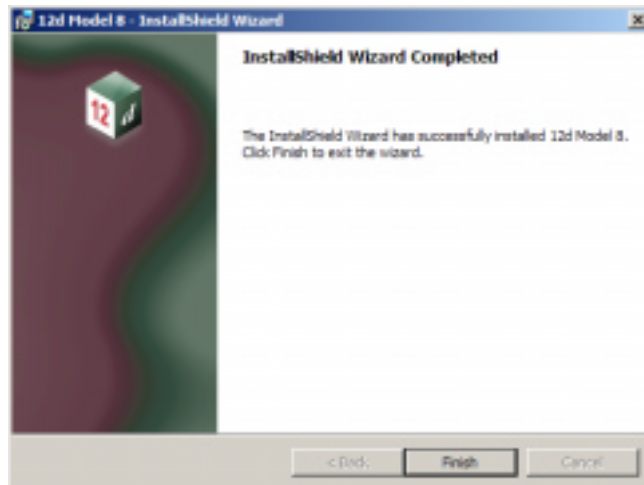
select **Install** to continue the installation

The software will be copied and installed onto the computer.



Setup Complete

End of installation



Select **Finish** to complete the installation

The *12d Model Release* screen will then appear.



Select **Exit** at the bottom right hand corner of the screen to end the installation.

This completes the installation for **new Installations of 12d Model**.

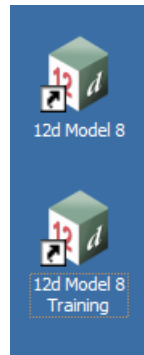
Icons Created by Installing 12d Model

The installation loads the appropriate components and creates the icons

Release

12d Model 8

12d Model 8 Training



The *12d Model 8* icon attaches to the folder *12djobs*.

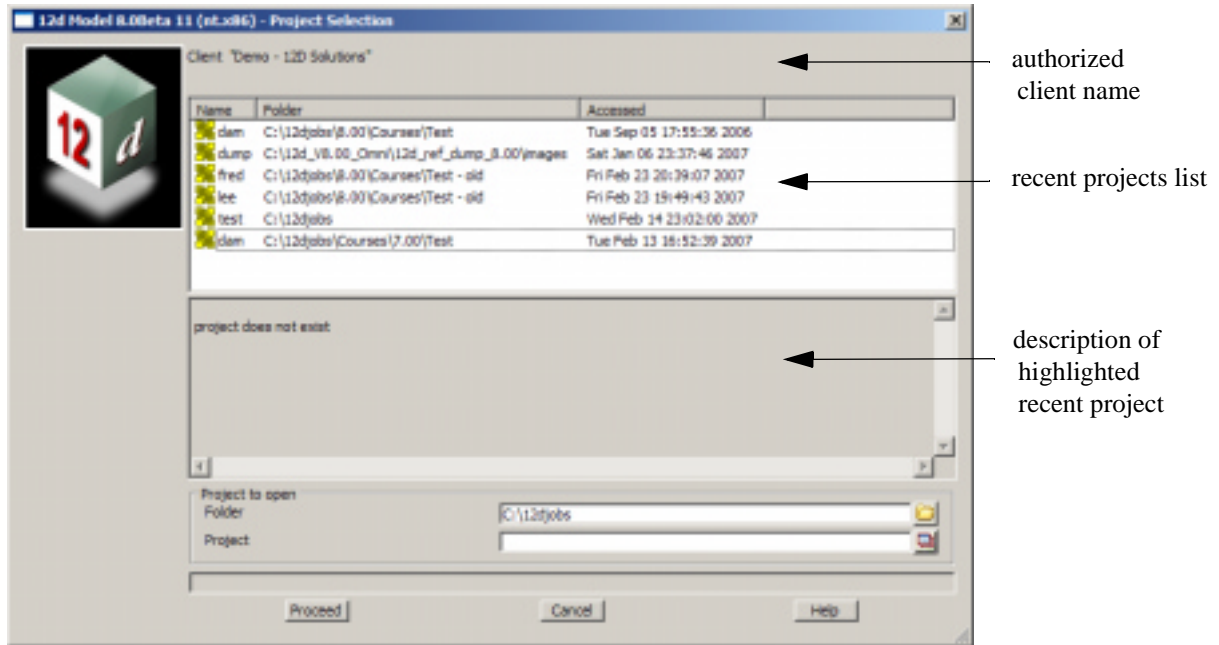
The *12d Model 8 Training* icon attaches to the folder containing the data to use with the *Getting Started for Design, Getting Started for Surveying* and other training manuals.

12d Model 8 Not Authorising

error_authorizing_release_version

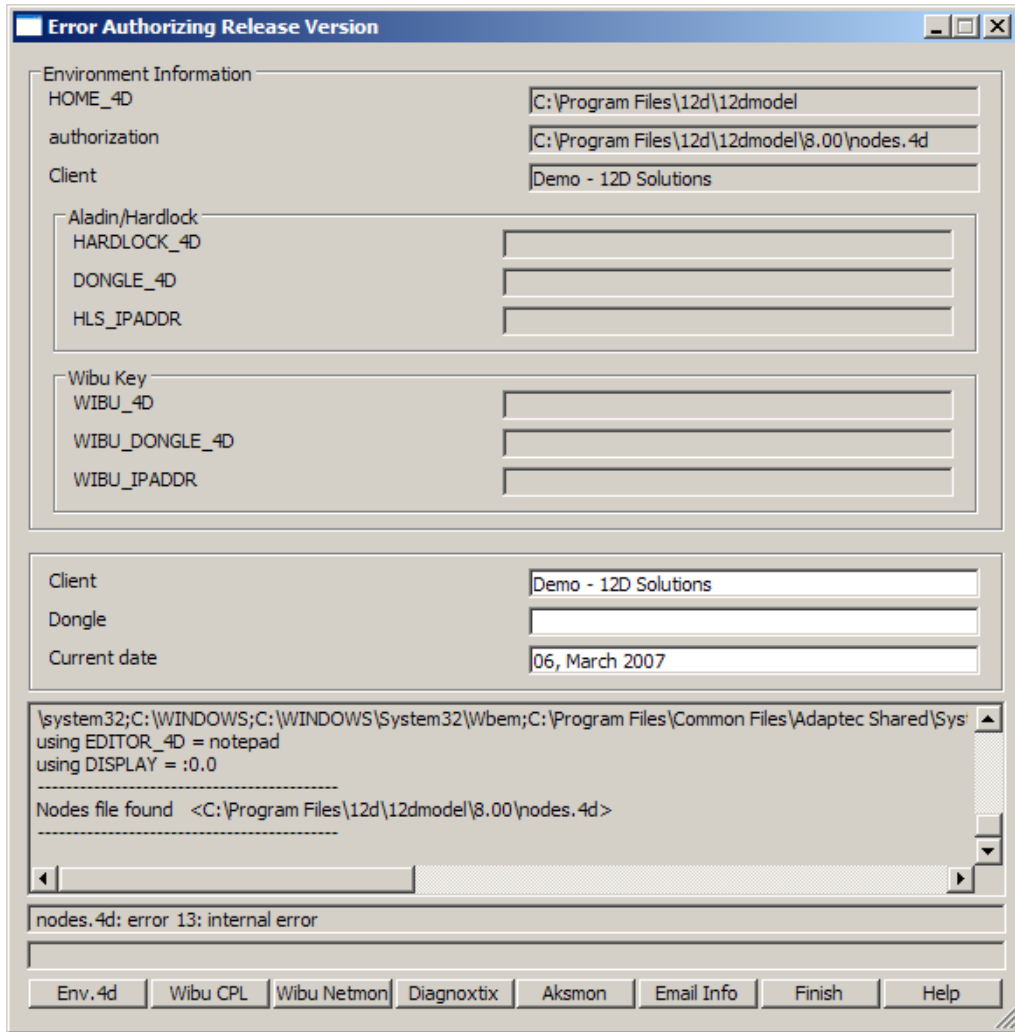
When installing the Release version of 12d Model on the computer, a *nodes.4d* is normally installed at the same time. The *nodes.4d* file must match the *dongle* attached to the printer/USB port and contains the codes for which modules are authorized for the user.

If the *nodes.4d* file is valid, then when 12d Model 8 is started by double clicking on the *12d Model 8* or the *12d Model 8 Training* icon, the 12d Model splash screen will appear and then the initial 12d Model screen with the **Project Selection** panel.



If the **Project Selection** panel appears, then 12d Model is authorized and ready to use.

If there is an **error** with the *nodes.4d* file, then the **Error Authorizing Release Version** panel appears with possibly an error message in the panel message area.



If there is no error message on the panel or it is still not obvious what the problem is, please check the list of possible errors in the next section, “Possible Problems When Authorizing the Release Version”

For example, in the above panel the dongle number is blank which means no dongle has been detected.

If there is still a problem, information can be recorded and emailed to 12D Solutions (to help debug the problem) by clicking on the **Email Info** button to bring up the **Email Information on 12d Model to 12D Solutions** panel.

Email Information on 12d Model to 12d Solutions

WARNING!

The 12d Model release version and all documentation is supplied by 12d Solutions Pty Ltd for the use of 12d Model customers and genuine prospects only. The use of 12d Model release version by commercial competitors to 12d Model is strictly prohibited. The Requester hereby acknowledges that they are not using 12d Model for competitive purposes or passing any information on to a third party that is using the information for competitive purposes. The Requester hereby acknowledges 12d Solutions copyright in the 12d Model software and documentation or whether it has been filed with the copyright office.

Press F1 for help.

First Name Family Name

Company Name

Address

Town/City Post/Zip Code

State Country

Phone Fax

Email Address

Email System

Connected to the internet?

nodes.4d: error 13: internal error

Fill in all the fields and then click on **Email** to try and automatically send an email to 12D Solutions.

If the **Email** button does not send an email, the **Save** button can be used to write the information out to a file called **12d_auth.txt**. This file can then be emailed to **support@12d.com**.

Possible Problems When Authorizing the Release Version

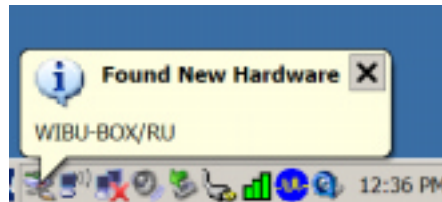
1. There is no *nodes.4d* file in the correct area on your computer.
The *nodes.4d* file is normally in the folder *Program files\12d\12dmodel\8.00*
If you do not have the correct *nodes.4d* file. Contact your local distributor.
2. There is no dongle on your computer or on the network.
Please attached the dongle and retry starting up 12d Model.
3. The dongle number does not come up in the Dongle field of the **Error Authorizing Release Version** panel. Please check
 - (a) the dongle is firmly attached to the computer.
 - (b) if it is a parallel dongle, the dongle is before any Rainbow dongles. For example, before any AutoCAD dongle.
 - (c) your computer has the latest dongle drivers installed. These can be obtained from *Updates* section of the web site *www.12d.com*
If the dongle number still does not come up in the **Error Authorizing Release Version** panel, please click on the **Email info** button to bring up the **Email Information on 12d Model to 12D Solutions** panel. Fill in the panel and click on **Email** to send the information to 12D Solutions and then contact 12D Solutions or your local distributor.
4. The dongle number in the *nodes.4d* file does not match the dongle on the computer.
You do not have the correct *nodes.4d* file. Contact your local distributor.
5. The date on your computer is not the correct date.
Change the date on your computer and retry starting up 12d Model.
6. The date on your computer is the correct date but is not between the *start* and *end dates* given for your dongle in the *nodes.4d* file.
You do not have the correct *nodes.4d* file. Contact your local distributor.
7. 12d Model is still not running.
Please click on the **Email info** button to bring up the **Email Information on 12d Model to 12D Solutions** panel. Fill in the panel and click on **Email** to send the information to 12D Solutions and then contact 12D Solutions or your local distributor.

Wibu XP SP2 Problems

First we installed the WIBU drivers using the WIBU-KEY Setup (Version 5).

Now that the WIBU drivers have been successfully installed, the WIBU USB dongle is attached to the USB port.

Windows XP realises new hardware has been attached to the USB port and the *Found New Hardware* (WIBU-BOX/RU) message is displayed

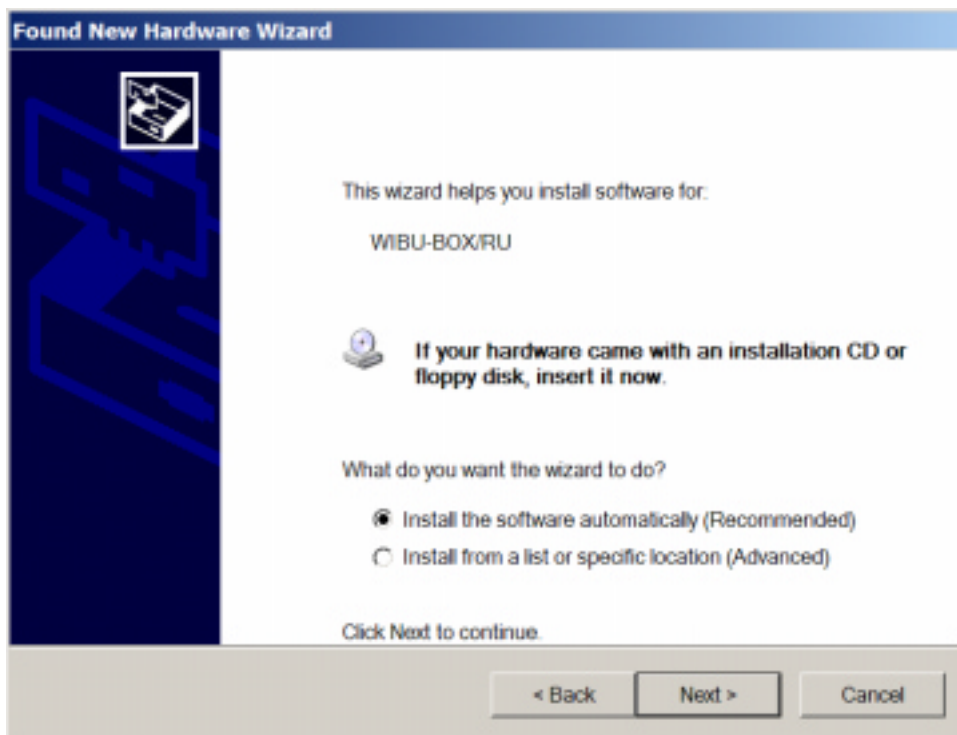


Unfortunately, XP SP2 does not find the WIBU-BOX/RU drivers and install them and you get the Found New Hardware Wizard instead:

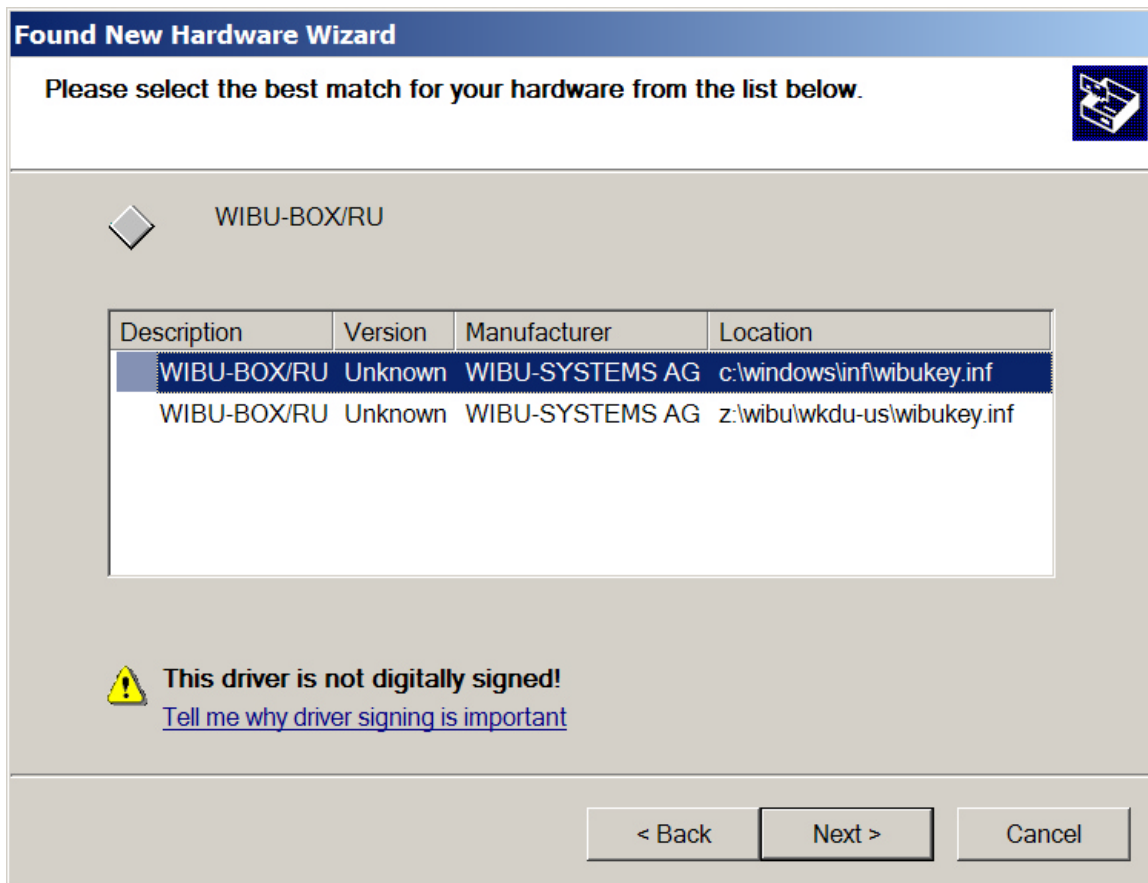




Click on "No, not this time" and select **Next** to continue



try "Install the software automatically" and select **Next** to continue

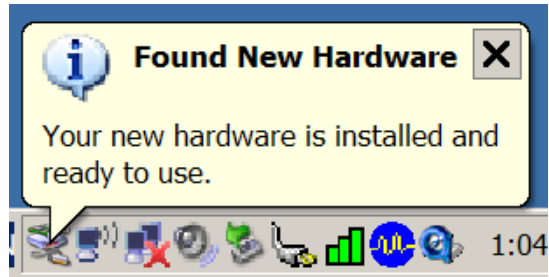


NOTE: XP now finds "C:\windows\inf" but for some reason can't when it first detects the new hardware (as it used to do in earlier XP's and Win 2000).

choose either location and select **Next** to continue



select **Finish**



The New hardware has now been installed

2 Installation of 12d Model 8 Practice Version

The *Practise* version is limited to a maximum of 5,000 points and creates projects that cannot be accessed by the *Release* versions of *12d Model* and vice-versa. However the *Practise* version can be used free of charge by 12D Solutions customers and registered *Practise* Users.

These notes are for installing the ***Practise version*** of 12d Model 8. There are separate notes for installing the *Release* version.

The *Practise* version must be Registered with 12D Solutions once it is installed on a computer. A new Registration is required for each computer that the *Practise* version is run on.

The *12d Model 8 Installation CD* can be used to install the *Practise* versions of 12d Model 8.

Or

The file *12dModel 8 Practise.exe* can be down loaded from the web site www.12d.com. The file *12dModel 8 Practise.exe* is a self-extracting file for installing the *Practise* version of 12d Model.

Extra Notes for All Installations

1. A three-button mouse is essential.
2. The *12d Model Installation CD* contains extra information other than just the installation version of *12d Model*. For example, extra documentation, course notes and source code to macros.

The extra data can be copied from the *12d Model Installation CD* but the copied files may only have a “read only” attribute set. This means that the files can not be edited or modified in any way.

To change the attribute so that a file can be modified, select the file in Explorer, bring up the Properties sheet and under the General tab sheet change the “read only” box so that it is not ticked on.

Selecting ***OK*** or ***Apply*** will then modify the attribute of the file.

Installing the Practise Version of 12d Model 8

These notes are for installing the **Practise** version of 12d Model 8. There are separate notes for installing the **Release** version.

A. Disk Space required for installing 12d Model 8

Approximately 200 megabytes of disc space will be required for the installation to succeed. After installation this can be reduced to a minimum of 60 megabytes.

B. Before installing from the CD or the Web

For Windows 2000, XP:

Reboot the PC **before** installing 12d Model from the CD or the Web.

Your login must have Administrator privileges.

C. Installing 12d Model from the Web

The self-extracting file *12dModel 8 Practise.exe* can be down loaded from the web site *www.12d.com* and used to install the *Practise* version of *12d Model*.

After down loading *12dModel 8 Practise.exe*, double-click on *12dModel 8 Practise.exe* and the installation software will be automatically extracted from the file and fires up the ***Install 12d Model Practise*** screen.

Please go to section "12d Model Practise" Screen"

D. Installing Using the 12d Model 8 Installation CD

Insert the ***12d Model 8 Installation CD*** into the CD drive.

On inserting the CD, the 12d Model Setup program automatically begins.

If it doesn't, simply double click on the program "setup.exe" from the CD.

The ***12d Model Release*** front screen will appear.



Click on the *12d Practise* tab

The *12d Model Practise* screen will appear.

E. 12d Model Practise" Screen

The *12d Model Practise* screen:

Note - when installing from the web, the *tabs* with "12d Release", "12d Practise", "Other Software" and "Documentation" will not appear. The extra tabs only appear if you are installing from the *12d Model Installation CD*.



The Steps on the *12d Practise* tab of the Installation CD will lead you through the installation of the *Practise* version of *12d Model*.

The names of each screen and the required response are given in the order in which the screens appear.

Step 1. Install Camtasia Codec

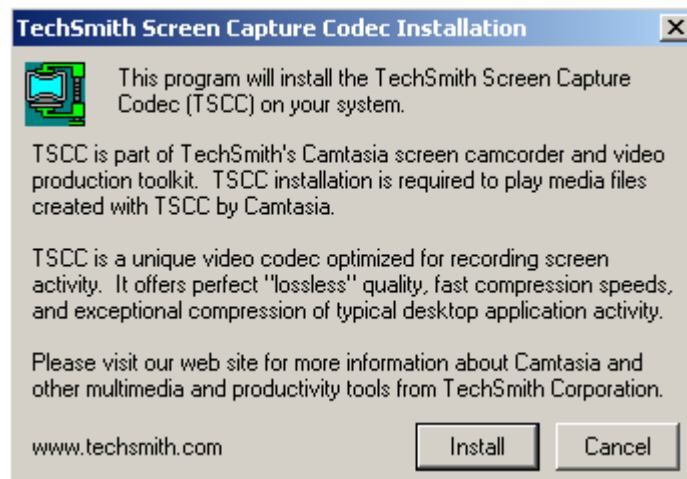
Install the drivers for use with displaying the 12d Model Training CDs and DVDs.

Note - you need Administrator rights to install the Camtasia Codec.

Click on *Camtasia codec*:

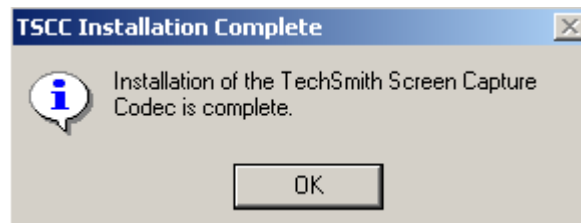
Installation

Installation message



Select **Install** to continue with the installation

Installation Complete



Select **OK**.

This completes the installation of the *Camtasia Codec*.

The *12d Model Practise* screen will then appear.

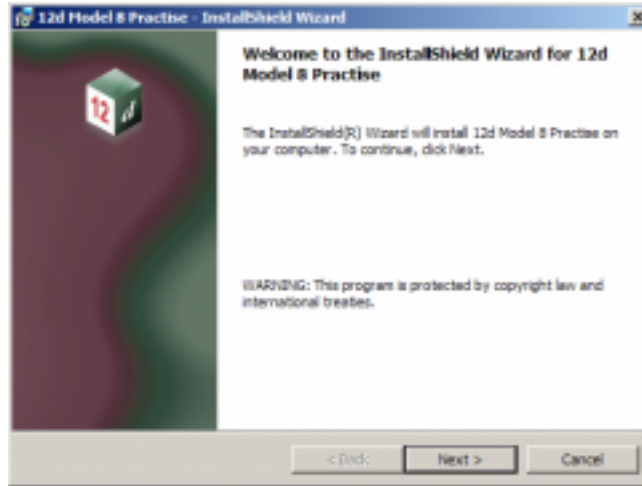
Step 2. Install 12d Model 8 Practise

Install the 12d Model Practise software and Training area.

Click on *12d Model 8 Practise*:

Welcome

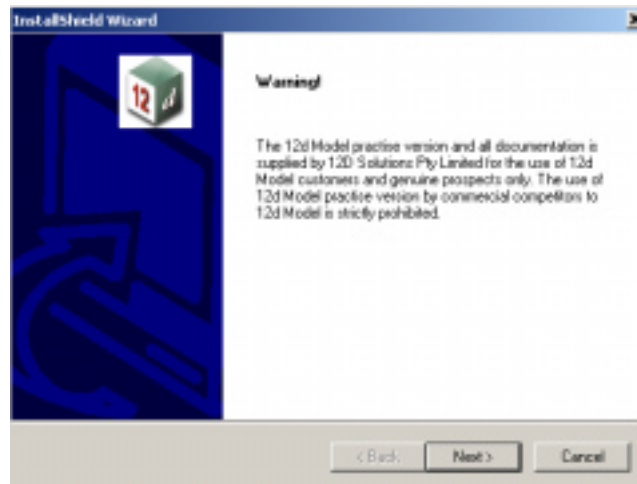
Welcome message



Select **Next** to continue with the installation

Warning for commercial competitors

12D Solutions warning



The 12d Model Practise version and all documentation are supplied by 12D Solutions Pty Limited for the use of 12d Model Customers and genuine prospects only. The use of the 12d Model practise versions by commercial competitors to 12d Model is strictly prohibited.

Select **Next** to continue if you are a 12d Model Customers or a genuine prospect

Software License Agreement

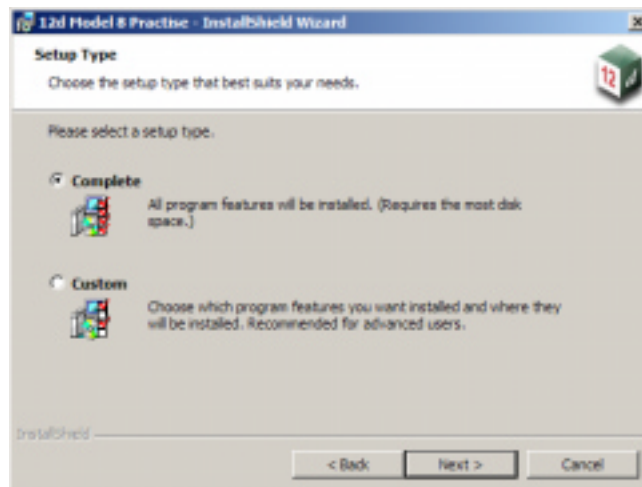
12D Solutions license agreement



If you agree with the License conditions, click on *I accept the terms in the license agreement*

Select **Next** to continue with the installation

Setup Type

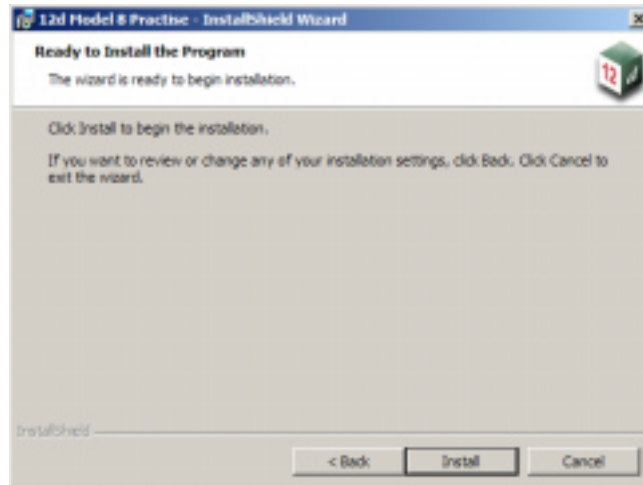


select **Complete**

select **Next** to continue with the installation

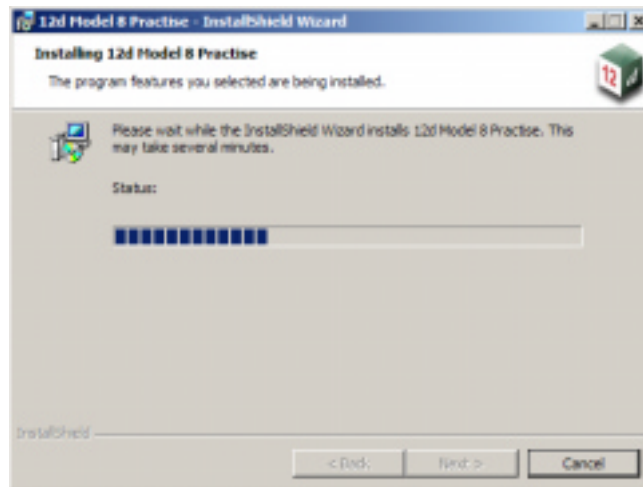
Ready to Install

Begin the installation



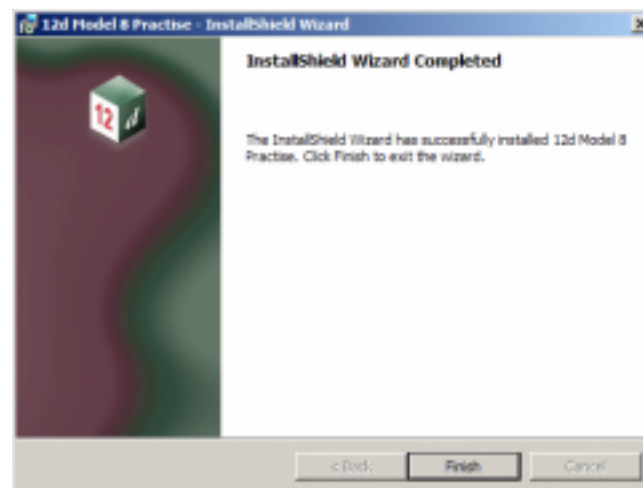
select **Install** to continue the installation

The software will be copied onto the computer and installed.



Setup Complete

End of installation



Select **Finish** to complete the installation

The *12d Model Practise* screen will then appear.



Select **Exit** at the bottom right hand corner of the screen to end the installation.

For *Practise* versions, the software needs to be authorised by emailing information about your computer to 12d Solutions.

The form for the required information is automatically created when an unauthorised 12d Model Practise version is started up. The form can be emailed to 12D Solutions from the 12d software.

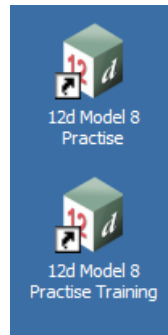
Icons Created by Installing 12d Model Practise

The installation loads the appropriate components and creates the icons

Practise

12d Model 8 Practise

12d Model 8 Practise Training



The *12d Model 8 Practise* icon attaches to the folder *12d Model 8 Practise*.

The *12d Model 8 Practise Training* icon attaches to the folder containing the data to use with the *Getting Started for Design*, *Getting Started for Surveying* and other training manuals.

Authorizing the Practise Version of 12d Model 8

[authorization_request_form](#)

[accept_code](#)

Warning

The *12d Model Practise* version and all documentation is supplied by 12D Solutions Pty Ltd for the use of 12d Model Customers and genuine prospects only. The use of the *12d Model Practise* version by commercial competitors to 12d Model is strictly prohibited.

The Practise version is limited to a maximum of 5,000 points and creates projects that cannot be accessed by the Release versions of 12d Model and vice-versa. However the Practise version can be used free of charge by 12D Solutions customers and registered Practise Users.

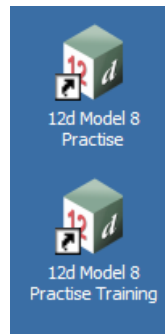
The Practise version needs to be Registered with 12D Solutions once it is installed on a computer and a new Registration is required for each computer the Practise version is run on.

The installation creates the two icons

Practise

12d Model 8 Practise

12d Model 8 Practise Training



The *12d Model 8 Practise* icon attaches to the folder *12d Model 8 Practise*.

The *12d Model 8 Practise Training* icon attaches to the folder containing the data to use with the *Getting Started for Design*, *Getting Started for Surveying* and other training manuals.

After installing the Practise version of 12d Model on the computer, fire up **12d Model Practise** by double clicking on the *12d Model 8 Practise* icon

12d Model Practise will then start up and the **Authorize Request Form** panel will be displayed.

WARNING!

The 12d Model practise version and all documentation is supplied by 12d Solutions Pty Ltd for the use of 12d Model customers and genuine prospects only. The use of 12d Model practise version by commercial competitors to 12d Model is strictly prohibited. The Requester hereby acknowledges that they are not using 12d Model for competitive purposes or passing any information on to a third party that is using the information for competitive purposes. The Requester hereby acknowledges 12d Solutions copyright in the 12d Model software and documentation or whether it has been filed with the copyright office.

Press F1 for help.

First Name Family Name

Company Name

Address

Town/City Post/Zip Code

State Country

Phone Fax

Email Address

Email System

Connected to the internet ?

practise.4d: error -1:

Fill in the details (all those in black type must be filled in) and then either

(a) click on the **Email** button to send the information to 12D Solutions Pty Ltd.

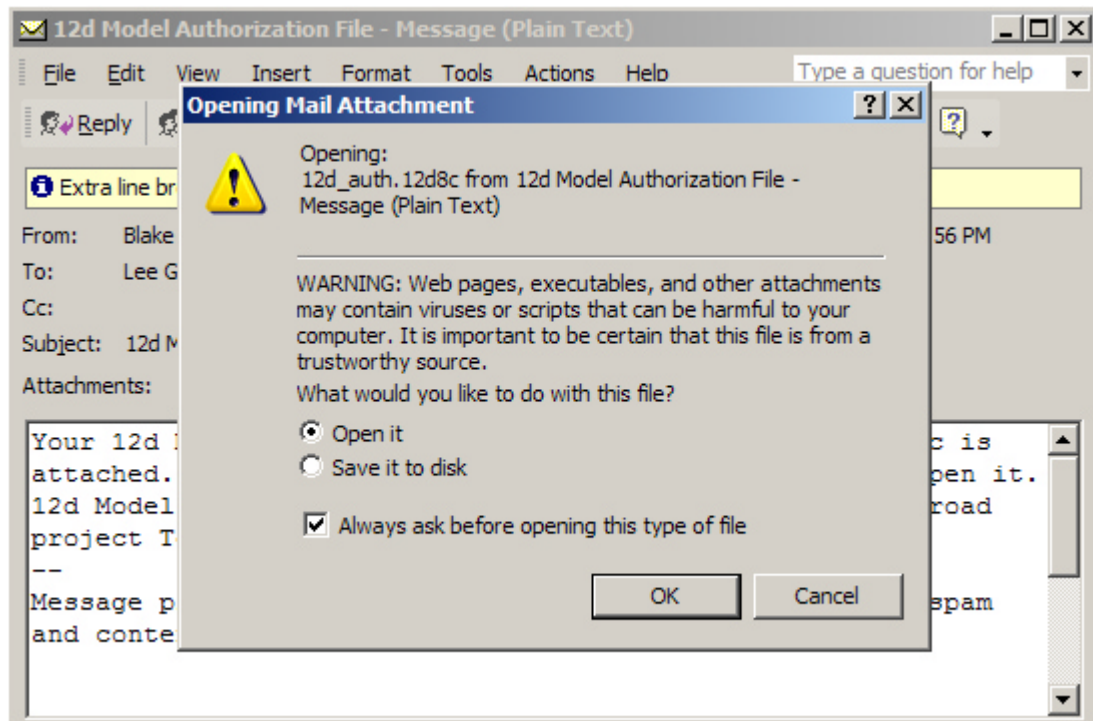
or if this fails

(b) click on the **Save** button. A file called *12d_auth.12d8r* is then written out. Please email this file (as an attachment) to authorize@12d.com

Then click on the **Finish** to exit *12d Model*.

On receiving your request, 12D Solutions will generate an authorization code and send an email back to you with an attachment called *12d_auth.12d8c*

When you receive the email with the file *12d_auth.12d8c* attached to it, double click on the attached file *12d_auth.12d8c*, click on **Open it** and finally click on **OK**.



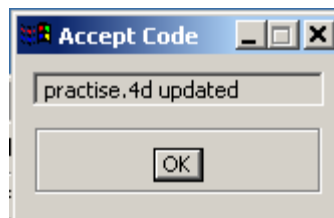
12d Model Practise will then start up and

validate the *12d_auth.12d8c* file, and if it is valid

save the authorization code away as the file *practise.4d* in the folder

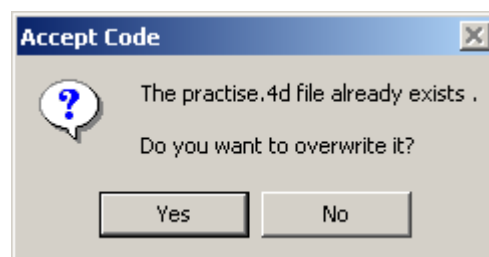
Program files\12d Model 8 Practise\12d model\8.00

and then bring up the **Accept Code** panel with the *practise.4d updated* message.



Click on **OK** and *12d Model Practise* will open and display the project *Road*.

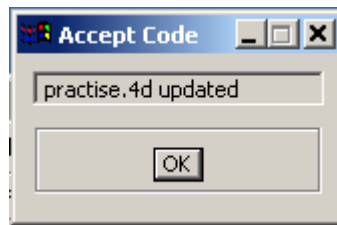
*Note: if you already have a practise.4d file in the folder then the **Accept Code** panel will be brought up, stating that the practise.4d file already exists, and asking to overwrite it.*



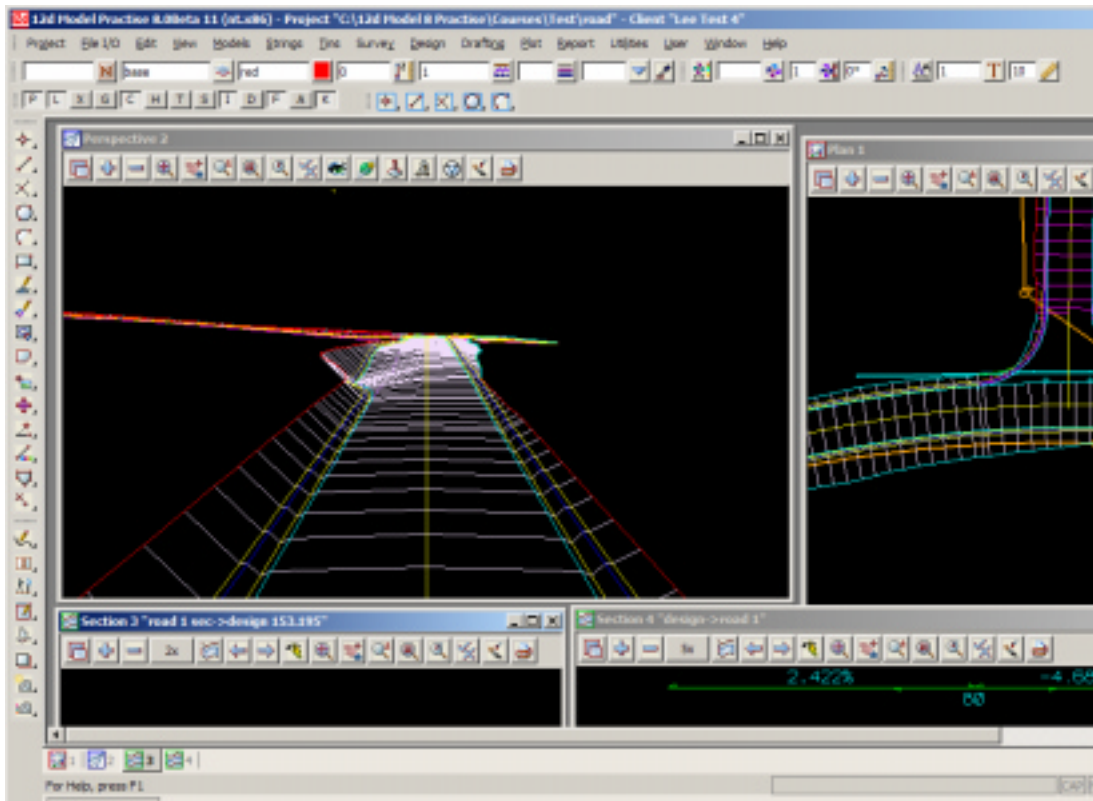
Click on **Yes** and the new authorization code will be saved away as the file *practise.4d* in the folder

Program files\12d Model 8 Practise\12d model\8.00

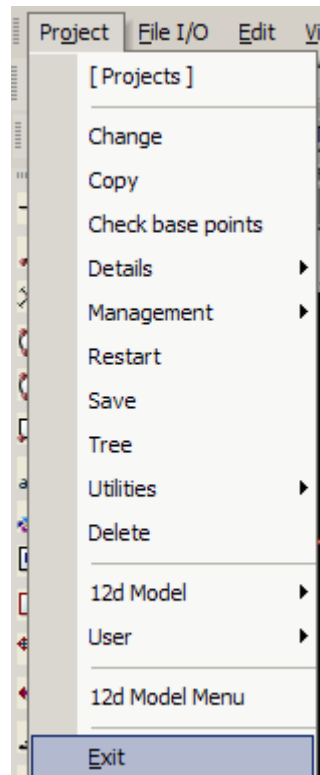
The *Accept Code* panel then comes up with the *practise.4d updated* message.



Click on *OK* and *12d Model Practise* will open and display the project *Road*.



To exit *12d Model Practise*, click on **Project =>Exit**



If *12d Model Practise* does not start up correctly, please go to the next section “Possible Problems When Authorizing the Practise Version”

Possible Problems When Authorizing the Practise Version

1. The date on your computer is not the correct date.
2. The computer your are authorizing is not the same one that the *Authorisation Request Form* was generated for.

The *12d_auth.12d8c* and the generated *practise.4d* file are only valid for the computer that the *Authorisation Request Form* was generated on. If you want the Practise version to run on another computer, you need to generate a new *Authorisation Request Form* on that computer and send it to 12D Solutions.

3. If you change your network card after generating the *Authorisation Request Form* then the authorization will stop working. A new *Authorisation Request Form* needs to sent to 12D Solutions.
4. If the file *12d_auth.12d8c* does not appear as an attachment then your email system can't handle MIME attachment. Please contact 12D Solutions at authorize@12d.com

3 Tools and Concepts

The Mouse

The mouse is used extensively in 12d Model.

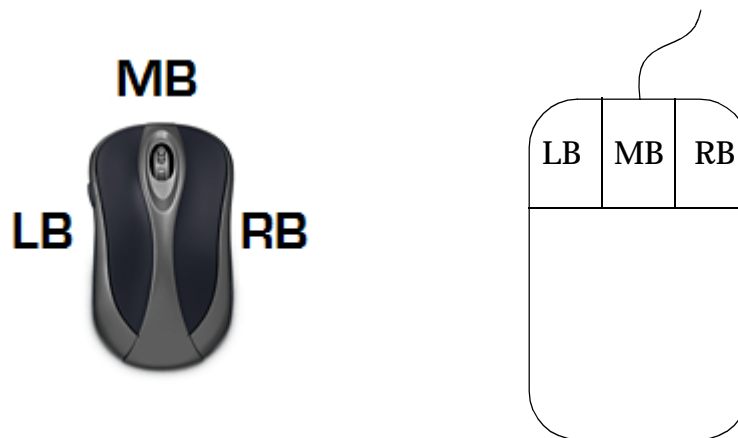
12d Model can be operated with either a two or a three button mouse but a three button mouse is preferred.

In this manual the buttons will be denoted by

LB = the left button

MB = the middle button

RB = the right-button



12d Model monitors the mouse being pushed down and when it is subsequently released as separate events. Unless otherwise specified in the manual, **clicking** a button will mean **pressing the button down and releasing it again**. The **position of the mouse** is normally taken as being when the **button is released**.

In screen messages, the effect of pressing each button on the mouse is shown by enclosing the effect for each button in square brackets ([]) in left-to-right button order. That is

[left button effect] [middle button effect] [right button effect]

Empty brackets, [], indicate that pressing the button has no effect at that time.

NOTE: If the Middle button is also a wheel, then the wheel can be used in some 12d Model operations such as zoom.

Please continue to the next section “The Keyboard”.

The Keyboard

For clarity, the characters and special keys on the keyboard will be enclosed in the angle brackets < >. For example, the delete key is .

When two or more keys are to be pressed down together, they will be shown in angle brackets

separated by a plus sign (+).For example, <ctrl> + <d> means that the control key and d are pressed down together.

In 12d Model, the *escape* key (normally labelled "esc" on the keyboard and denoted by <esc> in this manual) is used to **stop drawing** in a view or to **break out** of computer intensive options ("escape" or "abort" the option) but still remain in 12d Model. Options which can be terminated by <esc> are noted in the manual.

Please continue to the next section "Screen Layout".

Screen Layout

Inside the 12d Model screen are six distinct areas (main menu, top tool bar area, side tool bar area, view area, output window and status bar) which create and control nine associated objects (panels, tool bars, control bars, floating menus, plan views, section views, perspective views, hidden perspective views and OpenGL perspective views) displayed on the screen.

The main areas and their purposes are:

(a) Main Menu

The **Main Menu** is at the top of the 12d Model screen and is a standard Microsoft type menu. Options are selected in the standard Microsoft way and bring up 12d Model **panels** and **floating menus**.

(b) Views Area

The **Views Area** displays the 12d Model drawing views for seeing and examining the data. There is no limit to the number of **plan**, **section** or **perspective** and **hidden perspective views** that can be created, overlapped or iconized.

(c) Output Window

The **Output Window** displays 12d Model system and error messages. The Output Window can be turned on/off from the Main menu.

(d) Status Bar

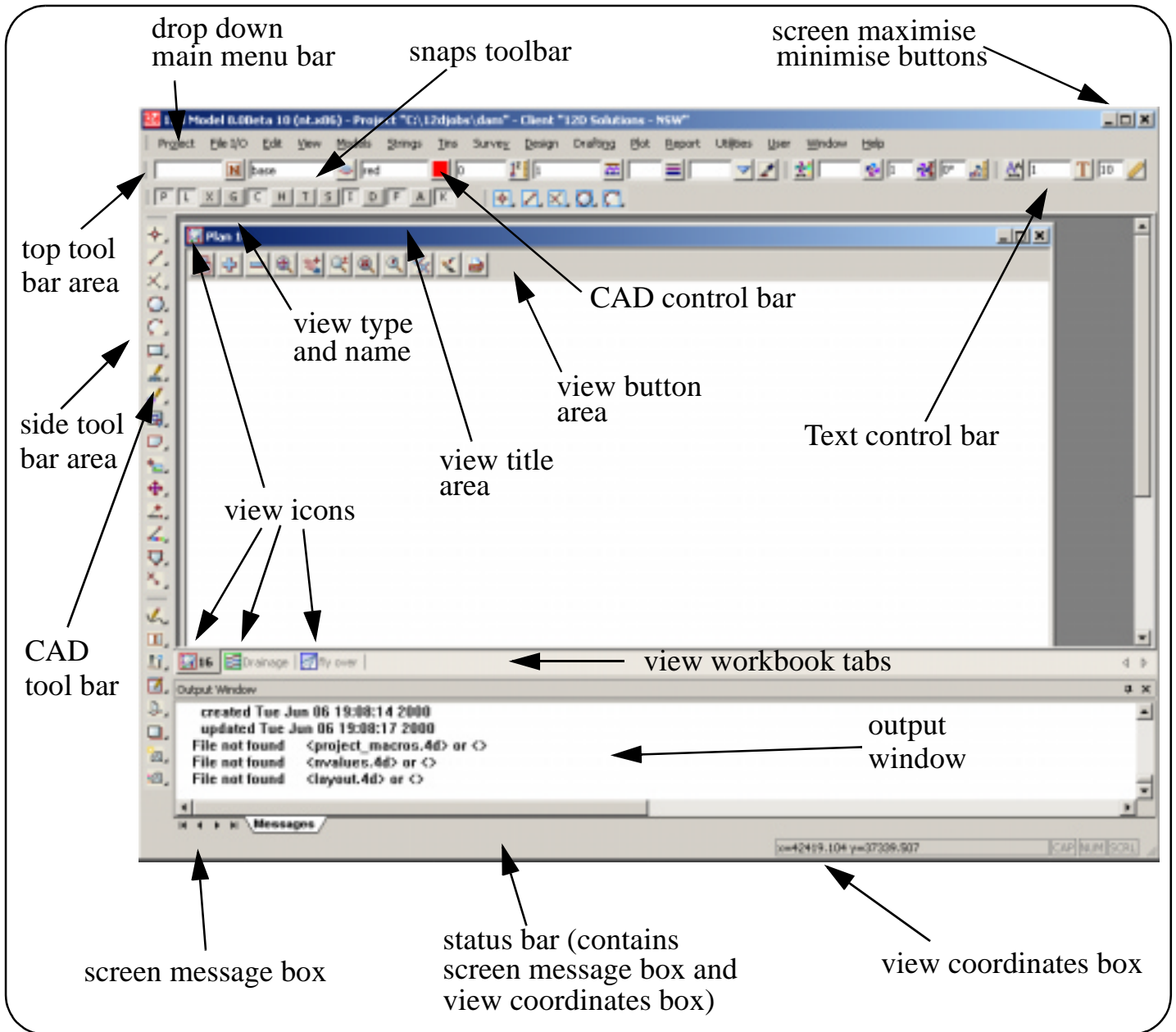
The **Status Bar** displays message prompts and the x, y and z co-ordinates of the cursor when it is in a drawing view. The Status Bar can be turned on/off from the Main menu.

(e) Top Tool Bar area

The **Top Tool bar area** is below the Main Menu and contains the CAD control bar, Text control bar and the snaps toolbar.

(f) Side Tool Bar area

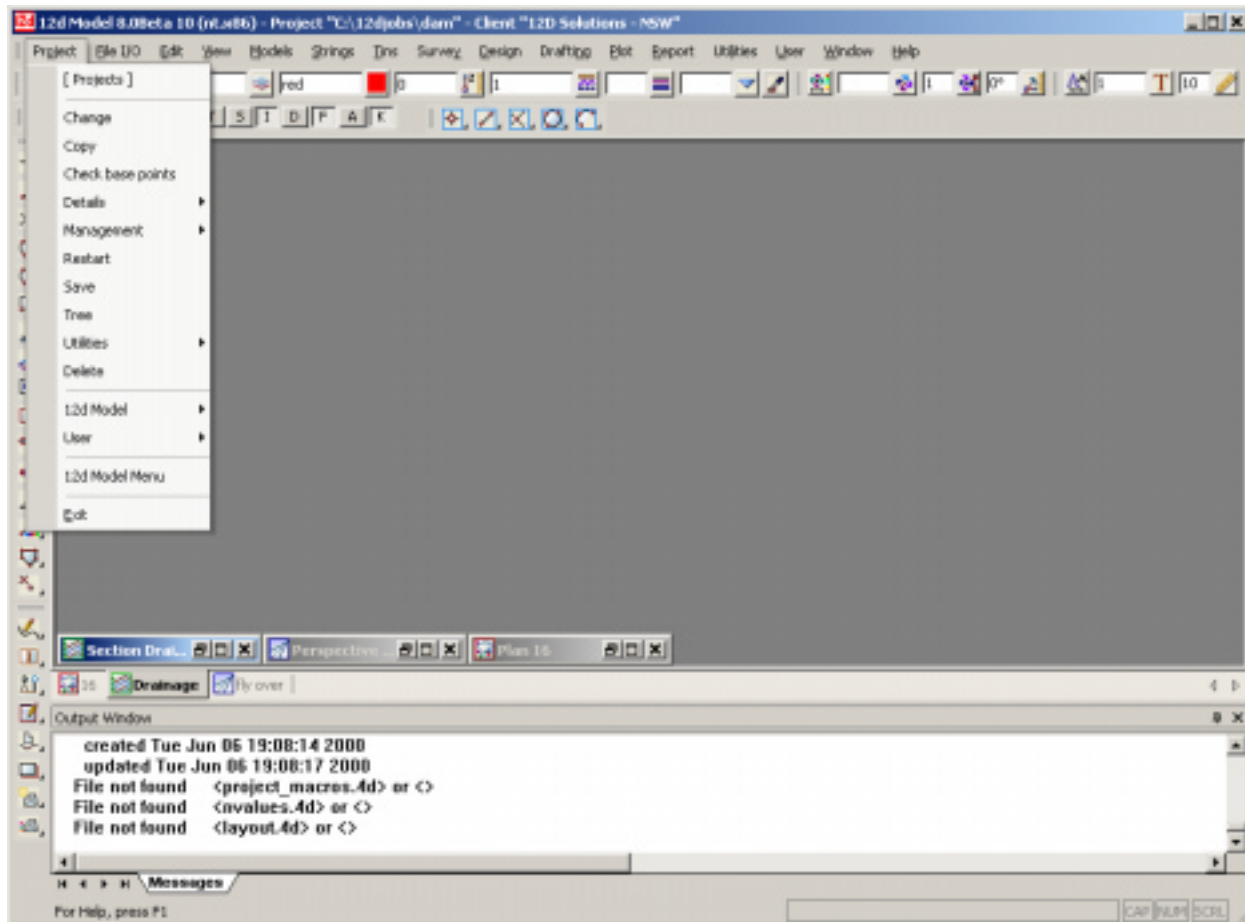
The **Side Tool bar area** is on the far left side and the CAD tool bar and other tool bars defined in *Toolbars.4d*



Please continue to the next section "Main Menu".

Main Menu

At the top of the 12d Model window is the Main menu, a standard Microsoft type menu.



Options can be selected in the standard Microsoft way and bring up 12d Model panels (dialogues) or create floating menus.

The Main menu can be moved around, or docked on any of the four sides of the window.

If the window is not wide enough, the Main menu will automatically wrap around onto two or more lines.

Please continue to the next section “Floating Menus”.

Floating Menus

As well as the standard Microsoft type menu, 12d Model has the concept of **floating (tear away) menus**.

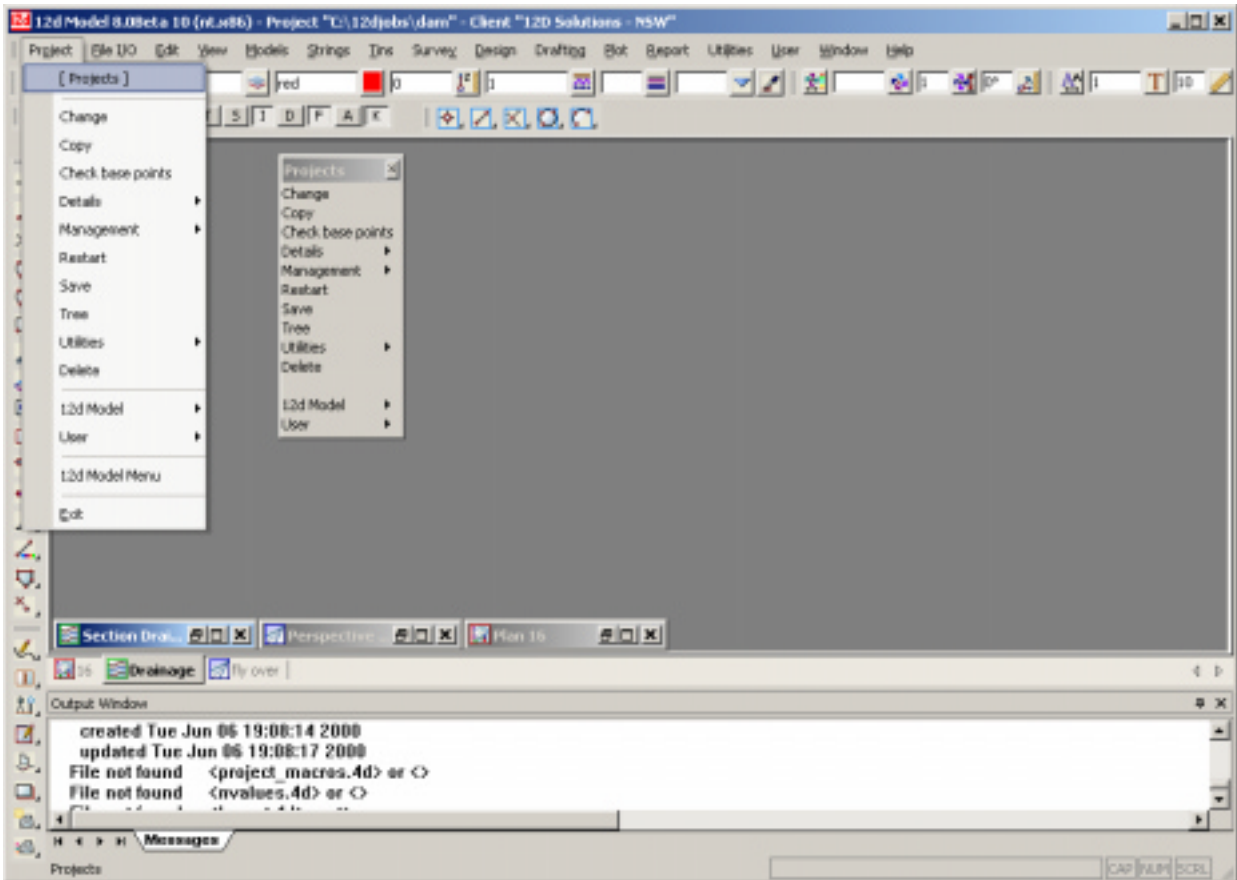
The presence of a floating menu on the Main menu is indicated by a menu item enclosed in square brackets []. Selecting a menu item in square brackets will create a floating menu of that name.

For example, selecting [Project] from the top menu Project creates the floating menu called Projects.

A floating menu can be moved around the screen, even outside the 12d Model window, and will stay up until the [X] button is selected on the top right hand side of the floating menu.

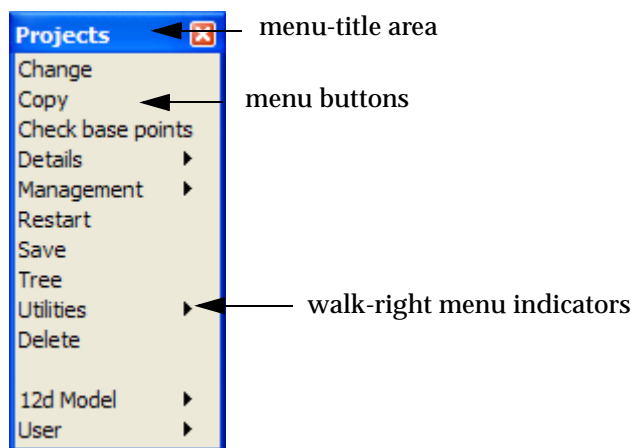
A floating menu created from the Main menu usually contains the same items and walk-right

menus as the Main menu but has the distinct advantage that it doesn't disappear when the cursor is moved to select other menus from the Main menu.



Floating menus or just Menus, consist of a menu title area and a series of options, called menu buttons, lined up under the menu title.

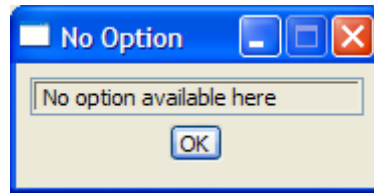
For example, the Projects menu looks like



no_option

An option on the menu is invoked (or selected) by clicking LB whilst over the option.

If no option exists, a **No Option** panel is placed on the screen. The panel will remain until the **OK** or **[X]** button is selected.



A ">" on a menu-option indicates that there is a walk-right menu attached to that button.

The walk-right menu only appears as the cursor **moves over** the >.

The walk-right menu can consist of further menu options and walk-rights.

If a walk-right menu is showing and the user wanders back into the menu where the walk-right originated, the walk-right menu will collapse back to the >.

Moving a Menu

A menu can be moved (dragged) by **holding down LB** anywhere in the menu title area (except on the [X] button) and then moving the cursor with the LB still depressed. A menu outline appears and moves with the cursor to indicate where the new menu position will be. The menu is finally positioned when LB is released.

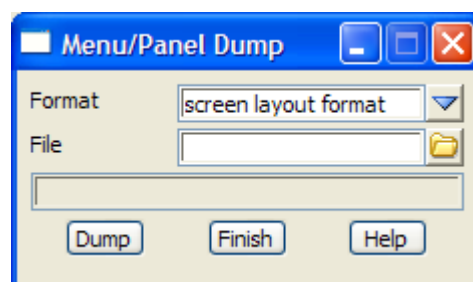
When an expanded walk-right menu is moved, a **copy** of the walk-right menu will be moved and placed on the screen as a new floating menu. The original menu still contains the walk-right menu.

Dumping a Menu

menu_panel_dump

An image of the menu can be written out to disk in either bmp, tif, colour postscript or a screen layout file. This is called dumping the menu.

The **dump** option is invoked by clicking the middle mouse button (MB) anywhere in the menu title area. The **Menu/Panel Dump** panel is then displayed



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Format	input	screen layout file	bmp, colour postscript, tif, screen layout file

format for writing the image to disk.

File input

disk file to write the dump image to.

Dump button

dump the menu image to disk.

Deleting a Menu

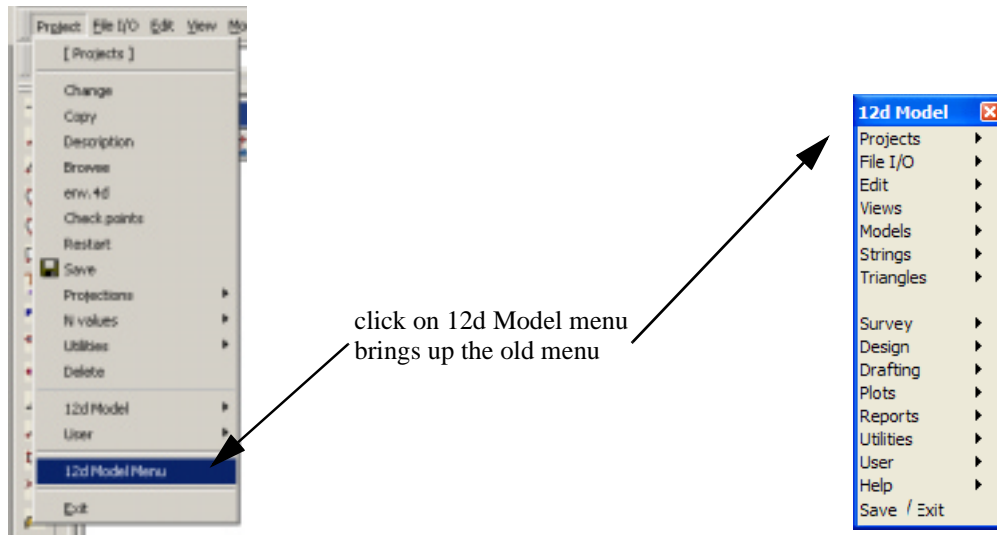
A floating menu is deleted by selecting the [X] button in the menu-title area.

Please continue to the next section “12d Model Menu”.

12d Model Menu

The **12d Model** menu familiar from 12d Model version 3.20 is available by selected **12d Model Menu** on the **Projects** menu.

Selecting **12d Model Menu** again will *remove* the **12d Model** menu.



All of the options down the **12d Model** menu are also available in the same order going across the Main menu.

Please continue to the next section “Toolbars and Controlbars”.

Toolbars and Controlbars

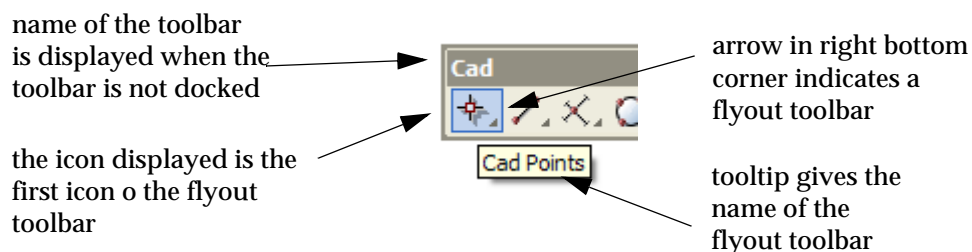
Toolbars

Options can be grouped together on *toolbars*. *Toolbars* are made up entirely of *icons* and each icon can have a 12d Model option attached to it.

Toolbars have unique names which are displayed on the top of the toolbar when it is not docked.

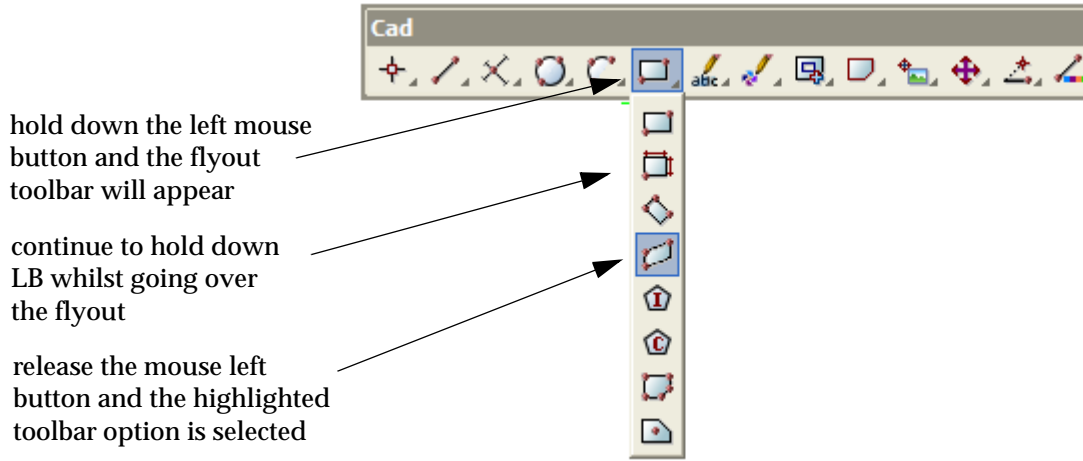
Toolbars can also have one level of **Flyouts** of other toolbars and when a flyout exists, there is a small arrow on the bottom right of the icon to indicate a flyout exist. The *tool tip* for the icon gives the *name* of the flyout toolbar. The actual icon itself is the icon of the *first item* on the *flyout* toolbar.

For example, the *CAD toolbar* is entirely made up of flyout toolbars.



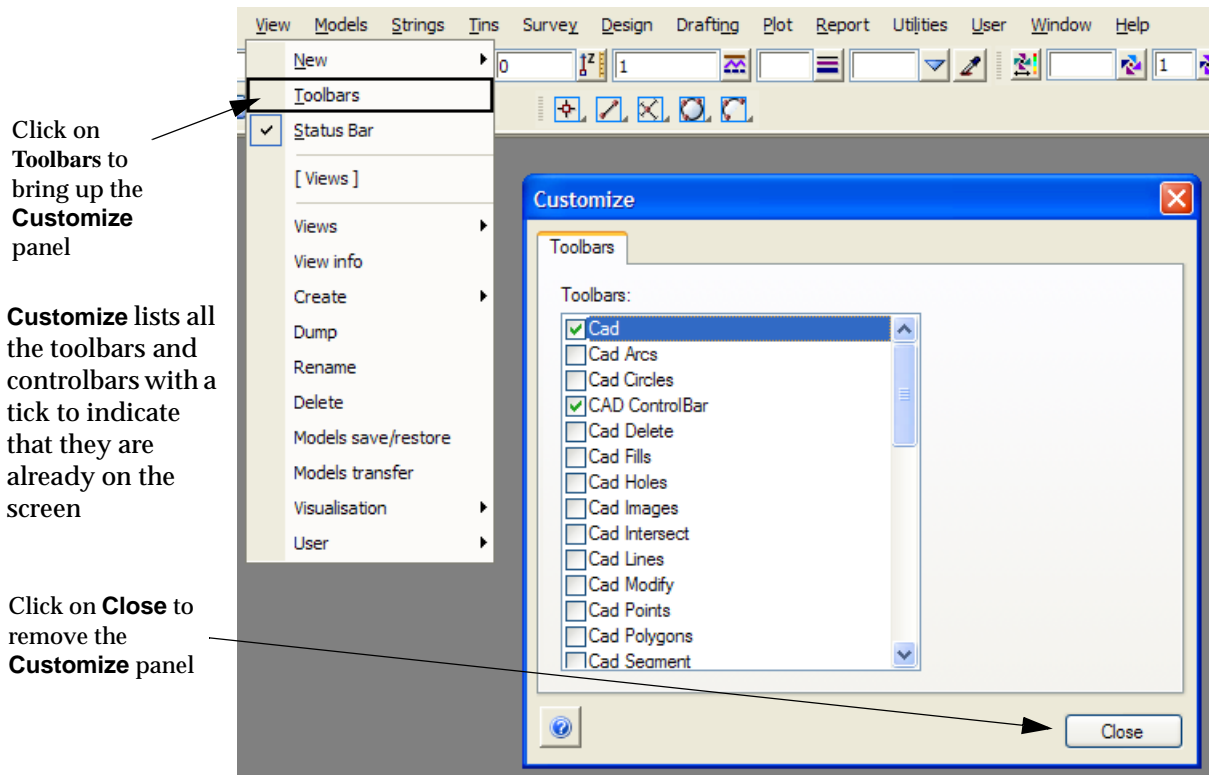
To display and select from a flyout toolbar, hold down LB whilst over the icon on a toolbar with a flyout menu and the flyout menu will appear. Whilst still holding down LB, move along the flyout toolbar to the appropriate option and then release LB. The option attached to the highlighted icon will then be selected.

Note - if LB is released whilst a icon with a flyout toolbar is highlighted, the first option on the flyout tool bar is selected.



All the toolbars in 12d Model are defined in a file with the default name *toolbars.4d* (for the definition of toolbars, see the section “User Defined Toolbars” in the Appendix “Functions Keys, Menus, Toolbars”).

The list of all defined toolbars is given by selecting **View =>Toolbars** from the main menu which brings up the **Customize** panel. A toolbar is shown with a tick if it is already on the screen.



Ticking **on** a toolbar in the list brings up the toolbar in the top left hand corner of the screen. The toolbar can then be moved or docked.

Ticking **off** a toolbar in the list removes the toolbar from the screen.

Important Note - the toolbars are not active whilst the **Customize** panel is on the screen. Close the **Customize** panel as soon as you finished with it.

What toolbars are on the screen and their position is recorded with the project so that when a project is existed and later started again, the final position of the toolbars is restored.

Also at any time, a workspace file can be read in and define a new setup and position of toolbars. For more information on using workspace files, please go to the section “Workspace” in the chapter “Projects”.

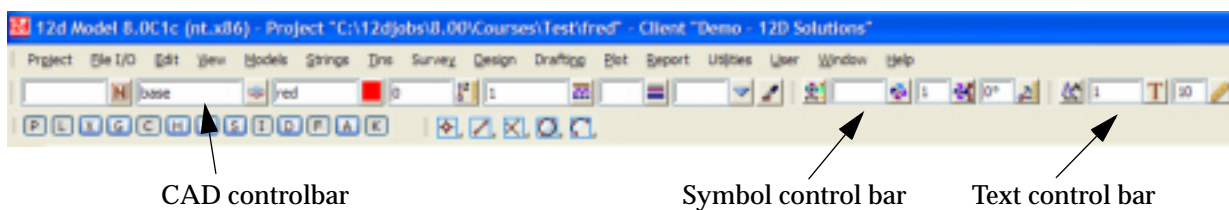
For links to the options on each *Toolbar*, go to “Options on Toolbars”

Controlbars

Controlbars can have icons on them but they also have controls such as a model box on them.

Controlbars are not user defined and there are only three of them in *12d Model* - the **Cad Controlbar**, **Symbol Controlbar**, and **Text Controlbar**.

This default position of the *controlbars* is on the top left hand side of the screen under the main menu.



Although not toolbars, the *Controlbars* do appear in the *Toolbars* list in the **Customize** panel and can be turned on/off and docked just like toolbars.

Important Note - the toolbars are not active whilst the **Customize** panel is on the screen. Close the **Customize** panel as soon as you finished with it.

The *controlbars* are used by *CAD toolbars* and the *Strings Create* options. *Strings* created by the *CAD toolbars* and *Strings Create* options use values in the *controlbars* to define string attributes such as name, model and colour.

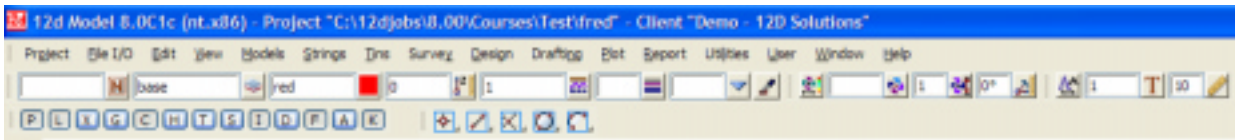
Like toolbars, the type and position on the screen of controlbars is recorded with the project so that when a project is exited and then started later, the final position of the *controlbars* is restored.

Also at any time, a workspace file can be read in and define a new setup and position of the *controlbars*. For more information on using workspace files, please go to the section “Workspace” in the chapter “Projects”.

The three *Controlbars* will be described in detail in the section “CAD, Symbol and Text Controlbars” in the chapter “Strings”:

Snap Toolbar

The **Snaps (Horiz)** menu has been replaced by the **Snaps Toolbar** which has the default position at the top left hand side of the *12d Model* screen, under the controlbars.



snaps toolbar



Snaps are documented in the section “Snaps”.



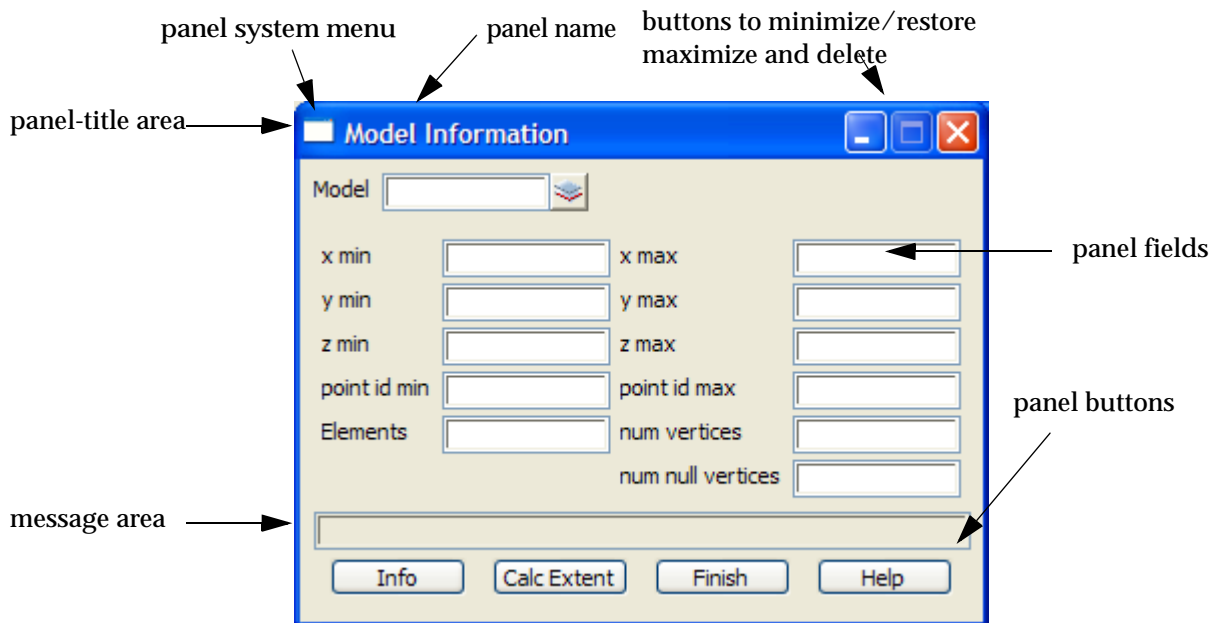
Panels

After a menu option has been selected, extra information is often required before the operation represented by the menu option can begin.

For example, before the contour option can proceed, the required contour interval must be supplied.

In 12d Model, an object called a **panel** is used to collect and validate any extra information required to run the option.

For example, the **Model Information** panel is



A Panel consists of four types of areas.

Panel title area

Contains the title (name) of the panel, the buttons to minimize and restore the panel, and the [X] button. In the example above, the panel title is **model information**.

Panel fields

These are both input and output areas for the panel. The user can type answers into some fields (input and output fields) or the program may display special information in the fields (output only fields). In the example, Model is an input/output field, xmin is only an output field.

If the panel field is *optional*, then the description text is greyed out - entering data into the field will cause the text to be redrawn in black.

If there are choices available to select from for the panel field, a + is displayed at the right hand side of the field. Selecting the + brings up a panel field pop-up (documented below).

Message area

Each panel has its own area where 12d Model displays messages for the option.

Messages are used for a variety of purposes including

- ▲ indicating the **next step** in a complex option
- ▲ reporting **errors**
- ▲ giving **progress** in time consuming operations

- ▲ informing that an option has **completed** successfully.

Most messages are sent to the panel message area but a few are displayed in the Status Bar.

Panel buttons

Buttons are used on the panel to select things or control the processing of the panel. Almost every panel has minimize and restore button, and a **Finish** and **[X]** buttons which when selected will end the option and remove the panel from the screen. All panels also has a **Help** button which brings up on-line help about the panel.

The minimize, restore, **Finish**, **[X]** and **Help** buttons will not be documented for each panel.

Data Entry in a Panel

To help save the user time, many panel fields have default answers.

However, any panel field value can be replaced by typing in new information (**typed input**) or when available, by selecting an answer from the **panel field pop-up** or using special name completion characters.

All panel fields are validated before the option runs and any error messages displayed in the panel message area.

Typed input

To type information into a panel field, move the cursor to the position for the information, left click to get focus in the panel field and then start typing. The information will go into the field starting at the input-position indicator (a upright bar in the panel field).

The input-position indicator can be moved by

- ▲ clicking LB when the cursor is at the new position for input
- ▲ using the keys `->`, `<-`, home and end

The **backspace** key, `<backspace>`, will delete one character before the input-position indicator and the **delete** key, ``, will delete one character after the input-position indicator.

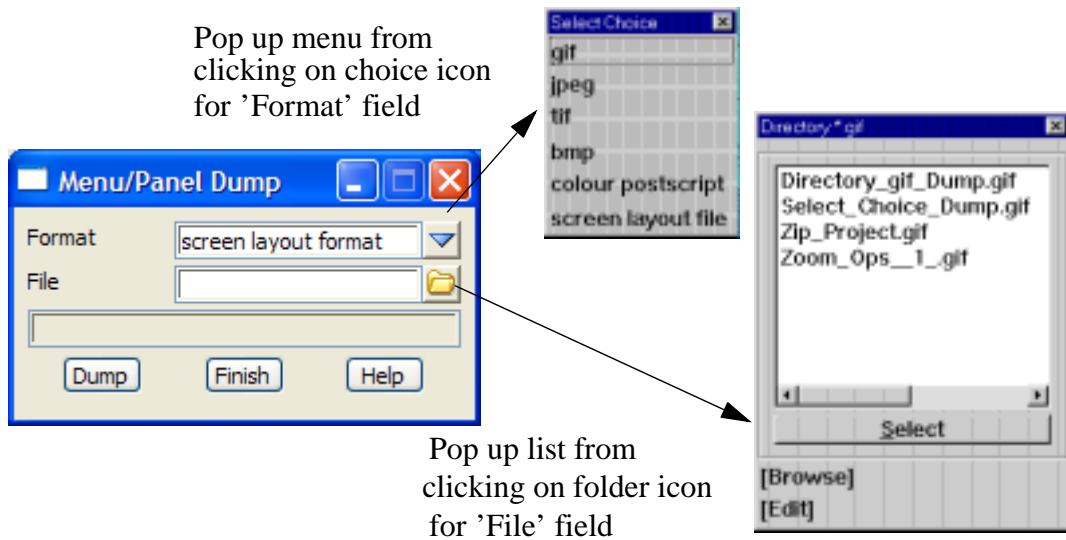
The user can move to any field in the panel by using the mouse. The `<tab>` key will move the cursor to the next panel field or button and `<shift>+< tab>` will move the cursor to the previous panel field or button.

Note - the entire field is used as the answer, not just up to the input-position indicator. The input-position indicator indicates where the characters will go when typing, not the end of the data.

Pop-Up Lists and Menus

The **panel field pop-up list** or **menu**, or panel field pop-up, is raised by clicking LB on the `[+]` or other choice icons at the right of the panel field.

A panel field pop-up consists of a list of choices which may be displayed as either a *menu* or a *list*.



For a pop-up list, an answer is chosen from the list by **double** clicking LB over the required answer. This answer is then displayed in the panel field and the pop-up list disappears.

For a pop-up menu, an answer is chosen from the pop-up menu by clicking LB over the required answer. This answer is then displayed in the panel field and the pop-up menu disappears.

The pop-up list or menu can also be removed without a selection by clicking LB on the [X] on the pop-up list or menu, by clicking LB again on the icon or [+] for the panel field, or by simply typing into any visible part of the panel field that the pop-up is for (some of the field may be obscured by the pop-up itself).

The pop-up lists and menus and the choice icons are described in more detail in the section on *Special Panel Fields*.

Name completion

To help speed data entry a process called **name completion** is available in most panel fields. <ctrl> + <d> is the special key combination used for name completion and how it works will now be described.

If one or more characters have been typed into a panel field and the <ctrl> + <d> combination is pressed, then 12d Model checks to see how many answers in the available pop-up start with the same typed characters. If a unique match exists, then it will be placed into the panel field. If more than one match exists, a pop-up menu with all the matches will be presented for the user to select from.

Name mapping

When typing a string name into a panel field, a **name mapping file** can be specified and is used to fill out information such as colour, model etc. for given string names.

The name mapping works in two ways. After typing part or all of a string name,

- (a) if <enter> is entered, the name map file is searched for a match in the first column (the key). If a match is found, the name, colour, model, style etc. from the other columns in the name mapping file are used to fill out the panel fields. The key can contain wild cards and/or characters.
- (b) if <ctrl> + <d> is entered, the **second** column of the name mapping file is searched for a list of completions which is written to the field if it is unique or displayed in a pop-up if there is more than one match. If a * is found in the second column, the first column is used for matching. When an entry is selected from the completion list, the name, colour, model, style etc. from the columns in the name mapping file are used to fill out the panel fields.

If a name mapping file exists, then the [+] for the *name* panel field will include the entries from

the first column of the name mapping file. If an item is selected from the list, then the name, colour, model, style etc. from the columns in the name mapping file are used to fill out the panel fields

The name mapping file is pointed to by the environment variable

NAME_MAPPINGS_4D

or is if the environment variable is not set, the default name is **names.4d**.

During a 12d Model session, the name mapping file can be changed by the *Name Settings* tab on the option **Utilities=>Defaults**. Note that this new name mapping file is not saved with the project.

Validation

After the panel field information is entered, an <enter> key requests that the panel field information be validated. Any error message will be displayed in the panel's message area. If there is no error, the cursor will move onto the next panel field. If an error occurs, the cursor will remain in the invalid panel field.

New panels or menus can be fired up before completing panels or menus already on the screen. This gives the user full control over the work flow, rather than being locked in by fixed sequences in a program.

Panel System Menu

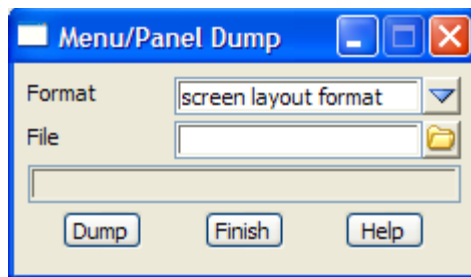
The Panel System menu is brought up by clicking LB on the windows icon on the left hand corner of the panel title area.

The Panel System menu has options to move, minimize, close and dump the panel.

Dumping a Panel

An image of the panel can be written out to disk in either bmp, tif, jpeg, postscript or as a screen layout file or a dialog default file. This is called dumping the panel.

The **dump** option is selected from the **panel system** menu which is invoked by clicking the left mouse button (LB) on the Windows icon on the left of the panel title area. The **Menu/Panel Dump** panel is then displayed



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Format	input	screen layout file	bmp, tif, jpeg, postscript, screen layout file, dialog default file

format for writing the image to disk.

File input
disk file to write the dump image to.

Dump button

dump the panel image to disk.

Moving a Panel

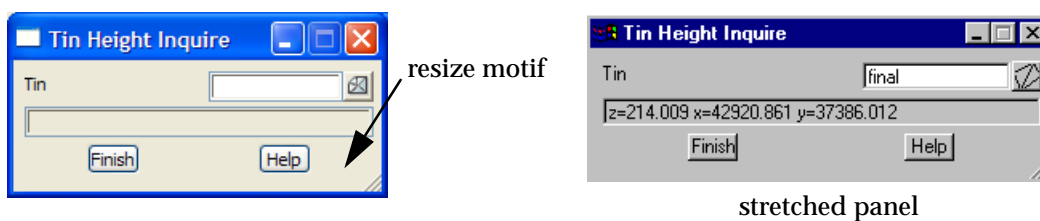
A panel can be moved (dragged) by **holding down LB** anywhere in the menu title area (except over the windows icon on the left and the minimize, restore and **[X]** buttons on the right) and then moving the cursor with the LB still depressed. A panel outline appears and moves with the cursor to indicate where the new panel position will be. The panel is finally positioned when LB

Minimizing and Maximizing a Panel

The panel can be minimized (iconized)/restored and maximized using the standard Windows minimize/restore and maximize buttons on the top right hand corner of the panel.

Resizing Some Panels

Some panels can be resized in *width* and have a *Resize motif* on the bottom right hand corner. For example



Deleting a Panel

Three methods are available for deleting a panel - picking the **[X]** button in the panel title area, using the **finish** button or by selecting close from the panel system menu.

ok_panel

OK Panel

The **OK** panel requires the selecting of the button **OK**.

yes_no_panel

Yes-No Panel

The **yes no** panel requires the selecting of the button **yes** or **no**.

yes_no_cancel_panel

Yes-No-Cancel Panel

The **yes no cancel** panel requires the selecting of the button **yes**, **no** or **cancel**.

yes_no_all_cancel_panel

Yes-No-All-Cancel Panel

The **yes no all cancel** panel requires the selecting of the button **yes**, **no**, **all** or **cancel**.

The next section is “Views”.

Views

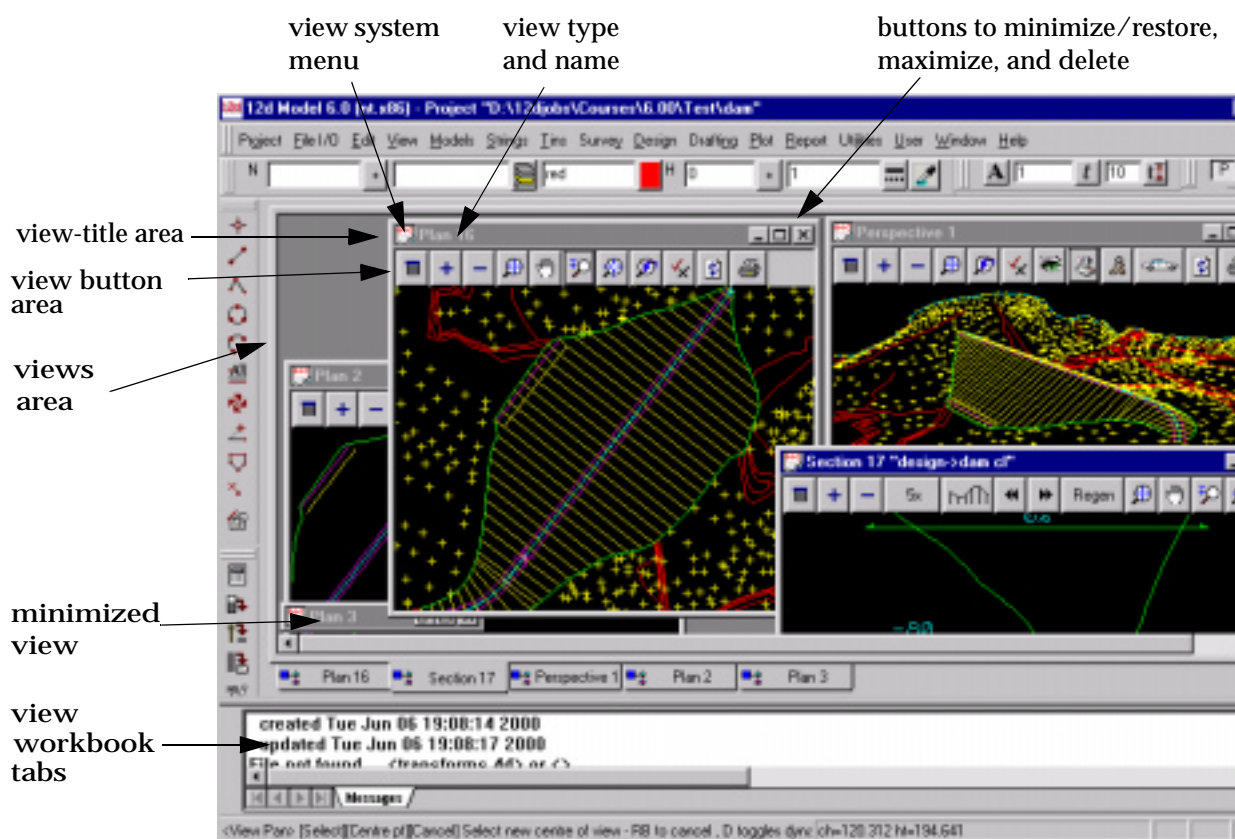
Views are the screen drawing areas for 12d Model and come in three flavours - plan, perspective and section.

Views can be created and deleted as required by the user and there is no limit to the number of views on the screen. Views can be overlapped and minimized.

Each view has a unique name of up to two hundred characters. The view type and name are displayed on the top left corner of the view in what is called the **view-title area**.

There is an option to list all the views available in a 12d Model session (the view list). The view list (or a restriction to those of a specific view type) is also used in various pop-ups and walk-right menus.

As for menus and panels, each view has a *view title area* which is used to display the view type and name.



View System Menu

The view system menu is brought up by clicking LB on the windows icon on the left hand corner of the *view title area*.

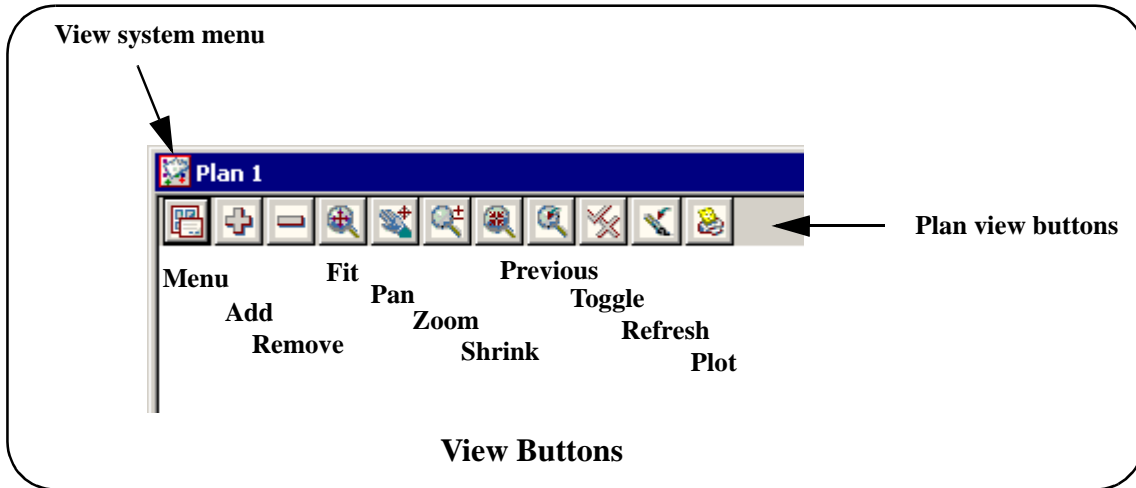
The view system menu has options to move, minimize, close and dump the view.

View Buttons

On the row under the view type and name, are a number of options called **view buttons**.

The view buttons act like menu items and are activated by clicking LB when the cursor is above the button.

The function of each view button will be described elsewhere in this manual.



View Workbook

If the **View workbook mode** is turned on, a workbook tab for each view is created at the bottom of the Views Area.

If the view is not minimized, then selecting the workbook tab for the view will bring the view to the top of the other views. If any of the views are maximized, then selecting any of the workbook tabs will bring that view to the top already maximized.

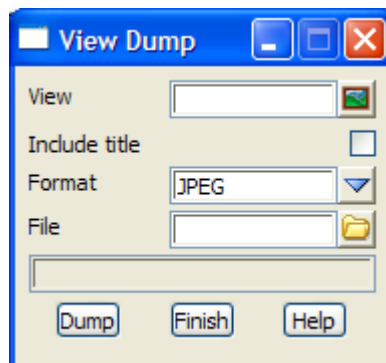
The View Workbook Mode toggles is toggled on/off by the option View => Workbook Mode on the Main menu.

Dumping a View

view_dump

An image of the view can be written out to disk in either bmp, tif, postscript format or as a screen layout file. This is called dumping the view.

The **Dump** option is selected from the **view system menu** which is invoked by clicking the left mouse button (LB) on the Windows icon on the left of the view-title area. The **View Dump** panel is then displayed



The fields and buttons have the following functions.

Field Description	Type	Defaults	Pop-Up
View	input	view option is picked from	available views

the view to dump out in the specified format.

Include title tick-cross

if tick, the view title area is included in the dump.

Format input gif bmp, tif, jpeg, postscript

the format to dump the view out in.

File input *.gif

the file to dump the view images out to

Dump button

dump in the given format the image of the view given in the view field to the file given in the file field.

Moving a View

A view can be moved (dragged) by **holding down LB** anywhere in the view-title area (except over the windows icon on the left and the minimize, restore and **[X]** buttons on the right) and then moving the cursor with the LB still depressed. A view outline appears and moves with the cursor to indicate where the new view position will be. The view is finally positioned when LB is released.

Resizing View

A view can be resized using the standard Windows resize methods.

Minimizing and Maximizing a View

A view can be minimized (iconized), restored and maximized using the standard Windows minimize/restore and maximize buttons on the top right hand corner of the view.

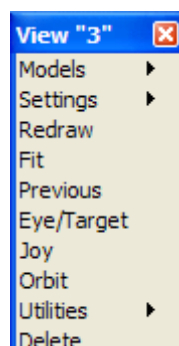
Deleting a View

Picking the **[X]** button in the *view-title area* or selecting close from the view system menu will delete the view.

View Menu

If RB is clicked in the *view title area* or the *view buttons area*, a new menu called the View menu will appear. To remove the View menu, select **[X]** from the View menu or click RB again in the *view title area* or the *view button area*.

Because of the differences between plan, perspective and section views, the options on the View menu vary for each view type. For example, the perspective View menu is



The View menus will be discussed in the chapter “View Menus”.

Please continue to the next section “Status Bar”.

Status Bar

The Status Bar is used to display many of the messages generated by 12d Model options (each panel also has its own special message area) and the dynamic co-ordinate position of the cursor as it moves around in any view on the screen.

The co-ordinate values displayed depends on the view type. For example, the world co-ordinate (x,y) position of the cursor is displayed when inside plan views, and a (chainage,height) position when in a section view.

The messages are displayed on the left hand side of the Status Bar and the view co-ordinates on the right hand side of the Status Bar.

The Status Bar is toggled on/off by the option View => Status Bar on the Main menu.

Please continue to the next section “Output Window”.

Output Window

The **Output Window** displays 12d Model system and error messages.

The Output Window is toggled on/off by the option *Window => Output Window* on the Main menu.

If an error message is sent to the Output Window and the Output Window it is turned off, then the Output Window is automatically toggled on to indicate an error has occurred.

Hence the Output Window can be left turned off and it will reappear when an error message occurs.

Please continue to the next section “Data Types”.

Data Types

Strings

12d Model uses the string as one of its basic modelling elements.

A string is simply an *ordered* series of vertices or points.

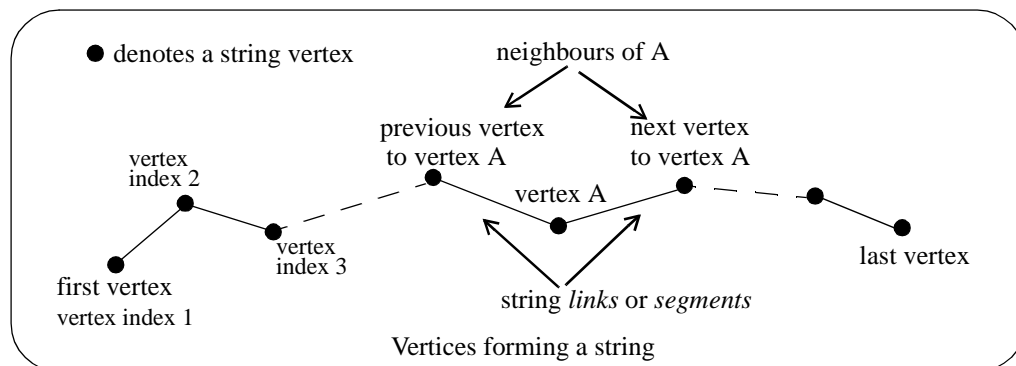
Apart from the first and last vertex in a string, each vertex in a string has a unique previous vertex (predecessor) and a unique next vertex (successor). The previous and next vertices for a vertex are called its string neighbours.

The lines joining a vertex with its neighbours are called string links or segments. Segments may be straight or arcs, visible or invisible.

The string has an implied **direction** starting from the first vertex of the string and always proceeding to the successor vertex in the string.

The ordering along a string allows each vertex to be given a vertex index where the first vertex has vertex index **1**. Note that if additional vertices are inserted or vertices deleted then the vertex indices will change. Also note that for super strings, a vertex may have a *point id* (*vertex id*, *point number*) which is **not** the same thing as the vertex index.

A string which has the same first and last vertex is called a closed string otherwise a string is said to be open.



Strings are very useful in the modelling of terrain and design surfaces. 12d Model uses a number of different **types** of strings and they are defined as:

2d or contour string

the z-value is the same at every vertex in the string.

3d string

the z-value can vary for each vertex in the string.

4d string

the string has (x,y,z) values at each vertex plus text defined at each string vertex. Useful for such things as survey stations.

alignment string

this string holds both the horizontal and vertical information needed in defining entities such as the centre line of a road. Horizontal intersection points (HIP's), circles and leading and trailing spirals are stored to define the plan geometry. Vertical intersection points (VIP's) and parabolic curves are stored to define the vertical geometry of the string. Alignment strings are essential for

describing roads.

arc string

an arc in a plan projection but with a linearly varying z-value on the circumference. So the arc string is actually a 3d helix. The centre point of the arc is for display purposes only.

circle string

a circle with a constant z-value around the circumference. The centre point of the circle is for display purposes only.

drainage and sewer string

special string made up of straights, arcs and manholes.

feature string

a circle with a z-value at the centre point but only null values on the circumference.

If a feature string is given a **world** line style, then the style is centred on the centre point of the feature string and scaled up to the radius of the feature string.

If a feature string is given a **screen** or **paper** line style, then the style is wrapped around the circumference of the feature string.

interface string

an interface string is a special string constructed from a string and a surface. Each vertex of the interface string records whether the corresponding vertex on the original string was above or below the surface.

pipe string

a 3d string with a diameter.

pipeline string

an alignment string with a diameter.

polyline string

similar to a 3d string except that there can be straights or arcs joining the string vertices.

super string

a super string is a general purpose string. Each link has visibility, colour and breakline flags and values for diameter, radius, text and an unlimited number of user definable attributes. Each vertex has tinability, symbol with its own size and rotation, z-value, text and an unlimited number of user definable attributes. Segments can be lines, arcs or spirals. Each segment has colour, diameter, visibility, tinability, text and an unlimited number of user defined attributes.

super alignment string

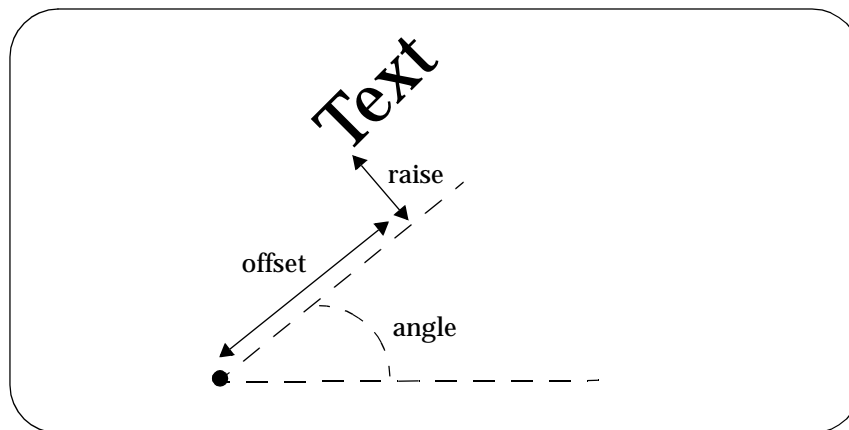
like an alignment string, this string holds both the horizontal and vertical information needed in defining entities such as the centre line of a road. However the super alignment is not restricted to just IP methods for constructing the horizontal and vertical geometry of the string.

control station

control stations are used in the survey reduction option where a name of a station can be given in the 12d survey field file and the co-ordinates of the station can given by the control station of that name in the specified model of control points. In 12d Model, a Control station is represented by a one vertex 4d or super string and the name of the control station is the name of the one vertex string. Usually the point id for the vertex of the super string, or the text for the 4d string, is also the Control station name.

text string

a text string has an (x,y) position and contains characters and information about how the characters are displayed (textstyle, units, height, offset, raise, justification, angle, slant and x factor).



String Chainage

Every vertex along a string has a unique **chainage** value. This chainage is calculated by taking the start chainage defined for the first vertex of the string, and adding to it the plan distance along the string from the start vertex to the selected vertex on the string.

Breakline Type

When triangulating data, the sides of non-crossing strings can be preserved as the sides of triangles. Such strings in 12d Model are called **breakline** or **line** strings. Non-breakline strings are called point strings.

For triangulation purposes, each of the string types 2d, 3d, 4d and polyline can be used as **either** breaklines (line strings) or not (point strings).

Line strings are useful in describing terrain features such as ridge lines and creek beds or design features such as the edge of a building platform. Point strings can represent information such as spot heights.

Alignments, arcs, circles, pipelines, interfaces, drainage and sewer strings can only be breakline strings. Feature strings can only be point strings with a z-value at the centre of the circle.

Tinable

For a **super string**, the concept of breakline has been extended to a property called **tinable** which can be set *independently* for each vertex and each segment of the super string.

If a **vertex** is tinable, then the vertex is included in triangulations. If the vertex is not tinable, then the vertex is ignored when triangulating.

If a **segment** is tinable, then the segment is used as a side of a triangle during triangulation. That is, the segment is used as a breakline. This may not be possible if there are *crossing* tinable segments.

Note that for a segment to be used as a side of a triangle, then its end vertices must also be tinable.

Linestyle and Colour

All strings (except text) can be given a user defined **linestyle** or simply **style**. The style describes how the string is drawn on the screen and on plots. The default style is **1**.

A style can also be continuous or just at the vertices of a string, regardless of the breakline type of the string. A breakline string (line string) with default style **1** will be drawn with solid lines between the nodes, and a non breakline string (point string) with default style will be drawn with crosses at the string nodes with no visible lines between the nodes.

Strings have a default colour but how that colour is used depends on the breakline type and style of the string. For example, a line string with default style **1** is drawn with the string's links in the string colour and for a point string with default style **1**, crosses are drawn at each string point in the string colour. However, styles can have their own colours which override the default colour of the string. Interface strings have two colours (red and green) which are used to represent cut and fill information.

Hence, 2d, 3d and 4d strings with **default styles** appear on the screen as

point string (non breakline string)

each string link is considered to be an **invisible** line. String values are not defined along the string links.

line string (breakline string)

each string link is considered to be a **solid** line. String values are defined along the string links by linear interpolation between the end points of the string link.

Name and Model

Strings have a text name of up to two hundred alphanumeric characters, spaces and dots (.). The string name does not have to be unique and can be blank. When strings are created, they are stored in **models**. A string is in one and only one model. Models are discussed in the next section.

Models

Within a 12d Model project, information is collected in units called **MODELS**. Models contain strings and tins (see the next section).

Each model has a unique user-defined text name of up to two hundred alphanumeric characters and spaces.

For convenience, model names should reflect the nature of the information in the model. For example, a model containing terrain data could be called **terrain**. **design** could be another model containing design data.

Each model has minimum and maximum x, y and z values which define a bounding box which encloses all the data in the model (the model bounding box). The size of the model bounding box is automatically updated as new data is added to the model, but not adjusted as data is deleted. A re-calculation of the model bounding box is performed by the **calc extents** buttons on the model and view information panels.

There is an option to list all the models available in a 12d Model session (the model list). The model list is also used in various pop-ups and walk-right menus.

Displaying Models

The screen display areas in 12d Model are the views. Models are displayed in views by "adding" the model to the view. Similarly, when a model is "removed" from a view, it is no longer displayed in that view.

There are options in the 12d Model menu and on each view to add and remove models from views.

Tins

To form a continuous surface representing the data in a model, a process called triangulation is used. Triangulation creates a web of non-overlapping triangles whose nodes are the model data points. Because the data points are normally irregularly spaced, the triangulation is referred to as a **TIN** - a **Triangulated Irregular Network**.

For 2d, 3d, 4d and interface strings, all non null points are included in the triangulation. For super strings, only vertices that are tinable are included in a triangulation.

To allow the triangulation to accurately represent features such as ridge lines and creek beds, the links of breakline strings (line strings) are preserved as edges of triangles in the tin.

For a super string, only segments that are tinable and whose end vertices are also tinable, are included as break lines.

Each tin is given a unique user-defined name of up to two hundred alphanumeric characters and spaces.

Unlike strings, tins can be in more than one model, or even no model at all. However, to be **displayed** in a view or used for **profiling** on a section view, tins need to be in at least one model. It is suggested that each tin be in its own model called "tin **tin_name**". This makes it easy to know the model a tin is in, and also to see which models contain tins and obtain lists of all tins when using <ctrl> + <d> for name completion.

There is an option to list all the tins available in a 12d Model session (the tin list) which also displays the models the tin is in as a walk-right. The tin list is also used in various pop-ups and walk-right menus.

Tins can be "added" and "removed" from models with options in the triangles option in the 12d Model menu. If a tin is to be displayed in a view, it must be "added" to a model that is being displayed in that view.

Tins can only be **deleted** by using the Triangles=>Delete options - for safety, they are **not** deleted when any model containing them is cleaned or deleted.

WARNING

Tins are stored with **copies** of the points that were triangulated. If the original points are then modified, the triangulation will not reflect this change.

Templates

Templates are used as a quick and easy method for defining design details along a string for use in conceptual and detail designs, and visualizations. Templates are stored with each project but can be written out and read in using a readable file format.

Projects

In 12d Model, information is organised into **projects**.

When 12d Model begins, the user specifies the name of the project to work on. A project name can be up to two hundred alphanumeric characters and spaces.

All the information created for that project is kept together in a special folder called the **project area**.

The project area contains all the models, templates and tins associated with the project. Copies of models and tins created in other projects can be added to another project from within 12d Model.

External data files can be read into the project (imported) using special input options. Similarly,

output options are provided to write data out for use in other software packages (exported).

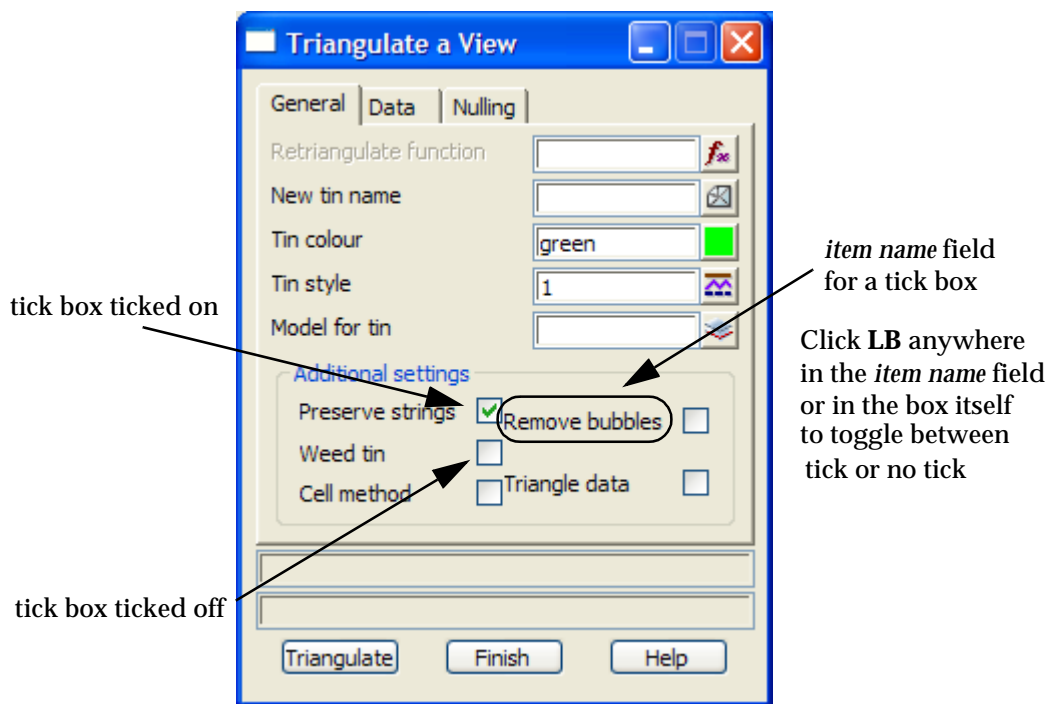
Please continue to the next section “Tick Box”.

Tick Box

Many items require a mode to be either on or off.

In **12d Model**, there is a special box with a **tick** to indicate that the setting is **on** and **nothing** to indicate that the setting is **off**.

In a **tick** box, the tick is changed to the nothing state by clicking LB in the box surrounding the tick or clicking LB on the **item name** field for the tick box.



Please continue to the next section "Picking Strings".

Picking Strings

In many 12d Model options, the user is required to “pick” the string to be used in the option, or to get information about a string.

After any option requiring a pick is selected, a message regarding the function of the mouse buttons is written to the screen message area.

<option> [picks][fast][menu]

There are three picking method available in 12d Model:

- (a) fast pick where the pick and the accept occur as one operation
- (b) fast accept where the if there is only one item satisfying the snap conditions then it is automatically accepted but if there is more than one, the tentative pick mechanism is used and
- (c) tentative picks with a separate pick and accept mechanism

Fast pick will be documented first, followed by **fast accept** and **tentative pick** (pick and accept).

Fast Pick

To **fast pick** a string, simply move the cursor near the string and **click MB** or type <enter>. The nearest string to the cursor satisfying the snap conditions is selected.

Fast pick is used when the **F** snap is on.

Various snap modes can be set for the fast pick. The available snaps are point (vertex), line, grid, tin and cursor. One or more snaps can be set simultaneously. The snaps are described in more detail in the section “Snaps”.

Fast Accept

To **fast accept** a string, simply move the cursor near the string and **click LB** or type <enter>. If there is only one string satisfying the snap conditions, then it is automatically accepted.

If there is more than one string satisfying the snap conditions, the nearest string to the cursor satisfying the snap conditions highlighted and an information menu containing information about the selected string is displayed.

If the correct string has been tentatively picked, **click MB** or **type <enter>** accepts the string. If the incorrect string is tentatively picked, click LB and the next closest string satisfying the snap conditions will be highlighted. See the section “Tentative Pick” for more information on tentative picking.

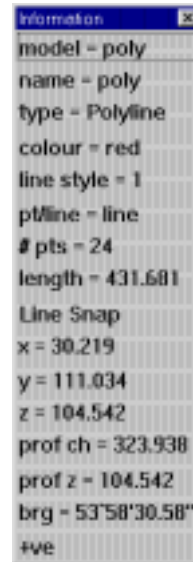
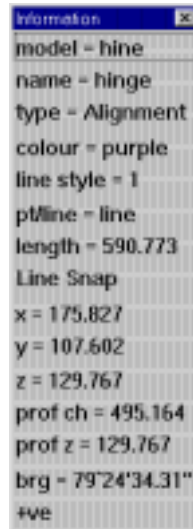
Fast accept is used when the **A** snap is on.

Various snap modes can be set for the fast pick. The available snaps are point (vertex), line, grid, tin and cursor. One or more snaps can be set simultaneously. The snaps are described in more detail in the next major section “Snaps”.

Tentative Pick

information_al information_poly

To **tentatively pick** (or tentatively select) a string, move the cursor near the string and **click LB**. The nearest string to the cursor satisfying the snap conditions (see the next section on Snaps) is highlighted and an information menu containing information about the selected string is displayed (the information varies for each string type- see the section “String Information” in the chapter “Strings”).



The information menu disappears if the cursor is moved slightly.

The string name, the string model and the mouse button functions are also displayed in the Status Bar when the picked string is highlighted:

<option> [selects][accepts][menu] “model->string name”

If the correct string has been tentatively picked, **click MB** or **type <enter>** to accept the string. If the information menu was still up, it disappears when the string is accepted.

Note - if the information menu does not appear when a string is highlighted, then the *information snap* may be set to off. See the section “Snaps”.

Tentative Picking and Repicking

If one string is tentatively picked (and highlighted) but another string was intended to be picked, click LB again without moving the cursor and the next nearest string to the current cursor position will be selected, highlighted and an information menu put up for it. Any strings already rejected during the pick will be ignored. Continuing to click LB again without moving the cursor will sequentially pick the next nearest string and ignore the earlier rejected strings.

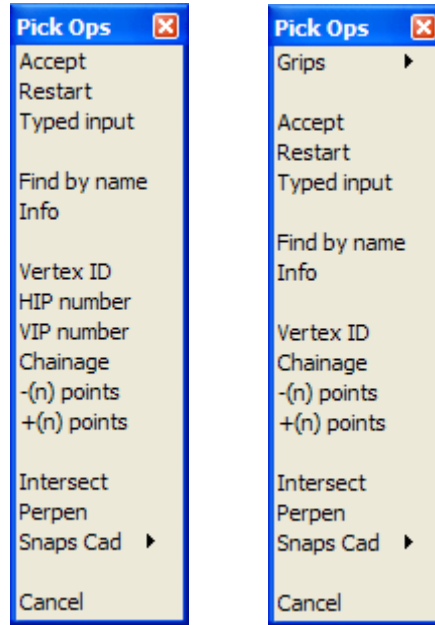
To allow **all** strings to be eligible for picking again, simply move the cursor a small distance (the reset distance - default five pixels) and start picking again. This will automatically **reset** the rejection list.

Pick Ops Menu

pick_ops

Options to allow all strings to be eligible for picking again, to cancel the pick operation and to accept a picked string are all available from the Pick Ops menu.

The Pick Ops menu appears whenever RB is clicked whilst in the pick option. The Pick Ops menu is



Alignment and Pipeline strings

For most other string types

To allow all strings to be eligible for picking again, select **Restart** from the Pick Ops menu. This has the same effect as moving the cursor the reset distance.

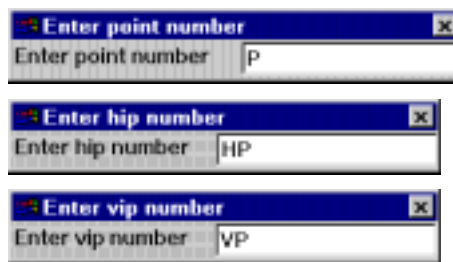
To cancel the pick without selecting any string, select **Cancel** from the Pick Ops menu.

Selecting **Accept** from the Pick Ops menu, accepts the current picked string. This is the same as clicking MB without calling up the Pick Ops menu.

The **Find by name** option allows the user to specify a string name to restrict the pick by. This options is also available in the snap option and will be described there.

Selecting **Info** will redisplay the information menu for the string.

If Vertex/HIP/VIP number, is selected, the **enter vertex/hip/vip number** box is displayed.



Typing the number into the box terminated by <enter> will move the pick position to that vertex or IP point.

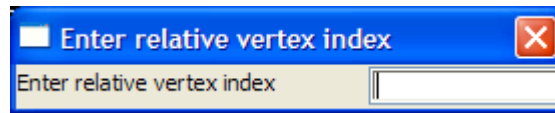
If Chainage is selected, the **Enter Chainage** box is displayed.



Typing a chainage into the box terminated by <enter> will move the pick position to that chainage on the tentatively selected string.

enter_relative_vertex_index

If -(n) vertices or +(n) vertices is selected, the **Enter relative vertex index** box is displayed.



Typing a positive/negative number into the box terminated by <enter> will move the pick vertex to that many vertices after/before the selected position on the tentatively selected string.

The left and right arrow keys (<-, ->) can also be used to move the pick position to the previous or following vertex respectively.

To remove the Pick Ops menu without selecting an option, either select the **[X]** button from the Pick Ops menu title area or simply click RB again whilst the cursor is in a view.

Various snap modes can be set for the pick. The available snaps are point, line, grid, tin and cursor. One or more snaps can be set simultaneously. The snaps are described in more detail in the next section.

Picking with Direction

Picking a string is one operation where 12d Model is monitoring the cursor position when button LB (or MB for fast pick) is pushed down and also the cursor position when button LB (MB) is subsequently **released**.

The **pick position** is taken as the cursor position when button LB (MB) is released, but the difference between the down and up positions for button LB (MB) defines a **direction** vector or **sense** to the pick. This direction is called the **picking direction** or **picking sense**.

The **picking direction** is used in a number of 12d Model options.

For example, in the information panel displayed for any picking operation, if the picking direction is the same as the string direction, a **+ve** is displayed at the bottom of the panel. If the directions are opposite, then a **-ve** is displayed in the panel.

Important Note

If a string was picked with direction, then to automatically reset the rejection list, the cursor must be move fifty (50) pixels rather than the five required for a non-directional pick.

Summarising the 12d Model Picking Mechanisms

Tentative picking - pick and accept as separate operations

LB - left button	select the next nearest string. moving the cursor more than five pixels resets the rejection list for a non-directional pick. moving the cursor more than fifty (50) pixels resets the rejection list for a directional pick.
MB - middle button	accept the current selected (highlighted) string - ends the pick.
RB - right button	brings up the Pick Ops menu.
Typing <enter>	same as MB: accepts the current selected (highlighted) string - ends

the pick

Fast accepting - pick and accept in one operation if there is only one item satisfies the snap conditions or a tentative pick if more than one item.

LB - left button select the next nearest string. If there is only one item possible then it is automatically accepted. Otherwise it is the same as for a tentative pick.
moving the cursor more than five pixels resets the rejection list for a non-directional pick.
moving the cursor more than fifty (50) pixels resets the rejection list for a directional pick.

MB - middle button accept the current selected (highlighted) string - ends the pick.

RB - right button brings up the Pick Ops menu.

Typing <enter> same as MB: accepts the current selected (highlighted) string - ends the pick

Fast picking - pick and accept in one operation

MB - middle button pick and accepts the nearest string.
or

Typing <enter> same as MB: pick and accepts the nearest string - ends the pick.

Please continue to the next section "X Y Z and Ch Ht Typed Input Box".

X Y Z and Ch Ht Typed Input Box

Many **12d Model** options use a *cursor select* (picking) in a view to pick strings, obtain information about a string, get an x, y and z co-ordinates for a new vertex etc.

In most cases, **typed input** can also be used to enter the information instead of using the cursor select. For example, an exact values for the x, y (and possibly z) co-ordinates could be typed in or a chainage and a height typed in rather than picking a position on a view.

Typed input is available in 12d Model whenever a *cursor select* is used.

To use *typed input*, simply begin typing the values. As soon as a character is typed, a special *typed-input* box appears on the screen and the typed characters are automatically placed in it.

Alternatively, instead of clicking **LB** to select a string, click **RB** to bring up the **Pick Ops** menu and then select Typed Input from the Pick Ops. This will also bring up the *typed input* box.

Depending on the view type that the cursor is over, the *typed input* box will be either an *Enter X Y Z* or an *Enter Ch Ht* box. If the focus is on a Plan or Perspective view, then an **Enter X Y Z** box comes up. If the focus is on a Section view, then an **Enter Ch Ht** box appears. These are also called the *XYZ typed input* box and the *Chainage Height typed input* box respectively.



The x, y (and possibly z) co-ordinate values or chainage height required by the box are simply typed in, each value being separated by **one or more spaces**.

An <enter> terminates the typed input and sends the entered values to the option. The typed-input box then disappears.

If the user wishes to **abort** the typed input and return to mouse input, simply select the **[X]** button on the typed input box, or type <enter> with no values in the typed input box.

The *Enter X Y Z/Ch Ht* box can be **moved** (dragged) to a new position on the screen in the standard way.

The default mode for the **Enter X Y Z** box is to receive absolute x, y and z values.

However, by typing special character codes before the values, the **Enter X Y Z** box can be used to enter data in a variety of formats including relative co-ordinates and bearing-distance combinations.

The full list of typed input codes now follows (the text will be given in lower case, but it can be typed in either upper or lower case).

▲ *actual x actual y actual z*

x y z

or

a *x y z*

▲ *relative x relative y relative z*

r *x y z*

▲ bearing in degrees-minutes-seconds distance actual z

bd ddd.mmssfff distance

where ddd.mmssfff is the bearing expressed in degrees, minutes and seconds as

ddd	whole degrees
.	separator between degrees and minutes
mm	whole minutes
ss	whole seconds
fff	fractions of seconds (as many as required)
▲ bearing in decimal degrees	distance actual z
dbd	ddd.dd distance z
▲ angle in degrees-minutes-seconds	distance actual z
ad	ddd.mmss distance z
▲ angle in decimal degrees	distance actual z
dad	ddd.dd distance z

The default mode for the **Enter Ch Ht** box is to receive *chainage* and *height* values.

However, by typing special character codes before the values, the **Enter Ch Ht** box can be used to enter data in a variety of formats including grade distance and slope distance.

The full list of typed input codes now follows (the text will be given in lower case, but it can be typed in either upper or lower case).

▲ actual <i>chainage</i>	actual <i>height</i>
	<i>chainage height</i>
or	
a	<i>chainage height</i>
▲ relative <i>chainage</i>	relative <i>height</i>
r	<i>chainage height</i>
▲ <i>slope</i> and <i>distance</i>	
sd	<i>slope distance</i>
	where slope is 1 vertical in slope horizontal units
▲ <i>grade</i> and <i>distance</i>	
gd	<i>grade distance</i>
	where grade is 1/slope as a percentage

Please continue to the next section “Tentative Typed Inputs”.

Tentative Typed Inputs

If the string has been **tentatively** selected (by clicking LB and highlighting the string but not yet accepting it), then further typed inputs are available which then work for the **highlighted** string only.

The **Tentative typed inputs** are:

CH <i>chainage</i>	go to the given chainage
V <i>vertex-index</i>	go to vertex index

HP <i>number</i>	go to horizontal IP number " <i>number</i> "
VP <i>number</i>	go to vertical IP number " <i>number</i> "
+	go to the next vertex
-> (right arrow)	go to the next vertex
+ <i>number</i>	go forward <i>number</i> vertices
-	go back to the previous vertex
<- (left arrow)	go back to the previous vertex
- <i>number</i>	go backward <i>number</i> vertices

When a string is *tentatively* selected, the above *typed input* options are also available as *menu items* from the Pick-Ops menu. This has been documented in the section "**Pick Ops Menu**" in this chapter.

Please continue to the next section "Picking Point Ids (Point Numbers, Vertex ids)".

Picking Point Ids (Point Numbers, Vertex ids)

When a **12d Model** option uses a *cursor select* (picking) in a plan view to pick strings, then *typed input* can be used to select a point id (point number, vertex id) which exists in any model on the view (note that a point id can be numeric or alphanumeric).

When over the plan view, instead of clicking **LB** to select a string, simply type:

number to select a *numeric* point id

or

P*text* to select an *alphanumeric* point id of name *text*.

This will bring up the **Enter X Y Z** box and the typed information will go into the box. Type <enter> and the view will then be searched for the given point number.

If the point id exists, then a large cross will be drawn over the vertex on the view and the string containing the point id will be highlighted.

Note that if a string is *tentatively* selected (i.e. highlight but not yet accepted), then

Vn will select the nth vertex of the tentatively selected string (vertex index of n)

Please continue to the next section "Snaps".

Snaps

In most 12d Model options, the mouse is used to pick data from a string displayed on the screen. Unfortunately different options usually require different data so an easy method is needed to help select from all the strings on the screen, a specific string or part of a string.

In 12d Model, **Snaps** are used as part of the string picking mechanism (discussed in the previous sections) to help filter out what data is interactively selected on a view.

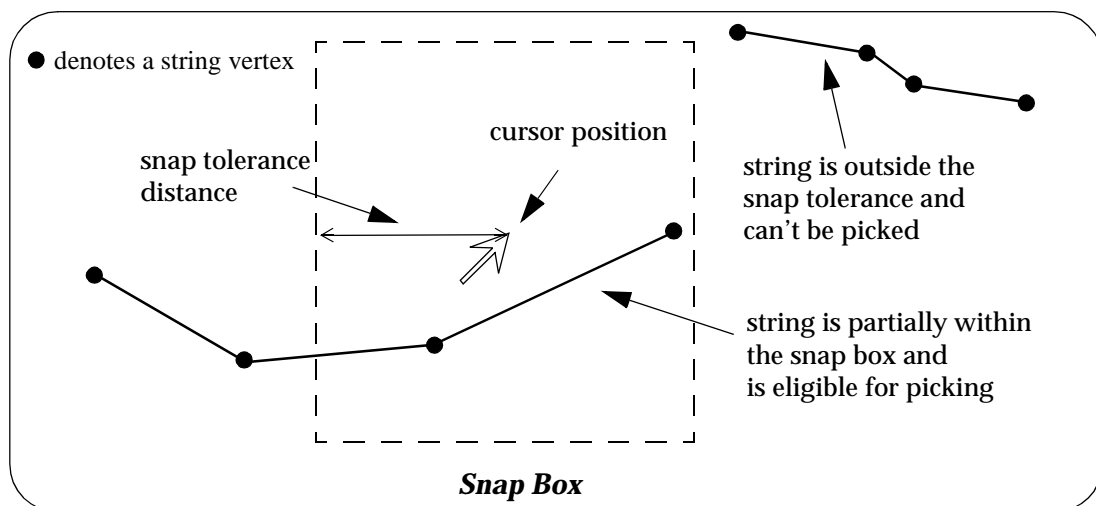
Using the 12d **snaps** it is possible to

- ▲ restrict any string picks to selected string names and/or models
- ▲ set modes which are used to determine what parts of strings are used for picking
- ▲ set the search distance for picking vertices (point snap tolerance)
- ▲ set the search distance for picking (snap tolerance)
- ▲ give the name of a tin to be used to set z-values at a (x,y) position
- ▲ set whether the user is prompted for a new height (z-value) after every point edit
- ▲ turn off the information menu when picking

Point and Line Snaps

When trying to interactively pick a string in 12d Model, the user moves the cursor near the string in a view and clicks LB (or the MB for a fast pick). 12d Model then makes a search of all the strings on the view to make a selection.

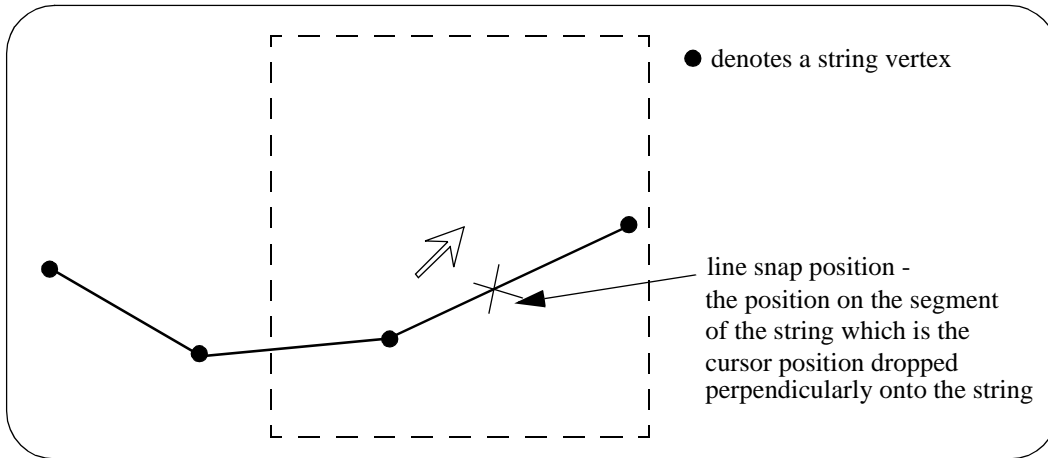
The help restrict the search, only strings that are partially or totally within an x and y distance called the **snap tolerance** of the cursor are eligible for picking. That is, only strings that have part, or all, of them within the **snap box** can be selected.



For strings inside the snap box, 12d Model has two snap modes, *point* and *line*, to specify which parts of the strings can be selected.

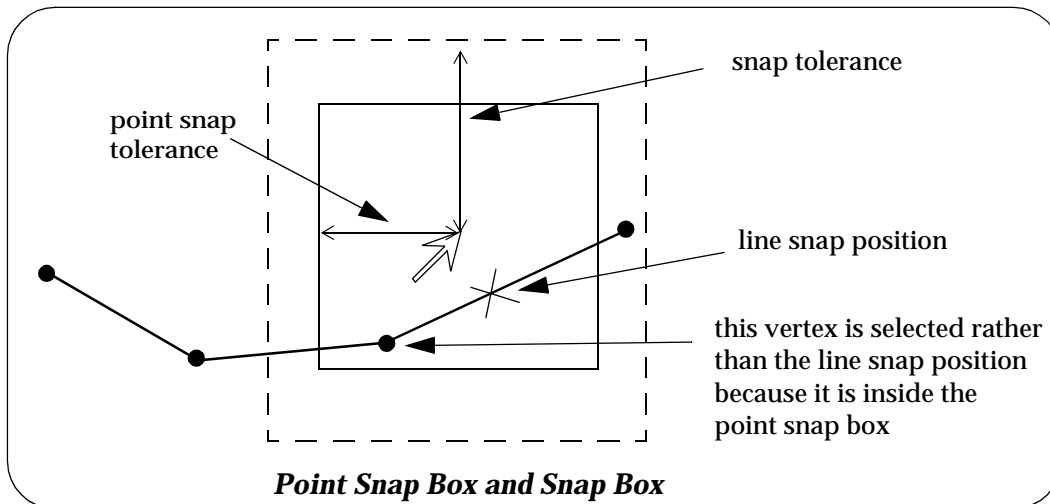
If **point** snap is set on, the vertices (points) of a string can be selected. If only *point* snap is on, then the string containing the **closest vertex** to the cursor is selected.

If **line** snap is set on, then the position on the string that is determined by dropping the cursor perpendicularly onto the string, can be selected. Note that there is usually no string vertex at the perpendicular position (line snap position). If only *line* snap is on, then the string containing the closest perpendicular position to the cursor is selected.



Since in general it is rare for a vertex of a string to be closer to the cursor than the line snap position, then with only the above definitions and *point* and *line* snap both on, the line snap position usually wins. Hence to pick a vertex, line snap would have to be turned off. Since this can lead to line snap being regularly toggled on and off, another distance called the **point snap tolerance** has been introduced to give vertices **priority** over line snaps when both snaps are on.

When *point snap* is set on, any vertex of a string that is within an x and y distance called the **point snap tolerance** of the cursor when LB is clicked, is considered for selection **before** any other type of snap is considered. That is, any vertices in the **point snap box** are selected before any line snap positions.

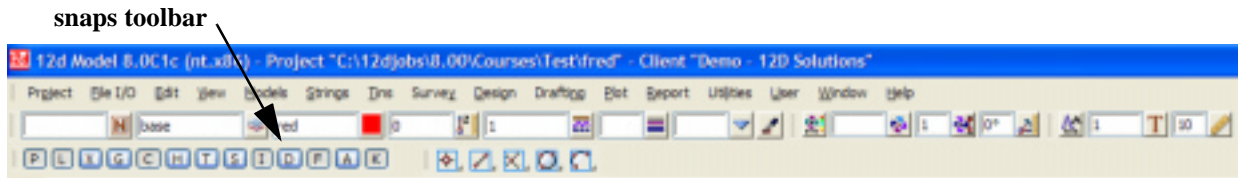


In the area between the point snap box and the snap box, vertices and line snap positions are treated equally and the closest one to the cursor is selected.

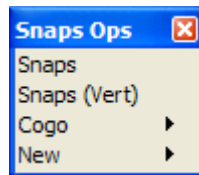
The other types of snaps are not as complicated and will be discussed in the following sections.

Setting Snaps

Snaps can be toggled on and off from the snaps tool bar, or the snap settings can be set from the Snaps menu under *Utilities* on the Main menu.



The menu *Utilities* => *Snaps* is:



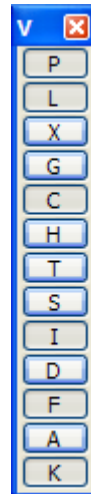
The *Snaps (Vert)* option brings up a Snaps toggle menu similar to the *Snaps* toolbar except that the *Snaps (Vert)* runs vertically rather than horizontally. Either can be used to toggle the snaps on and off.

Snaps toolbar



The Snaps (Vertical) menu

Point
Line
TeXt
Grid
Cursor
Height
Tin
Segment
Info
Data tip
Fast pick
fast Accept
Konstruction



The option *Utilities* => *Snaps* => *Snaps* option brings up a menu that provides tick boxes to turn the various snap modes on or off plus it is used to set the snap tolerance value, the point snap tolerance value, the tin for tin snaps and string and/or model names for restricting the snaps.

Any combination of snap modes and names can be set.

The Snaps menu is

Snaps		
Point	<input checked="" type="checkbox"/>	point snap on/off
Line	<input checked="" type="checkbox"/>	line snap on/off
Text	<input type="checkbox"/>	text snap on/off
Grid	<input type="checkbox"/>	grid snap on/off
Cursor	<input checked="" type="checkbox"/>	allow cursor point on/off
Height	<input type="checkbox"/>	ask for z value at each point in edits
Tin ""	<input type="checkbox"/>	name of tin to snap to
Tin	<input type="checkbox"/>	tin snap on/off
Segment	<input type="checkbox"/>	turn segment snap on/off
Name ""	<input type="checkbox"/>	restriction on string names
Model ""	<input type="checkbox"/>	restriction on model names
Tolerance 50		set snap tolerance
Pt tolerance 10		set point snap tolerance
Info	<input checked="" type="checkbox"/>	bring up info panel on/off
Data tip	<input type="checkbox"/>	turns data tips on/off
Fast pick	<input checked="" type="checkbox"/>	turns fast pick snap on/off
Fast accept	<input type="checkbox"/>	turns fast accept snap on/off
Fast cad	<input checked="" type="checkbox"/>	turns fast construction snap on/off

The snaps point, line, grid, cursor, tin and info are all set on or off using the tick-cross boxes.

The *snap tolerance* is displayed on the Tolerance line of the menu.

The *point snap tolerance* is displayed on the Pt tolerance line of the menu.

When a select with snap is made, the type of snap is given in the **Information** panel and also graphically displayed by **changing the shape** of the snap cursor. The shape of the snap cursor is

- a **diamond** for a point snap
- square** for a line snap
- circle** for a cursor snap
- circle** for a grid snap
- squiggles under a line** for a tin snap.

Each of these snaps/settings will now be discussed.

Point Snap - diamond

When point snap is set on, any vertex of a string within the point snap box around the cursor when LB is clicked, is considered for selection before any other type of snap is considered. Centres of circles, centres of arcs and arc end points are considered to be vertices.

Note that if there are no vertices within the point snap box then any vertices within the snap box of the cursor are considered for selecting

Line Snap - square

When line snap is set on, the cursor only needs to be within the tolerance distance of any visible segment of a string when LB is clicked, and that string is considered for selection. Also arcs and circles are considered for selection.

Note that if a non-zero point snap tolerance is given and point snap is set on, then any vertices that are closer than the point snap tolerance to the cursor will be considered for snapping before any line snap is considered.

Grid Snap - circle

When grid snap is set on, the cursor will snap to the intersection of any grid lines that are displayed in a view.

Cursor Snap - circle

If cursor snap is set on and the other snaps are either not set on or have failed, the cursor position is used for the (x,y) and possibly the z value of the pick.

Tin Snap - squiggles under a line

Tin snap means that when an (x,y) point is selected, the z-value for the point is taken to be the z-value on the tin at the same (x,y) position.

To use tin snap, the name of the tin to snap to must first be given. Then, snapping to that tin is controlled by the state of the tin snap tick box.

If the tick box is **on** (a tick), snapping to the tin is used. If the tick box is **off**, no tin snaps are used.

The name of the tin to snap to is set by selecting the Tin " " item on the Snaps menu to bring up the **Snap Tin** panel.

Model

The user can restrict the snap to only strings from a specific model. The name of the model to restrict the snap to is set by selecting the Model " " item on the Snaps menu to bring up the **Snap Model** panel.

Name

The user can restrict the snap to only strings of a specific name. The name of the strings to restrict the snap to is set by selecting the Name " " item on the Snaps menu to bring up the **Snap Name** panel.

When **12d Model** creates a new project, **line** and **point** snap are set to **on** and all other snaps set off.

Point Snap Tolerance

Point snap tolerance is not a tick box but a menu item. The point snap tolerance value is the distance to be used for considering vertices over anything else when point snap is on.

The point snap tolerance distance is given in screen units (pixels). There are one thousand pixels per screen width, hence a point snap tolerance of say 10 means that the point snap distance about a vertex is one hundredth of the screen width.

The *point snap tolerance* is given in terms of screen units rather than world units because it is a distance on the screen, independent of any co-ordinate system being used in a view.

The current point snap tolerance value is displayed as **Pt tolerance** on the *Snap* menu.

The *Point snap tolerance* is modified by selecting the Pt tolerance item on the Snaps menu to bring up the **Point Snap Tolerance** panel.

Snap Tolerance

Snap tolerance is not a tick box but a menu item. The snap tolerance value is the distance to be used for considering data when snaps are on.

The snap tolerance distance is given in screen units (pixels). There are one thousand pixels per screen width, hence a snap tolerance of say 50 means that the snap distance about a point, line etc. is one twentieth of the screen width.

Snap tolerance is given in terms of screen units rather than world units because it is a distance on the screen, independent of any co-ordinate system being used in a view.

The current snap tolerance value is displayed as **Tolerance** on the *Snap* menu.

The *Snap tolerance* is modified by selecting the Tolerance item on the Snaps menu to bring up the **Snap Tolerance** panel.

Height

If *height* is set, then when creating and/or editing strings, the z-value for a vertex is displayed.

Info

If *info* is set, then the information panel comes up whenever a string is picked.

Data Tip

If *data tip* is set, then data tipping for strings occurs.

Fast Snap

If *fast snap* is set, then fast picking is allowed.

NOTE: The **Text** snap (X) and **Segment** snap (S) are currently under development.

Summarising, the available snap modes are

- ▲ point - diamond cursor
- ▲ line - square
- ▲ grid - circle
- ▲ cursor - circle
- ▲ tin - squiggles under a line
- ▲ name
- ▲ model

On starting up a new project, point and line snap are on, all others off, point tolerance is set to 10 and tolerance is set to 50.

When an existing project is saved, the snap settings, point snap tolerance, snap tolerance and positions of any snaps menus on the screen, are also saved.

Expressions in Panel Fields

Non Bearing/Angle Panel Fields

Whenever a real value such as height or width is required in a box (other than an angle or bearing panel field), mathematical expressions can be typed in and then evaluated by 12d Model when <enter> is pressed. See the section “Expressions in Bearing, Angle Panel Fields” for what is allowed in angle/bearing panel fields.

Expressions can be made up from the operators

*	multiply
/	divide
+	addition
-	subtraction

where * and / take precedence over + and -.

Nested brackets "(" and ")" are supported to any level.

The following functions are also supported

sin
cos
tan
sqrt
square
null

Note that for the trigonometric functions, the angle is in **degrees, minutes and seconds** (see section on Angles and Bearings) and is either a cartesian angle or a bearing depending on the setting of the Angle mode in the *System Settings* tab of **Utilities=>Defaults**.

For example, cos(90) is 0 for a Cartesian angle of 90 or 1 for a bearing of 90 degrees.

Examples of expressions are:

10.0 + 19.7
sin(90.30)
(10 + sin(45))/3.0

After the expression has been evaluated, it is still possible to bring back the last expressions, make modifications to the expression and then re-evaluate it.

To get the last expression, simply click on the [+] button at the end of the field to bring up the measures menu and select Last expression from it. The last expression is then returned to the panel field ready for modifications.

Warning

Expressions are not supported for bearing/angle boxes -

Please continue to the next section “Special Panel Fields”.

Special Panel Fields

Pre*Postfix Panel Fields

In many options in 12d Model, text needs to be added to the beginning (prefix) of a name and also added to the end (postfix) of a name. For example, the

Instead of needing a panel field for the prefixed text and another for the postfixed text, 12d Model often used a special shorthand notation called pre*postfix to combine the two into one text field.

When the word "pre*postfix" is used on a panel field, it has the special meaning that for any text type into the panel field, any text before the * is considered to be text for prefixing, and any text after the * is taken to be text for postfixing. Note that spaces are significant.

Hence "E * m" means that "E " is prefix text and " m" is postfix text.

If prefix text only is required, just give the text since the * is not required at the end of the text. For example "E " or "E *" will prefix the text "E ".

If postfix text only is required then the text must be preceded by a *. For example "* m" will postfix the text " m".

For example, if a panel field had

Pre*postfix for models new * data

then "new " would be added to the beginning of the model names and " data" would be added to the end of the model names.

Data Source

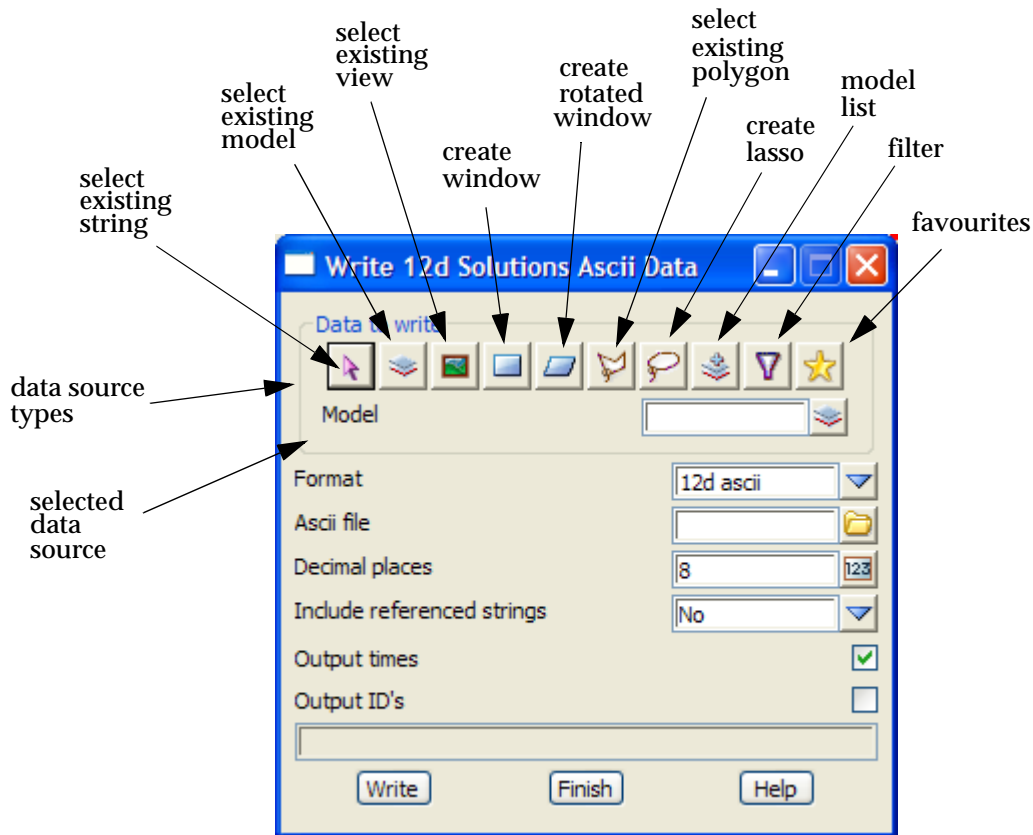
select_choice

Many options contain the panel field **Data source** which may have one or more of the selection choices:

string, model, view, window, rotated window, polygon, lasso, model list, filter, favourites

Depending on the choice, the next panel field will be changed to suite the choice.

For example, for the choice **Model**, the next field will be Model.



In the documentation for a panel with a data source, only the panel for **Data Source type Model** will be shown.

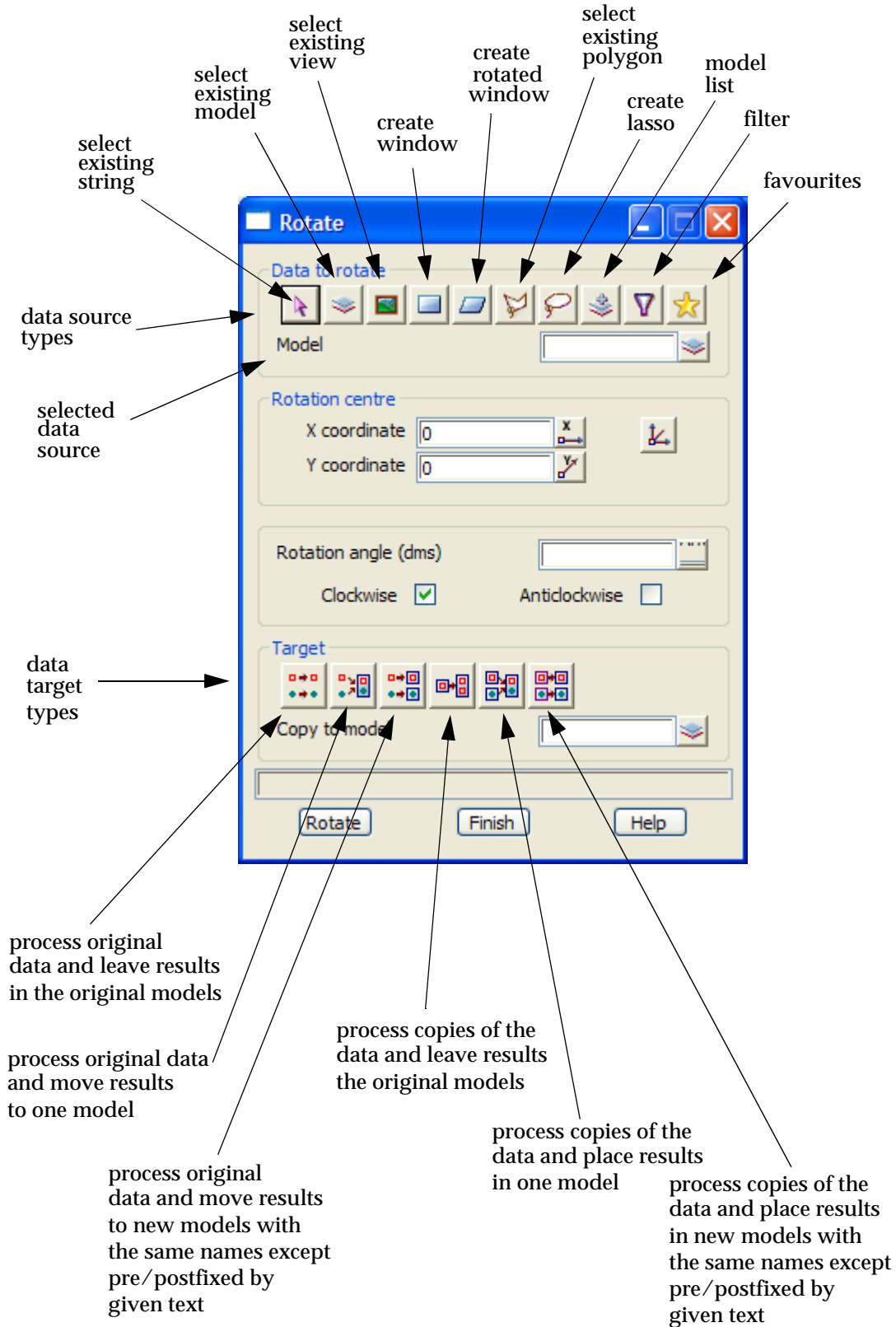
Data Target

Many options contain the panel field **Data target** which may have one or more of the selection choices:

move to original model(s)/replace	// process the original data and leave in models
move to one model	// move the processed data to one model
move to many models	// move processed data to models with the same
	// names as the original models except the model
	// names are pre/postfixed by given text.
copy to original model(s)/replace	// process copies of the data and leave in models
copy to one model	// process copies of the data and place in one model
copy to many models	// process copies of the data and place in models with
	// the same names as the original models except the
	// model names are pre/postfixed by given text.

Depending on the choice, the next panel field will be changed to suite the choice of target.

For example, for the choice **Copy to one model**, the next field will be Copy to model.






























In the documentation for a panel with a data target, only the panel for **Data Target type Copy to Model** will be shown.

Pop-Up Lists and Menus

`select_colour` `select_linestyle` `select_model` `select_name` `select_text_style`
`select_tin` `select_choice` `choice` `choice_measure` `select_view` `select_symbol`

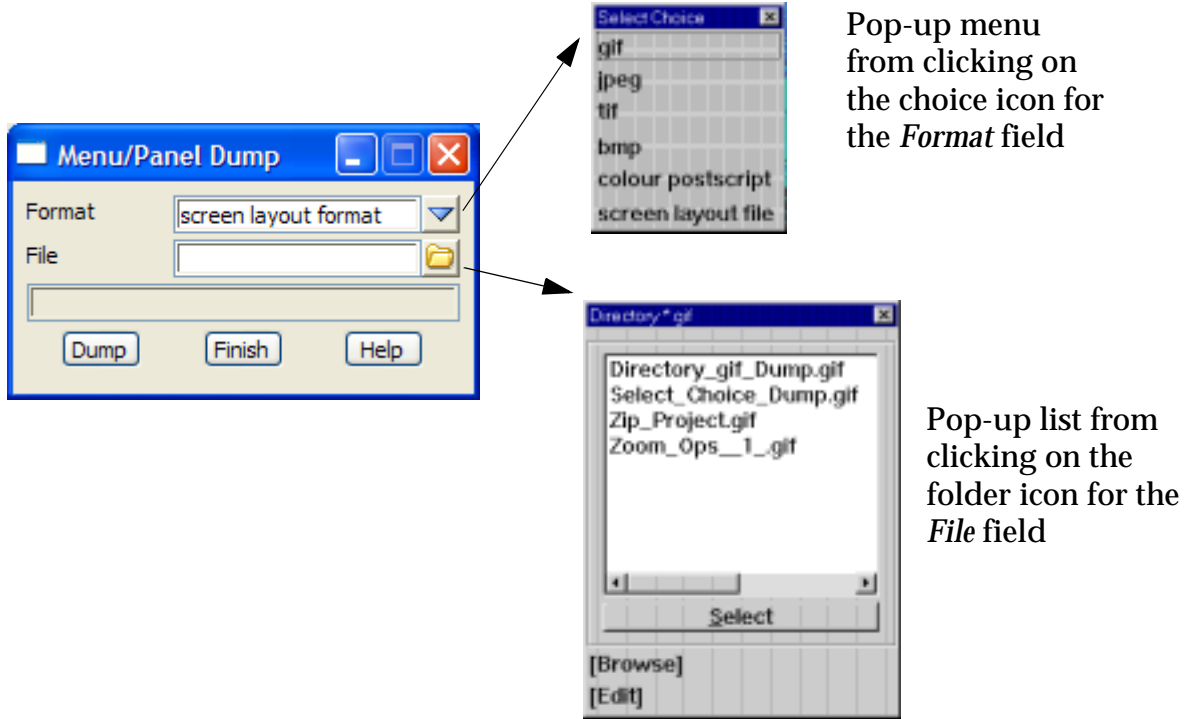
If there are *choices* available to select from for the panel field, there is a [+] or another special icon displayed at the right hand side of the panel field.

For example, icons that may be used in place of the + are:

 file	 tin	 textstyle info
 model	 choice	 line weight
 colour when none selected	 selected colour	 view
 line style	 polygon	 symbol
 project	 XYZ	 X
 Y	 Z	 chainage
 string name	 select	 angle
 date/time	 function	 typed input
 ID	 plotter/printer	 same as

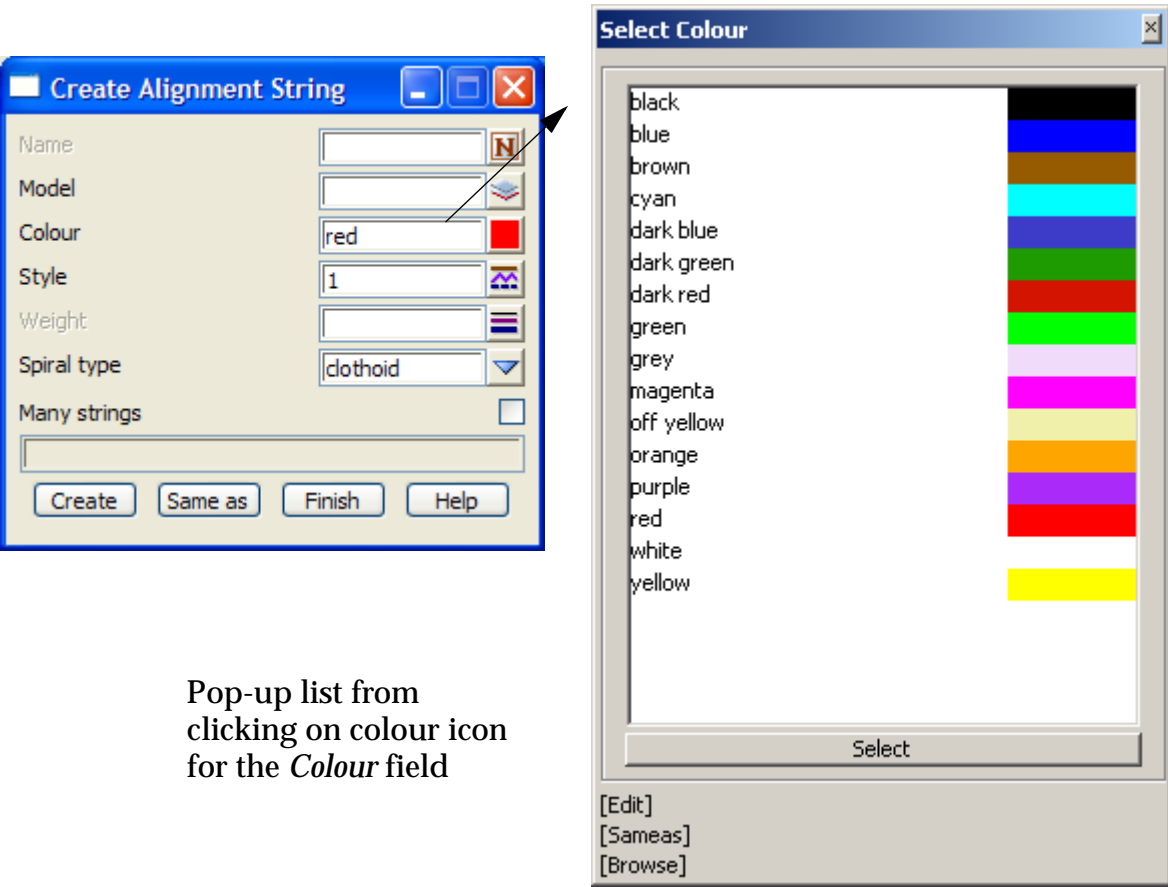
Clicking LB on the one of the above icons or a [+] brings up a the **panel field pop-up list** or **pop up menu**.

A panel field pop-up consists of a list of choices which may be displayed as either a *menu* or a *list*



Pop-up menu from clicking on the choice icon for the *Format* field

Pop-up list from clicking on the folder icon for the *File* field



Pop-up list from clicking on colour icon for the *Colour* field

For a *pop-up list*, an answer is chosen from the list by **double** clicking LB over the required answer. This answer is then displayed in the panel field and the pop-up list disappears.

At the bottom of some *pop-up lists* is a [Sameas] button. If [Sameas] is selected then an object with the require property is selected using the mouse and the value from the selected item is written to the panel field.

For some options, more than one selection from a list can be made. In that case, simply use the standard Microsoft methods for multiple selections and then click on **Select**.

For a *pop-up menu*, an answer is chosen from the pop-up menu by clicking LB over the required answer. This answer is then displayed in the panel field and the pop-up menu disappears.

If there are more than twenty five choices to be displayed in a pop-up menu (or the number Popup length in the panel Defaults), the list of choices will be split up alphabetically into sub-lists with walk-rights to access each of the sub-lists, A pop-up list has scroll bars on the list if it is longer than the pip-up length.

The pop-up list or menu can also be removed without a selection by clicking LB on the [X] on the pop-up list or menu, by clicking LB again on the choice icon or [+] for the panel field, or by simply typing into any visible part of the panel field that the pop-up is for (some of the field may be obscured by the pop-up itself).

textstyle_info
textstyle_data
select_textdata

Textstyle Info and Textstyle Data

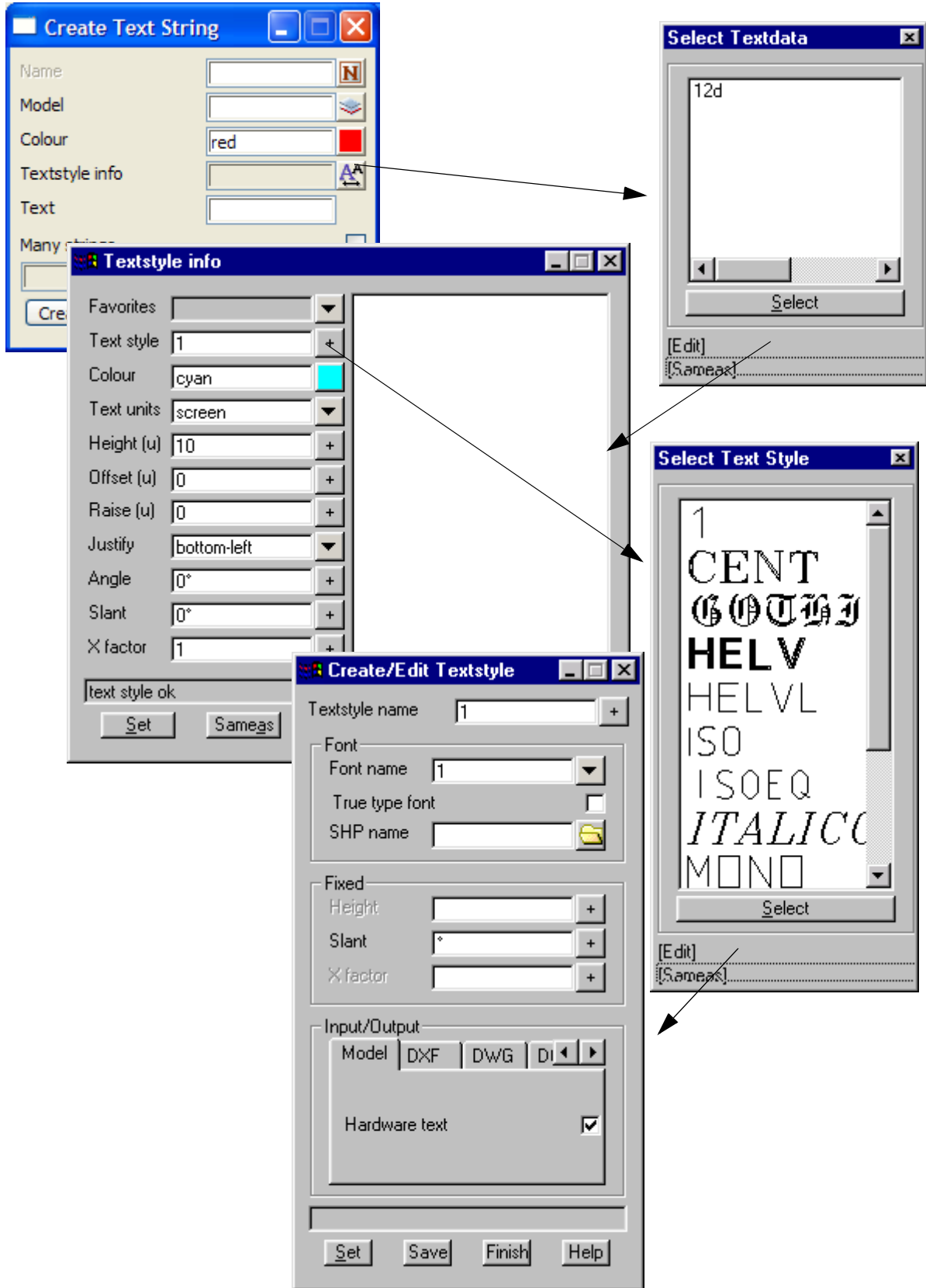


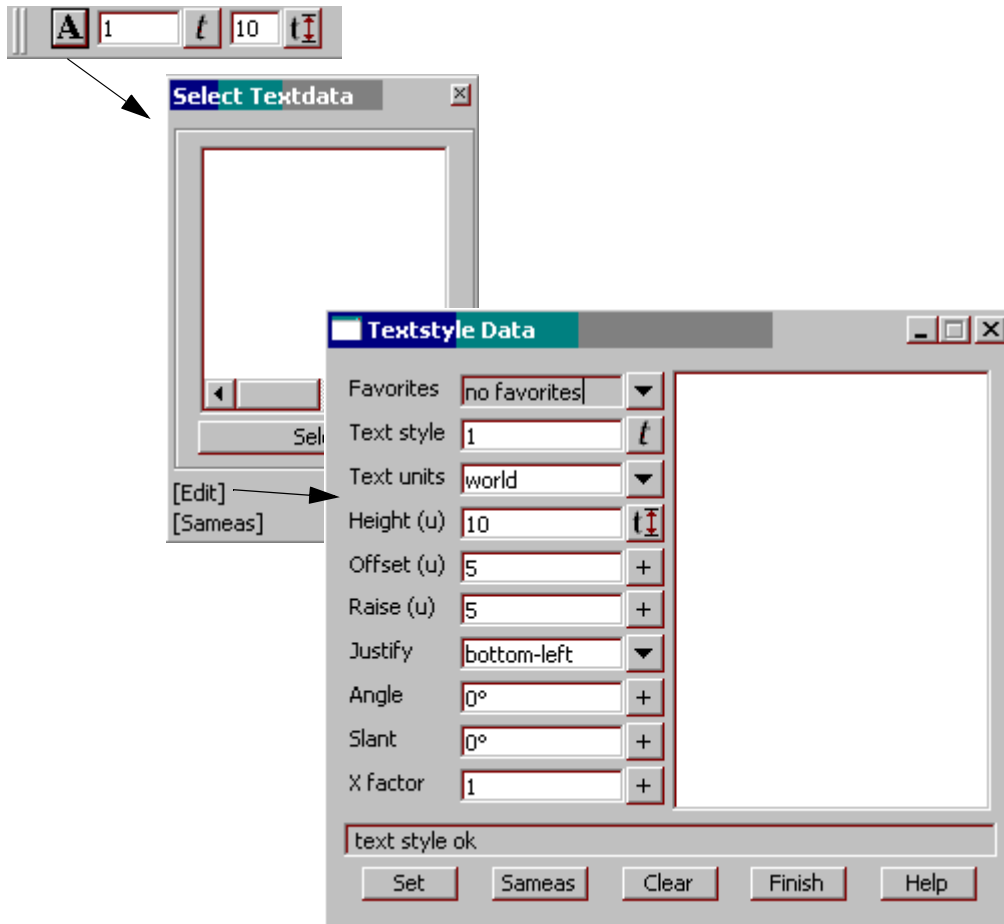
There is now a textstyle info panel field for defining the text parameters. Clicking on the textstyle info icon brings up the Select

Textdata pop-up menu which lists the textstyle favourites. By clicking on [Edit], the **Textstyle Info** panel is brought up and all the definitions for the text style can be modified and written to the textstyle info panel field by clicking on **Set**.

Textstyle favourites are defined in the Browse option *Projects=>Browse=>Textstyle data favourites* and documented in the section “Textstyle Data Favourites” in the chapter “Projects”.

Note that there is a **Textstyle Data** panel that is identical to the **Textstyle Info** panel except that it doesn't have the Colour field. The Textstyle Data panel is brought up by clicking on the **A** on the Text toolbar.



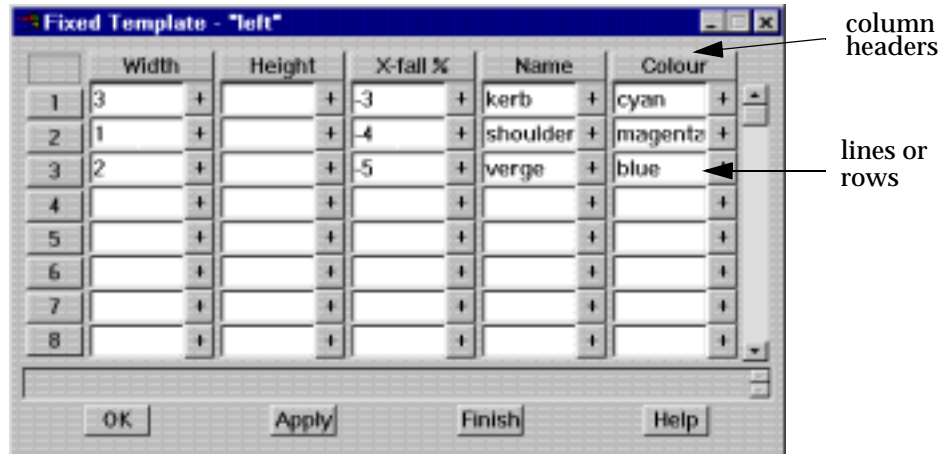


Scrolling Panel Tables

Many **12d Model** panels include tables or lists of information which hold an unlimited number of lines or **rows**. The tables may have more than one **column** but the number of columns is fixed for that table.

Such tables are displayed and edited in a **scrolling panel table**.

For example, the **Fixed Template** panel can contain an unlimited number of lines (rows) defining fixed links for the template.



Normally a set number of lines of the table are displayed in the **scrolling panel table** and once the number of lines exceeds the set number, the up and down arrows on the right hand side of the scrolling panel table are needed to scroll the lines up or down to see the extra information.

Each column of the panel table normally has a **column header** such as **width** and **height** in the above example of the **Fixed Template** scrolling panel table.

The **numbers** on the left hand side of the scrolling panel table indicate the line (row) numbers of the information being displayed and the line numbers are also buttons which when selected, bring up the **Edit Line n** panels. For example



The options on the **Edit Line n** panel have the following functions:

- clear clear the current line
- copy copy the current line into the next line; all following lines are pushed down
- delete delete the current line
- insert insert a blank line; the current line and all following lines are pushed down
- up swap the current line with the preceding line
- down swap the current line with the following line

Also, when the **number** on the left is selected, typing will **delete** the line
<insert> will **insert** a line.

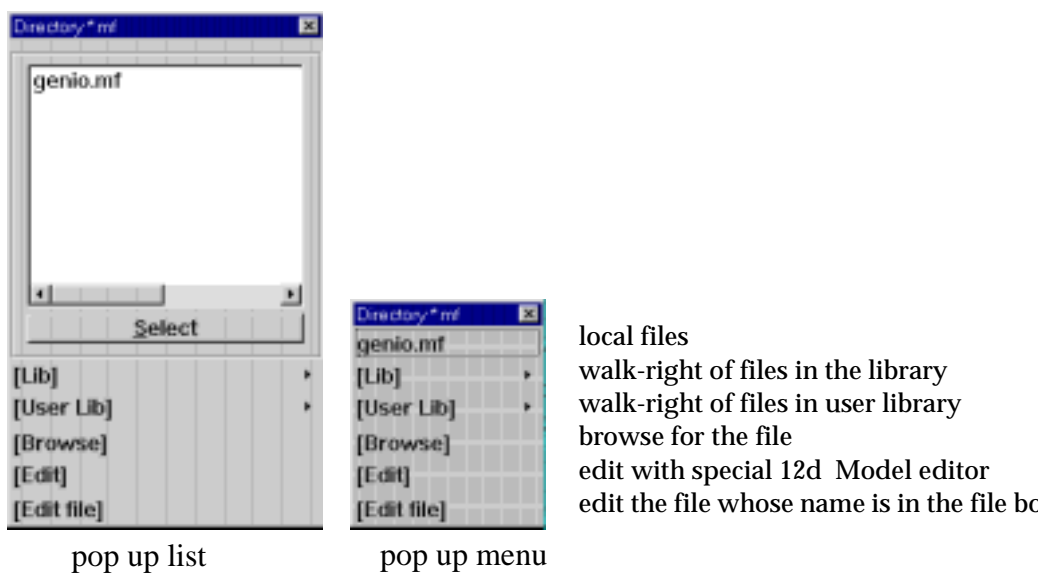
File Box

12d Model panels frequently include a field for entering a **file** name. This type of panel field is called a **file panel** field or box, or simply **file box**.

When RB is clicked on the [+] at the right of the panel field to bring up the list of available files, the pop-up menu can contain up to five different types of items:

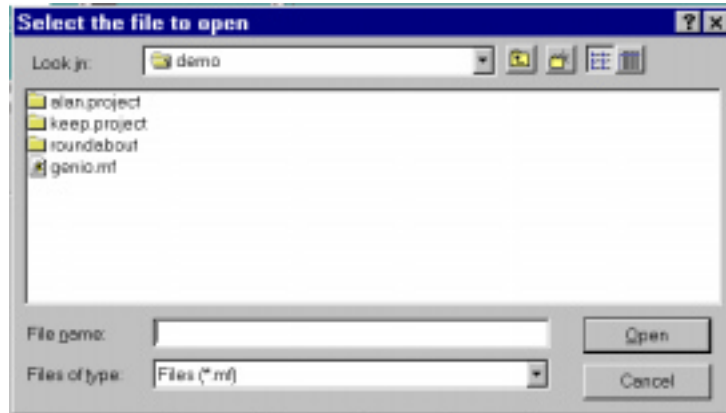
- (a) list of **local** files satisfying the file ending for the file box
- (b) [Lib] button
- (c) [User lib] button
- (d) [Browse] button
- (e) [Edit] button for some special files which have an internal 12d Model editor
- (f) [Edit file]

For example,



The special menu items, [Lib], [User Lib], [Browse], [Edit] and [Edit file], in the file box pop-up list and menu have the following meanings:

- [Lib]** the walk-right lists all files satisfying the file box ending, in the library pointed to by the environment variable LIB_4D (see Appendix A)
- [User Lib]** the walk-right lists all the files satisfying the file box ending, in the user library pointed to by the environment variable USER_LIB_4D (see Appendix A)
- [Browse]** selecting browse brings up the **Microsoft File Browser** which can be used to search for a file with a specified ending in the local or other directories.



[Edit] selecting edit will bring up the special 12d Model editor for the file. For example, for map file. The edit only exists when a special 12d Model editor exists for the file type.

[Edit file] selecting edit file when there is a file name already in the file box, will edit the file using the editor pointed to by the EDITOR_4D environment variable.

Model Panel Field

12d Model panels frequently include a field for entering the name of a model. These fields are called **model panel** fields or simply model fields.

Because models are often required to be displayed on views and hence, need to be **added** to a view, there is a short-hand method for adding models to views when using a model field.

After the model name is entered into the model field, the name of the view that the model is to be added to is typed in, preceded by a comma. If the model is to be added to more than one view, simply type in each of the view names separated by commas.

For example, to add the model **fred** to the views **1**, **3**, and **5**, type

fred,1,3,5

into the model field.

Alternatively, the view names can be enclosed in round brackets.

For example,

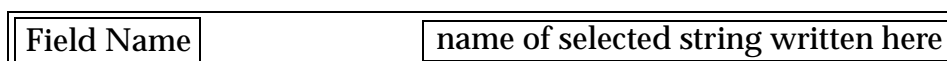
fred (1,3,5)

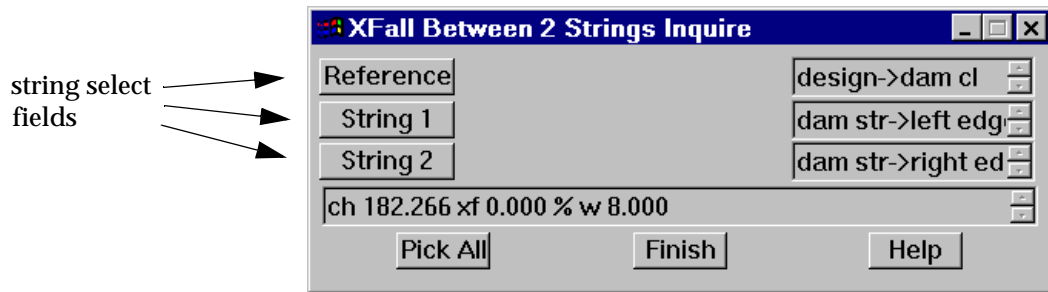
String Select Panel Field

There is a special panel field called a **string select** panel field, which consists of a button and an information area. It is used for **selecting** a string and **recording** the string name in the panel field.

The **field name** is raised slightly acts as a button which highlights as the cursor moves over it. Like a button, it is activated by clicking LB on the highlighted **field name** and a string select operation then begins (see the section on picking strings).

Once a string is selected, the name of the string is written into the information area of the string select panel field.





Same As for Panel Fields

For most panel fields/ input boxes, clicking the middle mouse button (MB) in the field will activate a **same as** pick which allows the user to get information from other objects.

After clicking MB, simply select a string, plot frame etc. from a view and the appropriate value will be extracted from the selected item and piped into the panel field.

At present **same as** picks works for

- models
- colours
- justify
- text styles
- text units
- names
- plotter (from plot frames)
- sheet size (from plot frames)
- line styles

Please continue to the next section “Measures”.

Measures

measures

measure_x

measure_y

measure_z

Whenever a real value is required in a box (e.g. height, width), the pop-up menu on the [+] button includes a measures menu.

The measures menu allows the user to pick a selected measure value from existing strings, and the picked value is displayed and piped into the panel field.

For example, the x, y, or z coordinate of a point or the plan distance between two points.

If default values already exist for the pop-up menu, the options on the measures menu will be added to the bottom of the default list.

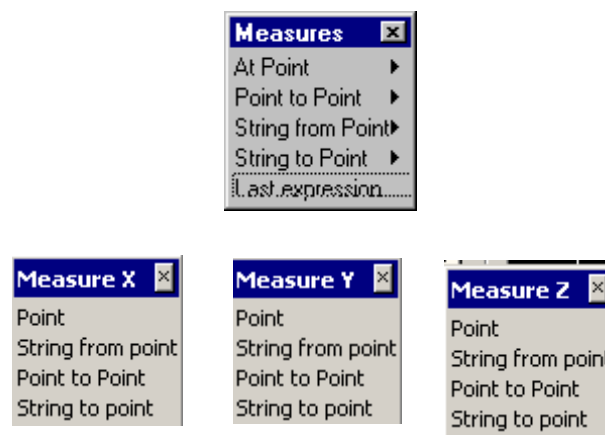
The measures functions support dynamic measures to give the user more visual feedback. This includes the drawing of a rubber line in the case of **Point Point** and **String to Point** measures, or a cross in the case of **At Point**.

The measures and their dynamic aspect can be easily explored via the option

Utilities=>Measure=>Value

The walk-right Measure menus are documented in the next four sections.

The stand alone measures menus is



For the option *At point*, go to section “Measure At Point”

Point to point

“Measure Point to Point”

String from point

“Measure String from Point”

String to point

“Measure String to Point”

Last expression

“Last Expression”

If information on measures is not required, please continue to the next section “Text Units”.

Measure At Point

measure_point



get x co-ordinate of selected point
 y co-ordinate
 z co-ordinate
 chainage at the point
 instantaneous angle
 instantaneous bearing
 cross-fall of selected point
 slope at the point
 radius (0 if no curve)

The At Point measures calculate and display the picked measure at a selected point.

For example, **X** gets the x-coordinate of a selected point.
Bearing gets the instantaneous bearing of a selected point.

The dynamic aspect of the at point measures is as follows:

after the desired at point option is picked and the string for the **at point** measure is tentatively selected but not yet accepted, and if the cursor is moved around, then the cursor position is dynamically dropped perpendicularly onto the highlighted string and a cross displayed on the string at the dropped point, and the picked measure value is dynamically displayed in the panel field.

For example, if the x measure was picked from the Measure Point menu and a string highlighted but not yet accepted, then as the cursor is moved around the screen, the cursor position is dropped perpendicularly onto the highlighted string and displayed as a cross and the x-coordinate of the cross is displayed in the panel field.

Measure Point to Point

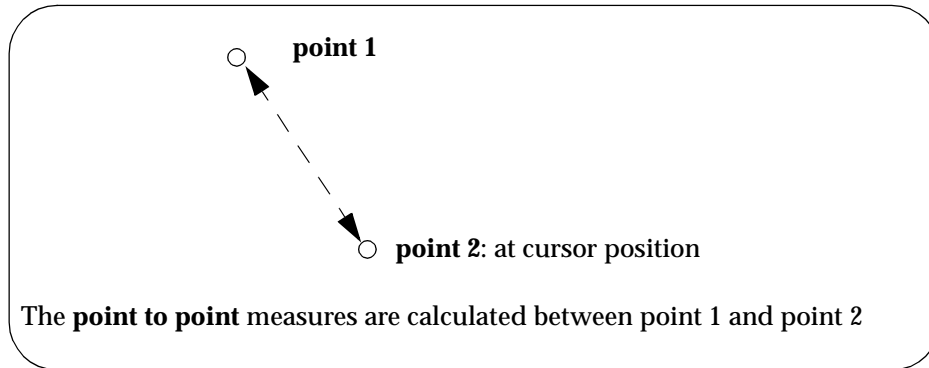
measure_point_to_point



get 2d length between selected points
 3d length
 delta x
 delta y
 delta z
 delta chainage
 angle of line joining selected points
 bearing of line
 cross-fall of line
 slope of line

The Point to Point measures calculate and displayed the picked measure between two selected points.

For example, **Length** gets the plan distance between two selected points.
X-fall % gets the % cross fall of the line joining two selected points.



The dynamic aspect of the point to point measures is as follows:

after the desired point to point measure is picked, and the first point for the **point to point** measure is selected, then a rubber line is dynamically drawn between the selected point and the current cursor position and the picked measure value is dynamically displayed in the panel field.

Further, if the selected string for the **second** point is tentatively selected but not yet accepted, and if the cursor is moved around, then the cursor position is dynamically dropped perpendicularly onto the highlighted string and the picked measure value to the second string is dynamically displayed in the panel field.

For example, if the length measure was picked from the Measure Point to Point menu and the first point selected, then a rubber line is dynamically drawn between the selected point and the cursor position and the plan length from the selected point to the current cursor position is dynamically displayed in the panel field.

If a string is selected for the second point but not yet accepted, the cursor position is dynamically dropped onto the highlighted string and the plan distance from the first point to the dropped point is dynamically displayed in the panel field.

Measure String from Point

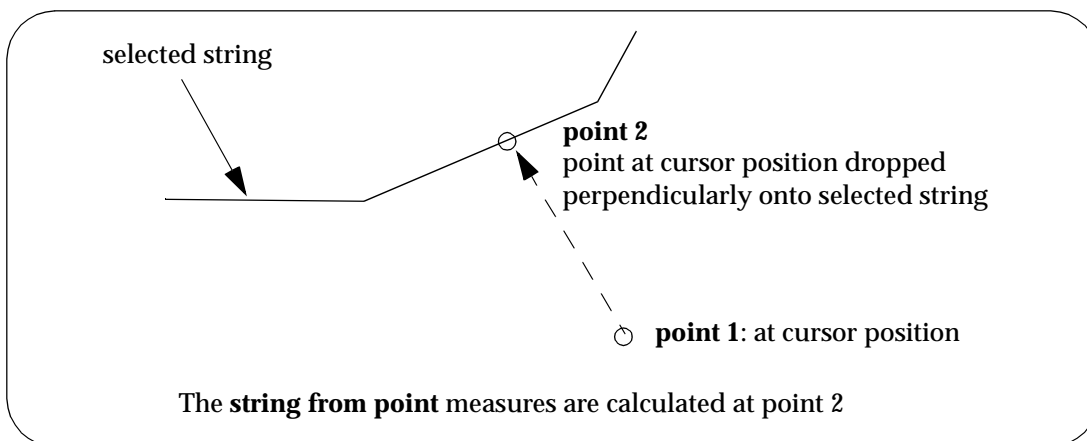
measure_string_from_point



get x co-ordinate of point dropped onto string
 y co-ordinate
 z co-ordinate
 chainage at the point
 instantaneous angle
 instantaneous bearing
 cross-fall of selected point
 slope at the point
 radius (0 if no curve)

The String from Point measures calculate the picked measure *from the selected string* by taking the current cursor position and dropping it perpendicularly onto the selected string and using the dropped point on the string to get the measure value.

For example, **X** gets the x-coordinate from the string of the cursor dropped onto the selected string.
Z gets the z-coordinate from the string of the cursor dropped onto the selected string
Bearing gets the instantaneous bearing from the string of the cursor dropped onto the selected string.



The dynamic aspect of the string from point measures is as follows:

after the desired string from point measure is picked and the string for the **string from point** measure is selected, then as the cursor is moved around, a rubber line is dynamically drawn between the cursor and the cursor position dropped perpendicularly onto the selected string, and the picked measure value of the dropped cursor position is dynamically displayed in the panel field.

For example, if the z measure was picked from the Measure String from Point menu and a string selected, then as the cursor is moved around the screen, the cursor position is dropped perpendicularly onto the selected string. The perpendicular line is dynamically redrawn and the z-coordinate of the dropped point on the string is dynamically displayed in the panel field.

Measure String to Point

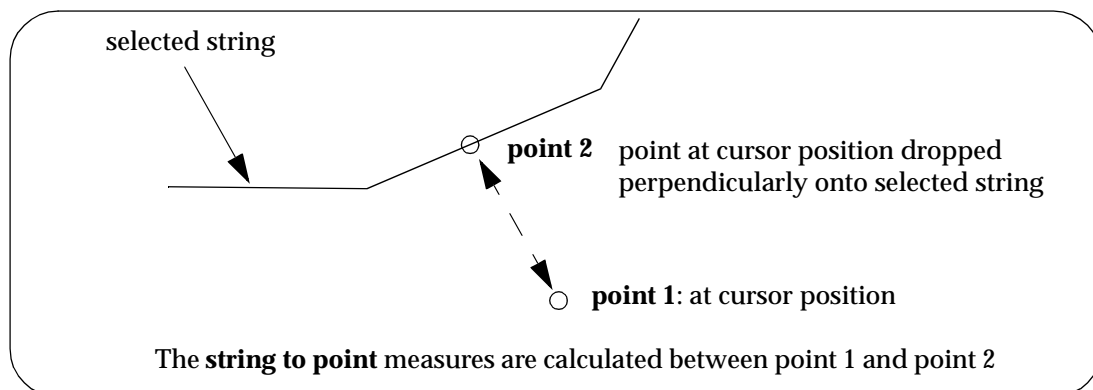
`measure_string_to_point`



get 2d length between selected points
 3d length
 delta x
 delta y
 delta z
 delta chainage
 angle of line joining selected points
 bearing of line
 cross-fall of line
 slope of line

The String to Point measures are similar to the *point to point* measures and calculate the picked measure from a point and the point **dropped perpendicularly** onto the selected string.

For example, **Length** gets the plan distance between the point and the point dropped perpendicularly on a selected string.
Bearing gets the bearing of line joining the point and the point dropped perpendicularly onto a selected string

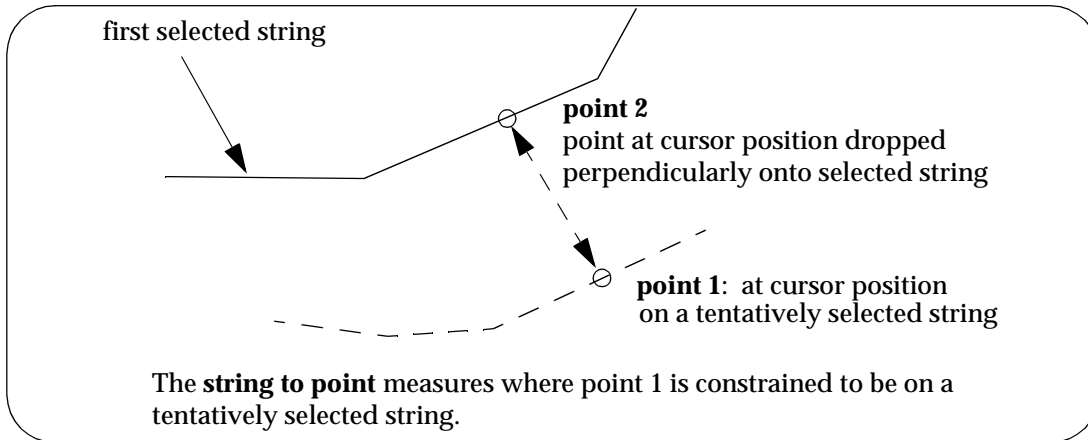


The dynamic aspect of the string to point measures is as follows:

after the desired string to point measure is picked, and a *string* selected, then a line is dynamically drawn between the cursor position and the cursor position *dropped perpendicularly* onto the selected string. The **string to point** value is dynamically displayed in the panel field as the cursor is moved around.

Further, if the cursor position is on a string which has been selected but not accepted and the cursor is moved around, then the cursor is *constrained* to remain on the tentatively selected string. It is dynamically dropped perpendicularly onto the original string and the measure value to the dropped point displayed in the panel field.

Hence the selected point is **constrained** to remain on the tentatively picked string and the measure dynamically calculated and displayed.



For example, if the length measure was picked from the Measure String to Point menu and the first string selected, then a line is dynamically drawn perpendicularly between the selected string and the current cursor position and the plan length from the string to the current cursor position is dynamically displayed in the panel field.

If a string is tentatively selected (picked but not yet accepted), the cursor position is dynamically dropped onto the first string and the plan distance measured perpendicularly from the point to the first string is dynamically displayed in the panel field.

Last Expression

Brings up the last expression or real value typed into the box. For example, if $3*4$ was typed and <enter> pressed, 12 will be displayed. The Last Expression pop-up will bring back the $3*4$.

Text Units

Text occurs in 12d Model in three ways -

- ▲ user defined **text strings**
- ▲ automatic text such as grid values, x-section and long-section plot annotation.
- ▲ text within linestyles.

The most difficult thing about text is that because of the different uses of text, there needs to be more than one systems of **units** to define text heights.

The height of text for a given textstyle is defined to be the height of a capital A. However, in 12d Model, there are three methods of defining the units for measuring this height.

- ▲ world units - the units used for data
- ▲ screen units - pixels (the screen is 1000 pixels wide)
- ▲ plot paper units - millimetres.

World Units

World units are the units of user data. For most users, the base unit for user data is metres. However 12d Model is a dimensionless system and the base unit is totally dependent on the user.

The height of world text when displayed in a view depends upon on the text height and the scale of the view.

When plotted, the height that world text appears on a plot sheet is the same as for any data defined in world units - the height depends on the **scale** used for the plot.

Text heights that are only given in world units have **(w)** after them.

For some text, the choice of units is either world or pixels. The text parameters then have a **(u)** after them.

Screen Units - pixels

When screen units (pixels) are used, the text is a fixed height on the screen. If the user zooms in on text given in pixels, the text remains the same height.

To have a height on a plot, screen unit text needs a height defined in millimetres.

For some screen text, both a pixel and a millimetre height is supplied when the text is defined.

For text with only a pixel height, there is a plotting multiplication parameter called **pixels-to-millimetres** which is used to convert pixel heights to plot paper heights. The value of pixels-to-millimetres is set using the **plots=>pixels to mm** option and is stored for the project.

Text heights that are only given in pixels have a **(pix)** or **(p)** after them.

For some text, the choice of units is either world or pixels. These text parameters then have a **(u)** after them.

Plot Paper Units - millimetres

Text defined in plot paper units (millimetres) has a well defined height on a plot sheet. When a view scale is set for a plan view, then paper text will draw at the correct size for that scale.

Text heights that are only given in millimetres have **(mm)** after them.

Special Text Characters

There are special text characters that do not appear on the standard keyboard but can still be entered into text strings with textstyles using true type fonts.

The special characters are entered by holding down the Alt key and typing in certain numbers on the *number pad* whilst the Alt key is still being held down). The character will appear when the Alt key is released.

Some commonly used special characters and their Alt codes are

Squared character	²	Alt 0178
Cubed character	³	Alt 0179
Middle dot character	·	Alt 0183
Large diameter character	Ø	Alt 0216
Small diameter character	ø	Alt 0248
Degree character	°	Alt 0176
Copyright character	©	Alt 0169
Registered character	®	Alt 0174
British Pound character	£	Alt 0163
Japanese Yen character	¥	Alt 0165

The Alt values come from the character map for Windows. This can be quickly viewed by
run charmap.

NOTE - these values may depend on the true typed font used in the textstyle.

Please continue to the next section “Bearings and Angles”.

Bearings and Angles

Many panels and options take angles or bearings as input. The 12d Model default for angles or bearings is in degrees, minutes and second (dms).

To save typing, this is written in the form

ddd.mmssfff

where **ddd.mmssfff** is the angle or bearing expressed in degrees, minutes and seconds as

ddd	whole degrees
.	separator between degrees and minutes
mm	whole minutes
ss	whole seconds
fff	fractions of seconds (as many as required)

Notes

1. the decimal point . indicates where the degrees stops and the minutes begin
2. if there is only whole degrees, the .mmssfff can be omitted. However, if there are any minutes, seconds or fractions of seconds, there must be **two digits** of whole minutes
3. if there are no seconds or fractions of seconds, then the ssfff can be omitted. However, if there are any seconds or fractions of seconds, there must be **two digits** of whole seconds
4. there are as many digits of fractions of seconds as required (possibly none).

For example

35	is 35 degrees
35.09	is 35 degrees and nine minutes
35.0901	is 35 degrees, nine minutes and one second
35.090107	is 35 degrees, nine minutes and 1.07 seconds

Expressions in Bearing, Angle Panel Fields

Because bearings (angles) and numbers **can not** be used interchangeably in mathematical expressions, only a limited number of expressions can be supported in a bearing or angle panel field.

Bearings (angles) can be added or subtracted from other bearings (angles) but a number can not be added or subtracted from a bearing (angle). So the addition and subtraction of bearings (angles) is supported but addition/subtraction of a bearing (angle) and a number is invalid.

Bearings (angles) can not be multiplied or divided by another bearing (angle) but a bearing (angle) can be multiplied or divided by a number. However because the input of a bearing (angle) in degrees, minutes and seconds looks like a decimal number (see the previous section "Bearings and Angles"), a rule must be made to distinguish between bearings (angles) and numbers for multiplication and division. In 12d Model, the bearing (angle) is on the left of the number it is being multiple or divided by.

So in a bearing (angle) panel field and grid, the following is supported:

- (a) add or subtract bearings (angles) i.e. bearing + bearing or bearing - bearing is allowed
- (b) type bearing*number + bearing *number - note that the number is on the right of the *
- (c) type bearing *number - bearing *number - note that the number is on the right of the *
- (d) type bearing /number + bearing *number - note that the number is on the right side of the /
- (e) type bearing /number + bearing *number - note that the number is on the right side of the /

Because a user often wishes to add or subtract 90 degrees from a bearing or angle, the Page Down/Page Up keys have a special meaning when the focus is on the bearing (angle) panel field. For a bearing (or angle) panel field (but **not for a grid**):

- | | |
|------------------------------|---|
| (f) Page up | - subtracts 90 degrees to the bearing/angle |
| (g) Ctrl + page up | - subtracts 15 degrees to the bearing/angle |
| (h) Shift + page up | - subtracts 10 degrees to the bearing/angle |
| (i) Shift + Ctrl + page up | - subtracts 6 degrees to the bearing/angle |
| | |
| (j) Page down | - adds 90 degrees to the bearing/angle |
| (k) Ctrl + page down | - adds 15 degrees to the bearing/angle |
| (l) Shift + page down | - adds 10 degrees to the bearing/angle |
| (m) Shift + Ctrl + page down | - adds 6 degrees to the bearing/angle |

Please continue to the next section "Precision".

Precision

Double precision variables are used throughout 12d Model for all co-ordinate values and calculations.

Although this increases the time taken for calculations, it is more than offset by the increase in the accuracy of the data and the results of any calculations.

Because of the accuracy of double precision variables (fourteen significant figures), there is no practical restriction on the co-ordinate area covered by projects.

The default number of decimal places for displaying values in the *information menu* is three (3). This number of decimal places is controlled by the display precision field in the **System Settings** tab of the **Defaults** panel (option Utilities=>Defaults).

The default number of decimal places for displaying values in *boxes* and *panels* is four(4). This number of decimal places is controlled by the box precision field in the **System Settings** tab of the **Defaults** panel (option Utilities=>Defaults).

Please continue to the next section "Colours".

Colours

edit_colours

The palette of colours available for elements drawn in a view depends on the 12d colour definition file, `colours.4d` (see section “Colours” in Appendix “Set Ups”). A default file is distributed with 12d Model and resides in the `set_ups` folder. Up to 10,240 colours can be defined.

In this manual, colours will be referred to by names. However, 12d Model stores colours by the **colour number**. This is independent of the colour names and if a different `colours.4d` is used, the colours on the screen may change.

Note: colour numbers can be used instead of a colour name in any panel fields.

Please check your `colours.4d` file if your screen colours do not match those mentioned in this manual.

The colour names are used (sorted into alphabetical order) in colour pop-ups. When a large number of colours have been defined, the pop-up list can get unwieldy so there is a default parameter, `display colours` (in the panel brought up by *Utilities =>Defaults*), which gives the number of colours to use in a pop-up.

The order that the colours are taken from the colour file for the pop-up is **not** the colour number but the *pop-up number order* which can be completely different. This means that the user can add extra colours after the standard 2000 12d Model colours number and easily have the new colours come up in the colours pop-up.

Hence it is possible to have thousands of defined colours for shades and plots, but still have only a selected sixteen displayed in colour pop-ups.

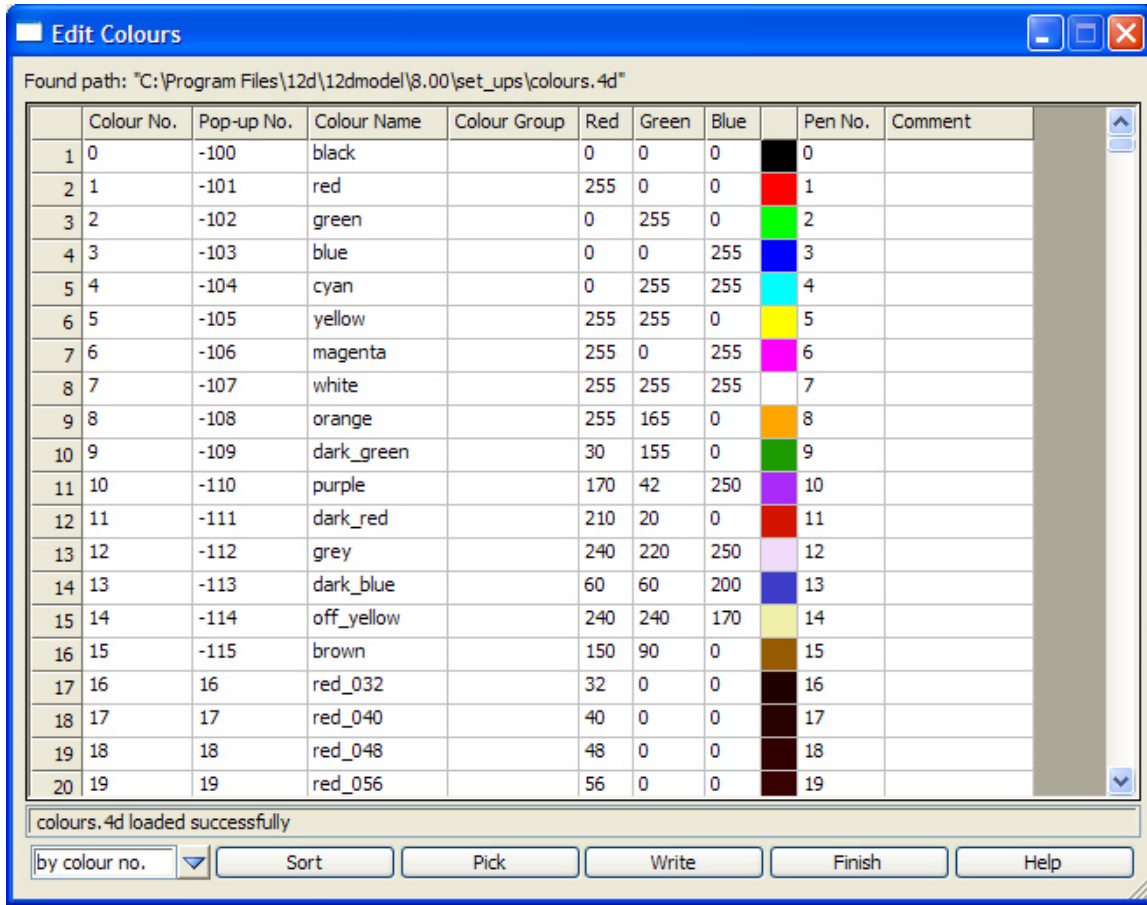
WARNING

Do not change the colour numbers and definitions for colour numbers 0 to 2000 - they are restricted for 12D Solutions use only.

In the 12d Model database, only the colour number is saved so if any of the first 2000 colour numbers are changed then the display of colours in existing projects may change.

Editing Colours

To add/modify colours to the 12d Model `colours.4d` file, bring up the **Edit Colours** panel by clicking on the [Edit] section of the Select Colours pop-up.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Grid Cells

Colour No. integer

number of the colour. A unique integer value between 0 and 10,239.

Pop-up No. integer

the colours are selected for the pop-up by this number. It is a unique integer - positive, 0 or negative.

Colour name text

text name for the colour.

Colour Group text

group for the colour.

Red/Green/Blue integer

amount of red/green/blue in the colour. Value is between 0 and 255.

Pen No. text box

pen number to map the colour to.

Comment text box

optional comment.

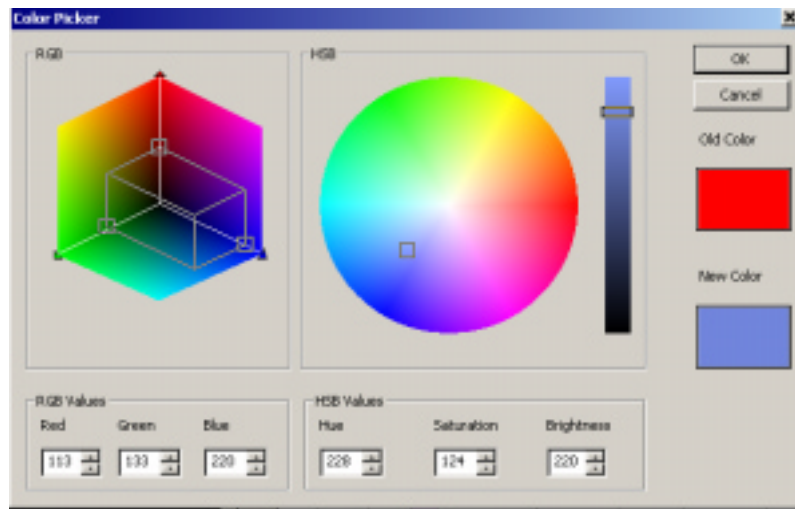
Buttons

Sort button

sort the table with respect to the column given in the adjacent field.

Picker button

if a row of the table is highlighted, selecting **Picker** brings up the **Color Picker** to interactive define the RGB for new colours.



Write button

write the table out to a *colours.4d* file.

Please continue to the next section “Defaults”.

Defaults

Default Panel Values

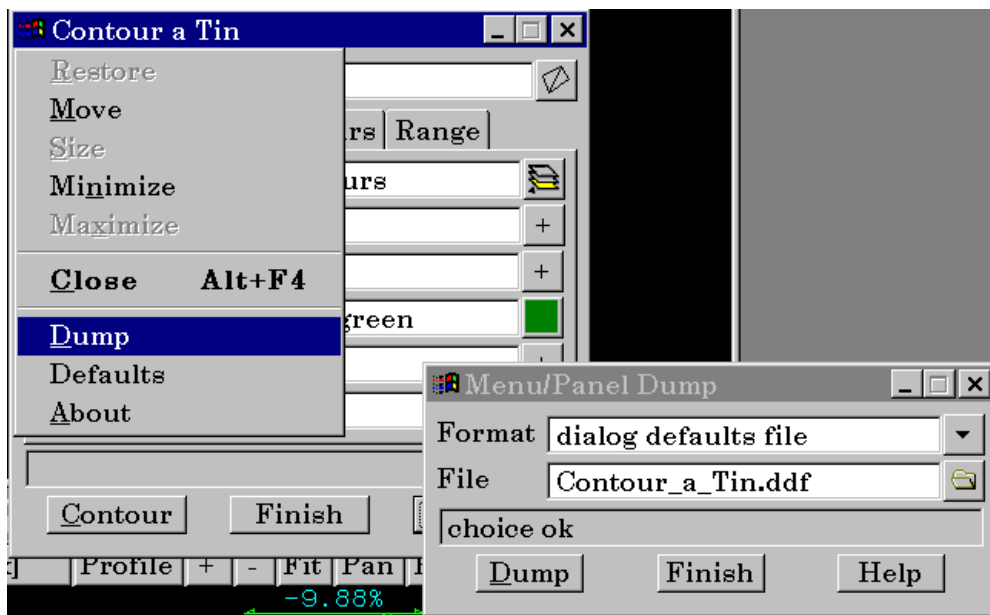
When a 12d Model panel starts up, the standard paths are searched for a *dialogue default file* to use to set default values for the panel fields. Not all the panel field values need to be in the ddf.

If a ddf file is not found, the 12d Model system defaults are used.

The *dialogue default file* has the same contents as a screen layout files but the file name ends in.ddf and must have the unique panel name as given by the panel dump option.

A *dialogue default file* can be created for a panel by using the panel *dump* option and selecting the format 'dialogue default file'. The ddf file is a text file and can be edited to add/change/remove information in the file.

The panel **dump** option is selected from the **panel system** menu which is invoked by clicking the left mouse button (LB) on the Windows icon on the left of the panel title area. The **Menu/Panel Dump** panel is then displayed. For example, for the **contour a tin** panel:



Defaults

Many panels and operations in 12d Model require settings which are almost always the same. To save repetitious typing, 12d Model provides a number of user defined defaults that are used throughout 12d Model.

For example, the chord to arc tolerance, point cross size and highlight cross size and colour.

Certain default values are read in from a file when a new project is created. These defaults can also be modified inside 12d Model using the **Defaults** panels.

The lay out of the file used to define the default values for a new project is given in the appendix **Set Ups**.

Default File Ending

In any panel pop-up requiring a file name, default file endings are used to restrict the names of the files selected from the current folder to be displayed in the pop-up.

The list of special file endings is given in the appendix **Special File Formats**

Please continue to the next section “Plotters”.

Plotters

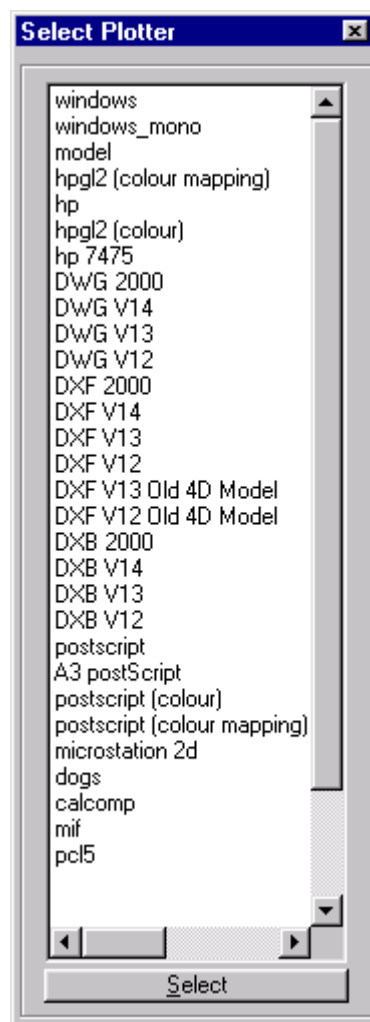
select_plotter

When creating a **plot**, 12d Model can either drive the plotter directly using Windows printer drivers or plot indirectly by creating a computer disk file (the plot file) containing the relevant plotter instructions for producing the plot, or in the case of the plotter type **model**, a 12d Model model is created.

If a plot file is created then there is a variety of formats available, each with its own special file ending.

In the plotting options, the choice of plotters that is available through the pop-up menu can be the default 12d Model list or a user defined list of plotters.

The default 12d Model list is

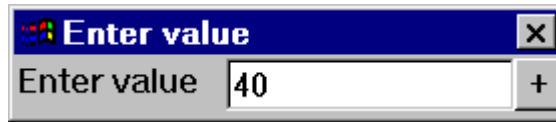


When the plot file is created, it can be passed to a user specified program or batch file which can automatically direct the plot file to a plotter.

See the appendices "Set Ups" and "Plotters and Plotting" for more information on plotters and defining plotters.

Miscellaneous Panels

enter_value



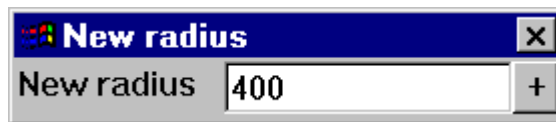
The value is entered into the typed-input box, terminated with <enter>.
The **Enter Value** typed-input box then disappears.

new_length



The length is entered into the typed-input box, terminated with <enter>.
The **New Length** typed-input box then disappears.

new_radius



The radius is entered into the typed-input box, terminated with <enter>.
The **New Radius** typed-input box then disappears.

No Option Available

`no_licence_available`

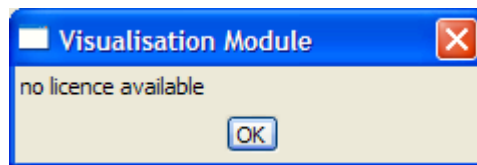
`no_license_available`

`visualisation_module`

12d Model consists of a base module of varying point sizes and optional modules.

If a module has not been purchased and any options included in that option are selected then a **No licence available** message will be displayed.

The missing module can be purchased by contacting your 12d Model distributor or 12D Solutions Pty Ltd.



No Information Available

`dongle_missing`

`save_project_poll`

There is no information available on this panel or menu.

Options on Toolbars

For general information *Toolbars* and *Controlbars*, go to “*Toolbars and Controlbars*”

Each *Toolbars* is described in detail in:

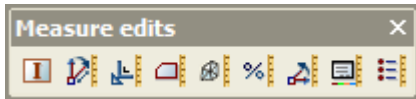
<i>Cad</i>	in the section “CAD Options”
<i>Cad Arcs</i>	“CAD Arcs”
<i>Cad Circles</i>	“CAD Circles”
<i>Cad Controlbar</i>	“CAD, Symbol and Text Controlbars”
<i>Cad Delete</i>	“CAD Delete”
<i>Cad Fills</i>	“CAD Fills”
<i>Cad Holes</i>	“CAD Holes”
<i>Cad Images</i>	“CAD Images”
<i>Cad Intersect</i>	“CAD Intersect”
<i>Cad Lines</i>	“CAD Lines”
<i>Cad Modify</i>	“CAD Modify”
<i>Cad Points</i>	“CAD Points”
<i>Cad Polygons</i>	“CAD Polygons”
<i>Cad Segment</i>	“CAD Segment Edits”
<i>Cad String</i>	“CAD Edit Strings”
<i>Cad Symbols</i>	“CAD Symbol”
<i>Cad Text</i>	“CAD Text”
<i>Cad Vertex</i>	“CAD Edit Points”
<i>H</i>	“Snap Toolbar”
<i>Measure edits</i>	“Measure Edits Toolbar”
<i>Menu Bar</i>	can't be turned off - all the options in <i>12d Model</i>
<i>Options</i>	turns off the area for docking toolbars on left hand side of 12d Model window
<i>Road</i>	“Road Toolbar”
<i>Snaps Cad</i>	
<i>Snaps Cad Arcs</i>	
<i>Snaps Cad Circles</i>	
<i>Snaps Cad Intersect</i>	
<i>Snaps Cad Lines</i>	
<i>Snaps Cad Points</i>	
<i>Strings Edits</i>	“String Edits Toolbar”
<i>Super alignment tools</i>	“Super Alignment Tools Toolbar”
<i>Survey reductions</i>	“Survey Reductions Toolbar”
<i>Symbol Controlbar</i>	“CAD, Symbol and Text Controlbars”
<i>Text Controlbar</i>	“CAD, Symbol and Text Controlbars”
<i>Tin Utility</i>	“Tin Utility Toolbar”
<i>Traverse Spreadsheet</i>	“Traverse Spreadsheet Toolbar”
<i>Visualisation</i>	“Visualisation Toolbar”

Measure Edits Toolbar

measure_edits

Position of option on menu: various

The Measure Edits toolbar is:



Options on Toolbar

- string inquire
- measure bearing/distance
- measure value
- measure plan area
- measure surface area
- measure xfall
- measure angle by 3 points
- match properties
- measure menu

For	<i>String inquire</i>	go to the section	"Inquire"
	<i>Measure bearing/distance</i>		"Bearing and Distance"
	<i>Measure value</i>		"Value"
	<i>Measure plan area</i>		"Plan Area"
	<i>Measure surface area</i>		"Surface Area"
	<i>Measure xfall</i>		"X Fall by Strings"
	<i>Measure angle</i>		"Angle by 3 Points"
	<i>Match properties</i>		"Match"
	<i>Measure menu</i>		"Measure"

Road Toolbar

road

Position of option on menu: various

The Road toolbar is:



Options on Toolbar	
	create pad
	edit pad
	special chainage file
	special chainage file for kerb returns
	set out points using super string
	label chainage and offset
	create/edit dimensions
	create/edit traffic island
	road widening with min/mac xfall
	convert polyline to alignment
	overlay design
	set up for create roads
	create roads
	modify kerb return chainages
	create kerb return using computators

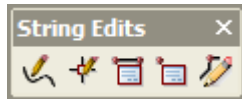
For	<i>Create pads</i>	go to the section	"Allotment Pad Create"
	<i>Edit pads</i>		"Allotment Pad Edit"
	<i>Create special chainage file</i>		"Special Chainages File"
	<i>Special chainage file for kerb return</i>		"Kerb Special Chainages File"
	<i>Setout points using super string</i>		"Create Setout Points Using Super String"
	<i>Label chainage & offsets</i>		"Chainage/Offset Label Inquire"
	<i>Create/edit dimensions</i>		"Create/Edit Dimensions"
	<i>Create/edit traffic island</i>		"Create Combined Traffic Island"
	<i>Road widening min/max cross falls</i>	"Road Widening with Minimum and Maximum Crossfall"	
	<i>Convert polyline to alignment</i>		
	<i>Overlay design</i>		"Overlay Design"
	<i>Setup for create roads</i>		"Create Roads - Setup"
	<i>Create roads</i>		"Create Roads - Manager"
	<i>Modify kerb return chainages</i>		"Intersection MTF Update"
	<i>Create kerb return using computators</i>		

String Edits Toolbar






string_edits

Position of option on menu: various

The String edits toolbar is:



Options on Toolbar

	edit string
	edit vertex
	edit segment properties
	edit vertex properties
	change strings

For	<i>Edit string</i>	go to the section	“Editor”
	<i>Edit vertex</i>		“Edit Vertex”
	<i>Edit segment properties</i>		“Segment”
	<i>Edit vertex properties</i>		“Vertex”
	<i>Change string</i>		“Change”

Super Alignment Tools Toolbar

string_edits

Position of option on menu: various

The Super Alignment Tool toolbar is:



Options on Toolbar	
	create super alignment
	edit super alignment
	resolve a super alignment
	turn fixed/floating super alignment to IP super alignment
	dereference a super alignment
	parallel a super alignment
	split a super alignment
	join a super alignment
	change style of a super alignment
	explode the labelling of a super alignment
	constrain super alignment moves
	define road design parameters
	create/edit a super alignment style
	tabulate a super alignment

For	<i>Create super alignment</i>	go to the section	"Create - Super"
	<i>Edit super alignment</i>		
	<i>Turn fixed/float to IP</i>		
	<i>Dereference a super alignment</i>		
	<i>Parallel a super alignment</i>		
	<i>Split a super alignment</i>		
	<i>Join a super alignment</i>		
	<i>Change style of a super alignment</i>		
	<i>Explode labelling of a super alignment</i>		
	<i>Constrain super alignment moves</i>		
	<i>Define road design parameters</i>		
	<i>Create/edit a super alignment style</i>		"Super Alignment Style"
	<i>Tabulate a super alignment</i>		"Alignment & Super Alignment Table"

Survey Reductions Toolbar

survey_reductions

Position of option on menu: various

The Survey Reductions toolbar is:



Options on Toolbar	
	survey menu
	create control stations
	bearing/distance entry
	traverse adjustment
	horizontal least squares adjustment
	level nets adjustment
	set up data collector
	download survey data
	convert raw survey file to 12d field file
	survey data reduction function
	quick change code
	join surveyed strings
	insert target height
	start new survey strings
	auto order survey shots
	order by survey point ids
	reset order to original order
	edit survey data
	edit survey field data by string
	lock a function
	edit a text file

For	<i>Survey menu</i>	go to the section	"Survey"
	<i>Create control stations</i>		"Create - Control Stations"
	<i>Bearing/distance entry</i>		"Plane Bearing/Distance Entry"
	<i>Traverse adjustment</i>		"Traverse Adjustment"
	<i>Horizontal least squares</i>		"Least Squares Network"
	<i>Level network adjustment</i>		"Level Network"
	<i>Set default data collector</i>		"Setup"

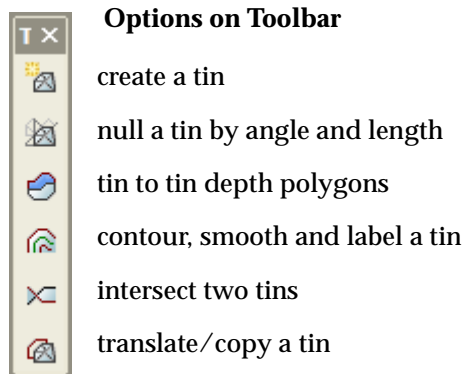
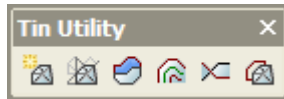
<i>Set default data collector</i>	"Setup"
<i>Download from data collector</i>	"Download Raw"
<i>Convert data collector file to field file</i>	"Convert Raw"
<i>Create survey data reduction function</i>	"Create Survey Function"
<i>Survey code change</i>	"Quick Change"
<i>Join strings</i>	"Join Two Strings of Same Feature Code"
<i>Insert target height</i>	"Insert Target Height"
<i>Start new string</i>	"New String"
<i>Auto order string points</i>	"Auto Order"
<i>Order by points</i>	"By Points"
<i>Remove ordering</i>	"Remove Order"
<i>Edit survey data</i>	"Field Data"
<i>Edit field data by picking a string</i>	"Field Data by String"
<i>Lock a function</i>	"Lock"
<i>Edit a report file</i>	"Edit"

Tin Utility Toolbar

tin_utility

Position of option on menu: various

The Tin Utility toolbar is:



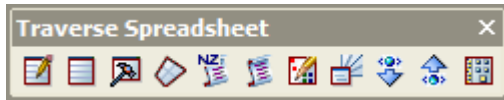
For	<i>Create at tin</i>	go to the section	“Triangulate Data”
	<i>Null by angle and length</i>		“Null by Angle and Length”
	<i>Tin to tin depth polygons</i>		“Depth Range Polygons”
	<i>Contour, smooth and label</i>		“Contour, Smooth and Label”
	<i>Intersect two tins</i>		“Intersection”
	<i>Translate/copy a tin</i>		“Translate/Copy”

Traverse Spreadsheet Toolbar












traverse_spreadsheet

Position of option on menu: various

The Traverse spreadsheet toolbar is:



Options on Toolbar

-  edit traverse spreadsheet
-  create a traverse spreadsheet
-  traverse spreadsheet utilities
-  lot check for tss
-  New Zealand traverse spreadsheet report
-  standard traverse spreadsheet report
-  drafting of traverse spreadsheet
-  drafting of radiation tables
-  read a Landonline XML file
-  write a Landonline XML file
-  set up parameters for traverse spreadsheet

For	<i>Edit traverse spreadsheet</i>	go to the section	"TSS Edit"
	<i>Create a traverse spreadsheet</i>		"TSS Create"
	<i>Traverse spreadsheet utilities</i>		"TSS Utilities"
	<i>Lot check for traverse spreadsheet</i>		"Lot Check"
	<i>NZ traverse spreadsheet report</i>		"NZ TSS Report"
	<i>Traverse spreadsheet report</i>		"Standard TSS Report"
	<i>Traverse spreadsheet drafting</i>		"TSS Drafting"
	<i>TSS radiation tables drafting</i>		"TSS Radiation Table Drafting"
	<i>Read Landonline XML</i>		"Landonline XML Read"
	<i>Write Landonline XML</i>		"Landonline XML Write"
	<i>Set up tss parameters</i>		"TSS Parameters"

Visualisation Toolbar

visualisation

Position of option on menu: various

The Visualisation spreadsheet toolbar is:



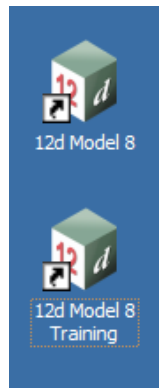
Options on Toolbar	
	tin render settings
	create roadside furniture
	create trees and shrubs
	create houses
	create fences
	create forest
	create clouds
	create/edit a texture map file
	change polygon drape
	create and place billboards
	change super string billboards

For	<i>Tin render settings</i>	go to the section	"Render Settings"
	<i>Create roadside furniture</i>		"Roadside Furniture"
	<i>Create trees and shrubs</i>		"Trees/Shrubs as Faces and Billboards"
	<i>Create houses</i>		"Houses"
	<i>Create fences</i>		"Fences"
	<i>Create forest</i>		"Create Forest"
	<i>Create clouds</i>		"Clouds"
	<i>Create/edit texture map file</i>		"Texture Map Edit"
	<i>Change polygon drape</i>		"Render Drape"
	<i>Create and place billboards</i>		"Create Billboards"
	<i>Change super string billboards</i>		"Add and Remove Billboard from Super String"

3 Starting Up

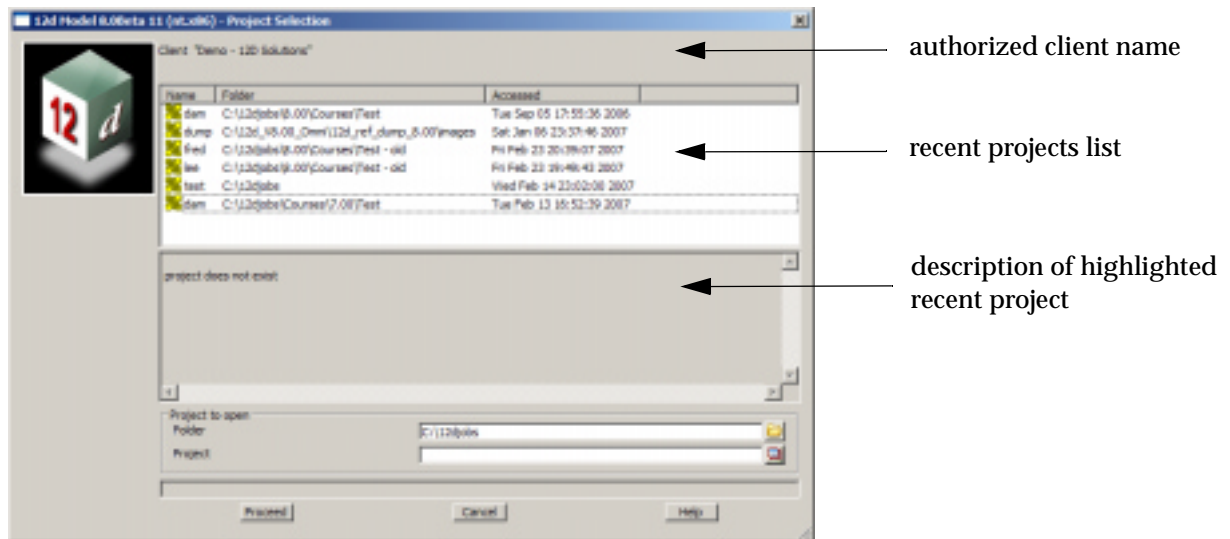
Initial Screens

When 12d Model is installed from the 12d Installation CD, the 12d icons **12d Model 8** and **12d Model 8 Training**.



The **12d Model** icons are **shortcuts** to start 12d Model and then attach to a particular **folder**. For example, 12d Model 8 starts 12d Model and attaches to the folder C:\12djobs
project_selection

Clicking on any of the 12d Model icons starts 12d Model. First the 12d Model splash screen will appear and then the initial 12d Model screen with the **Project Selection** panel.



Note

If this does not work, please contact your 12d Model administrator to check the procedure to be used on your system. For a detailed description on how to install 12d Model, please refer to the *Installing 12d Model* chapter in the *Getting Started* manuals.

The user specifies which project is to be worked on by providing

- the name of the folder that the project is to be placed in (working folder)

- (b) the name of the project inside the working folder (working project).
 If no folder is given, the project is assumed to be in the folder the user is currently in.
 If the project does not exist, a new project is created.

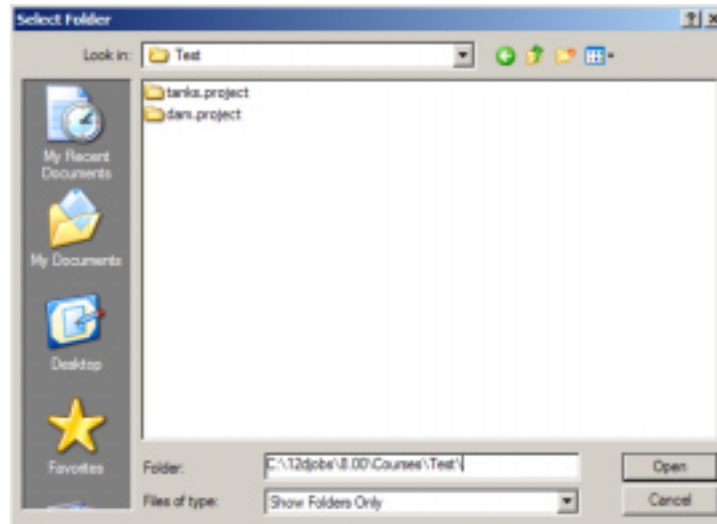
The description of the functions of the fields and buttons in the **Project Selection** panel are:

Field Description	Type	Defaults	Pop-Up
Client name <i>authorized 12d Model client.</i>	display only		
Recent projects list <i>names and folders of project recently select. Single clicking on an entry in the list displays the projects description in the Project description area. Double clicking on an entry in the list changes the project</i>	output	recent projects	
Project description <i>description of the project highlighted in the Recent projects list.</i>	output		
Folder <i>name of the folder to become the working folder.</i>	input	current folder	Microsoft browser
Project <i>name of the project to become the working project in the folder given in the folder field.</i>	input	none	projects in folder
Proceed <i>after selecting this button, the working folder is changed to the folder specified in the folder field. The working project is set to the project given in the project field. If the folder or project does not exist, it will be created.</i>	button		
Cancel <i>end the program.</i>	button		

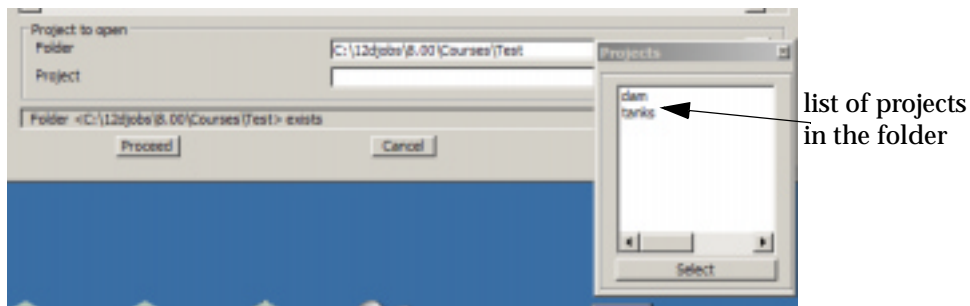
Note: This panel a resizable panel.

To select a project in the *Recent projects list*, simply double click on the entry in the list and 12d Model will open the project up.

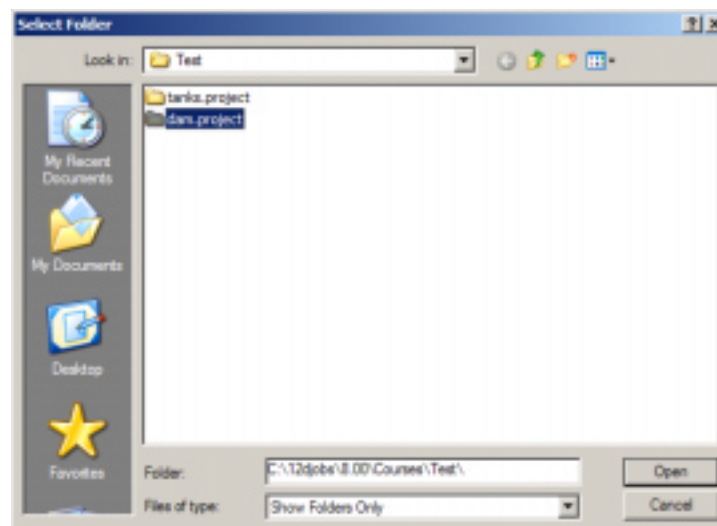
Alternatively, the Folder and Project fields can be used to select another project. If the initial folder in the Folder field is not the required folder, clicking LB on the folder icon on the right side of the field will bring up the Microsoft browser which is used to navigate to the folder where either the new project is to be created, or an existing project resides.



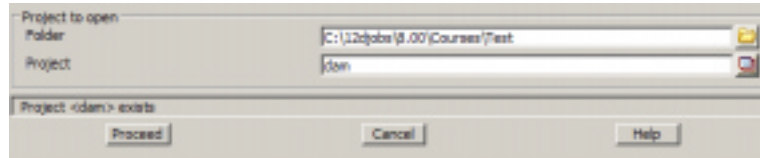
If the folder containing existing projects is selected, then a list of projects in the folder is displayed and the required project can be selected from the list.



Alternatively, the actual project can be selected by double clicking on the project name in the browser.



In either case, selecting the project fills in the Project field. Selecting **Proceed** then opens the project.



If a new project is required, then after the folder to contain the project is selected, the name of the new project is typed into the Project field and **Proceed** selected.

Organizing Working Areas

For each project, 12d Model creates a unique sub-folder of the working folder with the name consisting of the project_name followed by ".project". For example, "Olympic.project".

This sub-folder is called the **project area**. All the internal 12d Model information for that project is kept inside the project area.

All outputs, reports and plots are written to the working folder and are **not** held inside the project area.

Hence to get a complete backup of the project and all associated information, it is best to backup the entire working folder.

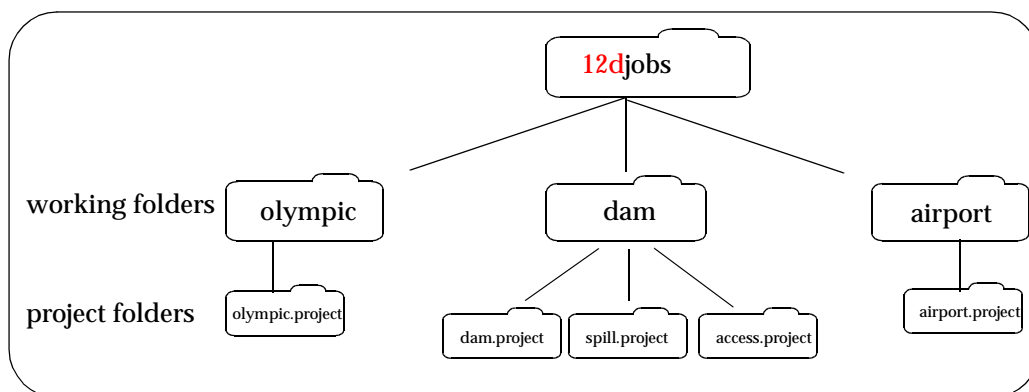
The project name, which can be up to 256 alphanumeric characters and can include spaces, must be unique within the working folder but other folders may include 12d Model projects with the same name - these projects are distinct and are not related in any way.

There is no limit to the number of projects in a particular working folder but because all the outputs, reports and plots for each project in the same working folder would be mixed in together, it is recommended to have each distinct project in its own working folder.

If unrelated 12d Model projects are going to be created, then it is suggested that they each have their **own working folder**. That way the inputs files, output files, plots, reports etc. from the separate projects do not end up in the same working folder. Each separate working folder can also then be easily backed up.

As an example, if three unrelated projects - olympics, airport, and dam - are to be created in a folder called 12djobs, it is suggested that three **sub folders** of 12djobs are first created to use as the working folders - e.g. olympics, airport and 'dam works'.

The 12d Model projects would then be created **inside** the appropriate working folder - e.g. the projects *dam*, *spill* and *access* relating to the job *dam works* would be created inside the folder *dam works*.



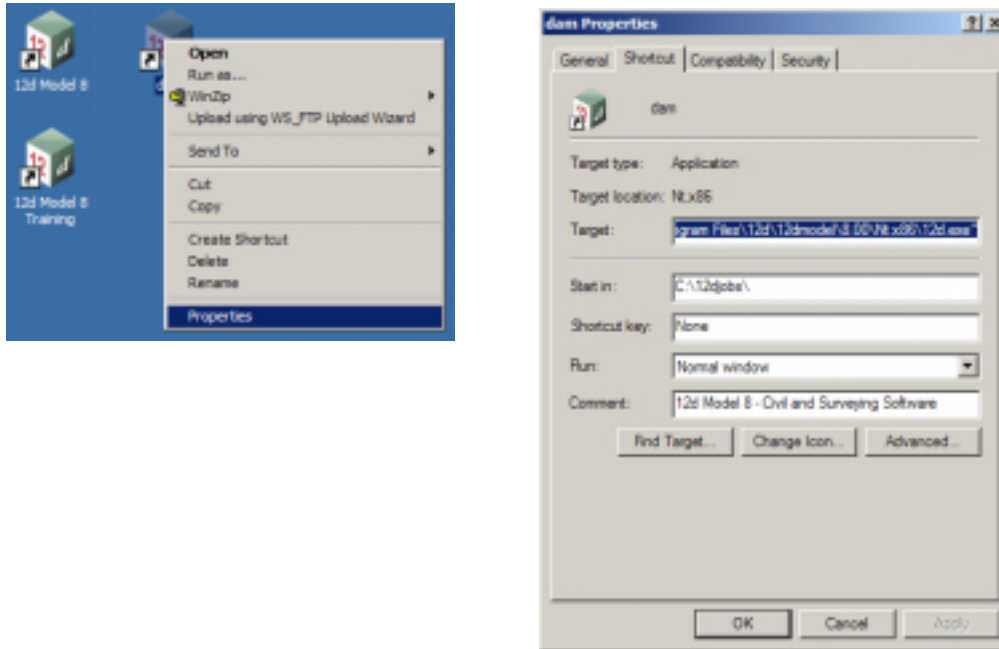
Project Shortcuts

The list of most recent projects makes it very easy for 12d operators to get into their projects.

However if there is a folder of projects, or even a particular project, that a user wants to get into by simply double clicking on an Icon on the screen, then a Windows shortcut can be used to do it.

To set up a 12d icon on the desktop, it is easiest to copy either the *12d Model 8* or *12d Model 8 Training* icons that are already on the screen. Rename the copied icon to say *dam*.

The Properties for the icon *dam* must now be modified. To display the properties of an icon, click RB over the icon and select *Properties* from the menu. Click on the *Shortcut* tab



The Properties for the icon *dam* can now be modified.

If an icon is to start in a given folder, then the **Start in** field is set to the desired folder.

For example, if the 12d Model project *dam* was in the folder "12djobs\dam works", set the **Start in** for the icon *dam* to:

"C:\12djobs\dam works"

The icon *dam* would then automatically start in the folder **C:\12djobs\dam works**.

Note that if the pathname for **Start in** contain spaces, then it must be enclosed in double quotes (").

If the *dam* icon was double clicked on, it would now attach to the working folder *dam works*

Only the appropriate project would then need to be selected from the project field of the 12d Model **Project Selection** panel

Further, if a project such as *dam* already exists in the folder, then by setting the **Target** field, the icon can be set so that 12d Model starts up in that existing project.

If the **Target** for the shortcut has the **project_name** added after the path to *12d.exe*, then 12d Model will actually start up with that project opened. The **project_name** can be a pathname.

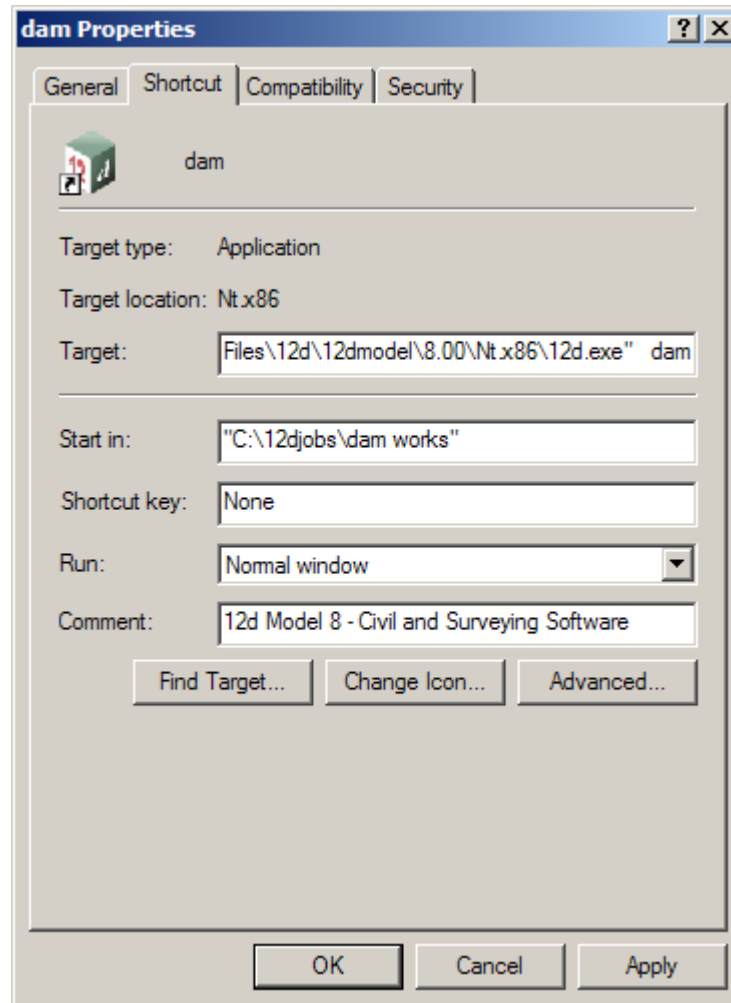
For example, the **Target**:

"C:\12d\12dmodel\8.00\nt.x86\12d.exe" dam

would automatically open the project **dam** in the **Start in** folder of the shortcut.

Note that if either the pathname for the **Target** or the **project_name** contain spaces, then they must be enclosed in double quotes (").

The following picture shows the Properties setting for **Target** and **Start in** for the *dam* icon so that double clicking on *dam* would automatically start 12d Model with the project *dam* in the folder *dam works*:



Environment Variables Shortcut

If a file of 12d Model environment variables has been set up by the user (see section “Environment Variables” in Appendix “Set Ups”), then instead of setting the environment variable ENVIRONMENT_4D to point to the file or setting it up with the default name, env.4d, the environment file can be passed to 12d Model using the **Target** of the icon properties.

For example, the **Target**:

```
C:\12d\12dmodel\8.00\nt.x86\12d.exe -env F:\12d\env.4d
```

would fire up 12d using the file of environment variables called F:\12d\env.4d

The **Target**:

```
C:\12d\12dmodel\8.00\nt.x86\12d.exe -env F:\12d\env.4d dam
```

would fire up 12d using the file of environment variables called F:\12d\env.4d **and** also automatically open the project **dam** in the **start in** folder of the shortcut.

Again if any of the pathnames contain spaces, then they must be enclosed in double quotes (“”).

Error Logging File

When 12d Model starts up, it tries to create an **error logging file**, called

log?????.4de

where ????? is a hashed number using your login name, process id & the current time.

When 12d Model terminates, the error log file is deleted if no errors were logged.

The **folder** that the error log file is created in is given by the environment variable LOG_DIR_4D

If LOG_DIR_4D is not used, 12d Model tries to create the log file in the current folder, the HOME folder, the TMP folder and the TEMP folder.

If creating a **error log file** fails in all these areas, 12d Model will not start up. This should never happen.

Running Macros and Chains on Start Up

To allow for tailoring *12d Model* when a new project is created or an existing project opened, *12d Model* runs user supplied files of macros and/or chains.

For **new** projects, the default name of the file is

macros.4d

This can be changed to a different file by setting the environment variable

`RUN_MACROS_4D` *file_of_macros_to_run*

For **existing** projects, the default name of the file is

project_macros.4d

This can be changed to a different file by setting the environment variable

`RUN_PROJECT_MACROS_4D` *file_of_macros_to_run*

(the environment variables can be set on the **Extra A** tab of the env.4d editor - see “env.4d”)

The files consist of macros and/or chains, one per line, where

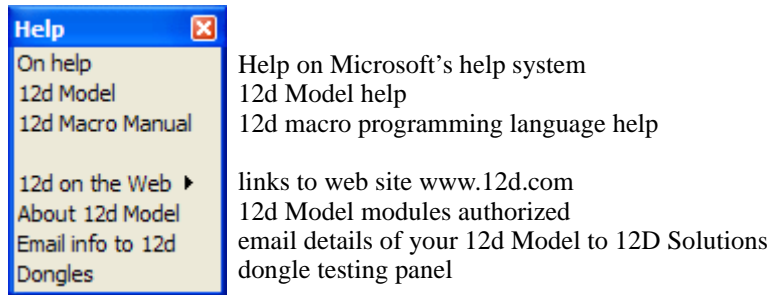
for macros, just the **name of the macro** is needed on the line

and for chains, the command **run_chain** *name_of_the_chain* is needed on the line.

The macros and chains are run in the order that they occur in the file.

4 12d Model Help

The 12d Help can be accessed by selecting *12d Model* on the *Help* menu item on the main 12d Model menu.

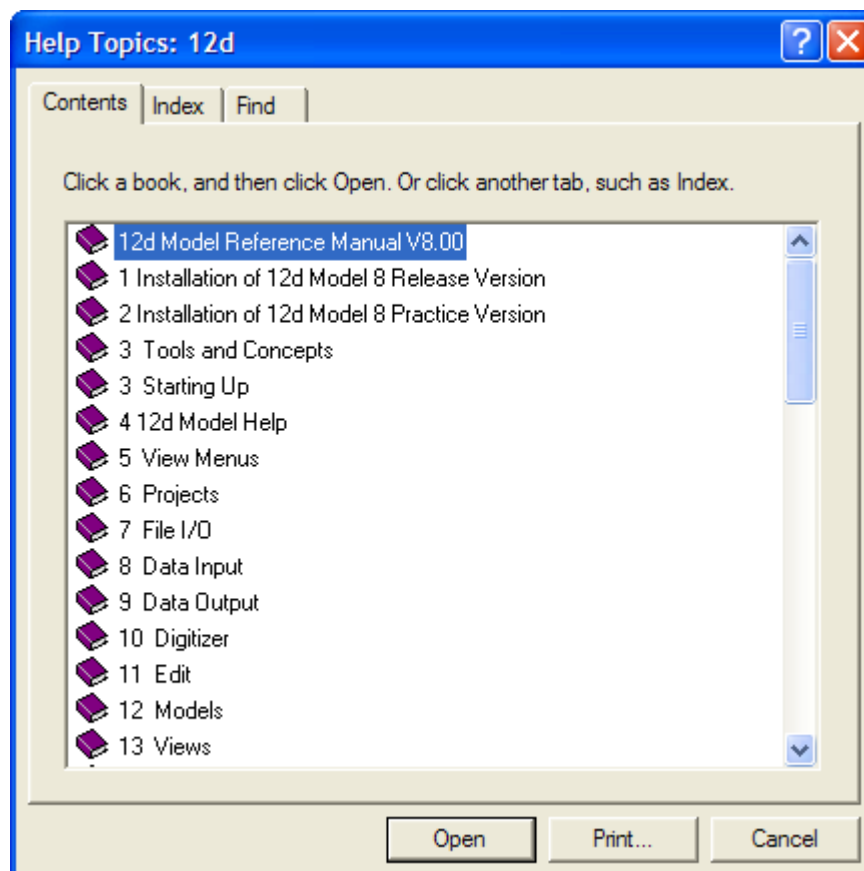


Alternatively, individual topics for a panel or menu can be invoked by using the F1 key or the Help button on any 12d Model panel.

More information on the Help system will now be given.

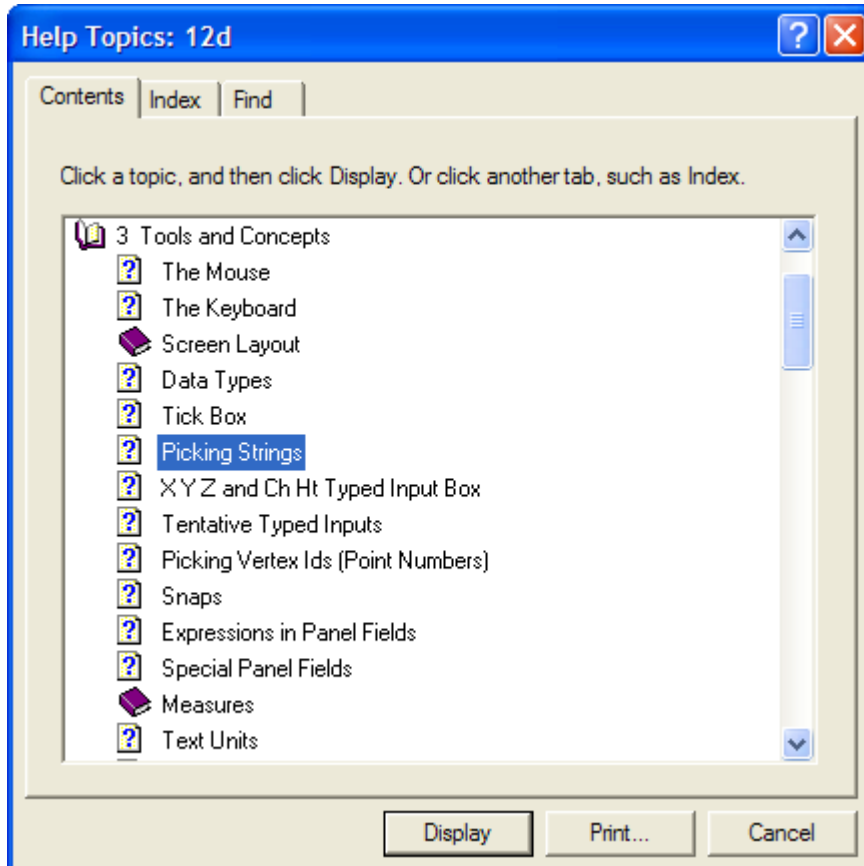
Contents

The **Contents** allows you to look at the overall structure of the Help and access any part of it.

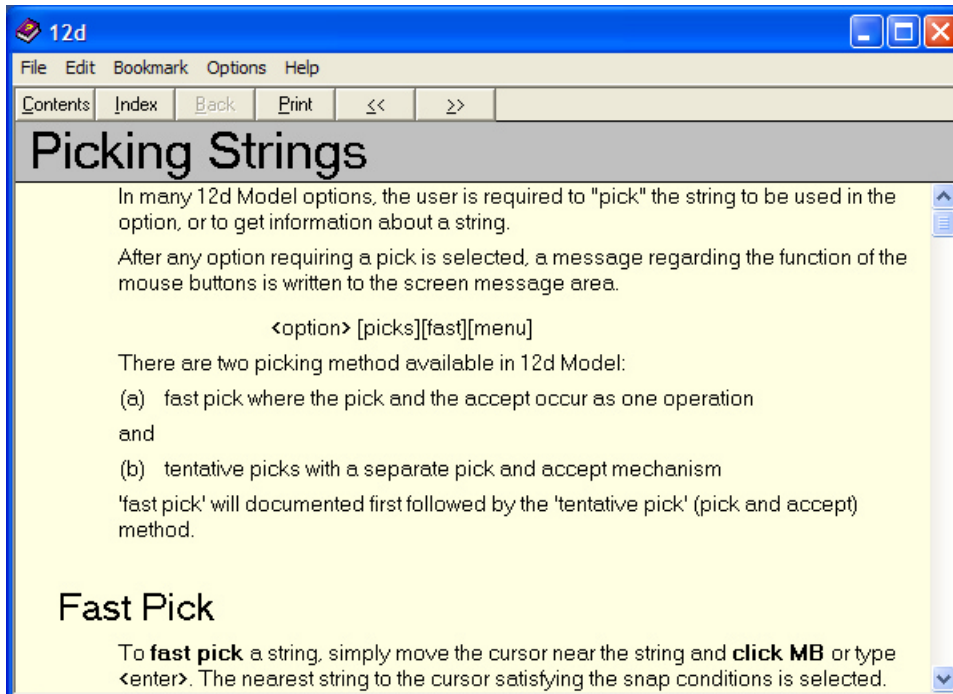


Warning - only *topics* in the Help can be accessed through the *Contents* list so any folders in the Content folders must be expanded until topics are displayed. *Topics* can be easily identified because they have a question mark beside them indicating that Help is available.

For example, double clicking on '*Tools and Concepts*' expands the next level of '*Tools and Contents*'.



Double clicking on the topic 'Picking Strings' will then display the topic. The Contents then disappear leaving Help open at the selected topic.

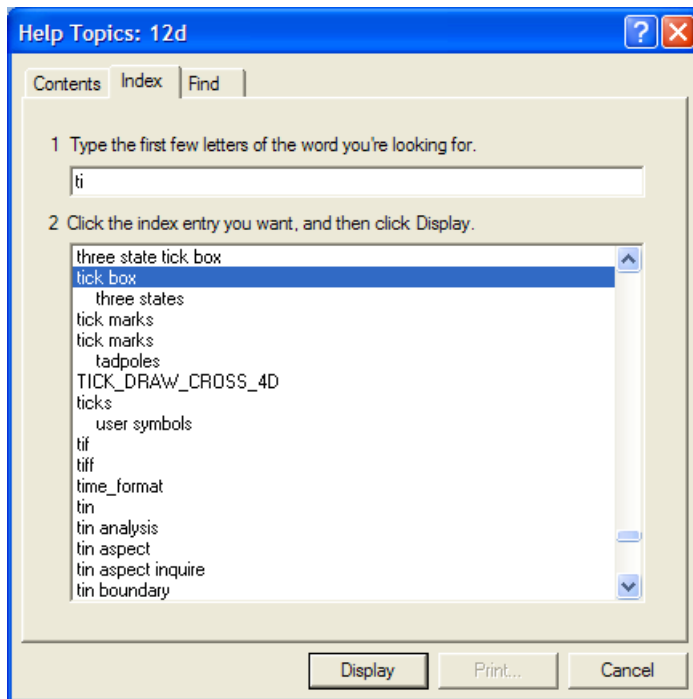


Double clicking on 'Contents' on the top of the Help will bring the Contents listing back up.

Index

The *Index* option searches through all entries in the Index of the Help.

As the first few characters of the required entry are typed in, the matching index entries are displayed.



Double clicking on the displayed entries will go to the topic in the Help containing the selected index entry. If more than one topic includes the index entry, then the list of topics is displayed.

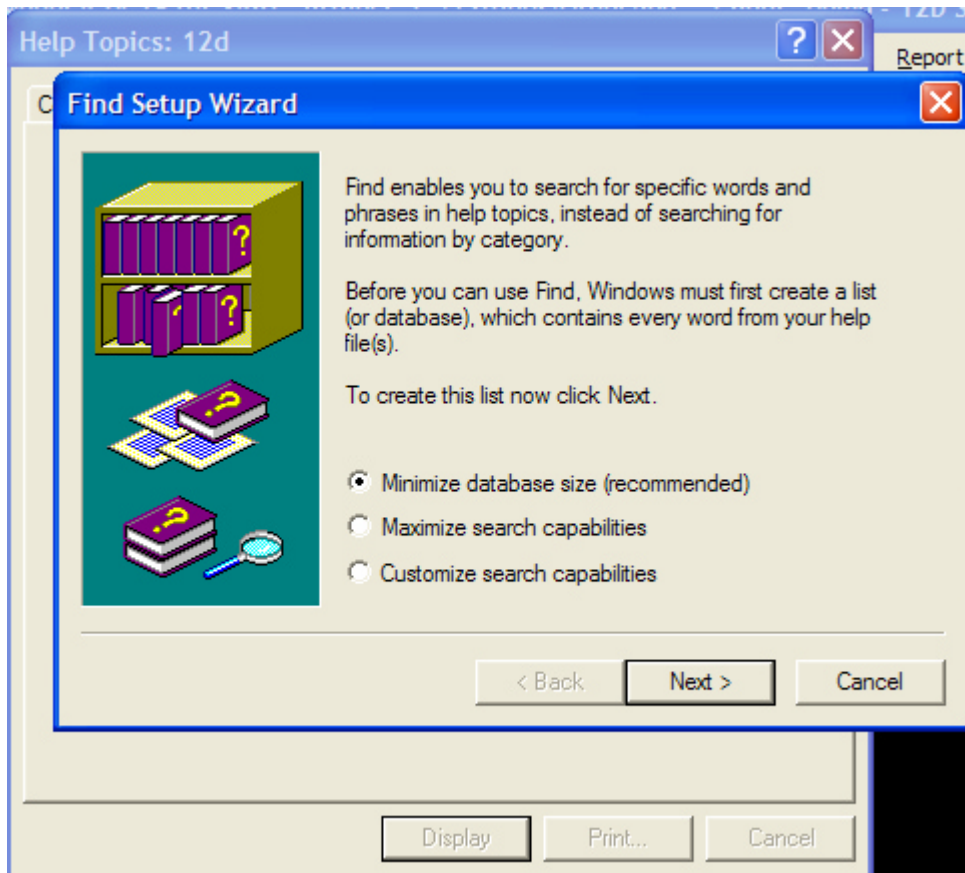
If the index has sub-indices, they can be searched by first typing in the main index followed by a comma, then a space and the first few characters of the sub-index.

Find

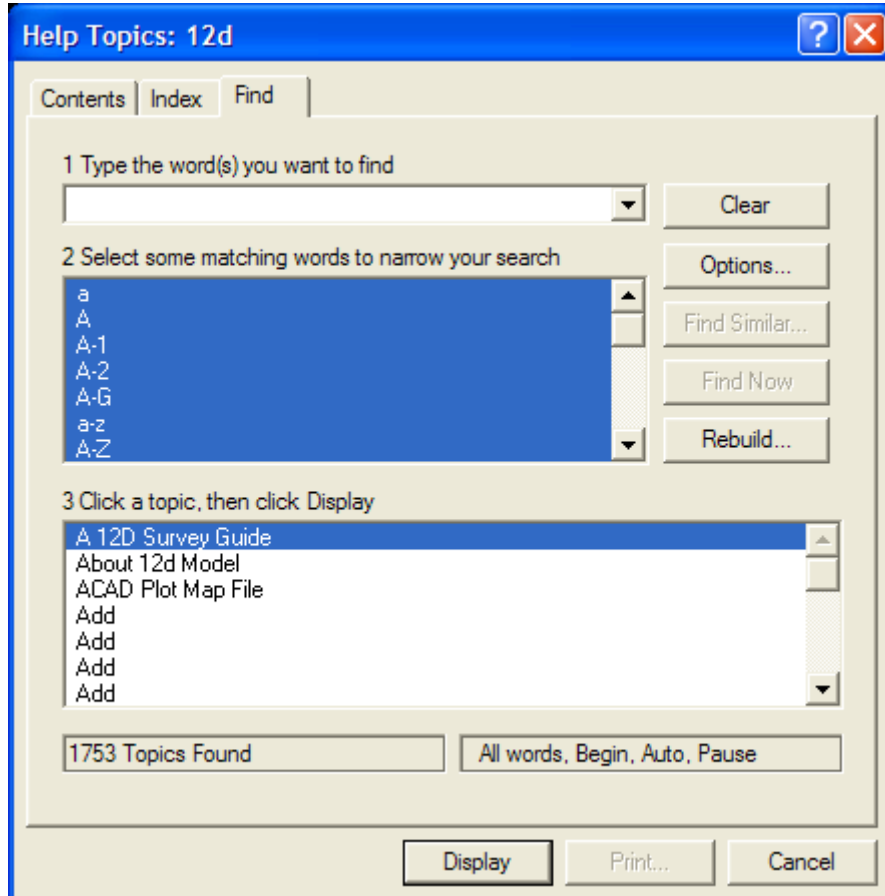
The most powerful searching method for the Help system is *Find*.

Simply click on the *Find* tab to search for words or phrases that may be contained in a Help topic.

If *Find* is being invoked for the first time, the 'Find Setup Wizard' runs to create an index of every word in the Help.

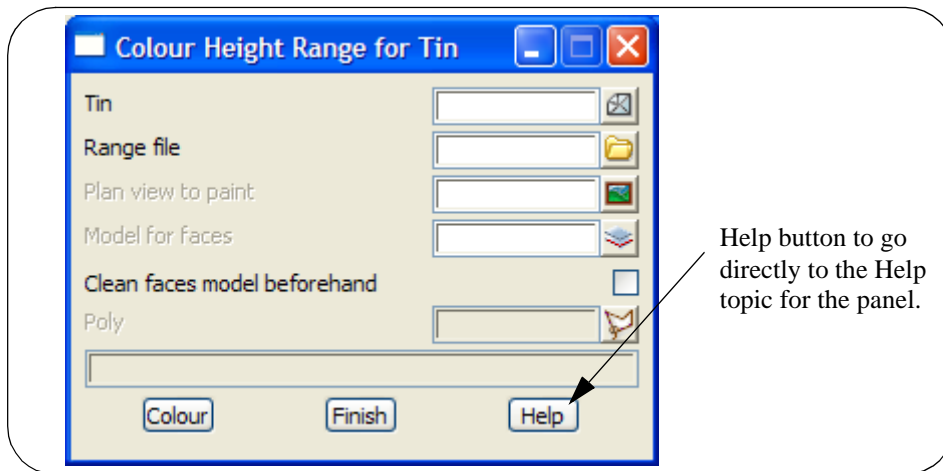


From then on, selecting the *Find* tab goes straight to the *Find* screen.



Panel Help Button

Every panel has a Help button which when selected goes to the *topic* describing that panel.



F1 Key

Another method of invoking Help is by using the F1 key as follows:

when a menu or panel is on the screen and has focus (the menu or panel title area will be highlighted), pressing F1 will bring up the help for that menu or panel.

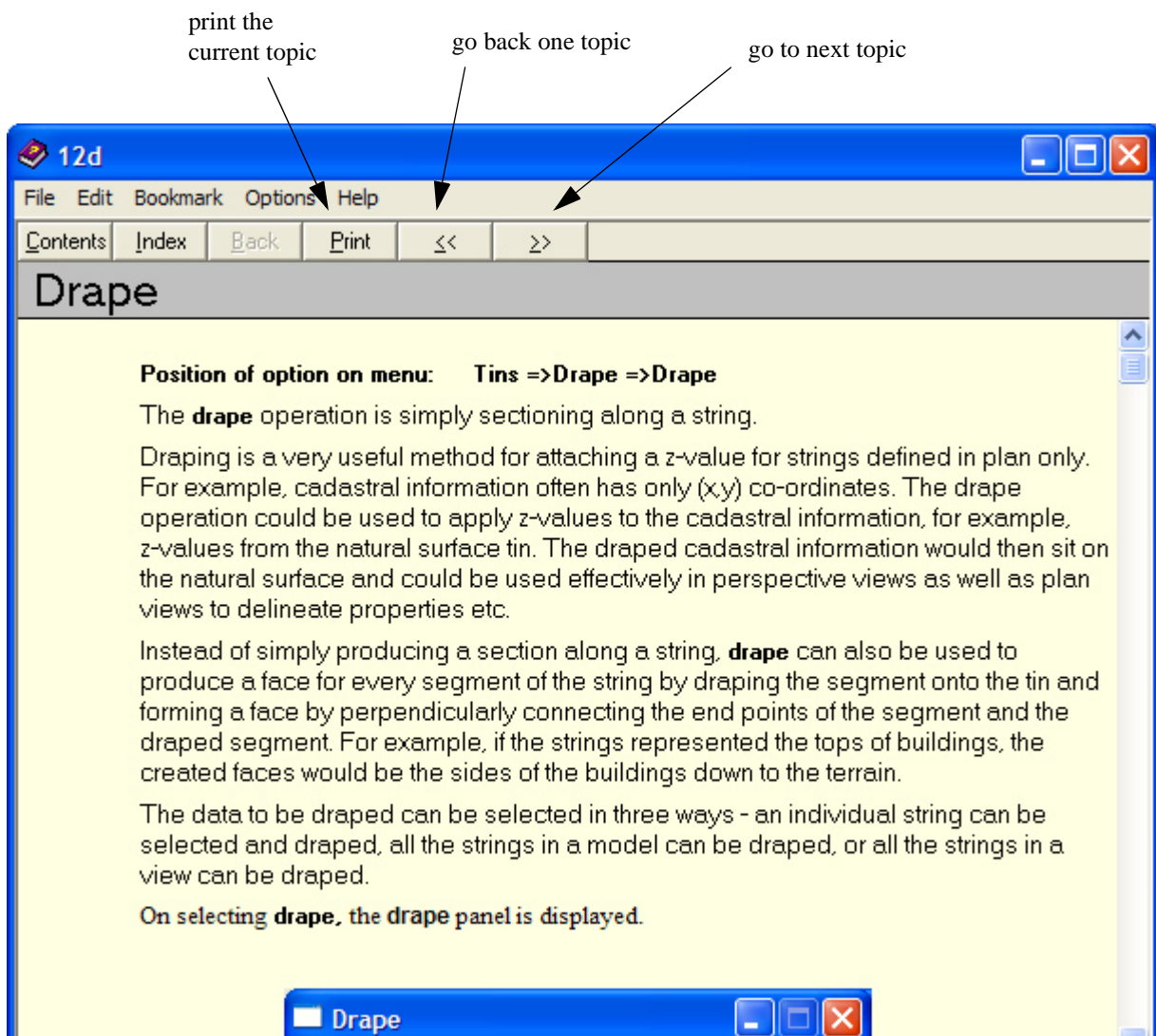
Warning - some of the items on the *Strings* menu automatically start up a string select and change the focus from the panel to a View. This means that pressing F1 will bring up the Help for the View and not the Help for the panel.

To get Help for such a panel, click on the panel to bring the focus back to the panel before pressing F1. The top of the panel will highlight showing that it has focus.

Navigating in Help

Once at a *topic* in the Help, the << and >> buttons at the top of the Help topic will go to the previous and next Help topics respectively.

Individual Help topics can be printed by clicking **Print** at the top of the Help page.



Because it is difficult to print large sections of Microsoft's Help system, a PDF file of the entire 12d Model Reference Manual has been created and can be used to print out large sections of the manual.

The 12d Model Reference Manual PDF file is on the 12d Model 8 Installation CD in the folder Documentation\Reference_Manual.

5 View Menus

[perspective_opengl_view_help](#)

[section_view_help](#)

[perspective_view_help](#)

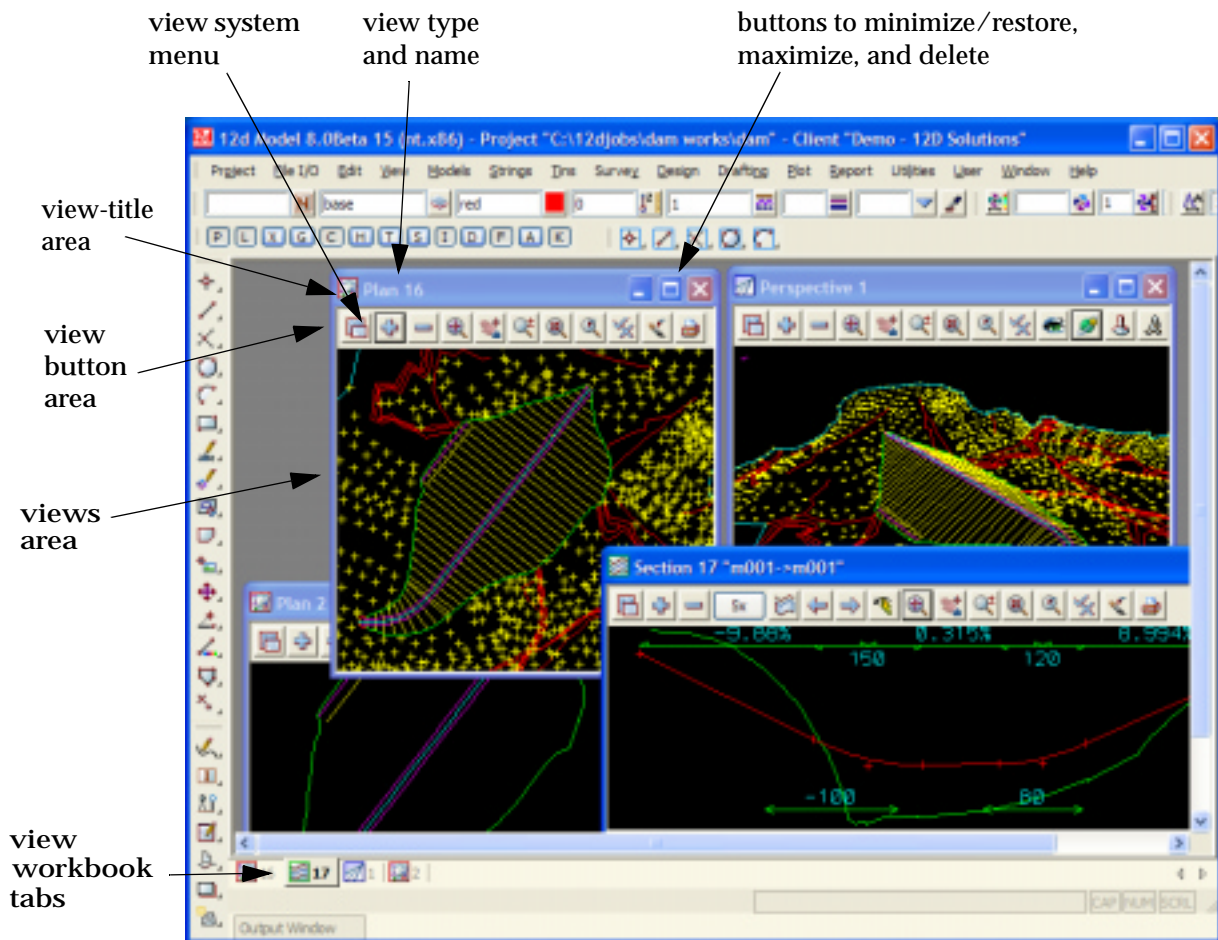
[hidden_perspective_view_help](#)

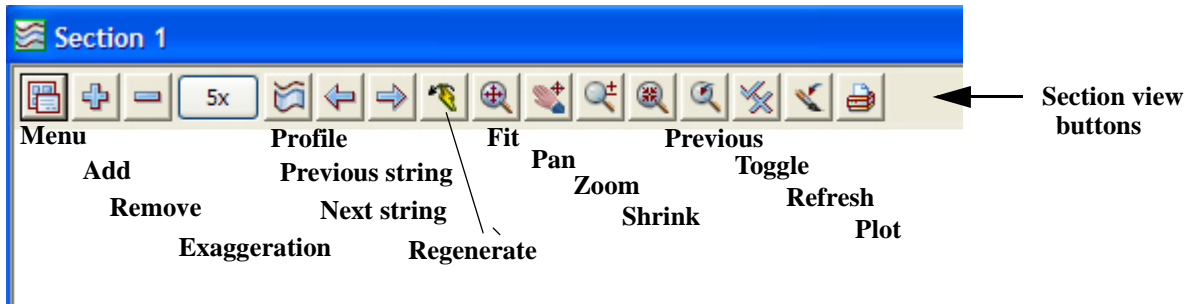
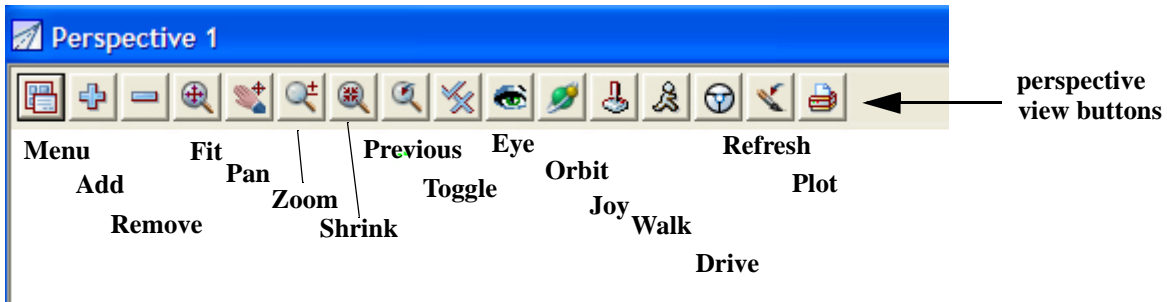
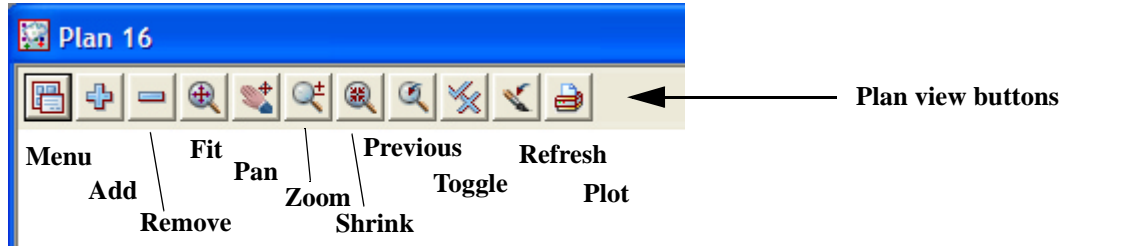
[plan_view_help](#)

Views are the screen drawing areas for 12d Model and come in three flavours - plan, perspective and section. Views can be created and deleted as required by the user and there is no limit to the number of views on the screen. The views can overlap and be minimized.

Each view has a unique name of up to two hundred characters.

Each view has a *view title area* which is used to display the view name and a *view button area* which displays the view buttons.



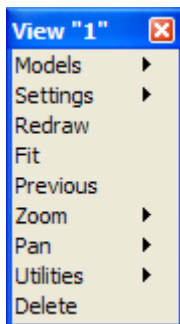


The *View Buttons* are documented in the section “View Buttons”

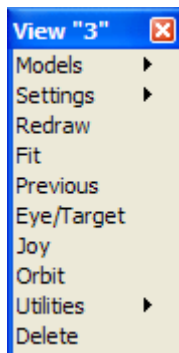
If the **Menu** button is selected in the *view button area* of any view, or if **RB** is clicked in the *view-title area* or in the *view-button area*, a new menu called the View menu appears.

Because of the differences between plan, perspective and section views, the options on the View menu vary for each view type. The plan, perspective and section View menus are

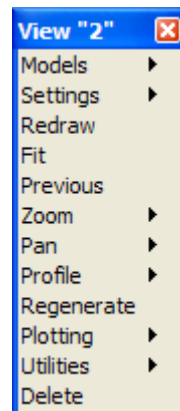
Plan View Menu



Perspective View Menu



Section View Menu



The View menu is removed by selecting the **[X]** button or if the View menu hasn't been moved, by simply clicking **RB** again in the *view-title* or *view button* area. If the View menu has been moved, clicking **RB** will warp the cursor to the moved View menu.

For further documentation on the options on the View menus, please see:

for the option *Models*, go to the section "Model Ops" .

<i>Settings,</i>	"Plan View Settings"
or "Perspective View Settings" or "Section View Settings" .	
<i>Redraw,</i>	"Redraw" .
<i>Fit,</i>	"Fit" .
<i>Previous,</i>	"Previous" .
<i>Zoom,</i>	"Zoom" .
<i>Joy,</i>	"Joy" .
<i>Profile,</i>	"Profile" .
<i>Regenerate,</i>	"Regenerate" .
<i>Pan,</i>	"Pan" .
<i>Utilities,</i>	"Plan Utilities"
or "Perspective Utilities" or "Section Utilities" .	
<i>Delete,</i>	"Delete" .

The option *Models* which is common to each menu will be discussed first, followed by the special options for each of the view menus.

Please continue to the next section "Model Ops" .

Model Ops

[view_model_ops_menu](#)

Position of menu: Plan View Menu View =>Models

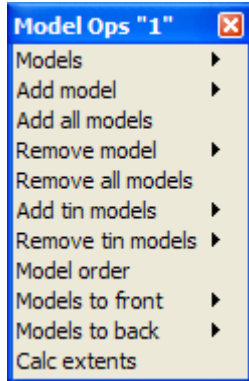
Position of menu: Section View Menu View =>Models

Position of menu: Perspective View Menu View =>Models

Walking right on *Models* brings up the Model Ops walk-right menu which is used to add and remove models from the view.

These options are the same for Plan, Perspective and Section views.

The Model Ops walk-right is



For the option *Models*, go to the section "Models" .

<i>Add model</i>	"Add Model" .
<i>Add all models</i>	"Add All Models" .
<i>Remove model</i>	"Remove Model" .
<i>Remove all models</i>	"Remove All Models"
<i>Add tin models</i>	"Add Tin Models" .
<i>Remove tin models</i>	"Remove Tin Models" .
<i>Model order</i>	"Model Order" .
<i>Models to front</i>	"Models to Front" .
<i>Models to back</i>	"Models to Back" .
<i>Calc extents</i>	"Calc Extents" .

Models

models_to_add

Position of menu: Plan View Menu View => Models =>Models

Position of menu: Section View Menu View => Models =>Models

Position of menu: Perspective View Menu View => Models =>Models

Models is a walk-right option which lists the models currently attached to that view.

If a model is selected from the displayed list, the model will be redrawn on the view. It will also be brought to the top of the display list, i.e., it is in the foreground and all the other models on the view are drawn before it.

Add Model

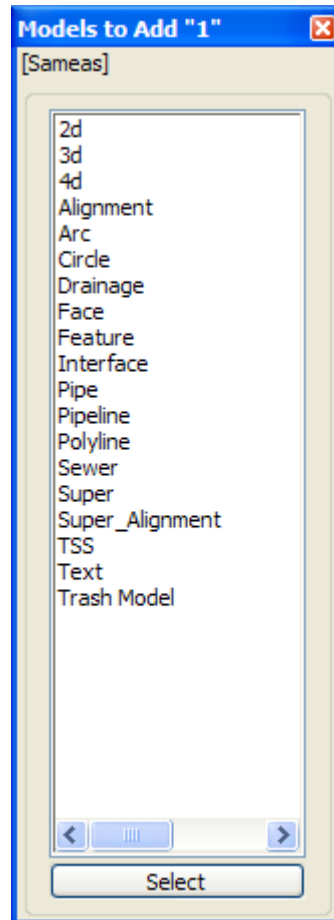
Position of menu: Plan View Menu View => Models =>Add model

Position of menu: Section View Menu View => Models =>Add model

Position of menu: Perspective View Menu View => Models =>Add model

The Add model menu item operates two ways.

The Add model walk-right brings up the Models to Add list which is a list of all the models not currently added to the view.



By double clicking on one of the models from the Models to Add list, it is added to the view. The list is then removed. To add a number of models from the list to the view, select the models in the list in the standard Microsoft way and then click on **Select**.

If the Models to Add list has been moved or pinned, models can be selected from the list and added to the view and the Models to Add list will remain with the selected models removed from the list. When all the required models have been added, delete the list using the [X] button.

If Add model itself is activated (by clicking LB when Add model is highlighted), the **Add Model to a View** panel appears. The **Add Model to a View** panel can be used to create new models as well as add existing models to any view. Wild cards and characters are allowed for adding models.

Any models added to a view are immediately drawn on the view.

Add All Models

Position of option on menu: Plan View Menu View => Models =>Add all models

Position of option on menu: Section View Menu View => Models =>Add all models

Position of option on menu: Perspective View Menu View => Models =>Add all models

The Add all models option adds all the models to the view.

Remove Model

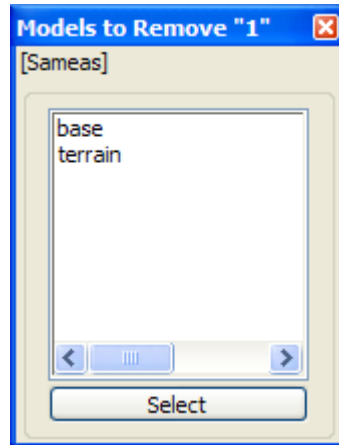
models_to_remove

Position of menu: Plan View Menu View => Models =>Remove model

Position of menu: Section View Menu View => Models =>Remove model

Position of menu: Perspective View Menu View => Models =>Remove model

The Remove model menu item also operates in two ways. The Remove model walk-right brings up the Models to Remove list which is a list of all the models currently added to the view.



By double clicking on one of the models from the Models to Remove list, it is removed from the view. The list is then removed. To remove a number of models on the list from the view, select the models in the list and then click on **Select**.

If the Models to Remove list has been moved or pinned, models can be selected from the list and removed from the view and the Models to Remove list will remain with the selected models removed from the list. When all the required models have been removed, delete the list using the [X] button.

If Remove model itself is activated, the **Remove Model from a View** panel appears. The **Remove Model from a View** panel can be used to remove any models from any view. Wild cards and characters are allowed for removing models.

NOTE

Models still exist after they are removed from a view. Models can only be deleted from 12d Model by using the Models=>Delete option.

Remove All Models

Position of option on menu: Plan View Menu View => Models =>Remove all models

Position of option on menu: Section View Menu View => Models =>Remove all models

Position of option on menu: Perspective View Menu View => Models =>Remove all models

The Remove all models option removes all the models from the view and clears the view.

Add Tin Models

tin_models_to_add

Position of menu: Plan View Menu View => Models =>Add tin models

Position of menu: Section View Menu View => Models =>Add tin models

Position of menu: Perspective View Menu View => Models =>Add tin models

The Add tin models walk-right brings up the Tin Models to Add list of all tins in the project whose models have not been added to the view

By double clicking on one of the tins from the Tin Models to Add list, all the models in the tin are added to the view. The list is then removed. To add the models from a number of tins from the list to the view, select the tins in the list in the standard Microsoft way and then click on **Select**.

If the Tin Models to Add list has been moved or pinned, tins can be selected from the list and their models added to the view and the Tin Models to Add list will remain with the selected tins removed from the list. When all the required tins have been added, delete the list using the [X] button.

Any models added to a view are immediately drawn on the view.

Remove Tin Models

tin_models_to_remove

Position of menu: Plan View Menu View => Models =>Remove tin models

Position of menu: Section View Menu View => Models =>Remove tin models

Position of menu: Perspective View Menu View => Models =>Remove tin models

The Remove tin models walk-right brings up the Tin Models to Remove list of all tins whose models are currently added to the view.

By double clicking on one of the tins from the Tin Models to Remove list, all the models in the tin are removed from the view. The list is then removed. To remove the models from a number of tins on the list from the view, select the tins in the list and then click on **Select**.

If the Tin Models to Remove list has been moved or pinned, tins can be selected from the list and removed from the view and the Tin Models to Remove list will remain with the selected tins

removed from the list. When all the required tins have been removed, delete the list using the [X] button.

Model Order

model_order

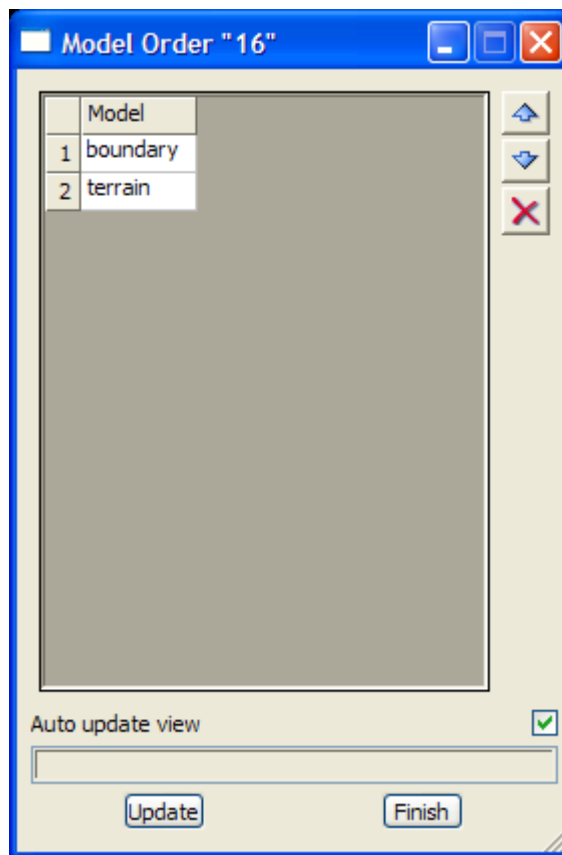
Position of menu: Plan View Menu View => Models =>Model order

Position of menu: Section View Menu View => Models =>Model order

Position of menu: Perspective View Menu View => Models =>Model order

The Model order options displays the list of all models on a view in the reverse model drawing order. That is, the first model on the list is the last model drawn and hence the most visible model.

Selecting Model order brings up the **Model Order** panel.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
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Model

list of models on the view in the reverse drawing order. That is, the first model on the list is drawn last and so is the most visible.



Up Arrow, Down Arrow

when a model name is highlighted, clicking the Up/Down arrow will change the order of the model.

**Delete**

*when a model name is highlighted, clicking the Delete icon will remove the model from the view.
when a model name is highlighted, clicking on the Cross will remove the model from the view.*

Auto update view tick box tick

if tick then the view is redrawn each time a model is moved in the list or added/removed from the list.

Update button

redraws the view using the new model order.

Models to Front

models_to_front

Position of menu: Plan View Menu View => Models =>Models to front

Position of menu: Section View Menu View => Models =>Models to front

Position of menu: Perspective View Menu View => Models =>Models to front

Models to front is a walk-right option. When the walk-right is chosen, the list of models currently attached to that view is displayed.

If a model is selected from the displayed list, the model will be the last to be drawn on the view. Hence, it is in the foreground and all the other models on the view are drawn before it.

Models to Back

models_to_back

Position of menu: Plan View Menu View => Models =>Models to back

Position of menu: Section View Menu View => Models =>Models to back

Position of menu: Perspective View Menu View => Models =>Models to back

Models to back is a walk-right option. When the walk-right is chosen, the list of models currently attached to that view is displayed.

If a model is selected from the displayed list, the model will be the first to be drawn on the view. Hence, it is in the background and all the other models on the view are drawn after it.

Calc Extents

Position of option on menu: Plan View Menu View => Models =>Calc extents

Position of option on menu: Section View Menu View => Models =>Calc extents

Position of option on menu: Perspective View Menu View => Models =>Calc extents

For each model on the view, the size of the x, y, z box required to enclose the data in the model is calculated. That is, the option calculates the model bounding box for each model on the view.

Redraw

Position of option on menu: Plan View Menu View => Models =>Redraw

Position of option on menu: Section View Menu View => Models =>Redraw

Position of option on menu: Perspective View Menu View => Models =>Redraw

As its name implies, this option redraws all the models on the view using the current drawing parameters. This is the same as clicking MB in the view title area.

NOTES

1. When a model is removed from a view, it is “undrawn”, that is, drawn in black. This may also black out important details of other models still attached to the view. If this happens, use the redraw option to refresh the view.
2. Clicking MB in the view-title area is the easiest method of redrawing a view.

Fit

Position of option on menu: Plan View Menu View => Models =>Fit

Position of option on menu: Section View Menu View => Models =>Fit

Position of option on menu: Perspective View Menu View => Models =>Fit

When the fit option is chosen, 12d Model calculates viewing parameters which will allow all the models attached to the view to be fully displayed. The view is then redrawn using these new drawing parameters.

Note if the data does not fill the view after a fit, then a calc extents may be needed to re-calculate the model bounding boxes.

Previous

Position of option on menu: Plan View Menu View => Models =>Previous

Position of option on menu: Section View Menu View => Models =>Previous

Position of option on menu: Perspective View Menu View => Models =>Previous

Each time a view has its viewing parameters changed, the old set is recorded as the previous parameter set. The previous option sets the viewing parameters back to this previous parameter set.

The view is then redrawn using those settings. The last set then becomes the old set.

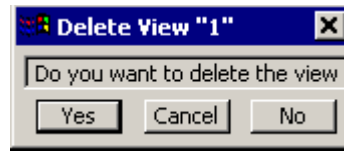
Delete

view_menu_delete_view

Position of option on menu: Plan View Menu View =>Delete

Position of option on menu: Section View Menu View =>Delete

Position of option on menu: Perspective View Menu View =>Delete



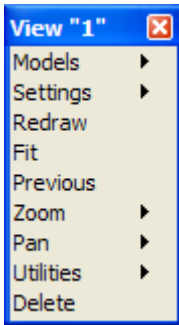
This option is used to delete the view and remove it from the screen. After selecting the Delete option, a **Delete View** yes-no panel appears. If **Yes** is selected, the view is deleted and removed from the screen. Selecting **No** removes the **Yes-No** pop-up and leaves the view as it is.

Plan View Menu

plan_view_menu

Position of menu: Plan View Menu View

The plan view menu is



For the option *Models*, go to the section

Settings

Redraw

Fit

Previous

Pan

Utilities

Delete

"Model Ops"

"Plan View Settings" .

"Redraw" .

"Fit" .

"Previous" .

"Pan" .

"Plan Utilities" .

"Delete" .

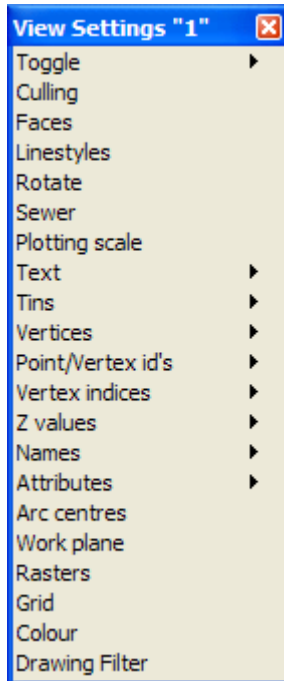
Plan View Settings

plan_view_settings_menu

Position of menu: Plan View Menu View => Settings

If the Settings option is picked rather than moving onto the walking right, then the toggle menu from the toggle walk-right menu is displayed on the screen. The toggle menu will be described in the next section.

The view settings walk-right menu for the plan view is



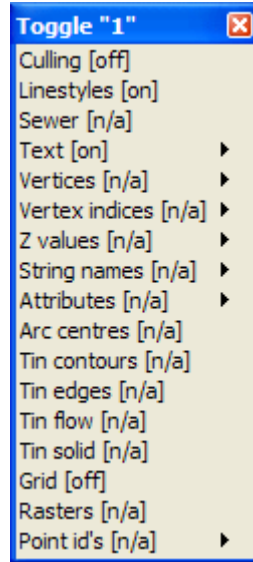
For the option <i>Toggle</i> , go to the section	"Plan Toggle"
<i>Culling</i>	"Culling"
<i>Faces</i>	"Faces"
<i>Linestyles</i>	"Linestyles"
<i>Rotate</i>	"Rotate"
<i>Sewer</i>	"Sewer"
<i>Plotting scale</i>	"Plotting Scale"
<i>Text</i>	"Text"
<i>Tins</i>	"Tins"
<i>Vertices</i>	"Vertices"
<i>Point/vertex id's</i>	"Point/Vertex Id's"
<i>Vertex indices</i>	"Vertex Indices"
<i>Z values</i>	"Z Values"
<i>Names</i>	"Names"
<i>Attributes</i>	"Vertex Attributes"
<i>Arc centres</i>	"Arc Centres"
<i>Work plane</i>	"Work Plane"
<i>Rasters</i>	"Rasters"
<i>Grid</i>	"Grid"
<i>Colour</i>	"Colour"
<i>Drawing filter</i>	"Drawing Filter"

Plan Toggle

plan_view_toggle_menu

Position of menu: Plan View Menu View => Settings =>Toggle

The toggle walk right brings up the **toggle** plan view menu.



Selecting any options from this menu will toggle the option on/off.

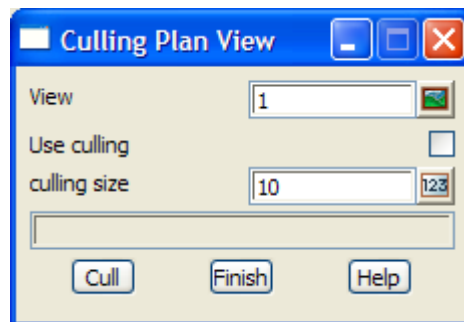
Culling

culling_plan_view

Position of option on menu: Plan View Menu View =>Settings => Culling

The culling option is used to suppress the drawing of strings whose on-screen extent is less than a user defined pixel size.

Selecting culling raises the **culling plan view** panel.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
View <i>name of the view to set cutting for.</i>	input/output	current view	available views
Use culling	tick-cross		
<i>if tick, a string is not drawn on the plan view whenever the string's extent box when drawn on the view would be smaller than the culling size given in the culling size field.</i>			

Culling size input 10
pixel size used for culling

Cull button

record the culling size given in the culling field. If the use culling field is set to tick, the recorded culling size will be used whenever the plan view is redrawn.

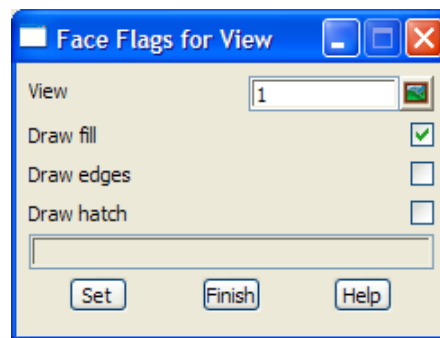
Faces

face_flags_for_view

Position of option on menu: Plan View Menu View =>Settings => Faces

The faces option allows the user to specify how faces are displayed in the plan view and on any plan view plots.

Selecting faces fires up the **face flags for view** panel.



The fields and buttons have the following functions.

Field Description	Type	Defaults	Pop-Up
View <i>name of the view to set for drawing faces.</i>	input/output	current view	available views

Draw fill <i>if tick, all faces in the view are drawn in their fill colour.</i>	tick-cross	tick
---	------------	------

Draw edges <i>if tick, all face edges in the view are drawn.</i>	tick-cross	
--	------------	--

Draw hatch <i>if tick, all faces in the view are drawn in their hatch pattern.</i>	tick-cross	
--	------------	--

Set	button
------------	--------

set the draw fill/edges/hatch fields to the value in the panel fields. The plan view is then redrawn using this value.

Linestyles

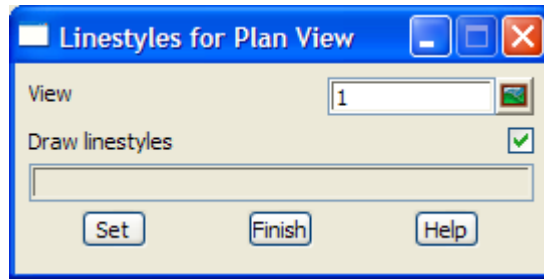
linestyles_for_plan_view

Position of option on menu: Plan View Menu View => Settings => Linestyles

The linestyles option allows the user to specify how linestyles (**styles**) are displayed in the plan view and on any plan view plots.

If linestyles are not used for drawing in a view then all strings are drawn according to their breakline type. That is, line strings are drawn with solid lines for each line in the string and point strings with only crosses at the string points. This style is the default style, 1.

Selecting linestyles fires up the **linestyles for view** panel.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
View <i>name of the view to modify draw linestyle flag for.</i>	input/output	current view	available views
Draw linestyles <i>if tick, all strings in the view are drawn with linestyles. If no tick, all lines strings are drawn as solid lines and point strings with crosses at their vertices.</i>	tick-cross	tick	
Set <i>set the draw linestyles field to the value in the panel field. The plan view is then redrawn using this value.</i>	button		

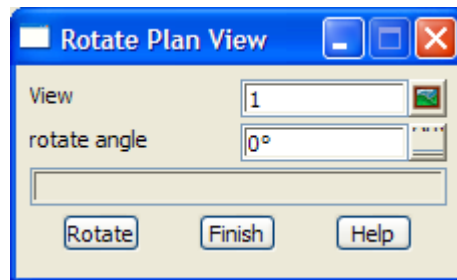
Rotate

rotate_plan_view

Position of option on menu: Plan View Menu View => Settings => Rotate

The rotate option is used to rotate a plan view through a user supplied angle about the centre point of the plan view.

After selecting the rotate option, the **rotate plan view** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
View <i>name of the view to set rotation angle for.</i>	input/output	current view	available views
Rotate angle <i>angle (in degrees) to rotate the view to.</i>	input	0	angles
Rotate <i>rotate the view about the view centre point until the angle the view makes with the positive x axis is the angle given in the rotate angle field.</i>	button		

Sewer

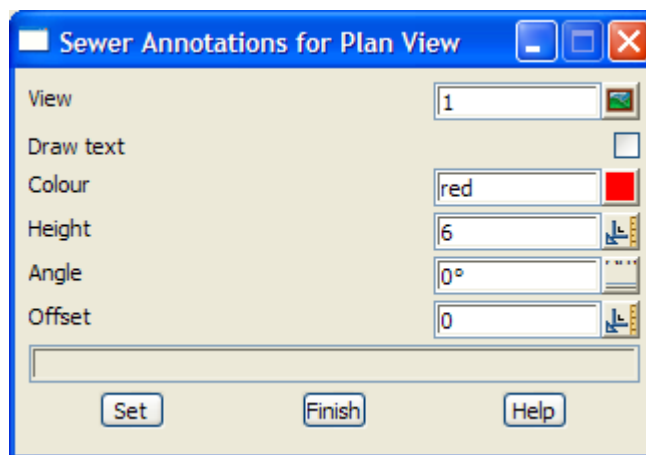
sewer_annotations_for_plan_view

Position of option on menu: Plan View Menu View => Settings => Sewer

This is part of the optional sewer module.

The sewer option allows the user to specify how sewer text is displayed in the plan view and on any plan view plots.

Selecting sewer fires up the **sewer annotations for plan view** panel.



The fields and buttons have the following functions.

Field Description	Type	Defaults	Pop-Up
View <i>name of the view to set sewer annotation information for.</i>	input/output	current view	available views
Draw text <i>if tick, sewer text annotation will be drawn for any sewer strings in the plan view.</i>	tick-cross		
Colour <i>the colour for any sewer text annotation.</i>	input	red	available colours
Height <i>the height for any sewer text annotation.</i>	input	default text height	
Angle <i>the angle for any sewer text annotation.</i>	input	0	
Offset <i>the offset for any sewer text annotation.</i>	input	0	
Set <i>set the values in the panel fields and then redraw the view.</i>	button		

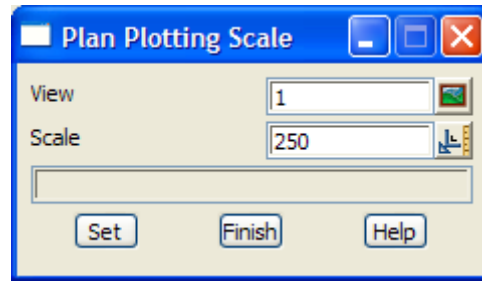
Plotting Scale

plan_plotting_scale

Position of option on menu: Plan View Menu View => Settings => Plotting scale

The plotting scale option is used to set a scale for the plan view which is used to determine the size to draw any *paper* text on the plan view.

After selecting the plotting scale option, the **plan plotting scale** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
View <i>name of the view to set the scale for.</i>	input/output	current view	available views
Scale <i>"1 in" to use to calculate a drawing size for any paper text on the view.</i>	input	250	
Set <i>set the plotting scale for the view.</i>	button		

Text

plan_view_text_settings_menu

Position of menu: Plan View Menu View => Settings =>Text

The text option allows the user to specify whether the text from any strings (text strings, 4d strings and survey strings) in models on the plan view is

- (a) not drawn at all
- or
- (b) if drawn and the text is defined in world units, then the text can be drawn in full, quick mode or not at all depending on the display size of the text on the screen. This stops the drawing of *world* text when its display size is **small** on the screen (e.g. when zooming out).
- (c) if drawn and the text is defined in pixel units, then when the screen scale is such that the height of the text in world units is too large, then the text is not drawn. This stops the drawing of *pixel* text when its displaying world size is large in proportion to other world units (e.g. when zooming out).

Hence the text option tries to control the drawing of *both* pixel and world text in models on the view so that the text stops displaying in the view as the user *zooms out*

The choice of drawing text in full, quick mode or not at all also applies to the Vertex numbers and Z values text turned on by view settings (view text).

Depending on whether the environment variable *plan_table_settings_4d* is zero or not, the Text option draws/doesn't draw text for *any* model on the view, or the drawing of text can be set for individual models.

If the environment variable *plan_table_settings_4d* is set to 0:

The options in the text walk-right are used to display/not display text for **all** models on the plan view and the walk-right menu only contains the two options, Text and Single.

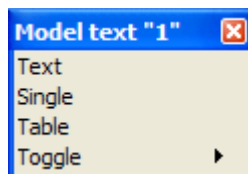
Selecting Single brings up the **Model Text for Plan View** panel, without the Model field and is only used to set a maximum height, not parameters for individual models.

If *plan_table_settings_4d* is non-zero:

The options in the text walk-right can be used to specify for *individual* models if the text in the model is display/not display text on the plan view.

For any setting *plan_table_settings_4d*, if Text is selected without walking right, then the **Plan Text** panel is brought up (documented in the next section).

The text walk-right menu is



Text

plan_text

Position of option on menu: Plan View Menu View => Settings => Text => Text

The Text option allows the user to specify how text is displayed in the plan view and on any plan view plots. Text can be drawn in **full, quick mode** consisting of the bottom half of a rectangle

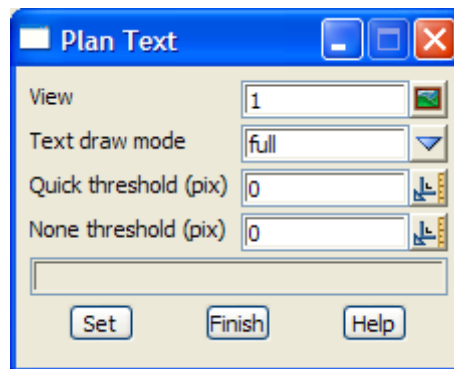
indicating the height and the length of the text, or **not drawn at all**.

This setting also applies to the z-values and vertex numbers controlled by view settings.

There are also two text threshold values (quick and none) designed for use with world text. When the *screen size* of text drops below the thresholds, the mode of display is automatically adjusted.

Hence when the *screen size* of **world** text gets small, the text can be drawn as quick text or even not displayed at all.

Selecting Text fires up the **Plan Text** panel.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
View <i>name of the view to modify text drawing flags for.</i>	input/output	current view	available views
Text draw mode <i>if full, any text in the plan view will drawn as expected. If quick, the text will not be drawn but replaced by a three sided box to indicate where the text is. If none, nothing is displayed where the text would have been.</i>	input	full	full, quick, none
Quick threshold (pix) <i>if the screen size of text displayed on the plan view goes below this pixel size, then the text is automatically drawn in quick mode.</i>	input	4.5	
None threshold (pix) <i>if the screen size of text displayed on the plan view goes below this pixel size, then the text is not drawn.</i>	input	2	
Set <i>set the text draw mode and thresholds to the values given in the panel fields. The plan view is then redrawn using the new values.</i>	button		

Note

The Text=>Text option applies to *all* text on the view. That is, for any text from strings in models on the view, or for the z-values and vertex numbers text controlled by view settings (view text). The Single and Table options of Text are *only* for text in models. There are Single and Table options for view text under the Vertex no.s and Z values Settings options.

Single

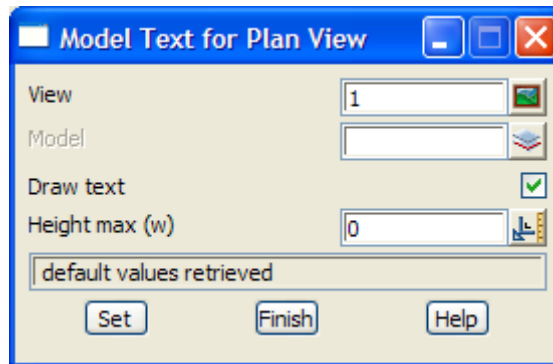
[model_text_for_plan_view](#)

Position of option on menu: Plan View Menu View => Settings => Text => Single

The Single option allows the user to stop drawing any text from models on the view (world or

pixel), or if text is drawn, set a maximum equivalent world size that is used as an upper limit for drawing *pixel* text in the model.

Selecting Single fires up the **Model Text for Plan View** panel.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
View <i>name of the view to modify model text drawing flags for.</i>	input/output	current view	available views
Model <i>the model to set the Draw text and Height max parameters for.</i>	input		
Draw text <i>If not tick, then no text from strings in models (text, 4d and survey strings) is drawn. if tick, any text from strings in models (text, 4d and survey strings) will then be checked against the height max for pixel text, or text drawn mode for world text, to see if it is drawn.</i>	tick-cross	tick	
Height max (w) <i>if non-zero, then when the screen scale is such that the height of any string text defined in pixels converted to a world size is greater than height max (w), then the text is not drawn. Hence on zooming out, any pixel text in the models will eventually stop drawing.</i>	input	0	
Set <i>set the text draw mode and thresholds to the values given in the panel fields. The plan view is then redrawn using the new values.</i>	button		

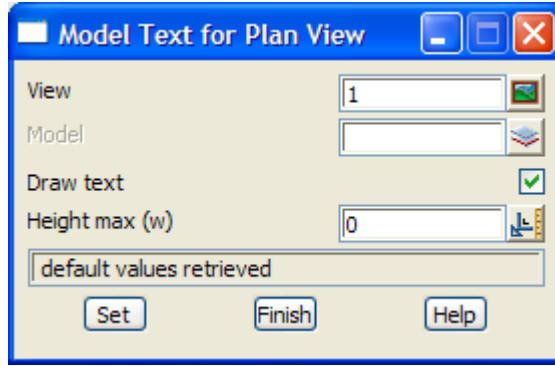
Table

[model_text_for_plan_view](#)

Position of option on menu: Plan View Menu View => Settings => Text => Table

The Table option displays a list a models on the view with their draw flag. The draw flag can be toggled to allow the drawing/stop drawing text from the model on the view (world or pixel).

Selecting Table fires up the **Model Text Table for Plan View** panel.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
View <i>name of the view to modify model text table drawing flags for.</i>	input/output	current view	available views

Draw tick-cross
 If not tick, then **no** text from strings in models (text, 4d and survey strings) is drawn.
 if tick, any text from strings in models (text, 4d and survey strings) will then be checked against the height max for pixel text, or text drawn mode for world text, to see if it is drawn.

Model input
 the model to set the Draw flag for.

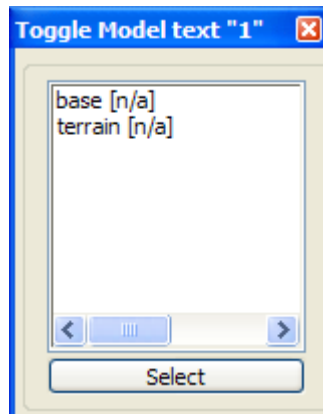
Set button
 set the text draw flags for the models in the table.

Toggle

plan_view_toggle_model_text

Position of menu: Plan View Menu View => Settings => Text => Toggle

Walking-right on the Toggle option displays a list a models on the view with their text draw flag. The text draw flag can be toggled on/off by selecting the model on the list. Note that [n/a] means that the model has *not* been individually set on or off and the general Text toggle is used for the model.

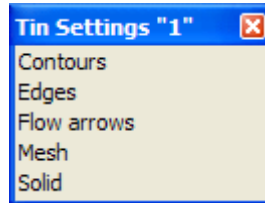


Tins

plan_view_tin_settings_menu

Position of menu: Plan View Menu View => Settings => Tins

The options on the tins walk-right menu control the display of tins on the view. The tins walk-right menu is



Contours

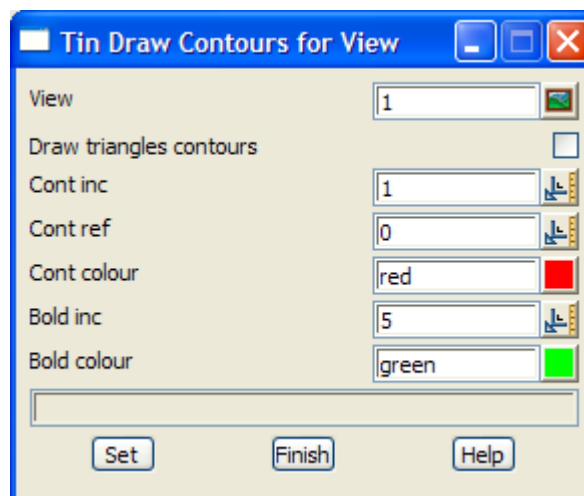
tin_draw_contours_for_view

Position of option on menu: Plan View Menu View => Settings => Tins => Contours

Position of option on menu: Perspective View Menu View => Settings => Tins => Contours

The Contours option defines contour and bold increments and colours, and also whether these contours are displayed for the triangles from any tins on the view. Because the contours are just drawn separately for each triangle, they are known as **quick** or **fast contours**.

Selecting Contours fires up the **Tin Draw Contours for View** panel.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
View <i>name of the view to modify fast contour drawing parameters for.</i>	input/output	current view	available views
Draw triangles contours <i>if tick, the contours for any triangles in any tins on the view are displayed.</i>	tick-cross		
Cont inc <i>increment between contoured values.</i>	input	1.0	
Cont ref <i>reference value for the contour increments.</i>	input	0.0	
Cont colour <i>colour of the contours</i>	input	cyan	available colours

Bold inc input 5.0
increment for the bold contours. If the bold increment is blank or zero, then no bold contours are drawn. If the bold increment is non-zero, it must be an integer multiple of the contour increment

Bold colour input magenta available colours
colour of the bold contours

Set button
set the value in the panel and then redraw the plan view.

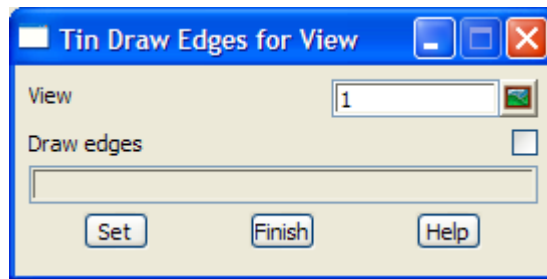
Edges

tin_draw_edges_for_view

Position of option on menu: Plan View Menu View => Settings => Tins => Edges

Position of option on menu: Perspectives View Menu View => Settings => Tins => Edges

The edges option allows the user to specify whether the edges of triangles from any tins on the view are displayed. Selecting edges fires up the **tin draw edges for view** panel.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
View	input/output	current view	available views

name of the view to modify tin edge drawing flag for.

Draw triangles edges tick-cross
if tick, the edges of any triangles in any tins on the view are displayed.

Set button
set the value and then redraw the plan view.

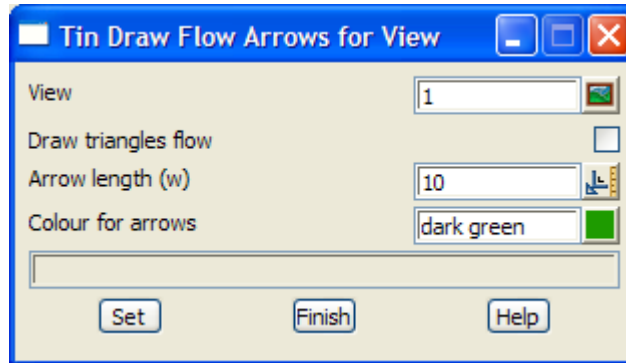
Flow Arrows

tin_draw_flow_arrows_for_view

Position of option on menu: Plan View Menu View => Settings => Tins => Flow arrows

Position of option on menu: Perspective View Menu View => Settings => Tins => Flow arrows

The flow arrows option defines the colour and length of flow arrows, and also whether the flow arrows are displayed for the triangles from any tins on the view. Selecting flow arrows fires up the **tin draw flow arrows for view** panel.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
View <i>name of the view to modify tin arrow drawing flag for.</i>	input/output	current view	available views
Draw triangles flow arrows <i>if tick, the flow arrows for any triangles in any tins on the view are displayed.</i>	tick-cross		
Arrow length (w) <i>length in world units to draw flow arrows.</i>	input		
Colour for arrows <i>colour for the arrows.</i>	input	cyan	available colours
Set <i>set the value in the panel and then redraw the plan view.</i>	button		

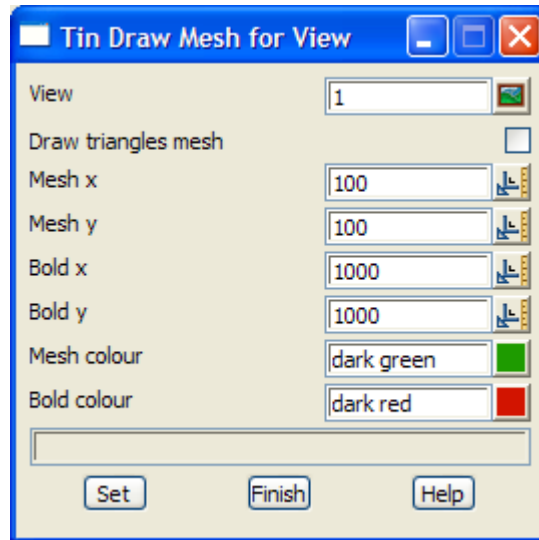
Mesh

tin_draw_mesh_for_view

Position of option on menu: Plan View Menu View => Settings => Tins => Mesh

Position of option on menu: Perspective View Menu View => Settings => Tins => Mesh

The mesh option defines a rectangular mesh, and also whether the mesh is displayed for the triangles from any tins on the view. Selecting mesh fires up the tin draw mesh for view panel.



The fields and buttons used in this panel have the following functions.

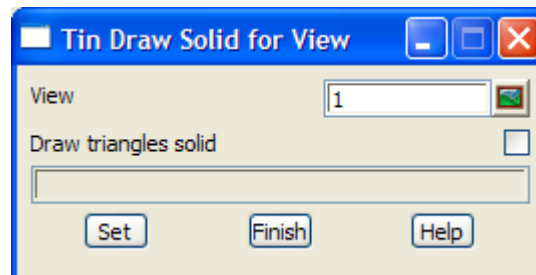
Field Description	Type	Defaults	Pop-Up
View <i>name of the view to modify tin mesh drawing flag for.</i>	input/output	current view	available views
Draw triangles mesh <i>if tick, a rectangular mesh for any triangles in any tins on the view are displayed.</i>	tick-cross		
Mesh x <i>the distance between the x mesh lines. If this value is zero, the x mesh lines will not be drawn.</i>	input	100	
Mesh y <i>the distance between the y mesh lines. If this value is zero, the y mesh lines will not be drawn.</i>	input	100	
Bold x <i>the distance between the bold x mesh lines. If this value is zero, the bold x mesh lines will not be drawn.</i>	input	1000	
Bold y <i>the distance between the bold y mesh lines. If this value is zero, the bold y mesh lines will not be drawn.</i>	input	1000	
Mesh colour <i>colour that the mesh is drawn in.</i>	input	dark green	available colours
Bold colour <i>colour that the bold mesh is drawn in.</i>	input	dark green	available colours
Set <i>set the value in the panel and then redraw the plan view.</i>	button		

Solid

tin_draw_solid_for_view

Position of option on menu: Plan View Menu View => Settings => Tins => Solid

The solid option allows the user to specify whether the triangles from any tins on the view are displayed as solid colour. Selecting solid fires up the **tin draw solid for view** panel.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
View <i>name of the view to modify tin solid drawing flag for.</i>	input/output	current view	available views
Draw triangles solid <i>if tick, any triangles in any tins on the view are displayed in solid colour.</i>	tick-cross		
Set <i>set the value and then redraw the plan view.</i>	button		

Vertices

`plan_view_vertices_settings_menu`

Position of menu: Plan View Menu View => Settings => Vertices

The Vertices option allows the user to specify whether crosses at the vertices of strings are

(a) not drawn at all

or

(b) if set to draw, then only drawn if equivalent world size is not too large. This stops the drawing of *crosses* when the displaying world size is large in proportion to other world units (e.g. when zooming out).

Hence the Vertices option tries to control the drawing of vertex crosses on the view so that the crosses stop displaying as the user *zooms out*

Depending on whether the environment variable `plan_table_settings_4d` is zero or not, the Vertices option draws crosses for string vertices for *any* model on the view, or the drawing of crosses can be set for individual models.

If the environment variable `plan_table_settings_4d` is set to `0`:

the Vertices option is used to display/not display crosses at the vertices of strings in **all** models on the plan view. For a text string, a cross is placed at the text justification position.

Selecting Vertices brings up the **Crosses at String Vertices for Plan View** panel, without the Model field.

If `plan_table_settings_4d` is non-zero:

the Vertices option then has a walk-right menu with options to specify for *each* model on the plan view whether crosses at the vertices of strings in the model are

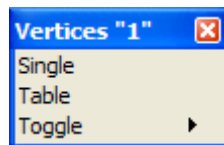
(a) not drawn at all

or

(b) if set to draw, then the crosses are only drawn if equivalent world size is not too large. This stops the drawing of *crosses* when its displaying world size is large in proportion to other world units (e.g. when zooming out).

If Vertices is selected without walking right, the **Crosses at String Vertices for Plan View** panel is brought up (documented in the next section).

The Vertices walk-right menu is



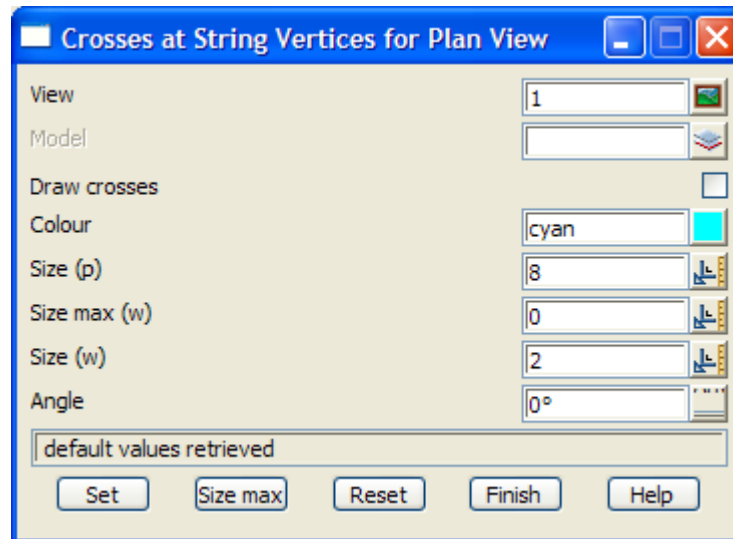
Single

`crosses_at_string_vertices_for_plan_view`

Position of option on menu: Plan View Menu View => Settings => Vertices => Single

The Single option is used to set parameters for drawing crosses at vertices of strings for all models not defined in the *Table* option or for a single model on the plan view. For a text string, a cross is placed at the text justification position.

After selecting the Single option, the **Crosses at String Vertices for Plan View** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
View <i>name of the view to modify string vertices drawing parameters for.</i>	input/output	current view	available views
Model <i>if blank, then all models not mentioned in the Table option use these parameters for drawing crosses on a view. If non blank, then this model only will be set to draw crosses with the parameters on this panel.</i>	input		
Draw crosses <i>If tick, vertex crosses for the model will be checked against the Size max (w) before being drawn. If not tick, then no vertex crosses for strings in the given model are drawn on the plan view.</i>	tick-cross		
Colour <i>colour of the crosses</i>	input	default pt colour	available colours
Size (p) <i>size in pixels that the crosses are drawn on a plan view</i>	input	default text height	
Size max (w) <i>if non-zero: when the cross is displayed on a plan view then there is an equivalent size of the cross in world units that matches the display size. If Size max (w) has a non-zero value, then if the equivalent world size of the cross on the plan view is greater than Size max (w), then the cross is not drawn. Hence zooming out will eventually stop the crosses from drawing.</i>	input	0	
Size (w) <i>size in world units of the cross when plotted or output.</i>	input	0	
Angle <i>angle in degrees that the cross is rotated about the (x,y) position of the string vertices.</i>	input	0	
Set <i>set the values in the panel and then redraw the plan view.</i>	button		
Size max (w) <i>sets Size max (w) to be the world size of crosses as they are currently displayed on the given plan view. Hence if any further zoom out is done, the crosses will stop drawing. The set button must then be clicked to set the values for the view.</i>	button		

Reset button
reset all the parameters so no models are individually set for the view.

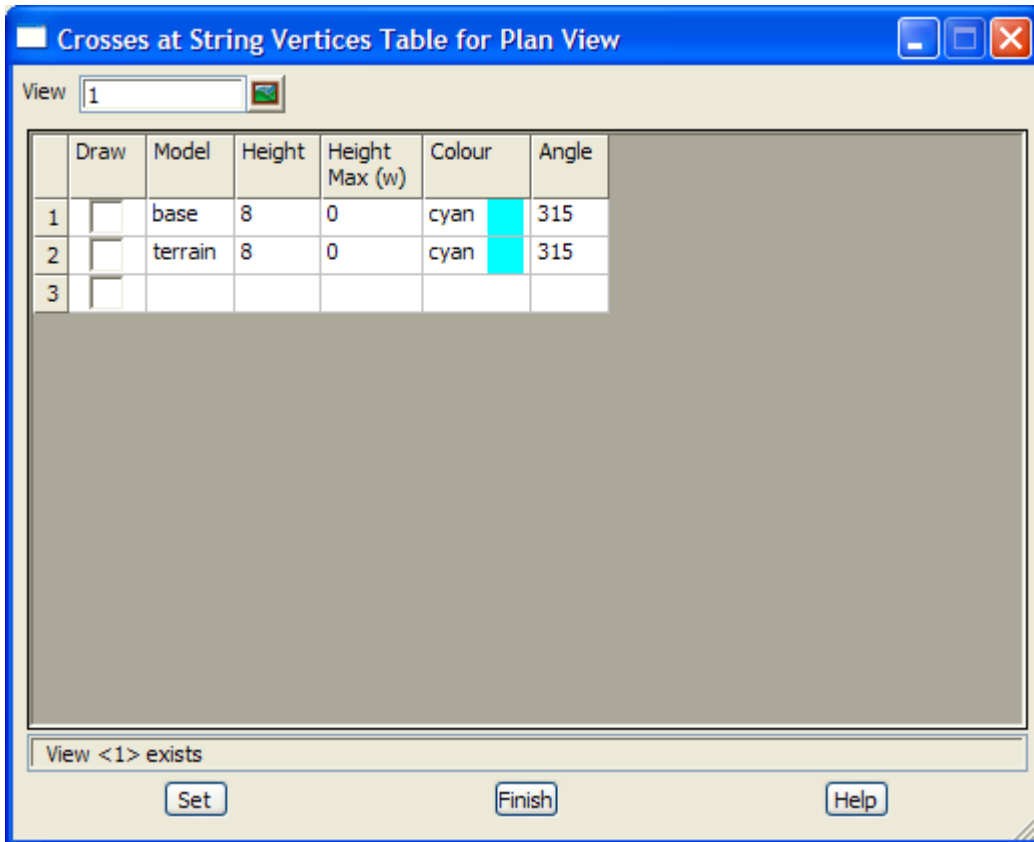
Table

crosses_at_string_vertices_table_for_plan_view

Position of option on menu: Plan View Menu View => Settings => Vertices => Table

The Table option displays a list of models on the view with their vertex drawing parameters which can then be modified from the table.

Selecting Table fires up the **Crosses at String Vertices Table for Plan View** panel.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
View	input/output	current view	available views

name of the view to modify string vertices drawing parameters for.

Draw	tick-cross	
-------------	------------	--

*If not tick, then **no** vertex crosses from strings in the given model are drawn on the plan view.
 if tick, any cross for vertices in the model will be checked against the Sz max (w) to see if it is drawn.*

Model	input
--------------	-------

the model to set the parameters for.

Colour	input	default pt colour	available colours
---------------	-------	-------------------	-------------------

colour of the crosses at the vertices

Size	input	default text height
-------------	-------	---------------------

size in pixels that the crosses are drawn on a plan view.

Sz max (w) input 0

if non-zero:

the size of the crosses in world units is greater than Sz max (w), then the crosses are not drawn. Hence zooming out will eventually stop the crosses from drawing.

Angle input 0

angle in degrees that the cross is rotated about the (x,y) position of the string vertices.

Set button

set the vertex cross drawing parameters for the models in the table.

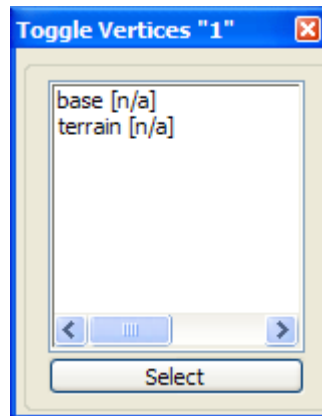
Toggle

plan_view_toggle_vertices

Position of option on menu: Plan View Menu View => Settings => Vertices => Toggle

Walking-right on the Toggle option displays a list of models on the view with their vertex cross draw flag. The vertex cross draw flag can be toggled on/off for the model by selecting the model on the list.

Note that [n/a] means that the model has *not* been individually set on or off and the general Vertex toggle is used for the model.



Point/Vertex Id's

plan_view_vertex_ids_settings_menu

Position of menu: Plan View Menu View => Settings => Point/Vertex id's

The Point/Vertex Id's option allows the user to specify whether the point/vertex id (a point number recorded for a vertex) for any super string vertex are

(a) not drawn at all

or

(b) if set to draw, then only drawn if the equivalent world size is not too large. This stops the drawing of *point/vertex id's* when the displaying world size is large in proportion to other world units (e.g. when zooming out).

Hence the Point/Vertex id's option tries to control the drawing of point numbers on the view so that the numbers stop displaying as the user *zooms out*

Note - Point/Vertex id's (numbers) are not to be confused with *vertex indices* which are simply the position of the vertex in the string.

Depending on whether the environment variable *plan_table_settings_4d* is zero or not, the Point/Vertex Id's option draws point/vertex numbers for string vertices for *any* model on the view, or the drawing of vertex id's can be set for individual models.

If the environment variable *plan_table_settings_4d* is set to 0:

the Point/Vertex id's option is used to display/not display vertex numbers at the vertices of strings in **all** models on the plan view.

Selecting Point/Vertex id's brings up the **Vertex ID's for Plan View** panel, without the Model field.

If *plan_table_settings_4d* is non-zero:

the Point/Vertex id's option then has a walk-right menu with options to specify for *each* model on the plan view whether point numbers for strings in the model are

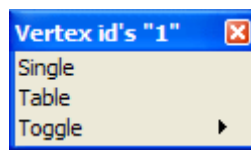
(a) not drawn at all

or

(b) if set to draw, then the point numbers are only drawn if the equivalent world size is not too large. This stops the drawing of *numbers* when the displaying world size is large in proportion to other world units (e.g. when zooming out).

If Point/Vertex id's is selected without walking right, the **Vertex ID's for Plan View** panel is brought up (documented in the next section).

The Point/Vertex id's walk-right menu is



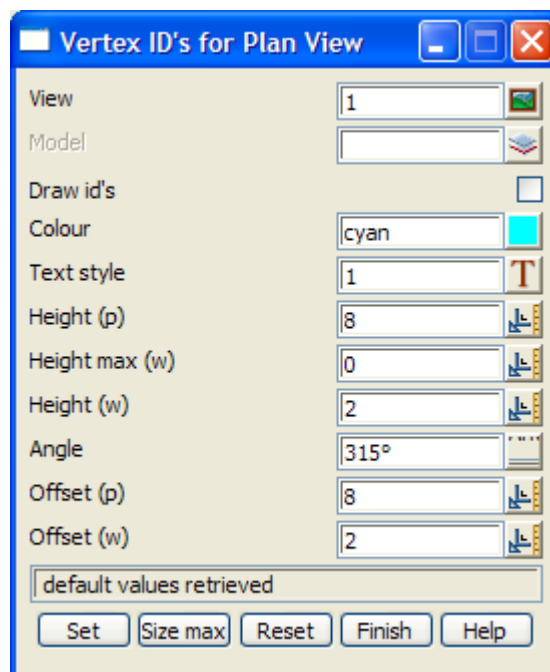
Single

[vertex_id_s_for_plan_view](#)

Position of option on menu: Plan View Menu View => Settings => Point/Vertex id s => Single

The Single option is used to set parameters for drawing point/vertex id's (numbers) of strings for all models not mentioned in the *Table* or set the parameters for an individual model on the plan view.

After selecting the Single option, the **Vertex ID's for Plan View** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
View <i>name of the view to modify point/vertex id's (number) drawing parameters for.</i>	input/output	current view	available views
Model <i>if blank, then all models not mentioned in the Table option use these parameters for drawing point numbers on a view. If non blank, then this model only will be set to draw point/vertex id's with the parameters on this panel.</i>	input		
Draw numbers <i>If tick, point/vertex id's (numbers) will be checked against the Height max (w) before being drawn. If not tick, then no point/vertex id's for strings are drawn on the plan view.</i>	tick-cross		
Colour <i>colour of the point/vertex id's (numbers)</i>	input	default pt colour	available colours
Text style <i>textstyle of the point/vertex id's (numbers)</i>	input	1	available text styles
Height (p) <i>height in pixels that the point/vertex id's (numbers) are drawn on a plan view.</i>	input	8	
Height max (w) <i>if non-zero: when the point/vertex id's (numbers) is displayed on a plan view then there is an equivalent height of the id's (numbers) in world units that matches the display size. If Size max (w) has a non-zero value, then if the equivalent world size of the id's (numbers) on the plan view is greater than Size max (w), then the id's (numbers) is not drawn. Hence zooming out will eventually stop the point/vertex id's (numbers) from drawing.</i>	input	0	
Height (w) <i>height in world units of the point/vertex id's (numbers) when plotted or output.</i>	input	2	
Angle <i>angle in degrees that the text is rotated about the (x,y) position of the string vertices.</i>	input	-45	
Offset (p) <i>distance in pixels that the text is drawn from the (x,y) position of the string vertices.</i>	input	default text height	
Offset (w) <i>distance in world units that the text is drawn from the (x,y) position of the string points when plotted</i>	input	default text height	
Set <i>set the values in the panel and then redraw the plan view.</i>	button		
Size max (w) <i>when clicked, size max (w) is set to be the world size of point id's (numbers) displayed on the given plan view. Hence if any further zoom out is done, the point id's (numbers) will stop drawing. The set button must then be clicked to set the values for the view.</i>	button		
Reset <i>reset all the parameters so no models are individually set for the view.</i>	button		

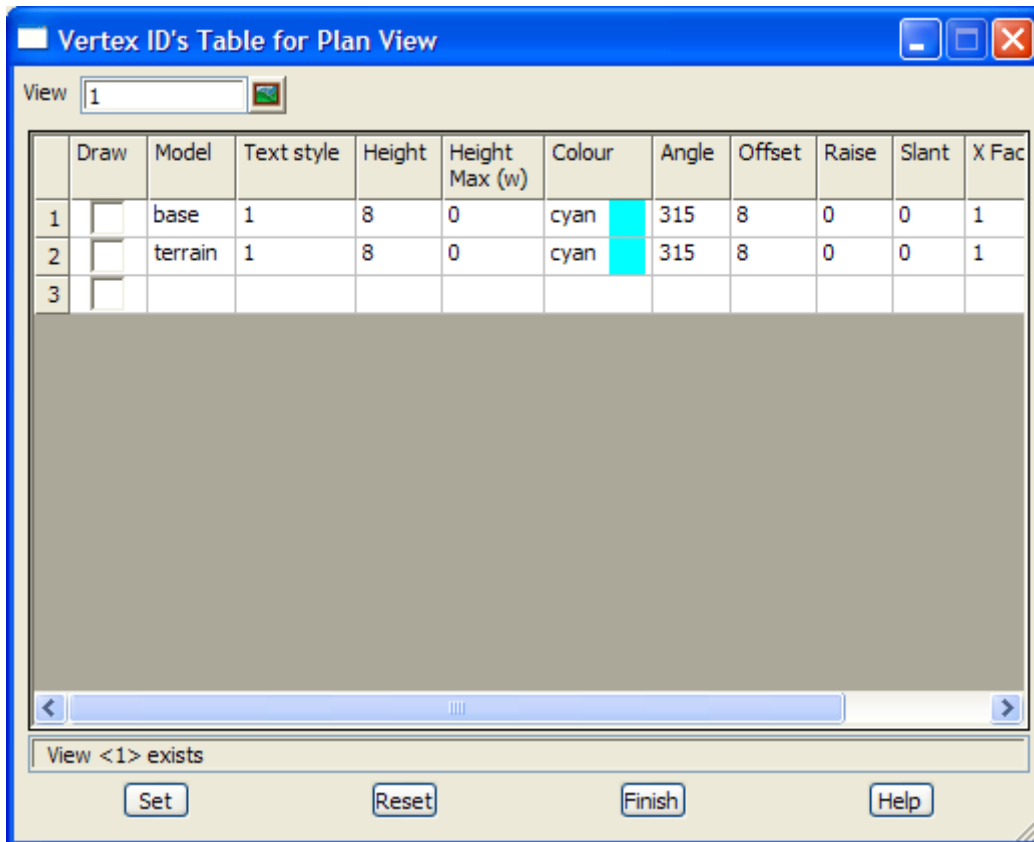
Table

[vertex_id_s_table_for_plan_view](#)

Position of option on menu: Plan View Menu View => Settings => Point/Vertex id's => Table

The Table option displays a list of models on the view with their point id's (numbers) drawing parameters which can then be modified from the table.

Selecting Table fires up the **Vertex ID's Table for Plan View** panel.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
View <i>name of the view to modify point id's (numbers) drawing parameters for.</i>	input/output	current view	available views
Draw <i>If not tick, then no point numbers for strings in the given model are drawn on the plan view. if tick, point id's (numbers) for strings in the model will be checked against the Ht max (w) to see if they are drawn.</i>	tick-cross		
Model <i>the model to set the parameters for.</i>	input		
Colour <i>colour of the point id's (numbers)</i>	input	default pt colour	available colours
Text style <i>textstyle of the point id's (numbers)</i>	input	1	available text styles
Height <i>height in pixels of the point id's (numbers).</i>	input	8	
Ht max (w) <i>if non-zero: when the plan view is such that the height of the point id's (numbers) in world units is greater than Height max (w), then the point id's (numbers) are not drawn. Hence as one zooms out, the point id's (numbers) will eventually stop drawing.</i>	input	0	
Angle <i>angle in degrees that the text is rotated about the (x,y) position of the string vertices.</i>	input	-45	

Offset input default text height
distance in pixels that the text is drawn from the (x,y) position of the string vertices.

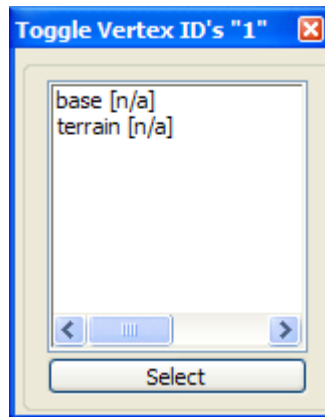
Set button
set the values in the panel and then redraw the plan view.

Toggle

[plan_view_toggle_vertex_id_s](#)

Position of menu: Plan View Menu View => Settings => Point/Vertex id's => Toggle

Walking-right on the Toggle option displays a list of models on the view with their point/vertex id's (numbers) draw flag. The point/vertex id's (numbers) draw flag can be toggled on/off for the model by selecting the model on the list. Note that [n/a] means that the model has *not* been individually set on or off and the general Point/vertex id's toggle is used for the model.



Vertex Indices

[plan_view_vertex_indices_settings_menu](#)

Position of menu: Plan View Menu View => Settings => **Vertex Indices**

The **Vertex Indices** option allows the user to specify whether the vertex indices (position of the vertex in the string) for all vertices of strings are

- (a) not drawn at all
- or
- (b) if set to draw, then only drawn if the equivalent world size is not too large. This stops the drawing of *vertex indices* when the displaying world size is large in proportion to other world units (e.g. when zooming out).

Hence the **Vertex Indices** option tries to control the drawing of vertex indices on the view so that the indices stop displaying as the user *zooms out*

Note - vertex indices are not to be confused with *point/vertex numbers* which may not be defined for a vertex in the string.

Depending on whether the environment variable *plan_table_settings_4d* is zero or not, the Vertex indices option draws vertex indices for string vertices for *any* model on the view, or the drawing of vertex indices can be set for individual models.

If the environment variable *plan_table_settings_4d* is set to 0:

the **Vertex Indices** option is used to display/not display vertex indices at the vertices of strings in **all** models on the plan view.

Selecting Vertex Indices brings up the **Vertex Indices for Plan View** panel, without the Model field.

If *plan_table_settings_4d* is non-zero:

the Vertex Indices option then has a walk-right menu with options to specify for *each* model on the plan view whether vertex indices for strings in the model are

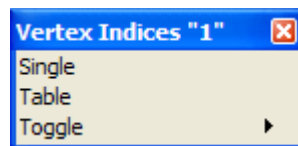
(a) not drawn at all

or

(b) if set to draw, then the vertex indices are only drawn if the equivalent world size is not too large. This stops the drawing of *indices* when the displaying world size is large in proportion to other world units (e.g. when zooming out).

If Vertex Indices is selected without walking right, the **Vertex Indices for Plan View** panel is brought up (documented in the next section).

The **Vertex Indices** walk-right menu is



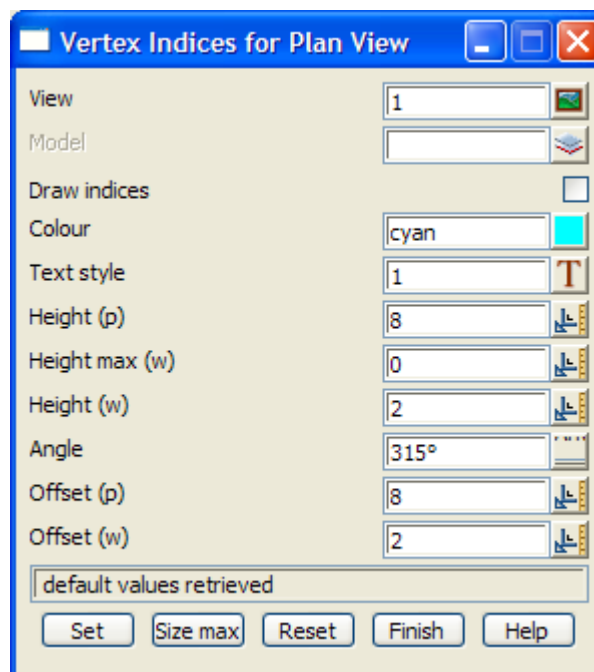
Single

[vertex_indices_for_plan_view](#)

Position of option on menu: Plan View Menu View => Settings => Vertex indices => Single

The Single option is used to set parameters for drawing vertex indices of strings for all models not mentioned in the *Table* or set the parameters for an individual model on the plan view.

After selecting the Single option, the **Vertex Indices for Plan View** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
View <i>name of the view to modify vertex indices drawing parameters for.</i>	input/output	current view	available views
Model <i>if blank, then all models not mentioned in the Table option use these parameters for drawing vertex indices on a view. If non blank, then this model only will be set to draw vertex indices with the parameters on this panel.</i>	input		
Draw numbers <i>If tick, vertex indices will be checked against the Height max (w) before being drawn. If not tick, then no vertex indices for strings are drawn on the plan view.</i>	tick-cross		
Colour <i>colour of the vertex indices</i>	input	default pt colour	available colours
Text style <i>textstyle of the vertex indices</i>	input	1	available text styles
Height (p) <i>height in pixels that the vertex indices are drawn on a plan view.</i>	input	8	
Height max (w) <i>if non-zero: when the plan view is such that the height of the vertex indices in world units is greater than Height max (w), then the vertex indices are not drawn. Hence as one zooms out, the vertex indices will eventually stop drawing. if non-zero: when the vertex indices are displayed on a plan view then there is an equivalent height of the number in world units that matches the display size. If Size max (w) has a non-zero value, then if the equivalent world size of the number on the plan view is greater than Size max (w), then the number is not drawn. Hence zooming out will eventually stop the vertex indices from drawing.</i>	input	0	
Height (w) <i>height in world units of the vertex indices when plotted or output.</i>	input	2	
Angle <i>angle in degrees that the text is rotated about the (x,y) position of the string vertices.</i>	input	-45	
Offset (p) <i>distance in pixels that the text is drawn from the (x,y) position of the string vertices.</i>	input	default text height	
Offset (w) <i>distance in world units that the text is drawn from the (x,y) position of the string points when plotted</i>	input	default text height	
Set <i>set the values in the panel and then redraw the plan view.</i>	button		
Size max (w) <i>when clicked, size max (w) is set to be the world size of vertex indices displayed on the given plan view. Hence if any further zoom out is done, the vertex indices will stop drawing. The set button must then be clicked to set the values for the view.</i>	button		
Reset <i>reset all the parameters so no models are individually set for the view.</i>	button		

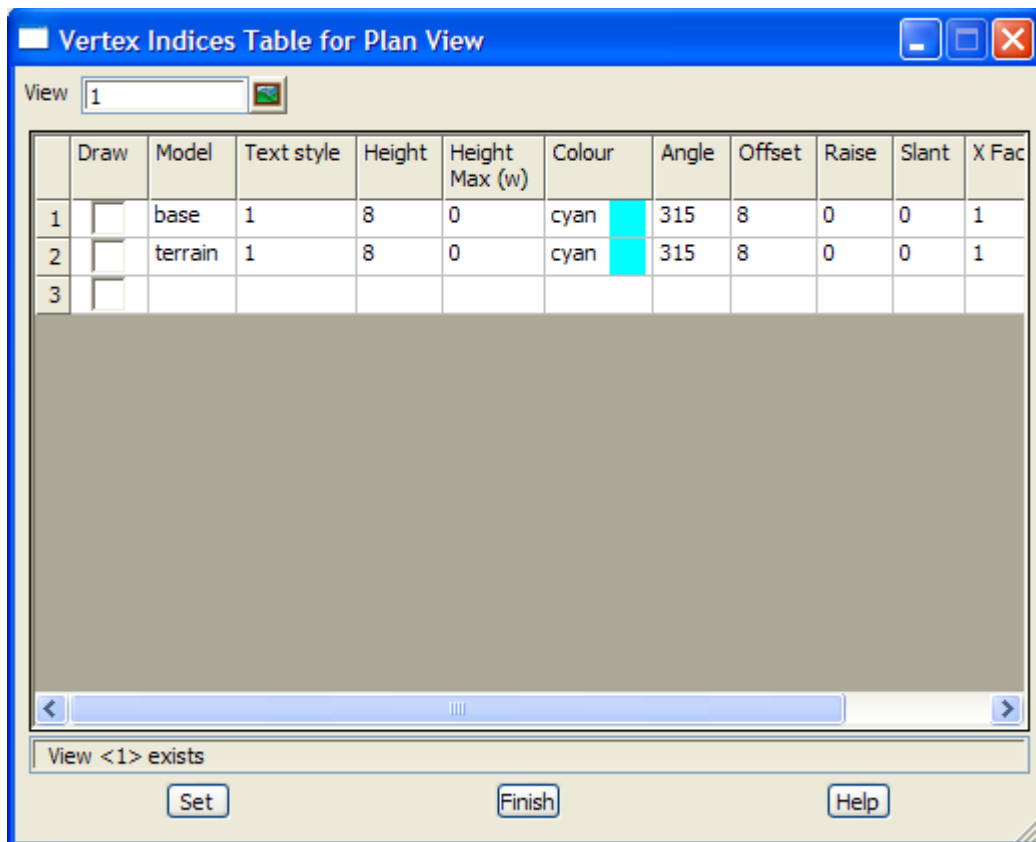
Table

[vertex_indices_table_for_plan_view](#)

Position of option on menu: Plan View Menu View => Settings => Vertex indices => Table

The Table option displays a list of models on the view with their vertex indices drawing parameters which can then be modified from the table.

Selecting Table fires up the **Vertex Indices Table for Plan View** panel.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
View <i>name of the view to modify vertex indices drawing parameters for.</i>	input/output	current view	available views
Draw	tick-cross		
<i>If not tick, then no vertex indices for strings in the given model are drawn on the plan view. if tick, vertex indices for strings in the model will be checked against the Ht max (w) to see if it is drawn.</i>			
Model <i>the model to set the parameters for.</i>	input		
Colour <i>colour of the vertex indices</i>	input	default pt colour	available colours
Text style <i>textstyle of the vertex indices</i>	input	1	available text styles
Height <i>height in pixels of the vertex indices.</i>	input	8	
Ht max (w) <i>if non-zero: when the plan view is such that the height of the vertex indices in world units is greater than Height max (w), then the vertex indices are not drawn. Hence as one zooms out, the vertex indices will eventually stop drawing.</i>	input	0	
Angle <i>angle in degrees that the text is rotated about the (x,y) position of the string vertices.</i>	input	-45	

Offset input default text height
distance in pixels that the text is drawn from the (x,y) position of the string vertices.

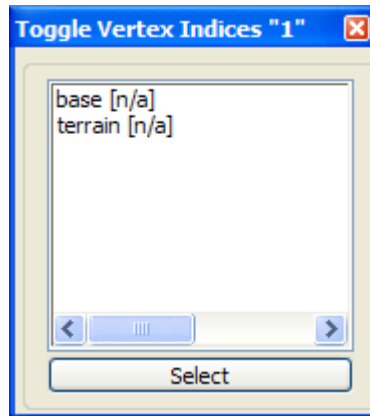
Set button
set the values in the panel and then redraw the plan view.

Toggle

plan_view_toggle_vertex_indices

Position of menu: Plan View Menu View => Settings => Vertex Indices => Toggle

Walking-right on the Toggle option displays a list of models on the view with their vertex indices draw flag. The vertex indices draw flag can be toggled on/off for the model by selecting the model on the list. Note that [n/a] means that the model has *not* been individually set on or off and the general Vertex Indices toggle is used for the model.



Z Values

plan_view_z_values_settings_menu

Position of menu: Plan View Menu View => Settings => Z values

The Z values option allows the user to specify whether the z co-ordinate for all vertices of strings are

(a) not drawn at all

or

(b) if set to draw, then only drawn if the equivalent world size is not too large. This stops the drawing of *z values* when the displaying world size is large in proportion to other world units (e.g. when zooming out).

Hence the Z values option tries to control the drawing of vertex z values on the view so that the numbers stop displaying as the user *zooms out*

Depending on whether the environment variable *plan_table_settings_4d* is zero or not, the Z values option draws z values for string vertices for *any* model on the view, or the drawing of vertex z values can be set for individual models.

If the environment variable *plan_table_settings_4d* is set to 0:

the Z values option is used to display/not display vertex z values at the vertices of strings in **all** models on the plan view.

Selecting Z values brings up the **Z Values for Plan View** panel, without the Model field.

If *plan_table_settings_4d* is non-zero:

the Z values option then has a walk-right menu with options to specify for *each* model on the plan view whether vertex z values for strings in the model are

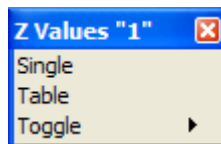
(a) not drawn at all

or

(b) if set to draw, then the z values are only drawn if the equivalent world size is not too large. This stops the drawing of *numbers* when the displaying world size is large in proportion to other world units (e.g. when zooming out).

If Z values is selected without walking right, the **Z Values for Plan View** panel is brought up (documented in the next section).

The Z values walk-right menu is



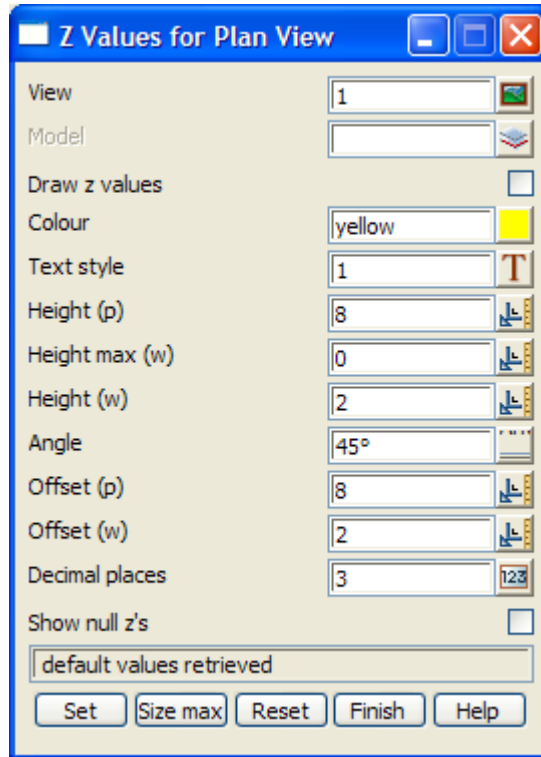
Single

z_values_for_plan_view

Position of option on menu: Plan View Menu View => Settings => Z values => Single

The Single option is used to set parameters for drawing vertex z values of strings for all models not mentioned in the *Table* or for an individual model on the plan view.

After selecting the Single option, the **Z Values for Plan View** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
View <i>name of the view to modify vertices z values drawing parameters for.</i>	input/output	current view	available views
Model <i>if blank, then all models not mentioned in the Table option use these parameters for drawing vertex z-values on a view. If non blank, then this model only will be set to draw vertex z-values with the parameters on this panel.</i>	input		
Draw z values <i>If tick, vertex z values will be checked against the Height max (w) before being drawn. If not tick, then no vertex z values for strings are drawn on the plan view.</i>	tick-cross		
Colour <i>colour of the z values</i>	input	default pt colour	available colours
Text style <i>textstyle of the z values</i>	input	1	available text styles
Height (p) <i>height in pixels of the z values.</i>	input	8	
Height max (w) <i>if non-zero: when the plan view is such that the height of the z values in world units is greater than Height max (w), then the z values are not drawn. Hence as one zooms out, the z values will eventually stop drawing.</i>	input	0	
Height (w) <i>height in world units of the z values when plotted or output.</i>	input	2	

Angle	input	-45	
			<i>angle in degrees that the text is rotated about the (x,y) position of the string vertices.</i>
Offset (p)	input	default text height	
			<i>distance in pixels that the text is drawn from the (x,y) position of the string vertices.</i>
Offset (w)	input	default text height	
			<i>distance in world units that the text is drawn from the (x,y) position of the string points when plotted or output.</i>
Decimal places	input	3	
			<i>number of decimal places when displaying the z value</i>
Show null z's	tick box		
			<i>if tick, null z values are displayed as null. If not tick, no z value is displayed at null z-values.</i>
Set	button		
			<i>set the values in the panel and then redraw the plan view.</i>
Size max (w)	button		
			<i>when clicked, size max (w) is set to be the world size of vertex z-values displayed on the given plan view. Hence if any further zoom out is done, the vertex z-values will stop drawing. The set button must then be clicked to set the values for the view.</i>
Reset	button		
			<i>reset all the parameters so no models are individually set for the view.</i>

Table

[z_values_table_for_plan_view](#)

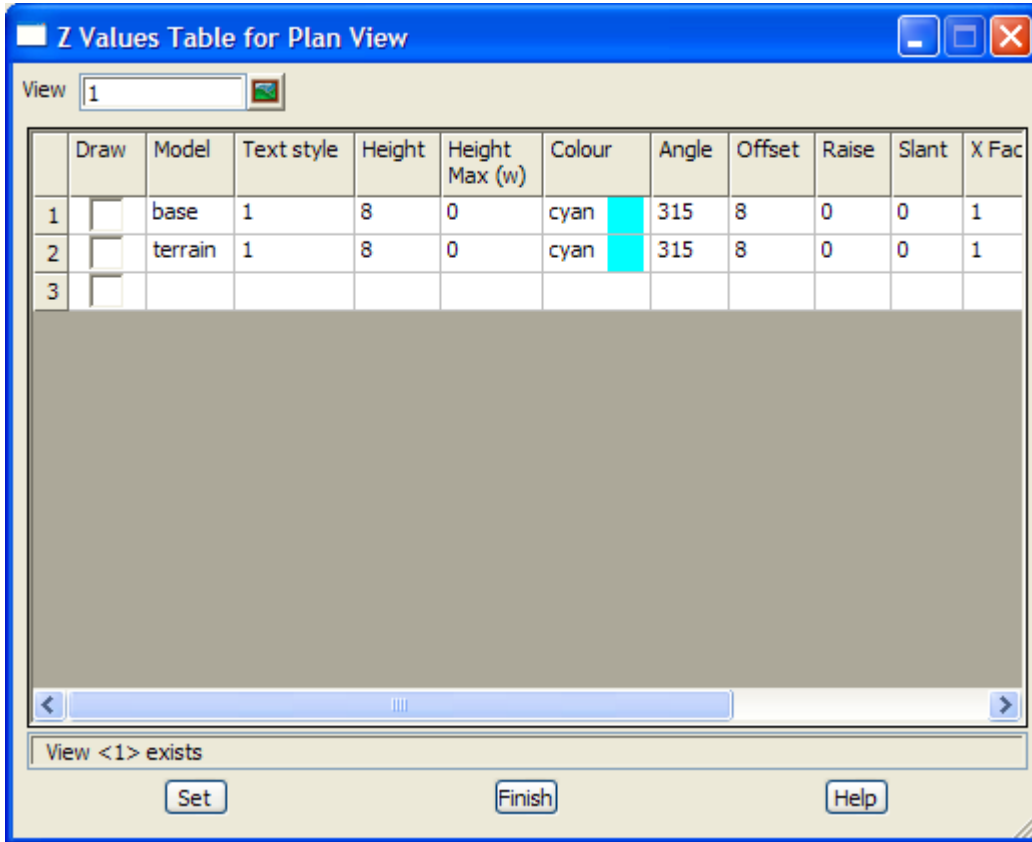
Position of option on menu: Plan View Menu View => Settings => Z values => Table

The Table option displays a list of models on the view with their vertex z value drawing parameters which can then be modified from the table.

Selecting Table fires up the **Z Values Table for Plan View** panel.

The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
View	input/output	current view	available views
			<i>name of the view to modify vertices z values drawing parameters for.</i>
Draw	tick-cross		
			<i>If not tick, then no vertex z values for strings in the given model are drawn on the plan view. if tick, z values for strings in the model will be checked against the Ht max (w) to see if it is drawn.</i>
Model	input		
			<i>the model to set the parameters for.</i>
Colour	input	default pt colour	available colours
			<i>colour of the z values</i>
Text style	input	1	available text styles
			<i>textstyle of the z values</i>
Height	input	8	
			<i>height in pixels of the z values.</i>



Ht max (w) input 0
if non-zero: when the plan view is such that the height of the z values in world units is greater than Ht max (w), then the z values are not drawn. Hence as one zooms out, the z values will eventually stop drawing.

Angle input -45
angle in degrees that the text is rotated about the (x,y) position of the string points.

Offset input default text height
distance in pixels that the text is drawn from the (x,y) position of the string points

Decimal places input 3
number of decimal places when displaying the z value

Nulls yes-no no yes, no
if tick, null z values are displayed as null. If not tick, no z value is displayed at null z-values.

Set button
set the values in the panel and then redraw the plan view.

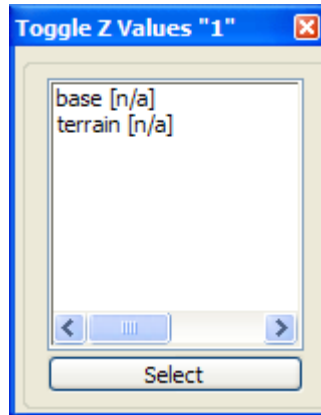
Toggle

[plan_view_toggle_z_values](#)

Position of menu: Plan View Menu View => Settings => Z values => Toggle

Walking-right on the Toggle option displays a list of models on the view with their vertex z values draw flag. The vertex z value draw flag can be toggled on/off for the model by selecting the model on the list.

Note that [n/a] means that the model has *not* been individually set on or off and the general Z values toggle is used for the model.



Names

`plan_view_string_names_settings_menu`

Position of menu: Plan View Menu View => Settings => Names

The names option allows the user to specify whether the string name is drawn at each string vertex. The string names can be

(a) not drawn at all

or

(b) if set to draw, then only drawn if the equivalent world size is not too large. This stops the drawing of *string names* when the displaying world size is large in proportion to other world units (e.g. when zooming out).

Hence the Names option tries to control the drawing of string names on the view so that the numbers stop displaying as the user *zooms out*

Depending on whether the environment variable `plan_table_settings_4d` is zero or not, the names option draws string names for string vertices for *any* model on the view, or the drawing of string names at vertices can be set for individual models.

If the environment variable `plan_table_settings_4d` is set to 0:

the names option is used to display/not display the string name at the vertices of strings in **all** models on the plan view.

Selecting names brings up the **Plan String Names for Plan View** panel, without the Model field.

If `plan_table_settings_4d` is non-zero:

the names option then has a walk-right menu with options to specify for *each* model on the plan view whether string names are drawn at vertices for strings in the model are

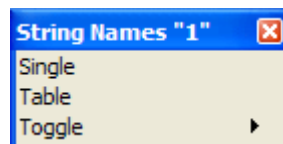
(a) not drawn at all

or

(b) if set to draw, then the string names are only drawn if the equivalent world size is not too large. This stops the drawing of *names* when the displaying world size is large in proportion to other world units (e.g. when zooming out).

If Names is selected without walking right, the **Plan String Names for Plan View** panel is brought up (documented in the next section).

The Names walk-right menu is



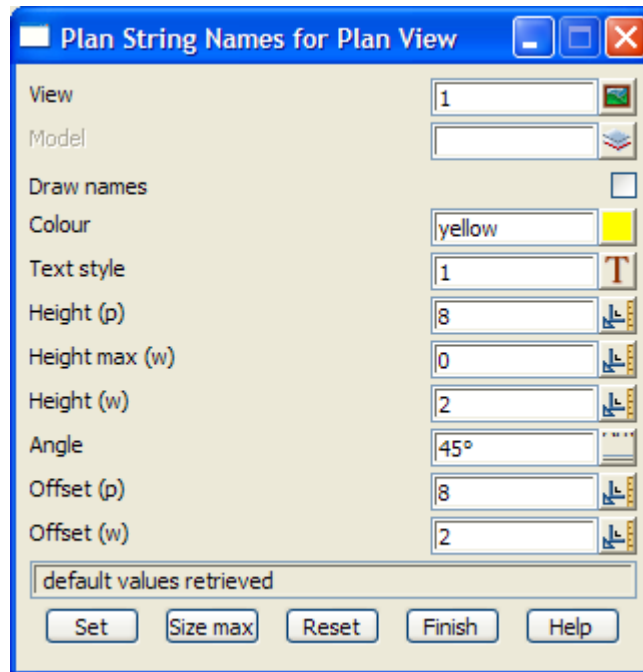
Single

`plan_string_names_for_plan_view`

Position of option on menu: Plan View Menu View => Settings => Names => Single

The Single option is used to set parameters for drawing the string name at each vertex of strings for any models not mentioned in the *Table*, or for an individual model on the plan view.

After selecting the Single option, the **Plan String Names for Plan View** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
View <i>name of the view to modify string name drawing parameters for.</i>	input/output	current view	available views
Model <i>if blank, then all models not mentioned in the Table option use these parameters for drawing the string name at each vertex on a view. If non blank, then this model only will be set to draw the string name at each vertex with the parameters on this panel.</i>	input		
Draw names <i>If tick, string names for the model will be checked against the Height max (w) before being drawn. If not tick, then no string names for strings in the given model are drawn on the plan view.</i>	tick box		
Colour <i>colour of the string names.</i>	input	default pt colour	available colours
Text style <i>textstyle of the string names.</i>	input	1	available text styles
Height (p) <i>height in pixels of the string names.</i>	input	8	
Height max (w) <i>if non-zero: when the plan view is such that the height of the string names in world units is greater than Height max (w), then the string names are not drawn. Hence as one zooms out, the string names will eventually stop drawing.</i>	input	0	
Height (w) <i>height in world units of the string names when plotted or output.</i>	input	2	
Angle <i>angle in degrees that the text is rotated about the (x,y) position of the string vertices.</i>	input	-45	

Offset (p) input default text height
distance in pixels that the text is drawn from the (x,y) position of the string vertices.

Offset (w) input default text height
distance in world units that the text is drawn from the (x,y) position of the string vertices when plotted or output.

Set button
set the values in the panel and then redraw the plan view.

Size max (w) button
when clicked, size max (w) is set to be the world size of string names as displayed on the given plan view. Hence if any further zoom out is done, the vertex string names will stop drawing. The set button must then be clicked to set the values for the view.

Reset button
reset all the parameters so no models are individually set for the view.

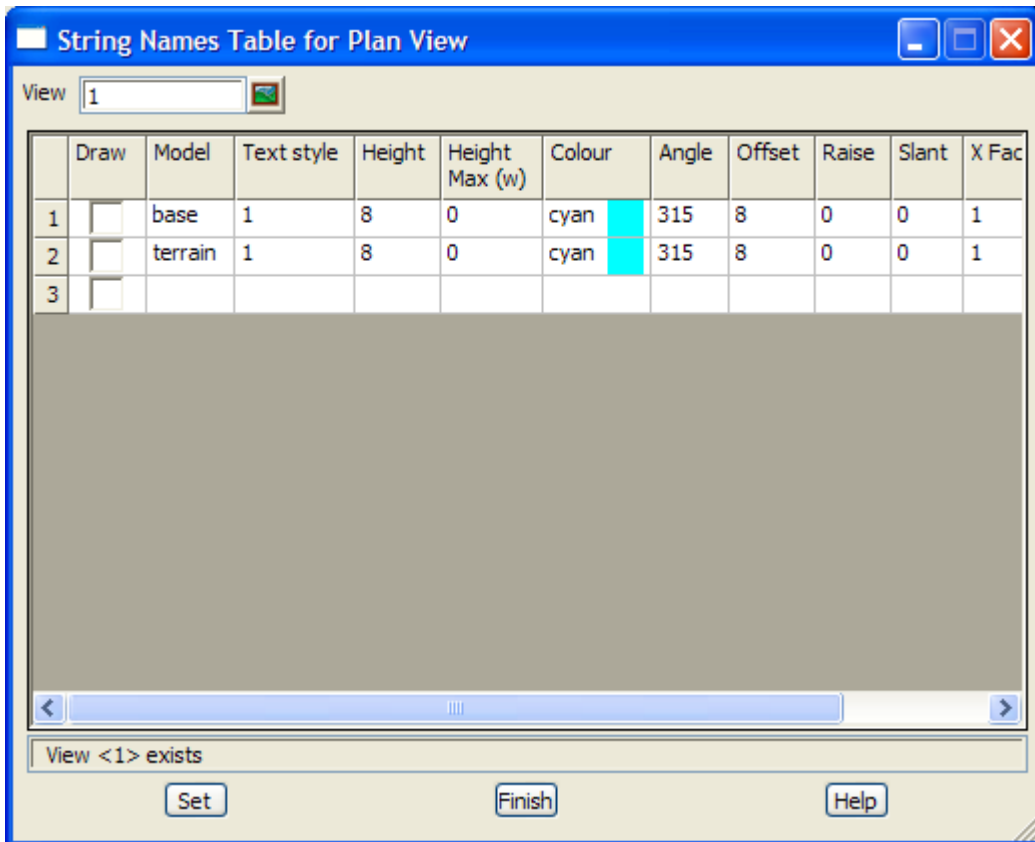
Table

string_names_table_for_plan_view

Position of option on menu: Plan View Menu View => Settings => Names => Table

The Table option displays a list of models on the view with their string names drawing parameters which can then be modified from the table.

Selecting Table fires up the **String Names Table for Plan View** panel.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
View <i>name of the view to modify string names drawing parameters for.</i>	input/output	current view	available views
Draw <i>If not tick, then no string names for strings in the given model are drawn on the plan view. if tick, string names for strings in the model will be checked against the Ht max (w) to see if it is drawn.</i>	tick-cross		
Model <i>the model to set the parameters for.</i>	input		
Colour <i>colour of the string names</i>	input	default pt colour	available colours
Text style <i>textstyle of the string names</i>	input	1	available text styles
Height <i>height in pixels of the string names.</i>	input	8	
Ht max (w) <i>if non-zero: when the plan view is such that the height of the string names in world units is greater than Ht max (w), then the string names are not drawn. Hence as one zooms out, the string names will eventually stop drawing.</i>	input	0	
Angle <i>angle in degrees that the text is rotated about the (x,y) position of the string vertices.</i>	input	-45	
Offset <i>distance in pixels that the text is drawn from the (x,y) position of the string vertices</i>	input	default text height	
Set <i>set the values in the panel and then redraw the plan view.</i>	button		

Toggle

plan_view_toggle_string_names

Position of menu: Plan View Menu View => Settings => Names => Toggle

Walking-right on the Toggle option displays a list of models on the view with their string names draw flag. The string name draw flag can be toggled on/off for the model by selecting the model on the list.

Note that [n/a] means that the model has *not* been individually set on or off and the general names toggle is used for the model.



Vertex Attributes

`plan_view_attributes_settings_menu`

Position of menu: Plan View Menu View => Settings => Attributes

The **Attributes** option allows the user to specify whether the vertex attributes are drawn at each string vertex. The vertex attributes can be

(a) not drawn at all

or

(b) if set to draw, then only drawn if the equivalent world size is not too large. This stops the drawing of *attributes* when the displaying world size is large in proportion to other world units (e.g. when zooming out).

Hence the **Attributes** option tries to control the drawing of attributes on the view so that the text stops displaying as the user *zooms out*

Depending on whether the environment variable `plan_table_settings_4d` is zero or not, the **attributes** option draws attributes string vertices for *any* model on the view, or the drawing of attributes at vertices can be set for individual models.

If the environment variable `plan_table_settings_4d` is set to 0:

the **Attributes** option is used to display/not display the attributes at the vertices of strings in **all** models on the plan view.

Selecting **Attributes** brings up the **Attributes for Plan View** panel, without the Model field.

If `plan_table_settings_4d` is non-zero:

the **Attributes** option then has a walk-right menu with options to specify for *each* model on the plan view whether attributes are drawn at vertices for strings in the model are

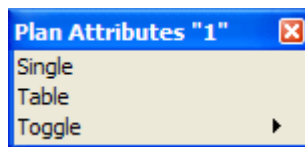
(a) not drawn at all

or

(b) if set to draw, then the attributes are only drawn if the equivalent world size is not too large. This stops the drawing of *attributes* when the displaying world size is large in proportion to other world units (e.g. when zooming out).

If **Attributes** is selected without walking right, the **Attributes for Plan View** panel is brought up (documented in the next section).

The **Attributes** walk-right menu is

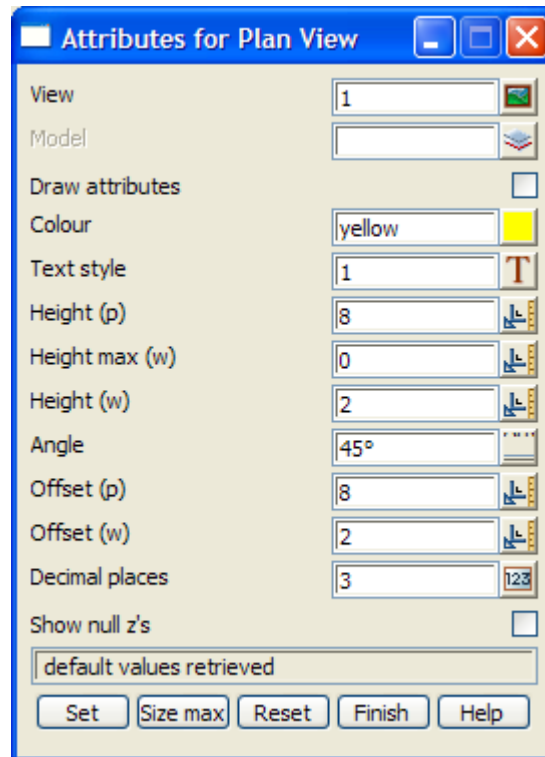


Single

Position of option on menu: Plan View Menu View => Settings => Attributes => Single

The **Single** option is used to set parameters for drawing the attributes at each vertex of strings for any models not mentioned in the *Table*, or for an individual model on the plan view.

After selecting the **Single** option, the **Attributes for Plan View** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
View <i>name of the view to modify attribute drawing parameters for.</i>	input/output	current view	available views
Model <i>if blank, then all models not mentioned in the Table option use these parameters for drawing the attributes at each vertex on a view. If non blank, then this model only will be set to draw the attributes at each vertex with the parameters on this panel.</i>	input		
Draw attributes <i>If tick, attributes for the model will be checked against the Height max (w) before being drawn. If not tick, then no attributes for strings in the given model are drawn on the plan view.</i>	tick box		
Colour <i>colour of the attributes.</i>	input	default pt colour	available colours
Text style <i>textstyle of the attributes.</i>	input	1	available text styles
Height (p) <i>height in pixels of the attributes</i>	input	8	
Height max (w) <i>if non-zero: when the plan view is such that the height of the attributes in world units is greater than Height max (w), then the attributes are not drawn. Hence as one zooms out, the attributes will eventually stop drawing.</i>	input	0	
Height (w) <i>height in world units of the attributes when plotted or output.</i>	input	2	

- Angle** input -45
angle in degrees that the text is rotated about the (x,y) position of the string vertices.
- Offset (p)** input default text height
distance in pixels that the text is drawn from the (x,y) position of the string vertices.
- Offset (w)** input default text height
distance in world units that the text is drawn from the (x,y) position of the string vertices when plotted or output.
- Decimal places** input 3
number of decimal places to use for real attributes.
- Show null z's** tick box
if tick, real attributes that are null z values are displayed as null. If not tick, no real attribute is displayed when it has a null z-value.
- Set** button
set the values in the panel and then redraw the plan view.
- Size max (w)** button
*when clicked, size max (w) is set to be the world size of attributes as displayed on the given plan view. Hence if any further zoom out is done, the vertex attributes will stop drawing. The **set** button must then be clicked to set the values for the view.*
- Reset** button
reset all the parameters so no models are individually set for the view.

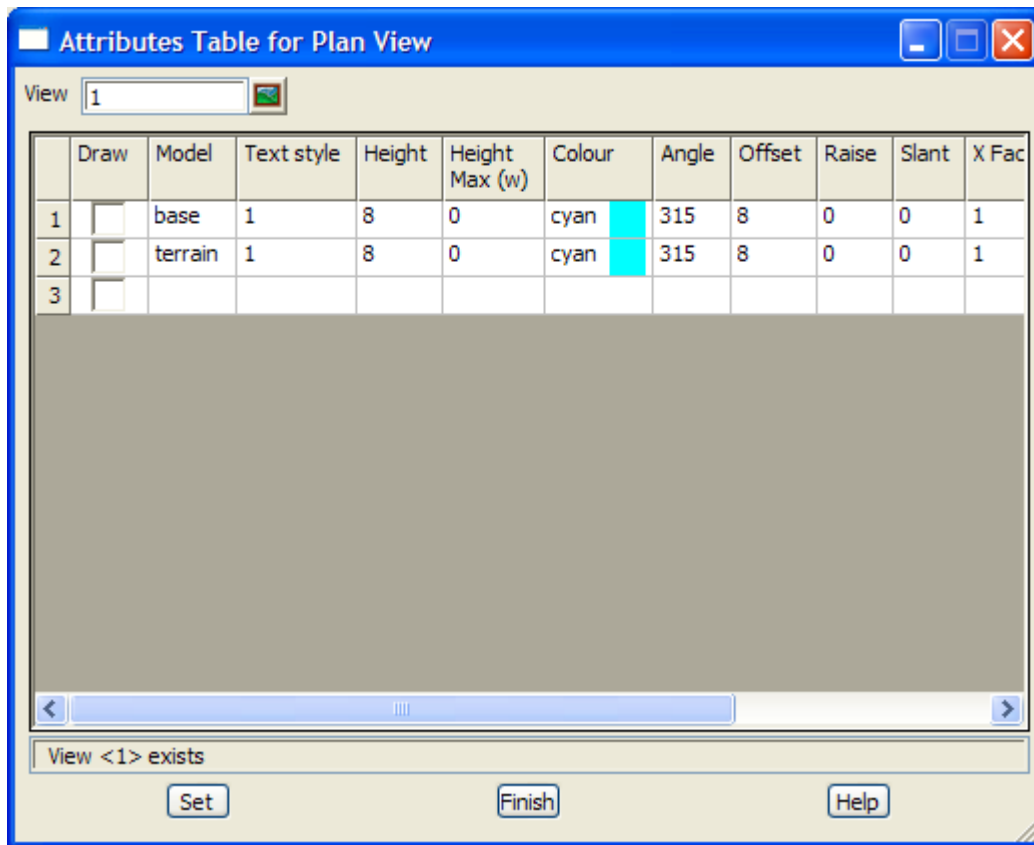
Table

[attributes_table_for_plan_view](#)

Position of option on menu: Plan View Menu View => Settings => Attributes => Table

The Table option displays a list of models on the view with their attributes drawing parameters which can then be modified from the table.

Selecting Table fires up the **Attributes Table for Plan View** panel.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
View <i>name of the view to modify vertex attribute drawing parameters for.</i>	input/output	current view	available views
Draw <i>If not tick, then no attributes for strings in the given model are drawn on the plan view. if tick, vertex attributes for strings in the model will be checked against the Ht max (w) to see if it is drawn.</i>	tick-cross		
Model <i>the model to set the parameters for.</i>	input		
Colour <i>colour of the vertex attributes</i>	input	default pt colour	available colours
Text style <i>textstyle of the vertex attributes</i>	input	1	available text styles
Height <i>height in pixels of the vertex attributes</i>	input	8	
Ht max (w) <i>if non-zero: when the plan view is such that the height of the vertex attributes in world units is greater than Ht max (w), then the vertex attributes are not drawn. Hence as one zooms out, the vertex attributes will eventually stop drawing.</i>	input	0	
Angle <i>angle in degrees that the text is rotated about the (x,y) position of the vertex attributes.</i>	input	-45	

Offset	input	default text height
	<i>distance in pixels that the text is drawn from the (x,y) position of the string vertices</i>	
Precision	input	3
	<i>number of decimal places to use for any real attributes</i>	
Null	tick box	
	<i>if tick, real attributes that are null z values are displayed as "null". If not tick, no real attribute is displayed when it has a null z-value.</i>	
Set	button	
	<i>set the values in the panel and then redraw the plan view.</i>	

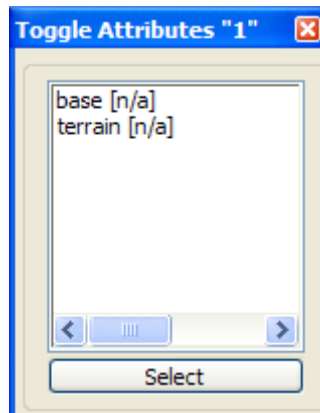
Toggle

plan_view_toggle_attributes

Position of menu: Plan View Menu View => Settings => Names => Toggle

Walking-right on the Toggle option displays a list of models on the view with their vertex attribute draw flag. The vertex attribute flag can be toggled on/off for the model by selecting the model on the list.

Note that [n/a] means that the model has *not* been individually set on or off and the general attributes toggle is used for the model.



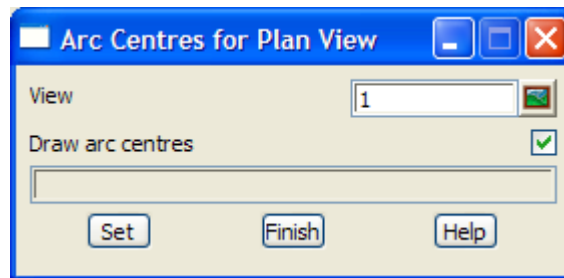
Arc Centres

arc_centres_for_plan_view

Position of option on menu: Plan View Menu View => Settings => Arc centres

The arc centres option allows the user to specify whether the centres of arcs and circles are displayed on the view.

Selecting Arc centres fires up the **Arc Centres for Plan View** panel.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
View	input/output	current view	available views

name of the view to modify arc centres flag for.

Draw arc centres	tick-cross	tick
-------------------------	------------	------

if tick is selected, any arcs or circles on the view will also have their centres drawn. Otherwise the centres are not displayed.

Set	button
------------	--------

set the draw arc centres mode to the value in the draw arc centre tick-cross panel box. The plan view is then redrawn using the mode.

Work Plane

work_plane

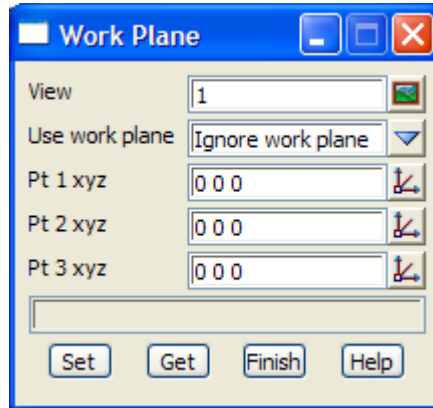
Position of option on menu: Plan View Menu View => Settings => Work plane

A plane not perpendicular to the (x,y) plane, can be used to define a unique z-value for any (x,y) co-ordinate pair. This fact is often invaluable when trying to defined three dimensional points using two-dimensional views.

In **12d Model**, a **work plane** can be defined by giving three non-colinear points. If the work-plane is used in a plan or perspective view, then the (x,y,z) values are restricted to lie in the defined work plane.

The work plane option is used to define and set work planes.

After selecting the work plane option, the **work plane** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
View <i>name of the view to get or set the work plane in.</i>	input		available views
User work plane <i>the work plane is used or not depending on this field value.</i>	input	ignore work plane	ignore work plane use work plane
Pt 1/2/3 xyz <i>points in the work plane</i>	input/output	0 0 0	
Set <i>A plane is defined by the three points given in the Pt xyz fields. This plane is set as the work plane for the view given by the view field. Although the work plane is set, it is not active unless the use work plane field is set to use work plane.</i>	button		
Get <i>get the three points of the defined work plane for the view given in the view field. The points are displayed in the Pt xyz fields of the panel.</i>	button		

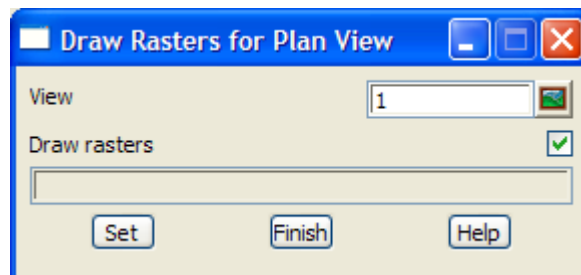
Rasters

draw_rasters_for_plan_view

Position of option on menu: Plan View Menu View => Settings => Rasters

The Rasters option is used to turn on or off the drawing of any rasters in models on the view.

After selecting the Rasters option, the Draw Rasters for Plan View panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
View <i>name of the view to toggle the drawing of rasters on or off.</i>	input/output	current view	available views
Draw rasters <i>if tick, draw any rasters in any models on the view.</i>	tick box	tick	
Set <i>set the draw rasters mode.</i>	button		

Grid

grid_on_view

Position of option on menu:		
Plan View Menu		View => Settings => Grid
Section View Menu		View => Settings => Grid
Perspective View Menu		View => Settings => Grid

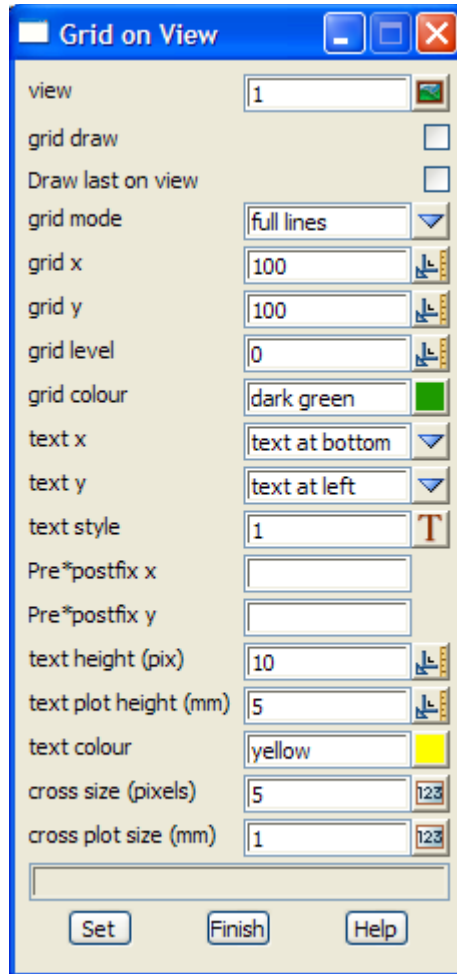
A regular grid of x (East) and/or y (North) lines can be displayed in a view. The grid is set in a plane of constant z (the level of the grid). The x and y spacing for the grid lines can be set and labelled independently.

For a plan or section view, the grid covers the entire view. However, for a perspective view, the grid only covers the maximum extents of the models in the view.

If the grid mode is set to

full lines	solid lines are drawn at the grid x (East) and y (North) spacing
crosses	crosses are drawn at the intersection of the grid x and y spacing
marks	lines are drawn at the beginning/end of the grid at x and y spacing

On selecting the option, the **Grid on View** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
View <i>the name of the view to define a grid for.</i>	input/output	current view	available views
Grid draw <i>if tick, the grid is drawn according to parameters in the rest of the panel.</i>	tick-cross		
Grid mode <i>the style of the grid being drawn - full lines, crosses or marks. If full lines, then solid lines are drawn at the grid x and y spacing. If crosses, then crosses of size cross size are drawn at the intersection of the grid x and y spacing. If marks, then solid lines size cross size are drawn at the beginning/end of the grid at the x and y spacing.</i>	input	full lines	full lines, crosses, marks
Grid x <i>the distance between the x (East) grid lines. If this value is zero, the x grid lines will not be drawn.</i>	input	100	
Grid y <i>the distance between the y (North) grid lines. If this value is zero, the y grid lines will not be drawn.</i>	input	100	
Grid level <i>the (x,y) grid is set in a plane of constant z. The grid level is the value of the constant z. This will only be used for a perspective view.</i>	input	0	
Grid colour	input	dark green	available colours

colour that the grid is drawn in.

Text x	input	text at bottom	text off, text at top, text at bottom, text at top and bottom
---------------	-------	----------------	--

the x (East) grid lines can be labelled with their x value. If the grid lines are labelled, the labels can be drawn on the top, the bottom or both ends of the x-grid lines

Text y	input	text at left	text off, text at left, text at right, text at left and right
---------------	-------	--------------	--

the y (North) grid lines can be labelled with their y value. If the grid lines are labelled, the labels can be drawn on the left, the right or both ends of the y-grid lines

Text style	input	1	
-------------------	-------	---	--

the text style of any grid labels.

Pre*postfix x	input		
----------------------	-------	--	--

*prefix/postfix (pre*post) to be applied to the value of x (East). If pretext only, just give the text. If post text is required, precede it by a *. For example E*m will place E before the x value and m after the number.*

Pre*postfix y	input		
----------------------	-------	--	--

*prefix/postfix (pre*post) to be applied to the value of y (North). If pretext only, just give the text. If post text is required, precede it by a *. For example N*m will place N before the y value and m after the number.*

Text height (pix)	input	10.0	
--------------------------	-------	------	--

height in screen pixels of any grid labels.

Text plot height (mm)	input	10.0	
------------------------------	-------	------	--

height in millimetres of any grid labels in a plot.

Text colour	input	yellow	available colours
--------------------	-------	--------	-------------------

colour that any grid labels are drawn in.

Cross size (pixels)	input	5.0	
----------------------------	-------	-----	--

size in screen pixels of grid crosses.

Cross plot size (mm)	input	1.0	
-----------------------------	-------	-----	--

size in millimetres of grid crosses in a plot.

Set	button		
------------	--------	--	--

the grid parameters are set to the values given in the panel. The grid is then redrawn in the view.

Note - If the view name is selected from the pop-up, or a <enter> is done after the view name is entered into the view field, the data for the grid on the named view is placed in the panel fields.

Colour

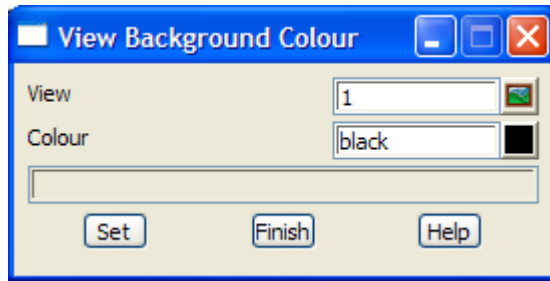
view_background_colour

Position of option on menu: Plan View Menu View => Settings => Colour

The Colour option is used to set the background colour for the view.

WARNING - in 12d Model V5, the background colour is not saved for the view. It defaults to the default background colour (black or set by the environment variable BACKGROUND_COLOUR_4D) each time the project is opened.

After selecting the Colour option, the **View Background Colour** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
View <i>name of the view to set the background colour for.</i>	input/output	current view	available views
Colour <i>if tick, draw any rasters in any models on the view.</i>	colour box	black	available colours
Set <i>set the background colour.</i>	button		

Drawing Filter

view_drawing_filter

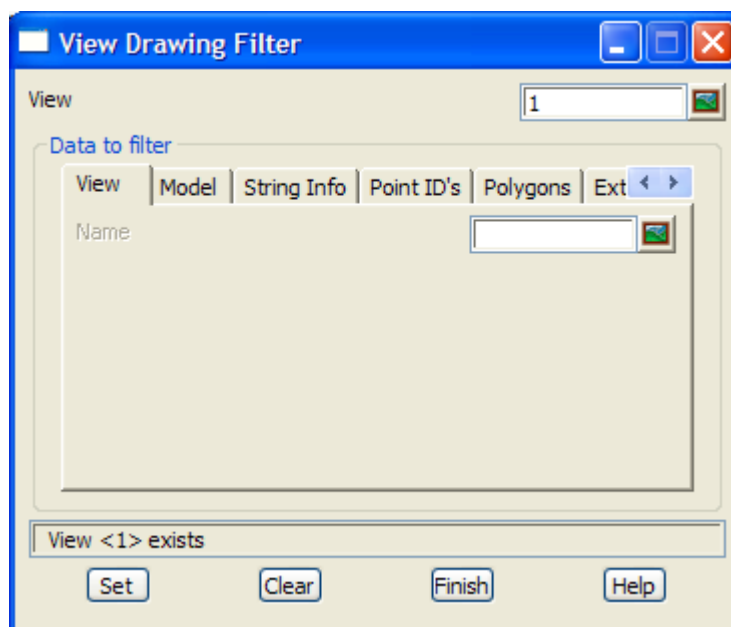
Position of option on menu: Plan View Menu View => Settings => Drawing filter

Position of option on menu: Perspective View Menu View => Settings => Drawing filter

The Drawing filter option is used to set a filter on the view so that only the data satisfying the filter is drawn.

NOTE: the filter is not saved with the project.

After selecting the Drawing filter option, the **View Drawing Filter** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
View <i>name of the view to apply the drawing filter to.</i>	view box	current view	available views
Data filter <i>only the data satisfying the drawing filter is drawn on the view.</i>	view box	current view	available views
Set <i>apply the drawing filter to the view.</i>	button		
Clear <i>clear the drawing filter being applied to the view.</i>	button		

Zoom

Position of menu: Plan View Menu View => Settings => Zoom

The zoom option operators in the same way for Plan and Section views.

The zoom option can be selected in three ways. By clicking LB on zoom on a view button area, selecting the **zoom option** itself by clicking LB when the zoom option is highlighted on the zoom menu, or by activating the zoom option's walk-right menu, **zoom ops**.

The zoom uses either a *dynamics zoom* or a *zoom box*

Dynamic Zoom

After selecting the zoom option, *dynamic zoom* is selected by clicking MB or by typing 'd'.

Then press LB at the point that is to stay put during the dynamic zoom and then move the mouse up to zoom in or move the mouse down to zoom out. Another point can be selected to dynamically zoom in or out about.

The dynamic zoom continues until either RB is clicked, or MB is clicked (or 'd' typed) to place the zoom option into *zoom box* mode.

Zoom Box

Position of option on menu: Plan View Menu View => Settings => Zoom =>Zoom

After selecting the zoom option, the user can define the zoom box by

- (a) pressing down LB at one corner of the box and dragging the mouse and releasing LB when at the other corner of the zoom box

or

- (b) picking two points from any plan views (by clicking LB in a plan view for each point) to define the diagonally opposite points of the zoom box. Note that the two points **do not** have to be from the same plan view.

Next the user selects the view (by clicking LB in the view) which is to be redrawn using this rectangle as the new drawing limits.

Often the same view is chosen for both defining the rectangle and redrawing. However, the power of the option is that the area to be "zoomed in" or "blown up" can be selected from one view and the zoomed area displayed in another view. The other view may not only be different to the views used to defined the zoom box, but may also have different models attached to it.

It is a useful technique to have a master view displaying the entire area of interest in one view, and use it to define zoom-rectangles for use in viewing smaller regions of data in other plan views.

To cancel the zoom after the zoom operation has been selected, click RB.

Next step messages - sent to the screen message area

```
<View Zoom> [Select][[]] select 1st corner of box - RB to cancel
<View Zoom> [Select][[]] select 2nd corner of box - RB to cancel
<View Zoom> [Select][[]] select destination view - RB to cancel
```

WARNING - this option can not be applied to a perspective view.

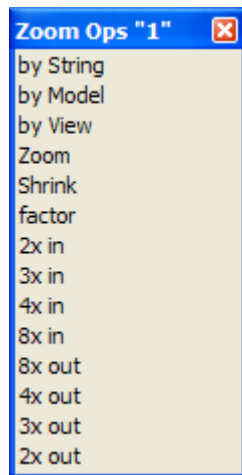
Please continue to the next section "Zoom Ops menu" .

Zoom Ops menu

[Section_View_Zoom_Menu](#)
[plan_view_zoom_menu](#)

Position of menu: Plan View Menu View => Settings => Zoom

The zoom walk-right menu is



a string defines the extent of the view
 a model defines the extent of the view
 a view defines the extent of the view
 two point zoom - see previous section
 two point shrink
 zoom by a user supplied factor
 zoom into the view by factor of 2
 zoom into the view by factor of 3
 zoom into the view by factor of 4
 zoom into the view by factor of 8
 zoom out of the view by a factor of 8
 zoom out of the view by a factor of 4
 zoom out of the view by a factor of 3
 zoom out of the view by a factor of 2

The by String, by Model and by View options use the x and y extents of the String, Model or View to define the display area for the view. These options will be described in more detail.

The option zoom is the same operation as the option just discussed, factor - to enlarge or reduce the view by a given magnification/reduction factor, and a number of preset view magnification and reduction factors.

By String, by Model and by View

[plan_zoom_by_view](#)
[plan_zoom_by_string](#)
[plan_zoom_by_model](#)

Position of option on menu: Plan View Menu

View => Settings => Zoom =>by string

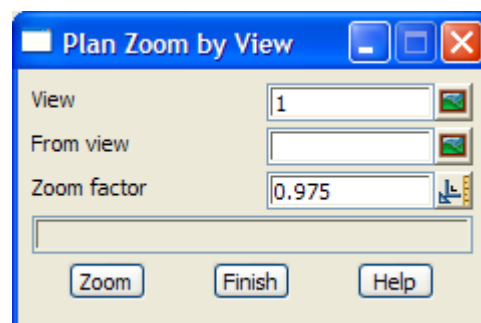
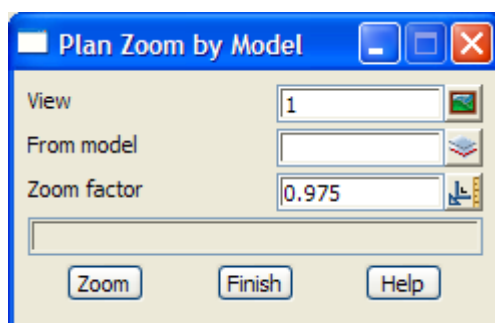
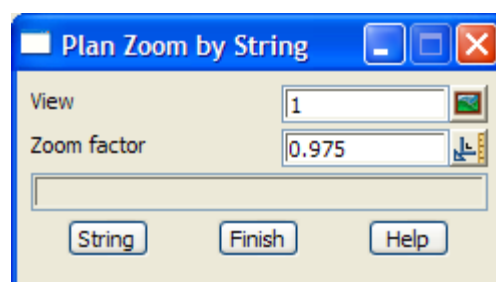
Position of option on menu: Plan View Menu

View => Settings => Zoom =>by model

Position of option on menu: Plan View Menu

View => Settings => Zoom =>by view

The three zoom options by String, by Model and by View work in a similar manner. After selecting the option, the **Plan Zoom by String/ Model/ View** panel is brought up.



For **by String**, the user selects a string using the **String** button and the data on the view is redrawn so the selected string is fitted to the view, adjusted by the Zoom factor given in the panel.

Note that the selected string can be from a different view.

For **by Model**, the user enters a model name into the Model field and then selects the **Zoom** button. The data on the view is redrawn so the specified model is fitted to the view, adjusted by the Zoom factor given in the panel.

Note that the specified model does not have to be on the view.

For **by View**, the user enters a view name into the View field and then selects the **Zoom** button. The data on the view is redrawn so the specified view is fitted to the current view, adjusted by the Zoom factor given in the panel.

Note that the specified view does not have to be on the current view.

Shrink

Position of option on menu: Plan View Menu View => Settings => Zoom => Shrink

Shrink is the opposite of zoom: instead of the information in the view box being expanded to fill the view, the information in the view is shrunk to fit into the zoom box.

After selecting the shrink option, the user picks two points from any plan views (by clicking LB in a plan view for each point) to define the diagonally opposite points of a rectangle. Note that the two points **do not** have to be from the same plan view.

Next the user selects the view (by clicking LB in the view) which is to be redrawn by shrinking the data on the view to fit into this rectangle.

To cancel the zoom after the zoom operation has been selected, click RB.

WARNING - this option can not be applied to a perspective view

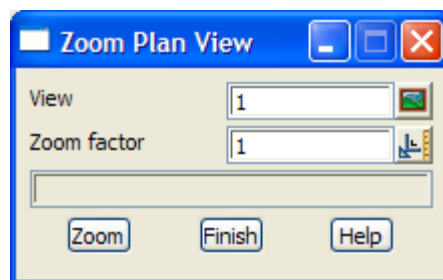
Factor

[zoom_plan_view](#)
[zoom_section_view](#)

Position of option on menu: Plan View Menu View => Settings => Zoom => Factor

Position of option on menu: Section View Menu View => Settings => Zoom => Factor

On selecting the factor option, the **zoom plan view** panel is displayed.



This option is used to magnify or reduce the information in the view by a user given amount.

The field and buttons in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
View <i>name of the view to set zoom factor for.</i>	input/output	current view	available views

Zoom factor input 1.0

factor to magnify/reduce the information inside the view by. The value can be greater than 1.0 (zoom in) or less than 1.0 (zoom out).

Zoom button

the information displayed in the view is magnified/reduced by the factor given in the zoom factor field.

WARNING - this option can not be applied to a perspective view.

Pre-set Zoom Factors

Upon selecting a particular zoom factor (e.g. 4 x in), the user is asked to indicate a point in a view which is to become the new view-centre. The user then indicates (by clicking LB in the view) which view is to be redrawn with this point as the new centre and with the selected zoom factor applied to that view.

To cancel the zoom after the zoom operation has been selected, click RB.

Next step messages - sent to the screen message area

<View Magnify> [Select][[]] select new centre of view - RB to cancel
<View Magnify> [Select][[]] select destination view - RB to cancel

Pan

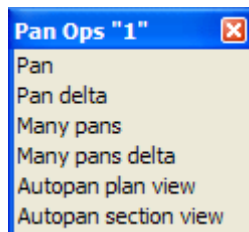
[plan_view_pan_menu](#)
[section_view_pan_menu](#)

Position of menu: Plan View Menu View => Settings => Pan

Position of menu: Section View Menu View => Settings => Pan

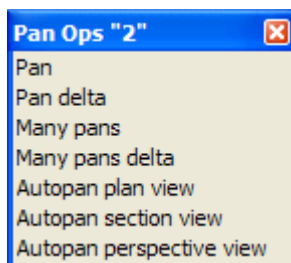
The Pan walk-right menu for Plan and Section views are

Plan View Pan Menu



make selected point the new view centre
pick a point and the place it is to be moved to on the screen
repeated pan
repeated pan delta
autopan for plan locked to plan view
autopan for plan locked to section view

Section View Pan Menu



make selected point the new view centre
pick a point and the place it is to be moved to on the screen
repeated pan
repeated pan delta
autopan for plan locked to section view
autopan for section locked to section view
autopan for perspective locked to section view

Pan operates the same way for *Plan* and *Section* views.

The pan option can be selected in four ways:

- (a) by clicking LB on Pan on a view button area
- (b) by clicking on <Control> LB whilst in the view

- (c) selecting the **Pan option** itself by clicking LB when the Pan option is highlighted on the Pan menu
- (d) by activating the Pan option's walk-right menu, Pan Ops.

The *pan* uses either a *dynamics pan* or two point mode.

Dynamic Pan

After selecting the pan option, *dynamic pan* is selected by clicking MB or by typing 'd'.

Then press LB at the point that is to be dragged across the view during the dynamic pan and then move the mouse to the new position for the point. Another point can then be selected to dynamically pan.

The *dynamic pan* continues until either RB is clicked, or MB is clicked (or 'd' typed) to place the pan option into *two point* mode.

After activating the pan walk-right menu, the user is presented with the option pan (which is the same operation as the option just discussed), pan delta, and many pans and many pans delta.

Pan

Position of option on menu: Plan View Menu View => Settings => Pan => Pan

Position of option on menu: Section View Menu View => Settings => Pan => Pan

After selecting the pan option, the user is asked to indicate a point in a view which is to become the new view-centre. The user then indicates (by clicking LB in the view) which view is to be redrawn with this point as the new centre.

To cancel the pan after the *pan* operation has been selected, click **RB**.

Next step messages - sent to the screen message area

<View Pan> [Select][][] select new centre of view - RB to cancel
<View Pan> [Select][][] select destination view - RB to cancel

Pan Delta

Position of option on menu: Plan View Menu View => Settings => Pan => Pan delta

Position of option on menu: Section View Menu View => Settings => Pan => Pan delta

After selecting the pan delta option, the user is asked to indicate a point in a view and the point on a view where the first point will be moved to. The user then indicates (by clicking LB in the view) which view is to be redrawn with the new position of the point on the view.

To cancel the pan delta after the *pan delta* operation has been selected, click RB.

Next step messages - sent to the screen message area

<View Pan> [Select][][] select 1st position of pan - RB to cancel
<View Pan> [Select][][] select 2nd position of pan - RB to cancel
<View Pan> [Select][][] select destination view - RB to cancel

Many Pans

Position of option on menu: Plan View Menu View => Settings => Pan => Many pans

Position of option on menu: Section View Menu View => Settings => Pan => Many pans

The many pans option is simply one *pan* operation followed by another.

After one *pan* operation has been performed, a new *pan* operation is begun.

The sequence is terminated by clicking RB.

Many Pans Delta

Position of option on menu: Plan View Menu View => Settings => Pan => Many pans delta

Position of option on menu: Section View Menu View => Settings => Pan => Many pans delta

The many pans delta option is simply one *pan delta* operation followed by another.

After one *pan delta* operation has been performed, a new *pan delta* operation is begun.

The sequence is terminated by clicking RB.

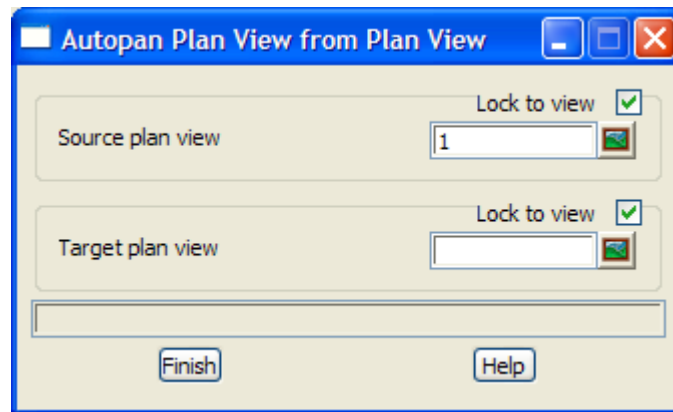
Autopan Plan View Locked to a Plan View

autopan_plan_view_from_plan_view

Position of option on menu: Plan View Menu View => Settings => Pan => Autopan plan view

The Autopan plan view option locks a target plan view to a source plan view. As the cursor is moved in the source plan view, the target plan view is automatically panned to keep the cursor in the middle of it. The target plan view keeps its scale.

Selecting Autopan plan view fires up the **Autopan Plan View from Plan View** panel.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Lock to view	tick box	tick	
Source plan view <i>plan view to lock the target plan view to.</i>	view box	current view	available plan views
Lock to view	tick box	tick	
Target plan view <i>plan view to lock the source plan view. As the cursor moves in the source plan view, the target view is automatically panned so that the cursor is in the centre of the target plan view.</i>	view box		available plan views

Autopan Section View Locked to a Plan View

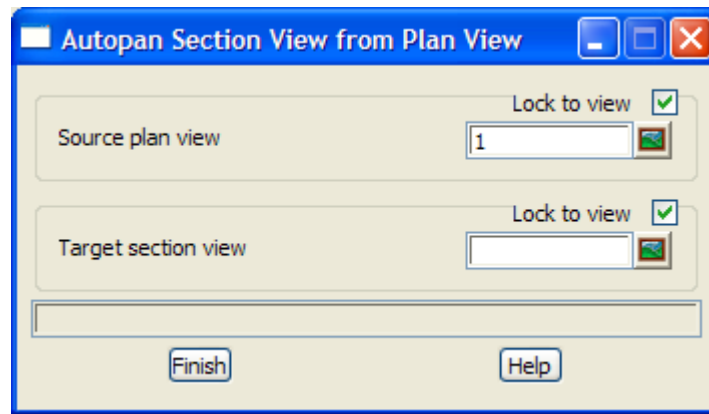
autopan_section_view_from_plan_view

Position of option on menu: Plan View Menu View =>Settings =>Pan =>Autopan section view

The Autopan section view option locks a target section view to a source plan view. As the cursor is moved in the source plan view, the cursor position is dropped onto the profiled string in the target section view and the target section view is automatically panned to keep the dropped cursor in the middle of it. The target section view keeps its scale.

Selecting Autopan section view fires up the **Autopan Section View from Plan View** panel.

The fields and buttons used in this panel have the following functions.



Field Description	Type	Defaults	Pop-Up
Lock to view	tick box	tick	
Source plan view <i>plan view to lock the section view to.</i>	view box	current view	available plan views
Lock to view	tick box	tick	
Target section view <i>section view to lock the source plan view. As the cursor is moved in the source plan view, the cursor position is dropped onto the profiled string in the target section view and the target section view is automatically panned to keep the dropped cursor in the middle of it. The target section view keeps its scale.</i>	view box		available section views

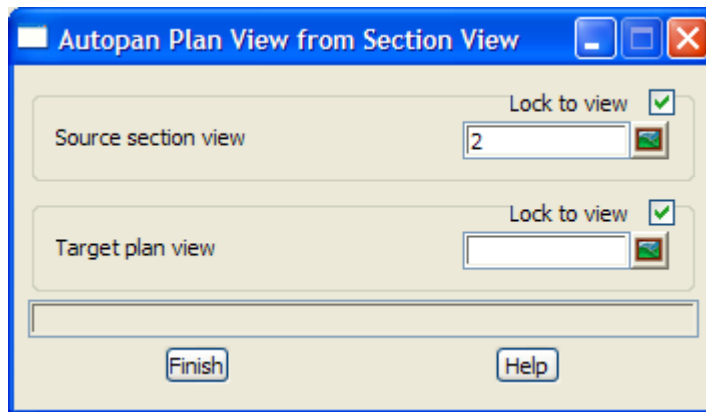
Autopan Plan View Locked to a Section View

[autopan_plan_view_from_section_view](#)

Position of option on menu: Section View Menu View => Settings => Pan => Autopan plan view

The Autopan plan view option locks a target plan view to a source section view. As the cursor is moved in the source section view, the target plan view is automatically panned to keep the cursor in the middle of it. The target plan view keeps its scale.

Selecting Autopan plan view fires up the **Autopan Plan View from Section View** panel.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Lock to view	tick box	tick	
Source section view <i>section view to lock the target plan view to.</i>	view box	current view	available plan views
Lock to view	tick box	tick	
Target plan view <i>plan view to lock the source section view. As the cursor moves in the source section view, the target view is automatically panned so that the cursor is in the centre of the target plan view.</i>	view box		available plan views

Autopan Section View Locked to a Section View

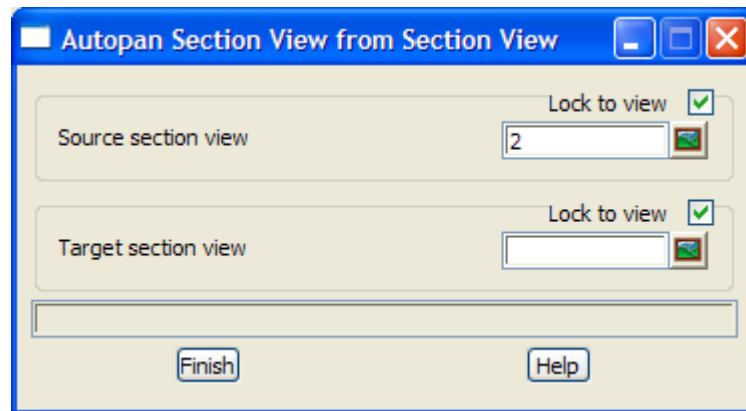
[autopan_section_view_from_section_view](#)

Position of option on menu: Section View Menu View =>Settings =>Pan =>Autopan section view

The Autopan section view option locks a target section view to a source plan view. As the cursor is moved in the source section view, the cursor position is dropped onto the profiled string in the target section view and the target section view is automatically panned to keep the dropped cursor in the middle of it. The target section view keeps its scale.

Selecting Autopan section view fires up the **Autopan Section View from Section View** panel.

The fields and buttons used in this panel have the following functions.



Field Description	Type	Defaults	Pop-Up
Lock to view	tick box	tick	
Source section view	view box	current view	available section views
		<i>section view to lock the target section view to.</i>	
Lock to view	tick box	tick	
Target section view	view box		available section views
		<i>section view to lock the source section view. As the cursor is moved in the source section view, the cursor position is dropped onto the profiled string in the target section view and the target section view is automatically panned to keep the dropped cursor in the middle of it. The target section view keeps its scale.</i>	

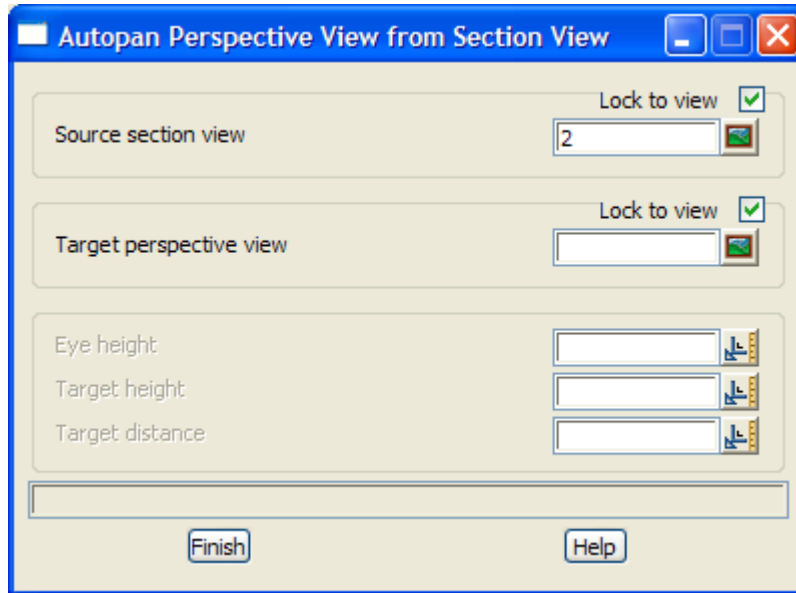
Autopan Perspective View Locked to a Section View

[autopan_perspective_view_from_section_view](#)

Position on menu: Section View Menu View => Settings => Pan => Autopan perspective view

The Autopan perspective view option locks a target perspective view to a source section view. As the cursor is moved in the source section view, the eye and target for the perspective view is automatically changed. Only the eye and target positions are modified for the target perspective view.

Selecting Autopan perspective view fires up the **Autopan Perspective View from Section View** panel.



The fields and buttons used in this panel have the following functions.

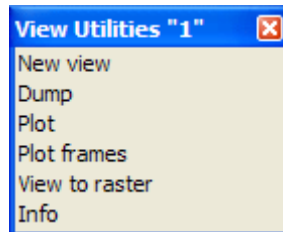
Field Description	Type	Defaults	Pop-Up
Lock to view	tick box	tick	
Source section view	view box	current view	available section views
<i>section view to lock the target perspective view to.</i>			
Lock to view	tick box	tick	
Target perspective view	view box		available perspective views
<i>perspective view to lock to the source section view. As the cursor moves in the source section view, the eye and target position for the target perspective view is calculated from the (x,y,z) of the profiled string in the section view, and the eye and target information in the panel.</i>			

Plan Utilities

plan_view_utilities_menu

Position of menu: Plan View Menu View => Settings => Utilities

The utilities menu contains miscellaneous options involving the plan view. The **utilities** walk-right menu is



For the option *New view*, go to the section “New View”

<i>Dump</i>	“Dump”
<i>Plot</i>	“Plan Plot”
<i>Plot frames</i>	“Plot Frames”
<i>View to raster</i>	“Create Raster from Plan View”
<i>Info</i>	“View Info”

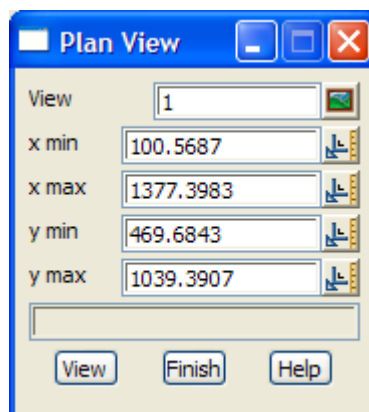
New View

plan_view

Position of option on menu: Plan View Menu View => Settings => Utilities => New view

The new view option displays the current view setting and permits the user to specify new x and y minimum and maximum values as the viewing parameters.

Selecting new view fires up the **plan view** panel.



Because the aspect ratio of the view may be different from the aspect ratio defined by the user supplied x and y minimums and maximums, slightly more data than the specified range may need to be drawn in the view. However, the view will always **include** the user given range.

The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
View <i>view to set min and max for.</i>	input/output	current view	available views
x min/max <i>minimum/maximum x co-ordinate for the view</i>	input/output	current x min/max	
y min/max <i>minimum/maximum y co-ordinate for the view</i>	input/output	current y min/max	
View <i>define the view parameters according to the information in the panel. If the box given by the x and y values in the panel is not the same shape as the view itself (that is, has the same aspect ratio), the x and y values will be modified so that the x and y values match the view shape. The final x and y values are displayed in the panel.</i>	button		

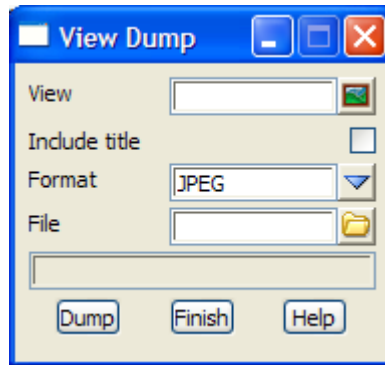
Dump

view_dump

Position of option on menu: Plan View Menu View => Settings => Utilities => Dump

This option is used to write the image of the view out to disk in a user selected format.

After selecting the dump option, a **view dump** panel appears.



The fields and buttons have the following functions.

Field Description	Type	Defaults	Pop-Up
View <i>view to dump out in the specified format.</i>	input	view option picked from	available views
Include title <i>if tick, the view title area is included in the dump.</i>	tick-cross		
Format <i>the format to dump the view out in.</i>	input	gif	gif, xwd, colour postscript
File <i>the file to dump the view images out to</i>	input	*.gif	
Dump <i>dump in the given format the image of the view given in the view field to the file given in the file field.</i>	button		

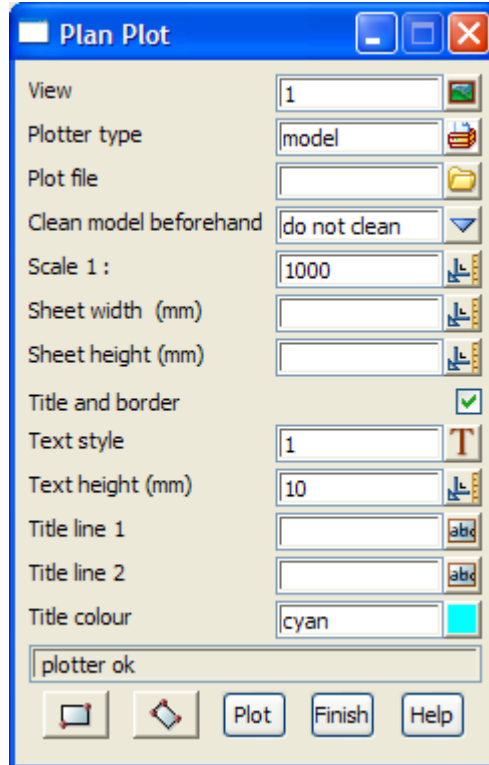
Plan Plot

plan_plot

Position of option on menu: Plan View Menu View => Settings => Utilities => Plot

The plot option writes out all the information displayed in the plan view to either a plot file (in a user selected format) or to a 12d Model model. The user selects a scale for the plot and the sheet width and height are calculated by 12d Model.

After selecting the plot option, the **plan plot** panel is displayed.



The fields and buttons have the following functions.

Field Description	Type	Defaults	Pop-Up
View <i>view to plot.</i>	view box	current view	available views
Plotter type <i>format for the plot information.</i>	input	hp	hp, dxf, postscript etc.
Plot file <i>stem of the name of the file to write the plot of the view to. The name ending is added automatically and depends on the plotter type.</i>	input	depends on plotter type	
Clean model beforehand <i>only applicable if plotting to a model.</i> <i>if always clean, the model is cleaned before the plot is created.</i> <i>If prompt for clean, the user is prompted that the model will be cleaned before the plot is created.</i> <i>If do not clean, the model is not cleaned before the plot is created.</i>	choice box		do not clean prompt for clean always clean
Scale 1: <i>if a value is entered by the user and an <enter> given, the sheet width and height required by the plot are calculated and displayed in the sheet width and sheet height fields.</i>	input		

- Sheet width (mm)** output
*if a value is entered by the user and an <enter> given, the scale and height required by the plot are calculated and displayed in the scale and sheet height fields. The units for sheet width are **millimetres**.*
- Sheet height (mm)** output
*if a value is entered by the user and an <enter> given, the scale and width required by the plot are calculated and displayed in the scale and sheet width fields. The units for sheet height are **millimetres***
- Title and border** tick-cross
*if **tick**, a border and two lines of title are placed on the bottom of the plot.*
- Title line 1/2** input
first/second line of title information.
- Title height (mm)** input 10
*height (in **millimetres**) to draw the two lines of title information.*
- Title colour** input cyan available colours
colour used for the border and the title information.
- Rectangle** button
create a rectangle (parallel to the x,y axis) that the plot is restricted to.
- Rotated Rectangle** button
create a rotated rectangle that the plot is restricted to.
- Plot** button
write out the plot of the information displayed in the view to the file given in the plot file field. The format of the file is given by the plotter type.

Plot Frames

Position of option on menu: Plan View Menu View => Settings => Utilities => Plot frames

To create plan plots of an arbitrary size, rotation and scale, 12d Model uses **plot frames**.

Basically a plot frame consists of a sheet size (in mm), margins within the sheet and a scale for the plot. This will define a plotting area in world co-ordinates (the plot frame).

The plot frame can be arbitrarily positioned and rotated on a plan view.

This option is documented in the section “Plotting Old Plot Frames” of the chapter “Plots”

Create Raster from Plan View

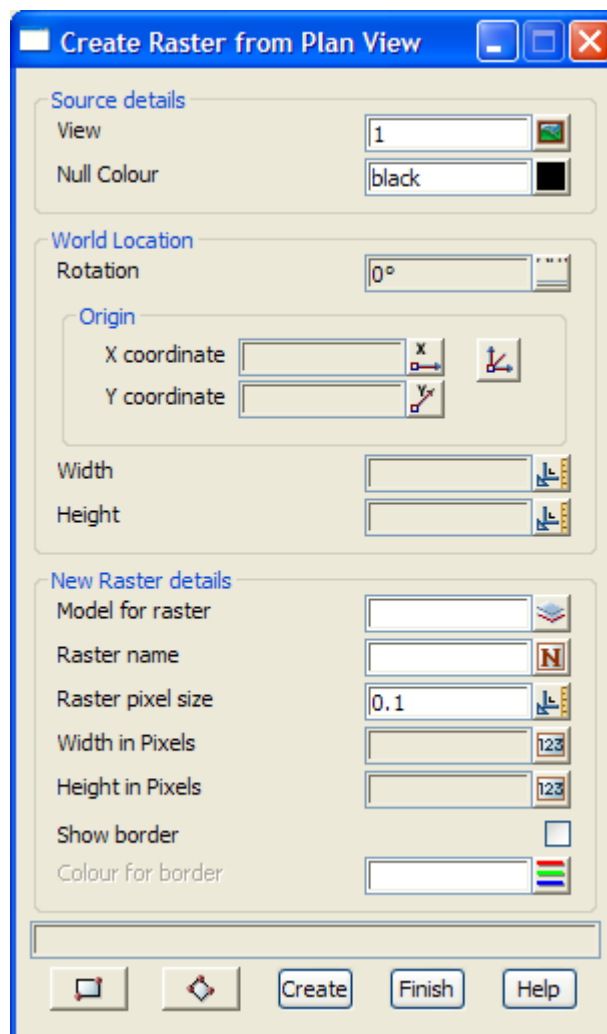
`create_raster_from_plan_view`

Position of option on menu: Plan View Menu View => Settings => Utilities => View to raster

Position of option on menu: Strings => Raster => Plan to raster

This option creates a 12d raster of a user specified pixel size, for the image on a plan view. This is useful for creating a 12d raster from an ECW file to use in draping on a tin in visualisations.

On selecting the View to Raster option, the **Create Raster from Plan View** panel is displayed.



The fields and buttons have the following functions.

Field Description	Type	Defaults	Pop-Up
Source Details			
View <i>view to create raster from.</i>	view box	current view	available views
Null colour <i>colour to set to no pixel in the raster</i>	colour box		available colours
World Location			
Anticlockwise rotation <i>the world rotation of the selected rectangle.</i>	angle box		

X/Y co-ordinate real box
the world x/y co-ordinate of the corner of the bottom left corner of the rectangle.

Width/height real box
the width/height in world units of the rectangle.

New Raster Details

Model for raster model box available models
name of the model for the raster element.

Raster name text box
the name for the raster.

Raster pixel size input
the size (in world units) for each pixel in the created raster.

Width/Height in pixels output only
the width/height in pixels of the created raster.

Show border tick-cross tick
if tick then the border of the created raster element is displayed.

Colour for border input default colour available colours
the colour of the border for the created raster.

Rectangle button
create a rectangle (parallel to the x,y axis) that the created raster is restricted to.

Rotated Rectangle button
create a rotated rectangle that the created raster is restricted to.

Create button
create a 12d raster from the image on the plan view.

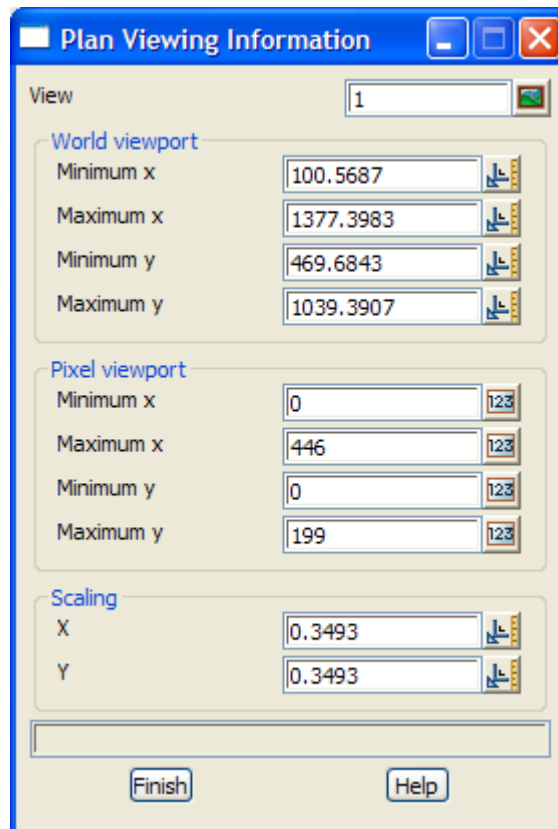
View Info

plan_viewing_information

Position of option on menu: Plan View Menu View => Settings => Utilities => Info

This option displays information about the world and pixel size of a plan view.

On selecting the Info option, the **Plan Viewing Information** panel is displayed.

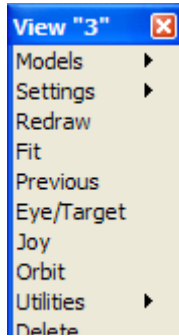


Perspective View Menu

perspective_view_menu

Position of menu: Perspective View Menu View

The perspective view menu is



For the option *Models*, go to the section

Settings

Redraw

Fit

Previous

Eye/Target

Joy

Utilities

Delete

“Model Ops” .

“Perspective View Settings” .

“Redraw” .

“Fit” .

“Previous” .

“Eye/Target” .

“Joy” .

“Perspective Utilities” .

“Delete” .

Perspective View Settings

perspective_view_settings_menu

Position of menu: Perspective View Menu View =>Settings

If the settings option is picked rather than moving onto the walking right, then the toggle menu from the toggle walk-right menu is displayed on the screen. The toggle menu will be described in the next section.

The settings walk-right menu for the perspective view is



For the option *Toggle*, go to the section

Culling

“Perspective Toggle” .

“Culling” .

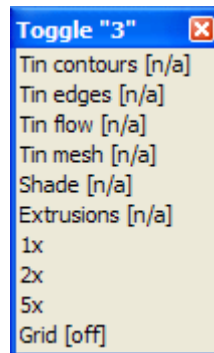
<i>Faces</i>	"Faces" .
<i>Hide</i>	"Hide" .
<i>Planes</i>	"Clipping Planes" .
<i>Exaggeration</i>	"Exaggeration" .
<i>Tins</i>	"Tins" .
<i>Shade</i>	"Shade" .
<i>Work Plane</i>	"Work Plane" .
<i>Grid</i>	"Grid" .
<i>Colour</i>	"Colour" .
<i>Drawing filter</i>	"Drawing Filter"

Perspective Toggle

[perspective_view_toggle_menu](#)

Position of menu: Perspective View Menu View =>Settings =>Toggle

The toggle walk right brings up the **toggle** perspective view menu.



Selecting any options from this menu will toggle the option on/off.

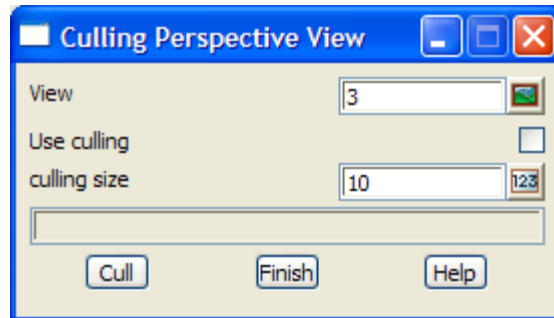
Culling

culling_perspective_view

Position of option on menu: Perspective View Menu View =>Settings =>Culling

The culling option is used to suppress the drawing of strings whose on-screen extent is less than a user defined pixel size.

Selecting culling raises the **culling perspective view** panel.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
View	input/output	current view	available views

view to set culling parameters for.

Use culling	tick-cross
--------------------	------------

*if tick, a string is **not** drawn on the perspective view whenever the string's extent box when drawn on the view would be smaller the culling size given in the culling size field.*

Culling size	input	10
---------------------	-------	----

pixel size used for culling

Cull	button
-------------	--------

record the culling size given in the culling field. If the use culling field and redraw the view.

Faces

face_flags_for_view

Position of option on menu: Perspective View Menu View =>Settings =>Faces

The faces option allows the user to specify how faces are displayed in the perspective view and on any perspective view plots.

Selecting faces fires up the **face flags for view** panel.



The fields and buttons have the following functions.

Field Description	Type	Defaults	Pop-Up
View <i>view to face flags for.</i>	input/output	current view	available views
Draw fill <i>if tick, all faces in the view are drawn in their fill colour.</i>	tick-cross	tick	
Draw edges <i>if tick, all face edges in the view are drawn.</i>	tick-cross		
Draw hatch <i>if tick, all faces in the view are drawn in their hatch pattern.</i>	tick-cross		
Set <i>set the draw fill/edges/hatch fields to the value in the panel fields. The plan view is then redrawn.</i>	button		

Hide

hide_view

Position of option on menu: Perspective View Menu View =>Settings =>Hide

When looking across a landscape, part of the terrain is often hidden by other parts of the terrain. For example hills in the foreground will hide hills behind them.

In 12d Model, a landscape is represented by a triangulated surface (a tin) and a tin can be used by a hidden line algorithm to determining what is visible in a scene.

The hide option in 12d Model uses a tin to define a surface and processes any strings on the perspective against the tin to determine what is visible or hidden.

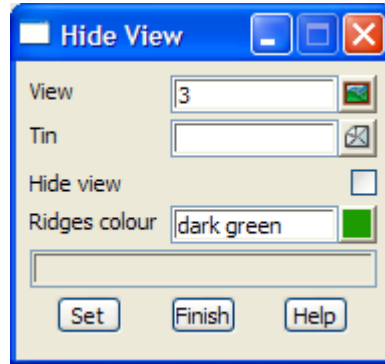
Only strings that lie on the tin can be sensibly processed. For example, contours, meshes, draped strings and any of the data that was used to create the tin.

When viewing a terrain from an eye point, the **ridge lines** are the edges of transition between visible and invisible areas. The hide option displays the ridge lines to delineate the hidden regions.

Once the hide option is set on, a hide will be done on the view whenever the view parameters are changed. If a model is added to the view when hide is set on, the strings in the model are processed and only the visible sections displayed in the view.

Note - strings can still be selected in a hidden view.

Selecting hide raises the **hide view** panel.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
View <i>view to set hide parameters for.</i>	input/output	current view	available views
Tin <i>the name of the triangulated surface (tin) to be used for determining what is visible or not.</i>	input		available tins
Hide view <i>if tick, then the view is processed when the set button is selected.</i>	tick-cross		
Ridges colour <i>the colour for the ridge lines.</i>	input		available colours
Set <i>record the answers for the hide view, tin and ridges colour fields and then process the perspective view using the new parameters. The view type will be changed to hidden.</i>	button		

WARNING - a hide can be very slow for large tins and/or large data sets.

Clipping Planes

clipping_planes_for_view

Position of option on menu: Perspective View Menu View =>Settings =>Planes

The perspective viewing direction is defined by specifying an eye and target point.

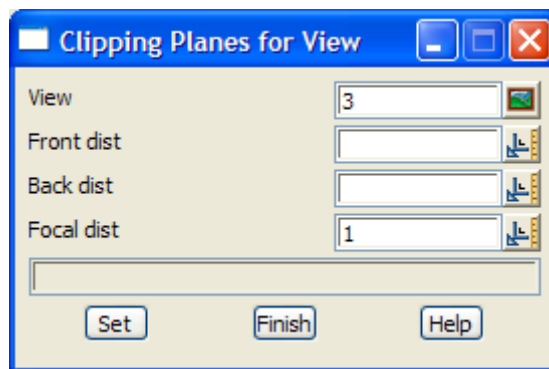
The three dimensional view is then projected onto a plane at right angles to the eye-target line, and at a user defined distance from the eye-point. This plane is called the focal plane and the distance from the eye-point to the focal plane is the focal distance.

The projection of all the data onto the focal plane is what is seen on the screen in a perspective view. Moving the focal plane has the same effect as varying the telephoto lens on a camera - it gives the impression of zooming into and out of the view.

It is not always desirable to include all the data in the perspective view. For example, data behind the viewer is not normally required to be seen. The user can specify the position of two planes (called the front and back clipping planes) parallel to the focal plane. Only data lying between the clipping planes will be seen. Thus the view is "clipped" using the front and back clipping planes.

The distance to the clipping planes is measured from the eye point along the line joining the eye and target points (the eye-target line).

Selecting planes fires up the **clipping planes for view** panel. This panel allows the user to set the focal distance and the front and back clipping plane distances.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
View <i>view to set clipping plane for.</i>	input/output	current view	available views
Front dist <i>distance from the eye point to the front clipping plane. If this field is blank, no front clipping plane is used.</i>	input/output		
Back dist <i>distance from the eye point to the back clipping plane. If this field is blank, no back clipping plane is use.</i>	input/output		
Focal dist <i>distance from the eye point to the focal plane. This distance must be non-zero.</i>	input/output		
Set <i>set the distances to the front and back clipping planes and the focal plane. If the front or back clipping distance is blank, that plane is not set. After the set button is chosen, the view is redrawn using the new parameters,</i>	button		

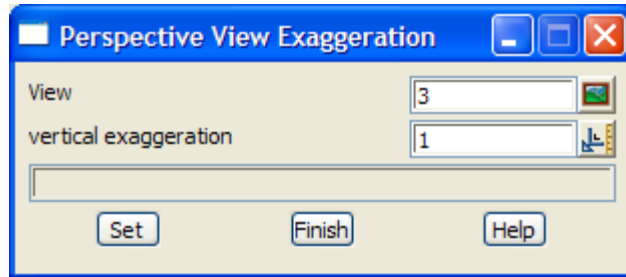
Exaggeration

perspective_view_exaggeration

Position of option on menu: Perspective View Menu View =>Settings =>Exaggeration

The exaggeration option allows the user to specify the vertical exaggeration in the perspective view. The heights (z values) are multiplied by the vertical exaggeration value before drawing on the perspective view.

Selecting exaggeration fires up the **perspective view exaggeration** panel.



The fields and buttons used in this panel have the following functions.

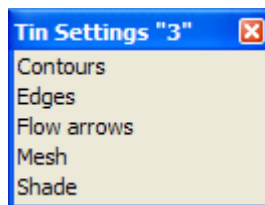
Field Description	Type	Defaults	Pop-Up
View <i>view to set exaggeration for.</i>	input/output	current view	available views
Vertical exaggeration <i>value to multiply the heights (z values) by before drawing in the perspective view.</i>	input	10	1,5,10
Set	button	<i>set the vertical exaggeration to the value in the vertical exaggeration field.</i>	

Tins

perspective_view_tin_settings_menu

Position of menu: Perspective View Menu View =>Settings =>Tins

The options on the tins walk-right menu control the display of tins on the view. The tins walk-right menu is



Contours

Position of option on menu: Perspective View Menu View =>Settings =>Tins =>Contours

The contours option defines contour and bold increments and colours, and also whether these contours are displayed for the triangles from any tins on the view. The panel is the same as for the plan view option. If shade is set on, the triangles will be drawn in back to front order.

Edges

Position of menu: Perspective View Menu View =>Settings =>Tins =>Edges

The edges option allows the user to specify whether the edges of triangles from any tins on the view are displayed. The panel is the same as for the plan view option. If shade is set on, the triangles will be drawn in back to front order.

Flow Arrows

Position of option on menu: Perspective View Menu View =>Settings =>Tins =>Flow arrows

The flow arrows option defines the colour and length of flow arrows, and also whether the flow arrows are displayed for the triangles from any tins on the view. The panel is the same as for the plan view option. If shade is set on, the triangles will be drawn in back to front order.

Mesh

Position of option on menu: Perspective View Menu View =>Settings =>Tins =>Mesh

The mesh option defines a rectangular mesh, and also whether the mesh is displayed for the triangles from any tins on the view. The panel is the same as for the plan view option. If shade is set on, the triangles will be drawn in back to front order.

Shade

shade_view

Position of option on menu: Perspective View Menu View =>Settings =>Tins =>Shade

Position of option on menu: Perspective View Menu View =>Settings =>Shade

In 12d Model, a landscape is represented by a triangulated surface - a tin. Each triangle in the tin is a part of a plane and has its own colour.

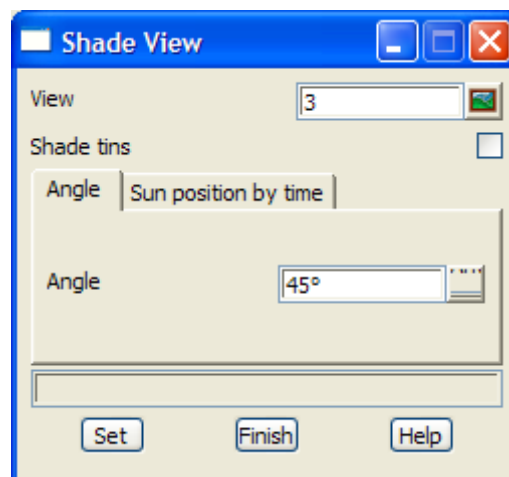
In a perspective view, each triangle can be drawn with a colour that is modified depending on the angle that the triangle makes with the sun (a point light source at infinity). This is called a **flat shade**.

If the triangles are drawn in a back to front order, then when the shaded landscape is drawn, any triangles in the foreground obscure triangles in the background and it looks like a hidden view.

If shade is set for a view, all the triangles in all the tins on the view are drawn as shaded triangles and the triangles are drawn in a back to front order.

Once the shade is set on, a shade will be done on the view whenever the view parameters are changed. A plot of the shaded view can be made using the dump option on the view.

Selecting shade fires up the **shade view** panel:



The fields and buttons used in this panel have the functions.

Field Description	Type	Defaults	Pop-Up
View <i>view to set shade parameters for.</i>	input/output	current view	available views
Shade tins <i>if tick, draw all the tins on the perspective view in shade mode.</i>	tick-cross		
Angle <i>angle of the sun (measured from the horizon).</i>	input	45	
Set <i>record and redraw the view using the current parameters.</i>	button		

Shade

Position of option on menu: Perspective View Menu View =>Settings =>Shade

This is exactly the same option as the shade described in the previous section "Shade" .

Eye/Target

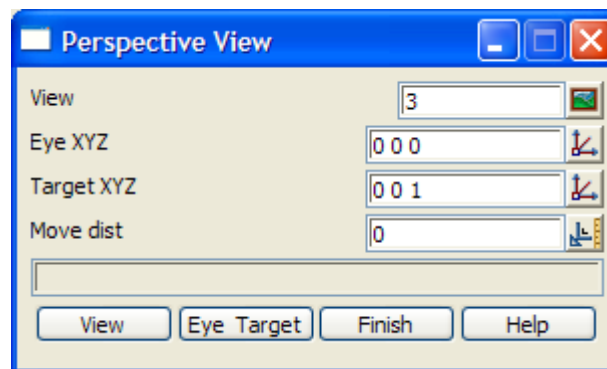
perspective_view

Position of option on menu: Perspective View Menu View =>Eye/Target

The Eye/Target option displays the current eye and target co-ordinates and also allows the user to specify new eye and target points. The points can be chosen from any plan view using the cursor or by typed-input.

The view is projected onto a focal plane using a perspective transformation, and clipped using front and back clipping planes. The focal distance and the front and back clipping plane distances are set and modified in the planes option.

Selecting new view fires up the **perspective view** panel.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
View <i>view to set perspective parameters for.</i>	input/output	current view	available views
Eye X Y Z <i>co-ordinates of the eye viewing point. New values can be typed, or a point selected using the xyz ops pop-up menu.</i>	input/output	current eye position	xyz ops menu
Target X Y Z <i>co-ordinates of the target viewing point. New values can be typed, or a point selected using the xyz ops pop-up menu.</i>	input/output	current target position	xyz ops menu
Move dist <i>distance to move the eye point along the eye-target line in the direction of the target point. The target point is also moved the same distance along the eye-target line so that the eye-target distance is kept constant.</i>	input/output		
View	button		
<i>define the perspective parameters according to the information in the panel. If the move distance is non-zero, then the eye and target points are both moved along the eye-target line by the distance given in the Move field. In this case, the new eye and target positions will be written to the eye and target fields.</i>			
Eye & Target	button		
<i>allows the user to define the (x, y) position of the eye and target points using the cursor and views.</i>			
<i>After selection the button, the user is asked to select the eye position from a view by clicking LB in a view. A level input box is then displayed on the screen for the user to enter the level (z value) for the eye point. The level is recorded and the level box removed after a <enter> is entered in the level input box.</i>			
<i>The user is then asked to select the target point from any view by clicking LB at the position of the</i>			

target point. A level input box is then displayed for the user to enter the level (z value) for the target point.

After the target point is defined, the view is redrawn using the new eye and target positions.

How to Use the Panel and Panel Messages

- (a) The eye and target points are set by using typed-input, the xyz ops pop-up menu in either the eye XYZ or target XYZ fields, or the **eye & target** button.

When the **view** button is selected, the perspective viewing parameters are calculated according to the information in the panel. If a non-zero move distance is given, the eye and target points are both moved along the eye-target line through the move distance. The new values for the eye and target points are written into the panel. If no errors are detected in calculating the new viewing parameter, the view is redrawn using the new parameters.

Joy

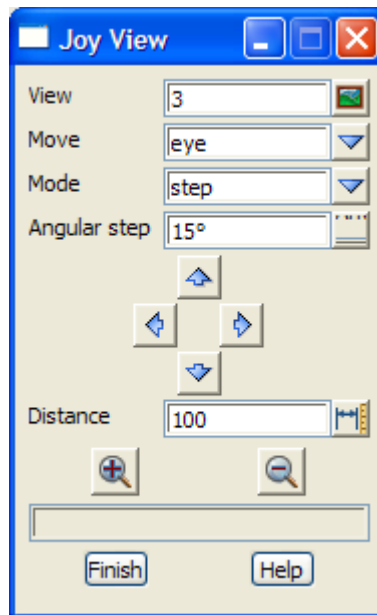
joy_view

Position of option on menu: Perspective View Menu View =>Joy

The hardest thing in a perspective view is finding a good viewing position. The joy option makes it easy to construct a new perspective viewing position relative to the existing position.

The panel can be used to move the eye or target point by rotating them through a given angle to the left, right, up or down, or to move one towards or away from the other. It is also possible to move the eye and target points keeping the distance between them the same.

Selecting joy fires up the joy view panel.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
View <i>view to set joy parameters for.</i>	input/output	current view	available views
Move <i>move the eye point, the target point or both.</i>	input	eye	eye, target, eye & target
Mode <i>in step mode, the view is modified each time an appropriate button is picked. In continuous mode, after the view is redrawn, the picked joy option is continually re-applied until either a new joy button is picked, button LB is clicked anywhere else in the joy panel.</i>	input	step	step, continuous
Angular step <i>angle in degrees that is used with the joy buttons up, down, left and right when moving just the eye or target point.</i>	input	45	
Distance <i>distance used to move the eye or target point.</i>	input	100	

Joy buttons up,down,left,right,in,out

The joy buttons are used to modify the perspective parameters and then redraw the view with the new parameters.

The effect of each joy button depends on whether the move field is set to eye, target or eye & target.

move **field set to eye**

up/down button

rotate the eye-target line about the target point up/down by the angle given in the angle step field. That is, the eye point is moved upwards/downwards, the target point kept fixed.

left/right button

rotate the eye-target line about the target point to the left/right by the angle given in the angle step field. The target point kept fixed.

in/out button

move the eye point towards/away the target point along the eye-target line by the distance given in the distance field. The target point kept fixed.

move **field set to target**

similar to the movements when the move field is set to eye except the eye point is kept fixed and the target point is moved.

move **field set to eye & target**

up/down/left/right button

the eye and target points are both moved up/down/left/right by the distance given in the distance field. That is, the entire eye-target line is moved up/down/left/right and neither the eye or target point is kept fixed.

in/out button

move the eye and target points along the eye-target line by the distance given in the distance field. The direction is towards/away the target point.

How to Use the Panel

- (a) The move, mode, angular step and distance field are given the desired values and then one of the joy buttons (up, down, left, right, in or out) is selected. The perspective view is then redrawn
- (b) If the mode is set to continuous, once drawing is completed, the selected joy option will be re-applied. This sequence is repeated until either a new joy button is picked, button LB is clicked anywhere else in the joy panel or a c key is typed.

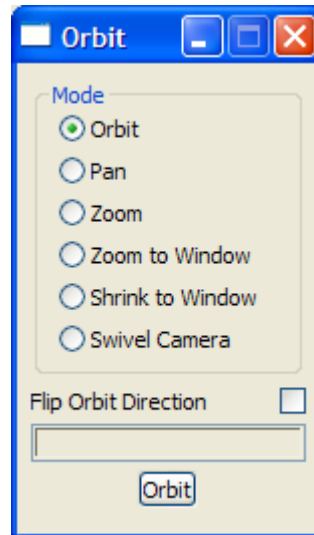
Orbit

joy

Position of option on menu: Perspective View Menu View =>Orbit

The orbit option quickly rotates the data around in the perspective view.

Selecting Orbit fires up the **Orbit** panel.



To use Orbit:

Orbit radio button on: Flip orbit direction radio button off:

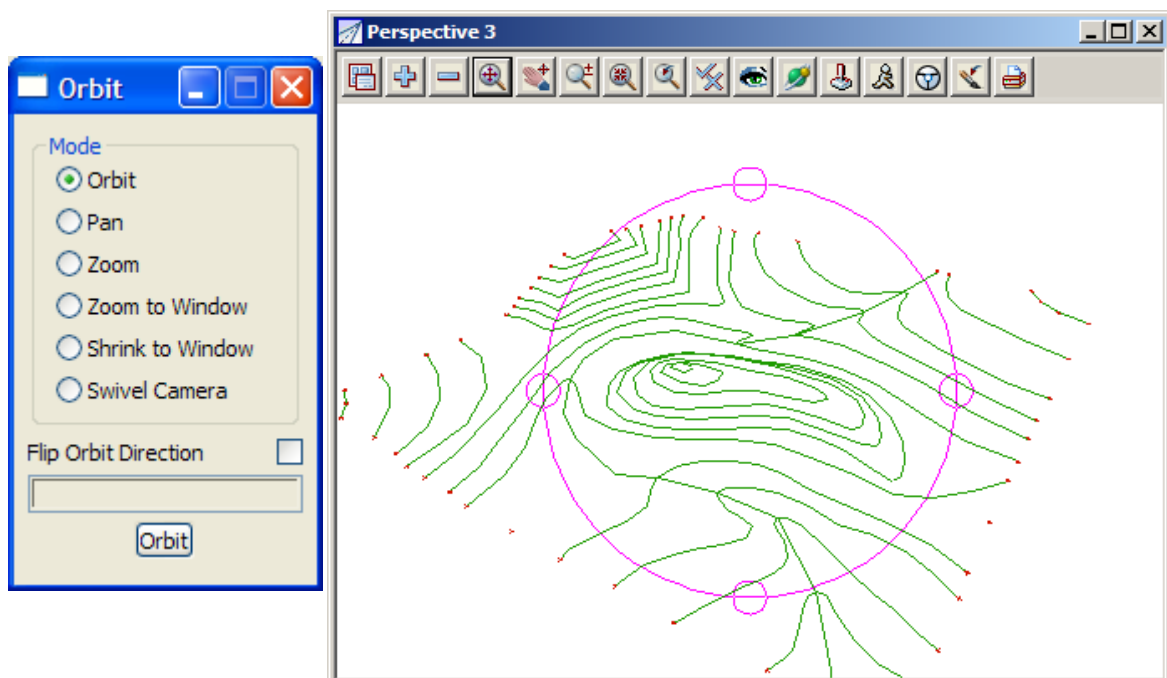
when the left button is clicked in the perspective view, the orbit circle appears and

*holding LB down and **moving up** in the orbit circle tilts the **object up***

*holding LB down and **moving down** in the orbit circle tilts the **object down***

*holding LB down and **moving left** rotates the **object to the left***

*holding LB down and **moving right** rotates the **object to the right***



Orbit radio button on: Flip orbit direction radio button on:the movement is reversed

Pan radio button on:

*holding LB down and **moving up** in the view **raises the object**
holding LB down and **moving down** in the view **lowers the object**
holding LB down and **moving left** in the view **pans the object to the left**
holding LB down and **moving right** in the view **pans the object to the right***

Zoom radio button on:

*holding LB down and **moving up** in the view **zooms into the object**
holding LB down and **moving down** in the view **zooms out from the object***

Zoom to window radio button on:

when a zoom box is drawn on the view, the perspective is modified so that the contents of the zoom box fill the entire view.

Shrink to window radio button on:

when a zoom box is drawn on the view, the perspective is modified so that the contents of the window are shrunk to fit into the zoom box.

Swivel camera radio button on:

holding LB down moves the target point.

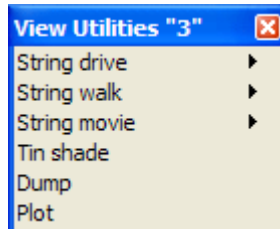
Perspective Utilities

perspective_view_utilities_menu

Position of option on menu: Perspective View Menu View => Utilities

The utilities menu contains miscellaneous options involving the perspective view.

The **utilities** walk-right menu is



For the option *String drive*, go to the section

String walk

String movie

Tin shade

Dump

Plot

"String Drive" .

"String Walk" .

"String Movie" .

"Tin Shade" .

"Dump" .

"Perspective Plot" .

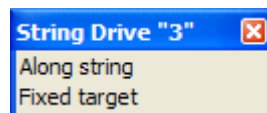
String Drive

perspective_view_drive_menu

Position of menu: Perspective View Menu View => Utilities =>String drive

The string drive option makes it easy to construct the perspective view one gets when moving along a string (for example, driving along a road centre line).

The two options on the **string drive** walk-right menu are



and they specify the positioning of eye and target points by:

along string - the eye and target points are automatically moved along the selected string

fixed target - the eye point automatically moves along the selected string but the target point is a selected fixed point.

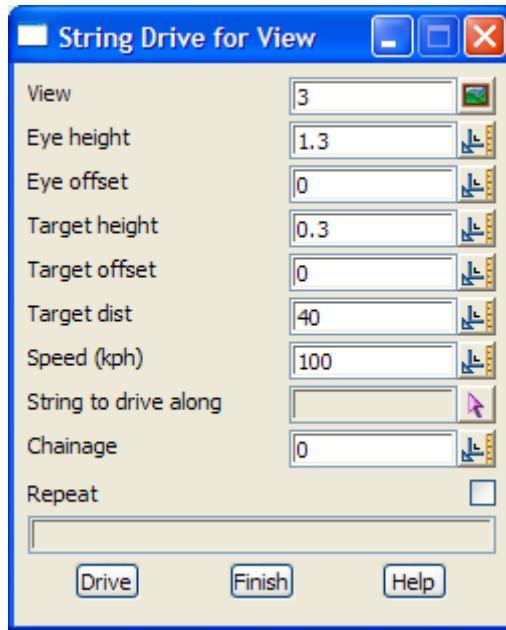
Note - the string drive option can be aborted by pressing the <esc> key or clicking RB.

String Drive - Along String

string_drive_for_view

Position of option on menu: Perspective View Menu View => Utilities =>String drive =>Along string

Selecting along string fires up the **string drive for view** panel.



For **string drive along a string**, a selected string is used to provide the (x, y, z) positions for the eye and target points.

The z-values can be adjusted by typing in a non-zero value for the eye and target heights in the **string drive** panel. These heights are relative to the z-values of the points on the string and are **added** to the z-values.

Like the new view option, the view is projected onto a focal plane and “clipped” using front and back clipping planes.

The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
View <i>view to set drive parameters for.</i>	input/output	current view	available views
Eye height <i>height of the eye viewing point above the picked string</i>	input	1.3	
Eye offset <i>offset of the eye viewing point from the picked string</i>	input	0	
Target height <i>height of the target viewing point above the picked string</i>	input	0.3	
Target offset <i>offset of the target viewing point from the picked string</i>	input	0	
Target distance <i>distance (in string chainage) from the eye point to the target point.</i>	input	40	
Speed (kph) <i>speed in kilometres per hour (that is, one thousand base units per hour) that the eye-target points move along the string.</i>	input	100	
String to drive along <i>a string to drive along is selected from any view. The string must have z-values.</i>	string select		

Chainage input/output 0

*the chainage that the eye point is at on the string. The chainage is updated as the eye and target points are automatically moved along the string. The drive can be set to start at a specific start chainage by simply entering the start chainage into the chainage field and then selecting the **drive** button.*

Repeat tick box

*if **tick**, the drive starts again at the beginning of the string.*

Drive button

*When the **drive** button is selected, the eye and target points are placed above the string as specified in the panel fields, and the view redrawn. The eye and target points are then moved along the string at the given speed until either reaches the end of the string. The chainage of the eye point is continually updated.*

Notes

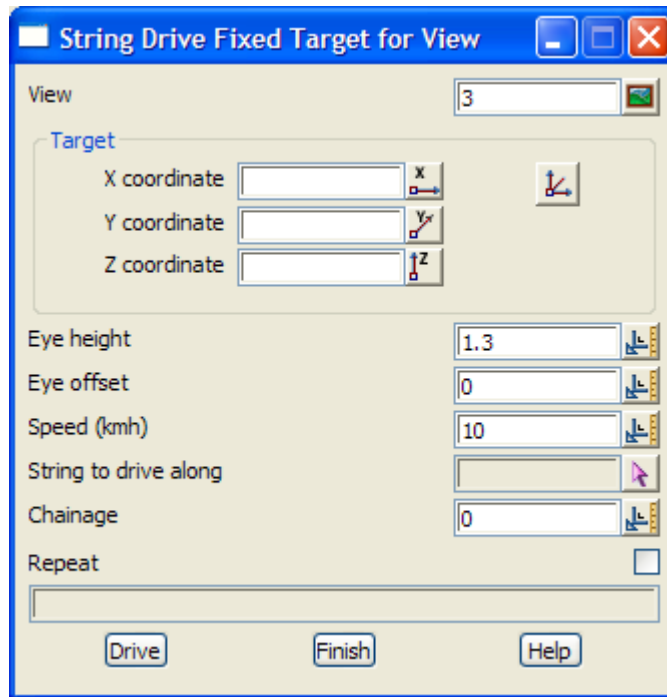
- ▲ the target distance and speed can be positive or negative.
- ▲ the eye and target points are shown on any view displaying the string being driven along. The eye point is drawn as a red cross, the target point, a green cross.
- ▲ if the front distance for the clipping plane of the perspective view is set to zero by the user, it is automatically reset to 2 so that the red cross drawn at the eye point is not visible in the perspective view.

String Drive - Fixed Target

string_drive_fixed_target_for_view

Position of option on menu: Perspective View Menu View => Utilities =>String drive =>Fixed target

Selecting fixed target fires up the **string drive fixed target for view** panel.



For **string drive fixed target**, a selected string is used to provide the (x, y, z) positions for the eye point, and the target is a selected fixed point. The z-value for the eye is adjusted by adding to it the eye height in the eye height field in the **string drive fixed target** panel.

The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
View <i>view to set drive parameters for.</i>	input/output	current view	available views
Target <i>a fixed target point is selected from any view. The point's co-ordinates are displayed in the X, Y, Z coordinates panel fields.</i>	xyz box		
Eye height <i>height of the eye viewing point above the picked string</i>	input	1.3	
Eye offset <i>offset of the eye viewing point from the picked string</i>	input	0	
Speed (kph) <i>speed in kilometres per hour (that is, in one thousand of the base units per hour that the eye point moves along the string).</i>	input	100	
String to drive along <i>a string to drive along is selected from any view. The string must have z-values.</i>	string select		
Chainage <i>the chainage that the eye point is at on the string. The chainage is updated as the eye point</i>	input/output	0	

automatically moves along the string. The drive can be set to start at a specific start chainage by simply entering the start chainage into the chainage field and then selecting the **drive** button.

Target button

a fixed target point is selected from any view. The point's co-ordinates are displayed in the target panel field.

Repeat tick box

if **tick**, the drive starts again at the beginning of the string.

Drive button

When the **drive** button is selected, the eye point is placed above the string at the chainage given in the chainage field, and the view redrawn. The eye point is then moved along the string at the given speed until it reaches the end of the string. The chainage of the eye point is continually updated.

Notes

- ▲ the speed can be positive or negative.
- ▲ the eye point is shown on any view displaying the string being driven along. The eye point is drawn as a red cross, the target point, a green cross.
- ▲ if the front distance for the clipping plane of the perspective view is set to zero by the user, it is automatically reset to 2 so that the red cross drawn at the eye point is not visible in the perspective view

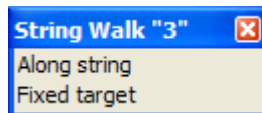
String Walk

[perspective_view_walk_menu](#)

Position of menu: Perspective View Menu View => Utilities =>String walk

The *string walk* option makes it easy to construct the perspective view one gets when walking along a string (for example, walking along a road centre line).

The two options on the **string walk** walk-right menu are



and they specify the positioning of eye and target points by:

along string - the eye and target points are automatically moved along the selected string

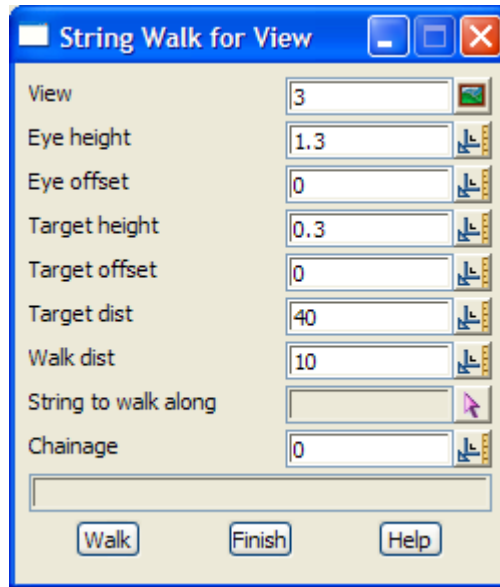
fixed target - the eye point automatically moves along the selected string but the target point is a selected fixed point.

String Walk - Along String

[string_walk_for_view](#)

Position of option on menu: Perspective View Menu View => Utilities =>String walk =>Along string

Selecting **along string** fires up the **string walk for view** panel



For **string walk along a string**, a selected string is used to provide the (x, y, z) positions for the eye and target points.

The z-values can be adjusted by typing in a non-zero value for the eye and target heights in the **string walk** panel. These heights are relative to the z-values of the points on the string and are **added** to the z-values.

Like the new view option, the view is projected onto a focal plane and “clipped” using front and back clipping planes.

The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
View <i>view to set walk parameters for.</i>	input/output	current view	available views
Eye height <i>height of the eye viewing point above the picked string</i>	input	1.3	
Eye offset <i>offset of the eye viewing point from the picked string</i>	input	0	
Target height <i>height of the target viewing point above the picked string</i>	input	0.3	
Target offset <i>offset of the target viewing point from the picked string</i>	input	0	
Target distance <i>distance (in string chainage) from the eye point to the target point.</i>	input	40	
String to walk along <i>a string to walk along is selected from any view. The string must have z-values.</i>	string select		
Walk dist <i>distance to move the eye point along string from the previous eye point chainage. The target point is also moved the same distance along the eye-target line so that the eye-target distance is kept constant.</i>	input	10	

Chainage input/output 0

the chainage that the eye point is at on the string. The chainage is updated whenever the walk button is activated. The eye point can be set to a specific chainage by simply entering the chainage into the chainage field and selecting the walk button.

Walk button

the perspective parameters are defined according to the information in the panel. The first time the walk button is selected, the eye point is placed above the string at the chainage given in the chainage field. For subsequent selections of the walk button, the eye and target points are moved along the eye-target line by the chainage distance given in the walk dist field.

The view is redrawn with the new view parameters and the new eye-chainage displayed in the panel message area and the chainage field.

Notes

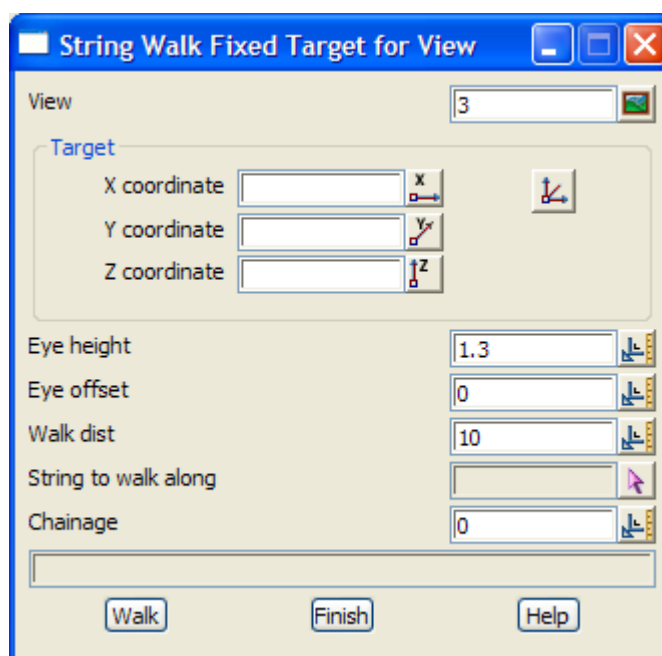
- ▲ the target and move distances can be positive or negative.
- ▲ the eye and target points are shown on any view displaying the string being walked along. The eye point is drawn as a red cross, the target point, a green cross.
- ▲ if the front distance for the clipping plane of the perspective view is set to zero by the user, it is automatically reset to 2 so that the red cross drawn at the eye point is not visible in the perspective view.

String Walk - Fixed Target

[string_walk_fixed_target_for_view](#)

Position of option on menu: Perspective View Menu View => Utilities =>String walk =>Fixed target

Selecting fixed target fires up the **string walk fixed target for view** panel.



For **string walk fixed target**, a selected string is used to provide the (x, y, z) positions for the eye point, and the target is a selected fixed point. The z-value for the eye is adjusted by adding to it the eye height in the eye height field in the **string walk fixed target** panel.

The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
View <i>view to set walk parameters for.</i>	input/output	current view	available views
Target <i>a fixed target point is selected from any view. The point's co-ordinates are displayed in the X, Y, Z coordinates panel fields.</i>	xyz box		
Eye height <i>height of the eye viewing point above the picked string</i>	input	1.3	
Eye offset <i>offset of the eye viewing point from the picked string</i>	input	0	
Walk dist <i>distance to move the eye point along string from the previous eye point chainage.</i>	input	10	
String to walk along <i>a string to walk along is selected from any view. The string must have z-values.</i>	string select		
Chainage <i>the chainage that the eye point is at on the string. The chainage is updated as the eye point automatically moves along the string. The walk can be set to start at a specific start chainage by simply entering the start chainage into the chainage field and then selecting the walk button.</i>	input/output	0	
Walk <i>the perspective parameters are defined according to the information in the panel. The first time the walk button is selected, the eye point is placed above the string at the chainage given in the chainage field. For subsequent selections of the walk button, the eye point is moved along the string by the chainage distance given in the walk dist field.</i> <i>The view is redrawn with the new view parameters and the new eye-chainage displayed in the panel message area and the chainage field.</i>	button		

Notes

- ▲ the walk distance can be positive or negative.
- ▲ the eye point is shown on any view displaying the string being walked along. The eye point is drawn as a red cross, the target point, a green cross.
- ▲ if the front distance for the clipping plane of the perspective view is set to zero by the user, it is automatically reset to 2 so that the red cross drawn at the eye point is not visible in the perspective view

String Movie

`perspective_view_movie_menu`

Position of menu: Perspective View Menu View => Utilities =>String movie

The string movie option makes it easy to construct and save to disk the sequence of perspective views one gets when walking along a string (for example, walking along a road centre line).

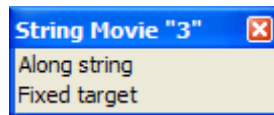
The screen images are automatically written out to disk in gif format so that they can be replayed at a later time.

This is especially useful when it takes a while to construct each view, for example, when hidden line is turned on.

Under NT/95, the screen images are written to an **avi** file.

Under Unix, the screen images are written to a **gif** file and there can be up to 99,999 of them in the one movie.

The two options on the **string movie** walk-right menu are



and they specify the positioning of eye and target points by:

along string - the eye and target points are automatically moved along the selected string

fixed target - the eye point automatically moves along the selected string but the target point is a fixed selected point.

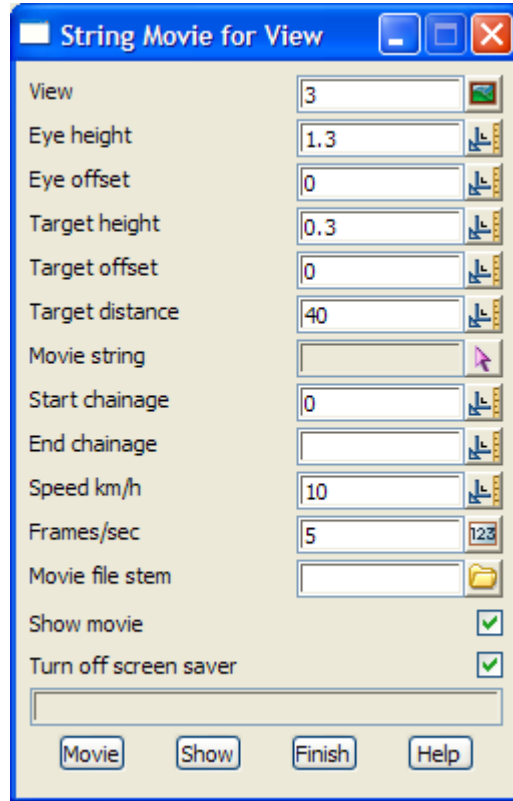
Note - the string movie option can be aborted by pressing the <esc> key or clicking RB.

String Movie - Along String

`string_movie_for_view`

Position of option on menu: Perspective View Menu View => Utilities =>String movie =>Along string

Selecting **along string** fires up the **string movie for view** panel



For **string movie along a string**, a selected string is used to provide the (x, y, z) positions for the eye and target points.

The z-values can be adjusted by typing in a non-zero value for the eye and target heights in the **string movie** panel. These heights are relative to the z-values of the points on the string and are **added** to the z-values.

Like the new view option, the view is projected onto a focal plane and “clipped” using front and back clipping planes

The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
View <i>view to set movie parameters for.</i>	input/output	current view	available views
Eye height <i>height of the eye viewing point above the picked string</i>	input	1.3	
Eye offset <i>offset of the eye viewing point from the picked string</i>	input	0	
Target height <i>height of the target viewing point above the picked string</i>	input	0.3	
Target offset <i>offset of the target viewing point from the picked string</i>	input	0	
Target distance <i>distance (in string chainage) from the eye point to the target point.</i>	input	40	
Movie string <i>a string to drive along is selected from any view. The string must have z-values.</i>	string select		

Start chainage	input/output	0
<i>the chainage that the eye point starts on the string for the movie.</i>		
End chainage	input/output	0
<i>the chainage to stop the movie at.</i>		
Speed (kph)	input	10
<i>speed in kilometres per hour (that is, one thousand base units per hour) that the eye-target points move along the string.</i>		
Frames/sec)	input	5
<i>number of frames per second to produce for the movie.</i>		
Movie file stem	input	4d-
<i>each frame of the drive in the view is written to disk in avi format using the movie file stem plus the ending .avi as the file name.</i>		
Show movie	tick box	tick
<i>if tick, after all the views along the string are written to disk, a new window, the same size as the perspective view, will be created and movie then run.</i>		
Turn off screen saver	tick box	tick
<i>if tick, the screen saver is disabled so it doesn't come on whilst creating the movie.</i>		
Movie	button	
<i>the perspective parameters are defined according to the information in the panel. When the movie button is selected, the eye point is placed above the string at the chainage given in the chainage field. The view is drawn with these view parameters. After that view is processed and written to disk, the eye and target points are moved along the eye-target line and frames written out to simulate the given speed.</i>		
Show	button	
<i>This button is used to display a previously created movie. If selected, the movie created with the stem given in the movie file stem field is displayed. If Unix, there is a pause between each frame by the number of seconds given in the delay field.</i>		

Displaying the Movie

If a movie has just been created and the show movie field is set to tick, or an existing movie name is given in the movie file stem field and the **show** button is selected, then a new window will be created and the movie will be displayed frame by frame. Outside of 12d Model, the movie can be displayed by simply double clicking on the **avi** file.

Notes

- ▲ the target and move distances can be positive or negative.
- ▲ the eye and target points are shown on any view displaying the string being walked along. The eye point is drawn as a red cross, the target point, a green cross.
- ▲ if the front distance for the clipping plane of the perspective view is set to zero by the user, it is automatically reset to 2 so that the red cross drawn at the eye point is not visible in the perspective view.
- ▲ the movie can also be displayed from outside 12d Model by simply double clicking on the avi file

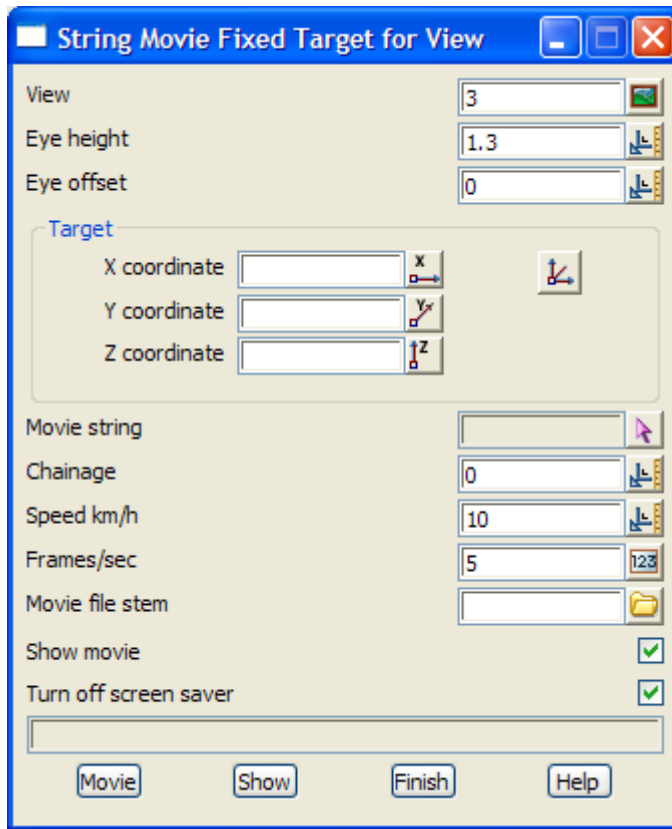
movie-file-stem.avi

String Movie - Fixed Target

`string_movie_fixed_target_for_view`

Position of option on menu: Perspective View Menu View => Utilities =>String movie =>Fixed target

Selecting fixed target fires up the **string movie fixed target for view** panel.



For **string movie fixed target**, a selected string is used to provide the (x, y, z) positions for the eye point, and the target is a selected fixed point. The z-value for the eye is adjusted by adding to it the eye height in the eye height field in the **string movie fixed target** panel.

The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
View	input/output	current view	available views

view to set movie parameters for.

Eye height	input	1.3	
-------------------	-------	-----	--

height of the eye viewing point above the picked string

Eye offset	input	0	
-------------------	-------	---	--

offset of the eye viewing point from the picked string

Target	xyz box		
---------------	---------	--	--

a fixed target point is selected from any view. The point's co-ordinates are displayed in the X, Y, Z coordinates panel fields.

Movie string	string select		
---------------------	---------------	--	--

a string to drive along is selected from any view. The string must have z-values.

Chainage	input/output	0	
-----------------	--------------	---	--

the chainage that the eye point starts on the string for the movie.

Speed (kph)	input	10
<i>speed in kilometres per hour (that is, one thousand base units per hour) that the eye-target points move along the string.</i>		
Frames/sec)	input	5
<i>number of frames per second to produce for the movie.</i>		
Movie file stem	input	4d-
<i>each frame of the drive in the view is written to disk in avi format using the movie file stem plus the ending .avi as the file name.</i>		
Show movie	tick box	tick
<i>if tick, after all the views along the string are written to disk, the movie is then run.</i>		
Turn off screen saver	tick box	tick
<i>if tick, the screen saver is disabled so it doesn't come on whilst creating the movie.</i>		
Movie	button	
<i>the perspective parameters are defined according to the information in the panel. When the movie button is selected, the eye point is placed above the string at the chainage given in the chainage field. The view is drawn with these view parameters. After that view is processed and written to disk, the eye and target points are moved along the eye-target line by the chainage distance given in the step distance field and the new view drawn and processed.</i>		
<i>This sequence is repeated until the end of the string is reached or the c key is pressed.</i>		
Show	button	
<i>This button is used to display a previously created movie. If selected, the movie created with the stem given in the movie file stem field is displayed. If Unix, there is a pause between each frame by the number of seconds given in the delay field.</i>		

Tin Shade

tin_shade_view

Position of option on menu: Perspective View Menu View => Utilities => Tin shade

In **12d** Model, a landscape is represented by a triangulated surface - a tin. Each triangle in the tin is a part of a plane and has its own colour.

In a perspective view, each triangle can be drawn with a colour that is modified depending on the angle that the triangle makes with the sun (a point light source at infinity). This is called a **flat shade**.

If the triangles are drawn in a back to front order, then when the shaded landscape is drawn, any triangles in the foreground obscure triangles in the background and it looks like a hidden view.

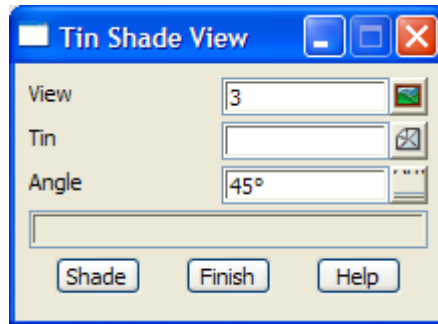
If shade is set for a view, all the triangles in all the tins on the view are drawn as shaded triangles and the triangles are drawn in a back to front order.

Once the shade is set on, a shade will be done on the view whenever the view parameters are changed. A plot of the shaded view can be made using the dump option on the view.

The tin shade option draws the selected tin over the perspective view as a shade. The selected tin does not have to be on the view for the shade to function.

When the view is refreshed, the shade is lost (the shade option under settings is used for setting a shade permanently on). A plot of the shaded view can be made using the dump option on the view.

Selecting tin shade option fires up the **tin shade view** panel.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
View <i>view to set shade parameters for.</i>	input/output	current view	available views
Tin <i>name of the tin to be used for the shade.</i>	input		available tins
Angle <i>angle of the sun.</i>	input	45	
Shade <i>draw the given tin on the view as a shaded tin.</i>	button		

Dump

Position of option on menu: Perspective View Menu View => Utilities =>Dump

This option is used to write the view image out to disk in a user selected format. It is the same as the dump option for a plan view.

Perspective Plot

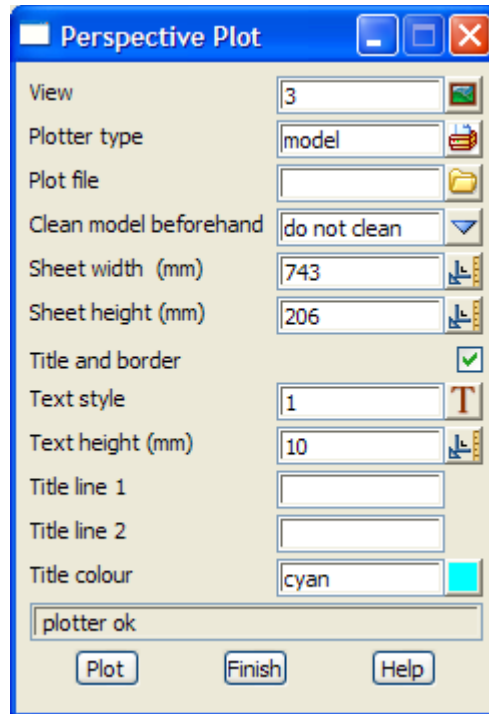
perspective_plot

Position of option on menu: Perspective View Menu View => Utilities =>Perspective plot

The plot option is used to make a plot file of all the information displayed in the perspective view.

The user simply gives a sheet width and height and 12d Model calculates the scaling factor required to best fit the plot of the view to the sheet.

After selecting the plot option, the **perspective plot** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
View <i>view to set perspective plot parameters for.</i>	input/output	current view	available views
Plotter type <i>file format for the plot information.</i>	input	hp	hp, dxf, postscript etc.
Plot file <i>stem of the name of the file to write the plot of the view to. The name ending is added automatically and depends on the plotter type.</i>	input	depends on plotter type	
Clean model beforehand <i>only applicable if plotting to a model. if always clean, the model is cleaned before the plot is created. If prompt for clean, the user is prompted that the model will be cleaned before the plot is created. If do not clean, the model is not cleaned before the plot is created.</i>	choice box		do not clean prompt for clean always clean
Sheet width/height (mm) <i>if a value is entered by the user and an <enter> given, the height/width required by the plot is calculated and displayed in the sheet height/width field. The units for sheet width and height are millimetres. If both Sheet width and height are given with no <enter>, then a scaling factor is calculated by 12d Model to best fit the plot of the view to a rectangle of size given by the sheet width and height.</i>	input		
Title and border <i>if tick, a border and two lines of title are placed on the bottom of the plot</i>	tick-cross		
Title line 1/2 <i>first/second line of title information</i>	input		

Title height (mm)	input	10	
	<i>height (in millimetres) to draw the two lines of title information</i>		
Title colour	input	cyan	available colours
	<i>colour used for the border and the title information</i>		
Plot	button		
	<i>write out the plot of the information displayed in the view to the file given in the plot file field. The format of the file is given by the plotter type</i>		

Section View Menu

section_view_menu

Position of menu: Section View Menu View

The section view is used to display string profiles and sections through tins and service items. The horizontal units are taken to be the **chainage** along a particular string called the **primary string** for the view. The z-values (heights) are the vertical units for the section. Hence, the section view is a (chainage, z-value) diagram with respect to the primary string on the view. The primary string's model and name is displayed in the view title area of the section view.

Since a tin represents a two dimension continuous surface, sectioning through a tin along a string appears as a continuous line string in a section view. For example, the natural surface on a road long-section is the section of the road centre-line through the natural surface tin.

When a corridor is set, any strings in models added to the section view (service items) will be drawn on the section view wherever they are inside the corridor.

A section view has a **vertical exaggeration** and whenever a string is profiled on the view, the vertical exaggeration is displayed inside square brackets after the view name in the view title area. For example [10x] is a vertical exaggeration of 10.

The section views menu is



For the option <i>Models</i> , go to the section	"Model Ops"
<i>Settings</i>	"Section View Settings"
<i>Redraw</i>	"Redraw"
<i>Fit</i>	"Fit"
<i>Previous</i>	"Previous"
<i>Pan</i>	"Pan"
<i>Profile</i>	"Profile"
<i>Regenerate</i>	"Regenerate" .
<i>Plotting</i>	"Section Plotting"
<i>Utilities</i>	"Section Utilities"
<i>Delete</i>	"Delete"

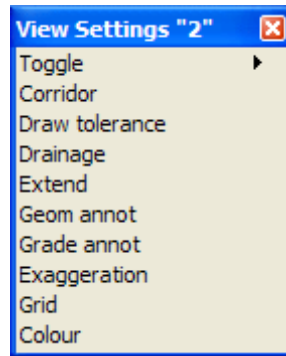
Section View Settings

section_view_settings_menu

Position of menu: Section View Menu View => Settings

If the settings option is picked rather than moving onto the walking right, then the toggle menu from the toggle walk-right menu is displayed on the screen. The toggle menu will be described in the next section.

The settings walk-right menu for the section view is



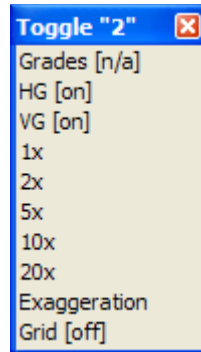
For the option <i>Toggle</i> go to the section	“Section Toggle”
<i>Corridor</i>	“Corridor”
<i>Draw tolerance</i>	“Draw Tolerance”
<i>Drainage</i>	“Drainage HGL”
<i>Extend</i>	“Extend”
<i>Grade annot</i>	“Grade Annotation”
<i>Exaggeration</i>	“Exaggeration”
<i>Grid</i>	“Grid”
<i>Colour</i>	“Colour”

Section Toggle

section_view_toggle_menu

Position of menu: Section View Menu View => Settings =>Toggle

The toggle walk right brings up the **toggle** section view menu.



Selecting any options from this menu will toggle the option on/off.

Corridor

section_corridor

Position of option on menu: Section View Menu View => Settings =>Corridor

The standard section view is designed to profile any selected string and create and display sections along the profiled string through any tins in any models added to the section view.

Hence the section view is like a vertical ribbon tracing out the path of the primary string.

The corridor option extends the ribbon to the left and right and projects any strings in any models added to the section view back onto the section view.

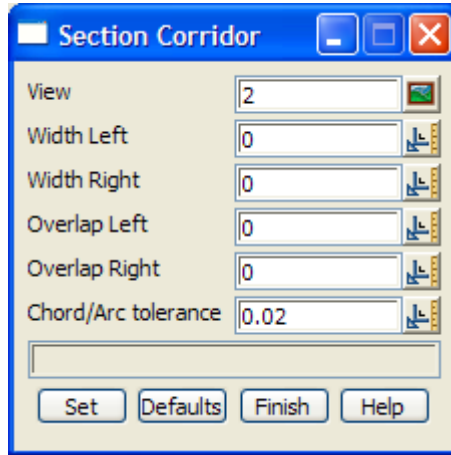
Consequently, the section view will display any strings or parts of strings that cross the corridor, run parallel to the primary string but stay within the corridor as well as displaying the standard sections through any tins in any models added to the section view.

The corridor is particularly useful for examining any **clashes** of strings with the primary string.

For example, services such as telephone cables, water and gas pipes and electricity cables could be modelled as 3d or pipe strings and added to the section view.

The section view with non-zero corridor widths would then display any of the services that lie within the corridor about the chosen primary string.

Selecting corridor fires up the **section corridor** panel.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	
View <i>view to set corridor parameters for.</i>	input/output	current view	available views
Width left/right <i>width of the corridor to the left/right of the primary string.</i>	input	0.01	
Overlap left/right <i>for each straight/arc in the primary string, extend the straight/arc to the left/right by the value of the overlap left/right field before drawing the straight/arc. Section through the extended string.</i>	input	0.01	
Chord/Arc tolerance <i>value of the chord to arc ratio to be used when approximating circles in alignments, arcs and pipeline strings.</i>	input	0.02	
Set <i>define the corridor parameters according to the information in the panel. The section view for the new corridor will then be calculated and displayed.</i>	button		
Defaults <i>reset the corridor settings to the default values.</i>	button		

Draw Tolerance

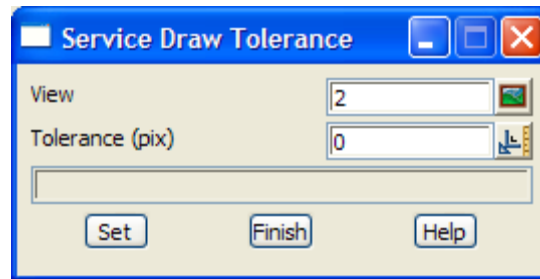
service_draw_tolerance

Position of option on menu: Section View Menu View => Settings => Draw tolerance

It is possible for the bits of services displayed on a section view to be very small and possibly too small to be easily seen. This is often the case for strings that are perpendicular to the corridor.

To overcome this visualization difficulty, a tolerance can be defined for the section view and when the size of any piece of a service is below the tolerance, it will be drawn as a cross.

Selecting draw tolerance fires up the **service draw tolerance** panel.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	
View <i>view to set service parameters for.</i>	input/output	current view	available views
Tolerance (pix) <i>if the size of any piece of a service is below this tolerance, it will be drawn as a cross.</i>	input	4	
Set <i>set the service draw tolerance.</i>	button		

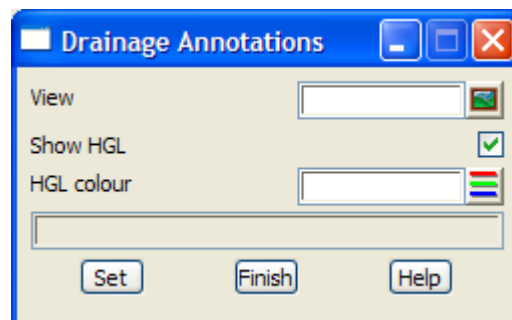
Drainage HGL

drainage_annotatons

Position of option on menu: Section View Menu View => Settings => Drainage annotations

If the data exists in the drainage string, the HGL line can be drawn when profiling a drainage string.

Selecting Drainage annotations fires up the **Drainage Annotations** panel.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	
View <i>view to set HGL parameters for.</i>	input/output	current view	available views
Show HGL <i>if tick then the HGL line is drawn for any drainage strings that are profiled (and have GHL data)</i>	tick box	tick	
HGL colour <i>colour to draw the HGL line</i>	colour box		available colours
Set <i>set the HGL drawing parameters</i>	button		

Extend

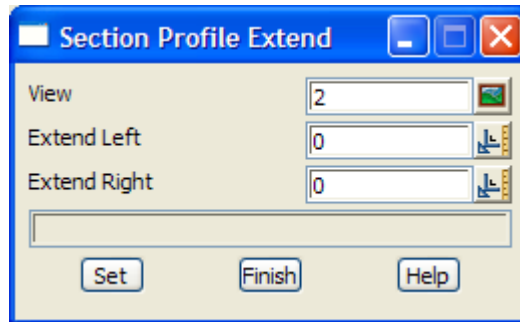
section_profile_extend

Position of option on menu: Section View Menu View => Settings =>Extend

When displaying the profile of a string on a section view, the user often wishes to see sections through the information before the string begins and after the string ends. This is particularly useful if it is intended to extend the string in either direction.

The extend option allows the user to extend the profile length.

Selecting extend fires up the **section profile extend** panel.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	
View <i>view to set extension parameters for.</i>	input/output	current view	available views
Extend left <i>pre-extend the profile by this distance before sectioning through any tins or models on the view.</i>	input	0	
Extend right <i>post-extend the profile by this distance before sectioning through any tins or models on the view.</i>	input	0	
Set <i>define the profile length according to the length of the primary string plus the two extend lengths. The section view for the new length will then be calculated and displayed.</i>	button		

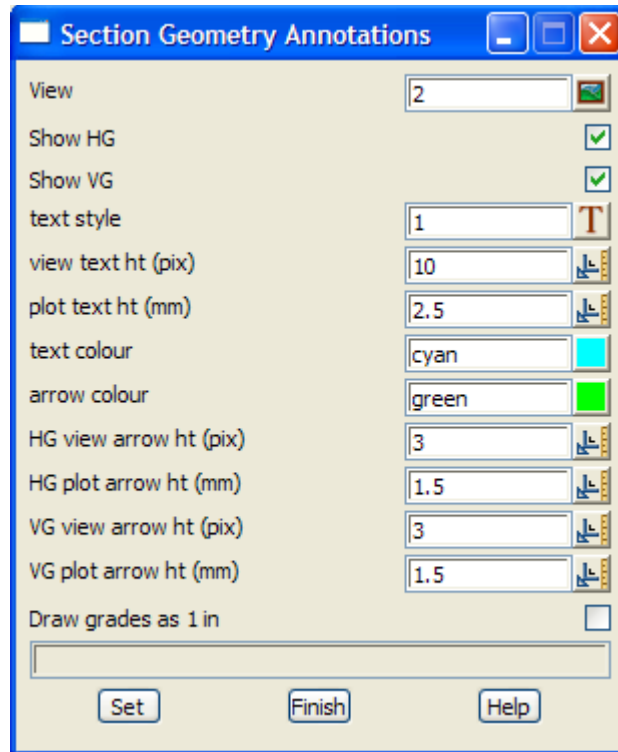
Geometry Annotation

section_geometry_annotations

Position of option on menu: Section View Menu View => Settings =>Geom annot

The geom annot option allows the user to specify whether horizontal geometry and/or vertical geometry is displayed for any alignment and pipeline strings profiled in the section view and hence on any section view plots.

Selecting geom annot fires up the **section geometry annotations** panel.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
View	input/output	current view	available views

view to set alignment geometry parameters for.

Show HG	tick-cross	tick	
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if tick, the value of the radii and spiral lengths for any horizontal curves selected as the primary string will be shown plus an arrow indicating the chainage extent of the radii.

If no tick, the horizontal geometry will not be displayed in the section view or on any plots of the section view.

Show VG	tick-cross	tick	
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if tick, the value of the curve length for any vertical curves selected as the primary string will be shown, plus an arrow indicating the chainage extent of the curve length. The percentage grades for any vertical straights will also be displayed with an arrow indicating the chainage extent of the vertical straight.

If no tick, the vertical curve lengths and percentage grades will not be displayed in the section view or on any plots of the section view.

Text style	input	1	
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text style to be used for all text in the geometry annotation.

View text ht (pix)	input	10	
---------------------------	-------	----	--

height (in pixels) to draw the geometry annotation values in the section view (the screen width is approximately 1000 pixels).

Plot text ht (mm)	input	10	
--------------------------	-------	----	--

height (in mm) to draw the geometry annotation values on any plots of the section view.

Text colour	input	cyan	available colours
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colour of the geometry annotation values drawn on the screen and any plots.

Arrow colour	input	green	available colours
<i>colour of the HG arrows drawn on the screen and any plots.</i>			
HG view arrow ht (pix)	input	3	
<i>height (in pixels) of the arrow head above the arrow line when drawing the HG arrows in the view.</i>			
HG plot arrow ht (mm)	input	1.5	
<i>height (in mm) of the arrow head above the arrow line when drawing the HG arrows on any plots of the section view.</i>			
VG view arrow ht (pix)	input	3	
<i>height (in pixels) of the arrow head above the arrow line when drawing the VG arrows in the view.</i>			
VG plot arrow ht (mm)	input	1.5	
<i>height (in mm) of the arrow head above the arrow line when drawing the VG arrows on any plots of the section view.</i>			
Draw grades as 1 in	tick box		
<i>if tick, grades are drawn as 1:in values. if not tick, grades as drawn as percent (%)</i>			
Set	button		
<i>set the section settings values to the values in the above panel fields. The section view is then redrawn using these values.</i>			

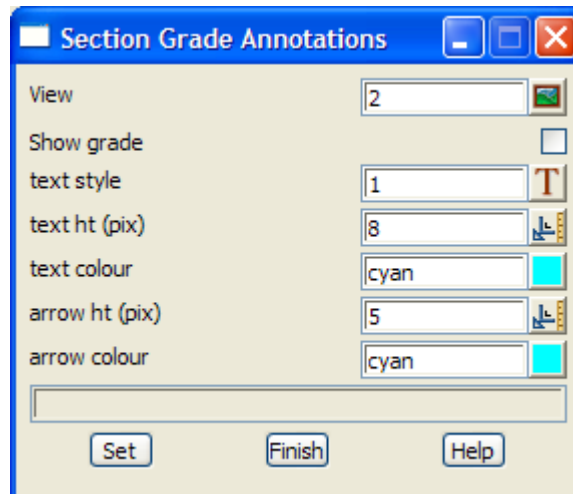
Grade Annotation

section_grade_annotations

Position of option on menu: Section View Menu View => Settings =>Grade annot

The grade annot option allows the user to specify whether the grades and plan widths of string links are displaced for strings profiled in the section view.

Selecting grade annot fires up the **section grade annotations** panel.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
View <i>view to set grade annotation parameters for.</i>	input/output	current view	available views
Show grade <i>if tick, the value of the grades (in percent grade) and plan widths of string links for any strings selected as the primary string will be shown plus an arrow indicating the chainage extent of the grade. If no tick, the grades and widths will not be displayed in the section view or on any plots of the section view.</i>	tick-cross	tick	
Text style <i>text style to be used for all text in the grade annotation.</i>	input	1	
Text ht (pix) <i>height (in pixels) to draw the grade annotation values in the section view (the screen width is approximately 1000 pixels).</i>	input	8	
Text colour <i>colour of the grade annotation values drawn on the screen and any plots.</i>	input	cyan	available colours
Arrow ht (pix) <i>height (in pixels) of the arrow head above the arrow line when drawing the arrows in the section view.</i>	input	3	
Arrow colour <i>colour of the arrows drawn on the screen.</i>	input	cyan	available colours
Set <i>set the section settings values to the values in the above panel fields. The section view is then redrawn using these values.</i>	button		

Exaggeration

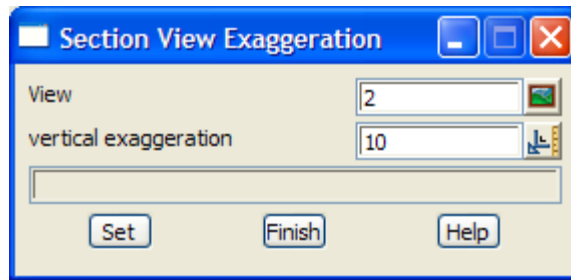
section_view_exaggeration

Position of option on menu: Section View Menu View =>Settings =>Exaggeration

The exaggeration option allows the user to specify the vertical exaggeration for the section view. The heights (z values) are multiplied by the vertical exaggeration value before drawing on the section view.

Whenever a string is profiled on the section view, the **vertical exaggeration** is displayed inside square brackets after the view name in the view title area. For example [10x] is a vertical exaggeration of 10.

Selecting exaggeration fires up the **section view exaggeration** panel.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
View <i>view to set exaggeration parameters for.</i>	input/output	current view	available views
Vertical exaggeration <i>value to multiply the heights (z values) by before drawing in the section view.</i>	input	10	1,5,10
Set	button		
<i>set the vertical exaggeration to the value in the vertical exaggeration field.</i>			

Profile

section_view_profile_menu

Position of menu: Section View Menu View => Profile

The profile option is used to display a long-section view of a selected string. That is, the coordinate system for the section view is defined in terms of the chosen string by

- (a) the chainage along the selected string defines the horizontal axis for the section view
- (b) the vertical axis is the z-axis (heights).

Hence a (chainage,height) diagram of the selected string is drawn in the section view. The scale is automatically chosen so that all of the selected string fits into the section view.

The string selected to be profiled is called the **primary string** for the section view.

The model and name of the primary string is displayed in the section view's title area (after the vertical exaggeration).

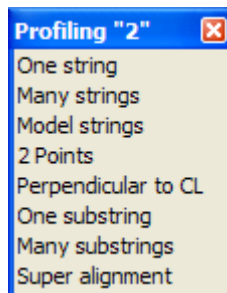
The primary string is drawn on the section view in the primary string's colour.

If the primary string is an alignment or pipeline string, the radii and chainage extent of any horizontal curves can be displayed in the section view plus any vertical curve lengths and percent-grades of vertical straights. For other strings, the grade and widths of each string link can be displayed.

For any tins in the models added to the section view, the section along the primary string through the tin will be calculated and drawn on the section view in the same colour as the tin colour. Any strings (service items) in models added to the section view, the parts of the strings in any corridor defined for the primary string will be calculated and drawn on the section view in the same colour as the strings.

Each time a new primary string is chosen with the profile option, the sections along the new primary string are calculated and displayed for all the tins and strings in the models added to the section view.

The profile walk-right menu is



The One string option allows one string to be profiled and then the option terminates.

The Many strings option profiles one string and then allows the user to select another string to be profiled without leaving the profile option. The many strings option is very useful when a number of strings need to be examined one after another in a section view.

The Model strings option profiles the strings from a given model, one at a time. For example, it is used to sequentially examine each cross-section down a road when all the cross-sections are stored in one model.

The 2 points option dynamically profiles between two selected points. The profile between the first selected point and the cursor position is dynamically recalculated as the cursor is moved around the view.

The Perpendicular to CL option dynamically profiles along a cross-section which is perpendicular to a selected string. The cross section profile is dynamically recalculated as the cursor is moved along the selected string.

The one substring and many substrings options are used to section along house connections and property controls for sewer and drainage strings.

For the option <i>One String</i> , go to the section	"One String"
<i>Many strings</i>	"Many Strings"
<i>Model strings</i>	"Model Strings"
<i>2 points</i>	"2 Points"
<i>Perpendicular to CL</i>	"Perpendicular to CL"
<i>One substring</i>	"One Substring"
<i>Many substrings</i>	"Many substrings"

One String

Position of option on menu: Section View Menu View =>Profile =>One string

After choosing the one string option, the user selects the string to be profiled. The option then terminates.

To cancel the option without selecting any string, click LB to bring up the pick ops menu and select **cancel**.

Many Strings

Position of option on menu: Section View Menu View =>Profile =>Many strings

The many strings option is designed for profiled a number of strings one after another.

After choosing the many strings option, a string is selected for profiling. After the string has been profiled, another string is selected for profiling.

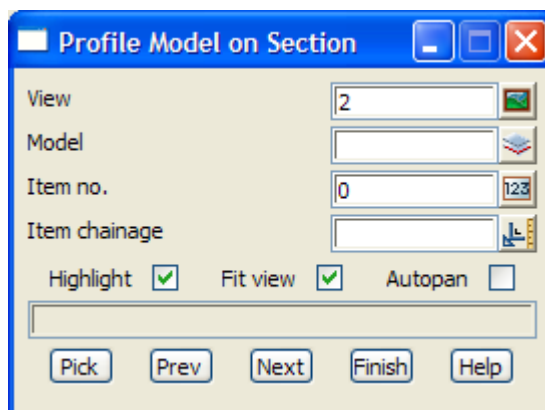
The option will keep profiling selected strings until the option is terminated by clicking LB to get the pick ops menu and selecting cancel.

Model Strings

[profile_model_on_section](#)

Position of option on menu: Section View Menu View =>Profile =>Model strings

After selecting the model strings option, the **Profile Model on Section** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
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View	input/output	current view	available views
	<i>view to set profile parameters for.</i>		
Model	input		available models
	<i>name of the model containing the strings to be profiled one at a time</i>		
Item no.	input/output		
	<i>number of the string in the model being profiled.</i>		
Item chainage	input/output		
	<i>chainage of the section string in the model being profiled. Also if a chainage is typed in followed by an <Enter> then the model will be searched for a X-section of that chainage and if it exists, it will be profiled.</i>		
Highlight	tick box	tick	
	<i>if tick, the string being profiled in the section view is locked and highlighted on any views where it is visible.</i>		
Fit view	tick box	tick	
	<i>if tick, the string being profiled is fitted to the section view. if no tick, the same scale is used for the next section being profiled.</i>		
Autopan	tick box		
	<i>if tick, then if the profiled string is not visible on any plan views that the model containing the string is on, then the plan view is modified so that the profiled string is in the centre of the plan view.</i>		
Pick	button		
	<i>after selecting the pick button, a string is selected. The string is automatically profiled and its model becomes the model being profiled and item no. is set to the string's number in the model.</i>		
Prev	button		
	<i>the previous string given by the item no. field is profiled and the item no. field decremented by one.</i>		
Next	button		
	<i>the next string given by the item no. field is profiled and the item no. field incremented by one.</i>		

How to Use the Panel

- Either a string is picked after selecting the **pick** button, or the name of the model containing the strings to be profiled is entered into the model field.
- The item no. field is initially set to the picked strings item no. or 0, but can be set to the number of any string in the model.
- When the **prev** or **next** button is selected, the string given by the number in the item no. field is decremented or incremented and the string given by the new item no. is profiled in the section view.

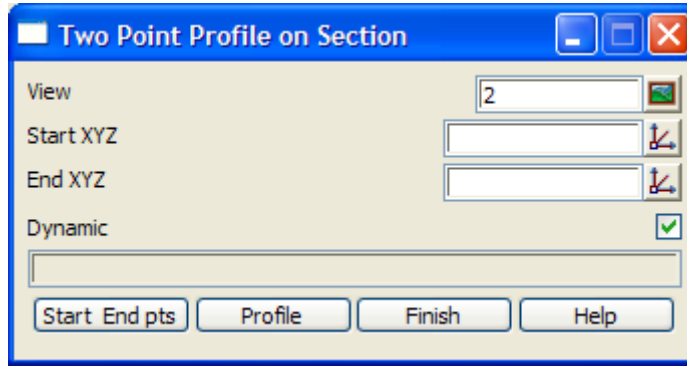
Hence with the model strings option, a number of strings in the one model can be profiled (one after another) by simply repeatedly selecting the **prev** or **next** buttons.

2 Points

two_point_profile_on_section

Position of option on menu: Section View Menu View =>Profile =>2 points

After selecting the 2 points option, the **two points profile on section** panel is displayed.



The fields and buttons used in this panel have the following functions.

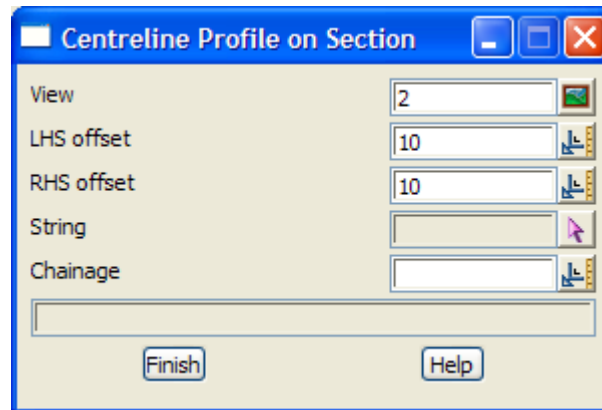
Field Description	Type	Defaults	Pop-Up
View <i>view to set profile parameters for.</i>	input/output	current view	available views
Start X Y Z <i>co-ordinates of the start section point. New values can be typed, or a point selected using the xyz ops pop-up menu.</i>	input/output		xyz ops menu
End X Y Z <i>co-ordinates of the end section point. New values can be typed, or a point selected using the xyz ops pop-up menu.</i>	input/output		xyz ops menu
Dynamic <i>if tick, the profile will be dynamically calculated between the first selected point and the cursor position.</i>	tick-cross	tick	
Start and End pts <i>after selecting the start and end pts button, the first point of the section to be profiled is selected and its value written to the start xyz field. If dynamic is set on, then a profile from the first point to the cursor position is automatically calculated as the cursor is moved around the view. Selecting the second points finalises the section and the co-ordinates of the final point is written to end xyz field.</i>	button		
Profile <i>after selecting the profile button, a section is calculated between the start xyz and end xyz points.</i>	button		

Perpendicular to CL

centreline_profile_on_section

Position of option on menu: Section View Menu View =>Profile =>Perpendicular to CL

After selecting the perpendicular to cl option, the **centreline profile on section** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
View	input/output	current view	available views

view to set profile parameters for.

LHS offset	input	10
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distance (in world units) to take the section to the left of the selected string.

RHS offset	input	10
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distance (in world units) to take the section to the right of the selected string.

String	string-select
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the selected string is used to specify the position where a cross-section is defined. Once the string is selected, then as the cursor is moved around in a view, its position will be dynamically be dropped perpendicularly onto the selected string, and a cross-section defined at right angle to the selected string. A profile along the cross-section will then be drawn in the section view. The cross-section profile will be dynamically modified as the cursor position is modified.

One Substring

Position of option on menu: Section View Menu View =>Profile =>One substring

As well as profiling strings, the one substring option can profile a house connection or property control (**substrings**) in a drainage or sewer string.

After the one substring option is chosen from the menu, the user selects a substring for profiling. After the string or substring has been profiled, the option terminates.

Many substrings

Position of option on menu: Section View Menu View =>Profile =>Many substrings

The many substrings option is designed for profiled a number of substrings, one after another.

After the many substring option is chosen, the user selects a substring for profiling. After the substring has been profiled, another string or substring can be chosen for profiling.

The option is terminated by clicking LB to get the pick ops menu and selecting cancel.

Regenerate

Position of option on menu: Section View Menu View =>Regenerate

The regenerate option is used to re-calculate and re-display the profile of the primary string of the section view.

This is necessary because modifications to the primary string or any strings or tins one the view may make the initial profile invalid. A regenerate is a quick method of bringing the profile up to date.

Section Plotting

section_view_plot_menu

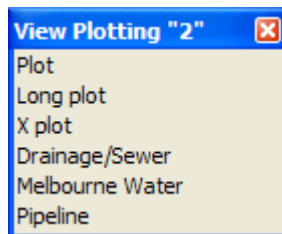
Position of menu: Section View Menu View =>Plotting

The plotting walk-right menu contains the options plot, long plot and X plot.

The plot option is used to make a plot file of all the information displayed in the section view.

The long plot option is used to make a traditional long section plot with string chainages and elevations displayed for each of the strings in the section view. The form of the long plot can be finely controlled by a file of plot parameters.

The X plot creates the traditional stacked x-section plots for each x-section string in a given model. The form of the x-plot can be finely controlled by a file of plot parameters.



For the option <i>Plot</i> , go to the section	"Section Plot"
<i>Long plot</i>	"Long Plot" in the chapter "Plots"
<i>X plot</i>	"X Plot" in the chapter "Plots"
<i>Drainage/Sewer</i>	"Drainage Longsections" in the chapter "Drainage and Sewer"
<i>Melbourne water</i>	"Melbourne Water" in the chapter "Drainage and Sewer"
<i>Pipeline</i>	"Plots" in the chapter "Pipeline"

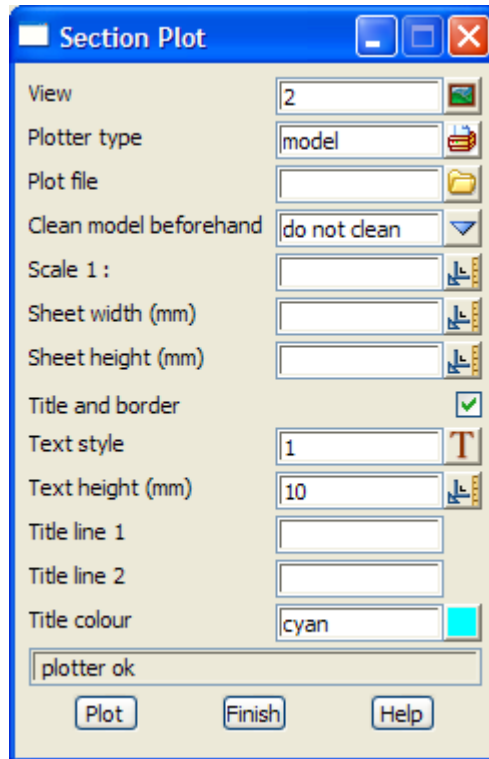
Section Plot

section_plot

Position of option on menu: Section View Menu View =>Plotting =>Plot

The plot option writes out all the information displayed in the section view to either a plot file (in a user selected format) or to a 12d Model model. The user selects a scale for the plot and the sheet width and height are calculated by 12d Model.

After selecting the plot option, the **section plot panel** is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
View <i>view to set plot parameters for.</i>	input/output	current view	available views
Plotter type <i>file format for the plot information.</i>	input	hp	hp, dxf, postscript etc.
Plot file <i>stem of the name of the file to write the plot of the view to. The name ending is added automatically and depends on the plotter type.</i>	input	depends on plotter type	
Clean model beforehand <i>only applicable if plotting to a model. if always clean, the model is cleaned before the plot is created. If prompt for clean, the user is prompted that the model will be cleaned before the plot is created. If do not clean, the model is not cleaned before the plot is created.</i>	choice box		do not clean prompt for clean always clean
Scale 1: <i>if a value is entered by the user and an <enter> given, the sheet width and height required by the plot are calculated and displayed in the sheet width and sheet height fields.</i>	input		
Sheet width (mm) <i>if a value is entered by the user and an <enter> given, the scale and height required by the plot are calculated and displayed in the scale and sheet height fields. The units for sheet width are millimetres.</i>	output		
Sheet height (mm) <i>if a value is entered by the user and an <enter> given, the scale and width required by the plot are</i>	output		

calculated and displayed in the scale and sheet width fields. The units for sheet height are **millimetres**

Title and border	tick-cross	tick	
	<i>if tick then a border and two lines of title are placed on the bottom of the plot</i>		
Text style	input	1	
	<i>text style for the title information</i>		
Text Height (mm)	input	10	
	<i>height (in millimetres) to draw the two lines of title information</i>		
Title line 1/2	input		
	<i>first/second line of title information</i>		
Title colour	input	cyan	available colours
	<i>colour used for the border and the title information</i>		
Plot	button		
	<i>write out the plot of the information displayed in the view to the file given in the plot file field. The format of the file is given by the plotter type</i>		

Long Plot

Position of option on menu: Section View Menu View =>Plotting =>Long plot

The option is for creating long section plots.

The Long plot option is documented in the section "Long Plot" in the chapter "Plots"

X Plot

Position of option on menu: Section View Menu View =>Plotting =>X plot

The x plot option is for creating x-section plots.

The option is documented in the section "X Plot" in the chapter "Plots"

Drainage/Sewer Plot

Position of option on menu: Section View Menu View =>Plotting =>Drainage/Sewer

The *Drainage/Sewer plot* option is used to make the long section plots for a drainage or sewer network.

This option is documented in the section "Drainage Longsections" of the chapter "Drainage and Sewer"

Melbourne Water Plot

Position of option on menu: Section View Menu View =>Plotting =>Melbourne Water

The *Melbourne Water plot* option is used to make the long section plots for a sewer network to Melbourne Water standards.

This option is documented in the section "Melbourne Water" of the chapter "Drainage and Sewer"

Pipeline Plot

Position of option on menu: Section View Menu View =>Plotting =>Pipeline

The *Pipeline plot* option is used to make the long section plots for a sewer network to Melbourne Water standards.

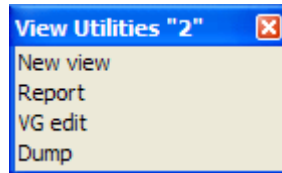
This option is documented in the section “Longsections” of the chapter “Pipeline”

Section Utilities

section_view_utilities_menu

Position on menu: Section View Menu View =>Utilities

The utilities menu contains miscellaneous options involving the section view. The **utilities** walk-right menu is



For the option <i>New view</i> , go to the section	“New View”
<i>Report</i>	“Report”
<i>VG edit</i>	“VG Edit”
<i>Dump</i>	“Dump”

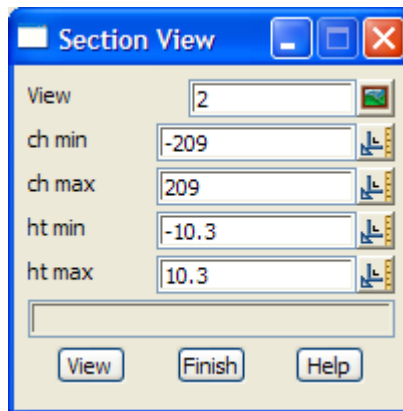
New View

section_view

Position of option on menu: Section View Menu View =>Utilities =>New view

The new view option displays the current minimum and maximum chainage and height values for the view, and permits the user to specify new values as the section’s viewing parameters.

Selecting New view fires up the **section view** panel.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults
View <i>view to set section parameters for.</i>	input/output	current view available views
chain min/max <i>minimum/maximum string chainage for the view. Chainage is used as the x-axis co-ordinates in a section view.</i>	input/output	current chainage min/max
Ht min/max <i>minimum/maximum height (z value) for the view. Height is used as the y-axis co-ordinates in a section</i>	input/output	current height min/max

view.

View button

define the section view parameters according to the information in the panel. If the box given by the chainage and height values in the panel is not the same shape as the view itself, the chainage and height values will be modified so that the chainage and height values match the view shape. The final chainage and height values are displayed in the panel.

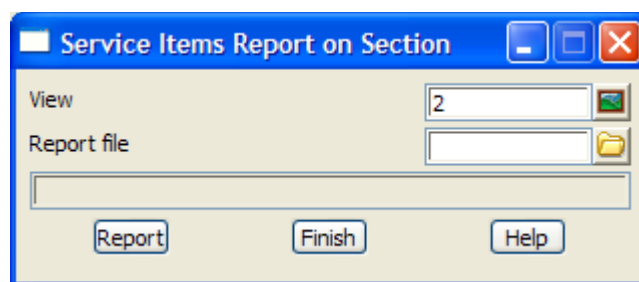
Report

service_items_report_on_section

Position of option on menu: Section View Menu View =>Utilities =>Report

This report option is for producing information on all the items displayed in the section view.

After selecting the report option, the **service items report on section view** panel is displayed



For the profiled string, this option generates a report which includes the

- ▲ section through any tins on the section view
- ▲ name and model of any services in the corridor defined by the section view
- ▲ co-ordinates and chainages of the parts of the service in the corridor, and the chainage and offset for each of the point of the parts projected onto the profiled string.
- ▲ clearance at the point where any service goes under or over the profiled string.

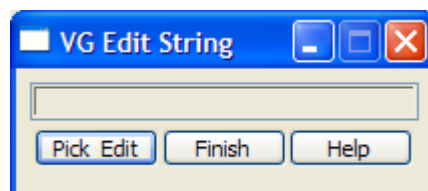
VG Edit

vg_edit_string

Position of option on menu: Section View Menu View =>Utilities =>VG Edit

The VG edit option is used to interactively create and modify the vertical geometry of a **12d** Model alignment string, or the vertical information of any string that can be edited in a section view (e.g. drainage string). Vertical geometry can only be created for an existing string.

After selecting the VG edit option, the **VG edit string** panel is placed on the screen.



The option is already in **pick** mode and the user simply picks and accepts the string whose vertical geometry is to be created and/or edited. The **pick & edit** button only needs to be used if the pick was cancelled from the pick ops menu.

Once the string has been selected, it is automatically made the primary string for the section view and a string profile created along the string.

As discussed in the section view profile options, for each tin in a model added to the section view, the section through the tin along the primary string (the selected string) is calculated and displayed in the section view.

The VG edit option then fires up the standard string editor which is described in detail in the string edit options.

Dump

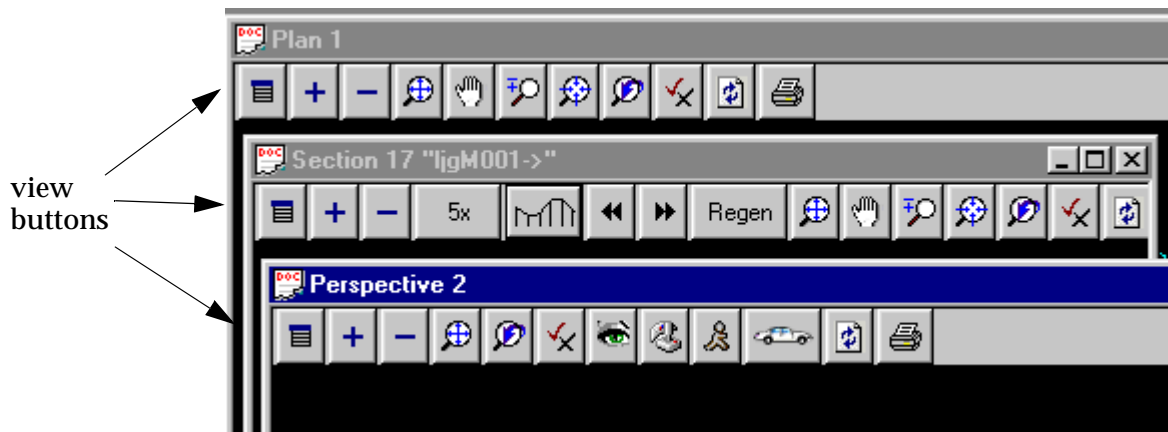
Position of option on menu: Section View Menu View =>Utilities =>Dump

This option is used to write the view out in a user selected format. It is the same as the dump option for the plan view and is fully documented in the plan **View => Utilities** section.

View Buttons

For each view type, there are a number of selected view menu options available as buttons (view buttons) in the *view title area*.

The options on each view type are



To select one of the view buttons, click LB whilst the cursor is over the button.

Note that the view buttons do not highlight when the cursor passes over them.

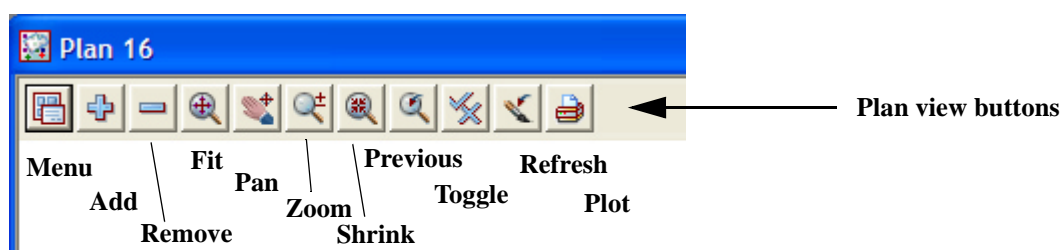
If RB is clicked over any view button other than **Profile** on the section view, the view menu for the view type will be displayed.

For documentation on the *Plan view buttons*, go to the section “Plan View Buttons” .

Perspective view buttons, go to the section “Perspective View Buttons” .

Section view buttons, go to the section “Section View Buttons” .

Plan View Buttons

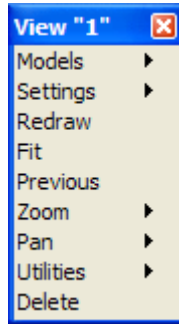


Menu

If the **Menu** button is selected in the *view button area* of any view, or if **RB** is clicked in the *view-title area* or in the *view-button area*, a new menu called the View menu appears.

Because of the differences between plan, perspective and section views, the options on the View menu vary for each view type.

The plan View menu is



The View menu is removed by selecting the [X] button or if the View menu hasn't been moved, by simply clicking **RB** again in the *view-title* or *view button* area. If the **View** menu has been moved, clicking **RB** will warp the cursor to the moved View menu.

+ or Add

The + view button works in four modes.

- ▲ clicking LB whilst the cursor is over the + brings up the Models to Add list. This list contains all of the models not yet added to the view.
- ▲ typing a keyboard character whilst the cursor is over the + brings up a Models to Add list containing only those models not on the view **with names beginning** with the typed character.
- ▲ typing a * character whilst the cursor is over the + brings up a Add Models to View panel which can then be used with wild cards and characters.
- ▲ clicking MB whilst the cursor is over the + brings up the Add Models to View by Pick panel and starts up a **same as** for a view. Models to add to the view are then selected by simply picking a string from the model. See chapter **Tools and Concepts** for further documentation on **same as**.
- ▲ clicking RB whilst the cursor is over the + brings up the **View** panel documented earlier in this chapter.

For the *Same as* option for the + and - view buttons, please continue to the section "Same As for Views" .

- or Remove

The - view button works in four modes.

- ▲ clicking LB whilst the cursor is over the - brings up the Models to Remove list. This menu lists all of the models on the view.
- ▲ typing a keyboard character whilst the cursor is over the - brings up a Models to Remove list containing only those models on the view with names beginning with the typed character.
- ▲ typing a * character whilst the cursor is over the - brings up a Remove Models from View panel which can then be used with wild cards and characters.
- ▲ clicking MB whilst the cursor is over the - brings up the Remove Models from View by Pick panel and starts up a **same as** for a view. Models to remove from the view are then selected by simply picking a string from the model. See the next chapter for further documentation on **same as**.
- ▲ clicking RB whilst the cursor is over the - brings up the **View** panel documented earlier in this chapter.

For the *Same as* option for the + and - view buttons, please continue to the section "Same As for Views" .

Fit

This is the same as fit from the view menu.
 If LB is clicked on the **fit**, then the fit option is activated.
 If RB is clicked on the **fit**, then the view option is activated.

Pan

This is the same as pan from the View=>Pan menu.
 If LB is clicked on the **Pan**, then the pan option is activated.

Zoom

This is the same as the two point zoom option from the plan View=>Zoom menu.
 If LB is clicked on the **Zoom**, then the zoom option is activated.

Shrink

This is the same as the two point shrink option from the plan View=>Zoom menu.
 If LB is clicked on the **shrink**, then the shrink option is activated.

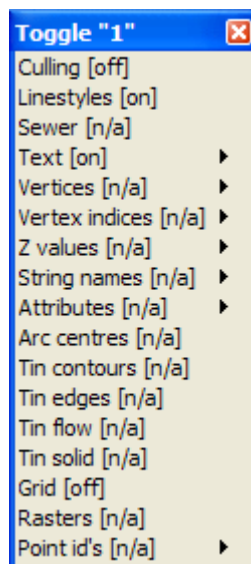
Previous

This is the same as previous from the view menu.
 If LB is clicked on the **prev**, then the previous option is activated.
 If RB is clicked on the **prev**, then the view option is activated.

Toggle

This is the same as toggle from the View=>Settings menu.
 If LB is clicked on the **toggle**, then the toggle menu is activated.
 If RB is clicked on the **toggle**, then the view option is activated.

The Toggle menu for the plan view types is:



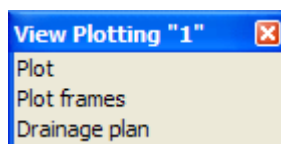
Refresh

As its name implies, this option redraws all the models on the view using the current drawing parameters. This is the same as clicking MB in the view title area.

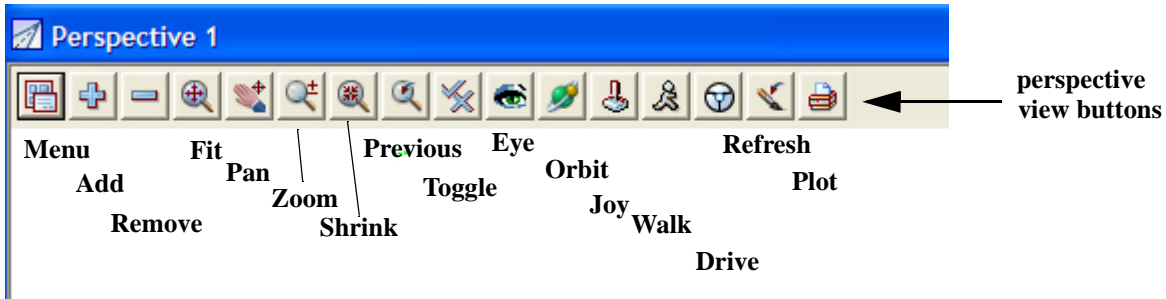
Plot

[plan_view_plot_menu](#)

If LB is clicked on **Plot**, then the View Plotting menu for the plan view is activated.



Perspective View Buttons

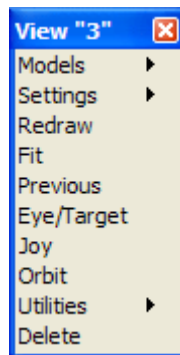


Menu

If the **Menu** button is selected in the *view button area* of any view, or if **RB** is clicked in the *view-title area* or in the *view-button area*, a new menu called the View menu appears.

Because of the differences between plan, perspective and section views, the options on the View menu vary for each view type.

The **Perspective View** menu is



The View menu is removed by selecting the **[X]** button or if the View menu hasn't been moved, by simply clicking **RB** again in the *view-title* or *view button* area. If the View menu has been moved, clicking **RB** will warp the cursor to the moved View menu.

+ or Add

The + view button works in four modes.

- ▲ clicking LB whilst the cursor is over the + brings up the Models to Add list. This list contains all of the models not yet added to the view.
- ▲ typing a keyboard character whilst the cursor is over the + brings up a Models to Add list containing only those models not on the view **with names beginning** with the typed character.
- ▲ typing a * character whilst the cursor is over the + brings up a Add Models to View panel which can then be used with wild cards and characters.
- ▲ clicking MB whilst the cursor is over the + brings up the Add Models to View by Pick panel and starts up a **same as** for a view. Models to add to the view are then selected by simply picking a string from the model. See chapter **Tools and Concepts** for further documentation on **same as**.
- ▲ clicking RB whilst the cursor is over the + brings up the View panel documented earlier in this chapter.

For the *Same as* option for the + and - view buttons, please continue to the section "Same As for Views" .

- or Remove

The - view button works in four modes.

- ▲ clicking LB whilst the cursor is over the - brings up the Models to Remove list. This menu lists all of the models on the view.
- ▲ typing a keyboard character whilst the cursor is over the - brings up a Models to Remove list containing only those models on the view with names beginning with the typed character.
- ▲ typing a * character whilst the cursor is over the - brings up a Remove Models from View panel which can then be used with wild cards and characters.
- ▲ clicking MB whilst the cursor is over the - brings up the Remove Models from View by Pick panel and starts up a **same as** for a view. Models to remove from the view are then selected by simply picking a string from the model. See the next chapter for further documentation on **same as**.
- ▲ clicking RB whilst the cursor is over the - brings up the **View** panel documented earlier in this chapter.

For the *Same as* option for the + and - view buttons, please continue to the section "Same As for Views" .

Fit

This is the same as fit from the view menu.

If LB is clicked on the **fit**, then the fit option is activated.

If RB is clicked on the **fit**, then the view option is activated.

Previous

This is the same as previous from the view menu.

If LB is clicked on the **prev**, then the previous option is activated.

If RB is clicked on the **prev**, then the view option is activated.

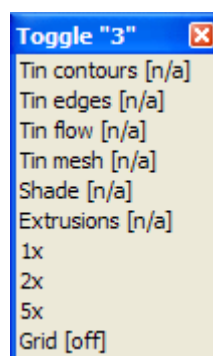
Toggle

This is the same as toggle from the View=>Settings menu.

If LB is clicked on the **toggle**, then the toggle menu is activated.

If RB is clicked on the **toggle**, then the view option is activated.

The Toggle menu for the perspective view is:

**Eye**

This is the same as eye/target from the View menu.

If LB is clicked on the **Eye**, then the **Eye-target** option is activated.

Joy

This is the same as joy from the View menu.

If LB is clicked on the **joy**, then the joy option is activated.

Walk

This is the same as string walk =>along string from the View =>Utilities menu.
If LB is clicked on the **walk**, then the walk along string option is activated.

Drive

This is the same as string drive => along string from the View =>Utilities menu.
If LB is clicked on the **drive**, then the drive along string option is activated.

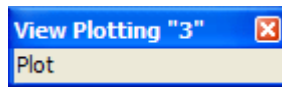
Redraw

As its name implies, this option redraws all the models on the view using the current drawing parameters. This is the same as clicking MB in the view title area.

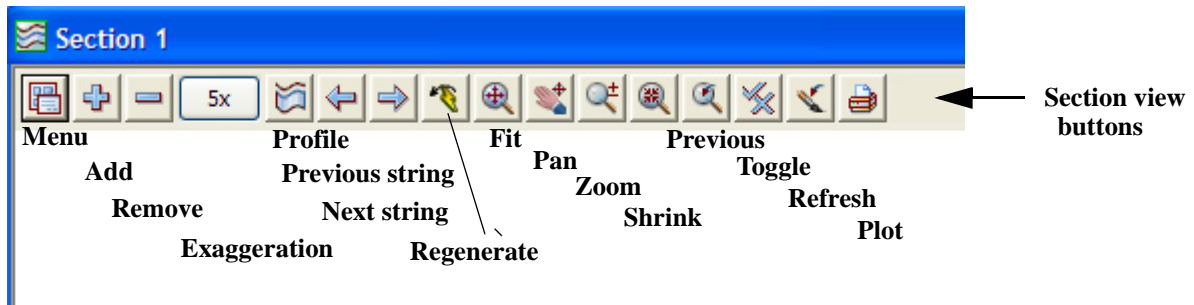
Plot

[perspective_view_plot_menu](#)

If LB is clicked on **plot**, then the view plotting menu for the perspective view is activated.



Section View Buttons



Menu

If the **Menu** button is selected in the *view button area* of any view, or if **RB** is clicked in the *view-title area* or in the *view-button area*, a new menu called the View menu appears.

Because of the differences between plan, perspective and section views, the options on the View menu vary for each view type.

The **Section View** menus is



The View menu is removed by selecting the **[X]** button or if the View menu hasn't been moved, by simply clicking **RB** again in the *view-title* or *view button* area. If the **View** menu has been moved, clicking **RB** will warp the cursor to the moved View menu.

+ or Add

The + view button works in four modes.

- ▲ clicking LB whilst the cursor is over the + brings up the Models to Add list. This list contains all of the models not yet added to the view.
- ▲ typing a keyboard character whilst the cursor is over the + brings up a Models to Add list containing only those models not on the view **with names beginning** with the typed character.
- ▲ typing a * character whilst the cursor is over the + brings up a Add Models to View panel which can then be used with wild cards and characters.
- ▲ clicking MB whilst the cursor is over the + brings up the Add Models to View by Pick panel and starts up a **same as** for a view. Models to add to the view are then selected by simply picking a string from the model. See chapter **Tools and Concepts** for further documentation on **same as**.
- ▲ clicking RB whilst the cursor is over the + brings up the **View** panel documented earlier in this chapter.

For the *Same as* option for the + and - view buttons, please continue to the section “Same As for Views” .

- or Remove

The - view button works in four modes.

- ▲ clicking LB whilst the cursor is over the - brings up the Models to Remove list. This menu lists all of the models on the view.
- ▲ typing a keyboard character whilst the cursor is over the - brings up a Models to Remove list containing only those models on the view with names beginning with the typed character.
- ▲ typing a * character whilst the cursor is over the - brings up a Remove Models from View panel which can then be used with wild cards and characters.
- ▲ clicking MB whilst the cursor is over the - brings up the Remove Models from View by Pick panel and starts up a **same as** for a view. Models to remove from the view are then selected by simply picking a string from the model. See the next chapter for further documentation on **same as**.
- ▲ clicking RB whilst the cursor is over the - brings up the **View** panel documented earlier in this chapter.

For the *Same as* option for the + and - view buttons, please continue to the section “Same As for Views” .

[exagg]

This is the vertical exaggeration for the view.

If LB is clicked on the exaggeration, then the toggle option for the section view is activated.

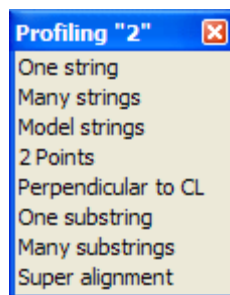
This has options to quickly change the vertical exaggeration.

Profile

section_view_profile_menu

If LB is clicked on **profile**, then the profile option is activated. This option is the same as View=>Profiling=>One string. If a string is being profiled, then the string name is displayed after the Section view name.

If **RB** is clicked on **Profile**, then the profiling menu is activated.



<<

Profile previous string.

>>

Profile next string.

Regen

This is the same as the option regenerate option from the section view menu.

If LB is clicked on the **regen**, then the regen option is activated.

Fit

This is the same as fit from the view menu.

If LB is clicked on the **fit**, then the fit option is activated.

If RB is clicked on the **fit**, then the view option is activated.

Pan

This is the same as pan from the View=>Pan menu.

If LB is clicked on the **Pan**, then the pan option is activated.

Zoom

This is the same as the two point zoom option from the plan View=>Zoom menu.

If LB is clicked on the **Zoom**, then the zoom option is activated.

Shrink

This is the same as the two point shrink option from the plan View=>Zoom menu.

If LB is clicked on the **shrink**, then the shrink option is activated.

Previous

This is the same as previous from the view menu.

If LB is clicked on the **prev**, then the previous option is activated.

If RB is clicked on the **prev**, then the view option is activated.

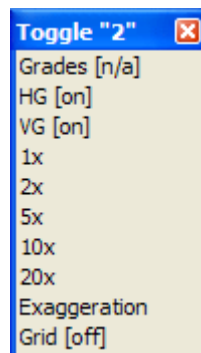
Toggle

This is the same as toggle from the View=>Settings menu.

If LB is clicked on the **toggle**, then the toggle menu is activated.

If RB is clicked on the **toggle**, then the view option is activated.

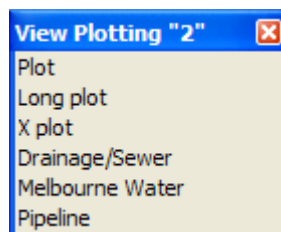
The Toggle menu for the section view is:

**Refresh**

As its name implies, this option redraws all the models on the view using the current drawing parameters. This is the same as clicking MB in the view title area.

Plot**section_view_plot_menu**

If LB is clicked on **plot**, then the view plotting menu for the section view is activated.

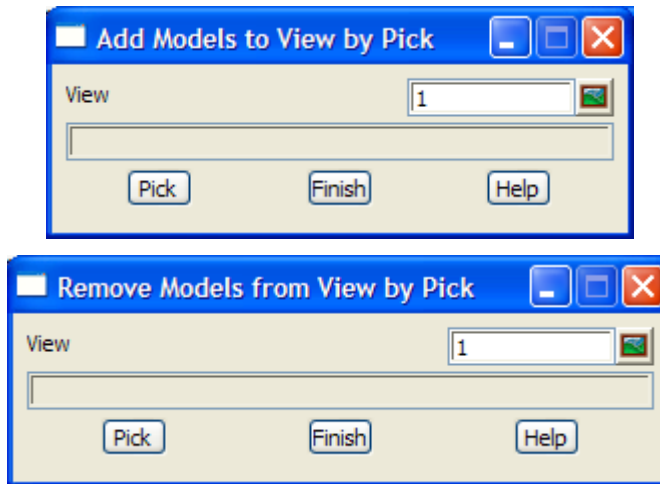


Same As for Views

`add_models_to_view_by_pick` `remove_models_from_view_by_pick`

Clicking the middle mouse button (MB) over the + or - view buttons will activate a **same as pick** which allows the user to select the model to add to (+) or remove from (-) the view by simply picking any string from the model to be added or removed.

After clicking MB over the + or - view button, the **add models to view by pick** or **remove models from view by pick** panel is brought up.



The option is already running and when a string is picked, the model containing the string is added to/removed from the view. Further strings can then be selected to add or remove another model.

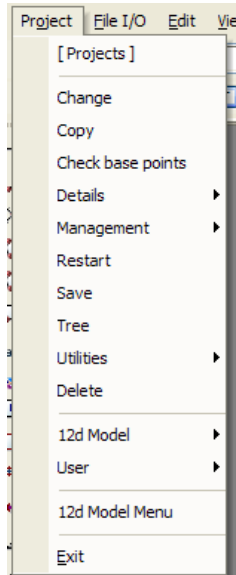
The option is terminated by selecting **[X]** or **finish** from the panels, or cancel from the pick ops menu.

6 Projects

projects

The projects walk-right menu is:

on Main menu

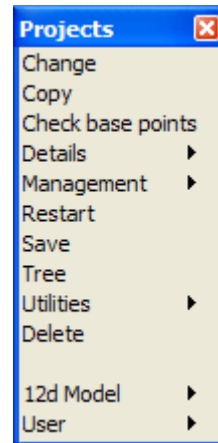


create floating Projects menu (see right)
 change working directory and/or project
 make a copy of a project
 number of points for base point count
 project description and details
 edit project setup/management files
 exit and restart in same project
 save the working project to disk
 project data and set up files in tree form
 project utilities
 delete a project from disk

information on 12d Model
 User Projects menu

create floating 12d Model menu
 exit 12d Model

on 12d Model menu
 and floating menu



For the option *Change*, go to the section "Change"

<i>Copy</i>	"Copy"
<i>Check points</i>	"Check Base Points"
<i>Details</i>	"Details"
<i>Management</i>	"Management"
<i>Restart</i>	"Restart"
<i>Save</i>	"Save"
<i>Tree</i>	"Tree"
<i>Utilities</i>	"Utilities"
<i>Delete</i>	"Delete"
<i>12d Model</i>	"12d Model"
<i>Exit</i>	"Exit"

Each option will now be discussed in the order that they appear on the **Projects** menu.

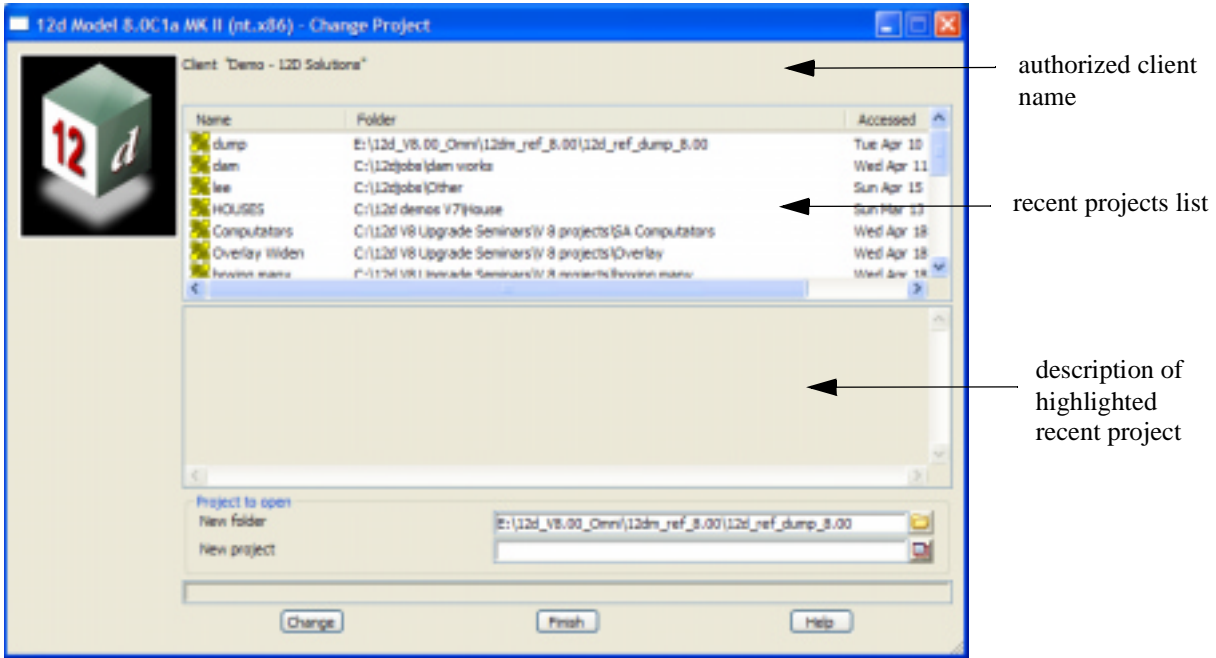
Change

change_project

Position of option on menu: Project =>Change

The **change** option is used to change the working directory and the working project. The panel can be resized.

On selecting the **change** option, the **change project** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Client name	display only		
--------------------	--------------	--	--

authorized 12d Model client.

Recent projects list	output	recent projects	
-----------------------------	--------	-----------------	--

names and directories of project recently select. Single clicking on an entry in the list displays the projects description in the Project description area. Double clicking on an entry in the list changes the project

Project description	output		
----------------------------	--------	--	--

description of the project highlighted in the Recent projects list.

New directory	input	current directory	local directories
----------------------	-------	-------------------	-------------------

name of the directory to become the working directory.

New project	input	projects in new directory	
--------------------	-------	---------------------------	--

name of the project to become the working project in the new directory.

Change	button		
---------------	--------	--	--

after selecting this button, the working directory is changed to the directory specified in the new directory field. The working project is set to the project given in the new project field. If the new directory or new project does not exist, it will be created.

Note: This is a resizable panel.

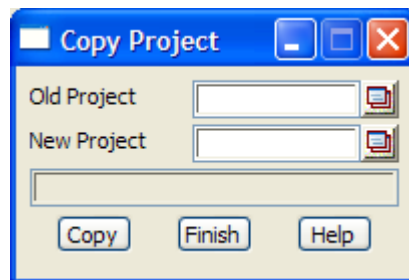
Copy

`copy_project`

Position of option on menu: Project =>Copy

The `copy` option is used to make a copy of any project (other than the current project) in the working directory.

On selecting the `copy` option, the **copy project** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Old project <i>name of the project to be copied.</i>	input	none	projects in directory
New project <i>name of the copy of the project. The new project name cannot be the same as an existing project in the working directory.</i>	input		
Copy <i>after selecting this button, a complete copy of the project given in the old project field is made and saved under the name given in the new project field.</i>	button		

Check Base Points

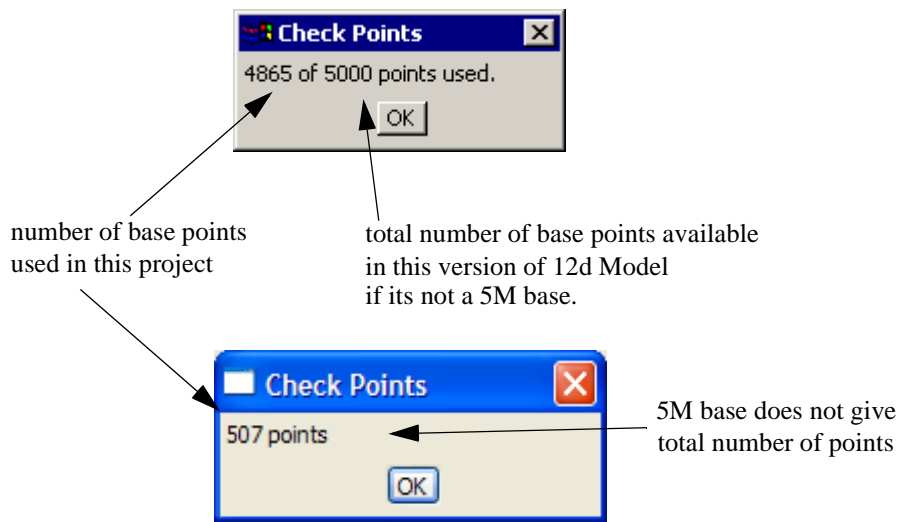
check_points

Position of option on menu: Project =>Check base points

The **Check points** option gives the number of *base* points used in the project and the total number of base points available in the customers version of 12d Model.

Note that not all vertices in all strings are "base" points and count towards the number of base points. For example, vertices in contours generated by the **Contour** option do not count as base points. The vertices of strings created when plotting to a model are also not counted as base points.

On selecting **Check points** from the **Projects** menu, the **Check Base Points** panel is displayed.



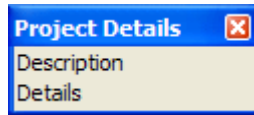
Details

project_details

Position of menu: Project =>Details

A project description and project details can be defined.

The **Project details** walk-right menu contains various projection items.



display/modify the project description
display/modify the project details

For the option *Description*, go to the section “Description”

Details

“Details”

The options in the menu will now be described.

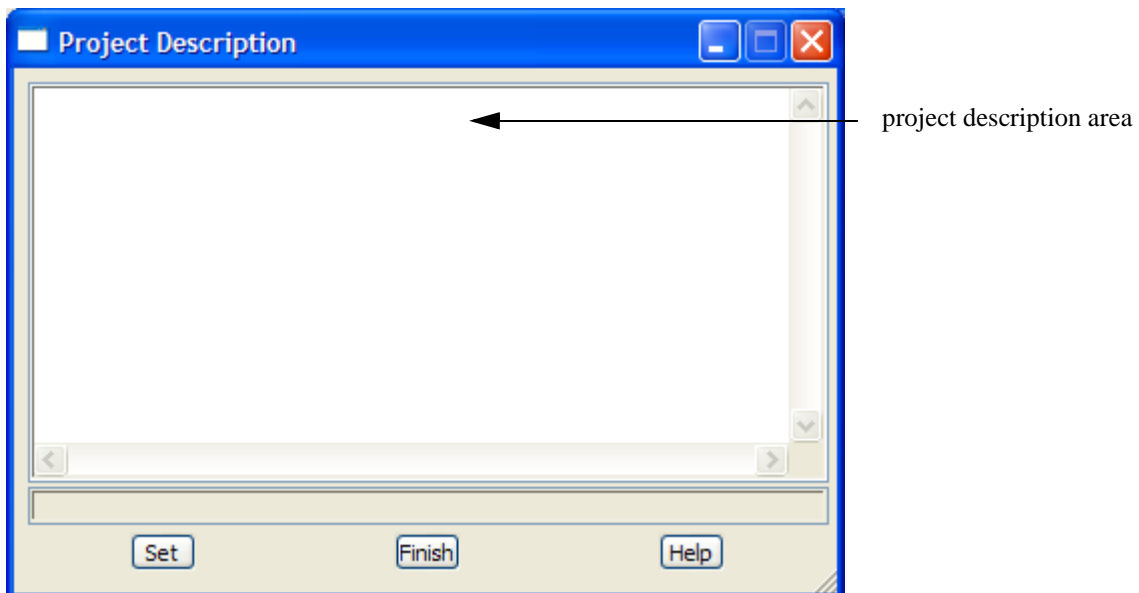
Description

project_description

Position of option on menu: Project =>Details =>Description

The **description** option is used to create and edit the project description.

On selecting the **Description** option, the **Project Description** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Project description area	input		
---------------------------------	-------	--	--

the description for the project to be rebuilt. The description can be more than one line long.

Set	button		
------------	--------	--	--

set the project description.to be the text in the project description area.

Note: This panel a resizable panel.

Details

[enter_project_details](#)

Position of option on menu: Project =>Details =>Details

The **Details** option is used to enter project details.

On selecting the **Details** option, the **Enter Project Details** panel is displayed.

What information is to be entered into the **Enter Project Details** panel is defined in the option

Project =>Management =>Details editor - go to "Details Editor"

The fields and buttons used in the **Enter Project Details** panel have the following functions.

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

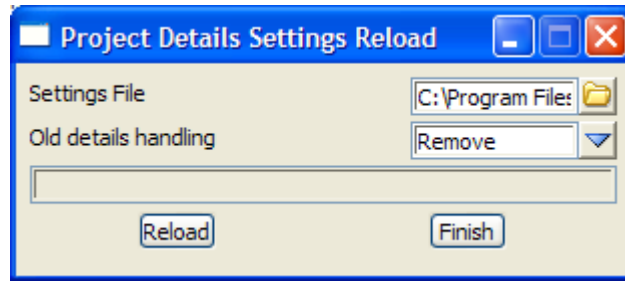
Set	button		
------------	--------	--	--

set the project details to the values show in the panel. The values are stored as project attributes.

Load	button		
-------------	--------	--	--

*brings up the **Projects Details Setting Reload** panel that is used to load a new definition of project detail attributes.*

[project_details_settings_reload](#)



*A file defining a new set of project attributes of project details can be loaded. How existing project details are handled depends on the value of **Old details handling***

Old details handling

Remove - all existing project detail attributes are removed and totally replaced by the new set

Keep (no update) - any existing project detail are kept but their values **are not** updated by the default setting if the same attribute exists in the Settings file.

Keep (with update) - any existing project detail are kept and their values **are updated** by the default setting if the same attribute exists in the Settings file.

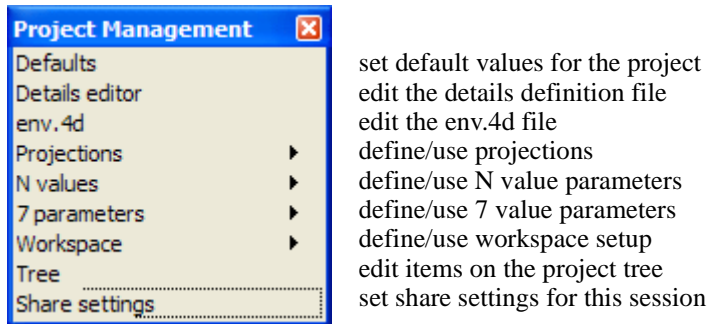
Management

project_management

Position of menu: Project =>Management

Options to set up the project

The **Project management** walk-right menu contains various projection items.



For the option *Defaults*, go to the section “Defaults”

<i>Details editor</i>	“Details Editor”
<i>env.4d</i>	“env.4d”
<i>Projections</i>	“Projections”
<i>N Values</i>	“N values”
<i>7 Parameters</i>	“7 Parameters”
<i>Workspace</i>	“Workspace”
<i>Tree</i>	“Tree”
<i>Share settings</i>	“Share Settings”

The options in the menu will now be described.

Defaults

defaults

Position of option on menu: Project =>Management =>Defaults

The **Defaults** option allows the user to view and modify many of the default values used in the current 12d Model project.

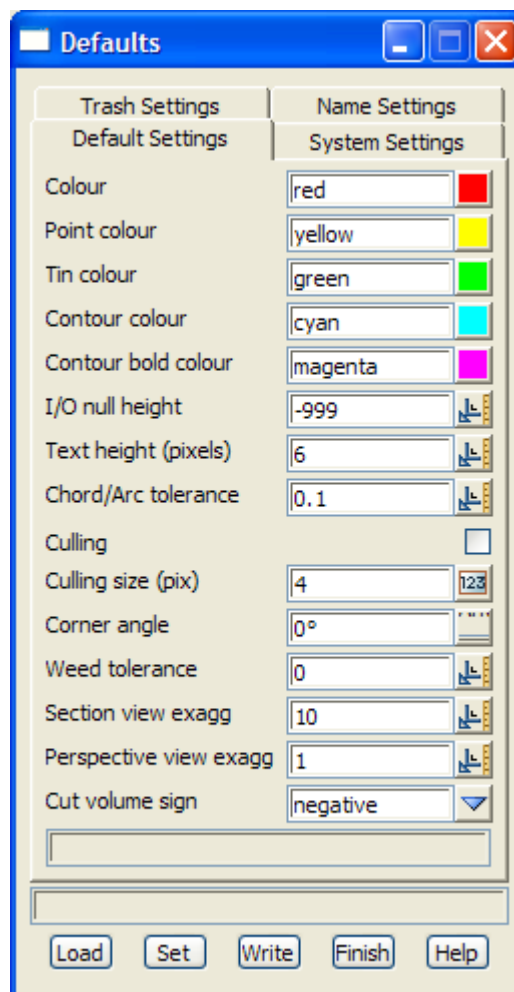
NOTE - The values in the default option panels are initially set for a new project by the values in the **defaults.4d** file. For more information on the defaults.4d file, go to the section “Defaults” in the Appendix “Set Ups”

Any changes made in the **Defaults** panel are used in the current session for the project when the **Set** button is pressed. The values are only **saved** for the project if a *Project =>Save* is done after the **Set**.

The **Defaults** panel consists of tabs for the groups of settings *Defaults*, *System*, *Trash* and *Name*.

Default Settings Tab

On selecting the **Default Settings** tab, the **Default Settings** are displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Colour <i>the name of the current default colour used for line strings.</i>	colour box	default colour	available colours
Point colour <i>the current default colour used for point strings.</i>	colour box	def point colour	available colours
Tin colour <i>the default tin colour used in the triangulate model and view panels.</i>	colour box	def tin colour	available colours
Contour colour <i>the default contour colour used in the contour panel.</i>	colour box	def cont colour	available colours
Cont bold colour <i>the default contour bold colour is used in the contour panel.</i>	colour box	def cont index col	available colours
I/O null height <i>this field contains the value of the value recognised as a null height when reading in and writing out data.</i>	input	-999.0	
Text height (pixels) <i>the default text height used in the sewer option and other panels.</i>	input	8	
Chord/Arc tolerance <i>the maximum value of a chord to arc distance. If this distance is exceeded when approximating curves by chords, extra points are inserted into the curve so that the chords all have chord/arc distances less than this value. A value of zero disables the chord/arc test.</i>	input	0.1	
Culling <i>the culling setting for any new perspective or plan views.</i>	tick box		
Culling size (pix) <i>the culling size for any new perspective or plan views.</i>	input	5	
Corner angle <i>when applying templates or calculating interfaces along a string, extra sections may be required at string vertices with no horizontal curve on them. If the corner angle is non-zero, extra sections are added in at multiples of the corner angle value for the plan angle at the vertex.</i>	input	15	
Weed tolerance <i>if two points on a string (with the same bearing) are closer than this distance then the second point is left out. This applies to the extra points added in at chainage points in interfacing and corner angles.</i>	input	0	
Section view exagg <i>the vertical exaggeration used for any new section views.</i>	input	10	
Perspective view exagg <i>the vertical exaggeration of any new perspective.</i>	input	1	
Cut volume sign <i>the sign (positive or negative) used for cut volumes and areas. The sign for fill is the opposite.</i>	choice box	negative	negative, positive
Load <i>read the default values from the current default.4d file for the project. The values are not used for the project until the Set button is pressed. The values are not saved for the project until a 'Project =>Save' is done after the Set.</i>	button		
Set <i>when set is selected, the defaults are set to the values given in the corresponding fields of this panel. These are not saved unless a 'Project =>Save' is done after the Set.</i>	button		

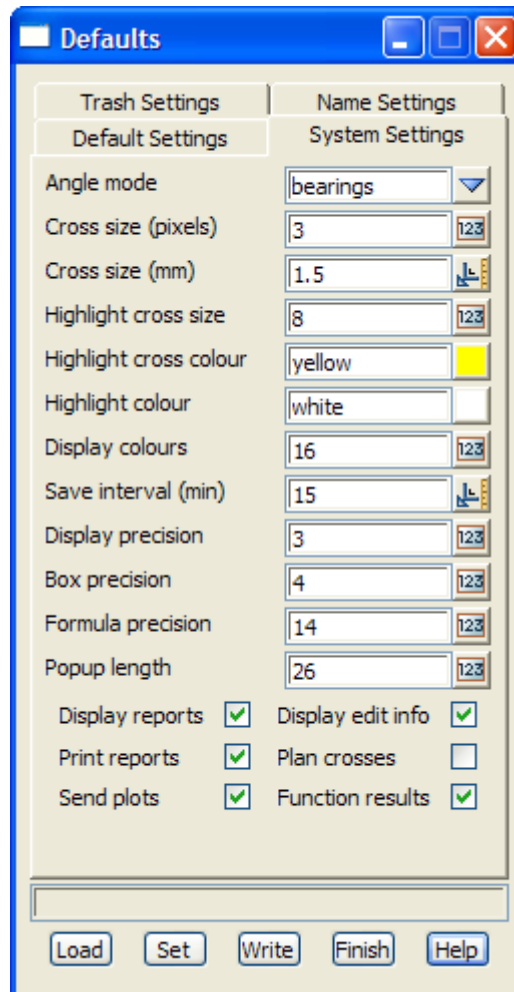
Write button

write the values in the panel to the defaults.4d file.

The values are not used for the project until the **Set** button is pressed. The values are not saved for the project until a 'Project =>Save' is done after the **Set**. For more information on the **Write** button, go to the section "Writing Set Up Files" in the Appendix "Set Ups".

Systems Settings Tab

On selecting the **System Settings** tab, the **System Settings** are displayed.



The fields and buttons used in this panel have the following functions.

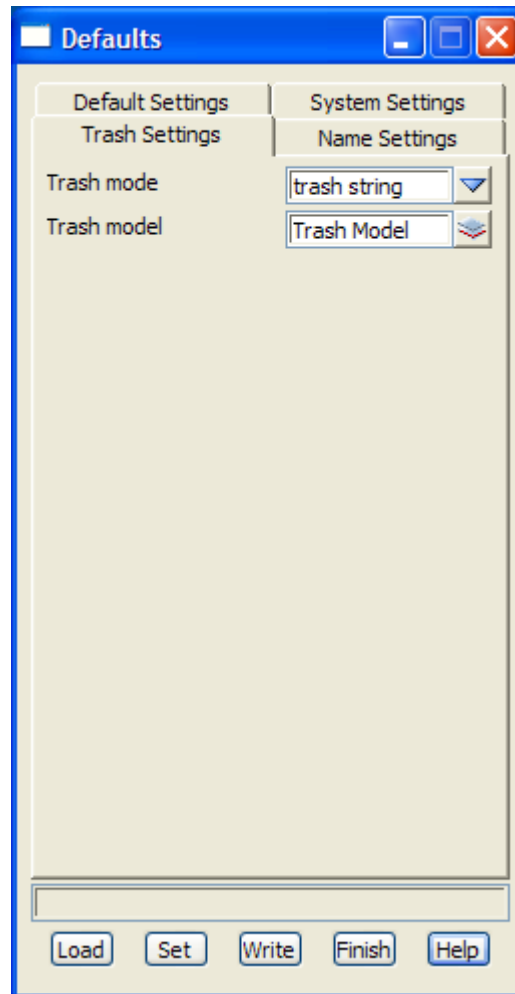
Field Description	Type	Defaults	Pop-Up
Angle mode	choice box	bearings	cartesian, bearings
<i>specifies whether bearings or cartesian angles are used in reporting the instantaneous direction of the selected string in the information menu.</i>			
Cross size (pixels)	input/output	2	
<i>the size in pixels that crosses (for points etc.) are drawn on the screen.</i>			
Cross size (mm)	input/output	2.5	
<i>the size in millimetres that crosses (for points etc.) are drawn on any plots.</i>			
Highlight cross size	input/output	8	
<i>the size in pixels of the cross used for highlighting objects in views.</i>			

Highlight cross colour	colour box	yellow	available colours
	<i>the colour of the cross used for highlighting objects in views.</i>		
Highlight colour	colour box	white	available colours
	<i>the colour used to display objects in views when they are highlighted.</i>		
Display colours	input/output	0	
	<i>the number of colours from the top of the colour map file, colour_map.def, that are displayed in a colour pop-up. If 0, all colours are displayed.</i>		
Save interval (min)	input/output	5	
	<i>the number of minutes that elapse after a save before the save project reminder panel comes up. If 0, the panel never comes up.</i>		
Display precision	input/output	3	
	<i>the number of decimal places used for values displayed in the information menus.</i>		
Box precision	input/output	4	
	<i>the number of decimal places used for values displayed in boxes and panels.</i>		
Popup length	input/output	28	
	<i>the maximum number of items in a pop-up before breaking the pop-up into walk-rights.</i>		
Display reports	tick box	tick	
	<i>if tick, as soon as a report is produced, it will be displayed in the editor defined by the environment variable, EDITOR_4D.</i>		
Display edit info	tick box	tick	
	<i>if tick, the edit info panel is automatically displayed whenever a string is created or edited.</i>		
Print reports	tick box	tick	
	<i>if tick, as soon as a report is produced, it will be passed to the script/program defined by the environment variable, PRINTER_4D.</i>		
Send plots	tick box	tick	
	<i>if tick, as soon as a plot is produced, it will be passed to the script/program defined by the environment variable, PLOTTER_4D.</i>		
Plan crosses	tick box		
	<i>This option is experimental - at the moment things will look messy when editing in a section view with plan crosses turned on.</i>		
	<i>if tick, when the cursor is in a plan or perspective view, it is projected onto any section views as well.</i>		
Function results	tick box	tick	
	<i>if tick, function results such as volumes will be displayed on the screen every time a recalc is done.</i>		
	<i>if not tick, no function results as displayed on a function recalc.</i>		
Load	button		
	<i>read the default values from the current default.4d file for the project. The values are not used for the project until the Set button is pressed. The values are not saved for the project until a 'Project =>Save' is done after the Set.</i>		
Set	button		
	<i>when set is selected, the defaults are set to the values given in the corresponding fields of this panel. These are not saved unless a 'Project =>Save' is done after the Set.</i>		
Write	button		
	<i>write the values in the panel to the defaults.4d file.</i>		
	<i>The values are not used for the project until the Set button is pressed. The values are not saved for the project until a 'Project =>Save' is done after the Set. For more information on the Write button, go to</i>		

the section “Writing Set Up Files” in the Appendix “Set Ups”

Trash Settings Tab

On selecting the **Trash Settings** tab, the **Trash Settings** are displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Trash mode	choice box	trash string	keep string, trash string, delete string

In many string options, new strings are created from existing strings. What happens to the original strings may be determined by the trash mode.

*If set to **keep string**, the original strings will not be touched*

***trash string**, the original strings will be moved to the trash model*

***delete string**, the original strings will be deleted.*

Trash model	model box	Trash Model	available models
--------------------	-----------	-------------	------------------

the model that trashed strings are put into. This model needs to be cleaned or deleted to permanently remove the strings.

Load	button
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*read the default values from the current default.4d file for the project. The values are not used for the project until the **Set** button is pressed. The values are not saved for the project until a 'Project =>Save' is done after the **Set**.*

Set	button
------------	--------

*when set is selected, the defaults are set to the values given in the corresponding fields of this panel. These are not saved unless a 'Project =>Save' is done after the **Set**.*

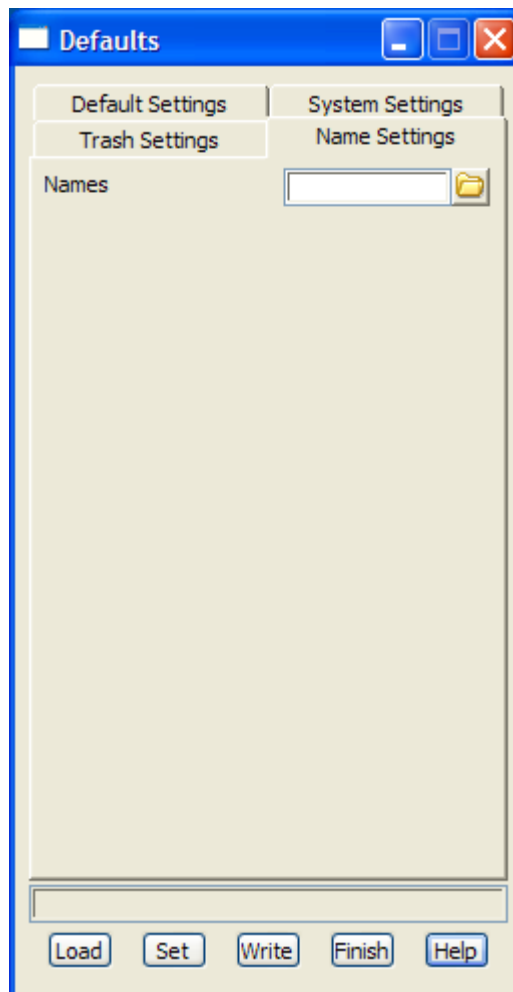
Write button

write the values in the panel to the defaults.4d file.

*The values are not used for the project until the **Set** button is pressed. The values are not saved for the project until a 'Project =>Save' is done after the **Set**. For more information on the **Write** button, go to the section "Writing Set Up Files" in the Appendix "Set Ups"*

Names Settings Tab

On selecting the **Name Settings** tab, the **Name Settings** are displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Names	input		*.mf files
<i>name of the mapping file used as the default name mapping file.</i>			

Load button

*read the default values from the current default.4d file for the project. The values are not used for the project until the **Set** button is pressed. The values are not saved for the project until a 'Project =>Save' is done after the **Set**.*

Set button

*when set is selected, the defaults are set to the values given in the corresponding fields of this panel. These are not saved unless a 'Project =>Save' is done after the **Set**.*

Write button

write the values in the panel to the defaults.4d file.

*The values are not used for the project until the **Set** button is pressed. The values are not saved for the project until a 'Project =>Save' is done after the **Set**. For more information on the **Write** button, go to the section "Writing Set Up Files" in the Appendix "Set Ups".*

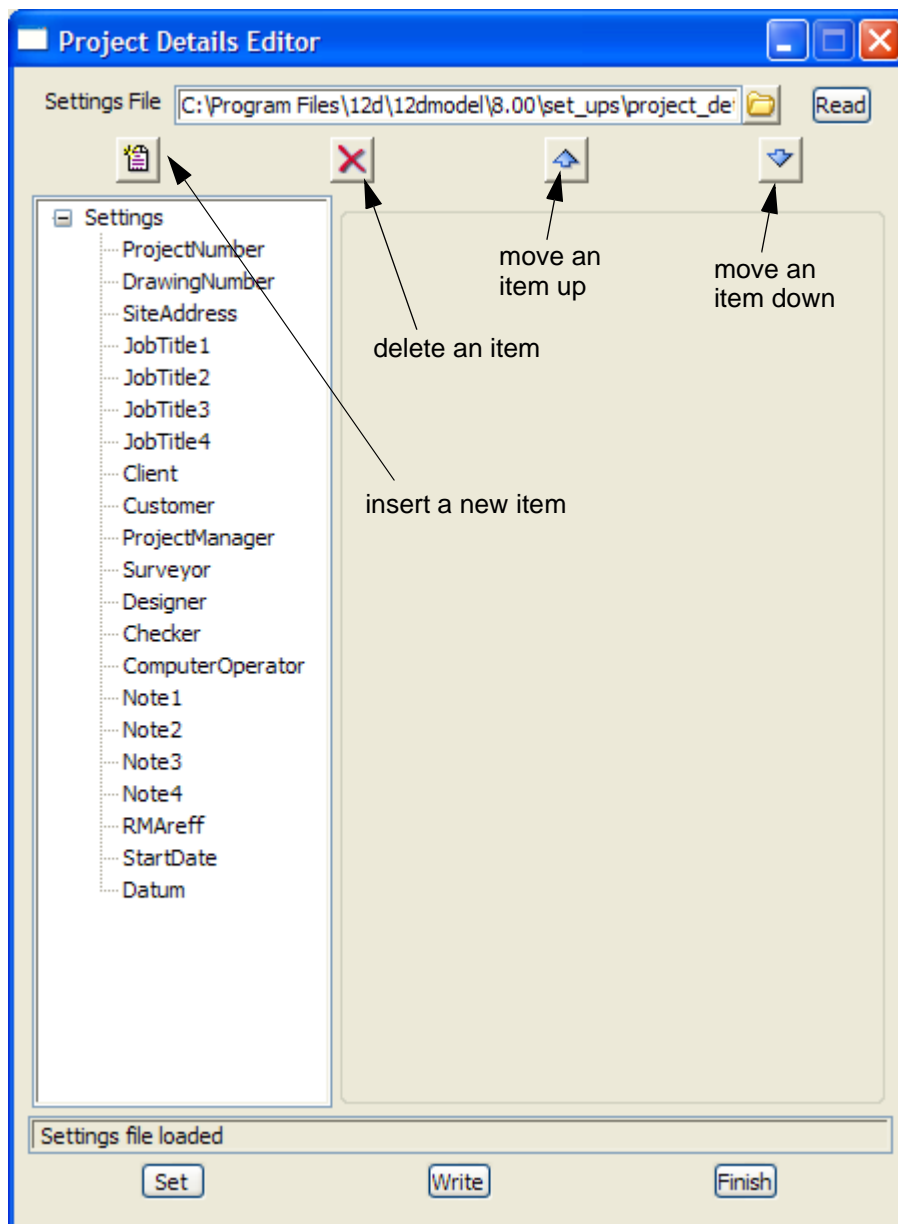
Details Editor

`project_details_editor`

Position of option on menu: **Project =>Details =>Management =>Details editor**

The **Details Editor** option creates the files used to define the project attributes displayed in the **Project Details** panel.

On selecting the **Details Editor** option, the **Project Details Editor** panel is displayed.



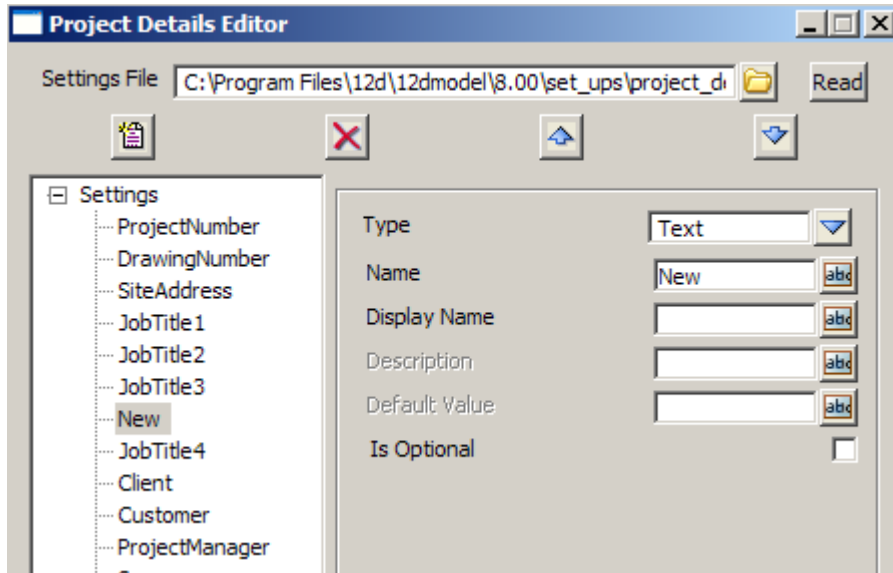
The items defined in the **Project Details Editor** panel can be of type Text (e.g. fred), Integer (e.g. 11) or Real (e.g. 23.15).

The fields and buttons used in the **Enter Project Details** panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Set <i>the values in the panel are set as the project details setup</i>	button		
Write <i>writes out a project details file.</i>	button		

When inserting a new "detail", the following is displayed

|



Field Description	Type	Defaults	Pop-Up
Type <i>the detail can be text, an integer or a real value</i>	choice box	Text	Text, Integer, Real
Name <i>name of the project attribute used to store the detail</i>	input		
Display name <i>name to appear in the Enter Project Details panel</i>	input		
Description <i>description that appears when the Display name is clicked in the Enter Project Details panel</i>	input		
Default value <i>default value for the detail</i>	input		
Precision <i>only for Type Real - number of decimal places</i>	integer box		
Is optional <i>if tick, then the detail does not have to be filled in. If not tick, it is compulsory to fill in the detail in the Enter Project Details panel before leaving the panel.</i>	tick box	tick	

env.4d

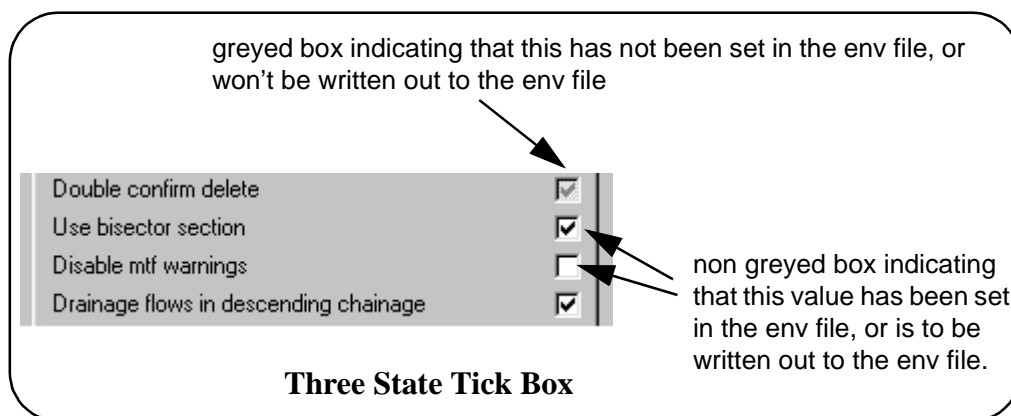
edit_environment_variables

Position of option on menu: Project =>Management =>env.4d

The **env.4d** option is used to create/update the *env.4d* file of environmental variables.

When the option is selected, it reads in the *current* env.4d file and displays in the panel, the values for any environment variables **in the file**. Hence the panel shows the values for the environment variables *in the file*, not those that are not in the file and have default values set by 12d Model.

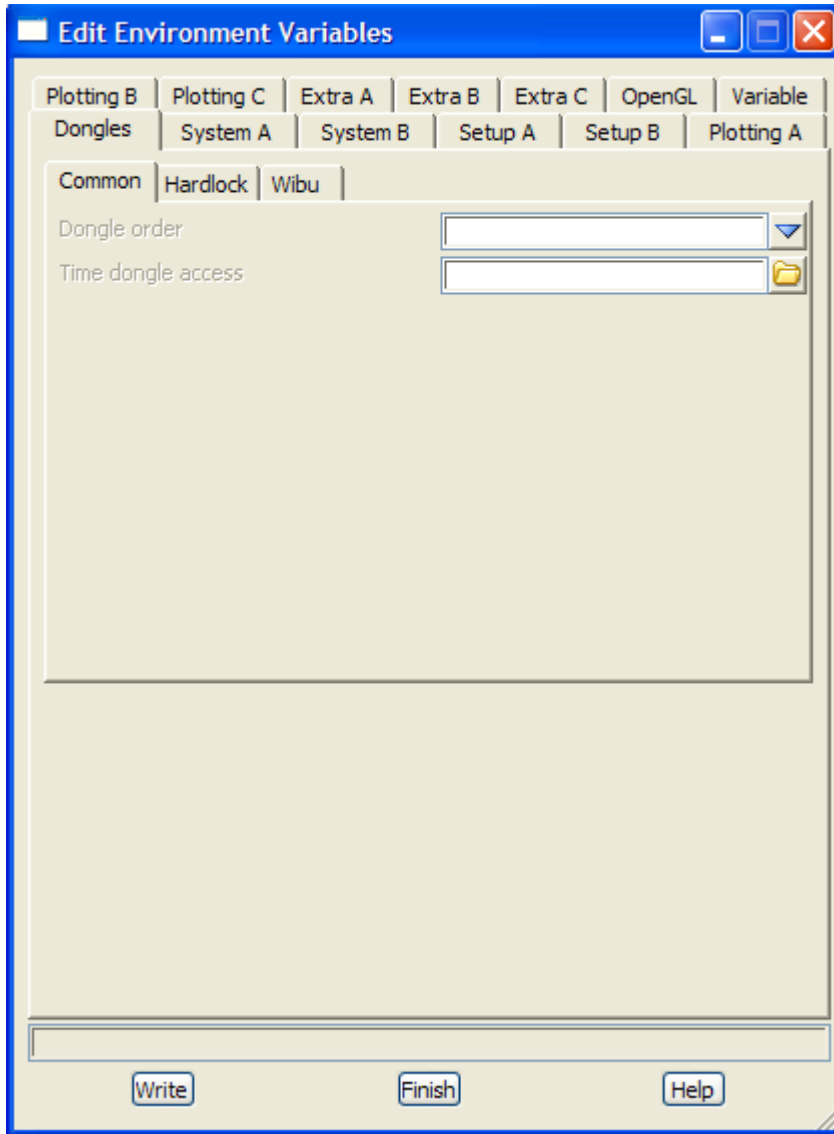
Hence the tick boxes in the *Edit Environment Variables* panel have three states rather than the standard two states. There is the standard tick or nothing to denote the value of the variable is set from the env file (or is going to be written out to the env file) or a greyed out tick or greyed out blank box to indicate that the value has *not* been set by the environment variable. Clicking on the tick box will toggle between the three states - on, off and no value.



After any modifications are made, the parameters are written out to an env.4d file.

Note that the *env.4d* file is only used when a project is loaded so the parameters written to an *env.4d* file can only take affect for the current project if a project **restart** is done.

On selecting the **env.4d** option, the **edit environmental variables** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Write	button		

*write the values in the panel to a file. For more information on the **Write** button, go to the section "Writing Set Up Files" in the Appendix "Set Ups"*

Note - the *env.4d* file is only used when a project is loaded so the parameters written to the *env.4d* file will only take affect for the current project if a project **restart** is done.

For more information on the variables on the tab *Dongles*, go to the "Dongles tab"

<i>System A</i>	"System B tab"
<i>System A</i>	"System B tab"
<i>Setup A</i>	"Setup A tab"
<i>Setup B</i>	"Setup B tab"
<i>Plotting A</i>	"Plotting A tab"
<i>Plotting B</i>	"Plotting B tab"
<i>Plotting C</i>	"Plotting C tab"
<i>Extra A</i>	"Extra A tab"

<i>Extra B</i>	“Extra B tab”
<i>Extra C</i>	“Extra C tab”
<i>OpenGL</i>	“OpenGL tab”
<i>Variable</i>	“Variable tab”

The environment variables are described in more detail in the section “Environment Variables” of the Appendix “Set Ups” .

Dongles tab

Common tab

Dongle order	DONGLE_ORDER_4D	Hardlock/Wibu, Wibu/Hardlock
		<i>order to search for network dongles</i>
Time dongle access	DEBUG_DONGLE_ACCESS_4D	
		<i>time between searches for a dongle</i>

Hardlock tab

User hardlock dongle	HARDLOCK_4D	tick box
		<i>if tick, search for 12d Hardlock dongles</i>
		<i>If no tick, don't search for Hardlock dongles</i>

Local	local, no local
	<i>if local, then a single user Hardlock dongle is looked for on the computer</i>
	<i>If no local, then no single user Hardlock dongle is looked for on the computer</i>

Network	no network, network first, network last
	<i>if no network, then no Hardlock network dongle is looked for.</i>
	<i>If network first, then a Hardlock network dongle is looked for before a single user local dongle.</i>
	<i>If network last, then a Hardlock network dongle is looked for after looking for a single user local dongle.</i>

Login retries

number of retries to find a Hardlock dongle

Login wait

time in seconds to wait between Hardlock dongle retries

Disable dongle	tick box
	<i>if tick, don't search for a Hardlock dongle</i>
	<i>if no tick, search for a Hardlock dongle</i>

Debug dongle	tick box
	<i>if tick, write out Hardlock dongle debug information</i>

Hardlock IP/Name addresses

*if **non blank**, a list of IP addresses and/or computer names to search for a 12d Hardlock network dongle.*

*If **blank**, search the entire network for a 12d Hardlock network dongle*

Wibu tab

User hardlock dongle	WIBU_4D	tick box
		<i>if tick, search for 12d Wibu dongles</i>
		<i>If no tick, don't search for 12d Wibu dongles</i>

Local	local, no local
<i>if local, then a single user Wibu dongle is looked for on the computer</i>	
<i>if no local, then no single user Wibu dongle is looked for on the computer</i>	
Network	no network, network first, network last
<i>if no network, then no Wibu network dongle is looked for.</i>	
<i>if network first, then a Wibu network dongle is looked for before a single user local dongle.</i>	
<i>if network last, then a Wibu network dongle is looked for after looking for a single user local dongle.</i>	
Login retries	
<i>number of retries to find a Wibu dongle</i>	
Login wait	
<i>time in seconds to wait between Wibu dongle retries</i>	
Disable dongle	tick box
<i>if tick, don't search for a Wibu dongle</i>	
<i>if no tick, search for a Wibu dongle</i>	
Debug dongle	tick box
<i>if tick, write out Wibu dongle debug information</i>	
Hardlock IP/Name addresses	
<i>if non blank, a list of IP addresses and/or computer names to search for a 12d Wibu network dongle.</i>	
<i>if blank, search the entire network for a 12d Wibu network dongle</i>	
System A tab	
Text editor	EDITOR_4D
<i>the script or program that is fired up when a report is created. It usually points to an editor.</i>	
Genio wildcard	GENIO_WILDCARD_4D
<i>Sets the ending of the files selected for the pop-up list for the File field in the Read Genio Data panel.</i>	
Degrees character	DEGREES_CHARACTER_4D
<i>The integer (base 10) value of the character to use as the degrees symbol.</i>	
Pre*postfix for model for tin	MODEL_FOR_TIN_PREFIX_4D
<i>Customize the default model for the tin in the panels for creating triangulations.</i>	
Amount of report header	REPORT_HEADER_4D
<i>Controls the amount of header information in reports.</i>	
Typed units mode	TYPED_UNITS_MODE_4D
<i>Controls the typed input units for feet - international and/or US.</i>	
Default table width	DEFAULT_TABLE_WIDTH_4D
<i>Gives the number of characters displayed in tables such as decisionals and mtf editor.</i>	
Default view colour	DEFAULT_VIEW_COLOUR_4D
<i>The default background colour for views.</i>	
Double confirm delete	DOUBLE_CONFIRM_DELETE_4D
<i>Controls whether the user is asked once or twice to confirm for deletes and cleans.</i>	
Use bisector section	BISECTORS_4D
<i>At a HIP with no curve on it, either two sections can be applied at the HIP point or just a single bisector section applied to the bisector of the change of angle through the HIP.</i>	

- Disable mtf warnings** `DISABLE_MTF_WARNINGS_4D`
Controls whether the mtf warnings go to a file or to the output window.
- Drainage flows in descending chainage** `DRAINAGE_FLOW_DIR_4D`
Defines the default flow direction used in the creating a drainage string.
- Plan table settings** `PLAN_TABLE_SETTINGS_4D`
Defines the default flow direction used in the creating a drainage string.
- Zoom origin dynamic** `ZOOM_ORIGIN_DYNAMIC_4D`
Controls the origin of the dynamic zoom.
- Zoom pan dynamic** `ZOOM_PAN_DYNAMIC_4D`
If set then dynamic pan is the default for the pan options.
- Data tool tips** `DATA_TIPS_4D`
If set then turn on data tool tips.
- Icons on views** `VIEW_BITMAP_BUTTONS_4D`
If set then icons are used for the menu items on views.
- Use new strings create** `NEW_STRING_CREATES_4D`
*If set then the string creates are for super strings.
 If not set, the string creates are the non-super string creates.*

System B tab

- Delete walkrights distance** `AUTO_DELETE_WALKRIGHTS_4D`
The distance in pixels that is used to collapse the cascade of walk-right menus when the cursor moves that distance past the end of the last walk-right menu.
- Drag reset distance** `AUTO_RESET_SELECT_DRAG_TOLERANCE_4D`
The distance in pixels to move the cursor to reset the picking rejection list for a directional pick. If blank then the value 50 is used.
- Reset distance** `AUTO_RESET_SELECT_TOLERANCE_4D`
The distance in pixels to move the cursor to reset the picking rejection list for a non-directional pick. If blank then the value 5 is used.
- Weed Tolerance** `WEED_TOLERANCE_4D`
Used in Alignment and Super strings so that when arcs have been chord-to-arc'd, the resulting points are weeded so that no point is closer than the weed tolerance. Is also used in Apply and Apply Many so that no cross sections are closer than the weed tolerance.
- Polyline draw** `POLYPOLYLINES_4D`
Different methods that speed up drawing of polylines.
- Web search** `WEB_SEARCH_4D`
Web address that's used in 12d option "Help =>12d on the Web =>Search the web"
- Recent projects** `RECENT_PROJECTS_4D`
Maximum number of accessed projects displayed in the Project list when 12d Model first starts up.
- Plan plot scale** `DEFAULT_PLAN_PLOT_SCALE_4D`
Default plot scale used on any plan views.
- Toolbars file** `TOOLBARS_4D`
The file of toolbar definitions and names.

Textstyle favourites file TEXTSTYLE_MAPPINGS_4D

The file of textstyle favourites.

Nodes file AUTHORIZATION_4D

The authorisation file (nodes.4d file).

Show full path name SHOW_PATHS_4D

When 12d Model fires up the actual file names defined by any environment variables are written to the output window. This is useful for debugging.

Show Vista full path name SHOW_VISTA_VIRTUAL_STORE_PATHS_4D

For Microsoft Vista, when 12d Model fires up the actual file names defined by any environment variables are written to the output window. This is useful for debugging.

Only use super string USE_SUPER_STRINGS_4D

If set, super strings are created by all options.

Enable undo UNDO_4D

Allow Undos.

Tin viewport clip TIN_VIEWPORT_CLIP_4D

Ignore extra tabs in field files FLD_IGNORE_EXTERA_WORDS_4D

If set, trailing tabs are not considered words in a field file. Mainly for Leach when it can't suppress trailing tabs when writing a 12d Field file.

Alignment VG Corridor fixup ALIGNMENT_CORRIDOR_FIXUP_4D

Autopan on selects AUTO_PAN_SELECT_4D

Setup A tab

Autocad template folder ACAD_SEEDFILES_4D

Folder of Autocad template files.

Microstation seed folder MS_SEEDFILES_4D

Folder of Microstation seed files.

CivilCAD folder CIVILCAD_PATH_4D

Folder of CivilCAD files.

TP Stakeout folder TP_STAKEOUT_PATH_4D

Folder of TP Stakeout files.

Xtra menu file EXTRA_OPTIONS_4D

The 12D Solutions supplied file of definitions for some menus.

Data collectors file DATA_COLLECTORS_4D

File defining the available data collectors.

Data collector DATA_COLLECTOR_4D

The data collector that is used in the Survey Data Setup panel or to use if no data collector has been set for a project.

Station prefix STATION_PREFIX_4D

The default prefix to use in the Survey Data Setup panel or to use if prefix has been set for the project.

Fonts file FONT_4D

The file of text fonts to use.

Function keys file	FUNCTION_KEYS_4D
	<i>The file of function key definitions.</i>
Library folder	LIB_4D
	<i>The 12D Solutions supplied library folder.</i>
Linestyles file	LINESTYLES_4D
	<i>The file of linestyle definitions.</i>
Log folder	LOG_DIR_4D
	<i>The folder for the 12d Model log files.</i>
Name mappings file	NAME_MAPPINGS_4D
	<i>The file of name mappings.</i>
Printer script	PRINTER_4D
	<i>Points to a script or program which can be fired up whenever a report is generated.</i>
Allow named point attributes	ALLOW_NAMED_POINT_ATTRIBUTES_4D

Setup B tab

Use "Documents and Settings\All Users" for env.4d, user, user_lib folders	USE_ALL_USERS_PROFILE_4D
Sharelocking folder	SHARE_LOCKS_FOLDER_4D
	<i>The 12D Solutions folder used keeping lock files for shares.</i>
Setups folder	SET_UPS_4D
	<i>The 12D Solutions supplied set_ups folder.</i>
Setups file	SET_UPS_FILE_4D
	<i>The file for setting up the initial screen layout for new projects.</i>
Spirals file	SPIRALS_4D
	<i>The file for spiral definitions.</i>
Textstyles file	TEXTSTYLES_4D
	<i>The file of text styles to use.</i>
User folder	USER_4D
	<i>The User folder.</i>
User library folder	USER_LIB_4D
	<i>The User Library folder.</i>
User options file	USER_OPTIONS_4D
	<i>File for the definition of user defined menus.</i>
Vpath DOS folder	VEHICLE_PATH_4D
	<i>Folder for the Queensland Main Road DOS program Vpath - for vehicle turning paths.</i>
Vpath Windows folder	WINDOWS_VEHICLE_PATH_4D
	<i>Folder for the Queensland Main Road DOS program Vpath - for vehicle turning paths.</i>
Winter program	WINTER_4D
	<i>The program WINTER for calculating N-values.</i>
Winter data folder	WINTER_4D
	<i>Folder containing the Winter data of N-values for Australia.</i>

- New project workspace file** WORKSPACE_FILE_4D
Full path name of the workspace file for new projects.
- New project details file** PROJECT_DETAILS_4D
Full path name of the project details file for new projects.
- Report files in non Unicode format** ANSI_REPORTS_4D
If set, report files are written out in ANSI from Unicode versions of 1'2d.

Plotting A tab

- Use V7 Title blocks** V7_TITLE_BLOCKS_4D
Use 12d ascii for title block definitions instead of old .tf files.
- Show title variables** SHOW_TITLE_VARIABLES_4D
For debugging the title block file.
- Binary drainage plan parameter file** NEW_DRAINAGE_PLAN_PPF_4D
Default binary drainage plan ppf file.
- Binary Melbourne Water parameter file** NEW_DRAINAGE_MELB_PPF_4D
Default binary drainage plan ppf file.
- Binary drainage parameter file** NEW_DRAINAGE_PPF_4D
Default binary drainage long section ppf file.
- Binary pipeline parameter file** NEW_PIPELINE_PPF_4D
Default binary pipeline long section plot ppf file.
- Binary plot frame parameter file** NEW_PLOT_FRAME_PPF_4D
Default binary plot frame ppf file.
- Binary long section parameter file** NEW_LONG_SECTION_PPF_4D
Default binary long section ppf file.
- Binary x- section parameter file** NEW_X_SECTION_PPF_4D
Default binary x-section ppf file.
- Symbol file for long and x-sections** PLOT_SYMBOLS_4D
Default plot symbols file.
- Plotter script** PLOTTER_4D
Points to a script or program which is fired up whenever a plot is generated.
- User plotters** PLOTTERS_4D
File containing the definitions of plotters.
- Plotter mapping file** PLOTTER_MAPPING_4D
The default plotter mapping file.
- Sheet sizes file** SHEET_SIZES_4D
File defining the plot sheet sizes.
- DGN plot seed file** DGN_PLOT_SEED_FILE_4D
Seed file to use for Microstation plots.
- DWT plot template file** DWG_PLOT_SEED_FILE_4D
Template file to use for AutoCAD plots.

Acad plot unit DWG_PLOT_UNIT_FILE_4D Metric, English

Plotting B tab

Use hardware arcs HARDWARE_ARCS_4D

Use computer hardware to draw arcs (rather than software).

Write all plot parameters WRITE_ALL_PLOT_PARAMETERS_4D

Controls whether all plot parameters are written out or just those that have been used in the ppf file.

Show old plotting options ALLOW_OLD_PLOTTING_4D

If set then a menu with all the old Ascii plot files is displayed.

Offset chainages to output window SPECIAL_OFFSET_CHAINAGES_4D

X-section parameter file X_SECTION_PPF_4D

Default x-section ascii ppf file.

Long-section parameter file LONG_SECTION_PPF_4D

Default long section ascii ppf file.

Drainage-parameter file DRAINAGE_PPF_4D

Default drainage long section ascii ppf file.

Melbourne Water parameter file SEWER_PPF_4D

Default Melbourne Water long section ascii ppf file.

Plotting C tab

Enable Windows printers WINDOWS_PRINTERS_4D

If set, use Windows printers.

Windows 2000/XP print dialog WINDOWS_PRINT_MODE_4D = 1

Use exclusive access to printer WINDOWS_PRINT_MODE_4D = 2

Use intermediate print file WINDOWS_PRINT_MODE_4D = 4

Raster resolutions dots/inch DEFAULT_RASTER_DPI_4D

dots per inch to use for plotting rasters

Maximum time for Pdf995 (seconds) PDF995_TIME_LIMIT_4D

Extra A tab

Acad pat AUTOCAD_PATTERNS_4D

If non blank, the full path name of the AutoCAD patterns file.

Colours.4d COLOURS_4D

If non blank, the full path name of the file to use as the 12d Model colour file.

Defaults.4d DEFAULTS_4D

If non blank, the full path name of the file to use as the 12d Model defaults file.

Digitizers.4d DIGITIZERS_4D

If non blank, the full path name of the file to use as the 12d Model digitizers file.

Drainage.4d DRAINAGE_4D

If non blank, the full path name of the file to use as the 12d Model drainage file.

Patterns.4d PATTERNS_4D

If non blank, the full path name of the file to use as the 12d Model patterns file.

Symbols.4d SYMBOLS_4D

If non blank, the full path name of the file to use as the 12d Model symbols file.

Macros.4d RUN_MACROS_FILE_4D

If non blank, the full path name of the file of macros that is run when 12d Model creates a new project.

Project_macros.4d RUN_PROJECT_MACROS_FILE_4D

If non blank, the full path name of the file of macros that is run when 12d Model opens an existing project.

Help folder HELP_4D

If non blank, the full path name of the folder containing the 12d Model help files.

Usage log folder USAGE_LOG_4D

Usage logs folder USAGE_LOGS_4D

Extra B tab

DIAMETER_LARGE_CHARACTER_4D

The integer (base 10) value of the character to use as the large diameter symbol.

CUBED_CHARACTER_4D

The integer (base 10) value of the character to use as the cubed symbol.

DIAMETER_SMALL_CHARACTER_4D

The integer (base 10) value of the character to use as the small diameter symbol.

MIDDLE_DOT_CHARACTER_4D

The integer (base 10) value of the character to use as the middle dot symbol.

SQUARED_CHARACTER_4D

The integer (base 10) value of the character to use as the squared symbol.

Extra C tab

Fast accept FAST_ACCEPT_4D

If set, the Fast Accept snap (A snap) is turned on by default.

Fast Construction snap FAST_CONSTRUCTION_SNAP_4D

If set, the Fast Construction Snap (K snap) is turned on by default.

Construction snaps model CONSTRUCTION_SNAP_MODEL_4D

If non blank, the model to use for constructions.

Plan height max HEIGHT_MAX_DEFAULT_4D

If non blank, the maximum height in pixels for a plan view.

Show help buttons HELP_BUTTONS_4D

If set, Help buttons are added to panels.

Windows printer resolution dots/mm HIMETRIC_4D 0 or 1

Use lists for popups LIST_POPUPS_4D

If set, the popup lists are scrolling lists.

If not set, the popups turn into walk-right menus when too long.

Macro input mode	MACRO_INPUT_MODE_4D	
Never snap to self	NEVER_SNAP_ITSELF_4D	
Default pan mode	PAN_MODE_4D	
Short project names	PROJECT_NAMES_4D	
Super strings ?	SUPER_STRINGS_4D	
System names	SYSTEM_NAMES_4D	Old, New, New then Old
Warp cursor hide	WARP_CURSOR_HIDE_4D	
Show old grading edit options	DRAINAGE_EDIT_GRADE_4D	
Show full hydraulic report details	FULL_HYDRAULIC_REPORT_4D	
Multi-line text edits	MULT_LINE_TEXT_4D	
MTF extra start/end	EXTRA_START_END_4D	
Speed tables	SPEED_TABLES_4D	
Always user Super Strings advanced model	SUPER_ADVANCED_MODE_4D	

OpenGL tab

Use offset	OPENGL_OFFSET_4D
Cache texture rasters	OPENGL_CACHE_4D
User mipmaps	OPENGL_MIPMAP_4D

Variable tab

Name	Value
-------------	--------------

*The variable tab consists of a table for specifying environment variable names (**Name**) and setting their values (**Value**).*

*This is mainly used for setting environment variables that are not already in the **Edit Environment Variables** panel.*

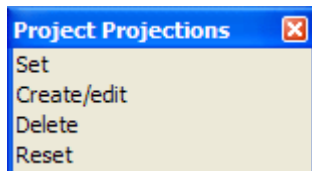
Projections

project_projections

Position of menu: Project =>Management =>Projections

User defined Projections can be defined using the Create/edit option. A user defined projection can then be set for the project (the project projection). Values from the project projection (e.g. scale factor) are used in various options.

The **Project projections** walk-right menu contains various projection items.



set the default projection for the project
create/edit project definitions
delete a project definition
reset the projection set for the project

For the option *Set*, go to the section "Set Projection" .

<i>Create/edit</i>	"Create/Edit Projection" .
<i>Delete</i>	"Delete Projection" .
<i>Reset</i>	"Reset Projection" .

The options in the menu will now be described.

Set Projection

set_projection

Position of option on menu: Project =>Management =>Projections =>Set

The Set option sets the Project projection.

On selecting the Set option, the **Set Projection** panel is displayed.

The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Datum name	input	all defined projections	

name of the projection to be set as the Project projection.

Depending on the projection type, the relevant projection parameters are displayed.

Set	button
------------	--------

after selecting this button, the current projection is set using the displayed values. These values are used for subsequent calculations in the project

Create/Edit Projection

[create_edit_projection](#)

Position of option on menu: Project =>Management =>Projections =>Create/Edit

On selecting the Create/edit option, the **Create/edit Projection** panel is displayed.

For more information about terminology used in this sections, see the Appendix “Geodetics Summary” .

Field Description	Type	Defaults	Pop-Up
Datum name	input	all defined projections	

name of the projection to be set as the Project projection.

Projection Type	input	Transverse Mercator, UTM
------------------------	-------	--------------------------

RSO, General

the type of projection to be set as the Project projection.

For more information on defining a "general" projection, please go to “Defining a General Cartographic Projection”

Depending on the projection type, the relevant projection parameters can be entered.

Use known ellipsoid tick box tick

if **tick**, the ellipsoid for the projection has been defined previously and the parameters for the particular ellipsoid can be used. The values of defined ellipsoids are displayed when a selection is made from the ellipsoid pop-up box (e.g. GRS80).

if **no tick** then the ellipsoid parameters can be defined by entering the ellipsoid parameters.

Add/Modify button

after selecting this button, the user defined projection is added to the current list or the existing projection definition is modified. using the entered values. A number of new projections can be added by simply entering the relevant data and selecting the add/modify button.

Write button

after selecting this button, the user defined projections defined by the add/modify process can be written in various locations. This means that the defined projections will be allowed to be set in current and future projects. For more information on the **Write** button, go to the section "Writing Set Up Files" in the Appendix "Set Ups"

Defining a General Cartographic Projection

A general *cartographic projection* is defined by giving a series of parameters starting with the mandatory **+proj** parameter giving the projection type. For example,

+proj=projection_type e.g. **+proj=tmerc** or **+proj=utm**

To specify the Earth's elliptical figure used in the projection, two parameters are required.

The first required value is the **major semi-axis** of the ellipse or equatorial radius,

major semi-axis of the ellipse **+a= value**

and the second parameter can be any one of the following standard forms:

minor semi-axis of the ellipse **+b= value**
 flattening **+f= value**
 reciprocal flattening (i.e. 1/f) **+rf= value**
 eccentricity **+e= value**
 eccentricity squared) **+es= value**

For example, the Australian National Spheroid (ANS) is defined by:

+a=6378160
+rf= 298.25

GRS80 is defined by:

+a=6378137
+rf= 298.257222101

WGS84 is defined by:

+a=6378137
+rf= 298.257223663

A further three parameters are common to most projections:

the **central meridian** **+lon_0=value**, and the cartesian offsets for the respective x and y axis, **+x_0=value**, **+y_0=value** (often referred to as false easting and northing).

central meridian **+lon_0= value** units in **decimal**
degrees

x offset- false easting **+x_0=value**
 y offset - false northing **+y_0=value**

A fourth parameter, **+lat_0=value**, is used to designate a central parallel and associated y axis origin for a projection.

Unless a value is specified for the parameters lon_0, lat_0, x_0 and y_0, they are assumed to be zero.

Other parameters will depend on the particular projection used.

Transverse Mercator Projection **+proj=tmerc**

project **+proj=tmerc**
scale factor **+k=value**

e.g. Metro-Perth is:

```
+proj=tmerc +a=6378160 +rf=298.25 +lon_0=115.833333333 +lat_0=0.0 +x_0=54466.561
+y_0=3690893.265 +k=1.0
```

Perth Coastal Grid 1984 (PCG84) is:

```
+proj=tmerc +a=6378160 +rf=298.25 +lon_0=115.833333333 +x_0=40000 +y_0=3800000
+k=1.000006
```

Universal Transverse Mercator Projection **+proj=utm**

This is a special form of the Transverse Mercator Projection. The central meridian is constrained to 6 degree intervals starting at 3 degrees. An extra parameter exists called **+zone** where **+zone=1** specifies the region from 180 degree W to 174 degrees W (equivalent to **+lon_0=177** degrees W) and proceeds easterly until **+zone=60** for the region from 174 degree E to 180 degrees E (i.e. **+lon_0=177** degrees E). Hence

+zone=N N = 1, 2,... 60

which automatically defines the central meridian **+lon_0= 6 x N - 183** where N = zone number.

The **+south** option adds a false northing of 10,000,000 m (used for AMG and MGA co-ordinates) for projection in the Southern Hemisphere.

+south defines **+y_0=10000000**

In all cases, for a Universal Transverse Mercator projection, a false easting of 500,000 m is used.

+x_0=500000

Australian Map Grid (AMG84)

The Australian Map Grid is a Universal Transverse Mercator Projection with

- coordinates are in metres
- zones are 6 degrees wide plus overlapping belts of 80 kilometres at each grid junction
- AMG zones are numbered from zone 49 with central meridian 111 degrees E to zone 57 with central meridian 159 degrees E.
- the origin of each zone is the intersection of the central meridian with the equator
- a central scale factor, k, is defined as 0.9996
- a false easting of 500,000 and a false northing of 10,000,000 are used
- uses the Australian National Spheroid **+a=6378160 +rf=298.25**

For example, the definition of AMG zone 50 is:

+proj=utm +south +zone=50 +k=0.9996 + a=6378160 +rf=298.25

Map Grid of Australia (MGA94)

The Map Grid of Australia is a Universal Transverse Mercator Projection with

- coordinates are in metres
- zones are 6 degrees wide plus overlapping belts of 80 kilometres at each grid junction

- (c) MGA zones are numbered from zone 49 with central meridian 111 degrees E to zone 57 with central meridian 159 degrees E.
- (d) the origin of each zone is the intersection of the central meridian with the equator
- (e) a central scale factor, k, is defined as 0.9996
- (f) a false easting of 500,000 and a false northing of 10,000,000 are used.
- (g) uses GRS80 +a=6378137 +rf=298.257222101

For example, the definition of MGA zone 50 is:

+proj=utm +south +zone=50 +k=0.9996 + a=6378137 +rf=298.257222101

Lambert Conformal Conic Projection +proj=lcc

This is a special form of the Conic Projection.

There are two standard parallels **+lat_1** and **+lat_2** and the projection is centred on **+lat_0** and **+lon_0**

For example, a Lambert Conformal Conic Conformal with standard parallels of 15 degrees South and 39 degrees South, centred at 27 degrees South 134 degrees East, with a false origin at that point is 5,000,000m/5,000,000m and using the Australian National Spheroid (i.e. AGD84) is

**+proj=lcc +lat_1=-15 +lat_2=-39 +lon_0=134 +lat_0=-27
+x_0=5000000 +y_0=5000000 +a=6378160 +rf=298.25**

Delete Projection

[delete_projection](#)

Position of option on menu: Project =>Management =>Projections =>Delete

The **Delete** option deleted a projection from the list of available projections.

On selecting the **Delete Projection** option, the **Delete Projection** panel is displayed.

The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Datum name	input		all defined projections

name of the projection to be deleted from the Project projection list.

Depending on the projection type, the relevant projection parameters are displayed.

Delete button

after selecting this button, the selected projection is deleted from the project projection list.

This can be done for a number of projections by simply selecting the projection to be deleted and selecting the delete button.

Write button

*after selecting this button, the list of projections altered by the delete process can be written in various locations. This means that the updated projections list will be used to set current and future projects. For more information on the **Write** button, go to the section “Writing Set Up Files” in the Appendix “Set Ups”*

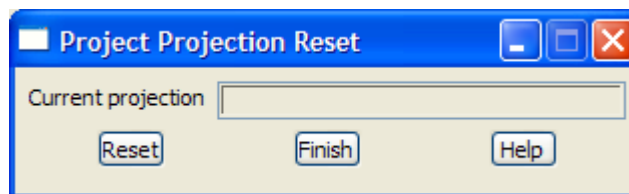
Reset Projection

[project_projection_reset](#)

Position of option on menu: Project =>Management =>Projections =>Reset

The **Reset** option is used to remove the projection set for the project.

On selecting the **reset Projection** option, the **Project Projection Reset** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	pop-Up
Current projection	output only		

name of the projection currently set for the project.

Reset button

after selecting this button, the projection for the project is set to none. That is, no project has been set for the Project

N values

project_n_value_settings

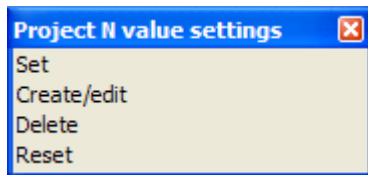
Position of menu: Project =>Management =>N values

N values are the separation distances between the geoid and the ellipsoid. In GPS surveys, heights are often given in ellipsoid heights whilst most other level datums are based on the geoid. Since most geodetic calculations are based on the ellipsoid, any observations should be reduced onto the ellipsoid. This reduction process takes into the consideration the heights above the ellipsoid. Therefore, it is necessary to convert non ellipsoid heights to ellipsoid values by adding the geoid-ellipsoid separations (n values). There are various methods for determining the N values.

An N value method can be defined using the Create/edit option. A user defined N value method can then be set for the project (the project N value setting). Values from the project N value settings are used to determine which method is used to calculate N values. These values are used in various options where the level values are not ellipsoid values and require the N value to be added to get to an ellipsoid height.

For more information about terminology used in this section, see the Appendix "Geodetics Summary" .

The **Project n value** walk-right menu contains various projection items.



set the default N-values for the project
create/edit N-values definitions
delete a N-values definition
reset the N-values set for the project

For the option *Set*, go to the section "Set N-Values" .

<i>Create/edit</i>	"Create/Edit N-Values" .
<i>Delete</i>	"Delete N-Values" .
<i>Reset</i>	"Reset N-Values" .

The options in the menu will now be described.

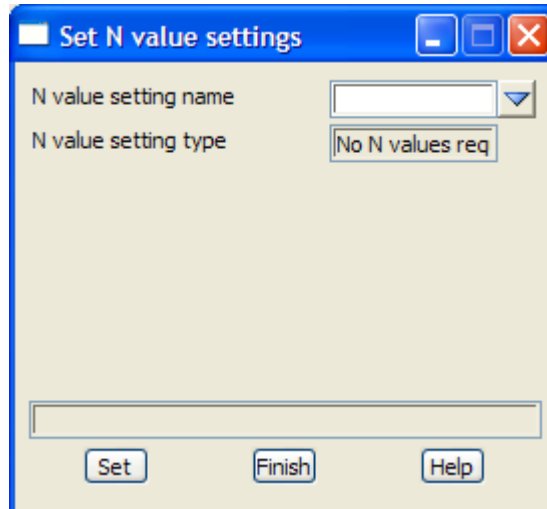
Set N-Values

set_n_value_settings

Position of option on menu: Project =>Management =>N values =>Set

The **Set** option sets the Project projection.

On selecting the **Set** option, the **Set N value settings** panel is displayed.



The fields and buttons used in this panel have the following functions.

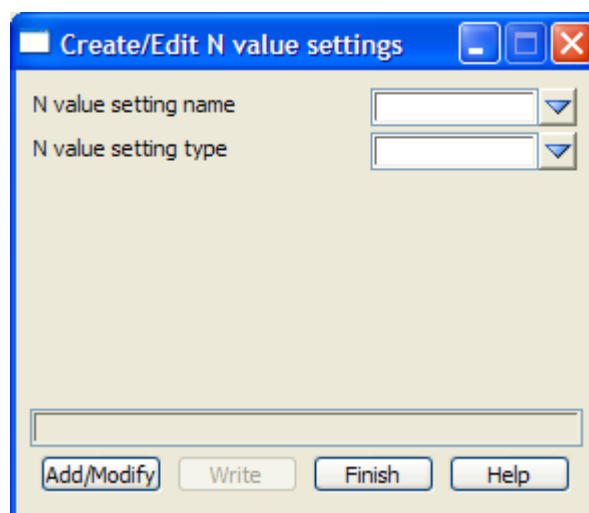
Field Description	Type	Defaults	Pop-Up
N value setting name	choice box		all defined N value settings
<i>name of the n value setting to be set as the Project N value setting.</i>			
N value setting type	input	defined N value types	
<i>Depending on the N value interpolation method, the relevant method is displayed.</i>			
Set	button		
<i>after selecting this button, the current N value setting is set using the displayed values. These values are used for subsequent calculations in the project</i>			

Create/Edit N-Values

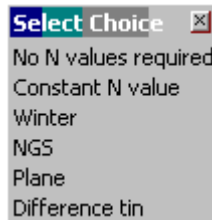
[create_edit_n_value_settings](#)

Position of option on menu: Project =>Management =>N values=>Create/Edit

On selecting the Create/edit option, the Create/edit N value settings panel is displayed.



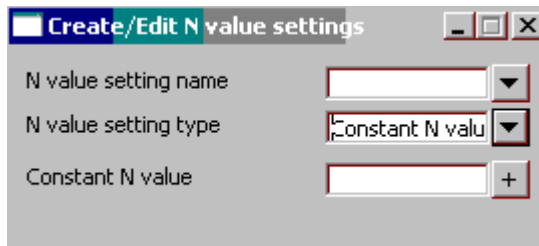
Field Description	Type	Defaults	Pop-Up
N value setting name	choice box		all defined N value settings
<i>name of the n value setting to be set as the Project N value setting.</i>			
N value setting type	choice box	defined N value types	
<i>There are various methods for the determination of the N values. These are given in the choice box:</i>			



Depending on the setting type chosen, the panel will display the appropriate fields.

No N values required: This applies to data that already has ellipsoid heights and requires no interpolation for N values.

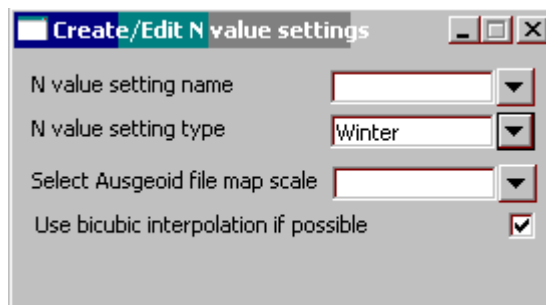
For N value setting type = Constant N value



Field Description	Type	Defaults	Pop-Up
Constant N value	input box		
<i>this N value will be used for the entire n value interpolation process. (i.e. it will not change).</i>			

For N value setting type = Winter

This method uses the same method as the Winter interpolation software supplied by Auslig. The data files used should be winter compatible and reside in a directory that is pointed to by the WINTER_DATA_4D parameter in the env.4d file. The data files can be downloaded from the Auslig website.



Field Description	Type	Defaults	Pop-Up
Select Ausgeoid file map scale	choice box	1:100,000 1:250,000 1:1,000,000	

*this value will be dependant on the type of files to be used by winter. **The files themselves should be in a directory that is pointed to by the WINTER_DATA_4D parameter in the setup area of the env.4d file.***

Use bicubic interpolation if possible tick box

if ticked, the bicubic interpolation method will be used if possible.

For N value setting type = NGS

This method is currently under development.

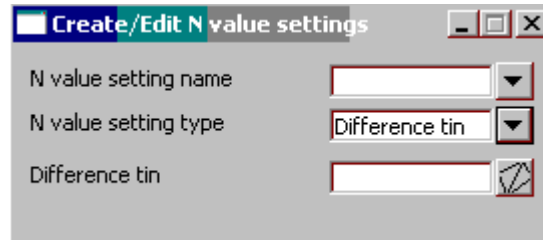
For N value setting type = Plane

This method allows a plane to be defined allowing N values to be derived from that plane.

Field Description	Type	Defaults	Pop-Up
Origin easting	input box		
<i>the origin easting value.</i>			
Origin northing	input box		
<i>the origin easting value.</i>			
Corr constant	input box		
<i>the constant z value of the plane.</i>			
Corr per unit easting	input box		
<i>the z value correction per unit easting.</i>			
Corr per unit northing	input box		
<i>the z value correction per unit nothing.</i>			

For N value setting type = Difference tick box

This method allows value to be interpolated from a difference tin. A difference tin is simply a tin of difference values (N values). This tin can be re-triangulated as new points become available, thus introducing more points than a regular grid.



Field Description	Type	Defaults	Pop-Up
Difference tin	tin box		Available tins
Add/Modify	button		

the difference tin from which the N values will be interpolated.

after selecting this button, the user defined N value settings are added to the current list or the existing N value settings is modified. using the entered values. A number of new settings can be added by simply entering the relevant data and selecting the add/modify button.

Write button

*after selecting this button, the user defined N value settings defined by the add/modify process can be written in various locations. This means that the defined N value settings will be allowed to be set in current and future projects. For more information on the **Write** button, go to the section “Writing Set Up Files” in the Appendix “Set Ups”*

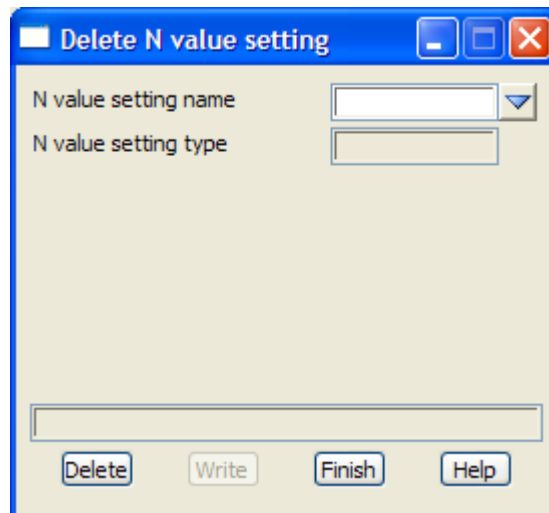
Delete N-Values

Delete_N_value_setting

Position of option on menu: Project =>Management =>N value =>Delete

The **Delete** option deleted a projection from the list of available projections.

On selecting the **Delete** option, the **Delete N value setting** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
N value setting name	input		all defined N value settings
<i>name of the setting to be deleted from the N value setting list. Depending on the setting type, the relevant setting parameters are displayed.</i>			
Delete	button		
<i>after selecting this button, the selected N value setting is deleted from the setting list. This can be done for a number of n value settings by simply selecting the projection to be deleted and selecting the delete button.</i>			
Write	button		
<i>after selecting this button, the list of n value settings altered by the delete process can be written in various locations. This means that the updated n value settings list will be used to set current and future projects. For more information on the Write button, go to the section "Writing Set Up Files" in the Appendix "Set Ups"</i>			

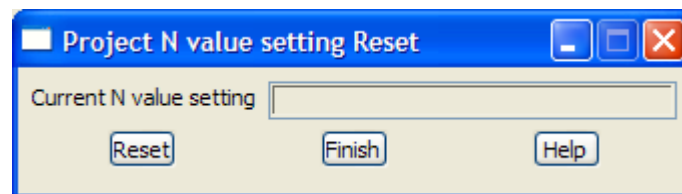
Reset N-Values

Project_N_value_setting_Reset

Position of option on menu: Project =>Management =>N values =>Reset

The **Reset** option is used to remove the projection set for the project.

On selecting the **reset** option, the **Project N value setting reset** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Current N value setting	output only		
<i>name of the n value setting, set for the project.</i>			
Reset	button		
<i>after selecting this button, the N value setting for the project is set to none. That is, no N value setting has been set for the Project</i>			

7 Parameters

[project_7_parameter_settings](#)

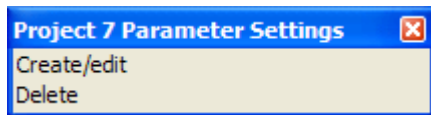
Position of menu: Project =>Management =>7 parameters

Seven (7) parameter transformations are used to transform data between two ellipsoids. They are also known as 7 parameter similarity transforms, Bursa-Wolf, 7 parameter Helmert transformations.

Warning: the definition and hence sign of some terms varies between countries.

In 12d Model, the seven parameter similarity transformations are used in the **General Transformation** option *Survey =>Conversions =>General transformations* (see “General Transformations” in the chapter “Survey”) and the transformation is applied in the Global XYZ system.

The **7 parameters** walk-right menu contains options to create and delete seven parameter transformation setting.



create/edit 7 parameter definitions
delete 7 parameter definitions

For the option *Create/edit*, go to the section “Create/Edit 7 Parameters”
Delete “Delete 7 Parameters”

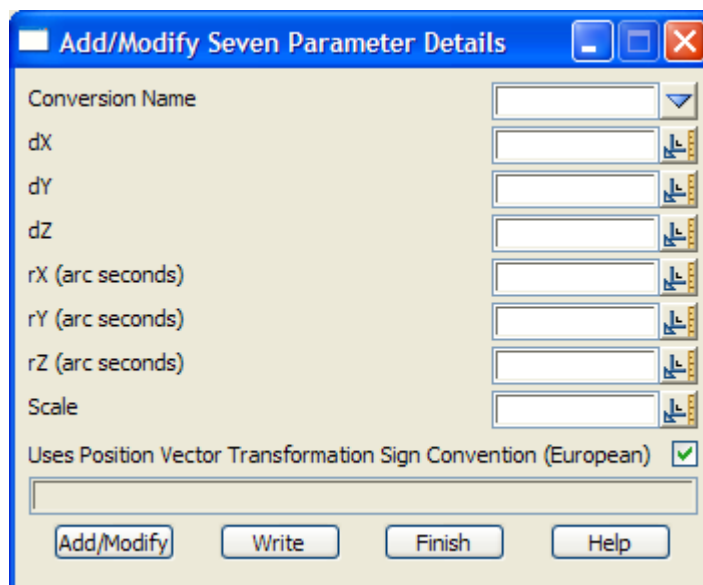
The options in the menu will now be described.

Create/Edit 7 Parameters

[add_modify_seven_parameter_details](#)

Position of option on menu: Project =>Management =>7 parameters=>Create/Edit

On selecting the *Create/edit* option, the **Add/Modify Seven Parameter Details** panel is displayed.



Field Description	Type	Defaults	Pop-Up
Conversion name <i>name of the 7 parameter setting to be created/edited.</i>	choice box		all defined 7 param settings
DX, DY, DZ <i>the translations for the 7 parameter transformation.</i>	input box		
rX (arc seconds), rY (arc seconds), rZ (arc seconds) <i>the rotations, in arc seconds, for the 7 parameter transformation.</i>	input box		
Scale <i>the scale for the 7 parameter transformation.</i>	input box		
Use Position Vector Transformation sign convention (European) <i>if tick, the European Position Vector Transformation convention is used. If not tick, PVT sign is not used (mainly not used for USA). Depending on the sign convention, some of the parameters will have the opposite sign.</i>	tick box		
Add/Modify <i>after selecting this button, either the new 7 parameter set is created or an exiting one modified. To save the setting list, use the Write button.</i>	button		
Write <i>after selecting this button, the user defined 7 parameter settings are written out to the file "7params.4d" in the user selected folder. This means that the 7 parameter settings will be available in the current and future projects. For more information on the Write button, go to the section "Writing Set Up Files" in the Appendix "Set Ups"</i>	button		

Delete 7 Parameters

[Delete_seven_parameter_details](#)

Position of option on menu: **Project =>Management =>7 parameters =>Delete**

The **Delete** option deleted a seven parameter set from the list of available seven parameter settings.

On selecting the **Delete** option, the **Delete 7 Parameter Details** panel is displayed.

The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Conversion name	input		all defined 7 param settings
<i>name of the 7 parameters setting to be deleted from the 7 parameter settings list. The relevant setting parameters are displayed.</i>			
Delete	button		
<i>after selecting this button, the selected 7 parameter setting is deleted from the setting list. This can be done for a number of 7 parameter sets by simply selecting the name to be deleted and selecting the delete button. To save the modified setting list, use the Write button</i>			
Write	button		
<i>after selecting this button, the user defined 7 parameter settings are written out to the file "7params.4d" in the user selected folder. This means that the 7 parameter settings will be available in the current and future projects. For more information on the Write button, go to the section "Writing Set Up Files" in the Appendix "Set Ups"</i>			

Workspace

[project_workspace](#)

Position of menu: Project =>Management =>Workspace

Options to set up the project

The **Project Workspace** walk-right menu contains various projection items.



For the option *Setup*, go to the section "Workspace Setup"
 For the option *Load*, go to the section "Workspace Load"

Workspace Setup

[workspace_setup](#)

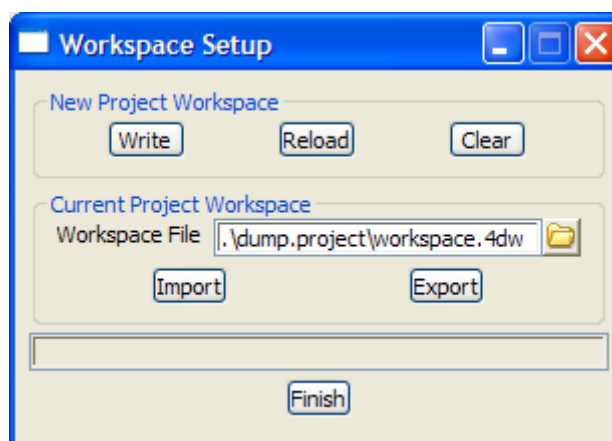
Position of option on menu: Project =>Management =>Workspace =>Setup

The workspace file is used to define the position of toolbars and output window for a new projects.

Once inside an existing project, the workspace file is no longer used and the final positions of the toolbars and output window are recorded inside the project so they come up in the same final position as when the project is reopened.

The Workspace Setup option allows the user to define new workspace setup files that can be loaded at any time in an existing project or used as the default workspace file used for all new projects.

On selecting the **Setup** option, the **Workspace Setup** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Write	button		
--------------	--------	--	--

write out the current toolbar configuration to a .4dw file.

Load	button		
-------------	--------	--	--

read in the workspace.4dw file in the current project folder.

Clear button

remove all the current toolbars and read in the default workspace.4dw file

Workspace file file box current workspace file *.4dw files

name of the workspace file to re imported/exported

Import button

read in and use the workspace file given in the Workspace file field.

Export button

write the current toolbar settings out to the workspace file given in the Workspace file field.

Workspace Load

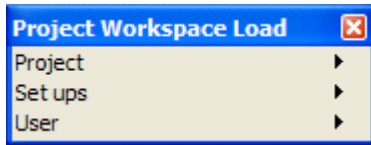
[project_workspace_load](#)

Position of menu: Project =>Management =>Workspace >Load

This option displays and selects a project workspace file to set up the icons etc. on the screen.

The **Project Workspace Load** walk-right menu contains further walk-rights to display the workspace files in the local project, the set ups folder and the user folder.

To load a workspace file, simply click on the name in the walk-right lists.



list and load workspace files in the project
list and load workspace files in the set ups folder
list and load workspace files in the user folder

Tree

Position of option on menu: Project =>Tree

Position of option on menu: Project =>Management =>Tree

For documented on this option, go to the section "Tree"

Share Settings

[project_share_settings](#)

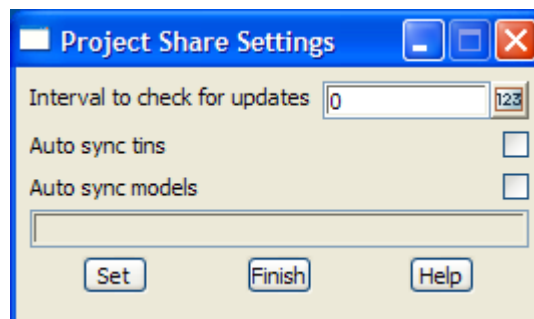
Position of option on menu: Project =>Management =>Share settings

There are three environment variables that control the auto-synchronizing of any shared models or tins added to this project.

SHARE_CHECK_INTERVAL_4D	number_of_seconds
AUTO_MODEL_SYNC_4D	1 or 0
AUTO_TIN_SYNC_4D	1 or 0

This option will temporarily modified the values for this session. When the project is restarted, the values will revert to those given by the environment variables.

Selecting Share settings, brings up the **Project Share Settings** panel.



The fields and buttons used in this panel have the following functions.

Field	Description	Type	Defaults	Pop-Up
-------	-------------	------	----------	--------

Interval to check for updates input

time in seconds to check if any of the shared models or tins added to the project have been updated in the server projects.

The environment variable controlling this when the project starts up is

SHARE_CHECK_INTERVAL_4D	number_of_seconds
-------------------------	-------------------

The value is only modified for this session. To permanently change the value, please modify the environment variable.

Autosync tins tick box

if tick, the server projects for any shared tins added to this project are checked to see if they have been modified (checked every SHARE_CHECK_INTERVAL seconds). If any tins have been modified, they are re-copied to this project.

The environment variable controlling this when the project starts up is

AUTO_TIN_SYNC_4D	1 or 0
------------------	--------

The value is only modified for this session. To permanently change the value, please modify the environment variable.

Autosync models tick box

if tick, the server projects for any shared models added to this project are checked to see if they have been modified (checked every SHARE_CHECK_INTERVAL seconds). If any models have been modified, they are re-copied to this project.

The environment variable controlling this when the project starts up is

AUTO_MODEL_SYNC_4D 1 or 0

The value is only modified for this session. To permanently change the value, please modify the environment variable.

Set

set the values in the panel for this session. The values will revert back to the ones given by the environment variables when the project is restarted.

The values are only modified for this session and will evert back to the ones given by the environment variables when the project is restarted. To permanently change the value, please modify the environment variable.

Restart

Position of option on menu: Project =>Restart

The **Restart** option exits the current **12d Model** project and then restart using the same project. Useful for testing changes to set up files etc.

It will prompt if project **Save** is required.

Save

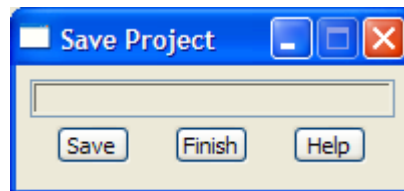
save_project

Position of option on menu: Project =>Save

The **Save** option saves the working project to disk.

On the **Save** from the Main menu, simply select the option and the project is saved.

On selecting **Save** from the floating **Projects** menu, the **save project** panel is displayed.



The position of the **save project** panel is also saved and the panel automatically placed on the screen when the project is started up again.

The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Save	button		

after selecting this button, the working project is saved to disk.

Tree

project_tree

Position of option on menu: Project =>Tree

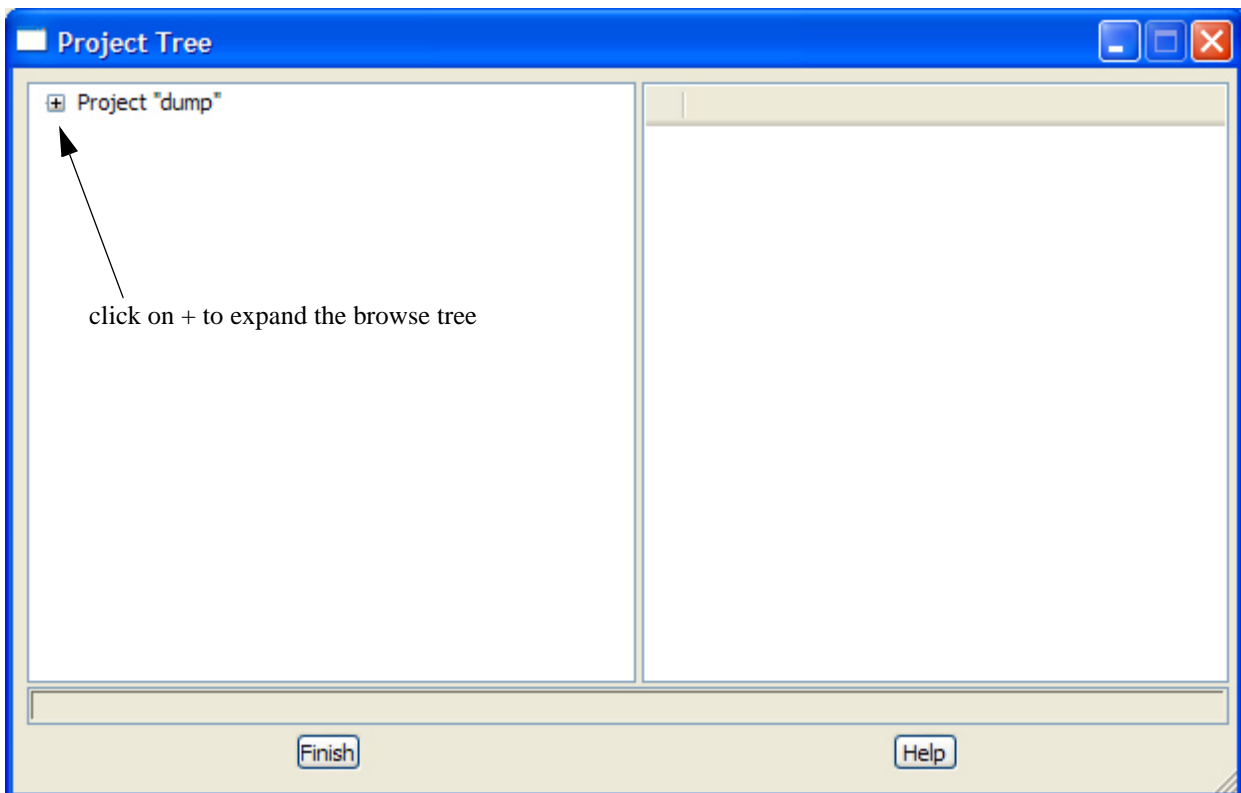
Position of option on menu: Project =>Management =>Tree

The **Tree** option is under continual development and being extended with each version of 12d Model.

Tree is used to drill down through information about the data in the project (for example models, tins and views) and also to interactive create/edit/edit most of the set-up information that is contained in text files. These include:

- (a) Name mapping (file names.4d) documented in the section “Name Mappings”
- (b) Plotters set-ups (file plotters.4d) which in not yet documented. See the section “Plotters” .
- (c) Survey data collectors (file survey.4d) documented in the section “Survey Data Collectors”
- (d) Linestyles (file linestyl.4d) documented in the section “Linestyles”
- (e) Symbols (file symbols.4d) documented in the section “Symbols”
- (f) Patterns (file patterns.4d) which in still under development and not yet documented. See the section “Patterns”
- (g) Textstyles (file textstyl.4d) documented in the section “Textstyles”
- (h) Textstyle data favourites (file textstyle_names.4d) documented in “Textstyle Data Favourites”
- (i) Sheet sized (file sheets.4d) documented in the section “Sheet Sizes”

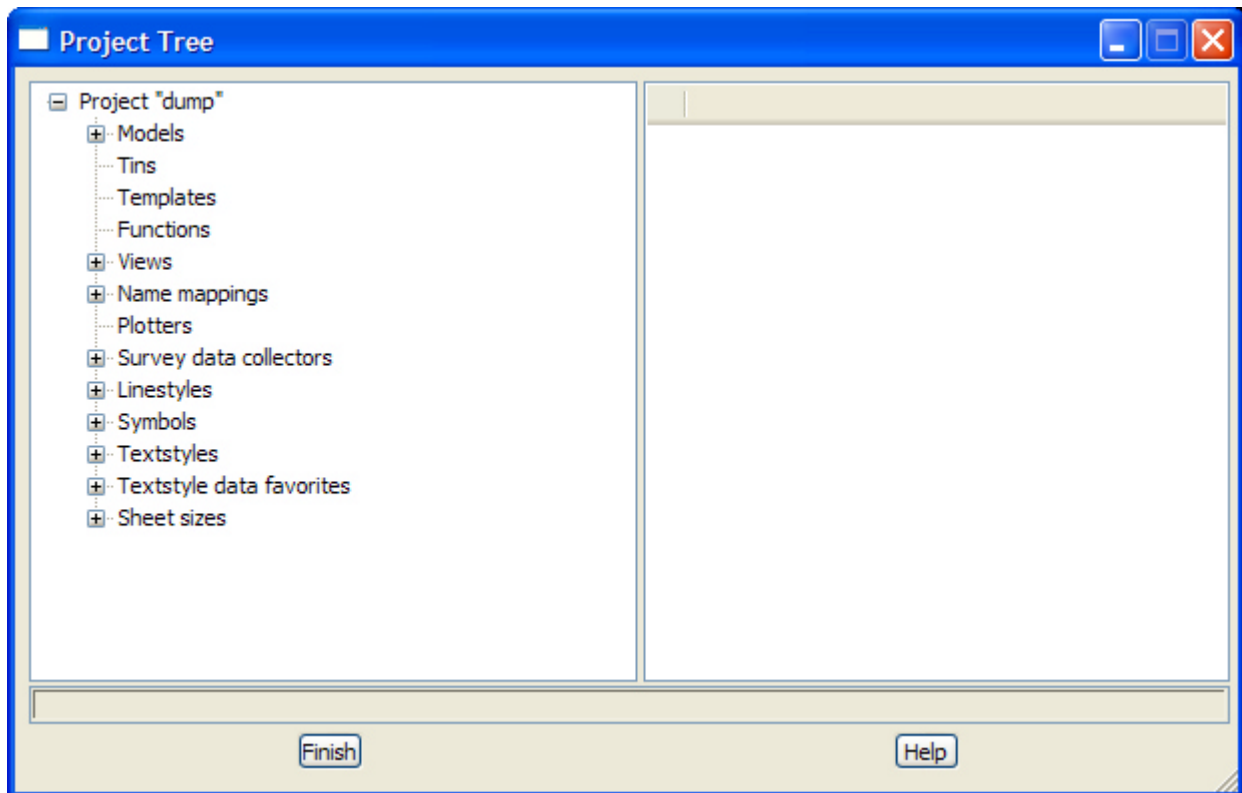
On selecting the **Tree** option, the **Project Tree** panel is displayed.



Note: This is a resizable panel.

Clicking on the '+' expands the browse tree to show what items are available to get more

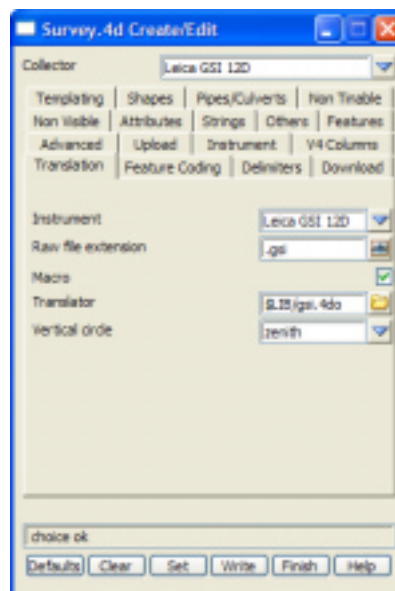
information on.



Again clicking on the + for any of the items in the expanded list then further expands the browse tree to show more items available to get information on.

For the items *Name mappings*, *Plotters*, *Survey data collectors*, *Textstyles* and *Textstyle data favourites*, once they are expanded then the items displayed need no further expansion (there is no + displayed in front of the items) and double clicking on the expanded items brings up the create/edit panels for the item.

For example, clicking on + for *Survey data collectors* and then double clicking on a data collector brings up the *Survey.4d Create/Edit* panel.



For the option *Name mappings*, go to the section “Name Mappings”

<i>Plotters</i>	“Plotters”
<i>Survey data collectors</i>	“Survey Data Collectors”
<i>Linestyles</i>	“Linestyles”
<i>Symbols</i>	“Symbols”
<i>Patterns</i>	“Patterns”
<i>Textstyles</i>	“Textstyles”
<i>Textstyle data favourites</i>	“Textstyle Data Favourites”
<i>Sheet sizes</i>	“Sheet Sizes”

Name Mappings

`names_4d_create_edit`

Position of option on menu: **Project =>Tree**

The name mapping file is used in all panel fields requiring the *name* of a string and the name field in the CAD Controlbar.

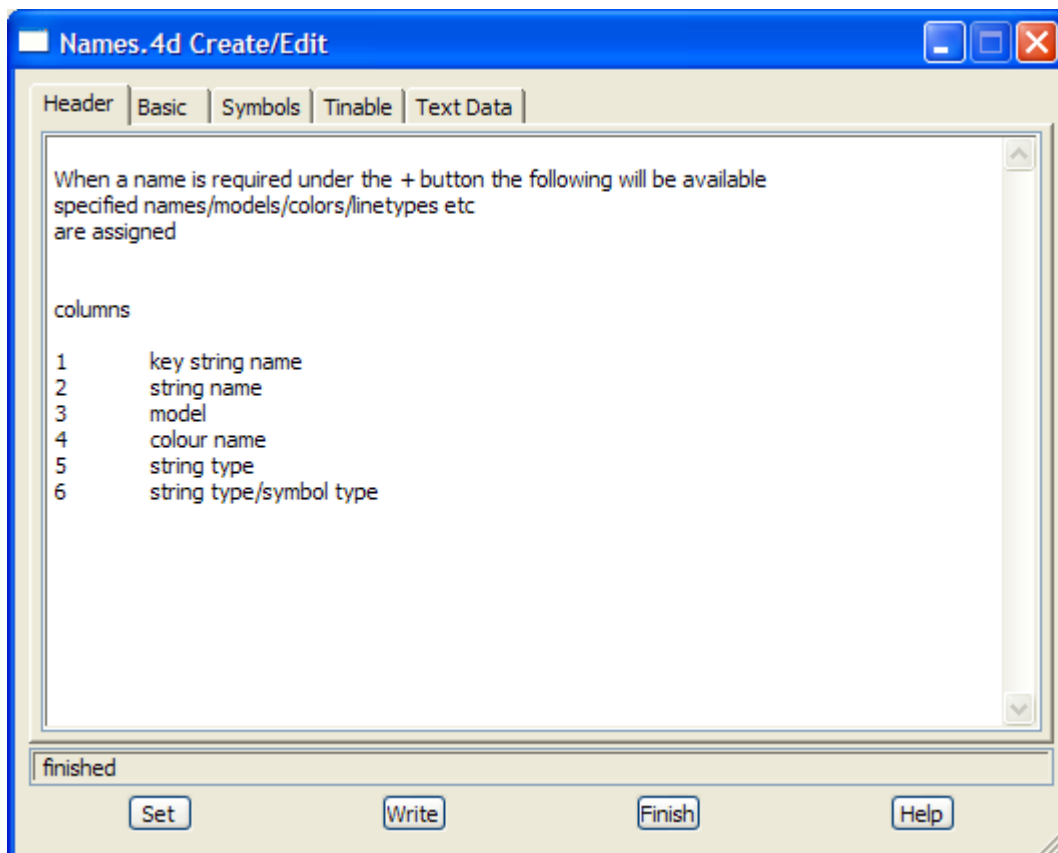
After the string name is typed, if the <Enter> is pressed then each section of the name mapping file being used for the project is searched for matches with the key.

If there is a match of the string name with a key, then the name, model, colour point/line type etc. for that key will be used in the appropriate panel fields, or toolbar fields, that go with the string name.

Click on *Name mapping* to expand the items and then double click LB on *Create name mapping* to create/edit the name mapping file *names.4d*.

Double clicking LB on any of the items below *Create name mapping* will also create/edit the *names.4d* file.

In either case, the **Names.4d Create/Edit** panel will then appear.



Buttons

Set button

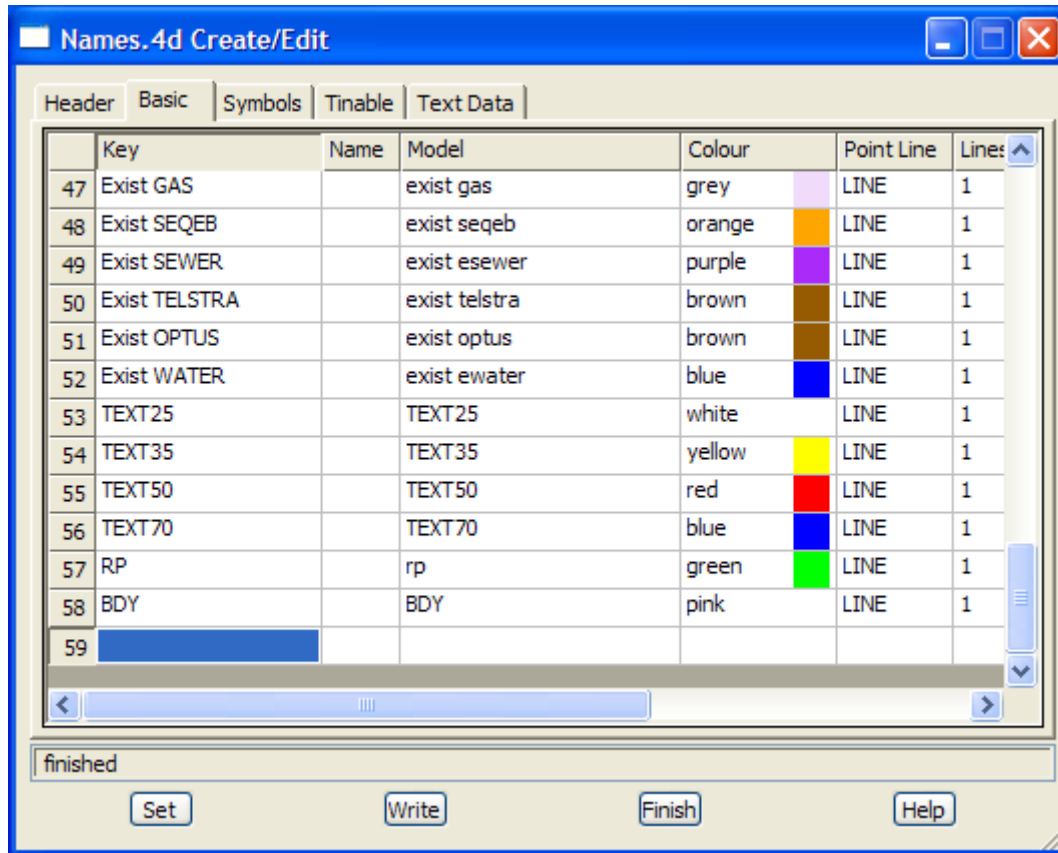
sets the definition for this editing session of the project - the information will be lost when the project is exited.

Write button

*write the information to the file names.4d. The file can then be used when projects are started. The information won't be used for the current session unless the **Set** button is selected as well. For more information on the **Write** button, go to the section "Writing Set Up Files" in the*

Appendix “Set Ups”

Basic Tab



Key input

*the string name is searched against the list of keys for the **Basic** tab until a first match is found. If a match is found, then any non-blank data in the grid is used to fill out the appropriate panel fields or toolbar fields. The key can include wild cards (*) or wild characters (?)*

Name input

if not blank, name used to replace the string name by. This is usually blank.

Model model grid available models

if not blank, model to use

Colour colour grid available colours

if not blank, colour to use

Point Line point/line grid point/line

if not blank, point-line type to use

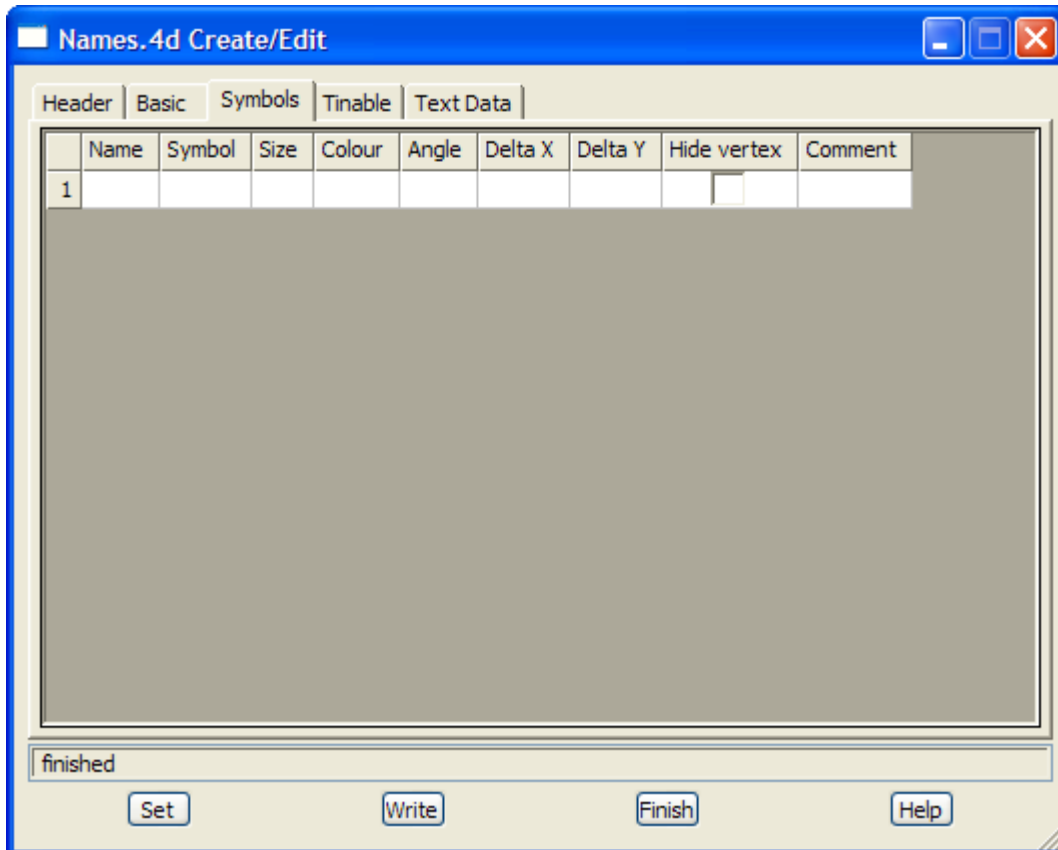
Weight input

if not blank, weight to use for strings with linestyle 1

Comment input

user comment

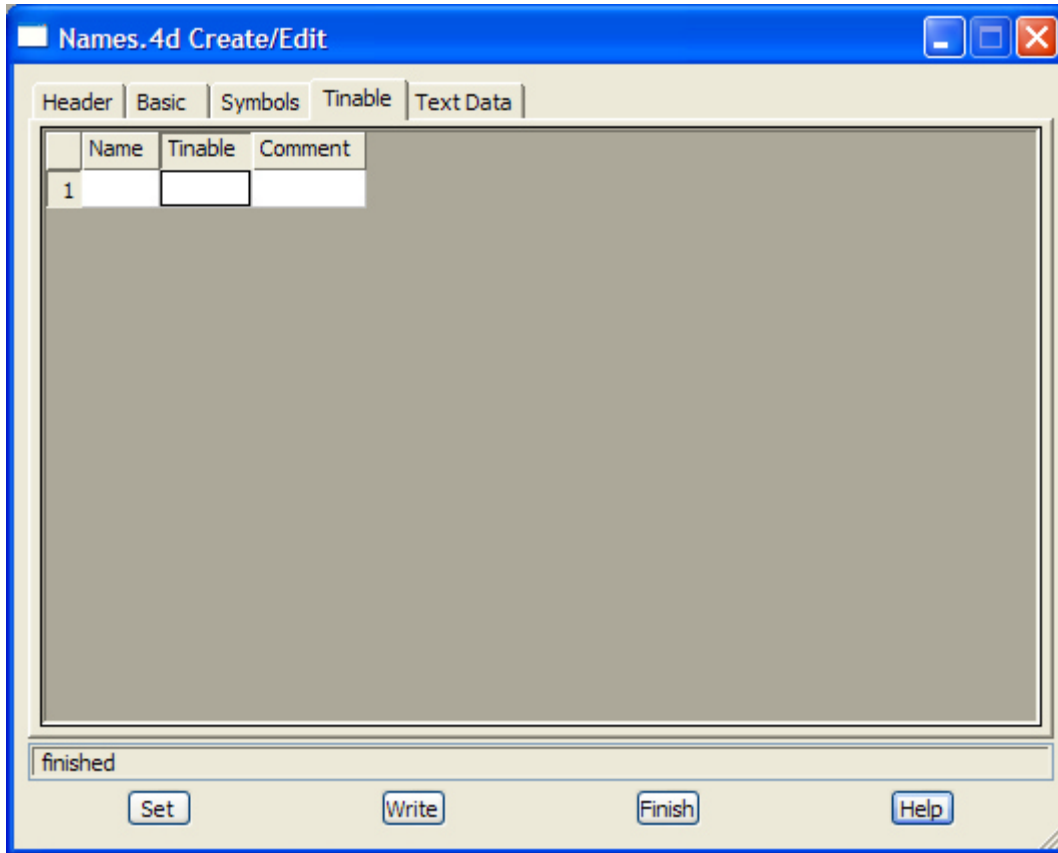
Symbols Tab



Key input

*the string name is searched against the list of keys for the **Symbols** tab until a first match is found. If a match is found, then any non-blank data in the grid is used to fill out the appropriate panel fields or toolbar fields. The key can include wild cards (*) or wild characters*

Tunable Tab



Key input

*the string name is searched against the list of keys for the **Tinable** tab until a first match is found. If a match is found, then any non-blank data in the grid is used to fill out the appropriate panel fields or toolbar fields. The key can include wild cards (*) or wild characters*

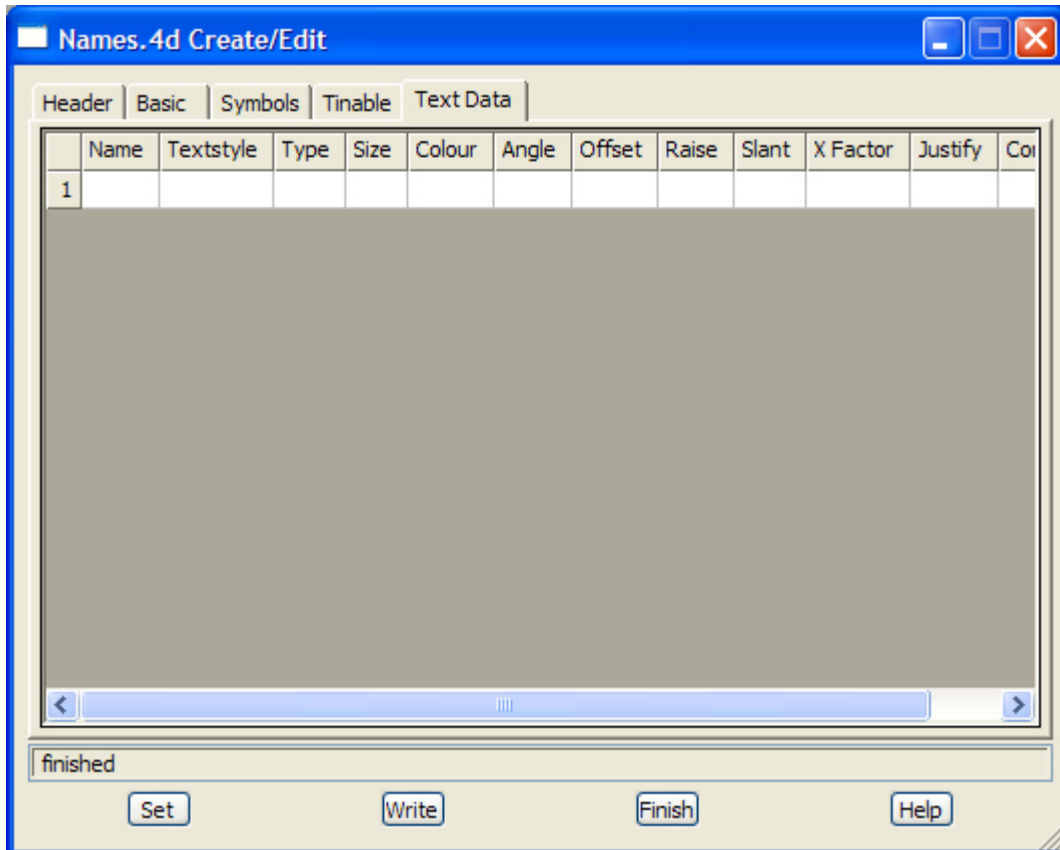
Tinable tinability grid

*if **no**, the entire string is non tinable. That is, the vertices are not included in any triangulation.*

*If **yes**, the entire string is tinable. That is, the vertices are used in any triangulation and the segments between the vertices are used as breaklines.*

*If **points**, the vertices of a string are tinable but the segments are not. That is, the vertices are used in any triangulation but the segments between the vertices are used as breaklines.*

Text Data Tab



Key input

*the string name is searched against the list of keys for the **Text Data** tab until a first match is found. If a match is found, then any non-blank data in the grid is used to fill out the appropriate panel fields or toolbar fields. The key can include wild cards (*) or wild characters*

Plotters

User defined plotters can be set up in 12d Model and the information is stored in the file **plotters.4d** which is fully documented in the section “User Defined Plotters” of the Appendix “Plotters and Plotting” .

The interactive editor **Plotters** on the Browse option is not yet fully implemented or documented.

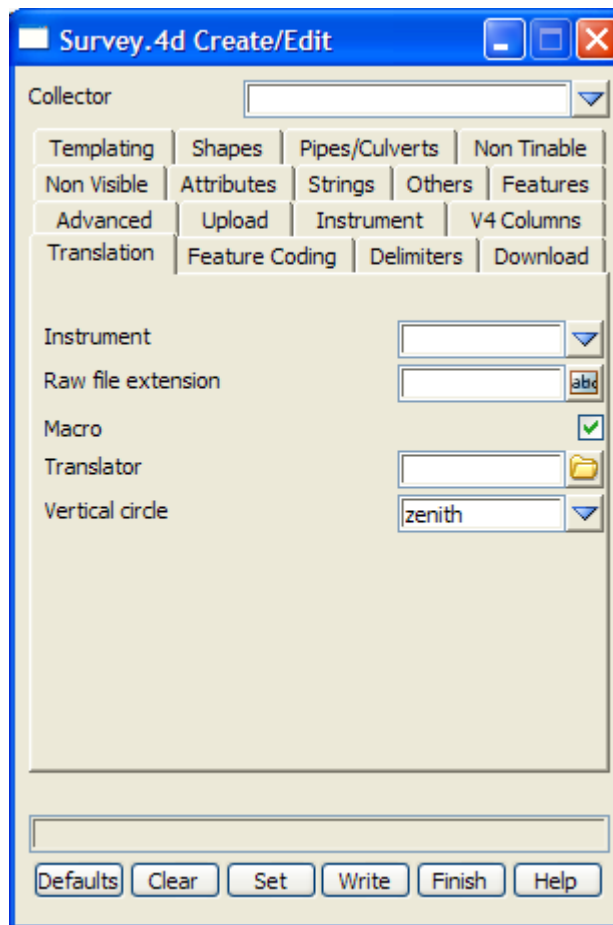
Survey Data Collectors

[survey_4d_create_edit](#)

Position of option on menu: Project =>Tree

Click on *Survey data collectors* to expand the item and then double click LB on *Create data collector* to create a new data collector, or double click LB on an existing data collector in the list to edit an existing data collector definition.

The **Survey.4d Create/Edit** panel will then appear.



This option is fully documented in the "Data Collector Definitions" section of the Appendix "12D Survey Guide".

Linestyles

linestyle_create_edit_delete

Position of option on menu: Project =>Tree

Click on *Linestyles* to expand the item and then double click LB on *Create linestyle* to create, edit or delete linestyles, or double click LB on an existing textstyle in the list to edit an existing linestyle definition. The **Linestyle Create/Edit/Delete** panel will then appear.

The linestyle can be created interactively in 12d Model by drawing the new linestyle using strings containing lines, arcs, circles and text. This information can then be used to create the linestyle.

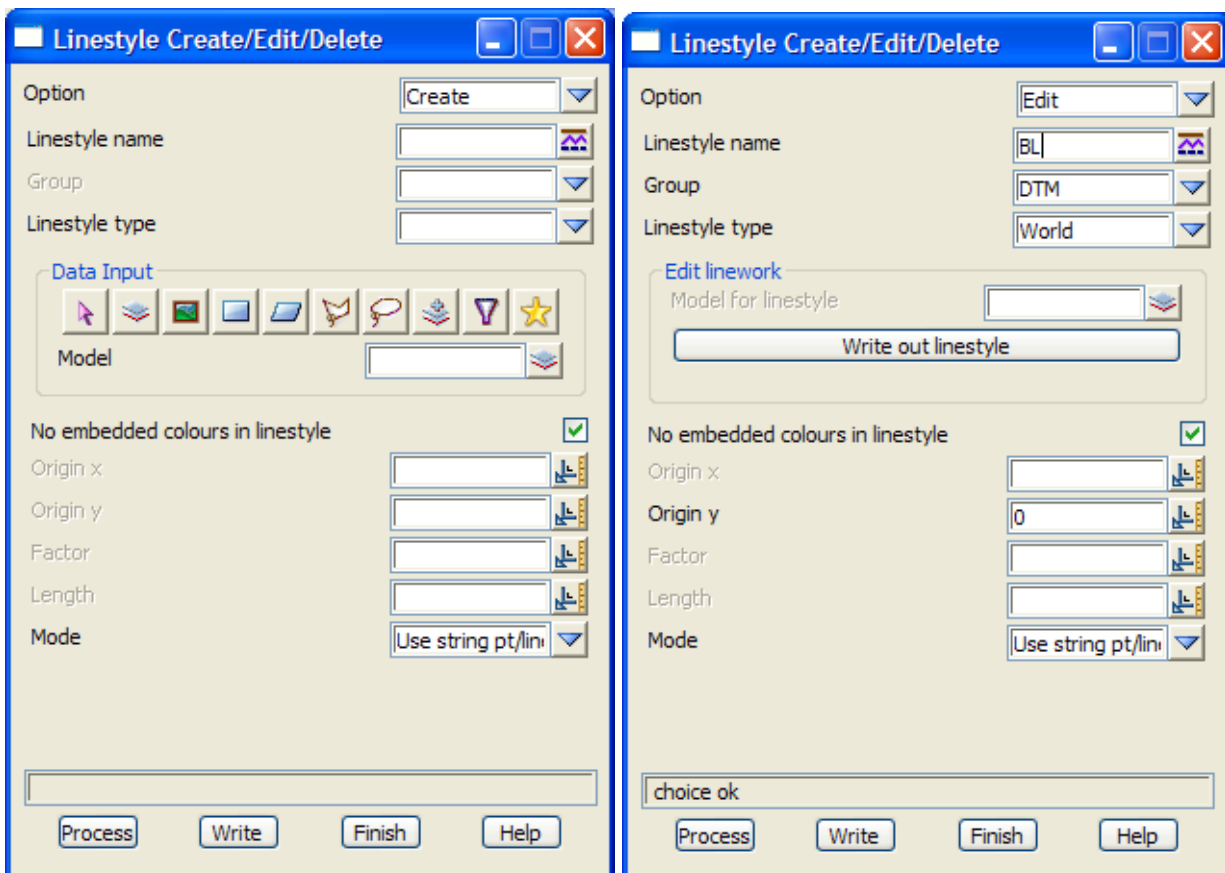
To edit a linestyle, the current definition is written to a model which can then be edited to create the modified linestyle.

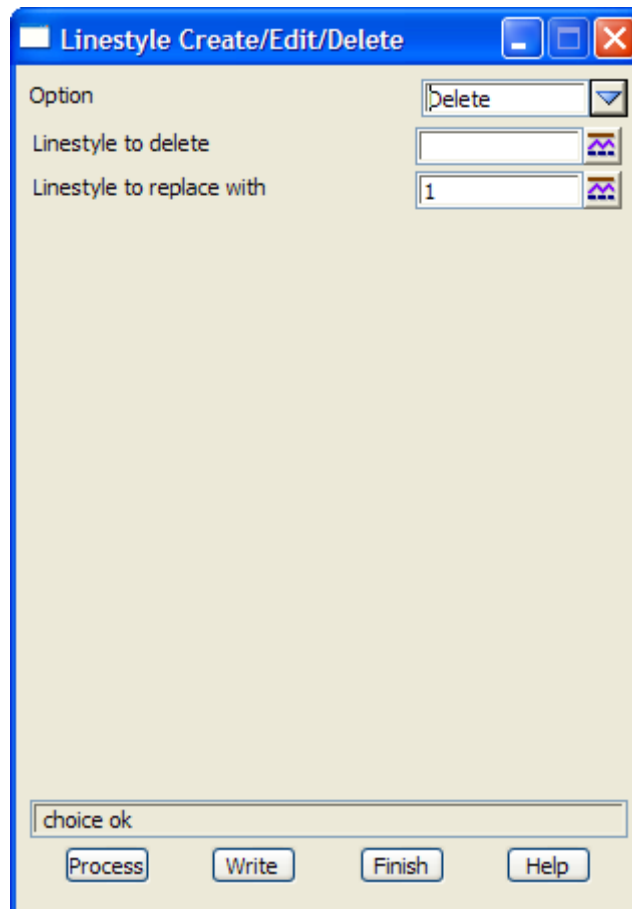
The definition of a linestyle includes:

- a unique name
- the Group to show the linestyle under in the linestyle pop-up
- the linestyle type

All the information for linestyles is stored in the text file *linestyl.4d* but the **Linestyle Create/Edit/Delete** panel is normally used to create and modify the file rather than using a text editor. (the file *linestyl.4d* is fully documented in the “Line Styles” section of the Appendix “Line styles, Symbols and Textstyles”).

The **Linestyle Create/Edit/Delete** panel is:





The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Option <i>type of edit</i>	choice box	Create	Create, Edit, Delete
Linestyle name <i>name of the linestyle to be created, edited or deleted.</i>	input		available linestyles
Group <i>name of the group for the linestyle - can be a new group name.</i>	input		available groups
Linestyle type <i>type of the linestyle.</i>	choice box	world	user, pixel, world, paper, 2 point, group
For Option choice "Create" - Data input			
Data input <i>data to be used to create the linestyle.</i>	source box	model	
For Option choice "Edit" - Edit line work			
Model for linestyle <i>model to write the linestyle out to so that it ca be edited.</i>	model box		available models
Write out linestyle <i>when selected, the linestyle is written out to the Model for linestyle.</i>	button		
For Option choice "Delete"			

Linestyle to delete linestyle box available linestyles
name of the linestyle to delete.

Linestyle to replace it with linestyle box 1 available linestyles
when the linestyle is deleted, any string with that linestyle has to have a new linestyle. This is the linestyle that is set for strings with the deleted linestyle

For the Linestyle type - User, Pixel, World, Paper

No imbedded colours in linestyle tick box tick
*if **tick** then no colours from the data are used in the linestyle.
 If **not tick** then any colours used in the data are used in the linestyle*

Origin x/y double box
*if non blank, the x/y value for the origin of the linestyle.
 If blank, a value is calculated by 12d.*

Factor double box
*if non blank, the linestyle is factored up by this value.
 If blank, the factor is taken to be 1.*

Length double box
*if non blank, the linestyle is repeated after this length.
 If blank, the linestyle length is calculated by 12d.*

Mode choice box use string pt/line type
 only at vertices, repeat style
*if "use string pt/line type", then if the string pt/line type is "line" then the linestyle is repeated after the Length value. If the string pt/line type is "point", then the linestyle is only drawn at each vertex of the string.
 If "only at vertices", then the linestyle is only drawn at each string vertex regardless of the strings pt/line type.
 If "repeat style", then the linestyle is repeated after the Length value regardless of the strings pt/line type.*

For the Linestyle type - 2 point

No imbedded colours in linestyle tick box tick
*if **tick** then no colours from the data are used in the linestyle.
 If **not tick** then any colours used in the data are used in the linestyle*

Origin x/y double box
*if non blank, the x/y value for the first origin of the linestyle.
 If blank, a value is calculated by 12d.*

Origin 2 x/y double box
*if non blank, the x/y value for the second origin of the linestyle.
 If blank, a value is calculated by 12d.*

Stretch in choice box one direction one direction, both directions
*if "one direction", the linestyle is only stretched along the axis joining the two original points.
 The linestyle is not stretched perpendicular to that axis.
 If "both directions", the linestyle is stretched in all directions.*

Drawn on choice box every line/arc
 every second line/arc
*if "one direction", the linestyle is only stretched along the axis joining the two original points.
 The linestyle is not stretched perpendicular to that axis.
 If "both directions", the linestyle is stretched in all directions.*



For Linestyle type - Group**Linestyle** grid*list of linestyles that make up the this one linestyle.***Buttons****Process** button*process the data in the panel fields. The internal definitions of the linestyles is modified. The definitions are not written to the linestyle file.***Write** button*write the modifications to the file `linestyl.4d` file. This files can then be used when projects are opened up. The information won't be used for the current session unless the **Process** button is selected as well. For more information on the **Write** button, go to the section "Writing Set Up Files" in the Appendix "Set Ups"*

This option updates the files `linestyles.4d` which is fully documented in the "Line Styles" section of the Appendix "Line styles, Symbols and Textstyles" .

Symbols

[symbol_create_edit_delete](#)

Position of option on menu: Project =>Tree

Click on *Symbols* to expand the item and then double click LB on *Create symbol* to create, edit or delete symbols, or double click LB on an existing symbol in the list to edit an existing symbol definition. The **Symbol Create/Edit/Delete** panel will then appear.

The symbol can be created interactively in 12d Model by drawing the new symbol using strings containing lines, arcs, circles and text. This information can then be used to create the symbol.

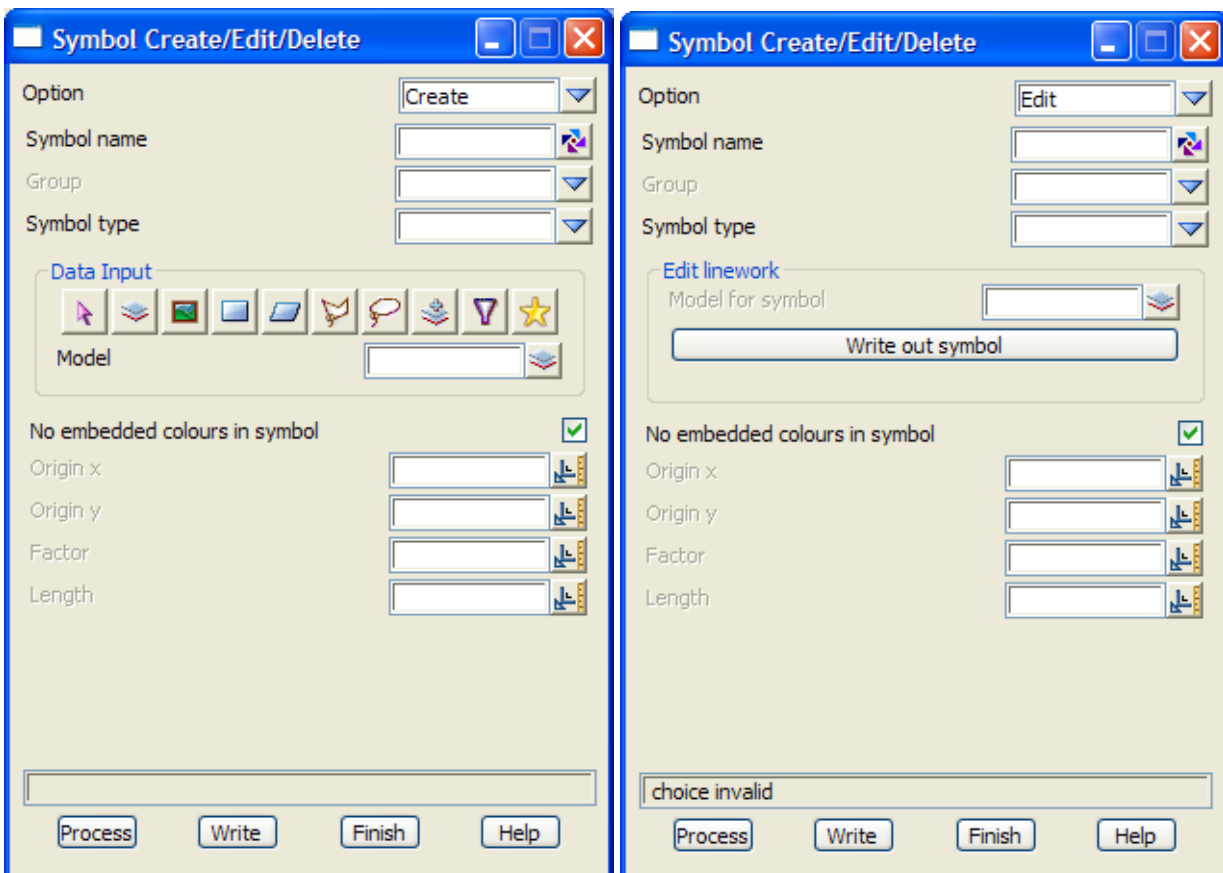
To edit a symbol, the current definition is written to a model which can then be edited to create the modified symbol.

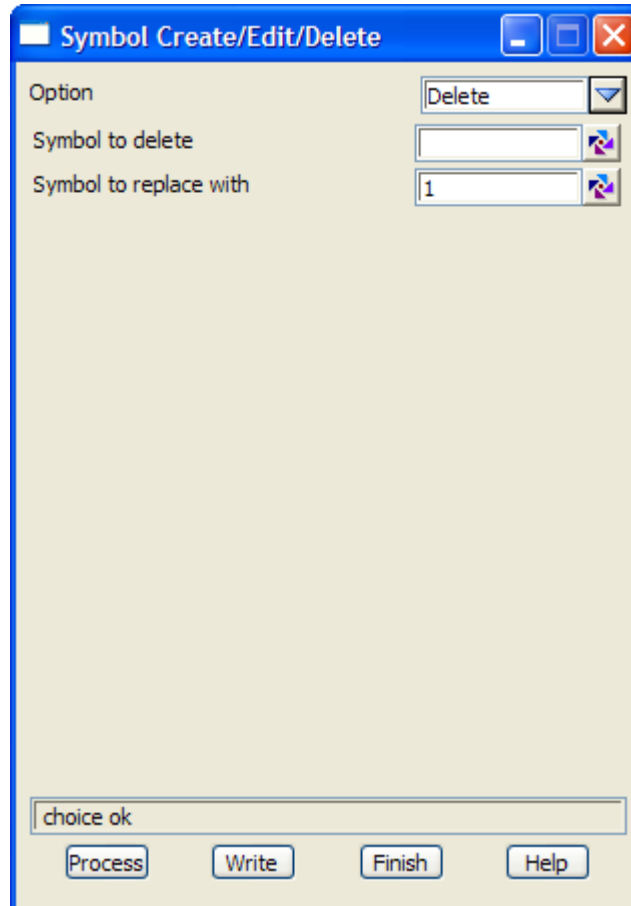
The definition of a symbol includes:

- a unique name
- the Group to show the symbol under in the symbol pop-up
- the symbol type

All the information for linestyles is stored in the text file *symbols.4d* but the **Symbol Create/Edit/Delete** panel is normally used to create and modify the file rather than using a text editor. (the file *symbols.4d* is fully documented in the “Line Styles” section of the Appendix “Line styles, Symbols and Textstyles”).

The **Symbol Create/Edit/Delete** panel is:





The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Option <i>type of edit</i>	choice box	Create	Create, Edit, Delete
Symbol name <i>name of the linestyle to be created, edited or deleted.</i>	input		available symbols
Group <i>name of the group for the symbol - can be a new group name.</i>	input		available groups
Symbol type <i>type of the symbol.</i>	choice box	world	pixel, world, paper
For Option choice "Create" - Data input			
Data input <i>data to be used to create the symbol.</i>	source box	model	
For Option choice "Edit" - Edit line work			
Model for symbol <i>model to write the symbol out to so that it ca be edited.</i>	model box		available models
Write out symbol <i>when selected, the symbol is written out to the Model for symbol.</i>	button		
For Option choice "Delete"			

- Symbol to delete** symbol box available symbols
name of the linestyle to delete.
- Symbol to replace it with** symbol box 1 available symbols
*when the symbol is deleted, any vertex of a string with that symbol has to have a new symbol.
This is the symbol that is set for strings with the deleted symbol*
- No imbedded colours in symbol** tick box tick
*if **tick** then no colours from the data are used in the symbol.
If **not tick** then any colours used in the data are used in the symbol*
- Origin x/y** double box
*if non blank, the x/y value for the origin of the symbol.
If blank, a value is calculated by 12d.*
- Factor** double box
*if non blank, the symbol is factored up by this value.
If blank, the factor is taken to be 1.*
- Length** double box
*if non blank, the symbol is repeated after this length.
If blank, the symbol length is calculated by 12d.*
- Process** button
*process the data in the panel fields. The internal definitions of the symbols is modified. The
definitions are not written to the symbol file.*
- Write** button
*write the modifications to the file symbols.4d file. This files can then be used when projects
are opened up. The information won't be used for the current session unless the **Process**
button is selected as well. For more information on the **Write** button, go to the section "Writing Set
Up Files" in the Appendix "Set Ups"*
- This option updates the files *symbols.4d* which is fully documented in the "Symbols" section of
the Appendix "Line styles, Symbols and Textstyles" .

Patterns

`pattern_create_edit_delete`

Still under development

Position of option on menu: Project =>Tree

Textstyles

create_edit_textstyle

Position of option on menu: Project =>Tree

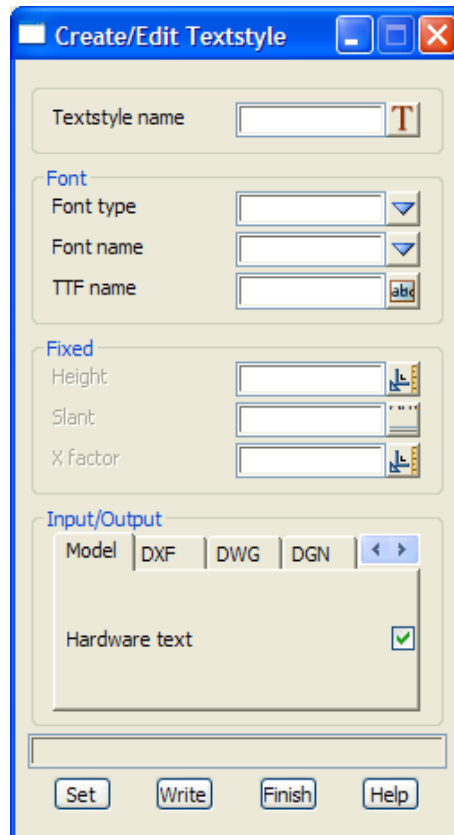
Click on *Textstyles* to expand the item and then double click LB on *Create textstyle* to create a new textstyle, or double click LB on an existing textstyle in the list to edit an existing textstyle definition. The **Create/Edit Textstyle** panel will then appear.

The textstyle definition includes

- (a) a unique name
- (a) the font used for textstyle - this may be a true type font
- (b) mappings of textstyle names when reading in data from AutoCAD and Microstation
- (c) mappings of textstyle names when writing data out to AutoCAD, Microstation and 12d Model Models.

All the information for textstyles and fonts is stored in text files (*textstyl.4d* and *fonts.4d*) but the **Create/Edit Textstyle** panel is normally used to create and modify the files rather than using a text editor. (the files *textstyles.4d* and *fonts.4d* which are fully documented in the "Textstyles and Fonts" section of the Appendix "Line styles, Symbols and Textstyles").

The **Create/Edit Textstyle** panel is:



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Textstyle name	input		available textstyles
<i>name of the textstyle to be defined or edited.</i>			

Font section

Font name output recent projects

name of the font to be used for the textstyle.

True type font tick box tick

*if **tick** then the font is a true type font. The next box asks for the True Type Font name.*

*If **not tick** then the font needs an SHP file to define the characters. The next box asks for the SHP name.*

TTF name input available true type fonts

name of the true type font.

SHP name input available SHP files

name of the SHP file to define the characters.

Fixed section

Input/Output section

Model tab

Hardware text tick box tick

*if **tick** then any 12d Model text is written out to a model as text strings.*

*If **not tick** then each characters of a text string is turned into individual lines and arcs (i.e. each character is stroked).*

DXF tab

Hardware text tick box tick

*if **tick** then any 12d Model text is written out to the DXF file as text.*

*If **not tick** then each characters of a text string is turned into individual lines and arcs (i.e. each character is stroked).*

Input name input

when a DXF file is read in, any text in the DXF file with style of this 'Input name', is converted to 12d Model text strings with the textstyle 'Textstyle name'.

Output name input

if the 'Hardware text' flag is set to tick - when data is written out to a DXF file, any 12d Model text with the textstyle of the name in the field 'Textstyle name', is converted to DXF text with style of this 'Output name'.

If the 'Hardware text' flag is not set to tick, then this field is ignored.

DWG tab

Hardware text tick box tick

*if **tick** then any 12d Model text is written out to the DWG file as text.*

*If **not tick** then each characters of a text string is turned into individual lines and arcs (i.e. each character is stroked).*

Input name input

when a DGN file is read in, any text in the DGN file with style of this 'Input name', is converted to 12d Model text strings with the textstyle 'Textstyle name'.

Output name input

if the 'Hardware text' flag is set to tick - when data is written out to a DWG file, any 12d Model text with the textstyle of the name in the field 'Textstyle name', is converted to DWG text with style of this 'Output name'.

If the 'Hardware text' flag is not set to tick, then this field is ignored.

DGN tab

Hardware text tick box tick

*if **tick** then any 12d Model text is written out to the DGN file as text.*

If **not tick** then each characters of a text string is turned into individual lines and arcs (i.e. each character is stroked).

Input name input

when a DGN file is read in, any text in the DGN file with style of this 'Input name', is converted to 12d Model text strings with the textstyle 'Textstyle name'. For DGN, the text style must be a number between 1 and 64.

Output name input

if the 'Hardware text' flag is set to tick - when data is written out to a DGN file, any 12d Model text with the textstyle of the name in the field 'Textstyle name', is converted to DGN text with style of this 'Output name'. For DGN, the text style name must be a number between 1 and 64.

If the 'Hardware text' flag is not set to tick, then this field is ignored.

Other tab

Hardware text tick box tick

if **tick** then any 12d Model text is written out to the file as text.
If **not tick** then each characters of a text string is turned into individual lines and arcs (i.e. each character is stroked).

Input name input

when a file is read in, any text in the file with style of this 'Input name', is converted to 12d Model text strings with the textstyle 'Textstyle name'.

Output name input

if the 'Hardware text' flag is set to tick - when data is written out to a file, any 12d Model text with the textstyle of the name in the field 'Textstyle name', is converted to text with style of this 'Output name'.

If the 'Hardware text' flag is not set to tick, then this field is ignored.

Buttons

Set button

sets the definition for this editing session of the project - the information will be lost when the project is exited.

Write button

write the information to the files textstyle.4d and fonts.4d files. These files can then be used when projects are started. The information won't be used for the current session unless the **Set** button is selected as well. For more information on the **Write** button, go to the section "Writing Set Up Files" in the Appendix "Set Ups"

This option updates the files textstyles.4d and fonts.4d which are fully documented in the "Textstyles and Fonts" section of the Appendix "Line styles, Symbols and Textstyles".

Textstyle Data Favourites

`textstyle_names_4d_create_edit`

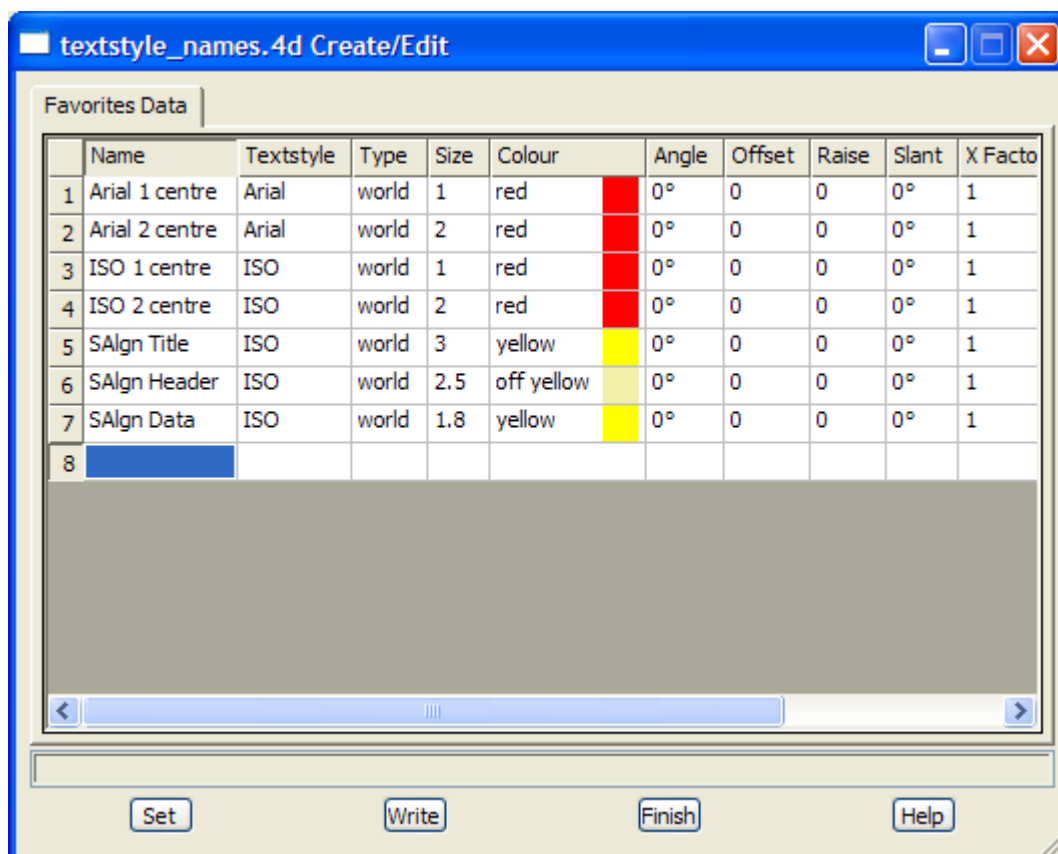
Position of option on menu: Project =>Tree

The *textstyle data favourites* option defines a set of text style parameters recorded with a user given name. When ever a text style needs to be defined, the name of a *textstyle data favourite* can be selected and the values of the favourite used for the text.

To define or modify a textstyle favourite, click on *Textstyle data favourites* in the *Browse* list to expand the item and then double click LB on *Create textstyle data favourite* to create/edit the *textstyle_names.4d* file.

Double clicking LB on any of the items below *Create textstyle data favourite* will also create/edit the *textstyle_names.4d* file.

In either case, the **Textstyle_names.4d Create/Edit** panel will then appear.



Buttons

Set button

sets the definition for this editing session of the project - the information will be lost when the project is exited.

Write button

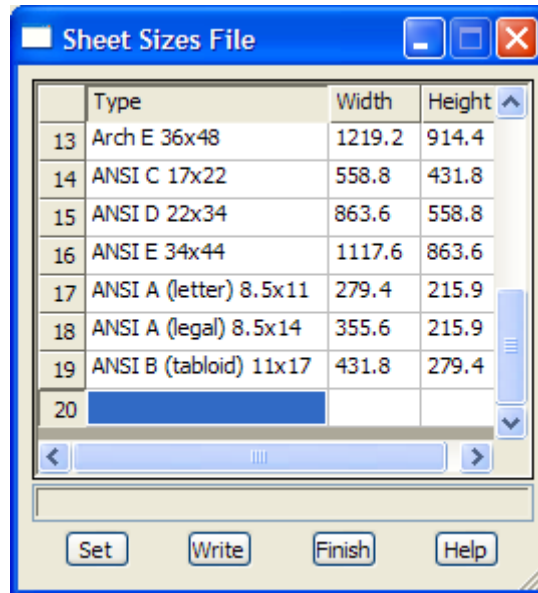
write the information to the textstyle_names.4d file. The file can then be used when projects are started. The information won't be used for the current session unless the Set button is selected as well. For more information on the Write button, go to the section "Writing Set Up Files" in the Appendix "Set Ups"

Sheet Sizes

sheet_sizes_file

Position of option on menu: Project =>Tree

Click on *Sheet sizes* to expand the item and then double click LB on *Create sheet size* to bring up the **Sheet Sizes File** panel to create, edit or delete sheet size definitions , or double click LB on an existing sheet size in the list to also bring up the **Sheet Sizes File** panel.



Buttons

Set button

sets the definition for this editing session of the project - the information will be lost when the project is exited.

Write button

write the information to the file *sheets.4d*. The file can then be used when projects are started. The information won't be used for the current session unless the **Set** button is selected as well. For more information on the **Write** button, go to the section "Writing Set Up Files" in the Appendix "Set Ups"

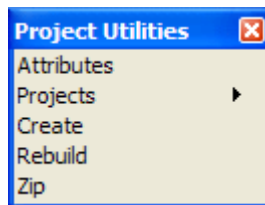
This option updates the file *sheets.4d* which is fully documented in the "Sheet Sizes" section of the Appendix "Set Ups" .

Utilities

project_utilities

Position of menu: Project =>Utilities

The **utilities** walk-right menu contains various project items.



For the option *Attributes*, go to the section “Attributes”

<i>Projects</i>	“Projects”
<i>Create</i>	“Create”
<i>Rebuild</i>	“Rebuild”
<i>Zip</i>	“Zip”

The options in the menu will now be described.

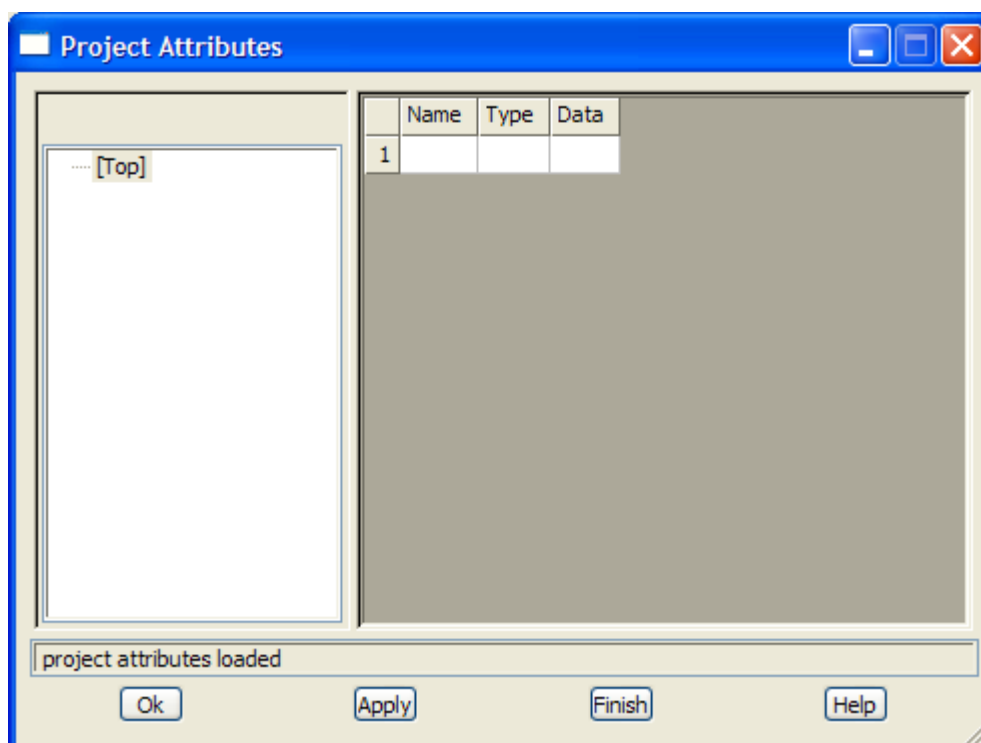
Attributes

project_attributes

Position of option on menu: Project =>Utilities =>Attributes

The **Attributes** options displays, creates and edits the attributes for the current project

On selecting **Attributes**, the **Project Attributes** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Name			
<i>name of the attribute</i>			
Type	integer, real, text		
<i>type of attribute - integer, real or text</i>			
Data			
<i>value for the attribute</i>			
OK	button		
<i>set the attributes to the values in the panel and then exit the panel.</i>			
Apply	button		
<i>set the attributes to the values in the panel but don't exit the panel.</i>			

Projects

Position of option on menu: Project =>Utilities =>Projects

The projects walk-right menu provides a list of all the projects available in the working directory. Each project is contained in a sub-directory of the working directory.

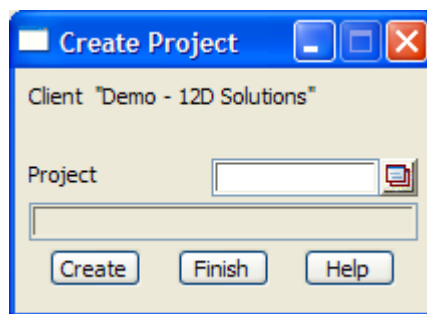
Selecting a project from the walk-right list will bring up the **Change Project** panel with the selected project name already in the new project panel field.

Create

create_project

Position of option on menu: Project =>Utilities =>Create

On selecting the Create option, the **Create Project** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Project	input		
<i>name of the new project to be created.</i>			
Create	button		
<i>after selecting this button, a new project directory is created. The working project does not change to the new project.</i>			

Rebuild

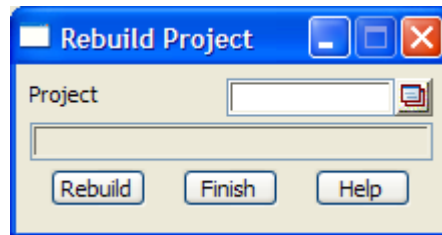
rebuild_project

Position of option on menu: Project =>Utilities =>Rebuild

The **rebuild** option is used to try and rebuild a project if some of the information has been corrupted.

On selecting the option, the project header file will be deleted and re-created and all the models, tins, templates and functions inside the project's directory added back into the project. The view information for the original project will be lost.

On selecting the **rebuild** option, the **rebuild project** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Project	input		
<i>the name of the project to be rebuilt.</i>			

Rebuild	button		
<i>after selecting this button, the project given in the project field is rebuilt.</i>			

Note - the current (working) project cannot be rebuilt.

Zip

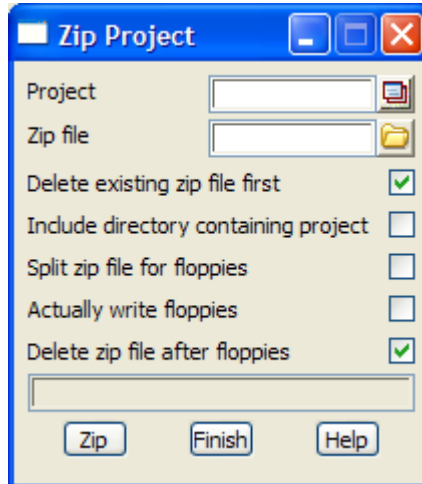
zip_project

Position of option on menu: Project =>Utilities =>Zip

The **zip** option is used to make a zipped up a copy of any project (including the saved current project) in the working folder.

NOTE - this only contains the information in the ".project" folder. It does not include any files in the working folder.

On selecting the **zip** option, the **zip project** panel is displayed.



The fields and buttons used in this panel have the following functions.

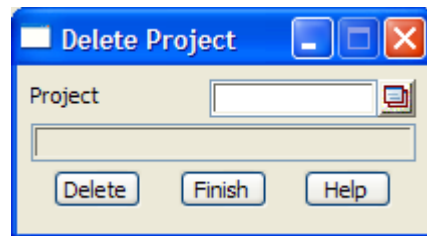
Field Description	Type	Defaults	Pop-Up
Project <i>name of the project to be zipped up.</i>	input	none	projects in directory
Zip file <i>name of the zip file for the project.</i>	input	*.zip	
Delete existing zip file first <i>if tick and a zip file already exists, the existing file is deleted before the zip is done. If no tick, any existing files of the same name in the existing zip file will be replaced and any new files will be added to the zip file.</i>	tick box	tick	
Include directory containing project <i>if tick, the whole directory containing the project (not just the project) will be zipped.</i>	tick box		
Split zip file for floppies <i>if tick, the zip file will be split into 1.4 Mb files.</i>	tick box		
Actually write floppies <i>if tick, a batch file will be created and begun which asks for floppies to be inserted and then writes the split zip files onto them.</i>	tick box		
Delete zip file after floppies <i>if tick, delete the zip file and any split files after the floppies are created.</i>	tick box	tick	
Zip <i>after selecting this button, a zip file of the project (or directory containing the project) given in the project field is made.</i>	button		

Delete

`delete_project`

Position of option on menu: Project =>Delete

On selecting the **delete project** option, the **delete project** panel is displayed.



The fields and buttons used in the delete project panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Project	input		available projects

name of project to delete

Delete	button
---------------	--------

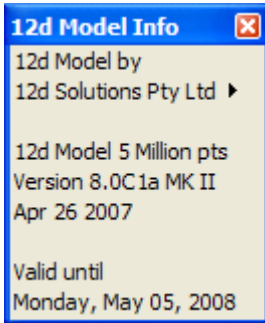
after selecting this button, a yes-no pop-up menu appears to confirm that deleting the project is required. If deletion is confirmed, the selected project is deleted from the computer disk.

12d Model

12d_model_info 12D_Solutions originators

Position of option on menu: Project =>12d Model

The 12d model walk-right menu and the walk-right by menu are



12D Solutions phone, fax etc.

12d Model version
date version compiled
date authorized to



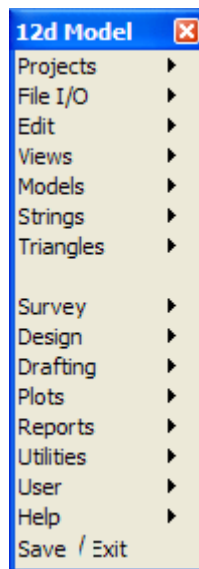
12D Solutions phone, fax etc.

12d Model Menu

12d_model

Position of option on menu: Project =>12d Model menu

Selecting the **12d Model Menu** option brings up the floating **12d Model** menu as described at the beginning of this chapter.



For the option *Projects*, go to the chapter “Projects”

<i>File I/O</i>	“File I/O”
<i>Edit</i>	“Edit”
<i>Views</i>	“Views”
<i>Models</i>	“Models”
<i>Strings</i>	“Strings”
<i>Triangles</i>	“Triangles”
<i>Survey</i>	“Survey”
<i>Design</i>	“Design”
<i>Drafting</i>	“Drafting”
<i>Plots</i>	“Plots”
<i>Reports</i>	“Reports”
<i>Utilities</i>	“Utilities”
<i>User</i>	“User”
<i>Help</i>	“Help”
<i>Save/ Exit</i>	“Save and Exit”

Exit

Selecting **Exit** exists **12d Model exit**

Also see the chapter “Save and Exit”

7 File I/O

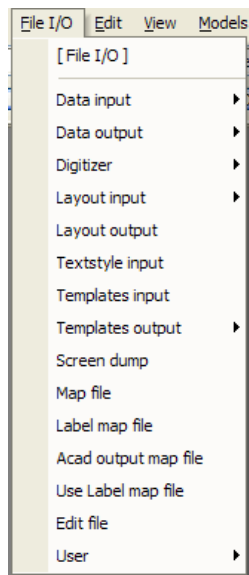
file_i_o

Position of menu: File I/O

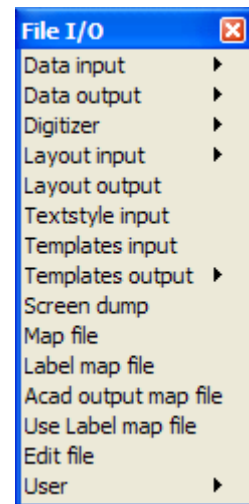
The facilities for reading and writing data files, layout files, textstyle definitions, template files into and out of 12d Model, plus screen dumps are collected under the file i/o menu.

The file i/o walk-right menu containing these options is:

on 12d Model menu
and floating menu



create floating File I/O menu
read in data files
write out data files
digitizing option
read in layout files
write out layout files
read in textstyle definitions file
read in templates file
write out templates file
screen dump of window
create/edit a map file
create a label map file
ACAD output map file
use a label map file
edit a file



The options under data input and data output and digitizer will be given in the following three chapters. The rest of the options will be described now.

For the option *Data input*, go to the chapter

Data output

Digitizer

Layout input, go to the section

Layout output

Textstyle input

Template input

Template output

Screen dump

Map file

Label map file

Acad output map file

Use label map file

Edit

“Data Input”

“Data Output”

“Digitizer”

“Layout Input”

“Layout Output”

“Textstyle Input”

“Templates Input”

“Templates Output”

“Screen Dump” .

“Map File”

“Label Map File”

“AutoCAD Output Map File Create/Edit”

“Use Label Map File”

“Edit”

Layout Input

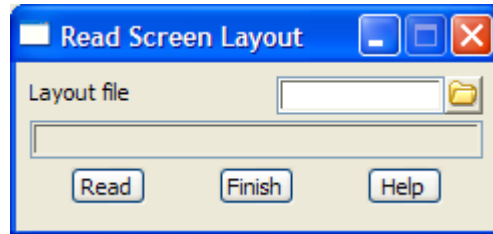
read_screen_layout

Position of option on menu: File I/O =>Layout input

The layout input option reads in a screen layout file (*.slf) which can create most menus and panels and place them on the screen.

The screen layout file can be created by the layout input option or by any editor.

On selecting the layout input option, the **read screen layout** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Layout file <i>the name of the file to read the screen layout information from.</i>	input		*.slf
Read <i>after selecting this button, the screen layout file will be read in.</i>	button		

Layout Output

write_screen_layout

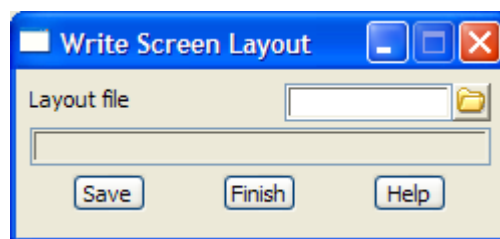
Position of option on menu: File I/O =>Layout Output

The layout output option writes out information on almost all the objects on the screen, and for views, their sizes.

The layout file can be read back in with the layout input option to recreate most menus and panels on the screen (not views). Since the layout file is editable, users can create their own special layout files.

The view size information is helpful in building up a set_up_file to define the initial screen layout.

On selecting the layout output option, the **write screen layout** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Layout file <i>the name of the file to print the screen layout information to.</i>	input		*.slf
Save <i>after selecting this button, the screen layout information will be printed out.</i>	button		

Textstyle Input

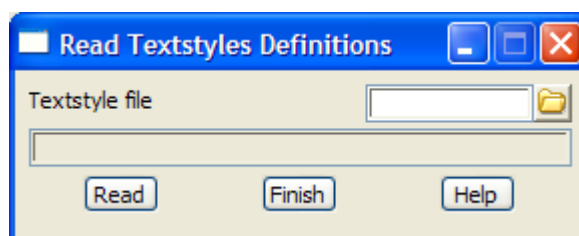
read_textstyles_definitions

Position of option on menu: File I/O =>Textstyle Input

When **12d** Model starts up, a textstyles definition file can be automatically read in. The textstyles definitions file defines the textstyles and fonts used in the project.

It is possible to redefine the textstyles by reading in another textstyles definitions file using the **textstyle input** option.

On selecting the textstyle input option, the **read textstyles definitions** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Textstyle file <i>the name of the file to read the textstyle information from.</i>	input		*.tsf
Read <i>after selecting this button, the textstyles definitions file will be rad in.</i>	button		

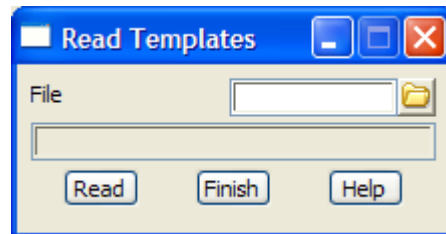
Templates Input

read_templates

Position of option on menu: File I/O =>Templates Input

This option is used to read in templates from files in the special **12d** Model template format.

On selecting the templates input option, the **read templates** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
File <i>name of the 12d template file to be read in</i>	input		*.tpl files
Read <i>read the data in.</i>	button		

Note if a template already exists, then the template in the file is ignored.

Templates Output

template_output

Position of menu: File I/O =>Templates Output

The templates output option writes out one or all templates in the 12d Model template format.

The output walk-right menu is



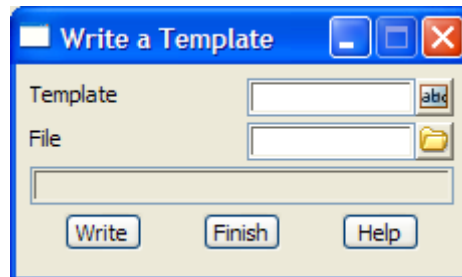
One Template

write_a_template

Position of option on menu: File I/O =>Templates Output =>One Template

This option is for writing a single template out in the special 12d template format.

On selecting the one template option, the **write a template** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Template <i>name of the template to be written out.</i>	input		available templates
File <i>name of the file to write the template to.</i>	input		
Write <i>after selecting this button, the template given in the template field will be written out to the file with the name given in the file field.</i>	button		

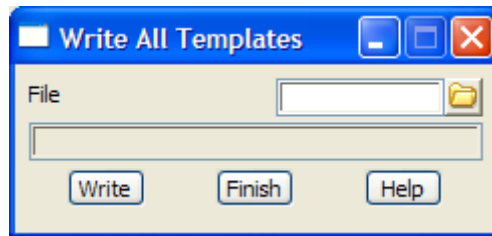
All Templates

write_all_templates

Position of option on menu: File I/O =>Templates output =>All templates

This option is for writing all template out in the special 12d Model template format.

On selecting the all templates option, the **write all templates** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
File	input		
<i>name of the file to write all the templates to.</i>			
Write	button		
<i>all the templates will be written out to the file with the name given in the file field.</i>			

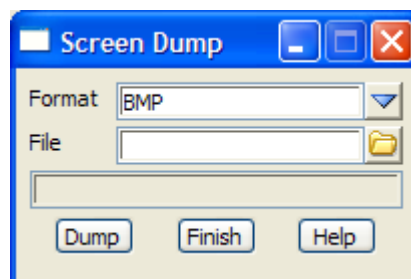
Screen Dump

screen_dump

Position of option on menu: File I/O =>Screen dump

The 12d Model screen can be dumped to disk in either gif or colour postscript format.

On selecting the screen dump option, the **screen dump** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Format	input	gif	gif, colour postscript
<i>format to write the screen dump out in.</i>			
File	input		*.gif files
<i>file to write the screen. dump to.</i>			
Dump	button		
<i>after selecting this button, the screen/window is dumped out in the selected format.</i>			

Map File

map_file_create_edit

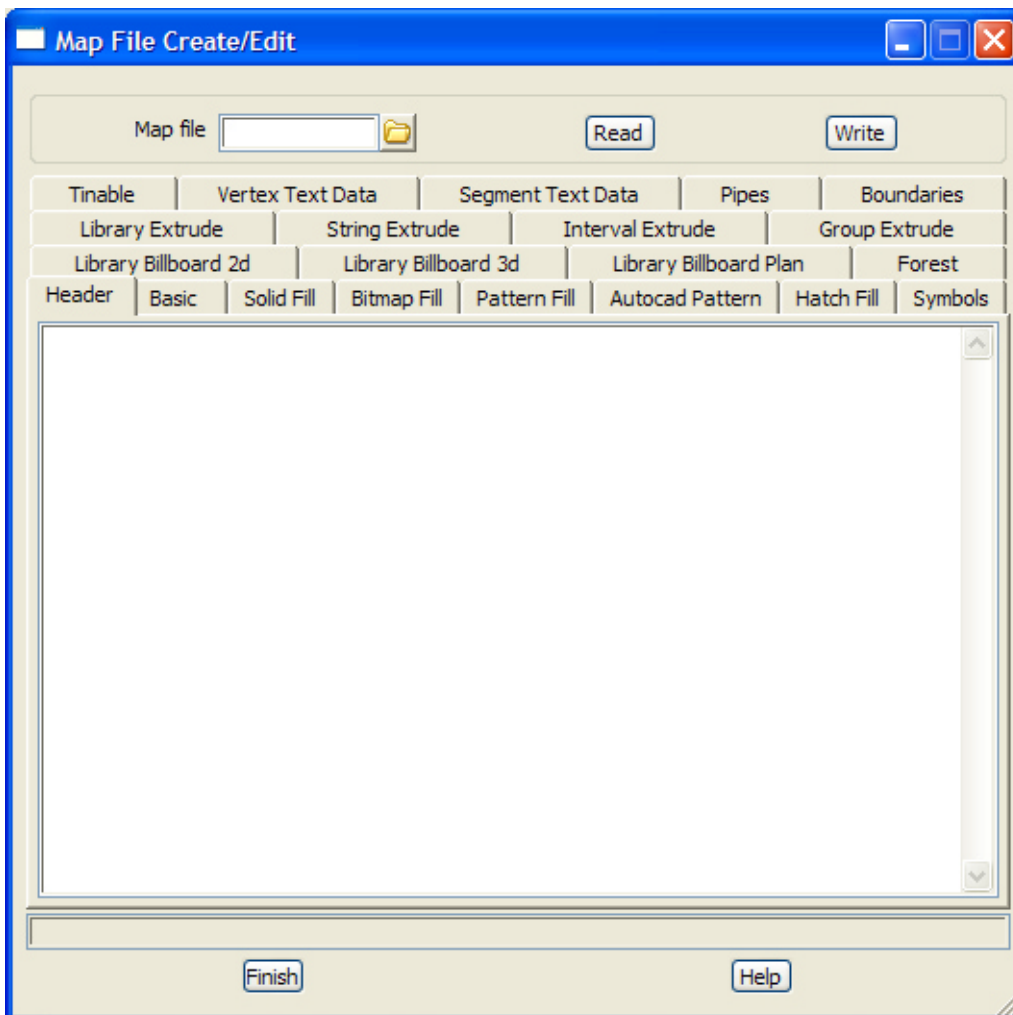
Position of option on menu: File I/O =>Map File

The map file option is used to **create** or **edit** the 12d Map Files which are used in many 12d Model options.

A **12d Map file** consists of tables of **keys** or **entity-masks** which are used to set many strings properties such as string name, colours, linestyles, symbols, models, extrusions and tinability to data that matches one of the keys.

When using a 12d map file, the part of the data that is matched against the *keys* is called the entity-name, and what the entity-name is depends on the option using the map file. For most options, the **entity-name** is a **string** name but it can vary. For example, the xyzs reader uses the **string name** in the xyzs file as the entity-name but in the DGN reader, no string name exists and the **DGN level** can be entity-name.

On selecting the map file option, the **map file create/edit** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Map file	input		*.mf

name of the map file to be created or edited.

Bottom buttons

Read button

read in the map file given in the map file field and load the data into the fields of the table. If the file doesn't exist, an error message is given.

Write button

write out the data in the table to the file name given in the map file field. If the file already exists, a yes-no-cancel panel checks to see if the existing file is to be over written - if no or cancel is selected, nothing is written out.

Header tab

the Header tab just has lines of comment text.

Basic tab

the Basic tab sets colours, linestyles, point-line type, weight and colours for strings.

Key select name menu

key to match the string name against in the Basic tab. The key can include wild cards () and wild characters (?).*

If a match occurs, then the rest of the grid fields for this line of the Basic tab of the map file are used and no other tests for matches against keys further down in the table are made.

If a match does not occur, then a test for a match is made against the key on the next line of the Basic tab of the map file.

Name select name menu

if non-blank, the string name to be used for all strings matching the key for this line of the map file. If blank, the original string name (which matched the key) is used.

*A blank name field is written out as a * to the ascii version of the map file and a * in the ascii map file for name is displayed as a blank line in the map file editor.*

Model select model menu

if non-blank, the model to be used for all strings matching the key for this line of the map file. If blank, the string's model is not modified.

*A blank model field is written out as a * to the ascii version of the map file and a * in the ascii map file for model is displayed as a blank line in the map file editor.*

Colour select colour menu

if non-blank, the colour to be used for all strings matching the key for this line of the map file. If blank, the string's colour is not modified.

*A blank colour field is written out as a * to the ascii version of the map file and a * in the ascii map file for colour is displayed as a blank line in the map file editor.*

Point Line point, line

if non-blank, the breakline type to be used for all the data fitting the key for this line of the map file.

If blank, the string's point-line type is not modified. If data is coming from a field file, then the data may be coded as a line or point string.

*A blank point-line field is written out as a * to the ascii version of the map file and a * in the ascii map file for point-line is displayed as a blank line in the map file editor.*

Linestyle

select linestyle menu

*if non-blank, the linestyle to be used for all strings matching the key for this line of the map file.
If blank, the string's linestyle is not modified.*

*A blank linestyle field is written out as a * to the ascii version of the map file and a * in the ascii map file for linestyle is displayed as a blank line in the map file editor.*

NOTE: If the point-line type is point then the linestyle is used as a symbol at each vertex of the string. The size of the symbol at each point is given in the linesytle definition. If a symbol at each point is required whose size, colour and rotation may need to be modified at each point, then the symbol tab must be used to place a symbol at each vertex and a world style must be used in the symbol name field for the symbol tab.

Weight

*if non-blank, the weight to be used for all strings matching the key for this line of the map file.
If blank, the string's weight is not modified.*

*A blank weight field is written out as a * to the ascii version of the map file and a * in the ascii map file for weight is displayed as a blank line in the map file editor.*

Comment

comment to be to be used in this line of the map file. A double slash // is written out to the ascii map file before the comment, and a comment in an ascii map file is read in and displayed without the double slash.

Solid Fill tab

the Solid Fill tab sets whether super strings (closed and non-closed) are filled with a solid colour.

Key

select name menu

key to match the string name against in the Solid Fill tab. The key can include wild cards () and wild characters (?).*

If a match occurs, then the rest of the grid fields for this line of the Solid Fill tab of the map file are used and no other tests for matches against keys further down in the table are made.

If a match does not occur, then a test for a match is made against the key on the next line of the Solid Fill tab of the map file.

Colour

select colour menu

colour to use to fill the super string with. If the super string is not closed, the fill will apply as if the super string was closed.

This field can not be blank.

Blend

if non blank, the blend value to use for the solid fill.

Drape name**Drape mode**

choice box

Colour, Colour by texture

Comment

comment to be to be used in this line of the map file. A double slash // is written out to the ascii map file before the comment, and a comment in an ascii map file is read in and displayed without the double slash.

Bitmap Fill tab

the Bitmap Fill tab sets whether super strings (closed and non-closed) are filled with a bitmap pattern.

Pattern Fill tab

this option is under development.

Autocad Pattern

the AutoCad Pattern tab uses a pattern from the AutoCAD pattern file to fill the selected strings

Hatch Fill tab

the Hatch Fill tab sets whether super strings (closed and non-closed) are filled with a hatch pattern.

Symbols tab

the Symbols tab sets what symbols to be used on vertices of strings.

Key

select name menu

key to match the string name against in the Symbol tab. The key can include wild cards () and wild characters (?).*

If a match occurs, then the rest of the grid fields for this line of this tab of the map file are used and no other tests for matches against keys further down in the table are made.

If a match does not occur, then a test for a match is made against the key on the next line of this tab of the map file.

Symbol

select symbol menu

*the name of the **symbol** to be used for each vertex of all strings matching the key.*

This field can not be blank. If the symbol does not exist when the map file is being used, then an error message will be written to the output window.

Size

measures menu

the size of the symbol to be used for each vertex of all strings matching the key.

This field can not be blank.

Colour

select colour menu

the colour of the symbol to be used for each vertex of all strings matching the key.

This field can not be blank.

Angle

measures menu

the angle of the symbol to be used for each vertex of all strings matching the key.

This field can not be blank.

Delta X

measures menu

the x-distance to offset the symbol from each vertex of the strings matching the key.

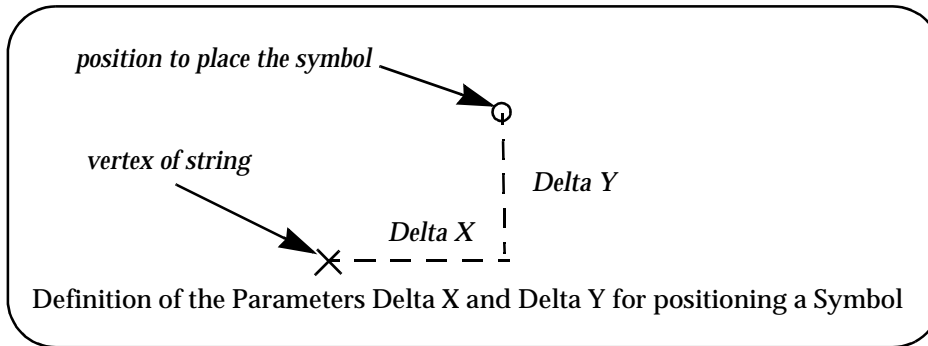
This field can not be blank.

Delta Y

measures menu

the y-distance to offset the symbol from each vertex of the strings matching the key.

This field can not be blank.



Hide vertex tick box

if tick, no default cross is placed at the vertex of the string.

Comment

comment to be to be used in this line of the map file. A double slash // is written out to the ascii map file before the comment, and a comment in an ascii map file is read in and displayed without the double slash.

Tinable tab

the Tinable tab sets whether the vertices and segments are tinable (used in triangulations), not tinable (not used in triangulations) or only the vertices (points) are tinable.

Key select name menu

key to match the string name against in the Tinable tab. The key can include wild cards () and wild characters (?).*

If a match occurs, then the rest of the grid fields for this line of this tab of the map file are used and no other tests for matches against keys further down in the table are made.

If a match does not occur, then a test for a match is made against the key on the next line of this tab of the map file.

Tinable yes, no, points

if yes, the vertices and segments for all the strings matching the key are tinable.

If no, the vertices and segments for all the strings matching the key are not tinable.

If points, the segments are not tinable and the vertices are tinable for all the strings matching the key.

This field can not be blank.

Comment

comment to be to be used in this line of the map file. A double slash // is written out to the ascii map file before the comment, and a comment in an ascii map file is read in and displayed without the double slash.

Vertex Text Data tab

the Vertex Text Data tab sets parameters for drawing text on the vertices of super strings.

Key select name menu

key to match the string name against in the Vertex Text Data tab. The key can include wild cards () and wild characters (?).*

If a match occurs, then the rest of the grid fields for this line of this tab of the map file are used and no other tests for matches against keys further down in the table are made.

If a match does not occur, then a test for a match is made against the key on the next line of this tab of the map file.

Textstyle select text style menu

*the textstyle used for any vertex text for all strings matching the key.
This field can not be blank.*

Type screen, paper, world

*the textstyle type used for any vertex text for all strings matching the key.
This field can not be blank.*

Size measures menu

*the size of the vertex text to be used for each vertex of all strings matching the key.
This field can not be blank.*

Colour select colour menu

*the colour of the vertex text to be used for each vertex of all strings matching the key.
This field can not be blank.*

Angle measures menu

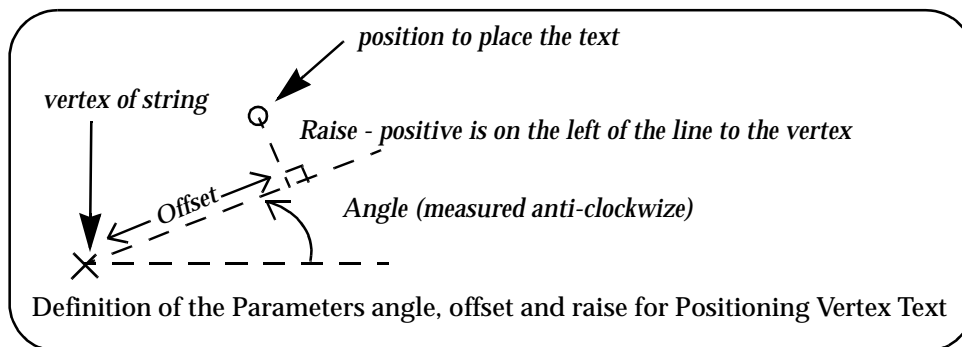
*the angle of the vertex text to be used for each vertex of all strings matching the key.
This field can not be blank.*

Offset measures menu

*the distance to offset the text from each vertex of the strings matching the key.
This field can not be blank.*

Raise measures menu

*the distance to perpendicularly raise the text for each vertex of all strings matching the key.
This field can not be blank.*



Slant Measures menu

*the slant for the vertex text of all strings matching the key.
This field can not be blank.*

X factor Measures menu

*the x-factor for the vertex text of all strings matching the key.
This field can not be blank.*

Justify Select Justification Choice menu

*the justification for the vertex text of all strings matching the key.
This field can not be blank.*

Comment

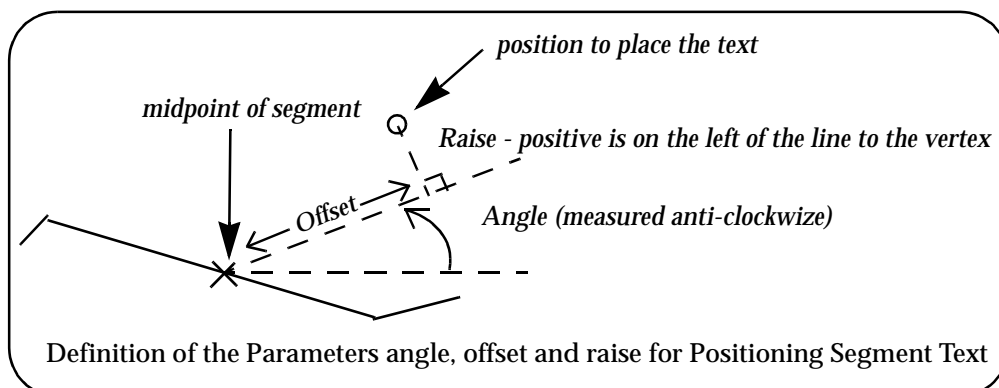
comment to be used in this line of the map file. A double slash // is written out to the ascii map file

before the comment, and a comment in an ascii map file is read in and displayed without the double slash.

Segment Text Data tab

the Segment Text Data tab sets parameters for drawing text on the segments of super strings. The text is positioned about the mid point of the segment.

Key	select name menu
key to match the string name against in the Segment Text Data tab. The key can include wild cards (*) and wild characters (?).	
If a match occurs, then the rest of the grid fields for this line of this tab of the map file are used and no other tests for matches against keys further down in the table are made.	
If a match does not occur, then a test for a match is made against the key on the next line of this tab of the map file.	
Textstyle	select text style menu
the textstyle used for any segment text for all strings matching the key. This field can not be blank.	
Type	screen, paper, world
the textstyle type used for any segment text for all strings matching the key. This field can not be blank.	
Size	measures menu
the size of the segment text to be used for each segment of all strings matching the key. This field can not be blank.	
Colour	select colour menu
the colour of the segment text to be used for each segment of all strings matching the key. This field can not be blank.	
Angle	measures menu
the angle of the segment text to be used for each segment of all strings matching the key. This field can not be blank.	
Offset	measures menu
the distance to offset the text from each segment of the strings matching the key. This field can not be blank.	
Raise	measures menu
the distance to perpendicularly raise the text for each segment of all strings matching the key. This field can not be blank.	



Slant Measures menu

*the slant for the segment text of all strings matching the key.
This field can not be blank.*

X factor Measures menu

*the x-factor for the segment text of all strings matching the key.
This field can not be blank.*

Justify Select Justification Choice menu

*the justification for the segment text of all strings matching the key.
This field can not be blank.*

Comment

comment to be used in this line of the map file. A double slash // is written out to the ascii map file before the comment, and a comment in an ascii map file is read in and displayed without the double slash.

Pipes tab

the Pipes tab sets parameters for sizing pipes and culverts for super strings.

Key select name menu

key to match the string name against in the Pipes tab. The key can include wild cards () and wild characters (?).*

If a match occurs, then the rest of the grid fields for this line of this tab of the map file are used and no other tests for matches against keys further down in the table are made.

If a match does not occur, then a test for a match is made against the key on the next line of this tab of the map file.

Justify invert, centre, obvert

*the pipe/culvert justification used for all strings matching the key.
This field can not be blank.*

Shape diameter, culvert

*the shape of the super string segment for all strings matching the key.
This field can not be blank.*

Size 1 measures menu

for a pipe shape, the diameter of the super string segment to be used for each segment of all strings matching the key.

For a culvert shape, the width of the super string segment to be used for each segment of all strings matching the key.

This field can not be blank.

Size 2 measures menu

for a culvert shape, the height of the super string segment to be used for each segment of all strings matching the key. Ignored for a pipe shape.

This field can only be blank for a pipe shape.

Comment

comment to be used in this line of the map file. A double slash // is written out to the ascii map file before the comment, and a comment in an ascii map file is read in and displayed without the double slash.

Boundaries tab

the Boundaries tab sets a parameters for a string so that when it is part of a triangulation it is also used to null or reset any triangles.

Key select name menu

key to match the string name against in the Boundaries tab. The key can include wild cards () and wild characters (?).*

If a match occurs, then the rest of the grid fields for this line of this tab of the map file are used and no other tests for matches against keys further down in the table are made.

If a match does not occur, then a test for a match is made against the key on the next line of this tab of the map file.

Boundaries exclude, include

If the mode is exclude, then any triangles inside the polygon are set to null.

If the mode is include, then any triangles inside the polygon are reset so that they aren't null.

Comment

comment to be to be used in this line of the map file. A double slash // is written out to the ascii map file before the comment, and a comment in an ascii map file is read in and displayed without the double slash.

Library Extrude tab

the Library Extrude tab applies an extrude from the 12d library to selected super strings. Note that extrudes can only be applied to super strings.

Key select name menu

key to match the string name against in the Library Extrude tab. The key can include wild cards () and wild characters (?).*

If a match occurs, then the rest of the grid fields for this line of this tab of the map file are used and no other tests for matches against keys further down in the table are made.

If a match does not occur, then a test for a match is made against the key on the next line of this tab of the map file.

Extrude select extrudes menu

the library extrude to apply to the super string

Comment

comment to be to be used in this line of the map file. A double slash // is written out to the ascii map file before the comment, and a comment in an ascii map file is read in and displayed without the double slash.

String Extrude tab

the String Extrude tab applies an extrude to selected super strings. Note that extrudes can only be applied to super strings.

Key select name menu

key to match the string name against in the String Extrude tab. The key can include wild cards () and wild characters (?).*

If a match occurs, then the rest of the grid fields for this line of this tab of the map file are used and no other tests for matches against keys further down in the table are made.

If a match does not occur, then a test for a match is made against the key on the next line of this tab of the map file.

Comment

comment to be to be used in this line of the map file. A double slash // is written out to the ascii map file

before the comment, and a comment in an ascii map file is read in and displayed without the double slash.

Interval Extrude tab

the String Extrude tab applies an extrude to selected super strings. Note that extrudes can only be applied to super strings.

Key

select name menu

key to match the string name against in the Interval Extrude tab. The key can include wild cards (*) and wild characters (?).

If a match occurs, then the rest of the grid fields for this line of this tab of the map file are used and no other tests for matches against keys further down in the table are made.

If a match does not occur, then a test for a match is made against the key on the next line of this tab of the map file.

Comment

comment to be used in this line of the map file. A double slash // is written out to the ascii map file before the comment, and a comment in an ascii map file is read in and displayed without the double slash.

Please see the next section "Ascii Form of the 12d Map File" for a discussion of the text form of the 12d map file.

Ascii Form of the 12d Map File

Basic Tab

The *Basic* tab enables the string name, model, colour, point-line type, linestyle and weight to be defined and for many applications, this is all that is required in the 12d Map file.

The Basic tab consisted of one or more lines of information. Each line begins with a key (entity-mask) followed by a string name, model name, colour, breakline type (point or line), line style, weight and comment. The key can contain wild cards (*) and wild characters (?).

When a string is read in and satisfies a key, the key's corresponding string name, model, colour, breakline type and style is used for that string.

For example, any entity name beginning with **31** can be created as a **12d** Model string with the name **picket**, colour **cyan**, breakline type **line**, line style **1** and model **fences** by the map file line

```
31      picket      fences      cyan      line      1
```

If a map file is used, as each entity is read in, the map file is searched **sequentially** until a match with a key is made and the key's name, colour etc. used. If no match is found, the default colours and model (given in the read panel) are used.

Notes

1. If the entity-name is to be used as the new string name, use an asterisk (*) in place of the string name. For example,

```
fred      *      fences      cyan      line      1
```

2. If the default model for the reader is to be used as the model name, use an asterisk in place of the model name. For example,

```
31      31      *      cyan      line      1
```

3. A * for colour, breakline type and linestyle means that if the entity has a colour, breakline style or linestyle, then it is used rather than be mapped to another one.
4. All model names used in the map file can be given an extra (common) prefix by typing the prefix into the prefix for models field in the read panel.
5. If any information includes a space, then it must be enclosed in quotes ". For example, the model name may be "trial 1" or a style "large tanks".
6. Comments can be included in the map file by preceding them with a double forward slash//. Anything on the line after the // is ignored.

An example of a 12d Model map file is

```
// 12d Model map file
// key      name      model      colour      pt-line      linestyle

102        break      breaks     red          line          solid
305        fence      cadast     green        point         dash
998        bdry       bound      cyan         line          solid
spots      *          spot       yellow       point         1
PS*        *          *          yellow       point         1
```

Other tabs

For all tabs other than the *Basic* tab, the map file is broken up into sections (one section for each tab of the map file editor) and each section begins with a header record which is the section name enclosed in braces { }. For example, the symbols section has the header

```
{symbol_data}
```

Inside each section, the data is similar to the *Basic* tab with lines consisting of a key (entity-mask) followed by the data required for that section. The key can contain wild cards (*) and wild characters (?).

The exact format for the map file is not required since they are created and edited from within 12d Model by the option

File i/o => Map file

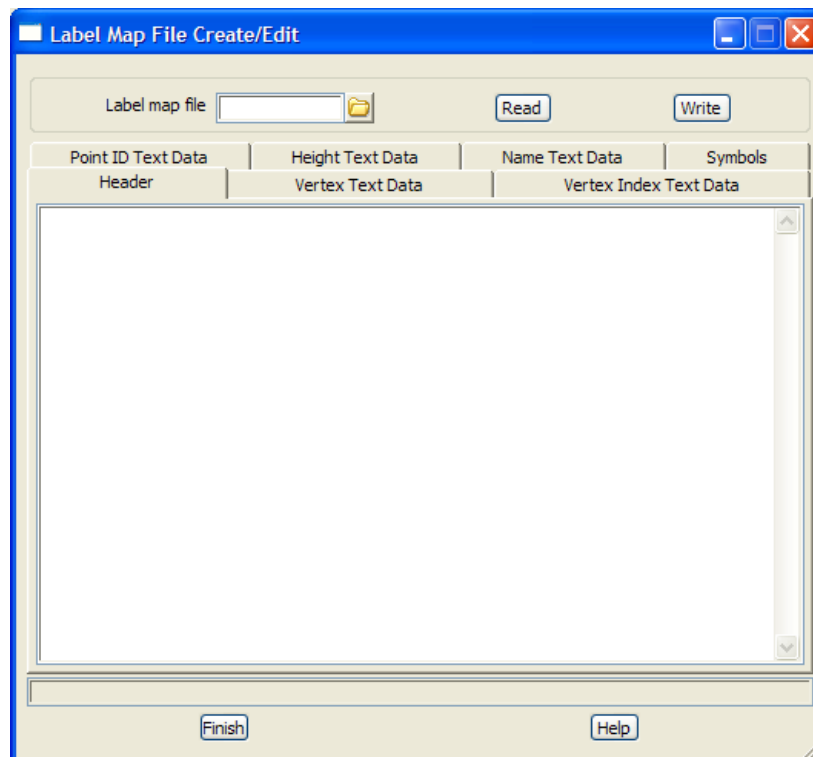
Label Map File

label_map_file_create_edit

Position of option on menu: File I/O =>Label Map File

The label map file option can be used to **create** or **edit** the map files used to create labelling for vertices.

On selecting the label map file option, the **label map file create/edit** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Label map file <i>name of the label map file to be created or edited.</i>	input		*.lmf

Bottom buttons

Read button

read in the label map file given in the label map file field and load the data into the fields of the table. If the file doesn't exist, an error message is given.

Write button

write out the data in the table to the file name given in the label map file field. If the file already exists, a yes-no-cancel panel checks to see if the existing file is to be over written - if no or cancel is selected, nothing is written out.

Header tab

lines of text that are written out at the top of the label map file.

Vertex text data tab - labelling of the text at each vertex

Key select name menu for fields
key to be used in this line of the label map file.

Textstyle select textstyle menu for fields
textstyle for labels.

Type/Size/Colour
units for size of text labels/size of the text/ colour of the text.

Angle/Offset/Raise/Slant/X Factor/Justify
angle/offset/raise/slant/x factor/justification for the text.

Comment
comment to be to be used in this line of the map file. A double slash // is written out to the file before the comment, and comment in a map file is read in and displayed without the double slash.

Vertex index text data tab - labelling of the vertex index

Key select name menu for fields
key to be used in this line of the label map file.

Textstyle select textstyle menu for fields
textstyle for labels.

Type pixel, world
units for size of text labels.

Size
size of the text in the given units.

Colour select colour menu for fields
colour of the text.

Angle/Offset/Raise/Slant/X Factor/Justify
angle/offset/raise/slant/x factor/justification for the text.

Comment
comment to be to be used in this line of the map file. A double slash // is written out to the file before the comment, and comment in a map file is read in and displayed without the double slash.

Point id text data tab - labelling the point id at each vertex

Key select name menu for fields
key to be used in this line of the label map file.

Textstyle select textstyle menu for fields
textstyle for numbers.

Type/Size/Colour
units for size of number labels/size of the text/ colour of the number.

Angle/Offset/Raise/Slant/X Factor/Justify
angle/offset/raise/slant/x factor/justification for the number text.

Comment

comment to be to be used in this line of the map file. A double slash // is written out to the file before the comment, and comment in a map file is read in and displayed without the double slash.

Height text data tab - labelling of the height of the vertex

Key select name menu for fields
key to be used in this line of the label map file.

Textstyle select textstyle menu for fields
textstyle for labels.

Type/Size/Colour
units for size of text labels/size of the text/ colour of the text.

Angle/Offset/Raise/Slant/X Factor/Justify
angle/offset/raise/slant/x factor/justification for the text.

Comment
comment to be to be used in this line of the map file. A double slash // is written out to the file before the comment, and comment in a map file is read in and displayed without the double slash.

Name text data tab - labelling of the string name(codes) at each vertex

Key select name menu for fields
key to be used in this line of the label map file.

Textstyle select textstyle menu for fields
textstyle for labels.

Type/Size/Colour
units for size of text labels/size of the text/ colour of the text.

Angle/Offset/Raise/Slant/X Factor/Justify
angle/offset/raise/slant/x factor/justification for the text.

Comment
comment to be to be used in this line of the map file. A double slash // is written out to the file before the comment, and comment in a map file is read in and displayed without the double slash.

Symbols - placing symbols at each vertex

Key select name menu for fields
key to be used in this line of the label map file.

Style select textstyle menu for fields
linestyle to apply to the vertex.

Size/Colour
size/colour of symbol.

Angle/Offset/Raise
angle/offset/raise for the symbol.

Comment
comment to be to be used in this line of the map file. A double slash // is written out to the file before the

comment, and comment in a map file is read in and displayed without the double slash.

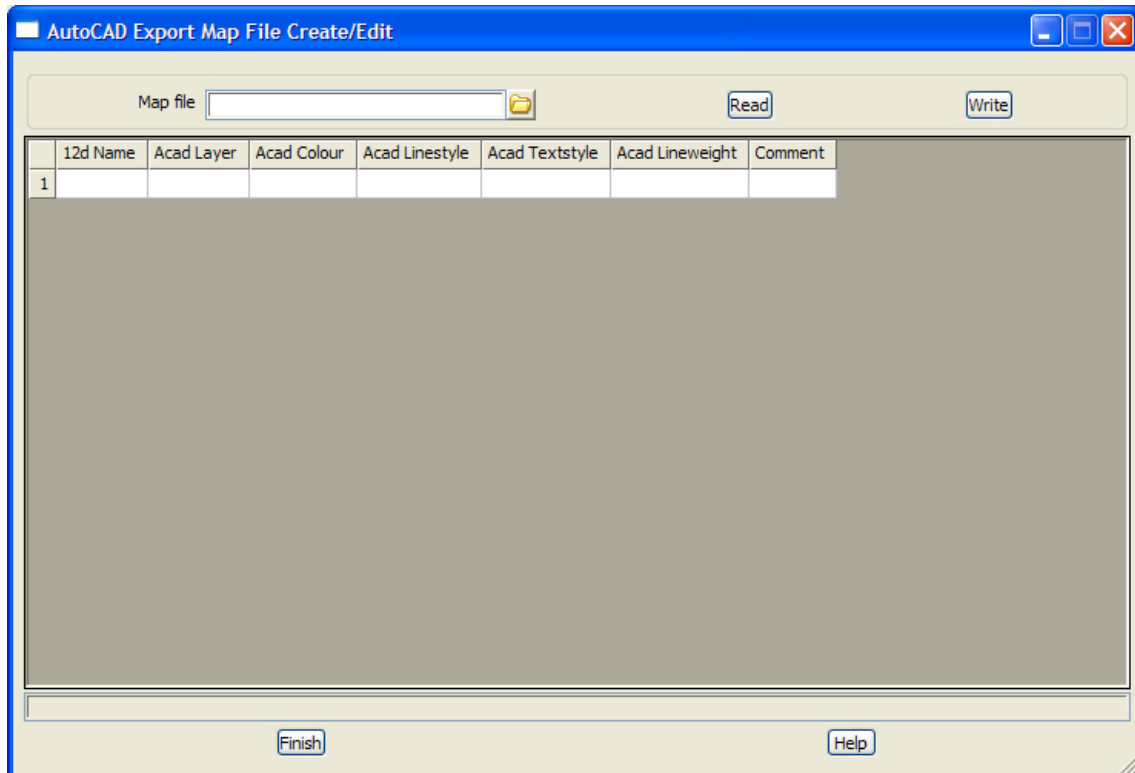
AutoCAD Output Map File Create/Edit

autocad_export_map_file_create_edit

Position of option on menu: File I/O =>AutoCAD output map file

The AutoCAD output map file option **creates** or **edits** the map files used when writing data out to AutoCAD using the DWG Output option (not used for plotting to AutoCAD).

On selecting the IAcad output map file option, the **Autocad Export Map File Create/Edit** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Map file	input		*.acadmf

name of the Autocad output map file to be created or edited.

Read	button
-------------	--------

read in the Autocad output map file given in the map file field and load the data into the fields of the table. If the file doesn't exist, an error message is given.

Write	button
--------------	--------

write out the data in the table to the file name given in the map file field. If the file already exists, a yes-no-cancel panel checks to see if the existing file is to be over written - if no or cancel is selected, nothing is written out.

Grid Cells

12d Name

12d Model string names for the mapping to apply to - wild cards () and characters (!) can be used.*

Acad layer

*AutoCAD layer to send the selected strings to. Use * to write the 12d Model model of the string out*

Acad colour

*AutoCAD colour to use for the selected strings - a number between 0 and 256. Use * for 12d Model colour number. Use BYLAYER for ACD BYLAYER*

Acad linestyle

*AutoCAD linestyle to use for the selected strings. User * for 12d Model linestyle or BYLAYER for ACD BYLAYER*

Acad Textstyle

*AutoCAD Textstyle to use for the selected strings. Use * for 12d Model text style*

Acad lineweight

AutoCAD lineweight to use for the selected strings.

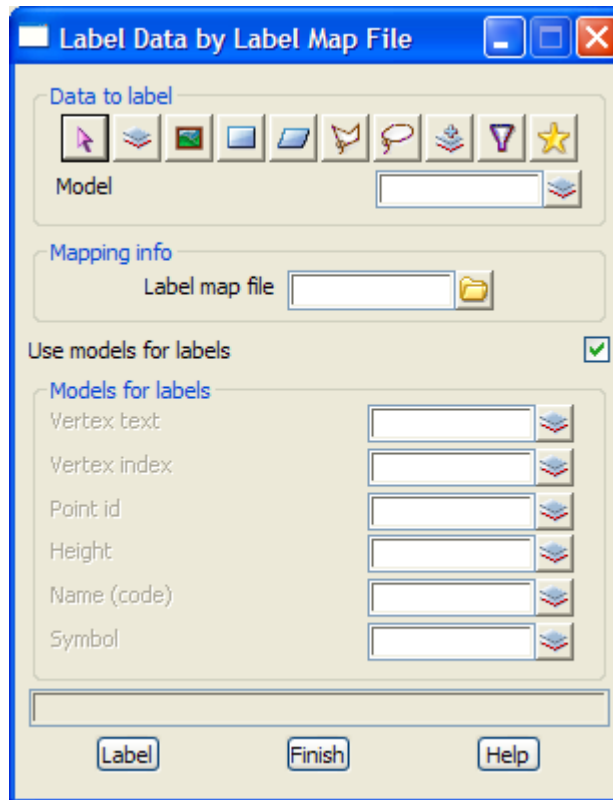
Use Label Map File

label_data_by_label_map_file

Position of option on menu: File I/O =>Use Label Map File

Use a label map file to create text labels for all strings is the selected data source.

On selecting the use label map file option, the **label data by label map file** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Data source type <i>data selection type</i>		Model	
Data source <i>source of data is to be written out to a file.</i>	input		
Label map file <i>name of the label map file to be created or edited.</i>	input		*.lmf
Use models for labels <i>if tick, all the labels for all vertices of the strings go into the appropriate models for vertex, vertex numbers, point ids, height, string name (code) and symbols given in the panel fields.</i> <i>if not tick, the labels for a string from a model go into the model of the same name but with a prefix/postfix given by the vertex, vertex ni, height and code panel fields.</i>	tick box	tick	
Vertex text, Vertex index, Point id, Height, Name, Symbol <i>model box</i>			available models

if User models for labels is ticked, these models are used for the create data.

Label button
process the selected strings and label them.

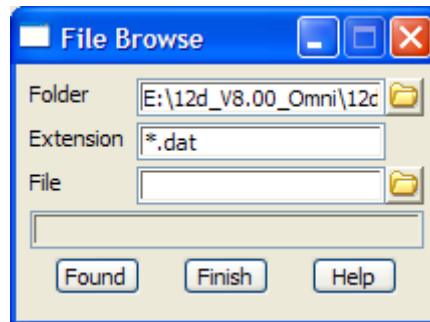
Edit

file_browse

Position of option on menu: File I/O =>Edit

Files can be searched for and then displayed in the editor using the browse option.

On selecting the Edit option, the **File Browse** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Folder <i>folder to search for files with the extension given in the extension field.</i>	input	current folder	Microsoft browser
Extension <i>wild cards and extension to limit the search of files. An <enter> needs to be typed after changing the extension.</i>	input	*.*	
File <i>select the file to be displayed in the editor.</i>	input		files satisfying the folder and extension fields.
Found <i>display in the editor the file of the name given in the file field.</i>	button		

Note

The **editor** is pointed to by the environment variable EDITOR_4D (see Appendix A).

8 Data Input

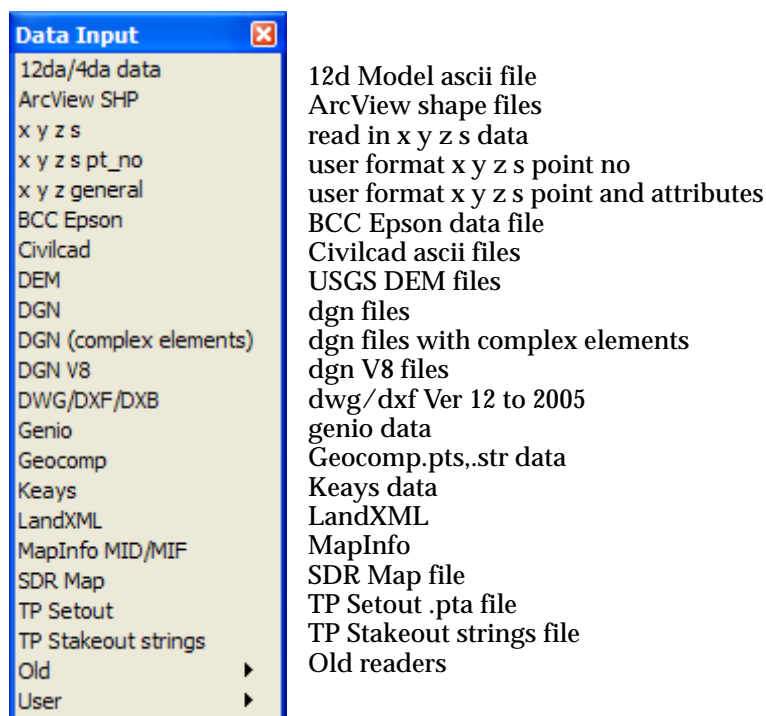
data_input

Position of menu: File I/O =>Data input

The facilities for reading data files into 12d Model are collected under the File i/o=>Data input menu.

Some of the formats are provided in the base product (xyz data, BCC Epson, 12d Model HP plots and 12d Model ascii files) and the rest are optional (dxf, genio, geocomp, etc.).

The default *Input null value* is described in the section “Input Null Value”



The default *Input null value* is described in the section “Input Null Value”

For the option *12da data*, go to the section

<i>ArcView SHP</i>	“12d Ascii Input” .
<i>x y z s</i>	“ArcView SHP Input” .
<i>x y z s pt_no</i>	“X Y Z S File Format” .
<i>x y z general</i>	“User Format X Y Z Input” .
<i>BCC Epson</i>	“User X Y Z and Attributes Input” .
<i>Civilcad</i>	“BCC Epson Input” .
<i>DEM</i>	“CivilCad Input” .
<i>DGN</i>	“DEM Input” .
<i>DGN (complex elements)</i>	“DGN Binary Input” .
<i>DGN V8</i>	“DGN With Complex Elements” .
<i>DWG/DXF/DXB</i>	“DGN V8” .
<i>Genio</i>	“DWG/DXF Input” .
<i>Geocomp</i>	“Genio File Format” .
	“Geocomp File Format” .

<i>Keays</i>	"Keays Input" .
<i>LandXML</i>	"LandXML Input" .
<i>MapInfo</i>	"Mapinfo Input" .
<i>SDR Map</i>	"SDR Map Input" .
<i>TP Setout</i>	"TP Setout Input" .
<i>TP Stakeout strings</i>	"TP Stakeout Strings Input" .
<i>Old</i>	"Old Inputs" .

Input Null Value

In three dimensional data, it is possible that a point can have a valid plan position but an undefined height. In **12d** Model, there is a special **null** value which is used internally when height is undefined (-9.9e29).

In other systems, the null value will be different.

To allow for the different null values, **12d** Model has an **i/o null height** parameter.

As data is read in, the height is checked and if it is equal to the **i/o null height**, then it is replaced by the **12d** Model null height.

The **i/o null height** is set in **Default Settings** tab of the **Defaults** panel in the option Utilities=>Defaults.

Note - some input panels have their own special null value field which is used instead of the i/o null height.

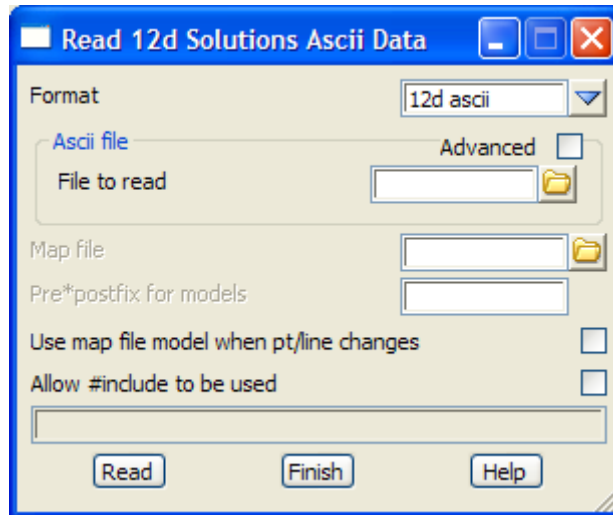
12d Ascii Input

read_12D_Solutions_ascii_data

Position of option on menu: File I/O =>Data input =>12d/4da data

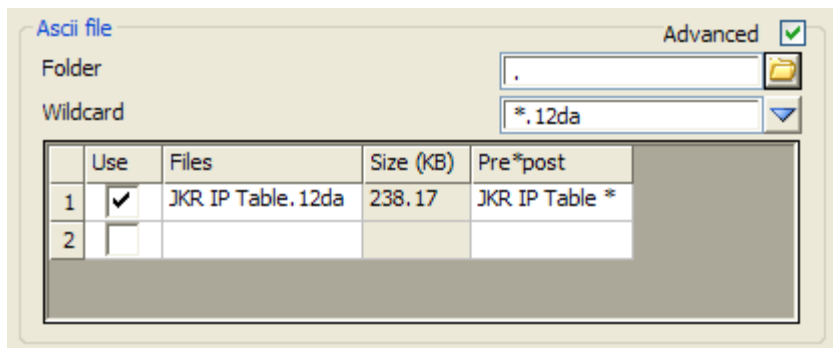
The 12d Ascii format is a special format defined by 12D Solutions to allow data to be easily transferred from other programs into 12D Solutions software such as 12d Model. The 12d Ascii format is given in the Appendix.

Selecting the 12d data brings up the **Read 12d Solutions Ascii Data** panel:



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Format <i>use 12d ascii or 4d ascii format (the only difference is the file name ending)</i>	choice box	12d ascii	12d ascii, 4d ascii
File to read <i>name of the 12d Model Ascii file to be read in.</i>	file box		*.12da or *.4da files
Advanced <i>if tick, a grid to allow multiple 12d ascii files to be read in, is opened. A wild card is used to select all the files to be read in.</i>	tick box		



Folder folder box
folder to search for files using the Wild card

Wildcard input

wild card to use in search for files in the given folder

Use tick box

*if **tick**, read in the file*

Files output

name of the file in the folder

Size output

file size

Pre*post text input

*if **non blank**, pre*post text to use for the models in this 12d ascii file (see “Pre*Postfix Panel Fields” for information on using pre*postfix.*

*If **blank**, use the pre*post text from the Pre*postfix for models panel field.*

Note - if a non-blank value for **Pre*post** is given in the column for a file then the **Pre*postfix for models** is ignored.

Map file file box *.mf files

*if non-blank, the name of the 12d map file to be used for all strings read in, including any files given with the **Advanced** mode ticked on.*

If blank, no map file is used

When using a map file, the string name is used as the entity-name for matching with the keys in the map file. See the section “Map File” in chapter “File I/O” for information about an 12d map file.

Pre*postfix for models pre*postfix box

if non-blank, a prefix and a postfix to be applied to the model names used in the mapping file.

*Go to the section “Pre*Postfix Panel Fields” for information on using pre*postfix.*

Note - if a non-blank value for **Pre*post** is given in the column for a file then the **Pre*postfix for models** is ignored.

Use map file model when pt/line changes tick box

*if **not tick** and the pt/line type of the string does not match that in the map file, then the string is placed in the .*

If tick, the .

Allow #include to be used tick box

if tick, XXXX.

Read button

read the data in.

ArcView SHP Input

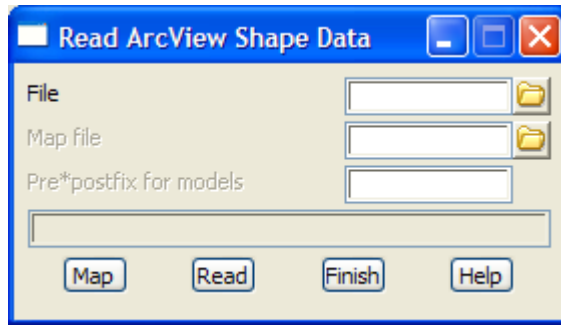
[read_ArcView_shape_data](#)

[ArcView_input_mapping](#)

Position of option on menu: File I/O =>Data input =>ArcView SHP

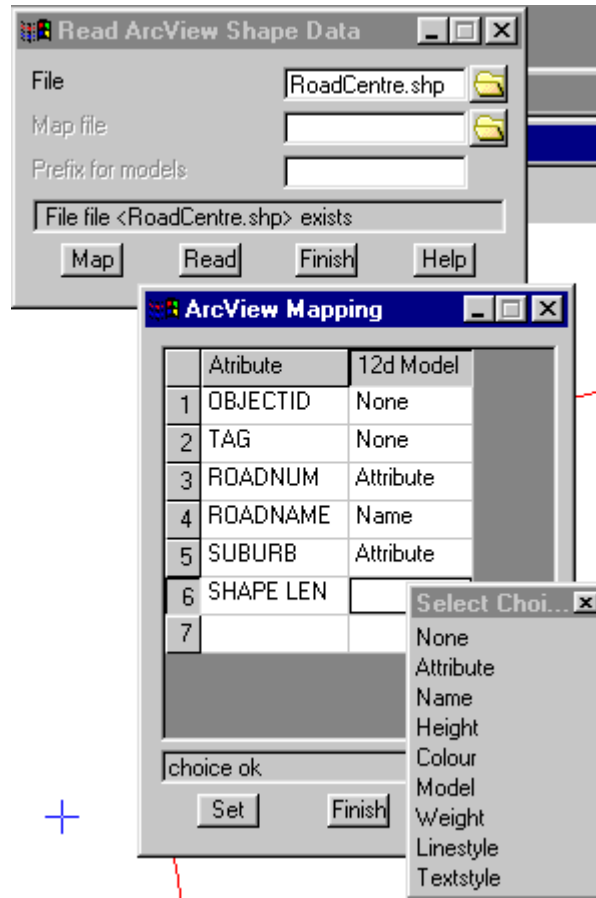
This Option is currently under development.

On selecting the **ArcView SHP** option, the **Read ArcView Shape Data** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
File	file box		*.shp files
<i>name of the ArcView shape file. 12d Model then reads this and the two (2) other files that go with the shape file. The two other file extensions are *.shx and *.dbf.</i>			
<i>If no attribute is mapped to model, then the file name (minus the .shp) is used as the model for the data.</i>			
Map file	file box		*.mf files
Pre*postfix for models	pre*postfix box		
<i>if non-blank, a prefix and a postfix to be applied to the model names used in the mapping file.</i>			
<i>Go to the section "Pre*Postfix Panel Fields" for information on using pre*postfix.</i>			
Map	button		
<i>After specifying the Shape file name, click on Map to scan the file and find the names of all the attributes in the shape file. An ArcView Input Mapping panel is then displayed with a list of all the ArcView attributes in the shape file. How the attribute are to be mapped and used in 12d Model is then be specified for each attribute in the panel. For example, the value of an attribute could be used for a 12d string name, or colour etc.</i>			



If None is selected for an attribute, then the attribute is ignored.

*Once the table is completely filled in (no field in the column titled 12d Model can be left blank) then the **Set** button must be selected and then the **Finish** button selected to remove the ArcView Input Mapping panel.*

NOTE - if no ArcView attribute is mapped to Model, then the file name (minus the .shp) is used as the model or the data.

Read button

read the data in.

X Y Z S File Format

`read_x_y_z_s_data`

The x-y-z-s format is designed so that point and line strings can be quickly and easily coded and entered into 12d Model. It is **not** intended for more complex strings such as alignments and text where the 12d Model ascii format is more suitable.

For the x-y-z format, **point** data is set out with one point of x y z data per line. The three values are separated by one or more spaces (free format). For example

```
990          3          10
112          1001       23.5
```

A point-string is represented in 12d Model with a cross at each point. The colour of the cross can be defined by including a POINT_COLOUR command on the line before the point-string begins.

For example, a two point point-string with red crosses would be coded as

```
POINT_COLOUR      red
100.3  990.3   10
112  1001     23.5
```

Line string data is also set out with one point per line (in the order that the points occur in the string) but with a string label included at the end of each line. The string label is repeated for each point in the string. The line string terminates when the string label changes to another name for a new line string or is blank for a point string.

A line-string is drawn with a line connecting a point to its neighbouring points in the string (the string links). The colour of the links of the string can be set using the LINE_COLOUR command.

For example, a green, three point line-string called S1 becomes

```
LINE_COLOUR green
100.3  990.3  10  S1
112  1001  23.5  S1
119.3 1203.1 29.4  S1
```

Notes

- The name of the line string can include spaces but in that case the name must be enclosed in quotes ". For example, the string name may be "toe 1".
- If a string of a certain name is created and the string name reoccurs in the file, then a new string with the same name is created. It is not joined to the earlier string.

xyz Map File

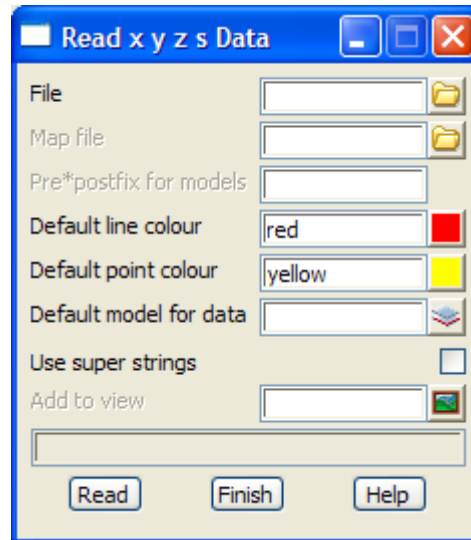
See the section "Map File" in chapter "File I/O" for information about an 12d map file.

The **name** of the xyzs string is used as the entity-name to be used for matching with a map file. The map file can be used to override the breakline type of line-strings in the x-y-z file.

X Y Z Input

Position of option on menu: File I/O =>Data input =>x y z s

On selecting the xyzs option, the **read xyzs data** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
File <i>name of the data file to be read in</i>	file box		*.dat files
Map file <i>if non-blank, the name of the 12d map file to be used for all strings read in. If blank, no map file is used</i>	map file box		*.mf files
Pre*postfix for models <i>if non-blank, a prefix and a postfix to be applied to the model names used in the mapping file. Go to the section "Pre*Postfix Panel Fields" for information on using pre*postfix</i>	pre*postfix box		
Default line colour <i>colour used for line-strings (if no colour is defined in the file)</i>	colour box	default colour	available colours
Default point colour <i>colour used for the crosses in point-strings (if no colour is defined in the file)</i>	colour box	default pt colour	available colours
Default model for data <i>name of the model that the data is to be placed in. The model will be created if it does not already exist. This field must be filled in.</i>	model box		available models
Use super strings <i>if tick, super strings will be created. If not tick, 3d strings will be created.</i>	tick box		
Add to view <i>if non blank, the default model will be automatically added to the view</i>	view box		available views

Read button

read the data into the model given in the model field.

User Format X Y Z Input

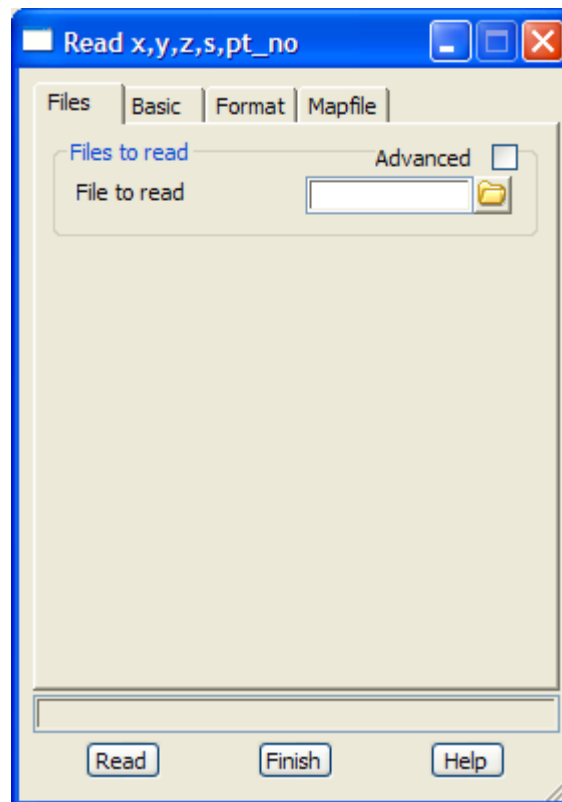
Read_x_y_z_s_pt_no

Position of option on menu: File I/O =>Data input =>x y z s pt_no

On selecting the read x,yzs,pt_no option, the **read xyzs pt no** panel is displayed.

This option reads data in one line at a time with the values separated by a delimiter (tab, space, semi-colon or comma) or the data on each line can be in fixed width columns.

In either case, the user specifies the order that the x, y, z, s and point number are in and if desired, only an x and y value needs to be read in.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

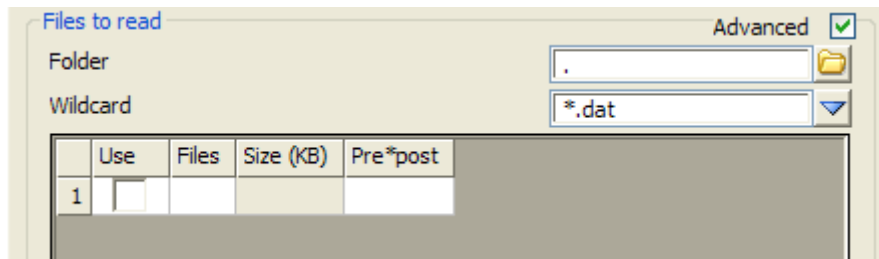
Button on bottom

Read	button		
<i>read the data into the model given in the model field.</i>			

Files tab

File to read	input		*.dat files
<i>name of the data file to be read in</i>			

Advanced	tick box		
<i>if tick, a grid to allow multiple files to be read in, is opened. A wild card is used to select all the files to be read in.</i>			



Folder folder box

folder to search for files using the Wild card

Wildcard input

wild card to use in search for files in the given folder

Use tick box

if tick, read in the file

Files output

name of the file in the folder

Size output

file size

Pre*post text input

*if non blank, pre*post text to use for the models in this file (see "Pre*Postfix Panel Fields" for information on using pre*postfix.*

*If blank, use the pre*post text from the Pre*postfix for models panel field.*

Note - if a non-blank value for **Pre*post** is given in the column for a file then the **Pre*postfix for models** is ignored.

Basic tab

Default line colour colour box default colour available colours

colour used for line-strings (if no colour is defined in the file)

Default point colour colour box default pt colour available colours

colour used for the crosses in point-strings (if no colour is defined in the file)

Default text style input available textdatas

textdata for the point ids

Skip column headers tick box

if tick, the first line of the file is skipped.

Join all tick box

if tick, all vertices with the same string names are joined together regardless of where they are in the file. The order of the vertices is the order they occur in the file.

If no tick then any time a string name changes in the file, a new string is created. So if the same string name occurs but separated by a different string name, then more than one string of that same name will be created. The order of the vertices is the order they occur in the file.

Default model for data model box available models

name of the model that the data is to be placed in. The model will be created if it does not already exist.

This field must be filled in.

Add to view view box available views
if non blank, the default model will be automatically added to the view

Format tab

Input mode choice box delimiter delimiter, fixed width
*if **delimiter**, the type of delimiter and the columns for the x, y and optionally z, name and point number are given.*

Delimiter choice box tab \f one space, tab \t,
semi colon, comma
many spaces

*if **fixed width**, the start and end positions are given for x, y and optionally z, name and point number.*

Mapfile tab

Map file file box *.mf files

*if **non-blank**, the name of the 12d map file to be used for all strings read in, including any files given with the **Advanced** mode ticked on.
If **blank**, no map file is used*

When using a map file, the string name is used as the entity-name for matching with the keys in the map file. See the section "Map File" in chapter "File I/O" for information about 12d map files.

Pre*postfix for models pre*postfix box

*if non-blank, a prefix and a postfix to be applied to the model names used in the mapping file.
Go to the section "Pre*Postfix Panel Fields" for information on using pre*postfix.*

***Note** - if a non-blank value for **Pre*post** is given in the column for a file then the **Pre*postfix for models** is ignored.*

User X Y Z and Attributes Input

Read_x_y_z_General_File

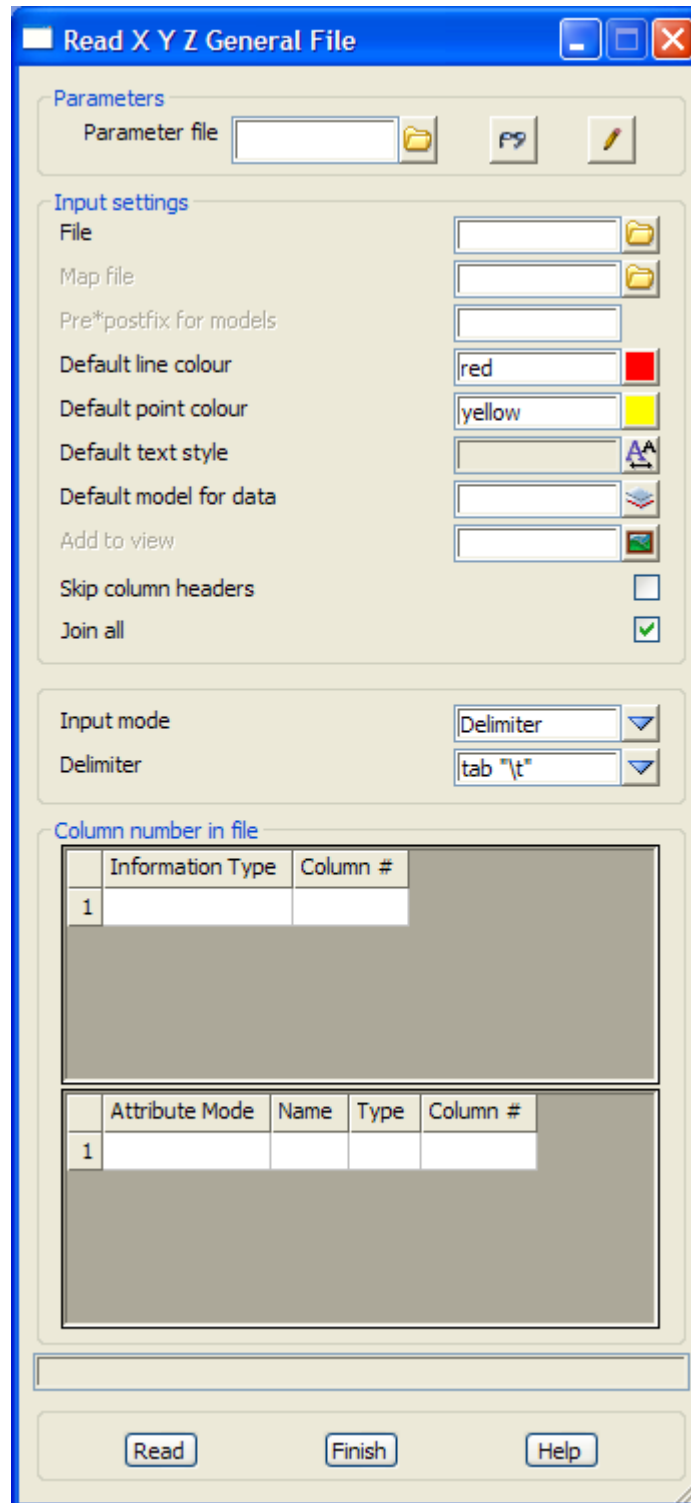
Position of option on menu: File I/O =>Data input =>x y z general

On selecting the read x,y,z general option, the **Read x y z s General File** panel is displayed.

This option reads data in one line at a time with the values separated by a delimiter (tab, space, semi-colon or comma) or the data on each line can be in fixed width columns.

In either case, the user specifies the order that the x, y, z, string name, point number and attributes appear in the file. If desired, only an x and y value needs to be read in.

The set-ups for defining all the positions of all the data in the file can be written out to a file (.xyf) for re-use.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Parameters section

Parameter file	input		*.xyf files
		<i>name of the file containing the settings for how the data is positioned in the input file.</i>	

Read icon	button
------------------	--------

read the parameter file in.

Write icon button

write the setting in the panel out to a parameter file.

Input settings section

File input *.dat files

name of the data file to be read in

Map file file box *.mf files

if non-blank, the name of the map file to be used for all strings read in. If blank, no map file is used. The string name is used as the entity-name for matching with the keys in the map file. See the section "Map File" in chapter "File I/O" for information about an 12d map file.

Pre*postfix for models pre*postfix box

if non-blank, a prefix and a postfix to be applied to the model names used in the mapping file. Go to the section "Pre*Postfix Panel Fields" for information on using pre*postfix.

Default line colour input default colour available colours

colour used for line-strings (if no colour is defined in the file)

Default point colour input default pt colour available colours

colour used for the crosses in point-strings (if no colour is defined in the file)

Default text style input available textdatas

textdata for the point ids and other text

Default model for data input available models

name of the model that the data is to be placed in. The model will be created if it does not already exist. This field must be filled in.

Add to view input available views

if a view name is entered, then the model will be automatically added to the view. This field can be blank.

Skip column headers tick box

if tick, the first line of the file is skipped.

Join all tick box

if **tick**, all vertices with the same string names are joined together regardless of where they are in the file. The order of the vertices is the order they occur in the file. If **no tick** then any time a string name changes in the file, a new string is created. So if the same string name occurs but separated by a different string name, then more than one string of that same name will be created. The order of the vertices is the order they occur in the file.

Input mode choice box delimiter delimiter, fixed width

if **delimiter**, the type of delimiter and the columns for the x, y and optionally z, name and point number are given.

Delimiter choice box tab \f one space, tab \t, semi colon, comma many spaces

if **fixed width**, the start and end column positions are given for x, y and optionally z, name and point number.

Column number/Start end position section

information to read in (x,y,z, attributes etc.) and its position in the input file.

Input mode: Delimiter

Delimiter: tab "\t"

Column number in file

	Information Type	Position #
1		

	Attribute Mode	Name	Type	Position #
1				

Input mode: Fixed width

Delimiter: tab "\t"

Start/end position

	Information Type	Start	End
1			

	Attribute Mode	Name	Type	Start	End
1					

BCC Epson Input

read_bcc_epson_data

Position of option on menu: File I/O =>Data input =>BCC Epson

The BCC Epson input option is designed to read in files in the BCC (Brisbane City Council) Epson format.

The BCC Epson format is point based with unique point numbers for each point. It also has the concept of **non-tinable** points. Since the super string supports vertex tinability, it is the best string type to use for storing data coming in BCC Epson format. Also the BCC Epson point ids are stored as the point ids of the super string vertices.

BCC Epson breaks its data up by a feature code and a 12d Model map file can be used to define models, colours, linestyles etc. where the BCC **feature code** as the entity-name (key) in the map file.

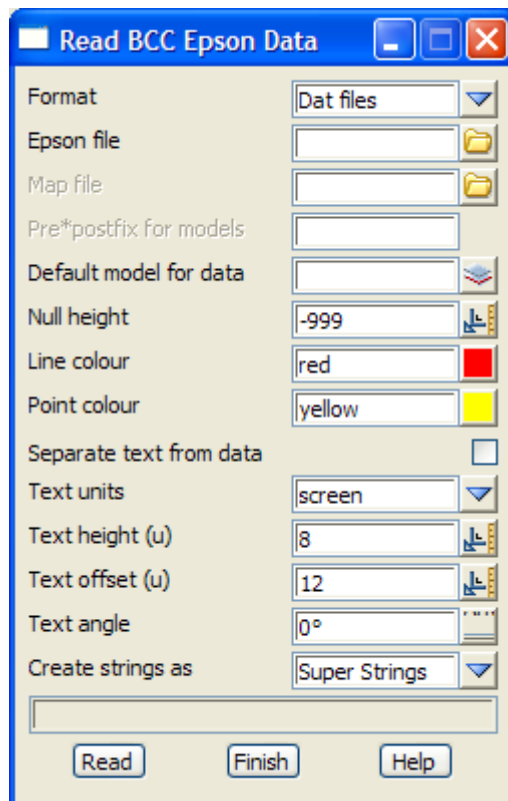
The best way to read in BCC Epson data is to have a map file which maps BCC Epson feature codes into strings with the same name as the feature code, and also places the strings into sensible models.

See the section “Map File” in chapter “File I/O” for information about a 12d map file.

Note:

All text after column 68 in the BCC Epson file is considered to be a note.

On selecting the BCC Epson option, the **Read BCC Epson Data** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Format	input	Dat files	Dat files, SUR files

format to use when reading in the BCC Epson file.

Epson file	input		matches the selected format
<i>name of the BCC Epson file to be read in.</i>			
Map file	input		*.mf files
<i>if non-blank, the name of the map file to be used for all strings read in.</i>			
<i>If blank, no map file is used.</i>			
<i>The BCC Epson feature code is used as the entity-name to match against the key in the 12d map file.</i>			
<i>See the section "Map File" in chapter "File I/O" for information about an 12d map file.</i>			
Pre*postfix for models	pre*postfix box		
<i>if non-blank, a prefix and a postfix to be applied to the model names used in the mapping file.</i>			
<i>Go to the section "Pre*Postfix Panel Fields" for information on using pre*postfix.</i>			
Default model for data	input		available models
<i>name of the model that any unmapped data is placed in. The model will be created if it does not already exist. This field must be filled in.</i>			
Null height	input	-999	
<i>if non-blank, any BCC Epson z values equalling this value are taken as null values.</i>			
Line colour	input	red	available colours
<i>colour for BCC Epson string s.</i>			
Point colour	input	yellow	available colours
<i>colour for BCC Epson points that are not part of strings.</i>			
Separate text from data	tick box		
<i>if not tick, text is used in 4d or super strings</i>			
<i>if tick, separate text strings are created.</i>			
Text units	input	pixels	pixels, world
<i>units for the height of the text label.</i>			
Text height (u)	input		
<i>height of the text (in text units).</i>			
Text offset (u)	input		
<i>distance (in text units) to offset the text from its (x,y) placement position.</i>			
Text angle	input		
<i>angle of the text.</i>			
Create strings as	input	Super Strings	3d, 4d, Polyline, Super
<i>type of strings to create.</i>			
Read	button		
<i>read the data in.</i>			

CivilCad Input

`read_civilcad_data`

CivilCad input is a separate chargeable module.

Position of option on menu: File I/O =>Data input =>Civilcad

The civilcad input option is designed to read in CivilCad Version 4, 5 and some 6 ascii files.

CivilCad breaks its data up by a layer name only. By default, CivilCad layers are mapped into 12d Model models.

CivilCad has no strings but only points, lines, arcs and circles. CivilCAD spirals are ignored. When reading in CivilCad data, 12d Model will try to head to tail consecutive lines from the same layer to create strings.

The CivilCad format is point based with unique point ids for each point. It also has the concept of **non-contourable** or **non-tinable** points.

Since the super string supports point tinability, it is the best string type to use for storing data coming in CivilCad format. CivilCad point ids are stored as the point numbers of the super string vertices.

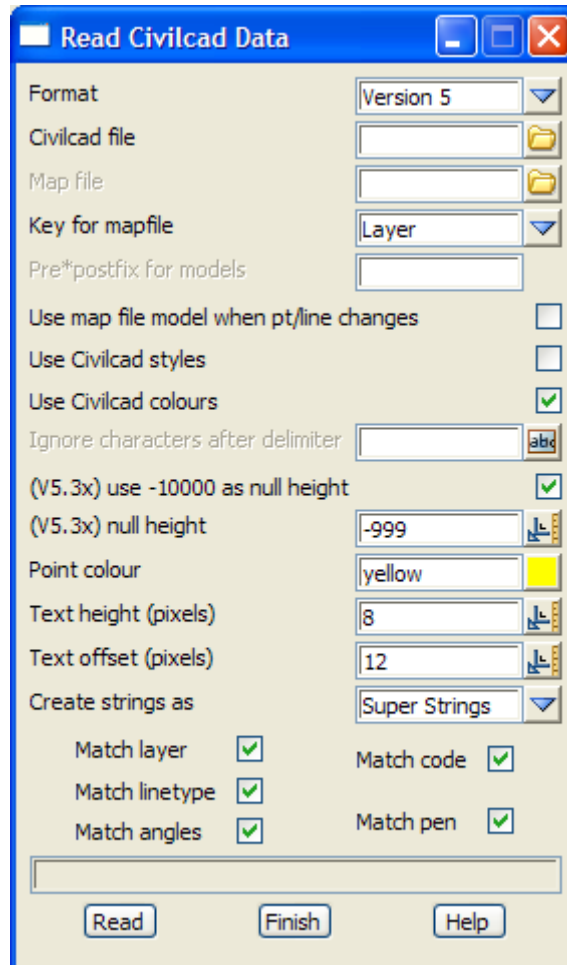
In CivilCad, a layer is defined to contain only breaklines or non-breaklines. In 12d Model, this simply corresponds to strings having a line or point *breakline* type.

If a **map** file is used when reading CivilCad data, either the CivilCad **layer** name, entity code, layer/code or code/layer can be used as the entity-name to match against the **key**.

See the section "*Map File*" in chapter "File I/O" for information about an 12d map file.

Warning - CivilCad has a null value of -10,000 - these values may need to be nulled in 12d Model after the CivilCad data is read in.

On selecting CivilCAD, the **Read Civilcad Data** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Format <i>format of CivilCad ascii file to be read in.</i>	choice box	Version 5	version 4, version 5, version 6
Civilcad file <i>name of the Civilcad ascii file to be read in.</i>	file box		*.asc
Map file <i>if non-blank, the name of the map file to be used for all strings read in If blank, no map file is used. The Key for map file defines what is used to match against the key in the map file. See the section "Map File" in chapter "File I/O" for information about an 12d map file.</i>	map file box		*.mf files
Key for map file <i>if Layer, the Civilcad layer is used as the entity-name to match against the key in the map file. if Code, the Civilcad layer is code as the entity-name to match against the key in the map file.</i>	choice box	Layer	Code, Layer, Code/Layer, Layer/Code
Pre*postfix for models <i>if non-blank, a prefix and a postfix to be applied to the model names used in the mapping file. Go to the section "Pre*Postfix Panel Fields" for information on using pre*postfix.</i>	pre*postfix box		
Use CivilCad styles	tick box		

if **tick**, then the CivilCad linestyle number is used as the 12d Model linestyle name.

Use CivilCad colours tick box

if **tick**, then the CivilCad colour number is used as the 12d Model colour number.

Ignore characters after delimiter tick box

if **tick**, r.

(V5.3x) use -10000 as null height tick box tick

if **tick**, any CivilCad z values of -10,000 are taken as null values.

(V5.3x) null height input -999

the value in the CivilCAD file to use as null height if User -10000 is not ticked.

Point colours colour box yellow available colours

colour for CivilCad points that are not part of strings.

Text height (pixels) input 8

the height in pixels of any text created, or for point numbers.

Text offset (pix) input 12

the offset (in pixels) from the (x,y) co-ordinate position for any text or point numbers.

Create strings as input Super Strings Lines and Arcs
3d Strings and Arcs,
Polyline Strings
Super Strings

type of strings to create.

Match flags tick box

CivilCad data consists of individual lines and arcs. When reading CivilCad data, it undergoes head to tail processing and the match flags specify what CivilCad data can be joined.

Match layer/code/linetype/angles/pen tick box

if **tick**, then any CivilCad lines and arcs must have the same layer/code/linetype/angle/pen before they can be joined in the head to tail process.

Read button

read the data in.

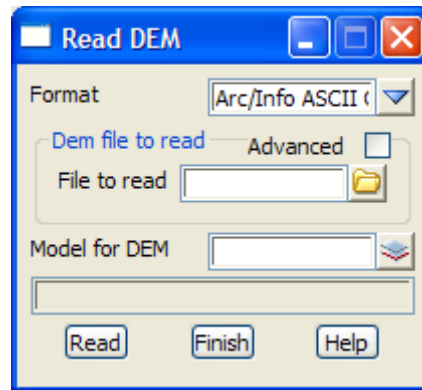
DEM Input

read_DEM

Position of option on menu: File I/O =>Data input =>DEM

The DEM option is designed to read in Digital Elevation Model data in the Arc/Info format.

On selecting Dem, the **Read DEM** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Format <i>format of the DEM to read in.</i>	choice box	Arc/Info ASCII	Arc/Info ASCII Grid *.dem
Dem file to read <i>name of the DEM file to be read in.</i>	file box		
Model for DEM <i>model to put the DEM data in.</i>	model box		available models
Read <i>read the data in.</i>	button		

DGN Binary Input

read_dgn_data

DGN binary input is a separate chargeable module.

Position of option on menu: File I/O =>Data input =>DGN

The DGN input option is designed to read in Intergraph and Microstation binary models (.dgn files) up to V7. Microstation V8 has a new undocumented format.

Because of the limited number of levels available in an DGN file, the colour, linestyle and weight of items are often used to differentiate data types. For special files for VicRoads, there is also an DGN attribute which can be used to tag data.

Hence the entity-name used for matching in a map file when reading DGN files into 12d Model can be either the:

- ▲ DGN level
- ▲ VicRoads attribute
- ▲ DGN level, colour, linestyle, weight
- ▲ VicRoads attribute, colour, linestyle, weight

In the DGN map file, the four level key is given as a single key made up of the four items separated by | (with no additional spaces) in the order:

level or VicRoads attribute | colour | line style | weight

For example, the key

30 | 2 | 0 | 0 means level 30, colour 2, style 0 and weight 0

A * can be used for any of the four items to indicate that no match is required for that item.

30 | * | 0 | * means level 30, any colour, style 0, any weight

If a map file is not used, the DGN data is read into a 12d Model string of the same **name** as the DGN level and the DGN colour numbers are mapped to 12d Model colours. All the strings created go to the 'Default model for data' specified in the *Read DGN Data* panel.

See the section "Map File" in chapter "File I/O" for information about an 12d map file.

Text for Points in DGN

A further complication with DGN is that many Microstation users record individual points as a text entity with a character from a possibly user defined DGN font to represent a symbol at the point. The text then often has a justification other than left-bottom.

However, Microstation does not record the (x,y) co-ordinates of the justification point but only the left-bottom position to draw the symbol at. The actual (x,y) point needs to be calculated from the text justification and the actual symbol size.

Unfortunately this requires a knowledge of the DGN font symbol being used to calculate the true (x,y) position for the text justification point.

To help read in text as points so that they may be included in processes such as triangulation, in the DGN reader, it is possible to create 4d strings (which consist of an (x,y,z) point plus a piece of text) instead of a text string.

Warning

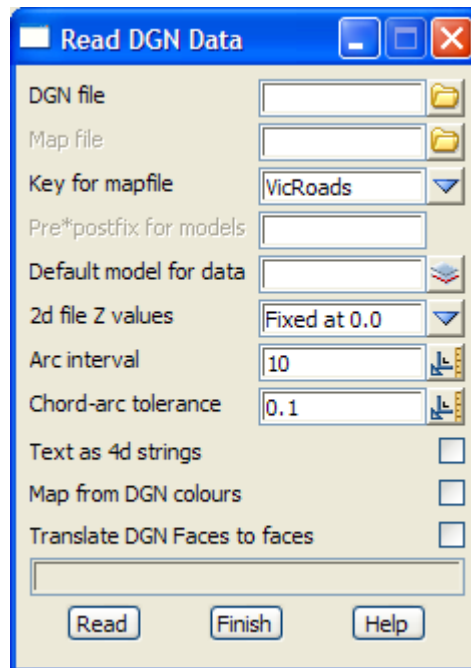
Because of the problem with needing to know the DGN font information to correctly calculate

the (x,y) co-ordinate of the text, creating a 4d string instead of text will not fix the error in the (x,y) co-ordinates if an incorrect font is used in 12d Model.

The only safe solution is to avoid data in DGN format if the points are being represented by text.

NOTE: the format for DGN V8 has been changed and has not been published. There is a beta version of the DGN reader to try and read DGNV8. At this stage it is probably better to use DWG I/O to go in and out of Microstation V8.

On selecting the DGN option, the **read DGN data** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
DGN file <i>name of the DGN binary file to be read in</i>	input		*.dgn files
Map file <i>if non-blank, the name of the map file to be used for all strings read in. If blank, no map file is used. The DGN level is used as the string name and all strings go to the 'Default model for data'.</i> <i>See the section "Map File" in chapter "File I/O" for information about an 12d map file.</i>	input		*.mf files
Key for mapfile <i>specifies how the key from the mapfile is interpreted.</i>	input	VicRoads	level, VicRoads, level/colour/linestyle/weight Vicroads/colour/linestyle/weight
Pre*postfix for models <i>if non-blank, a prefix and a postfix to be applied to the model names used in the mapping file. Go to the section "Pre*Postfix Panel Fields" for information on using pre*postfix.</i>	pre*postfix box		
Default model for data <i>model to use for strings not mentioned in the map file or if no map file is used.</i>	input		available models

2d file Z values	input	Fixed at 0.0	fixed at 0.0, contour Z low, contour Z element Z low, element Z
high			
high			
<i>z value to use for 2d .dgn file</i>			
Arc interval	input	10	
<i>interval to use to break 3d circles are broken up into segments.</i>			
Chord-arc tolerance	input	0.1	
<i>chord to arc tolerance to use when breaking 3d circles into segments.</i>			
Text as 4d strings	tick box		
<i>if tick, text is read in as a 4d string (an (x,y,z) co-ordinate plus a piece of text)</i>			
Map from DGN Colours	tick box		
<i>if not tick, DGN colour number n is mapped to 12d Model colour n. if tick, some of the DGN colours are attempted to be mapped to 12d Model colours.</i>			
Translate DGN faces to faces	tick box		
<i>if tick, DGN faces are read in as 12d Model face strings.</i>			
Read	button		
<i>read the data in.</i>			

[Read_DGN_Data__Complex_Elements_.bmp](#)

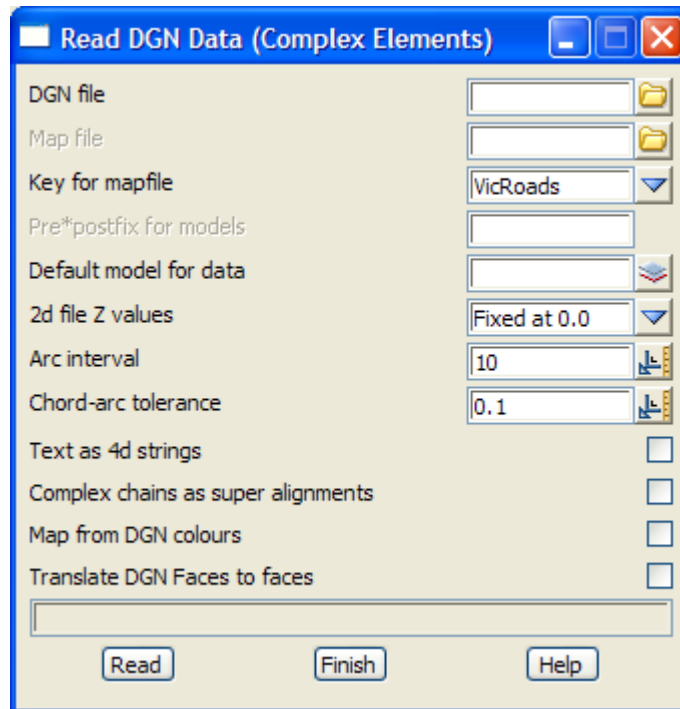
DGN With Complex Elements

This option reads DGN complex elements as super strings.

Note: this option is under development

NOTE: the format for DGNV8 has been changed and has not been published. There is a beta version of the DGN reader to try and read DGN V8. At this stage it is probably better to use DWG I/O to go in and out of Microstation V8.

On selecting the DGN Complex Elements option, the **read DGN Data (Complex Elements)** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
DGN file <i>name of the DGN binary file to be read in</i>	input		*.dgn files
Map file <i>if non-blank, the name of the map file to be used for all strings read in. If blank, no map file is used. The DGN level is used as the string name and all strings go to the 'Default model for data'.</i> <i>See the section "Map File" in chapter "File I/O" for information about an 12d map file.</i>	map file box		*.mf files
Key for mapfile <i>specifies how the key from the mapfile is interpreted.</i>	input	VicRoads	level, VicRoads, level/colour/linestyle/weight Vicroads/colour/linestyle/weight
Pre*postfix for models <i>if non-blank, a prefix and a postfix to be applied to the model names used in the mapping file. Go to the section "Pre*Postfix Panel Fields" for information on using pre*postfix.</i>	pre*postfix box		
Default model for data <i>model to use for strings not mentioned in the map file or if no map file is used.</i>	model box		available models
2d file Z values high high <i>z value to use for 2d .dgn file</i>	input	Fixed at 0.0	fixed at 0.0, contour Z low, contour Z element Z low, element Z
Arc interval <i>interval to use to break 3d circles are broken up into segments.</i>	input	10	

- Chord-arc tolerance** input 0.1
chord to arc tolerance to use when breaking 3d circles into segments.
- Text as 4d strings** tick box
if tick, text is read in as a 4d string (an (x,y,z) co-ordinate plus a piece of text)
- Complex chains as super alignments** tick box
if tick, DGN complex chains are read in as super alignments.
- Map from DGN Colours** tick box
*if not tick, DGN colour number n is mapped to 12d Model colour n.
 if tick, some of the DGN colours are attempted to be mapped to 12d Model colours.*
- Translate DGN faces to faces** tick box
if tick, DGN faces are read in as 12d Model face strings.
- Read** button
read the data in.

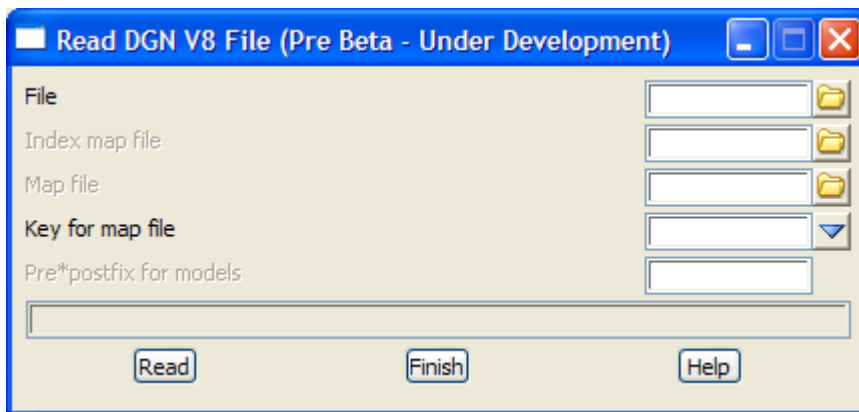
Read_DGN_V8_File__Pre_Beta__Under_Development_

DGN V8

NOTE: the format for DGN V8 has been changed and has not been published. There is a beta version of the DGN reader to try and read DGNV8. At this stage it is probably better to use DWG I/O to go in and out of Microstation V8.

Note: this option is under development

On selecting the DGN V8 option, the **read DGN V8 File** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
DGN file <i>name of the DGN V8 binary file to be read in</i>	input		*.dgn files
Index map file	input		*.imf files
Map file	map file box		*.mf files

if non-blank, the name of the map file to be used for all strings read in.

If blank, no map file is used. The DGN level is used as the string name and all strings go to the 'Default model for data'.

See the section "Map File" in chapter "File I/O" for information about an 12d map file.

Key for mapfile choice box Levels
Level/Colour/Linestyle/Weight

specifies how the key from the mapfile is interpreted.

Pre*postfix for models pre*postfix box

if non-blank, a prefix and a postfix to be applied to the model names used in the mapping file.

*Go to the section "Pre*Postfix Panel Fields" for information on using pre*postfix.*

Read button

read the data in.

DWG/DXF Input

read_dwg_dxf_data

DWG/DXF input is a separate chargeable option

Position of option on menu: File I/O =>Data input =>DWG/DXF

The DWG/DXF input option is designed to read most Autocad DWG and DXF files.

Each DWG/DXF item has an associated layer. By default, 12d Model creates models of the same name as the layers (or with an additional user supplied prefix) and the DWG/DXF items placed in them.

However, this can be over written using a standard 12d map file where the key is matched against Autocad **layers** rather than string names.

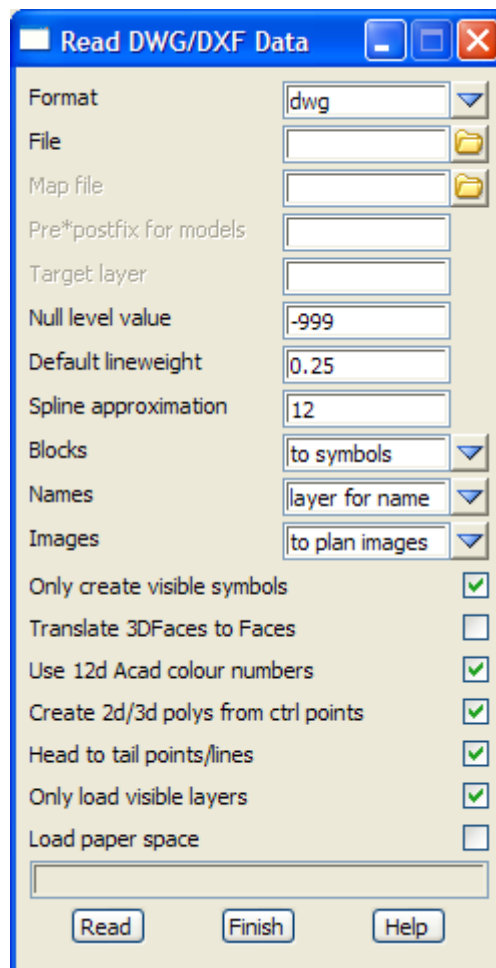
See the section “Map File” in chapter “File I/O” for information about an 12d map file.

Autocad blocks are recognised and either a point with the block name is created or the blocks are expanded into their components, each time they are referenced in the DWG/DXF file.

Bulges in polylines can only be interpreted correctly when the polyline has a constant z-value. For this case, a 12d Model polyline string is created from the DXF polyline.

Finally, DWG/DXF POINT entities of the same layer and colour can be concatenated into one point string as they are read in.

On selecting the DWG/DXF option, the **Read DWG/DXF Data** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Format <i>type of Autocad file to read in</i>	choice box	DWG	DWG, DXF
File <i>name of the DWG or DXF file to read in</i>	file box		*.dwg or *.dxf files
Map file <i>if non-blank, the name of the map file to be used for all DWG/DXF layers read in. The DWG/DXF layer is the entity-name for matching against the key in the map file. If blank, no map file is used. See the section "Map File" in chapter "File I/O" for information about an 12d map file.</i>	map file box		*.mf files
Pre*postfix for models <i>if non-blank, a prefix and a postfix to be applied to the model names used in the mapping file. Go to the section "Pre*Postfix Panel Fields" for information on using pre*postfix.</i>	pre*postfix box		
Target layer <i>if non-blank, only autocad items in the layer with the name given in the target layer field will be read in.</i>	input		
Null level value <i>z-value to treat as a null level</i>	input	-999	
Default AutoCAD lineweight <i>lineweight to use when it is undefined in an AutoCAD entity.</i>	input	0.25	
Spline approximation <i>splines are broken into small segments</i>	input	12	
Blocks <i>if to symbols, blocks are read in as 12d Symbols of the same name. If explode, blocks are read in and exploded into vertices and line work. If to points, a 12d vertex is created at each block.</i>	choice box	to symbols	to symbols, explode, to points
Names <i>if no name, strings are not given a name. If layer for name, strings are given the name of the AutoCAD layer they were on.</i>	choice box	layer for name	no name, layer for name
Images	choice box	to plan images	to plan images, to rasters, ignore
Only create visible symbols	tick box	tick	
Translate 3DFaces to facest <i>if tick, DWG/DXF faces are read in as 12d Model face strings.</i>	tick box		
User 12d ACAD colour numberst	tick box		
Create 2d/3d polys from ctrl points	tick box		
Head to tail points/lines <i>if tick, DWG/DXF POINT entities of the same layer and colour are concatenated into one point string as they are read in and DWG/DXF LINE entities of the same layer and colour are</i>	tick	tick	
Only load visible layers <i>if tick, only DWG/DXF visible layers are read in otherwise all layers are read in.</i>	tick	tick	
Load paper space <i>if tick, paper space data will be read in.</i>	tick	no tick	

Read

button

read the data in.

Genio File Format

Genio input is a separate chargeable module.

Position of option on menu: File I/O =>Data input =>Genio

The software package MX (formerly called Moss) includes a data file format called GENIO for use in transferring data between Moss and other programs (see the MX Manual for a partial description of genio). There is currently two default genio input formats - versions 6 and 7. **12d** Model recognizes both formats.

MX provides three options (001,003,017) to allow variations in the format of the genio 080 records. **12d** Model recognizes and uses each option.

MX free format (that is, using commas and the 'field-number=' syntax) is allowed.

For example

```
080,ABCD, ,5=0.0
```

MX 2d, 3d, 4d, 6d, text and most 12d and text strings are loaded directly into **12d** Model strings. For 5d, the strings are processed but only the 3d information is used and loaded into **12d** Model. The MX 10d (volume string) is allowed in the genio file but will not be read into **12d** Model.

In the genio file, the GENIO card defines the name of the MX model for the following strings. **12d** Model loads the strings into a **12d** Model model with the same name as the MX model. However, **12d** Model allows the user to define a **map file** which may over-ride the Genio card.

A genio file may contain more than one MX model, each genio model being separated by a 999 card. **12d** Model will load each separate MX model into a **12d** Model model with the same name as the MX model.

If an error occurs whilst reading a genio record, the genio record will be skipped and, if possible, the next genio record read.

12d Map File

See the section "*Map File*" in chapter "File I/O" for information about an 12d map file.

The **name** of the MX string is used as the entity-name to be used for matching with an 12d map file.

The MX model given in the GENIO record is taken to be the default model for the genio reader.

Hence the genio map file can be used to over-ride the MX GENIO card and the MX default for point strings (this is necessary for genio files generated from non MX systems that don't use the correct point string convention).

For **text** in a Genio file (the string name for text must start with a * in the Genio file), the *key in the map file must start with **geniotext** followed by the characters to match on which will be matched against the characters following the * in the genio string name. For example*

```
geniotextEB* * text yellow point "PHCP" // matches text
```

will match any Genio text with the string name starting with "*EB"

Note that * is not a wild card in the Genio string name but the "EB*" after "geniotext" is for use by the 12d map file and hence is an "EB" followed by a wild card. Hence it matches against any Genio text name starting with "*EB".

Summary

12d Model recognizes the following genio options for MX V6 and V7 formats -

```
GENIO
FINISH
001      format card
003      order card
```

017 angle card
080 for 2d, 3d, 4d, 6d, 12d and text strings
080 the 3d information only for 5d strings
090 triangulation information
999
genio comment lines

12d Model accepts MX null values of -999.0

12d Model **ignores** the genio options:

080 for **10d** strings

A12d map file can be used to select the colour and model for any strings read in from the MX genio file whose names match the keys in the map file.

Genio Input

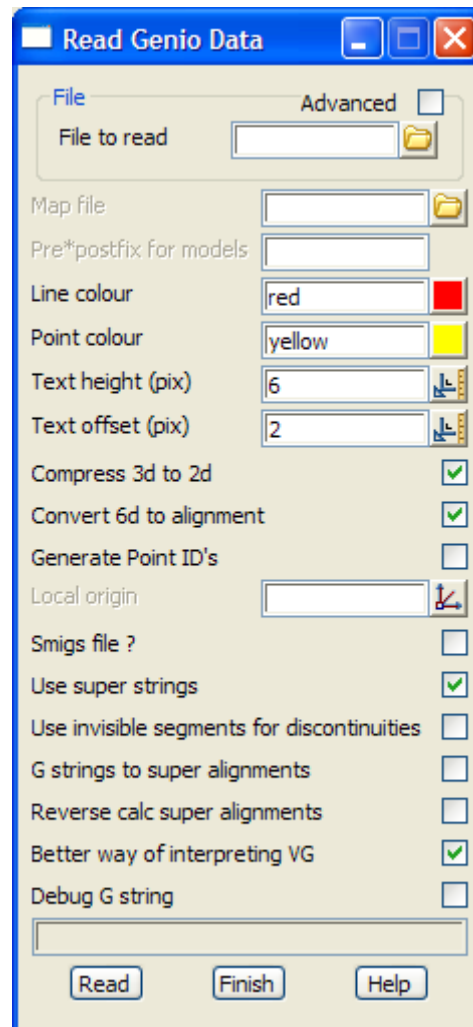
read_genio_data

Position of option on menu: File I/O =>Data input =>Genio

Genio input is a separate chargeable module.

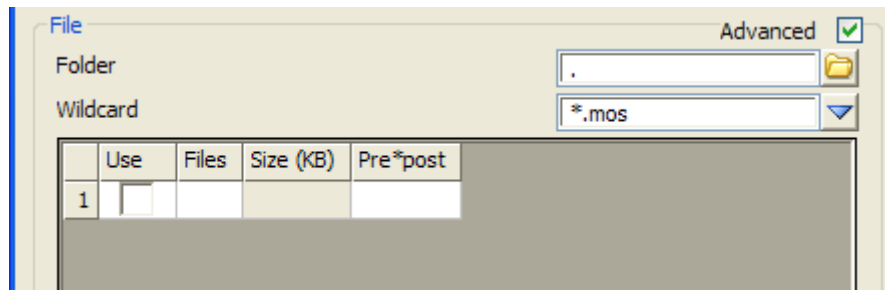
For information on the Genio file format support by 12d Model, please go to the section “Genio File Format”

On selecting the genio option, the **read genio data** panel is displayed.



The fields and buttons have the following functions.

Field Description	Type	Defaults	Pop-Up
File to read	file box		default *.mos files This can be modified by the environment variable GENIO_WILDCARD_4D
<i>name of the genio file to be read in</i>			
Advanced	tick box		
<i>if tick, a grid to allow multiple files to be read in, is opened. A wild card is used to select all the files to be read in.</i>			



Folder folder box

folder to search for files using the Wild card

Wildcard input

wild card to use in search for files in the given folder

Use tick box

if **tick**, read in the file

Files output

name of the file in the folder

Size output

file size

Pre*post text input

if **non blank**, pre*post text to use for the models in this file (see "Pre*Postfix Panel Fields" for information on using pre*postfix).

If **blank**, use the pre*post text from the Pre*postfix for models panel field.

Note - if a non-blank value for **Pre*post** is given in the column for a file then the **Pre*postfix for models** is ignored.

Map file file box *.mf files

if non-blank, the name of the 12d map file to be used for all strings read in, including any files given with the **Advanced** mode ticked on.

If blank, no map file is used

When using a map file, the string name is used as the entity-name for matching with the keys in the map file. See the section "Map File" in chapter "File I/O" for information about an 12d map file.

Pre*postfix for models pre*postfix box

if non-blank, a prefix and a postfix to be applied to the model names used in the mapping file. Go to the section "Pre*Postfix Panel Fields" for information on using pre*postfix.

Note - if a non-blank value for **Pre*post** is given in the column for a file then the **Pre*postfix for models** is ignored.

Line colour colour box default colour available colours

colour used for line-strings

Point colour colour box default pt colour available colours

colour used for the crosses in point-strings (genio string labels starting with **P**).

Text height (pix) input 8

the height in pixels of any text in a moss 4d string.

Text offset (pix)	input	2	
	<i>the offset in pixels of the 4d text from the (x,y) position.</i>		
Compress 3d to 2d	tick box	tick	
	<i>if tick, convert any 3d strings with constant z-value to 2d strings.</i>		
Convert 6d to alignment	tick box	tick	
	<i>if tick, convert any 6d strings to 12d Model alignment strings.</i>		
Local origin	x y box		x y selector
	<i>if non-blank, the given co-ordinates are used as a local origin when reading in the data. That is, the local origin values are subtracted from each data point as it is read in.</i>		
Smigs file ?	tick box	no tick	
	<i>if tick, try to interpret the genio file as a Smigs genio file.</i>		
Use super strings	tick box	tick	
	<i>if tick, all strings are read in as super string</i>		
Use invisible segments for discontinuities	tick box		
	<i>if tick, MX strings with discontinuities are read in as super strings with invisible segments. If not tick, MX strings with discontinuities are broken into pieces when read in.</i>		
G strings to super alignments	tick box	no tick	
	<i>if tick, MX G strings are read in as 12d super alignments</i>		
Debug G strings	tick box	no tick	
	<i>because of the lack of documentation of the G string in MX, a G string may not be interpreted correctly. If tick, a super string is created with the information from the MX G string to try and help interpret what the data was.</i>		
Reverse calc super alignments	tick box	no tick	
Better way of interpreting VG	tick box	tick	
	<i>if tick, a different method for interpreting vertical geometry in a MX G strings is used. This may or may not be successful.</i>		
Read	button		
	<i>read in the genio data from the file given in the file field.</i>		

Example of Genio 12d Map File

```
//
// 12d map file (for input data)
//
// This file allows strings to be mapped to specified models/colours/string types/ styles
// as they are read in.
//
// The columns are:
// 1   key   2   string name   3   model name
// 4   colour name (or number) 5   string type (point or line) 6   string style

// 1       2       3       4       5       6           comment
PHCP      *       mapp    yellow    point    "PHCP"      // horizontal control point
PVCP      *       mapp    yellow    point    "PVCP"      // vertical control point
PABB      *       struct  magenta  point    "AB"        // bottom bridge abutment
```

PCBU	*	struct	magenta	point	"CB"	// corner of building at ns
CUL*	*	embank	red	line	"EB"	// top of cutting left
RES*	*	utilit	green	line	1	// reservoir
BE*	*	cadast	green	line	"EP"	// easement boundary
VT*	*	roads	yellow	line	"BB"	// vehicular track edge
WC*	*	drain	cyan	line	"EP"	// watercourse drain dry
X*	*	surv	red	line	"XO01"	// contour depression
Z*	*	cont	white	line	"ZO01"	// indicator contour
B*	*	cadast	green	line	1	// title boundary
F*	*	fence	magenta	line	"F_FENCE"	// fence
R*	*	rail	white	line	"RAILINE"	// top of rail
X*	*	surv	red	line	"XO01"	// contour depression
Z*	*	cont	white	line	"ZO01"	// indicator contour
geniotextEB*	*	text	yellow	point	"PHCP"	// matches text starting EB

Geocomp File Format

Geocomp input is a separate chargeable module.

Geocomp is a software package used for manipulating and reducing survey data on a PC.

Geocomp is a point based system. The fundamental data consists of individual points with unique point numbers and entities such as lines and arcs defined in terms of the points.

Geocomp has an ascii data format consisting of two files - the points file and the strings file. These ascii files can be used to transfer data from Geocomp to 12d Model.

The Geocomp **points file** is a sequential list of points, one point per line. Each point consists of the data

easting, northing, elevation, stand-point-number

that is

x-value, y-value, z-value, stand-point-number

The line number of each point in the file is also the unique **point number** for that point. For example, the point defined on the eleventh line of the points file, is point number eleven.

The stand-point-number is the point number of the instrument station used for collecting the points co-ordinates. The stand-point-number is not used in 12d Model.

The Geocomp **strings file** defines how the Geocomp **entity types** are constructed from points in the point file. The Geocomp entity types are

Entity Number	Description
1	two point lines
2	irregular lines
3	arc defined by start point, point on arc, end point
4	arc defined by start point, arc centre, end point
5	point feature
6	circle defined by centre and a point on the circle

The strings file also gives each defined entity an **entity number**.

The 12d Model Geocomp data reader recognises all the entity types in the strings file **except** for irregular lines (type 2).

All point numbers referred to in the strings file are references to the (implied) point numbers of points in the points file. Hence both files are needed to define the Geocomp data and the order of points in the point file is critical and cannot be modified.

The Geocomp naming convention for the two files is to use the six digit Geocomp job number as a name stem and append **.pts** for the points file and **.str** for the strings file.

That is,

geocomp-job-number.pts	points file
geocomp-job-number.str	strings file

For example

099999.pts	is the point file for Geocomp job number 099999
099999.str	is the strings file for Geocomp job number 099999

12d Model uses a wider data set than is directly represented in the Geocomp points and strings files. However, by observing a number of conventions and processing the strings file data according to these conventions, the Geocomp data can be sensibly passed across to 12d Model.

For example, although the Geocomp strings file only defines two-point lines, 12d Model can

construct strings of many points from consecutive two-point lines by joining the lines together whenever

- (a) the second point of one line is the same as the first point of the next line in the file and
- (b) the lines have the same entity number.

The entity number of the consecutive lines is used as the 12d Model string name.

Similarly, consecutive point features with the same entity number are joined to form a 12d Model 4d **point** string with the entity number as the string name.

In the Geocomp strings file, **descriptive text** can also be included at the end of each line defining an entity. The text is enclosed within double quotes ". The descriptive text is ignored for all entities **except point features**.

For a point-feature, which is represented in 12d Model as a 4d string, the descriptive text is recorded as the text label for that point.

By using a systematic entity and descriptive text labelling system in Geocomp, it is possible to sensibly transfer all of the Geocomp data to 12d Model.

Note - in Geocomp, a z-value of -9999 represents a null z-value, that is, a z-value that has **not** defined. Any Geocomp null values are recorded as 12d Model null values.

Geocomp Map File

See the section "*Map File*" in chapter "File I/O" for information about an 12d map file.

Using the conventions described in the previous section, Geocomp data can be interpreted as 12d Model strings with entity-names corresponding to the Geocomp entity numbers.

Hence the Geocomp **entity numbers** are used as the entity-names for matching with a map file.

If no match is found with the map file, the default colours and model given in the Geocomp read panel are used. The point-line type is taken to be **point** for point feature entities (entity type 5) and **line** point-line type for all other entities. The geocomp entity number is used as the string name and the style set to 1.

WARNING

If the **breakline type** in the map file is set to point or line and this does not match the point or string type coming from the geocomp file, then the string is placed in the **defaults** model. This is a consistency check for entities that can only be a point **or** a line breakline type (but not both). To disable this feature, a * can be used in the map file for the breakline type and then the breakline type is determined by whether the Geocomp entity is a point feature or not.

Summary

12d Model **recognizes** the following Geocomp entity types

Entity Number	Entity type
1	two point lines
3	arc defined by start point, point on arc, end point
4	arc defined by start point, arc centre, end point
5	point feature
6	circle defined by centre and a point on the circle

12d Model **recognizes** the Geocomp null values of -9999

12d Model **ignores** the entity type

2	irregular lines
---	-----------------

A Geocomp map file can be used to specify the string name, breakline type, colour, style and model for strings read from the Geocomp ascii files.

Note - the breakline type of a string of Geocomp point features (entity type 5) will always be set to **point** regardless of the Geocomp map file.

Geocomp Input

geocomp_input

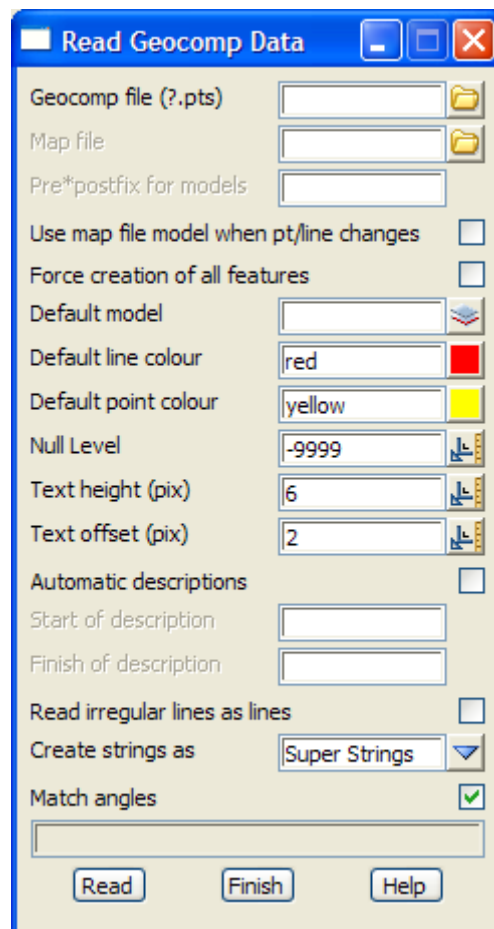
read_geocomp_data

Position of option on menu: File I/O =>Data input =>Geocomp

Geocomp input is a separate chargeable module.

Although there are three Geocomp Input options, V4.0 uses super strings and supersedes V3.1 and V3.2. More information on the Geocomp data structure is given in the previous section "Geocomp File Format" .

On selecting the Geocomp option, the **Read Geocomp Data** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Geocomp file (? .pts)	file box		*.pts files
<i>name of the Geocomp points file to be read in. The corresponding strings file is also used.</i>			
Map file	map file box		*.mf files
<i>if non-blank, the name of the map file to be used for all strings read in.</i>			
<i>If blank, no map file is used.</i>			
<i>See the section "Map File" in chapter "File I/O" for information about an 12d map file.</i>			
Pre*postfix for models	pre*postfix box		
<i>if non-blank, a prefix and a postfix to be applied to the model names used in the mapping file.</i>			

Go to the section “Pre*Postfix Panel Fields” for information on using pre*postfix.

Use mapfile model when pt/line changes	tick box	no tick	
<i>if tick, then if the geocomp.str file says the entity is a line (point) feature and the map file says it is a point (line), the mapfile is used.</i>			
Default model	model box		available models
<i>model to use for strings not mentioned in the map file</i>			
Default line colour	colour box	default colour	available colours
<i>colour used for line-strings</i>			
Default point colour	colour box	default pt colour	available colours
<i>colour used for the crosses in point-strings.</i>			
Null level	input	-9999	
<i>the Geocomp z-values to be considered null z-values.</i>			
Text height (pix)	input	8	
<i>the height in pixels of any text created for point number or Geocomp descriptions.</i>			
Text offset (pix)	input	2	
<i>the offset (in pixels) from the (x,y) co-ordinate position for the text of a 4d string.</i>			
Automatic descriptions	tick box		
<i>if tick, then the first three characters of the entity code are compared to the first 3 characters of the 20 character description and if they are the same, the text is only characters 6 to 15 of the description.</i>			
Start of description	input		
<i>the user can restrict the amount of the geocomp description that is read in. if non-blank, this is the number of the character position to start reading the description from. If blank, the start position is 1.</i>			
Finish of description	input		
<i>if non-blank, this is the number of the character position to end reading the description from. If blank, it is the end of the geocomp description.</i>			
Read irregular lines as lines	tick		
<i>if tick, Geocomp irregular lines are read in as strings.</i>			
Create strings as	input	Super Strings	Polyline Strings Super Strings
<i>type of strings to create.</i>			
Match angles	tick	tick	
<i>if tick, preference is given to joining geocomp lines of similar angles first. if not tick, geocomp lines are joined in the order they are in the file.</i>			
Read	button		
<i>read in the Geocomp data from the points file and (corresponding strings file) given in the file field.</i>			

Keays Input

read_keays_data

Position of option on menu: File I/O =>Data input =>Keays

The Keays input option is designed to read in Keays (RoadPak) files in trf format.

The Keays data has a code and notes, and the code and notes can be used with a 12d Model map file to define models, colours, linestyles etc.

The Keays note is made up of individual notes separated by spaces. Each individual note (in order) can be used as part of the entity-name for use with the map file.

In the Keays map file, the multi-level key is given as a single key made up of the required items separated by | (with no additional spaces) in the order:

Code | note 1 | note 2 | ... | note n

For example, the key:

BD|building| means code BD, note 1 = "building"

A * can be used for any of the items to indicate that no match is required for that item.

BD|*|top| means code BD, anything for note 1, note 2 = "top"

A * and nothing else after the code means that all notes are accepted.

BD* means code BD and any notes

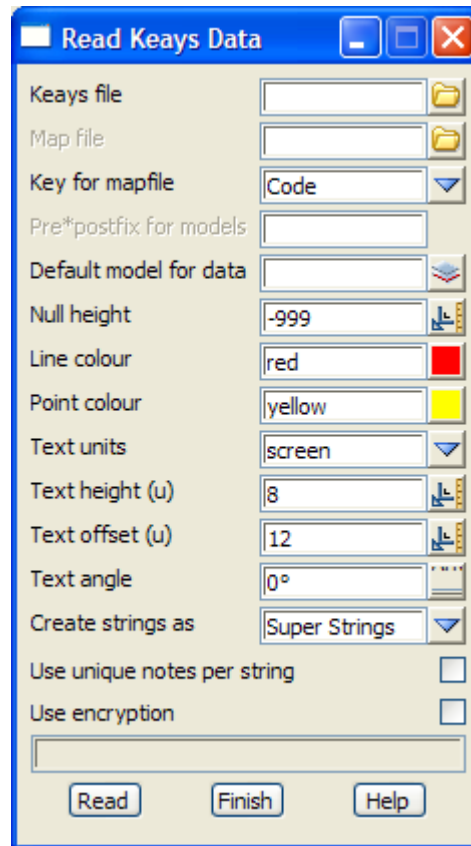
A * at the end of the notes means any note is a match from that point onwards.

BD|*|top|* means code BD, anything for note 1, note2 = "top",
and any note after note 2.

If a map file is not used or no match is found in the map file, the Keays data is placed into the default model with its code as the string name.

See the section "Map File" in chapter "File I/O" for information about an 12d map file.

On selecting the Keays option, the **Read Keays Data** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Keays file <i>name of the Keays trf file to be read in.</i>	file box		*.trf
Map file <i>if non-blank, the name of the map file to be used for all strings read in. If blank, no map file is used. The Keays code and note can be used as the entity-name to match against the key in the map file. See the section "Map File" in chapter "File I/O" for information about an 12d map file.</i>	map file box		*.mf files
Key for map file <i>if code, the Keays code is used as the key for the map file. If code/note, the Keays code and note is used as the key for the map file.</i>	input	code	code, code/note
Pre*postfix for models <i>if non-blank, a prefix and a postfix to be applied to the model names used in the mapping file. Go to the section "Pre*Postfix Panel Fields" for information on using pre*postfix.</i>	pre*postfix box		
Default model for data <i>name of the model that any unmapped data is placed in. The model will be created if it does not already exist. This field must be filled in.</i>	model box		available models
Null height <i>if non-blank, any Keays z values equalling this value are taken as null values.</i>	input	-999	
Line colour <i>colour for Keays string s.</i>	colour box	red	available colours

Point colour	colour box	yellow	available colours
<i>colour for Keays points that are not part of strings.</i>			
Text units	input	pixels	pixels, world
<i>units for the height of the text label.</i>			
Text height (u)	input		
<i>height of the text (in text units).</i>			
Text offset (u)	input		
<i>distance (in text units) to offset the text from its (x,y) placement position.</i>			
Text angle	input	0	
<i>angle of the note text.</i>			
Create strings as	input	Super Strings	3d, 4d, Polyline, Super
<i>type of strings to create.</i>			
Use unique notes per string	tick box		
<i>if tick, a change of code or note is used to break Keays string data into strings. This also applies to the point ids and notes text.</i>			
Use encryption	tick box		
<i>if tick, then the last 4 characters of the code is used to denote tinability and boundary information.</i>			
Read	button		
<i>read the data in.</i>			

LandXML Input

read_landXML_file

Position of option on menu: File I/O =>Data input =>LandXML

LandXML is a format that attempts to cover some civil and surveying entities. It does not include any information such as colours, styles etc. but just some geometry definitions.

Unfortunately to make the format useful, every vendor has their own proprietary extensions which makes the format of only limited value. A different tailored LandXML reader is required for each vendor variation.

Also the methodology behind the LandXML model is based on US ideas of using X-sections and not strings to model data.

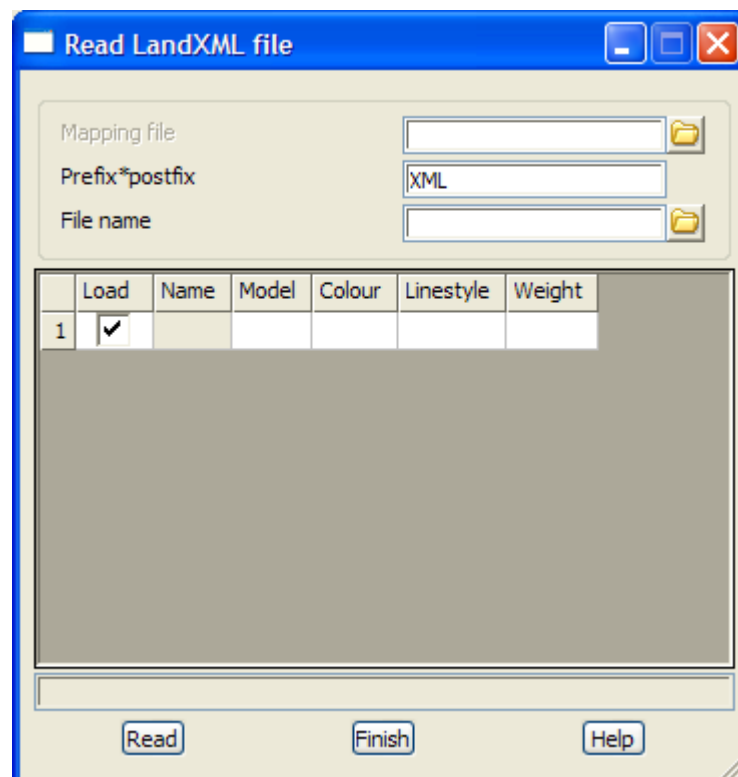
12d Model has special LandXML readers for LINZ-XML (for LandOnline NZ) and Leica-XML.

LandXML

One possible use of LandMXL may be to get access to data from vendors packages such as AutoCAD and Microstation who only have non-published proprietary formats.

This option is under continual developed as the LandXML standard keep changing.

On selecting the LandXML option, the **Read LandXML File** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
File <i>name of the LandXML file to be read in</i>	file box		*.xml files
Map file	map file box		*.mf files

*if non-blank, the name of the map file to be used for all strings read in.
If blank, no map file is used.*

See the section “Map File” in chapter “File I/O” for information about an 12d map file.

Pre*postfix for models pre*postfix box

*if non-blank, a prefix and a postfix to be applied to the model names used in the mapping file.
Go to the section “Pre*Postfix Panel Fields” for information on using pre*postfix.*

Load tick box

Name

Model model cell available models

model to read the data into

Colour colour cell available colours

colour to use for the strings

Linestyle linestyle cell available linestyles

linestyle to use for the strings

Weight input

weight to use for the strings

Read button

read the data into the model given in the model field.

Mapinfo Input

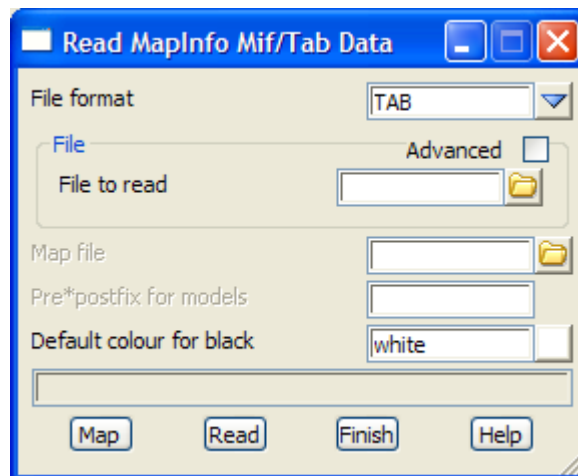
[read_mapinfo_mif_tab_data](#)

[mapinfo_input_mapping](#)

Position of option on menu: File I/O =>Data input =>Mapinfo MID/MIF

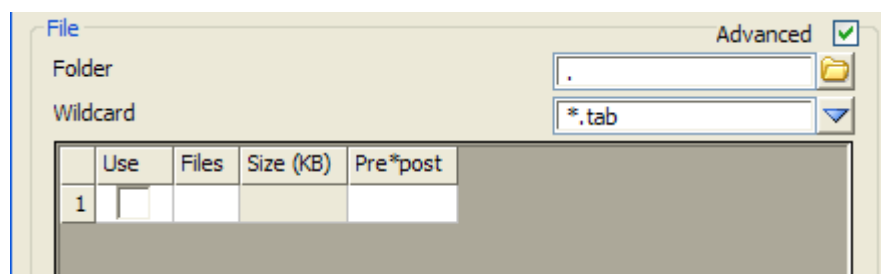
This Option is currently under development.

On selecting the 12d data option, the **Read 12d Solutions Ascii Data** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
File format <i>the MapInfo format</i>	choice	TAB	TAB, MIF
File to read <i>name of the MapInfo file.</i>	file box		*.tab or *.mif files
Advanced <i>if tick, a grid to allow multiple files to be read in, is opened. A wild card is used to select all the files to be read in.</i>	tick box		



Folder <i>folder to search for files using the Wild card</i>	folder box
Wildcard <i>wild card to use in search for files in the given folder</i>	input
Use	tick box

if **tick**, read in the file

Files output

name of the file in the folder

Size output

file size

Pre*post text input

if **non blank**, pre*post text to use for the models in this file (see “Pre*Postfix Panel Fields” for information on using pre*postfix).

If **blank**, use the pre*post text from the Pre*postfix for models panel field.

Note - if a non-blank value for **Pre*post** is given in the column for a file then the **Pre*postfix for models** is ignored.

Map file file box *.mf files

not yet implemented.

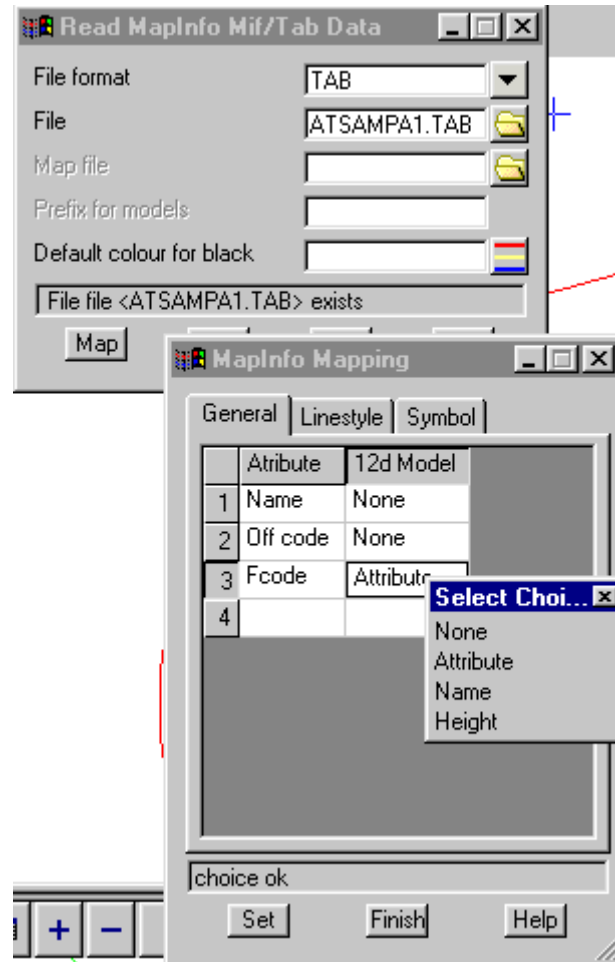
Pre*postfix for models pre*postfix box

if non-blank, a prefix and a postfix to be applied to the model names used in the mapping file. Go to the section “Pre*Postfix Panel Fields” for information on using pre*postfix.

Note - if a non-blank value for **Pre*post** is given in the column for a file then the **Pre*postfix for models** is ignored.

Map button

After specifying the MapInfo file format and name, click on **Map** to scan the file and find the names of all the attributes in the MapInfo file. A **Mapinfo Input Mapping** panel is then displayed with a list of all the MapInfo attributes in the file. How the attributes are to be mapped and used in 12d Model is then specified for each attribute in the panel. For example, the value of an attribute could be used as the 12d string name.



If None is selected for an attribute, then the attribute is ignored.

*Once the table is completely filled in (no field in the column titled 12d Model can be left blank) then the **Set** button must be selected and then the **Finish** button selected to remove the Mapinfo Input Mapping panel.*

Read button

read the data in.

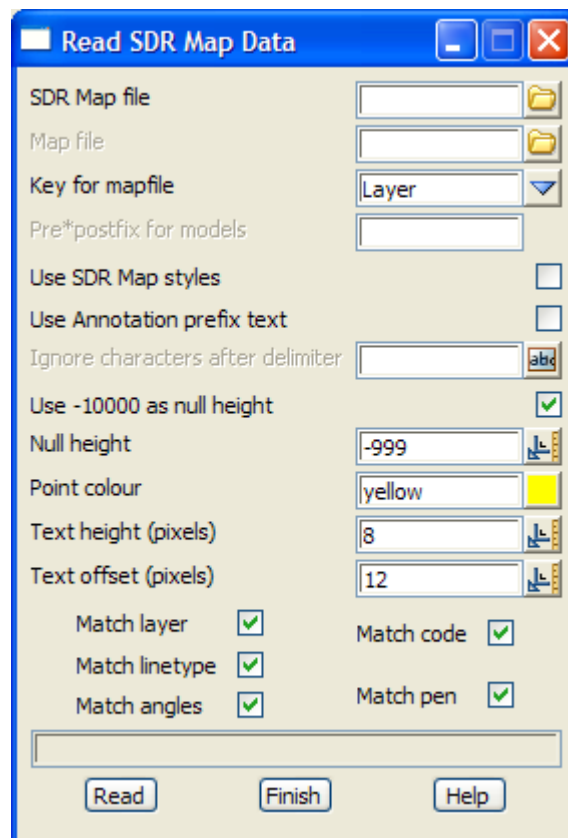
SDR Map Input

read_sdr_map_data

Position of option on menu: File I/O =>Data input =>SDR Map

The SDR Map input option is designed to read in files in the SDR Map ASCII format.

On selecting the SDR Map option, the **Read SDR Map Data** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
SDR Map file <i>name of the SDR Map ascii file to be read in.</i>	file box		*.txt
Map file <i>if non-blank, the name of the map file to be used for all data read in. See the section "Map File" in chapter "File I/O" for information about an 12d map file.</i>	map file box		*.mf files
Key for map file <i>if code, the SDRmap code is used as the key for the map file. If layer, the SDRmap layer is used as the key for the map file. If code/layer, the SDRmap code/layer is used as the key for the map file. If layer/code, the SDRmap layer/code is used as the key for the map file.</i>	choice box	code	code, layer code/layer, layer/code
Pre*postfix for models <i>if non-blank, a prefix and a postfix to be applied to the model names used in the mapping file.</i>	pre*postfix box		

Go to the section “Pre*Postfix Panel Fields” for information on using pre*postfix.

Use SDR Map styles tick box

if tick,

Ignore characters after delimiter input

if non-blank, all characters on the line after the given delimiter will be ignored.

Use SDR Map styles tick box

if tick,

Use -10000 as null height tick box tick

if tick, any z value of -10000 is converted to a null height in 12d Model.

Null height input -999

if non-blank, any SDR Map z values equalling this value are converted to null values in 12d Model.

Point colour colour box yellow available colours

colour for SDR Map points that are not part of strings.

Text units input pixels pixels, world

units for the height of the text label.

Text height (u) input

height of the text (in text units).

Text offset (u) input

distance (in text units) to offset the text from its (x,y) placement position.

Match flags tick box

SDRMap data consists of individual lines and arcs. When reading SDRMap data, it undergoes head to tail processing and the match flags specify what SDRMap data can be joined.

Match layer/code/linetype/angles/pen tick box

if tick, then any SDRMap lines and arcs must have the same layer/code/linetype/angle/pen before they can be joined in the head to tail process.

Read button

read the data in.

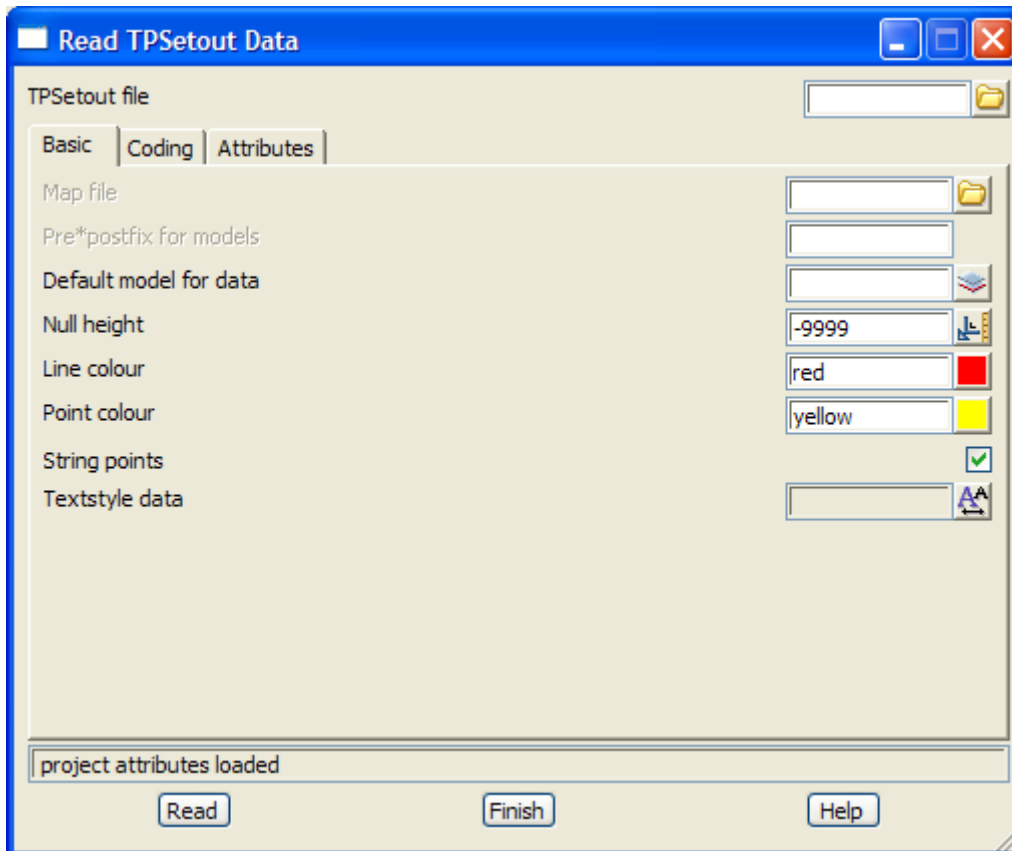
TP Setout Input

read_tpsetout_data

Position of option on menu: File I/O =>Data input =>TP Setout

The TP Setout input option is designed to read in .pta files from *TP Setout*

On selecting the TP Setout option, the **read TP Setout data** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
TP Setout file <i>name of the TP Setout .pta file to be read in.</i>	file box		*.pta

Basic tab

Map file <i>if non-blank, the name of the map file to be used for all strings read in. If blank, no map file is used. The TP Setout code is used as the entity-name to match against the key in the map file. See the section "Map File" in chapter "File I/O" for information about an 12d map file.</i>	map file box		*.mf files
Pre*postfix for models <i>if non-blank, a prefix and a postfix to be applied to the model names used in the mapping file. Go to the section "Pre*Postfix Panel Fields" for information on using pre*postfix.</i>	pre*postfix box		
Default model for data	model box		available models

name of the model that any unmapped data is placed in. The model will be created if it does not already exist. This field must be filled in.

Null height	input	-9999	
<i>if non-blank, any TP Setout z values equalling this value are taken as null values.</i>			
Line colour	colour box	red	available colours
<i>colour for TP Setout strings.</i>			
Point colour	colour box	yellow	available colours
<i>colour for TP Setout points that are not part of strings.</i>			
String points	tick box	tick	
<i>if tick, points with the same description are joined together.</i>			
<i>If not tick, points with the same description are not joined together.</i>			
Textstyle data	textstyle data box		available textstyle datas
<i>textstyle data used for any text labels</i>			

Coding tab

Point ids in column 5	tick box	
<i>if tick, there are points ids in column 5 of the file.</i>		
Feature code	input	
<i>number of characters in the feature code</i>		
String number	input	
<i>number of characters in the string number</i>		
Point ids	input	
<i>number of characters in the point ids</i>		

Attributes tab

Name

Type

Data

Read	button
<i>read the data in.</i>	

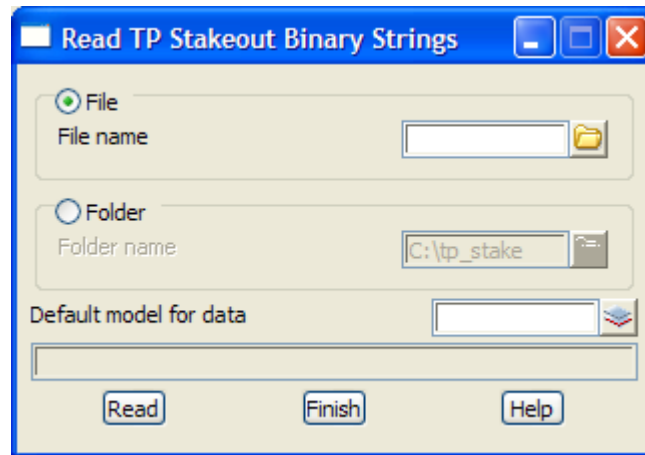
TP Stakeout Strings Input

read_tp_stakeout_binary_strings

Position of option on menu: File I/O =>Data input =>TP Stakeout strings

The TP Stakeout strings input option is designed to read in .3db files (binary strings) from TP Stakeout.

On selecting the TP Stakeout strings option, the **Read TP Stakeout Binary Strings** panel is displayed.



The fields and buttons used in this panel have the following functions.

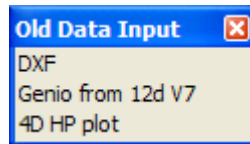
Field Description	Type	Defaults	Pop-Up
File	radio button		
<i>if on then an individual binary string file is to be read in.</i>			
File name	file box		*.3db files
<i>if non-blank, the name of the binary string file to read in.</i>			
Folder	radio button		
<i>if on then the all the binary string files in the folder are to be read in.</i>			
Folder name	folder box		
<i>if non-blank, all the binary string files in this folder are read in.</i>			
Default model for data	input		available models
<i>name of the model to read the binary strings into.</i>			
Read	button		
<i>read the data in.</i>			

Old Inputs

old_data_input

Position of menu: File I/O =>Data input =>Old

The Old menu contains superseded options. The Old walk-right menu is



12D HP Plot File

read_4D_hp_plot_file

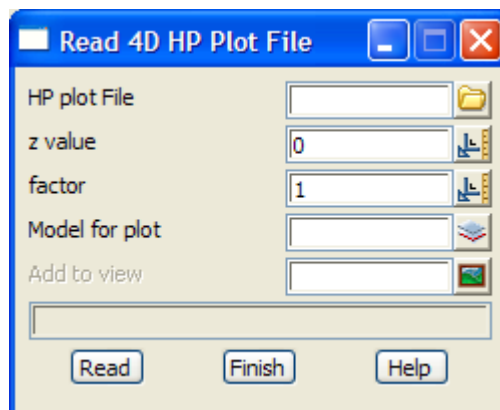
Position of option on menu: File I/O =>Data input =>Old =>4D HP plot

12d Model has options to create plots for HPGL compatible plotters. This option reads back into **12d** Model any plots created by **12d** Model using HPGL plot options.

A plot file is only a two dimensional file defined in millimetres. When read back into **12d** Model, the units are automatically multiplied by 1000.

In the option, the user can supply a further factor to multiply the x and y co-ordinates by and also a z-value which is used as a z co-ordinate for all the lines in the plot file.

On selecting the **12d** HP plot option, the **read 4D HP plot file** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
HP plot file <i>name of the 12d HP plot file to be read in</i>	input		*.hp files
z value <i>z co-ordinate to use for the lines read in from the plot file</i>	input	0.0	
Factor <i>the default units used when reading in a plot file are multiplied by 1000. They are then multiplied by this value.</i>	input	1.0	
Model for plot	input		available models

name of the model that the plot file is to be placed in. The model will be created if it does not already exist. This field must be filled in.

Add to view input available views

if a view name is entered, then the model will be automatically added to the view. This field can be blank.

Read button

read the plot file into the model given in the model field.

DXF Input

read_dxf_data

Position of option on menu: File I/O =>Data input =>Old =>DXF

DXF input is a separate chargeable option

The DXF input option is designed to read most autocad DXF files (up to Version 12), including binary DXF which was introduced in AutoCAD Release 10 as a means of addressing the problems of large file sizes, slow processing and limited accuracy that occur when using the ASCII DXF format. 12d Model will automatically sense whether the input file is binary or ASCII.

The standard Autocad colours can be mapped to the equivalent 12d Model colours or just mapped on a one-to-one basis to 12d Model colour numbers.

Each DXF item has an associated layer. By default, 12d Model creates models of the same name as the layers (or with an additional user supplied prefix) and the DXF items placed in them.

However, this can be over-written using a standard 12d map file where the key is matched against Autocad **layers** rather than string names.

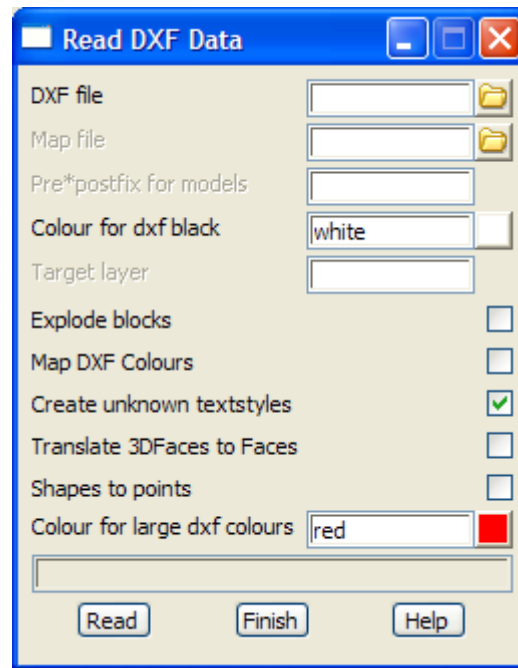
See the section “Map File” in chapter “File I/O” for information about an 12d map file.

Autocad blocks are recognised and either a point with the block name is created or the blocks are expanded into their components, each time they are referenced in the DXF file.

Bulges in polylines can only be interpreted correctly when the polyline has a constant z-value. For this case, a 12d Model polyline string is created from the DXF polyline.

Finally, DXF POINT entities of the same layer and colour are concatenated into one point string as they are read in.

On selecting the DXF option, the **read dxf data** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
DXF File <i>name of the DXF file to be read in</i>	input		*.dxf files
Map file <i>if non-blank, the name of the map file to be used for all DXF layers read in. The DXF layer is the entity-name for matching against the key in the map file. If blank, no map file is used. See the section "Map File" in chapter "File I/O" for information about an 12d map file.</i>	input		*.mf files
Prefix for models <i>if non-blank, all 12d Model model names created by the reader will be prefixed by this name.</i>	input		
Colour for dxf black <i>if the DXF colour of an item is black, then the colour in the colour for black field is used for the item in 12d Model.</i>	input	white	available colours
Target layer <i>if non-blank, only autocad items in the layer with the name given in the target layer field will be read in.</i>	input		
Explode blocks <i>if tick, autocad blocks are exploded in 12d Model. If not tick, blocks are not exploded and a point string is placed at the position of the block.</i>	tick	no tick	
Map DXF colours <i>if tick, the first seven DXF colours are mapped to the corresponding default 12d Model colours. If no tick, the nth DXF colour is mapped to the nth 12d Model colour.</i>	tick	no tick	
Create unknown textstyles <i>if tick, then if a textstyle in the DXF file is not already defined in 12d Model, then a new 12d Model textstyle of the same name is created. If no tick, then the 12d Model textstyle "1" is used for any unknown DXF textstyles.</i>	tick	tick	

Translate 3DFaces to facedick no tick

if tick, DXF faces are read in as 12d Model face strings.

Colour for large dxf colours input red available colours

if the DXF colour is greater than the largest colour number defined in the 12d Model colour map, then the colour in the colour for large dxf colours field is used for the DXF colour.

Read button

read the data in.

9 Data Output

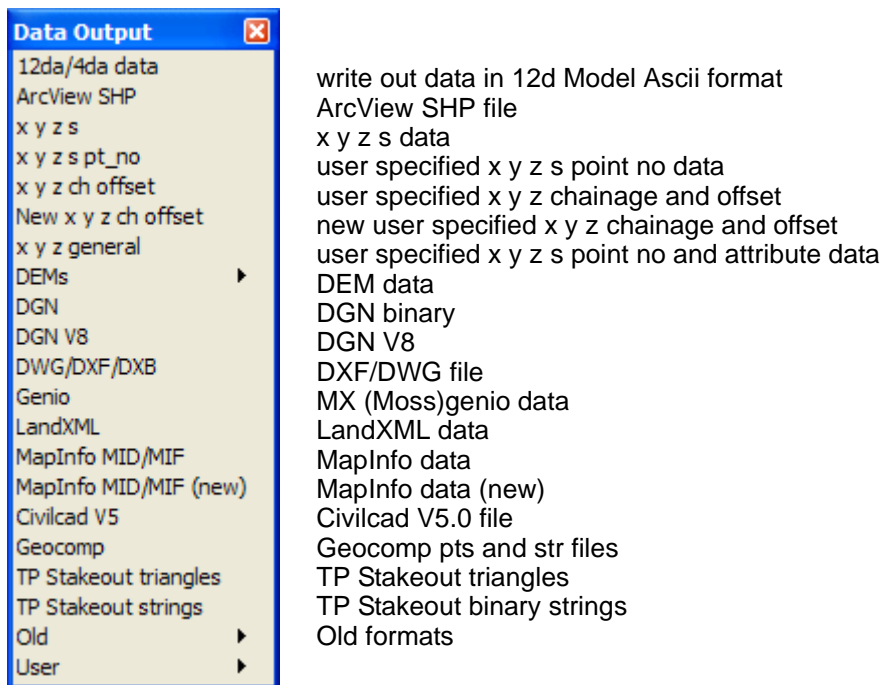
data_output

Position of menu: File I/O =>Data output

12d Model provides output options so that data in a model or on a view can be written out to a disk file. this may be to allow data to be transferred to other programs for further processing or simply to get a readable list of data.

The default *Output null value* is described in the section “Output Null Value”

The data output walk-right menu containing these options is



For the option *12da data*, please continue to the section “12d Ascii Output” .

ArcView SHP	“ArcView SHP Output”
x y z s	“X Y Z S Output”
x y z s pt_no	“User X Y Z S Output”
x y z s ch offset	“User X Y Z Chainage and Offset Output”
New x y z s ch offset	“User X Y Z Chainage and Offset Output”
x y z general	“User X Y Z S and Attributes Output”
DGN	“DGN Output”
DGN V8	“DGN V8”
DWG/DXF	“DWG/DXF Output”
Genio	“Genio Output”
LandXML	“LandXML Output”
MapInfo	“MapInfo Output”
Civilcad V5.0	“Civilcad”
Geocomp	“Geocomp”
TP Stakeout triangles	“TP Stakeout Triangles Output”

TP Stakeout strings
Old

“TP Stakeout Strings Output” .
“Old Outputs” .

Output Null Value

When writing out data for other systems, it is usually not appropriate to write out the internal 12d Model null height (- 9.9e29).

Consequently as data is written out, any 12d Model null heights are replaced by the value given by the **I/O null height** parameter.

The **I/O null height** is set in **Default Settings** tab of the **Defaults** panel in the option Utilities=>Defaults.

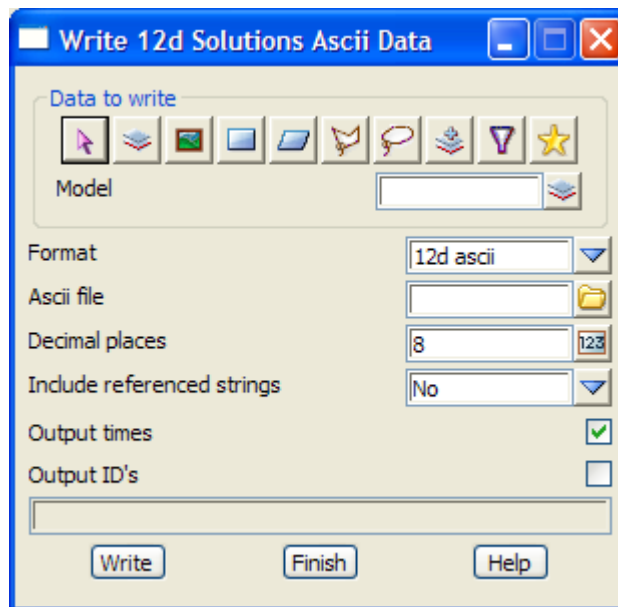
12d Ascii Output

write_12d_Solutions_ascii_data

Position of option on menu: File I/O =>Data output =>12da/4da data

The 12d ascii (4D Ascii) format is a special text format defined by 4D Solutions (see the Appendix) for writing out 12d Model data. This option is used to write out **12d** Model data in the 12d Ascii format.

On selecting the 12d data output option, the **Write 12d Solutions Ascii Data** for panel is displayed as the default choice for Data source.



The Data source field can then be modified for either *String*, *Model* or *View*.

The fields and buttons used in the two panels have the following functions.

Field Description	Type	Defaults	Pop-Up
Data source type		Model	
<i>data selection type - for a full description go to "Data Source" in the chapter "Tools and Concepts"</i>			
Data source	input		
<i>source of data is to be written out to a file.</i>			
Format	choice	12d ascii	12d ascii, 4d ascii
<i>use 12d ascii or 4d ascii format (the only difference is the file name ending)</i>			
Ascii file	input		*.12da or *.4da
<i>name of the file for the information to be written out to in 12d Ascii format. If the file already exists, the data will be appended to the file.</i>			
Decimal places	input	8	
<i>number of decimal places used when writing the data out.</i>			
Write	button		
<i>write out, in 12d Ascii format, all the string data specified by the Data source.</i>			

ArcView SHP Output

[write_ArcView_shape_files_for](#)

[Arcview_output_mapping](#)

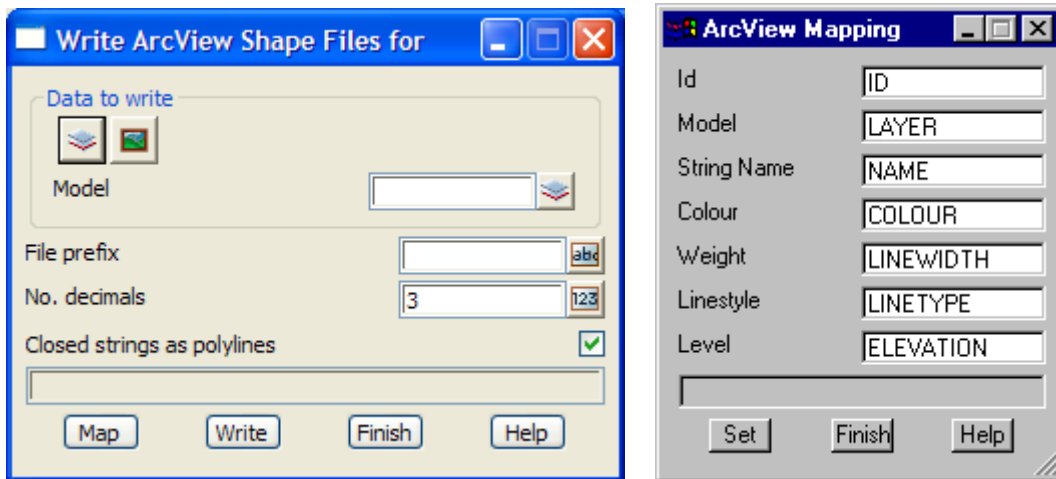
Position of option on menu: File I/O =>Data output =>ArcView SHP

This Option is currently under development.

The *ArcView Shape File* format consists of nine different files containing different data types.

The ArcView shape format has no colour, model or layer information, string names etc. so this information has to be passed through as attributes for the data.

On selecting the ArcView SHP option, the **Write ArcView Shape Files for** panel is displayed.



The fields and buttons used in the **Write ArcView Shape Files for** panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Data source type		Model	
<i>data selection type - for a full description go to "Data Source" in the chapter "Tools and Concepts"</i>			
Data source	input		
<i>source of data is to be written out to a file.</i>			
File prefix	input		
<i>prefix to use for the nine different shape files to be produced for the data.</i>			
Map	button		
<i>brings up the ArcView Mapping panel which defines the ArcView attributes to write the standard 12d Model string header information to.</i>			
Write	button		
<i>write out, in ArcView shape file format, all the string data specified by the Data source.</i>			

The fields and buttons used in the **ArcView Mapping** panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Id		ID	
<i>if non blank, write out an integer number which increments from 1.</i>			
Model		LAYER	

if non blank, write out the model of the string to this attribute.

String name NAME

if non blank, write out the name of the string to this attribute.

Colour COLOUR

if non blank, write out the colour of the string to this attribute.

Weight LINEWIDTH

if non blank, write out the weight of the string to this attribute.

Linestyle LINETYPE

if non blank, write out the linestyle of the string to this attribute.

Z value ELEVATION

if non blank, write out the first z-value of the string to this attribute.

Set button

record the attribute names given in the panel as the ones to be use when writing out the data.

X Y Z S Output

write_xyz_file_for

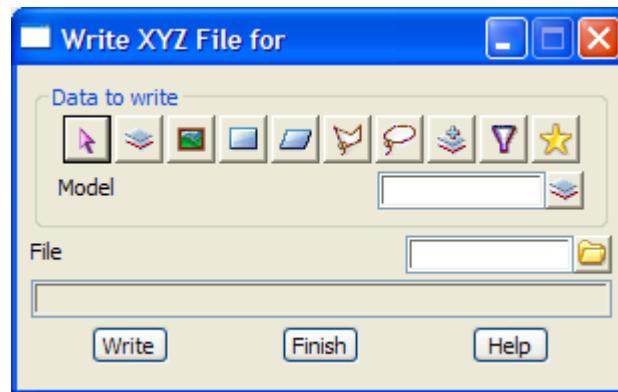
Position of option on menu: File I/O =>Data output =>x y z s

The xyzs output format is identical to the input format - one point per line with the x y and z values separated by spaces.

A string's colour and label are used as colour records and string labels in the output file.

At this stage, 4d, interface and alignment strings are only output as 3d strings. The use of the 12d Model ascii file format is suggested for writing out all strings.

On selecting the xyz option, the **Write XYZ File for** panel is displayed.



The Data source field can then be modified for either *View*, *String* or *Global*.

The fields and buttons used in the two panels have the following functions.

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Data source type		Model	
-------------------------	--	-------	--

data selection type - for a full description go to "Data Source" in the chapter "Tools and Concepts"

Data source	input		
--------------------	-------	--	--

source of data is to be written out to a file.

File	input		*.dat files
-------------	-------	--	-------------

name of the file for the information to be written out to.

Write	button		
--------------	--------	--	--

write out, in x y z format, all the string data specified by the Data source.

User X Y Z S Output

write_xyzs_pt_no_file_for

Position of option on menu: File I/O =>Data output =>x y z s pt_no

The xyzs output format is identical to the user specified input format - one point per line with the x y z s and point number values in a user specified order separated by either delimiters or in fixed width columns.

At this stage, 4d, interface and alignment strings are only output as 3d strings. The use of the **12d** Model ascii file format is suggested for writing out all strings.

On selecting the xyzs pt_no option, the **Write XYZS pt_no File for** panel is displayed.

The fields and buttons used in the two panels have the following functions.

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Data source type		Model	
-------------------------	--	-------	--

data selection type - for a full description go to "Data Source" in the chapter "Tools and Concepts"

Data source input

source of data is to be written out to a file.

Output mode choice box delimiter delimiter, fixed width

*if **delimiter**, the type of delimiter and the columns for the x, y, z, name and point number are given (and are all optional).*

*If **fixed width**, the start and end column positions are given for x, y, z, name and point number which are all optional.*

Output Settings

Number of decimal places input box 3

number of decimal places to use in the x, y and z values.

Default for null value input box -999

value to write out for z when it is a null value in 12d Model.

Include column names tick box

if tick, the names x, y, z etc. are written out in the appropriate columns as the first line of the file.

File input *.dat files

name of the file for the information to be written out to.

Write button

write out all the string data specified by the Data source.

User X Y Z Chainage and Offset Output

[write_xyzch_file_for](#)

[new_write_xyzch_file_for](#)

Position of option on menu: File I/O =>Data output =>x y z s ch offset

Position of option on menu: File I/O =>Data output =>New x y z s ch offset

The *New xyz ch offset* option was introduced in V7C1g and will replace the standard option.

The difference is that the new option turns off the panel fields that are not required.

The *xyz and ch* output option writes out the x, y, z and chainage values for each string or a centreline string can be selected and the x, y, z and chainage values from the original string are output along with the chainage and offset from the selected reference string.

On selecting the *xyzs ch offset* option, the **Write XYZSCH File for** panel is displayed.

Write XYZCH File for

Data to write

Model

General | Position

Number of decimal places: 3

Default for null value: -999

Include column names:

Output file:

Report at string points:

Report at centreline chainages:

Centre line:

Label mode:

n/a:

Ch reference:

Start chainage:

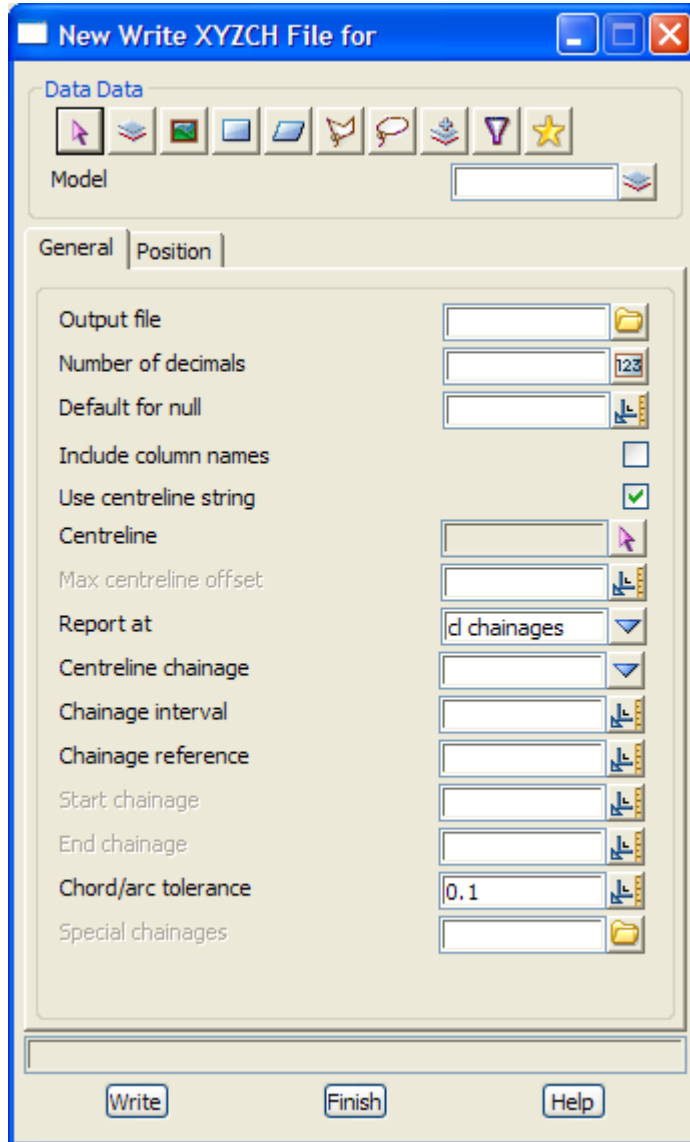
End chainage:

Special chainages:

Chord/Arc tolerance: 0.1

Maximum offset from centreline:

Write Finish Help



The fields and buttons used in the two panels have the following functions.

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Data source type		Model	
-------------------------	--	-------	--

data selection type - for a full description go to "Data Source" in the chapter "Tools and Concepts"

Data source	input		
--------------------	-------	--	--

source of data is to be written out to a file.

Write	button		
--------------	--------	--	--

write out all the data specified by the Data source.

General tab

Number of decimal places	input box	3	
---------------------------------	-----------	---	--

number of decimal places to use in the x, y, z and chainage values.

Default for null value	input box	-999	
-------------------------------	-----------	------	--

value to write out for z when it is a null value in 12d Model.

Include column names	tick box		
-----------------------------	----------	--	--

if tick, the names x, y, z etc. are written out in the appropriate columns as the first line of the file.

- Output File** input *.dat files
name of the file for the information to be written out to.
- Report at string points** tick box
if tick, the values are output for the points (vertices) of the strings from the data source. If a centre line has been selected, then the chainage for the centre line is calculated by dropping the string vertex onto the centre line.
- Report at centreline chainages** tick box
if tick, the specified chainages of the selected centre line (given by label mode etc.) are used and then the positions on the strings from the data source are calculated by going out at right angles to the centre line at the chainage.
- Centreline** string select
optional - a selected centreline to use for chainages.
- Label mode** input regular interval,
 regular interval plus end pts
 end points only
 horizontal TPs,
 vertical TPs,
 horizontal discontinuities
 vertical discontinuities
 all discontinuities,
 crests/sags
 all horizontal points
- type of chainages to use from the centreline.*
- Ch interval or n/a** input
the regular interval to use for chainages.
- Ch reference** input 0
the chainages to user are integer multiples of the chainage interval added to the reference chainage. For example, if the reference chainage is 23.2 and the chainage interval 10, the chainages 3.2, 13.2, 23.2, 33.2 etc. will be used.
- Start chainage** input
*if non-blank, the string chainage to start using.
If blank, start at the beginning of the string.*
- End chainage** input
*if non-blank, the string chainage to finish.
If blank, go to the end of the selected string.*
- Special chainage** input
file of special chainages to use.
- Chord/arc tolerance** input default chord/arc tolerance
the chord to arc tolerance to use on the centreline string for determining how many points are used around horizontal curves.
- Maximum offset from centreline**
*if non blank, any vertices further than this distance from the centreline will NOT be written out.
If non blank, all vertices will be written out.*
- Position tab**
- Output mode** choice box delimiter delimiter, fixed width
*if **delimiter**, then the specified data is written out, each value separated by the delimiter given in the Delimiter field.
If **fixed width**, the specified data is written out to a fixed position on the line. An end position is also*

given.

String name

if the column number (delimiter) or start-end position (fixed width) is given, then the name of the string from the data source is written out. Otherwise it is not written out.

String vertex no

if the column number (delimiter) or start-end position (fixed width) is given, then the vertex number of the string is written out.

String point no

if the column number (delimiter) or start-end position (fixed width) is given, then the point number of the vertex of the string is written out.

String chainage

if the column number (delimiter) or start-end position (fixed width) is given, then the string chainage of the vertex of the string is written out (not the centre line chainage).

String x/y/z

if the column number (delimiter) or start-end position (fixed width) is given, then the x/y/z co-ordinate of the position on the string is written out (not the centre line x/y/z).

CL offset

if the column number (delimiter) or start-end position (fixed width) is given, then the offset of the string from the centre line is written out.

CL chainage

if the column number (delimiter) or start-end position (fixed width) is given, then the chainage of the centre line is written out.

CL x/y/z

if the column number (delimiter) or start-end position (fixed width) is given, then the x/y/z co-ordinate of the position on the centre line string is written out.

User X Y Z S and Attributes Output

write_x_y_z_General_File_for

Position of option on menu: File I/O =>Data output =>x y z general

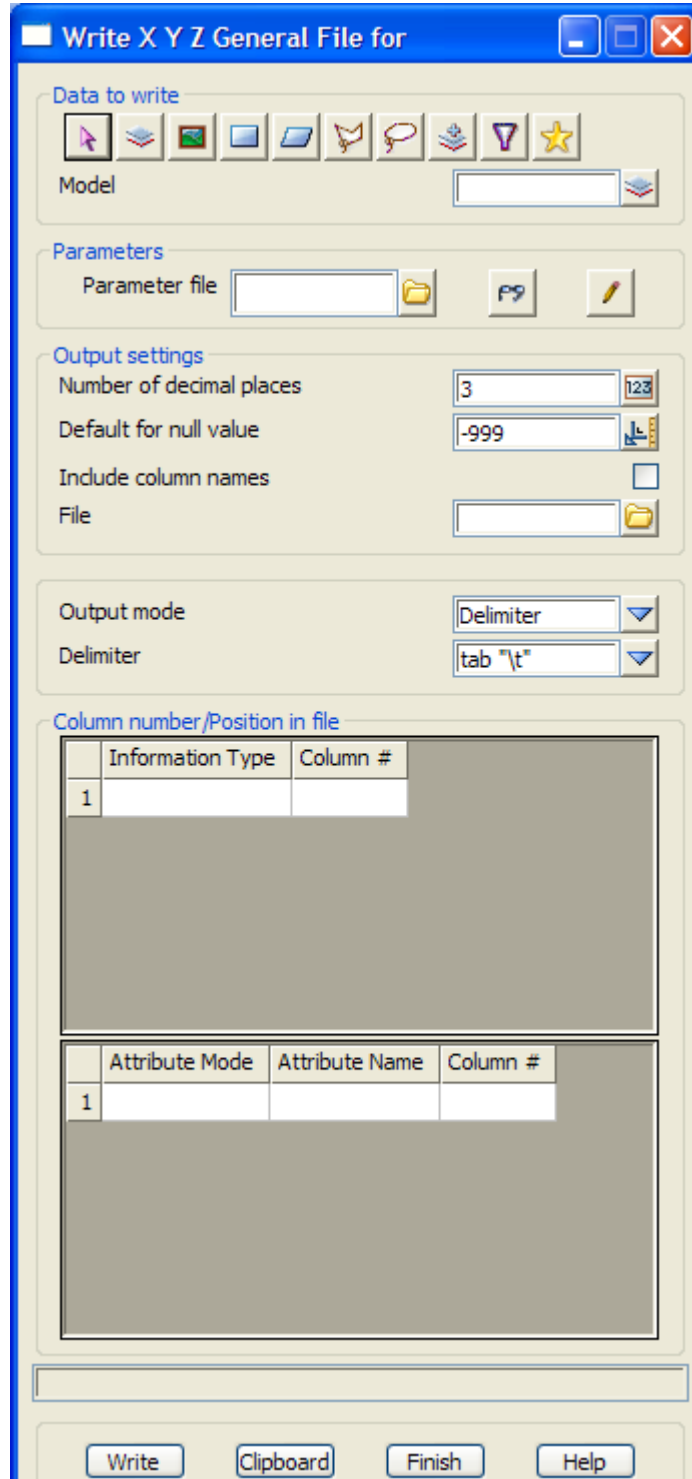
The xyzs output format is identical to the user specified input format - one point per line with the x y z s, point number and attribute values in a user specified order separated by either delimiters or in fixed width columns.

In either case, the user specifies the order that the x, y, z, string name, point number and attributes appear in the file. Only one or more of the items needs to be written out.

The set-ups for defining all the positions of all the data in the file can be written out to a file (.xyf) for re-use.

At this stage, 4d, interface and alignment strings are only output as 3d strings. The use of the **12d** Model ascii file format is suggested for writing out all strings.

On selecting the xyzs general option, the **Write X Y Z General File for** panel is displayed.



The fields and buttons used in the two panels have the following functions.

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Data to write section

Data source type Model

data selection type - for a full description go to "Data Source" in the chapter "Tools and Concepts"

Data source input

source of data is to be written out to a file.

DGN Output

write_dgn_file_for

Position of option on menu: File I/O =>Data output =>DGN

DGN output is a separate chargeable module.

Using the DGN output option, 12d Model produces DGN binary files (*.dgn files - as defined in the public domain by Intergraph Corp) as used by Intergraph and Microstation. Since DGN supports 3D facets, the triangles created in 12d Model can be transferred to DGN for use in shaded models and walk-throughs.

DGN files are either 2d or 3d. 12d Model can write either type of file. If a 3d file is being written, the 12d Model strings will be written out as three dimensional DGN lines. The alignment strings and arcs will be approximated by short lines.

If a 2d file is being written, arcs in alignment strings are written out as DGN plan arcs.

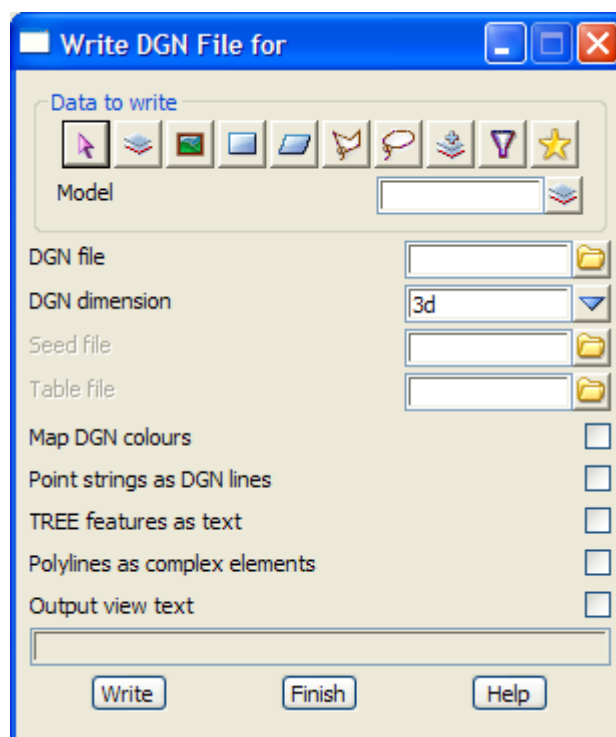
When creating a DGN binary file, it is often convenient to append the information to an existing DGN file known as a **seed file** (the seed file usually contains set up information for the DGN drawing).

In 12d Model, the user can specify a folder containing seed files by pointing to it using the environment variable MS_SEEDFILES_4D. In the DGN output options, the pop-up for the **seed file** panel field displays all the files ending in .dgn in the folder pointed to by MS_SEEDFILES_4D.

If the environment variable MS_SEEDFILES_4D has not been set, the pop-up uses the current working folder to search for seed files.

It is possible to use an output map file (called a table file) with string name as the key to set DGN levels, colours, weight, style and special symbols (see next section). Because of the limitation of 64 levels in DGN, using a table file is normally the best method of getting data across to DGN.

On selecting the DGN option, the **Write DGN File for** panel is displayed.



The fields and buttons used in the two panels have the following functions.

Field Description	Type	Defaults	Pop-Up
Data source type		Model	
<i>data selection type - for a full description go to "Data Source" in the chapter "Tools and Concepts"</i>			
Data source	input		
<i>source of data is to be written out to a file.</i>			
DGN file	input		*.dgn
<i>name of the DGN file to write the model/view data out to. If the file exists, it is appended to, and the settings for TCB variables are read from the file. If the file does not exist, it is created with default TCB settings. The file is created either 2d or 3d depending on the DGN Dimension field.</i>			
DGN Dimension	input	3d	2d/3d
<i>this field controls the dimension of DGN files created for the case where the file named in the Seed file does not exist.</i>			
Seed file	input		files in the seed folder
<i>if non-blank, this field gives the name of the DGN file to be used as a seed file for the DGN output. The folder containing the seed files, the seed folder, is given by the environment variable MS_SEEDFILES_4D.</i>			
Table file	input		*.tbl file
<i>if non-blank, the file is used as an output map file between 12d Model and the .dgn binary file.</i>			
Map DGN Colours	tick box		
<i>if not tick, 12d Model colour number n is mapped to DGN colour n. if tick, some of the 12d Model colours are attempted to be mapped to DGN colours.</i>			
Point strings as DGN lines	tick box		
<i>if tick, 12d Model points go out as DGN two point strings with the same value for each point. if not tick, 12d Model points go out to DGN points.</i>			
TREE features as text	tick box		
<i>if tick and there is a table file match for TREE, then 12d Model writes out feature strings of name "TREE" as text in DGN. Other feature strings go out as circles. if not tick, all 12d Model feature strings go out as DGN circles.</i>			
Polylines as complex elements	tick box		
<i>if tick and DGN dimension is 2d, 12d Model writes out polylines as complex elements made up of lines and arcs. if not tick, the polyline goes out as individual lines and arcs.</i>			
Output view text	tick box		
<i>if tick, any view text turned on (point numbers, z-values etc.) are output as text in DGN. if not tick, view text is not output.</i>			
Write	button		
<i>write out all the data specified by the Data source to the file given in the DGN file field.</i>			

DGN Output Map File (Table File)

When using the output options to write out a DGN file, an output map file (table file) can be used, with string names as the key, so that the user can specify DGN level, colour, weight, style and some information which is placed in an DGN attribute. The format is based on the VicRoads specification.

The key can have wild cards (*) and wild characters (?) as for the input map files.

The table consists of lines containing either 8 or 16 free format fields. Fields 9-16 can be left off if they are not needed.

The key for the map is the 12d Model string name which is given as the first field of a line. The rest of the fields on the line are used for .dgn information.

- field 1 12d Model string name (any length but if field 2 is a *, only the first four characters are passed)
- field 2 text of which the first four characters are used in a DGN attribute. For example, the VicRoads code
- field 3 AS2482 feature code
- field 4 description (any length but quotes needed if there are embedded spaces)
- field 5 line level (between 1 and 64)
- field 6 line colour (between 1 and 256)
- field 7 line weight (between 1 and 7)
- field 8 line style

fields 9-16 are only used for special symbols placed at points.

- field 9 symbol font (between 0 and 7)
- field 10 symbol character
- field 11 symbol character justification
- field 12 symbol character height
- field 13 symbol character width
- field 14 symbol level
- field 15 symbol weight
- field 16 symbol colour

Field 1, the 12d Model string name, can contain wild cards * or wild characters ?.

Field 2, a text string, and the first four characters of the text is inserted into a DGN attribute. This DGN attribute is used by the 12d Model DGN reader for matching with a 12d Model input map file.

If field 2 is a * then the first four characters of the 12d Model string name is inserted as an Intergraph attribute.

Line strings and Text strings only use fields 1 to 8 and ignore fields 9-16 (if they exist).

Fields 9 through 16 are only used for 12d Model point strings which are then mapped with the specified Intergraph symbol at each point of the string.

If either field 12 or 13 is zero, then it is interpreted to mean that only the first 8 fields are used.

If any of the fields 5 through 16 (except 9 and 11) is a *, then that field is not used in the map.

Double quotes " are entered as text as \", a ' as \' and a \ as \\.

An example of a map table where the first four characters of the 12d Model string names are passed directly through to the DGN attribute.

CONT	*	50020000	"Contour - Standard "	2	4	0	0								
TOP	*	25060001	"Top - Cut/fill/bank "	2	11	1	2								
TOE	*	25060002	"Toe - Cut/fill/bank "	3	11	1	7								
ES*	*	50090001	"Existing surface-spot "	4	9	1	0	110	A	7	1000	1000	4	0	9
CIND	*	50080000	"Contour - Index "	2	4	1	0								

An example of a map table where the 12d Model string names are used for mapping but different names go through to the DGN attribute.

```

101      CONT      50020000  "Contour - Standard "  2   4   0   0
102      TOP       25060001  "Top - Cut/fill/bank "  2  11   1   2
104  ES      50090001  "Existing surface-spot" 4   9   1   0 110 A  7 1000 1000  4   0   9

```

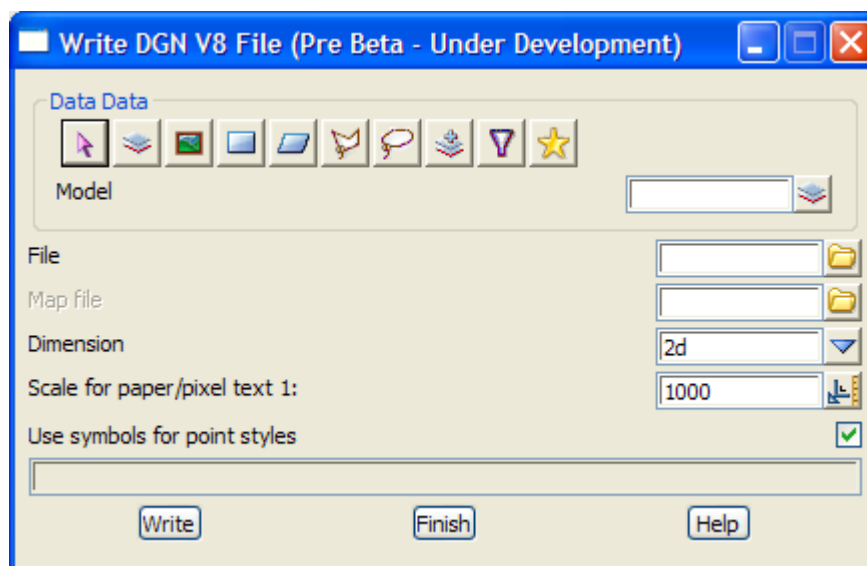
Write_DGN_V8_File__Pre_Beta___Under_Development_

DGN V8

NOTE: the format for DGNV8 has been changed and has not been published. This is a beta version of the DGN Write to try and write DGNV8. At this stage it is probably better to use DWG I/O to go in and out of Microstation V8.

Note: this option is under development

On selecting the DGN V8 option, the **Write DGN V8 File** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
DGN file <i>name of the DGN V8 binary model to be write to</i>	input		*.dgn files
Write <i>read the data out.</i>	button		

DWG/DXF Output

`write_dwg_dxf_file_for`

Position of option on menu: File I/O =>Data output =>DWG/DXF

The DWG/DXF output format is for writing data out in a format compatible with AutoCAD versions 2.5 to 2000.

12d Model line strings are output as POLYLINES, point strings as a series of Autocad POINTs and triangles as 3DFACEs.

By default, the string or triangle colour is used in the Autocad colour record. The DXF layer used is the items model name with any spaces in the model name replaced by a minus (-). However, a DXF output map file with matches on string name can be used to give DXF layers, colours and line type (see next section).

At this stage, 4d, interface and alignment strings are only output as Autocad POLYLINES.

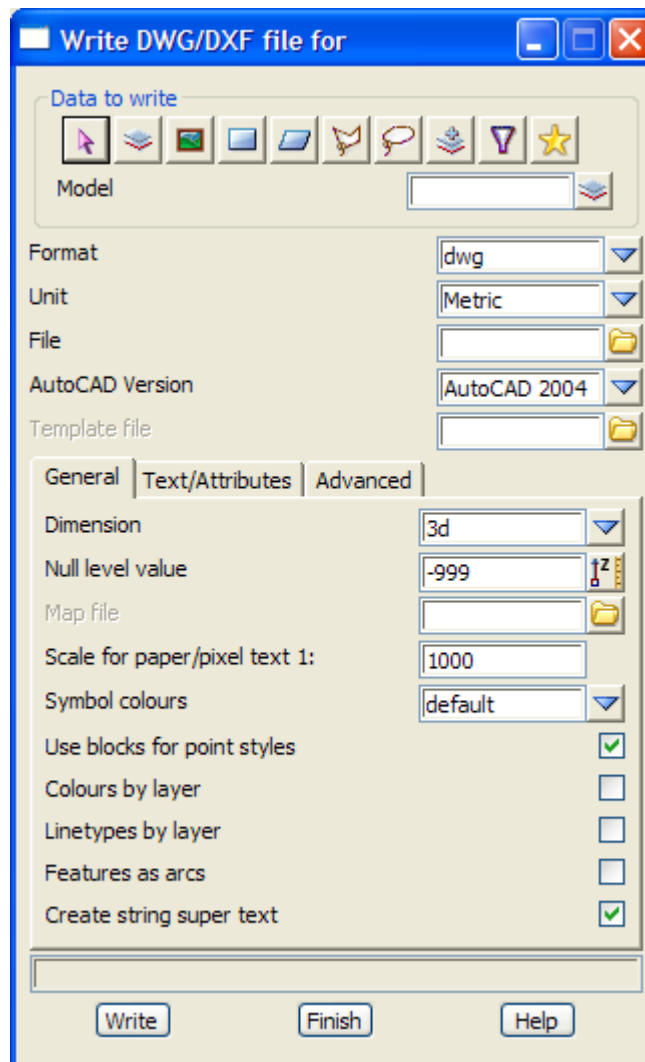
When creating an AutoCAD file, it is often convenient to use an existing AutoCAD file as a template or **seed file** (the seed file usually contains set up information for the AutoCAD drawing).

In **12d** Model, the user can specify a folder containing seed files by pointing to it using the environment variable ACAD_SEEDFILES_4D. In the AutoCAD DWG/DXF output option, the pop-up for the **seed file** panel field displays all the files with the appropriate ending in the folder pointed to by ACAD_SEEDFILES_4D.

If the environment variable ACAD_SEEDFILES_4D has not been set, the pop-up uses the current working folder to search for seed files.

It is also possible to use a label map file to create labels for vertex information such as z-values, symbols and point numbers which are written directly to the AutoCAD file. See the section "Label Map File" and "Use Label Map File" for more information on the label map file.

On selecting the DWG/DXF output option, the **Write DWG/DXF file for** panel is displayed.



The fields and buttons used in the two panels have the following functions.

Field Description	Type	Defaults	Pop-Up
Data source type		Model	
<i>data selection type - for a full description go to "Data Source" in the chapter "Tools and Concepts"</i>			
Data source	input		
<i>source of data is to be written out to a file.</i>			
Format	choice	dwg	dwg, dxf, bdx
<i>AutoCAD format of the file.</i>			
Unit	choice	Metric	Metric, English
<i>AutoCAD units type.</i>			
File	input		
<i>name of the ACAD file for the data to be written out to.</i>			
AutoCAD version	choice	AutoCAD 2004	AutoCAD 12, 13, 14 AutoCAD 2000, 2002, 2004 2005, 2006, 2007
<i>AutoCAD version of the file produced.</i>			
ACAD Template file	input		

name of the file to use as the AutoCAD template

Write button

write out, in DXF format, all the data specified by the Data source, to the file given in the file field.

General tab

Dimension choice 3d 2d, 2d and contours 3d,3d

if **2d**, the z-value of all the data is set to zero and arcs and curves in alignment strings are written out as dxf polylines with bulges for the arcs.

If **2d and contours 3d**, the z-value of all the non-contour data is set to zero and arcs and curves in alignment strings are written out as dxf polylines with bulges for the arcs. Contours are written out as 3d polylines.

If **3d**, strings will be written out as three dimensional DXF polylines. Alignment strings and arcs will be approximated by short lines.

Null level value input -999

AutoCAD z-value to use for any vertices with the 12d Model null value

ACAD output map file input *.mf files

if non-blank, the name of an AutoCAD output map file to map the data. See "AutoCAD Output Map File Create/Edit".

Scale for paper/pixel text 1: input 1000

scale to use to convert 12d Model paper and pixel text to ACAD world units

Symbol colour choice default default, by block, by layer

if **default**, use the 12d Model colour.

If **By block**, write out as BY BLOCK.

If **By layer**, write out as BY LAYER.

Colour by layer tick box no tick

if **tick**, the colour is set to BY LAYER

Linestyles by layer tick box no tick

if **tick**, the linestyle is set to BY LAYER

Features as arcs tick box no tick

if **tick**, feature strings output as arcs in DXF.

if not **tick**, the centre of the feature string is output as a point.

Create string super text tick box no tick

if **tick**,

Text/Attributes

Label map file input *.mf files

if non-blank, the name of a file to be used as label map file for creating labels.

Layer name for symbols input *.mf files

if non-blank, the name of a file to be used as label map file for creating labels.

Advanced

Space in model names choice space space, underscore, hyphen

if **space**, then spaces in 12d Model names go out as spaces to ACAD layer names.

If **underscore**, then spaces in 12d Model names go out as underscores to ACAD layer names.

If **hyphen**, then spaces in 12d Model names go out as hyphens to ACAD layer names.

Acad point style choice style 0 Acad point styles

Point mode choice relative relative, absolute

	<i>if relative, then</i>		
	<i>If absolute, then .</i>		
Point size (%)	input		5
Output view text	tick box		no tick
	<i>if tick, any view text turned on (point numbers, z-values etc.) are output as text in DXF.</i>		
	<i>if not tick, view text is not output.</i>		
Explode interface strings	tick box		no tick
	<i>if tick, interface strings are broken into separate strings for the cut or fill colour.</i>		
	<i>If not tick, interface strings are written out as one string in magenta.</i>		
Use model name for mapping	tick box		no tick
	<i>if tick,</i>		
	<i>if not tick, .</i>		
Use symbol name for mapping	tick box		no tick
	<i>if tick,</i>		
	<i>if not tick, .</i>		
Associate vertex attributes with symbol	tick box		no tick
	<i>if tick,</i>		
	<i>if not tick, .</i>		
Vertex attributes height	input		-999

DWG/DXF Output Map File

See "AutoCAD Output Map File Create/Edit" .

When using the output options to write out a DWG/DXF file, an output map file can be used, with 12d Model string names as the entity-name to match the key, so that the user can specify Autocad layer, colour and style. BYLAYER can be used with colour and style.

The key can have wild cards (*) and wild characters (?) as for the input map files. The fields in the DWG/DXF output map file are (ACD = Autocad):

field 1	key - string name	can include wild cards * and wild characters ?
field 2	new name	not output to DXF
field 3	ACD layer	* for 12d Model name
field 4	ACD colour	number between 0 and 256, * for 12d Model colour mapped to ACD,
		BYLAYER for ACD BYLAYER
field 5	ACD line type	* for 12d Model linestyle, BYLAYER for ACD BYLAYER
field 6	ACD text style	not yet used, * for 12d Model text style

An example of an DWG/DXF output map file is.

//	1	2	3	4	5	6
//	key	name	layer	colour	linetype	textstyle
	cont*	ignored	CONTOURS	1	1	*
	EB*	ignored	ROAD	2	CONTINUOUS	*
	103	ignored	*	3	*	*
	fe*	ignored	FENCE	*	BYLAYER	*
	SURV*	ignored	SURVEY	BYLAYER	DASH	*

Genio Output

`write_genio_file_for`

Genio i/o is a separate chargeable module.

The Genio output option write out the strings selected by the data source, to a genio file, the format used by MX (formerly Moss). A genio 001 option is used to specify the record format.

Because MX and in 12d Model have different data types, not all 12d Model data can be transferred to MX. The user must be aware of what data can be transferred to MX.

1. MX model names are limited to thirty two characters (in upper case). Hence the first thirty two characters of the 12d Model model name are converted to upper case and used as the MX model name.
2. MX string names can only be four characters and each string in MX must have a unique name. This limits MX to a maximum of 1,679,616 string. Strings can have the same name in the genio file but the strings will be *renamed* when read into MX to give each string a unique name.

Since 12d Model places no restrictions on string name length, the following rules are used to produce genio string names.

For a **line-string**, the first four characters of the string name are used as the genio string name. The four characters are mapped to upper case. Remember that MX line strings can not start with a P.

For a **point-strings** whose names start with **P**, the first four characters of the string name are used as the genio string name. Otherwise the genio string name is **P** plus the first three letters of the point-string name. The three letters are mapped to upper case.

3. 12d Model null heights go out as -999 to MX.
4. The four character limit and uniqueness for MX string names restricts the number of strings that can be read into MX. For example, since points strings must start with P so there can be a maximum of 46,656 point strings. Or if a MX string must start with ABB say, then there can only be 36 distinct ABB strings in the MX project.
5. All MX x and y co-ordinates have to be positive. That is, all co-ordinates must be in the first quadrant.
6. 12d text strings go out as MX text strings but there is a maximum of 44 characters in the MX text string. There is no unit for height in the MX text string as well as no font. The name of a MX text string must start with a * so 12d Model uses * and the first three characters of the text string's name.
7. 2d and 3d strings in 12d Model go out to MX as 2d and 3d strings respectively.
8. 4d strings in 12d Model go out to MX as 4d strings except that the text is restricted to four characters.
9. Alignment and super alignments can be written out to MX as MX 3d, 6d or 12d string.
10. For super strings:

Point id's are ignored in all cases.

On the Genio output panel, this is a tick box *Include segment text* and if it is ticked then segment text is written out as MX text strings, otherwise segment text is ignored.

On the Genio output panel, this is a tick box *Include vertex text* and if it is ticked then the super string is written out as a MX 4d string and with the first four characters as the vertex text for a point.

Attributes are ignored in all cases.

Diameter and culvert **width** and **height** are ignored.

Colour and **segment colour** are ignored.

If there is an **invisibility** segment, the string is broken into two.

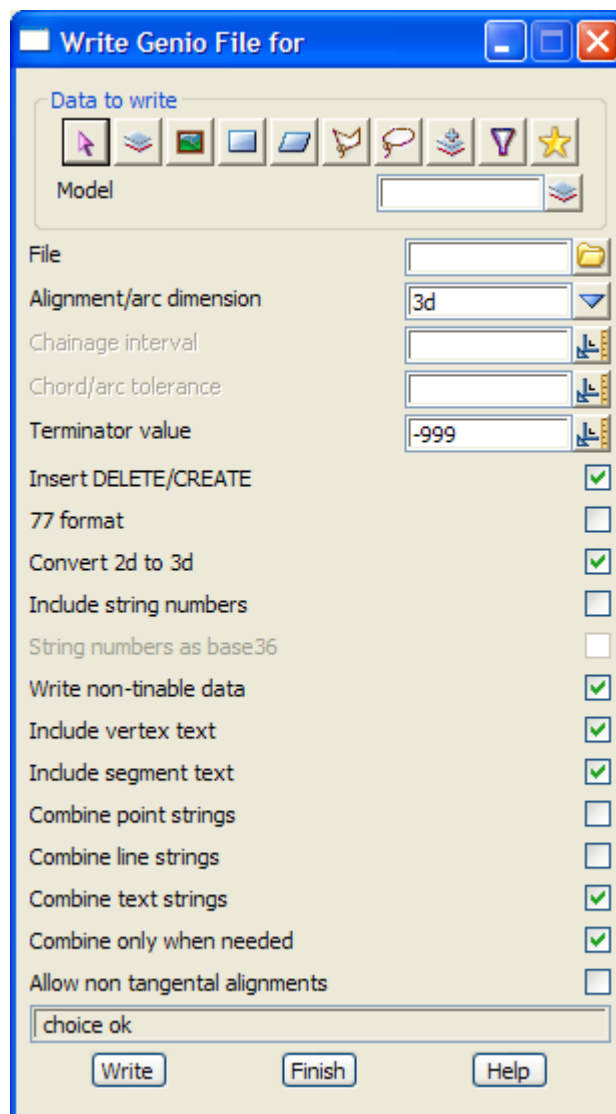
Tinability is a real problem. MX has no such concept apart from the entire string being a point string or a line string. There is a tick box to write out non-tinable data. If a segment is non tinable, the string is broken into two.

Arcs in super strings or arc strings or circles are broken into line segments using the chord to arc tolerance in the genio output panel, or the system default if there is no value in the panel. Super strings with a fixed z-value and no vertex text (i.e. that is no z-value at each point, just the one z for the entire string) go out at MX 2d strings.

Super strings with a z-value at each vertex and no vertex text (that is a z-value at each point) go out as MX 3d string

Super strings with a z-value at each vertex and vertex text (that is a z-value at each point and text at each point) go out as MX 4d strings with the four characters of the vertex text as the forth dimension.

On selecting the Genio output option, the **Write Genio File for** panel is displayed.



The fields and buttons used in the two panels panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Data source type		Model	

data selection type - for a full description go to “Data Source” in the chapter “Tools and Concepts”

- Data source** input
source of data is to be written out to a file.
- File** input *.mos files
name of the genio file the model/view is to be written out to. If the file already exists, the data will be appended to the bottom of the file.
- Alignment/arc dimension** input 3d 3d,6d,12d
*if 3d is selected, alignment and arc strings as written out as MX 3d string as a series of straight lines (x, y, z at each point).
If 6d is selected, alignment and arc strings are written out as MX 6d strings (chainage, x, y, z, bearing, and radius at each point).
If 12d is selected, alignment and arc strings are written out as MX geometry strings (called 12d strings in MX). This is the only way that full horizontal and vertical geometry can be transferred to MX.*
- Chainage interval** input
if 3d is selected as the Alignment/arc dimension, the alignments and arcs are approximated using the Chainage interval and the Chord/arc tolerance.
- Chord/arc tolerance** input
if 3d is selected as the Alignment/arc dimension, the alignments and arcs are approximated using the Chainage interval and the Chord/arc tolerance.
- Terminator value** input -999
value to use to terminate strings in the genio file.
- Insert DELETE/CREATE** tick box tick
if tick, the genio commands DELETE and CREATE are written at the top of the file to correctly define the moss models for the data.
- 77 format** tick box
if tick, use the MX 77 formats for the genio strings.
- Convert 2d to 3d** tick box tick
if tick, write strings with a fixed z-value (2d strings) out in MX 3d string format in the genio file.
- Include string numbers** tick box
if tick, the MX string name includes the surveyors string number. It still can be only four characters.
- Write non-tinable data** tick box tick
*if tick, strings that are non-tinable are written out.
If not ticked, strings that are non-tinable are not written out.*
- Include vertex text** tick box tick
if tick, write out strings with vertex text as MX 4d string with the first four characters of the vertex text as the text on the MX 4d string, otherwise do not write the text out.
- Include segment text** tick box tick
if tick, write out segment text as text strings otherwise do not write the text out.
- Combine point strings** tick box
if tick, point strings of the same name in 12d are combined into one point string when written out.
- Combine line strings** tick box
if tick, strings of the same name in 12d are combined into one MX string (using MX discontinuities to separate the strings) when written out. This is trying to get over the MX four character name limitation.
- Combine text strings** tick box tick
if tick, text strings of the same name in 12d are combined into one MX text string when written out.

This is trying to get over the MX four character name limitation.

Combine only when needed tick box tick

*if **tick**, when there are more strings of the same name in 12d than the MX four character name restriction would allow, the strings are combined into one MX string when written out. This is trying to get over the MX four character name limitation.*

Allow non tangential alignments tick box

*if **tick**, alignments where some elements are not tangential are written out.*

*if **not tick**, alignments with non tangential elements are not written out.*

Write button

write out in genio format all the data specified by the Data source, to the file given in the file field. If the file already exist, the data will be appended to the file.

LandXML Output

write_landXML_for

Position of option on menu: File I/O =>Data output =>LandXML

LandXML is a general format that attempts to cover civil and surveying entities.

Unfortunately every vendor has their own extensions which makes the format of only limited value unless LandXML readers are tailored for each vendor variation.

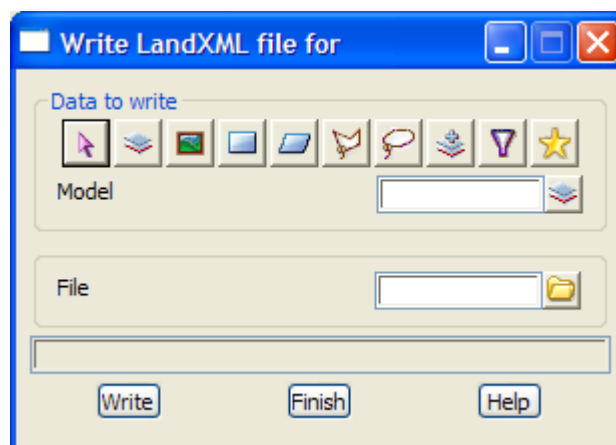
LandXML only covers some of the data in 12d Model and so is of limited value.

12d Model has special LandXML writers for LINZ-XML (for LandOnline NZ) and Leica-XML.

One benefit is that for it may allow access to data from vendors who only have non-published proprietary formats (AutoCAD, Microstation).

This option is under continual developed as the LandXML standard keep changing.

On selecting the LandXML option, the **Read LandXML File** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Data source type		Model	
<i>data selection type - for a full description go to "Data Source" in the chapter "Tools and Concepts"</i>			
Data source	input		
<i>source of data is to be written out to a file.</i>			
File	input		*.xml
<i>name of the LandXML file to write to</i>			
Write	button		
<i>write the selected data to a LandXML file.</i>			

MapInfo Output

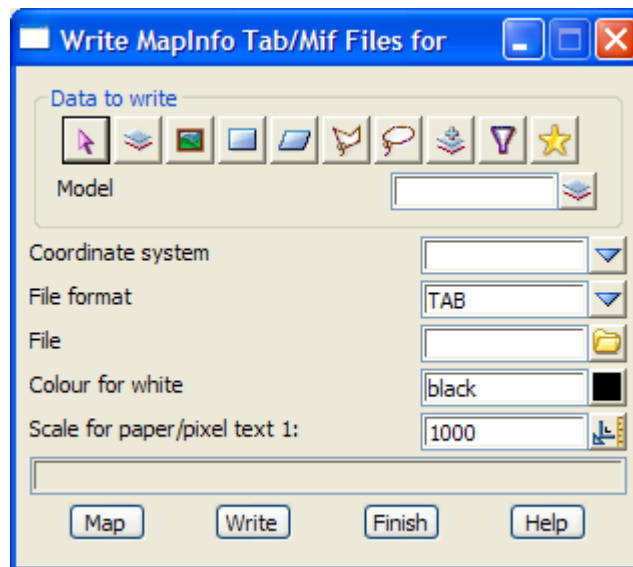
write_MapInfo_tab_mif_files_for

Position of option on menu: File I/O =>Data output =>MapInfo

This Option is currently under development.

The *MapInfo MID/MIF* format is used for sending data to MapInfo.

On selecting the MapInfo MID/MIF option, the **Write MapInfo Tab/Mif Files for** panel is displayed.



The Data source field can then be modified for either *View*, *String* or *Global*.

The fields and buttons used in the two panels have the following functions.

Field Description	Type	Defaults	Pop-Up
Data source type		Model	

data selection type - for a full description go to "Data Source" in the chapter "Tools and Concepts"

Data source	input		
	<i>source of data is to be written out to a file.</i>		

Co-ordinate system	choice box		
---------------------------	------------	--	--

MapInfo file of co-ordinate definitions. The co-ordinate system that the current data is in is selected from the list.

Note - data in MapInfo is stored in longitude and attitude. When MapInfo reads data in it needs to know the co-ordinate system that the data is in so that it can convert the data to longitude/attitude as it reads the file. The list of co-ordinate systems in the Co-ordinate system pop-up is in the file *mapinfo.4d*. *Mapinfo.4d* has exactly the same format as the file *MAPINFOW.PRJ* used by MapInfo.

*If there are any co-ordinate systems missing that are in your MapInfo system, simply copy the file *MAPINFOW.PRJ* from your MapInfo system into the 12d Model **User** folder and give it the name *mapinfo.4d* instead of *MAPINFOW.PRJ**

File format	choice box	TAB	TAB, MIF
	<i>MapInfo format to use for writing out the data.</i>		

File	choice box		*.tab, *.mif files
	<i>name of the file to write the data out to.</i>		

Colour for white colour box available colours
colour to use in MapInfo for white in 12d Model (because MapInfo has a white background).

Write button
write out, in MapInfo file format, all the string data specified by the Data source.

Civilcad

civilcad_write_panel

Position of option on menu: File I/O =>Data output =>Civilcad V5

Civilcad output is a *unsupported* option supplied to users with the Civilcad input option. Civilcad input is a chargeable module.

Because of the limitations of the CivilCAD ascii format, the CivilCAD output option can only output a limited number of 12d Model data types.

The Civilcad output option writes some 12d Model data to a CivilCAD 5.0 ascii file. Because CivilCAD ascii can only take points, lines between two points and arcs, only 12d Model data that can output that way can be written out.

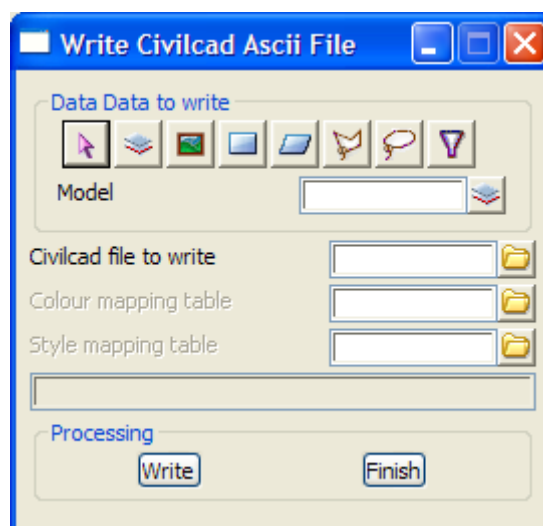
The only 12d Model data types that can be written out to Civilcad ascii are:

- 2d strings
- 3d strings
- arcs
- circles
- polylines
- the line work from super strings
- text

Note that the following 12d Model data that **can not** be output to CivilCAD ascii:

- alignments
- super alignments
- drainage/sewer strings
- pipeline strings
- pipe strings
- attributes
- most super string properties
- triangulations
- rasters

On selecting the Civilcad output option, the **Write CivilCAD ascii File** panel is displayed.



The fields and buttons used in the two panels panel have the following functions.

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Data to write	choice	Model	Model, View
	<i>the type of data to be written out to a file.</i>		
Data type source	input		
	<i>source of data is to be written out to a file.</i>		
CivilCAD file	input		*.as5 files
	<i>name of the file the model/view is to be written out to. If the file already exists, the data will be appended to the bottom of the file.</i>		
Write	button		
	<i>write out in CivilCAD format the data in the model/view given in the model/view field, to the file given in the file field.</i>		

Geocomp

geocomp_write_panel

Position of option on menu: File I/O =>Data output =>Geocomp

Geocomp output is a *unsupported* option supplied to users with the Geocomp input option. Geocomp input is a chargeable module.

Because of the limitations of the Geocomp points and strings files, the Geocomp output option can only output a limited number of 12d Model data types.

The Geocomp output option writes some 12d Model data to Geocomp Points and Strings files. Because Geocomp can only take points, lines between two points and arcs, only 12d Model data that can output that way can be written out.

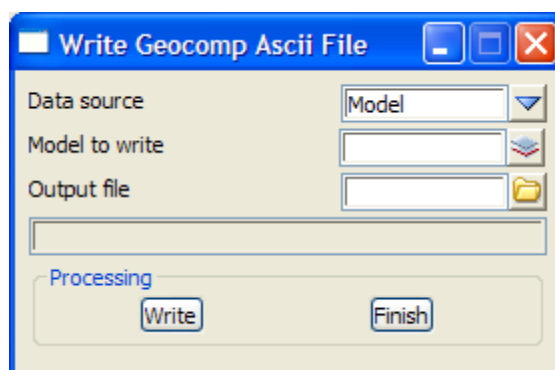
The only 12d Model data types that can be written out to Geocomp points and strings files are:

- 2d strings
- 3d strings
- arcs
- circles
- polylines
- the line work from super strings
- text

Note that the following 12d Model data types that **can not** be output to Geocomp:

- alignments
- super alignments
- drainage/sewer strings
- pipeline strings
- pipe strings
- attributes
- most super string properties
- triangulations
- rasters

On selecting the Geocomp output option, the **write Geocomp ascii file** panel is displayed.



The fields and buttons used in the two panels panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Data to write <i>the type of data to be written out to a file.</i>	choice	Model	Model, View
Data type source <i>source of data is to be written out to a file.</i>	input		

Output file input *.as5 files
name of the file the model/view is to be written out to. If the file already exists, the data will be appended to the bottom of the file.

Write button
write out Geocomp Points and Strings files the data in the model/view given in the model/view field, to the file given in the output file field.

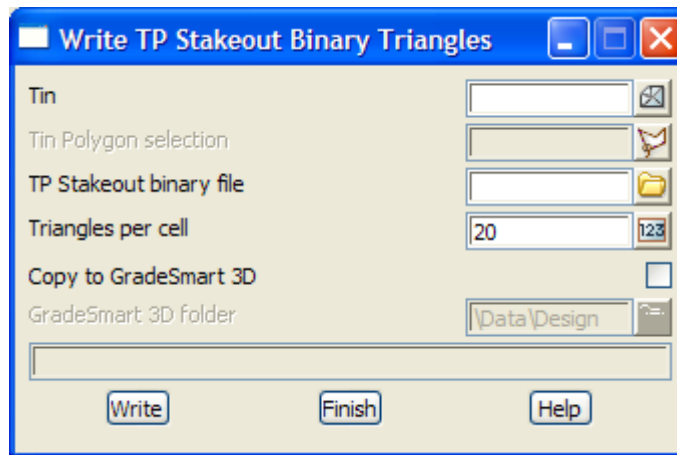
TP Stakeout Triangles Output

write_tp_stakeout_binary_triangles

Position of option on menu: File I/O =>Data output =>TP Stakeout triangles

The *TP Stakeout triangles* option writes out a tin as a TP Stakeout binary file.

On selecting the TP Stakeout triangles output option, the **Write TP Stakeout Binary Triangles** panel is displayed.



The fields and buttons used in the two panels have the following functions.

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Data source type

Model

data selection type - for a full description go to "Data Source" in the chapter "Tools and Concepts"

Data source

input

source of data is to be written out to a file.

Tin

input

available tins

name of the tin to write out in TP Stakeout binary format.

Tin polygon selection

poly string-select

if selected, only triangles with their centroid inside this string are written out.

TP Stakeout binary file

input

*.tsb

name of the file for the triangles.

Triangles per cell

a TP Stakeout parameter.

Write

button

write out the tin in TP Stakeout binary format.

TP Stakeout Strings Output

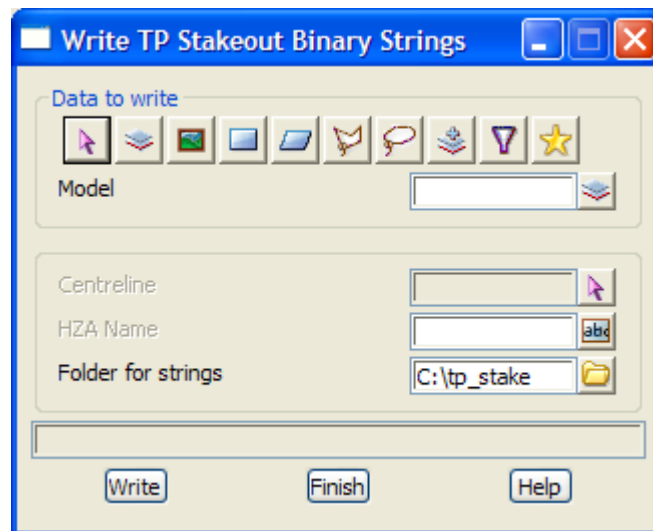
write_tp_stakeout_binary_strings

Position of option on menu: File I/O =>Data output =>TP Stakeout strings

Note - this is a chargeable option

The *TPStakeout strings* option writes out selected strings as a TP Stakeout binary file.

On selecting the TP Stakeout strings output option, the **Write TP Stakeout Binary Strings** panel is displayed.



The fields and buttons used in the two panels have the following functions.

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Data source type		Model	
-------------------------	--	-------	--

data selection type - for a full description go to "Data Source" in the chapter "Tools and Concepts"

Centreline	string select		
-------------------	---------------	--	--

centreline string to use as the reference chainage for other strings.

HZA name			
-----------------	--	--	--

Folder for stings	folder		
--------------------------	--------	--	--

name of the folder to write out the strings to.

Write	button		
--------------	--------	--	--

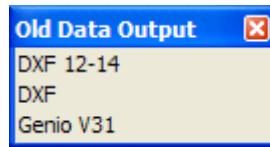
write out the strings in TP Stakeout binary format.

Old Outputs

old_data_output

Position of menu: File I/O =>Data output =>Old

The Old menu contains superseded options. The Old walk-right menu is



DXF 12-14 Output

[write_dxf_12_14_file_for](#)

Position of option on menu: File I/O =>Data output =>Old =>DXF 12-14

SUPERSEDED OPTION

The DXF 12-14 output format is for writing data out in a format compatible with AutoCAD. The DXF file produced **does not** have a full DXF header with the required line types, text styles, fonts already defined. Hence the DXF file needs to be loaded into an **existing** Autocad drawing.

AutoCAD Release 10 introduced binary DXF files as a means of addressing the problems of large file sizes, slow processing and limited accuracy that occur when using the ASCII DXF format.

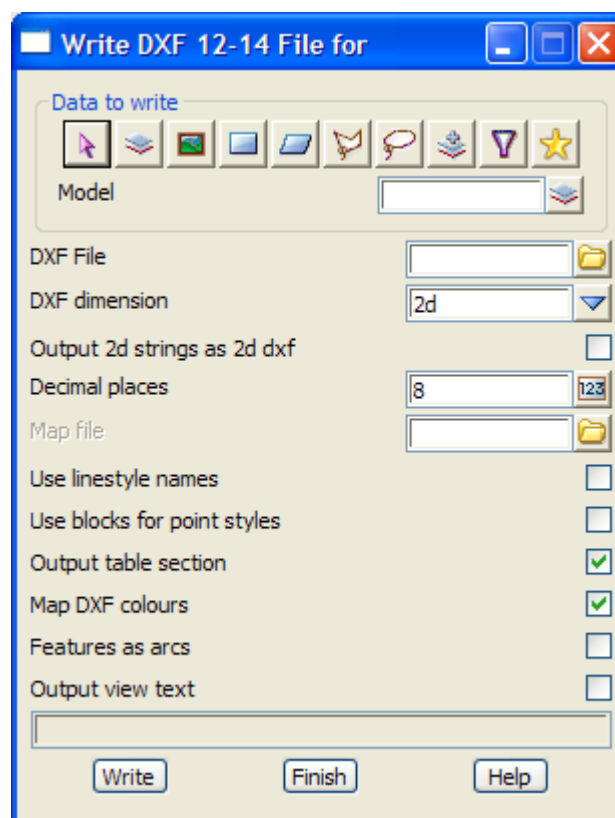
12d Model can write binary DXF files. See the Precision field below.

12d Model line strings are output as POLYLINES, point strings as a series of Autocad POINTs and triangles as 3DFACES.

By default, the string or triangle colour is used in the Autocad colour record. The DXF layer used is the items model name with any spaces in the model name replaced by a minus (-). However, a DXF output map file with matches on string name can be used to give DXF layers, colours and line type (see next section).

At this stage, 4d, interface and alignment strings are only output as Autocad POLYLINES.

On selecting the DXF 12-14 output option, the **Write DXF 12-14 File for** panel is displayed.



The fields and buttons used in the two panels have the following functions.

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Data source type		Model	
-------------------------	--	-------	--

data selection type - for a full description go to "Data Source" in the chapter "Tools and Concepts"

Data source	input		
--------------------	-------	--	--

source of data is to be written out to a file.

- DXF File** input *.dxf files
name of the file for the information to be written out to. If the file already exists, the data will be appended to the file.
- DXF Dimension** input 2d 2d, 3d
*if 3d, strings will be written out as three dimensional DXF polylines. Alignment strings and arcs will be approximated by short lines.
 If 2d, the z-value of all the data is set to zero and arcs and curves in alignment strings are written out as dxf polylines with bulges for the arcs.*
- Decimal places** input 8
*the number of decimal places to be used for co-ordinates etc. in the DXF file.
 If this number is **negative**, a binary DXF file will be written. The actual number specified becomes irrelevant in this case, since full precision is preserved in a binary DXF file.*
- Map file** input *.mf files
if non-blank, the name of a file to be used as a 12d Model to DXF output map file.
- Use linestyle names** tick box
*if **tick**, a 12d Model string's linestyle name is used as the DXF element's line type ("1" goes to CONTINUOUS).
 if not **tick**, all DXF line types are CONTINUOUS.*
- Use blocks for point styles** tick box
*if **tick**, for each 12d Model point string, an Autocad block of the same name as the 12d Model string's linestyle is placed at each point.*
- Output table section** tick box tick
*if **tick**, an AutoCAD table section is written out at the top of the DXF file.*
- Map DXF colours** tick box tick
*if **tick**, a mapping is made between the first seven default 12d Model colours and the corresponding DXF colours. The other 12d Model colours are mapped to the DXF colour of the same colour number.
 If not **tick**, the nth 12d Model colour is mapped to the nth DXF colour.*
- Features as arcs** tick box
*if **tick**, feature strings output as arcs in DXF.
 if not **tick**, the centre of the feature string is output as a point.*
- Output view text** tick box
*if **tick**, any view text turned on (point numbers, z-values etc.) are output as text in DXF.
 if not **tick**, view text is not output.*
- Write** button
write out, in DXF format, the data in the model/view given in the model/view field, to the file given in the file field.

DXF Output Map File

When using the output options to write out a DXF file, an output map file can be used, with **12d** Model string names as the entity-name to match the key, so that the user can specify Autocad layer, colour and style. BYLAYER can be used with colour and style.

The key can have wild cards (*) and wild characters (?) as for the input map files. The fields in the DXF output map file are (ACD = Autocad):

field 1	key - string name	can include wild cards * and wild characters ?
field 2	new name	not output to DXF
field 3	ACD layer	* for 12d Model name
field 4	ACD colour	number between 0 and 256, * for 12d Model colour mapped to ACD, BYLAYER for ACD BYLAYER
field 5	ACD line type	* for 12d Model linestyle, BYLAYER for ACD BYLAYER
field 6	ACD text style	not yet used, * for 12d Model text style

The DXF file produced needs to be loaded into an existing Autocad drawing which has the ACD layers and linetypes defined.

An example of an DXF output map file is.

//	1	2	3	4	5	6
//	key	name	layer	colour	linetype	textstyle
	cont*	CONT	CONTOURS	1	1	*
	EB*	TOP	ROAD	2	CONTINUOUS	*
	103	TOP	*	3	*	*
	fe*	TOP	FENCE	*	BYLAYER	*
	SURV*	TOP	SURVEY	BYLAYER	DASH	*

DXF Output

write_dxf_file_for

Position of option on menu: File I/O =>Data output =>Old =>DXF

SUPERSEDED OPTION

The DXF output format is for writing data out in a format compatible with AutoCAD version 15. The DXF file produced **does not** have a full DXF header with the required line types, text styles, fonts already defined. Hence the DXF file needs to be loaded into an existing Autocad drawing.

This option is the one used in 12d Model V3.1. It is now superseded by the DWG/DXF output option.

AutoCAD Release 10 introduced binary DXF files as a means of addressing the problems of large file sizes, slow processing and limited accuracy that occur when using the ASCII DXF format.

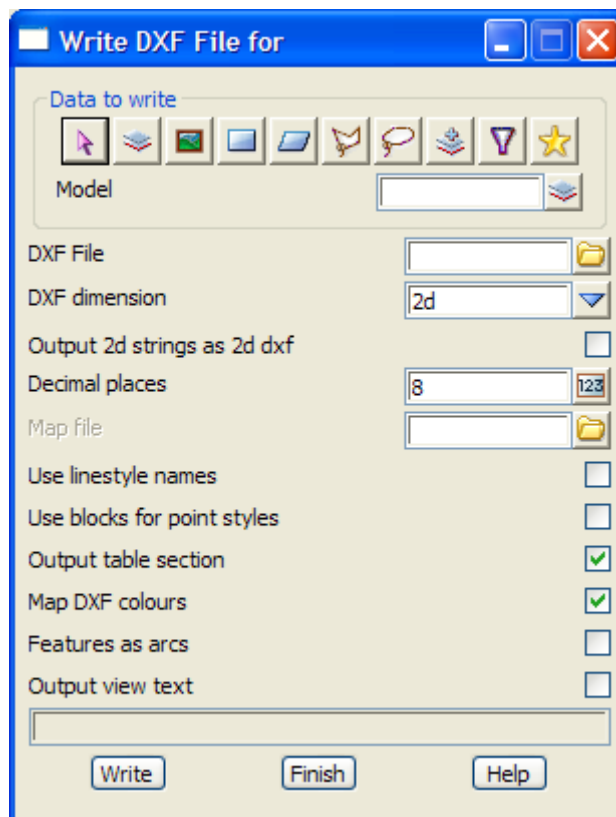
12d Model can write binary DXF files. See the Precision field below.

12d Model line strings are output as POLYLINES, point strings as a series of Autocad POINTs and triangles as 3DFACES.

By default, the string or triangle colour is used in the Autocad colour record. The DXF layer used is the items model name with any spaces in the model name replaced by a minus (-). However, a DXF output map file with matches on string name can be used to give DXF layers, colours and line type (see next section).

At this stage, 4d, interface and alignment strings are only output as Autocad POLYLINES.

On selecting the DXF output option, the **Write DXF file for** panel is displayed.



The fields and buttons used in the two panels have the following functions.

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Data source type		Model	
	<i>data selection type - for a full description go to "Data Source" in the chapter "Tools and Concepts"</i>		
Data source	input		
	<i>source of data is to be written out to a file.</i>		
DXF File	input		*.dxf files
	<i>name of the file for the information to be written out to. If the file already exists, the data will be appended to the file.</i>		
DXF Dimension	input	3d	2d, 3d
	<i>if 3d, strings will be written out as three dimensional DXF polylines. Alignment strings and arcs will be approximated by short lines.</i>		
	<i>If 2d, the z-value of all the data is set to zero and arcs and curves in alignment strings are written out as dxf polylines with bulges for the arcs.</i>		
Decimal places	input	8	
	<i>the number of decimal places to be used for co-ordinates etc. in the DXF file.</i>		
	<i>If this number is negative, a binary DXF file will be written. The actual number specified becomes irrelevant in this case, since full precision is preserved in a binary DXF file.</i>		
Map file	input		*.mf files
	<i>if non-blank, the name of a file to be used as a 12d Model to DXF output map file.</i>		
Use linestyle names	tick box		
	<i>if tick, a 12d Model string's linestyle name is used as the DXF element's line type ("1" goes to CONTINUOUS).</i>		
	<i>if not tick, all DXF line types are CONTINUOUS.</i>		
Use blocks for point styles	tick box		
	<i>if tick, for each 12d Model point string, an Autocad block of the same name as the 12d Model string's linestyle is placed at each point.</i>		
Output table section	tick box	tick	
	<i>if tick, an Autocad table section is placed at the beginning of the DXF file.</i>		
Map DXF colours	tick box	tick	
	<i>if tick, a mapping is made between the first seven default 12d Model colours and the corresponding DXF colours. The other 12d Model colours are mapped to the DXF colour of the same colour number.</i>		
	<i>If not tick, the nth 12d Model colour is mapped to the nth DXF colour.</i>		
Features as arcs	tick box		
	<i>if tick, feature strings output as arcs in DXF.</i>		
	<i>if not tick, the centre of the feature string is output as a point.</i>		
Output view text	tick box		
	<i>if tick, any view text turned on (point numbers, z-values etc.) are output as text in DXF.</i>		
	<i>if not tick, view text is not output.</i>		
Write	button		
	<i>write out, in DXF format, the data in the model/view given in the model/view field, to the file given in the file field.</i>		

DXF Output Map File

When using the output options to write out a DXF file, an output map file can be used, with **12d Model** string names as the entity-name to match the key, so that the user can specify Autocad layer, colour and style. BYLAYER can be used with colour and style.

The key can have wild cards (*) and wild characters (?) as for the input map files. The fields in the DXF output map file are (ACD = Autocad):

field 1	key - string name	can include wild cards * and wild characters ?
field 2	new name	not output to DXF
field 3	ACD layer	* for 12d Model name
field 4	ACD colour ACD,	number between 0 and 256, * for 12d Model colour mapped to BYLAYER for ACD BYLAYER
field 5	ACD line type	* for 12d Model linestyle, BYLAYER for ACD BYLAYER
field 6	ACD text style	not yet used, * for 12d Model text style

The DXF file produced needs to be loaded into an existing Autocad drawing which has the ACD layers and linestyles defined.

An example of an DXF output map file is.

//	1	2	3	4	5	6
//	key	name	layer	colour	linetype	textstyle
	cont*	CONT	CONTOURS	1	1	*
	EB*	TOP	ROAD	2	CONTINUOUS	*
	103	TOP	*	3	*	*
	fe*	TOP	FENCE	*	BYLAYER	*
	SURV*	TOP	SURVEY	BYLAYER	DASH	*

Genio V3.1 Output

write_genio_file_v31_for

Position of option on menu: File I/O =>Data output =>Old =>Genio V31

SUPERSEDED OPTION

Genio i/o is a separate chargeable module.

This is the genio output module from 12d Model V3.1. This module has been replaced by the new genio module but the genio v3.1 will be left in V4.0 in case there are any problems with the new module.

The genio v3.1 output option uses a non-default format to write out the strings in a model or on a view, to a genio file. A genio 001 option is used to specify the record format.

The first thirty two characters of the model name are converted to upper case and used as the Moss model name.

In Moss, string labels can have a maximum of four characters. Since 12d Model places no restrictions on string name length, the following rules are used to produce genio string labels.

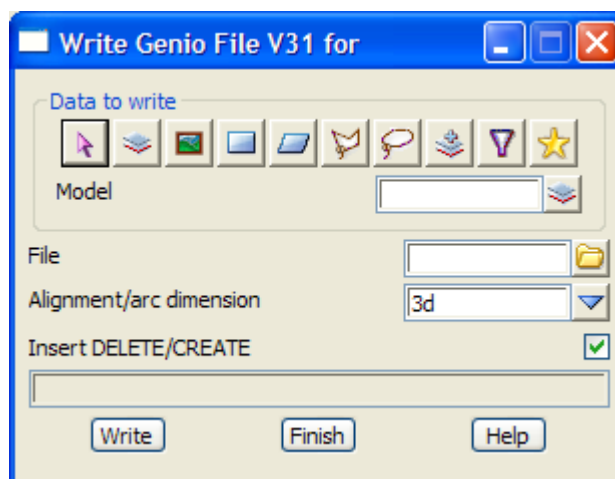
For a line-string, the first four characters of its string name are used as the genio string label. The four characters are mapped to upper case.

Similarly for point-strings whose names start with **P**. Otherwise the genio string label is **P** plus the first three letters of the point-string name. The three letters are mapped to upper case.

The name of a Moss text string must start with a * so 12d Model uses * and the first three characters of the text string's name.

An alignment string can be written out as either a moss 3d, 6d or 12 string.

On selecting the Genio V31 output option, the **Write Genio File V31 for** panel is displayed.



The fields and buttons used in the two panels have the following functions.

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Data source type		Model	
-------------------------	--	-------	--

data selection type - for a full description go to "Data Source" in the chapter "Tools and Concepts"

Data source	input		
--------------------	-------	--	--

source of data is to be written out to a file.

File	input		*.mos files
-------------	-------	--	-------------

name of the file the model/view is to be written out to. If the file already exists, the data will be appended to the bottom of the file.

Alignment dimension input 3d 3d,6d,12d

if 3d is selected, alignment strings are written out as a 3d string as a series of straight lines.

If 6d is selected, alignment strings are written out as Moss 6d strings.

If 12d is selected, alignment strings are written out as Moss geometry strings. This is the only way that full horizontal and vertical geometry can be transferred to Moss.

Insert DELETE/CREATE tick box tick

if tick, the genio commands DELETE and CREATE are written at the top of the file to correctly define the moss models for the data.

Write button

write out in genio format the data in the model/view given in the model/view field, to the file given in the file field. If the file already exist, the data will be appended to the file.

Eagle Output

write_eagle_command_file_for

Position of option on menu: File I/O =>Data output =>Old =>Eagle

Eagle is a 3D CAD package used throughout Australia, Asia and Europe.

Using the Eagle output option, **12d Model** produces an Eagle command file which is used by Eagle to create an Eagle model. Since Eagle supports 3D faces, the triangles created in **12d Model** can be transferred to Eagle for use in shaded models and walk-throughs.

Instead of colours, Eagle uses pens, dash styles, line thicknesses and frags. To allow the user to map **12d Model** colours to appropriate Eagle settings, an **Eagle map file** setting out the **12d Model** and Eagle relationships can be provided.

The eagle map file is a user created file consisting of a list of **12d Model** colours and the Eagle pen, dash style, pen thickness and frag to be used for the colour.

The map file is set out with one **12d Model** colour per line. The line begins with the **12d Model** colour followed by the Eagle pen number, dash style, thickness and frag to be used for the **12d Model** colour. Each item is separated by one or more spaces.

For example, if the **12d Model** colour **red** is to be mapped to Eagle pen 3, dash style 4, thickness 2 and frag 1, then the line in the eagle map file would be

```
red      3      4      2      1
```

If a map file is used, as each string is written out, the map file is searched sequentially until a colour match is made.

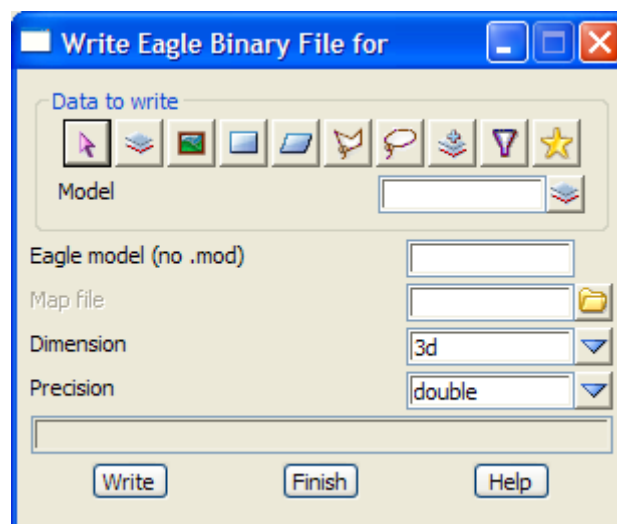
If no match is found, the colour of the string is used as a pen number and default values used for dash, thickness and frag.

Comments can be included in the map file by preceding the comment with a double forward slash (i.e. //). Anything on the line following the // will be ignored.

For example,

```
// 12d colour  pen      dash      thick      frag
red           3        4        2        1
green        4        1        1        2
```

On selecting the **Eagle** option, the **Write Eagle Command File for** panel is displayed.



The fields and buttons used in the two panels have the following functions.

Field Description	Type	Defaults	Pop-Up
Data source type		Model	
<i>data selection type - for a full description go to "Data Source" in the chapter "Tools and Concepts"</i>			
Data source	input		
<i>source of data is to be written out to a file.</i>			
Eagle Command File	input		*.cmd files
<i>name of the Eagle command file to write the model/view out to. If the file already exists, the data will be appended to the bottom of it. To be consistent with the Eagle file naming convention, the file name should end in .cmd</i>			
Eagle model	input		
<i>name of the Eagle model to be used for the data. Only the characters A-Z, a-z, 0-9 and - are allowed in an Eagle model name. Do not include a .mod in the name.</i>			
Map file	input		*.emf files
<i>if non-blank, the name of the map file to be used for all string colours. If blank, no map file is used.</i>			
Write	button		
<i>write out the data from the model/view given in the model/view field to the file given in the eagle command file field. The Eagle model has the name given in the Eagle model field. If the file already exists, the data is appended to the file.</i>			

Eagle Binary Output

write_eagle_binary_file_for

Position of option on menu: File I/O =>Data output =>Old =>Eagle Binary

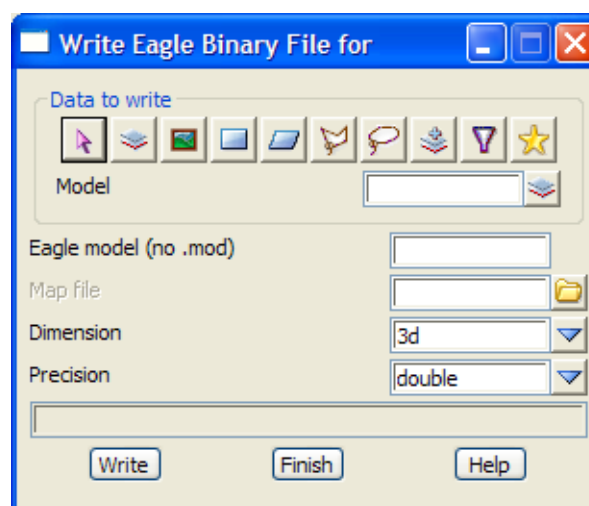
Eagle binary i/o is a separate chargeable module.

Using the Eagle binary output option, **12d** Model produces Eagle binary models. Since Eagle supports 3D faces, the triangles created in **12d** Model can be transferred to Eagle for use in shaded models and walk-throughs.

Since Eagle uses pens, dash styles, line thicknesses and frags rather than colours, an **eagle map file** is used to define the relationships between **12d** Model colours and Eagle pens, dash styles, thickness and frags. The map file is the same as described in the eagle output option.

The **12d** Model string name is written to the second attribute of the corresponding eagle item.

On selecting the Eagle binary option, the **Write Eagle Binary File for** panel is displayed.



The fields and buttons used in the two panels have the following functions.

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Data source type		Model	
-------------------------	--	-------	--

data selection type - for a full description go to "Data Source" in the chapter "Tools and Concepts"

Data source	input		
--------------------	-------	--	--

source of data is to be written out to a file.

Eagle model	input		
--------------------	-------	--	--

stem of the name of the eagle model to write the model/view data out to. Because an eagle model has a maximum size, more than one model may be created. The eagle model names will have a sequence number appended to the name stem given in the eagle model field.

Map file	input		*.emf files
-----------------	-------	--	-------------

if non-blank, the name of the map file to be used for all string colours. If blank, no map file is used.

Dimension	input	3d	2d/3d
------------------	-------	----	-------

if 3d, strings will be written out as three dimensional eagle lines. The alignment strings and arcs will be approximated by short lines.

If 2d, the z-value of all the data is set to zero and arcs and curves in alignment strings are written out as eagle plan arcs.

Precision	input	double	single/double
------------------	-------	--------	---------------

the precision of the eagle models.

Write button

write out the data from the model/view given in the Model/view field to the file given in the eagle model field.

10 Digitizer

digitizer

Position of menu: **File I/O =>Digitizer**

The Digitizer option is used with a digitizing table to create **12d** Model strings from existing maps or plans.

Contours (2d strings), feature strings (3d strings), spot heights (points strings), 4d strings, circles, arcs and text can all be digitized with this option.

The digitized data can be added to a new or existing **12d** Model project.

The digitizing process consists of a number of steps.

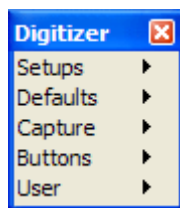
- ▲ providing a digitizer definition file
- ▲ selecting the type of digitizer to be used
- ▲ registering a new plan or map on the digitizer, or continuing with a previously registered plan (resuming).
- ▲ selecting a default digitizing tolerance, default model, colour and name for digitized strings.
- ▲ digitizing the information

These steps are described totally in the next five sections and are then summarized.

A summary of the step is given at the end of this chapter in the section “Summary” .

The digitizer can be set up using WinTab which is preferred method, or by using a definition in the 12d digitizer definitions file, digitize.4d. A quick description of the digitizer definition file is given in the section “Digitizer Definitions” . The format for the digitizers_definitions file is given in the section “Digitizer Definitions File” .

The Digitizer walk-right menu is laid out to reflect the standard sequence of digitizer operations.



define digitizers and plans
default tolerance, model, colour etc.
digitize strings
some digitizer button operations

For the option *Setups*, go to the section “Setups” .
Defaults “Defaults” .
Capture “Capture” .
Buttons “Buttons” .

Digitizer Definitions

Most digitizers now support the WinTab definition for communicating with Windows and that is the preferred method to be used with 12d Model.

If the digitizer supports WinTab then the WinTab drivers need to be installed before the digitizer can be used by 12d Model. The WinTab drivers are supplied with the digitizer, not by 12D

Solutions.

Once the WinTab drivers are installed, no further information is required by 12d Model and the rest of this section can be ignored.

Unfortunately if WinTab is not supported, each brand of digitizer has its own method of communicating with a computer and a software package.

To allow for a variety of digitizers not supported by WinTab, 12D Solutions has its own ascii format for defining the important features of a particular digitizer. The digitizer definitions file is also used to tailor digitizer button usage at a particular site.

For example, the **digitizer file** defines which buttons on the digitizer puck are used to:

digitize new (add) points	add button
end the digitizing of a string	end button
turn tolerance on/off	tolerance button
delete the last digitized point	delete point button

When 12d Model starts up, it checks to see if an environment variable called DIGITIZERS_4D exists and if it does, then the file it points to is used to provide the definitions for the digitizers.

If the environment variable is not set, then 12d Model searches for a file called **digitize.4d** in the standard 12d Model search sequence for set up files.

Only digitizers that have been defined in the digitizers definitions file can be selected for use from within 12d Model.

The format for the digitizers definitions file is given in the section “**Digitizer Definitions File**” .

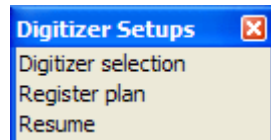
Setups

digitizer_setups

Position of menu: **File I/O =>Digitizer =>Setups**

The setups menu contains options to select the digitizer to be used, register the co-ordinate system on a new plan or map sheet and for resuming the registration for a plan or map sheet already registered.

The setups walk-right menu is



define which digitizer is being used
register a new plan
resume an existing registration

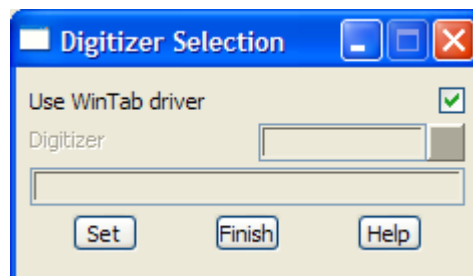
Each options will now be described in detail.

Digitizer Selection

digitizer_selection

Position of option on menu: **File I/O=>Digitizer=>Setups=>Digitizer selection**

On selecting the digitizer selection option, the **digitizer selection** panel is displayed.



This panel displays the current digitizer selected and allows a different one to be selected from those defined in the digitizers definitions file.

The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Use Wintab drive	tick box		
-------------------------	----------	--	--

if tick then user WinTab drivers.

If not ticked, then the Digitizer field is enabled and must have a digitizer selected.

Digitizer	input	current digitizer	available digitizers
------------------	-------	-------------------	----------------------

*the name of the current digitizer is displayed in this field. The current digitizer is changed by selecting a different name from the pop-up for the digitizer field and then selecting the **Set** button.*

This field is only used if 'Use WinTab' driver is not ticked.

Set	button		
------------	--------	--	--

if 'Use Wintab driver' is set to tick and the Wintab drivers exist, then the 'Wintab Monitor' panel is placed on the screen. The WinTab Monitor displays the digitizer co-ordinates and the digitizer button being used. The information describing the use of the digitizer buttons is written to the Output Window (see below). Do not close the Wintab Monitor panel or the digitizer will stop being read.

If 'Use Wintab driver' is set to tick and the Wintab drivers **don't** exist, an error message is displayed.

If 'Use Wintab driver' is not set to tick, then after selecting this button, the digitizer given in the digitizer field will be used as the current digitizer.

Typical Message to Output Window if WinTab Drivers are Installed

Interface: Wintab 32-bit Digitizer Services.

Number of devices: 1

Device 1: GTCO MM-compatible Tablet; Version 1.00.00.08; Format: MM; Firmware: MM III
12 x 12 Tablet by Summagraphics Firmware Version 1.91

The default device is device 1

Number of cursors is 3

Cursor 1: 2 button stylus

Cursor 2: 4 button puck - active

Cursor 3: 16 button puck

Number of buttons on active cursor is 4

Button 1: button 1

Button 2: button 2

Button 3: button 3

Button 4: button 4

Use Button 1 for Add point to string

Use Button 2 for End string

Use Button 3 for Delete point from string

Use Button 4 for Close string

Register Plan

digitizer_register_plan

Position of option on menu: **File I/O=>Digitizer=>Setups=>Register plan**

Before the information on a plan or map can be digitized, the relationship between the co-ordinate system of the plan and the digitizer must be determined.

In 12d Model, this relationship is given by specifying the plan co-ordinates and then the position on the digitizer of three or more points. These special points are known as control points.

The affine transformation for the control points is then calculated and if accepted by the user, is used to convert digitizer co-ordinates to plan co-ordinates.

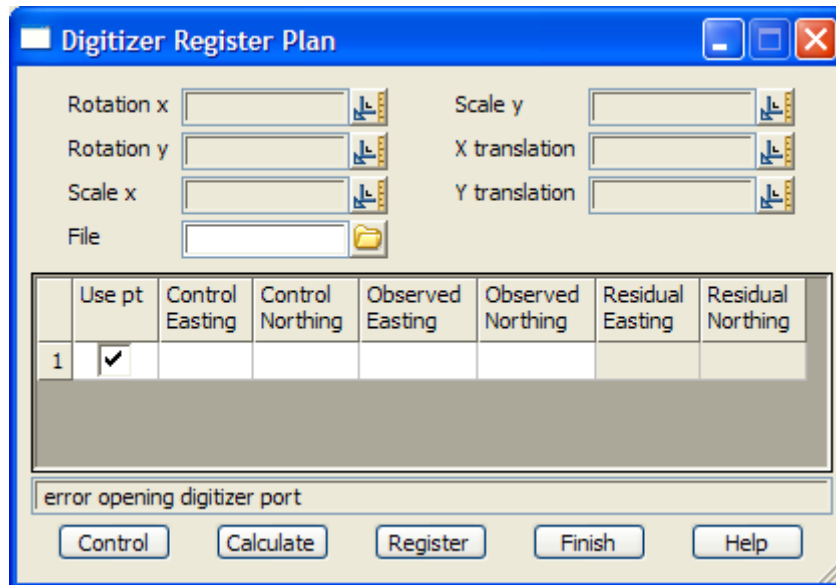
This process is called "registering a plan".

Once a plan has been registered, the information is saved to a file. This file can be used in the resume plan option to register the plan without having to re-enter the control points.

Warning

If the plan is moved on the digitizer, it must be re-registered since the current affine transformation will be invalid.

After selecting the register plan option, the **digitizer register plan** panel is displayed.



The main purpose of this panel is to display and register the affine transformation parameters. The fields and buttons used in the **digitizer register plan** panel will be discussed after the selection of the control points.

After selecting the register plan option, the **digitizer register plan** panel is placed on the screen and the option sits waiting for the user to enter the information for each control point.

This is achieved by

- ▲ selecting the control point with the mouse if it already exists in **12d Model**, or by typing in its plan co-ordinates (easting northing)

and then

- ▲ selecting the control point's position on the digitizer tablet using the digitizers **add point** button. Alternatively, if the control points already exist in **12d Model**, they can be selected rather than using typed input

This process is repeated for each control point and is terminated by selecting cancel from the pick ops pop-up menu instead of selecting a new control point.

The **calculate** button calculates the affine transformation for all the control points in the grid with the Use pt ticked on.

The affine parameters are

- ▲ the rotation of the x axis of the plan co-ordinates with respect to the digitizer x axis
- ▲ the rotation of the y axis of the plan co-ordinates with respect to the digitizer y axis
- ▲ the x and y scale factors for the plan co-ordinates with respect to the digitizer coordinates
- ▲ the x and y translations for the plan co-ordinates with respect to the digitizer coordinates

Once calculated, these values are displayed in the **digitizer register plan** panel.

If further control points are required, selecting the **control** button on the **digitizer register plan** panel will restart the control point picking mechanism. Each new control point will be added to the grid.

The new affine transformation can be calculated by selecting the **calculate** button on the **digitizer register plan** panel.

Finally, once the user is satisfied with the affine transformation, it can be **registered** and stored in an ascii file for future use by entering a filename into the file field of the **digitizer register plan** panel and then selecting the **register** button from that panel.

Summarising, the fields and buttons in the **digitizer register plan** panel have the following functions

Field Description	Type	Defaults	Pop-Up
Rotation x/y <i>the rotation of the x/y axis of the plan co-ordinates with respect to the digitizer x/y axis</i>	output		
Scale x/y <i>the x/y scale factor for the plan co-ordinates with respect to the digitizer coordinates</i>	output		
Translation x/y <i>the x/y translation for the plan co-ordinates with respect to the digitizer coordinates</i>	output		
File <i>the name of the file to record the affine parameters.</i>	input	*.aff	
Control <i>restarts the selection process for choosing more control points.</i>	button		
Calculate <i>calculates the affine parameters based on the control point selection.</i>	button		
Register <i>write the affine transformation to the file given in the file field and register the affine transformation as the current one to be used for the digitising session.</i>	button		
Finish <i>remove the panel from the screen.</i>	button		

Warning

The affine transformation must be registered using the **register** button before the **finish** button is selected or it will be lost.

Resume Plan

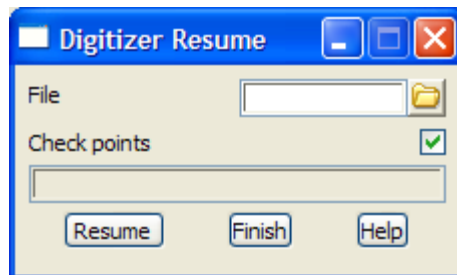
digitizer_resume

Position of option on menu: **File I/O=>Digitizer=>Setups=>Resume**

When digitising a large plan, it is often necessary to spread the digitising over more than one session in 12d Model.

If the plan has not been moved on the digitizer since it was registered, the affine transformation can be restored with the resume plan option rather than having to register the plan again.

On selecting the resume plan option, the **digitizer resume** panel is displayed.



To resume digitizing with an affine transformation recorded during an earlier registration

session, simply enter the name of the affine file into the file field on the **digitizer resume** panel and then select the **resume** button.

Warning

If the plan is moved on the digitizer, it must be re-registered since the current affine transformation will be invalid.

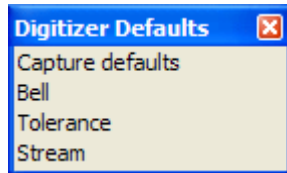
Defaults

digitizer_defaults

Position of menu: **File I/O=>Digitizer=>Deafults**

The defaults menu sets default model, colour etc. and tolerance which are used when digitizing.

The defaults walk-right menu is



default model, colour etc.
not yet used
minimum distance between points
set digitizer to stream mode

Each options will now be described.

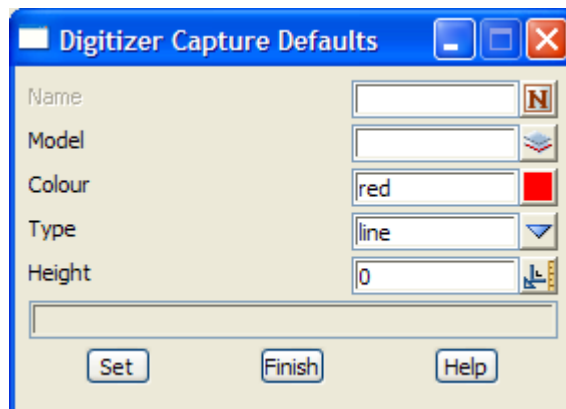
Capture Defaults

digitizer_capture_defaults

Position of option on menu: **File I/O=>Digitizer=>Deafults=>Capture defaults**

For any new string a name, model, colour, breakline type and default height are needed. When digitizing, the same values are often required for a large number of the strings. The **capture defaults** panel is used to set default values for digitized strings.

On selecting the capture defaults option, the **digitizer capture defaults** panel is displayed.



In the digitizing capture options, whenever a new string is selected, the values for name, model, colour, breakline type and height are taken from the **digitizer capture defaults** panel.

Bell

Not yet implemented

Tolerance

digitizer_tolerance_defaults

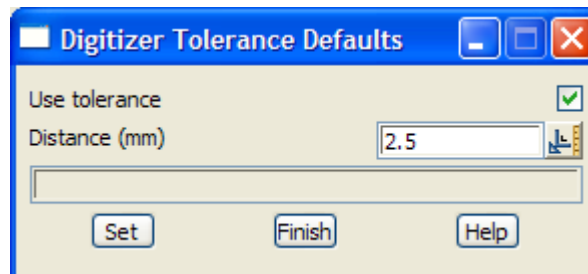
Position of option on menu: **File I/O=>Digitizer=>Deafults=>Bell**

When points are being digitized, a new point is often only required when it is a certain distance

from the previous point on the digitizer. This is especially important for stream digitizing when hundreds of points per second may be captured.

The tolerance option allows the user to specify the minimum plan distance (in millimetres) between successive digitized points in a string.

On selecting the tolerance option, the **digitizer tolerance defaults** panel is displayed.



The fields and buttons used in this panel have the following meanings.

Field Description	Type	Defaults	Pop-Up
Use tolerance	tick-cross	tick	
<i>if tick, a new point taken from the digitizer is only accepted if it is at least the distance given in the distance field away from the previous recorded point in the string.</i>			
Distance (mm)	input	2.5	
<i>the minimum separation distance, in millimetres, between successive digitized points in a string.</i>			
Set	button		
<i>set the use tolerance and distance values.</i>			

Stream

Position of option on menu: **File I/O=>Digitizer=>Deafults=>Stream**

Not yet documented.

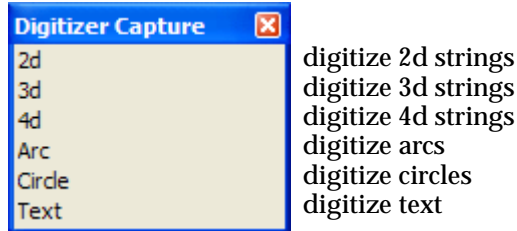
Capture

digitizer_capture

Position of menu: **File I/O=>Digitizer=>Capture**

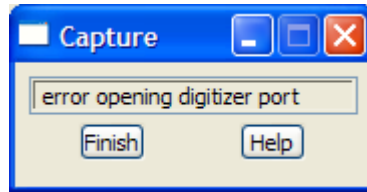
The capture menu is for digitizing strings into 12d Model.

The capture walk-right menu is



capture

The first time any of the option from this menu is selected, the **capture** panel is placed on the screen.

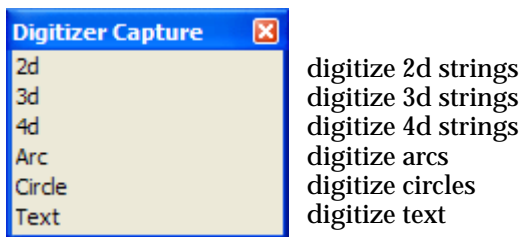


This panel is used to display the transformed co-ordinates for each digitized point that passes the tolerance test, and some special digitizer messages (for example, tolerance on/off).

To **change** the type of string being captured, simply select the new type from the **digitize capture** panel. This is normally only done at the end of capturing a string, not part way through.

To **terminate the digitizing session**, select **finish** on the **capture** panel.

Each of the methods for capturing data available in the digitizer capture menu will now be described.



For the option <i>2d</i> , go to the section	"2d"
<i>3d</i>	"3d"
<i>4d</i>	"4d"
<i>Arc</i>	"Arc"
<i>Circle</i>	"Circle"
<i>Text</i>	"Text"

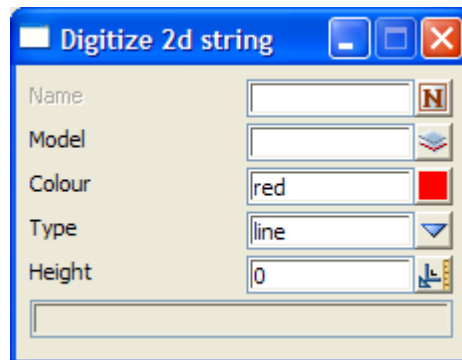
2d

digitize_2d_string

Position of option on menu: **File I/O=>Digitizer=>Capture=>2d**

This option is used to digitize 2d strings.

On selecting the 2d option, the **digitize 2d string** panel is displayed.



The fields and buttons in the **digitize 2d string** panel have the following meanings.

Field	Description	Type	Defaults	Pop-Up
Name		input	name of new string	name from capture defaults
Model	<i>model for the new string</i>	input	capture defaults model	available models
Colour	<i>colour of the new string</i>	input	capture def colour	available colours
Type	<i>breakline type of the new string.</i>	input	capture def type	point, line
Height	<i>height of the 2d string.</i>	input	capture def height	

If the **digitize 2d string** panel is created by the 2d option, the values in the name, model, colour, type and height fields are taken from the **digitizer capture defaults** panel.

Any of the values in the **digitize 2d string** can be modified before digitizing the 2d string begins.

Digitizing begins by pressing the **add** button on the digitizer puck when the puck is above the first point of the new string.

The co-ordinates of the selected point are then displayed in the **capture** panel and the **digitize 2d string** panel removed from the screen.

Further points are digitized by either pressing the **add** button again or if stream mode is on, holding the **add** button down and moving along the string being digitized.

The 2d string is terminated when the **end** button is pressed on the digitizer puck.

After selecting the **end** button, the **digitize 2d string** panel is again placed on the screen with the filed values the same as the 2d string just digitized.

The digitizing process is repeated for the new 2d string.

3d

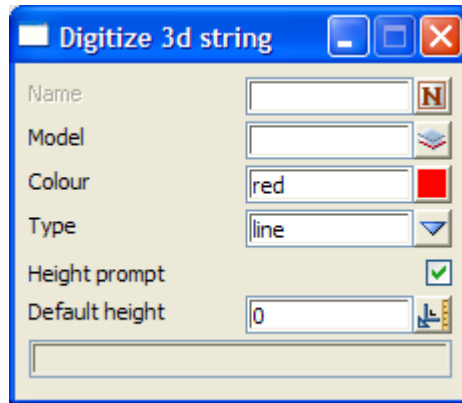
digitize_3d_string

Position of option on menu: **File I/O=>Digitizer=>Capture=>3d**

This option is used to digitize 3d strings.

Digitizing 3d strings is similar to 2d strings except that different z-values can exist at each of the digitized points.

On selecting the 3d option, the **digitize 3d string** panel is displayed.



The fields and buttons in the **digitize 3d string** panel are similar to the **digitize 2d string** panel except for the fields

Field Description	Type	Defaults	Pop-Up
Height prompt	tick-cross	tick	

if tick, after each point is digitized, an enter height box is placed on the screen. The height of the digitized point is typed into the box.

If not tick, the default height is used as the z-value for the digitized point.

Default height	input	capture default height	
-----------------------	-------	------------------------	--

height of the point if the height prompt is set to no.

If the **digitize 3d string** panel is created by the 3d option, the values in the name, model, colour, type and height fields are taken from the **digitizer capture defaults** panel.

As for digitizing 2d strings, any of the values in the **digitize 3d string** can be modified before digitizing begins.

Digitizing begins by pressing the **add** button on the digitizer puck when the puck is above the first point of the new string.

The co-ordinates of the selected point are displayed in the **capture** panel and the **digitize 3d string** panel removed from the screen.

If the height prompt field is set to tick, an enter height box is placed on the screen with the previous typed height in it. The height for the digitized point in typed into the box, terminated by a <return>. The enter height box then disappears.

Further points are digitized by either pressing the **add** button again or if stream mode is on, holding the **add** button down and moving along the string being digitized.

Again, if the height prompt is set to yes, the enter height box will appear after each digitized point.

The 3d string is terminated when the **end** button is pressed on the digitizer puck.

After selecting the **end** button, the **digitize 3d string** panel is again placed on the screen with the

field values the same as the 3d string just digitized.

The digitizing process is repeated for the new 3d string.

Warning

If stream digitizing is used for the 3d string, the height prompt should be set to not tick.

4d

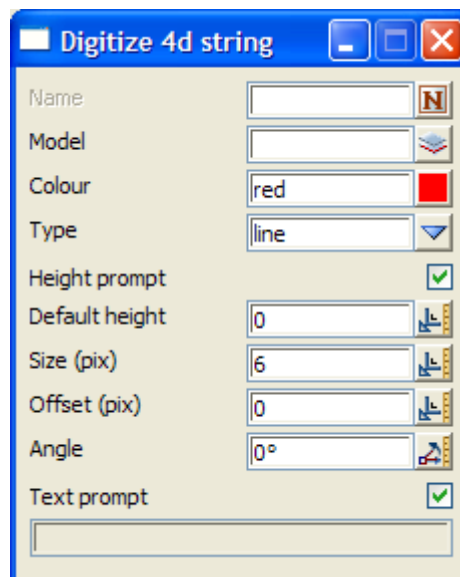
digitize_4d_string

Position of option on menu: **File I/O=>Digitizer=>Capture=>4d**

This option is used to digitize 4d strings.

Digitizing 4d strings is similar to 3d strings except that as well as a different z-value at each point, a text string also exits at each of the digitized points.

On selecting the 4d option, the **digitize 4d string** panel is displayed.



The fields and buttons in the **digitize 4d string** panel are similar to the **digitize 3d string** panel except for the fields

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Text prompt	input	yes	yes, no
--------------------	-------	-----	---------

if tick, after each point is digitized, an enter text box is placed on the screen. The text for the digitized point is typed into the box.

If not tick, no text is used at the digitized point.

Size (pix)	input	default text size
-------------------	-------	-------------------

height (in pixels) of the text at each point.

Angle	input	0
--------------	-------	---

angle of the text at each point.

Offset (pix)	input	0
---------------------	-------	---

offset (in pixels) of the text from the digitized point.

If the **digitize 4d string** panel is created by the 4d option, the values in the name, model, colour, type and height fields are taken from the **digitizer capture defaults** panel.

As for digitizing 3d strings, any of the values in the **digitize 4d string** can be modified before digitizing begins.

Digitizing begins by pressing the **add** button on the digitizer puck when the puck is above the first point of the new string.

The co-ordinates of the selected point are displayed in the **capture** panel and the **digitize 4d string** panel removed from the screen.

If the height prompt field is set to tick, an enter height box is placed on the screen with the previous typed height in it. The height for the digitized point is typed into the box, terminated by a <return>. The enter height box then disappears.

If the text prompt field is set to tick, an enter text box is placed on the screen. The text for the digitized point is typed into the box, terminated by a <return>. The enter text box then disappears.

Further points are digitized by either pressing the **add** button again or if stream mode is on, holding the **add** button down and moving along the string being digitized.

Again, the enter height and enter text boxes will appear after each digitized point if the height prompt and text prompts are set to tick.

The 4d string is terminated when the **end** button is pressed on the digitizer puck.

After selecting the **end** button, the **digitize 4d string** panel is again placed on the screen with the values in the fields from the 4d string just digitized.

The digitizing process is repeated for the new 4d string.

Warning

If stream digitizing is used for the 4d string, the height prompt and text prompt should be set to not tick.

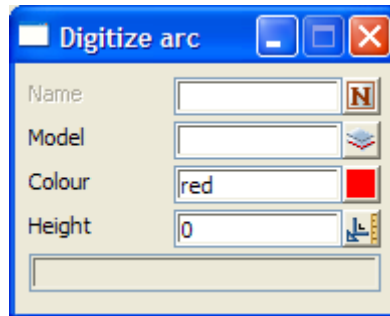
Arc

digitize_arc

Position of option on menu: **File I/O=>Digitizer=>Capture=>Arc**

This option is used to digitize arcs by digitizing three points on the arc - the arc start point, a point on the arc and the arc end point.

On selecting the arc option, the **digitize arc** panel is displayed.



The fields and buttons in the **digitize arc** panel are similar to the **digitize 3d string** panel except for the field

Field Description	Type	Defaults
Height	input	capture default height
<i>height given to the two end points of the arc.</i>		

If the **digitize arc** panel is created by the arc option, the values in the name, model, colour and height fields are taken from the **digitizer capture defaults** panel.

As for digitizing 3d strings, any of the values in the **digitize arc** panel can be modified before digitizing an arc begins.

Digitizing begins by pressing the **add** button on the digitizer puck when the puck is above the first point of the new arc.

The co-ordinates of the selected point are displayed in the **capture** panel and the **digitize arc** panel removed from the screen.

Next a point on the arc between the arc end points is digitized followed by the arc end point.

After the end point is digitized, the arc is automatically created and the **digitize arc** panel again placed on the screen with the field values the same as the arc just digitized.

The digitizing process is repeated for the new arc.

Warning

Stream digitizing should not be used for arcs.

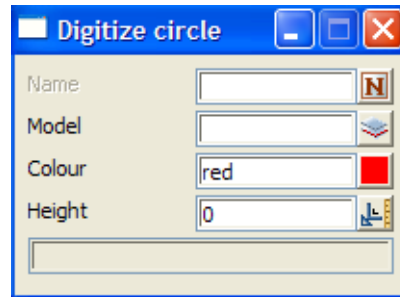
Circle

digitize_circle

Position of option on menu: **File I/O=>Digitizer=>Capture=>Circle**

The circle option is used to digitize circles by digitizing the centre point and one point on the circle.

On selecting the circle option, the **digitize circle** panel is displayed.



The fields and buttons in the **digitize circle** panel are the same as the **digitize arc** panel.

If the **digitize circle** panel is created by the circle option, the values in the name, model, colour and height fields are taken from the **digitizer capture defaults** panel.

As for digitizing arcs, any of the values in the **digitize circle** panel can be modified before digitizing of the circle begins.

Digitizing begins by pressing the **add** button on the digitizer puck when the puck is above the circle point of the new circle.

The co-ordinates of the selected point are displayed in the **capture** panel and the **digitize circle** panel removed from the screen.

Next a point on the circle is digitized. The circle is then fully defined and automatically created.

The **digitize circle** panel is again placed on the screen with the field values the same as the circle just digitized.

The digitizing process is repeated for the new circle.

Warning

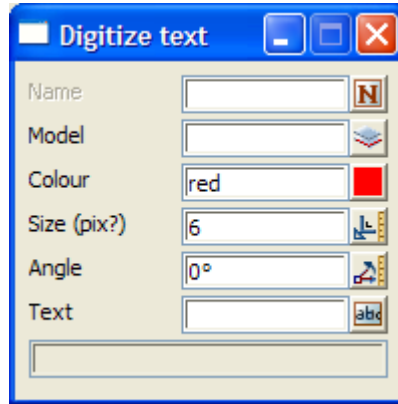
Stream digitizing should **not** be used for circles.

Text

digitize_text

Position of option on menu: **File I/O=>Digitizer=>Capture=>Text**

Not yet implemented



Buttons

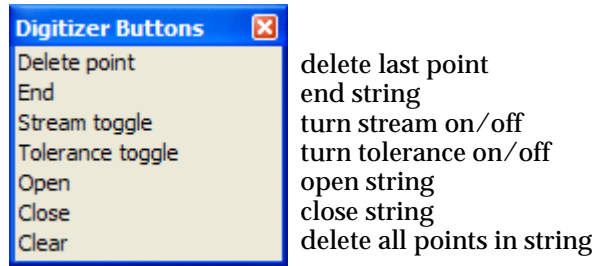
digitizer_buttons

Position of menu: **File I/O=>Digitizer=>Buttons**

The various options on the buttons menu can be used instead of pushing buttons on the digitizer puck.

The main use for this is when the digitizer puck has only a small number of buttons.

The buttons walk-right menu is



Summary

The steps for digitizing are

1. Point to digitizers definitions file

The file containing the definitions of the digitizers is created and either called **digitize.4d**, or the environment variable **DIGITIZERS_4D** is set to point to the file.

2. Select a digitizer

Use the menu item **File I/O =>Digitizer=> Setups=> Digitizer selection**

3. Register a new plan or resume an old plan

To register a new plan, use menu item **File I/O =>Digitizer=> Setups=> Register plan**

After selecting the option, the software is waiting for the user to give the co-ordinates and position of control points on the digitizer.

Control Point Loop

(a) type in easting northing of the control point

(b) pick point on the digitizer

The loop is terminated by getting up the pick ops menu with the mouse and picking **Cancel**

Then select **calculate** from the **digitizer control point table** panel and check the calculated affine parameters in the **digitizer register plan** panel.

Once happy with the affine parameters, save them away by typing a filename (ending in **.aff**) into the file field of the **digitizer register plan** panel and then select the **register** button.

Alternatively, to resume digitizing a previously registered plan that has not moved on the digitizing tablet, use menu item **File I/O =>Digitizer =>Setups=> Resume plan**

Type the affine file name into the file field of the **digitizer resume** panel and select **resume**.

4. Set the capture defaults

Menu items under **Digitizer =>Defaults**

5. Digitize a bounding polygon for the area to be digitized

Use the menu item **Digitizer =>Capture =>2d**

This step is not strictly necessary, however, the polygon can be used to easily fit the digitized data onto a view.

6. Digitize the data

Use the menu items under **Digitizer =>Capture**

Digitizer Definitions File

Unfortunately, each brand of Digitizer has its own method of communicating with a computer and a software package.

To allow for a variety of digitizers, 4D Solutions has its own ascii format for defining the important features of a particular digitizer.

When 12d Model starts up, it checks to see if an environment variable called DIGITIZERS_4D exists and if it does, then the file it points to is used to provide the definitions for the digitizers.

```
DIGITIZERS_4D      filename
```

If the environment variable is not set, then 12d Model searches for a file called **digitize.4d** in the standard 12d Model search sequence for set up files.

Only digitizers that have been defined in the digitizer definitions file can be selected for use from within 12d Model.

The digitizers definition file format is a simple ascii format and consists of one or more digitizer definitions. Each digitizer definition in the file begins with the key word **digitizer** followed by the digitizer name and then appropriate digitizer commands enclosed within curly braces { }.

Available Digitizer Commands

Commands to define communication with the digitizer:

```
port          text
baud          300 | 600 | 1200 | 2400 | 4800 | 9600 | 19200 | 38400
charbits      5 | 6 | 7 | 8
parity        none | even | odd
stopbits      1 | 2
```

Commands to define the size of the digitizing area:

```
xdimension    integer          // length of digitizer area in mm
ydimension    integer          // height of digitizer area in mm
resolution    real            // resolution in mm
```

Commands to define contents of the text string returned when digitizing:

```
stringlength  integer          // length of the text string returned
buttonstart   integer          // position in text for button id
buttonend     integer
xstart        integer          // position for x value
xend          integer
ystart        integer          // position for y value
yend          integer
```

Command to define sequences to send to digitizer:

```
startup       text            // digitizer start up sequence
finishup      text            // digitizer finish up sequence
pointmode     text            // text to put digitizer into point mode
streammode    text            // text to put into stream mode (track mode)
```

Commands to define the meaning of the button values returned from the digitizer:

These commands may occur more than once since some digitizers have more than one return

value for the same thing.

addpoint	text	// digitize a point
end	text	// end the string being digitized
delpoint	text	// delete the last point digitized
toggletol	text	// toggle tolerance
togglstream	text	// toggle stream mode
clearstr	text	// clear all points in the current string
openstr	text	// open the current string
closestr	text	// closes the current string

Notes

1. spaces in text - any text string that includes spaces or only numbers, must be enclosed in double quotes “.
2. comments - anything after // until the end of the line is ignored.
3. blank lines - blank lines are ignored

11 Edit

The Edit menu contains the Undo and Redo options.

Infinite **Undo** and **Redo** facilities have been implemented for many of the **12d** Model options.

However, because much of the power of **12d** Model comes from being able to leave options hanging and editing more than one string at a time, this made the standard concept of *Undo/Redo* of limited benefit to **12d** Model users.

Consequently, the following methodology has been adopted for **Undo** and **Redo** in **12d** Model:

Independent undo and redo lists are maintained for each string being edited and these list are cleared once the editor is left.

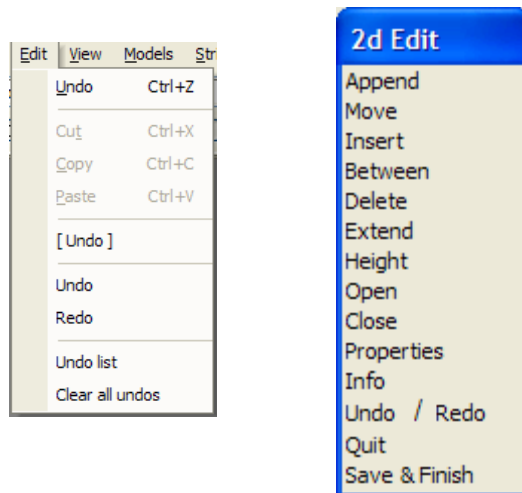
There is also a main undo/redo list which is used for all other options that can be undone. The main undo/redo lists are cleared when the **12d** Model session is exited.

Please continue to the next section “Undo and Redo for Editors” .

Undo and Redo for Editors

Each editor contains its own Undo/Redo option on its **nd Edit** menu and whilst a string is being edited, the editor maintains its own undo/redo lists.

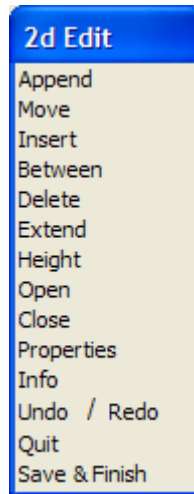
For example, for a 2d string, the Undo/Redo option is just above the Quit option.



As each edit is made to the string, the state of the string before the edit is added to the top of the string's **undo** list and the **redo** list is emptied.

If **undo** is selected from the **nd edit** menu, the last edit operation for that string will be **undone** and the undone operation added to the top of the string's **redo** list.

If another **undo** is selected before another edit is made to the string, what is now was last operation on the string will be **undone** (is was the second last operation before the previous **undo**) and the undone operation added to the top of the string's **redo** list.



If **redo** is selected from the **nd edit** menu, then the top operation on the **redo** list is redone, and the state of the string before the redo is added to the top of the undo list.

Hence edits for the string can be **undone** and **redone** whilst in the edit session for the string.

When the edit session is completed by selecting either **quit** or **finish** from the **nd edit** menu, the undo and redo lists for the edit session are deleted and the operations for the edit session can no longer be undone or redone.

Note

If more than one string is being edited at the same time, each string editor maintains its own undo/redo lists so that the undo/redo operations for the different strings do not get intertwined.

Hence if **undo** or **redo** is selected from a particular string's **nd edit** menu, the **undo** or **redo** applies **only** to the operations performed on that particular string, no matter what other **nd edit** options were performed on other strings.

Please continue to the next section "Undo and Redo for other Options".

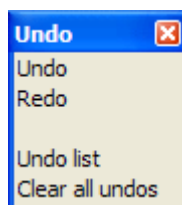
Undo and Redo for other Options

undo

As well as the undo/redo lists maintained by the string editors, there is another set of undo/redo list maintained for all other options that support undo and redo. These are called the **main undo** and **redo** lists.

For a description of the undo in 12d Model, please go to the section "Edit".

The **undo** option which controls the main undo/redo lists, is the one on the Edit menu from the main menu.



If **undo** is selected from the **undo** menu, the last undoable option performed (apart from editor operation on strings) will be **undone** and the undone operation added to the top of the main

redo list.

If another **undo** is selected before another undoable option is performed, what is now was last operation will be **undone** (is was the second last operation before the previous undo) and the undone operation added to the top of the main **redo** list.

If redo is selected from the **undo** menu, then the top operation on the main **redo** list is redone, and the state before the redo is added to the top of the undo list.

Hence many operations can be **undone** and **redone**.

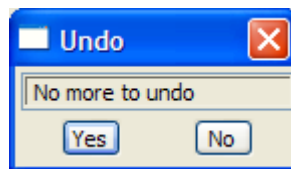
When the **12d** Model session is completed by selecting either exit from the **12d** Model menu, the undo and redo lists for the session are deleted and the operations for the session can no longer be undone or redone.

For the option <i>Undo</i> , go to the section	“Undo” .
<i>Redo</i>	“Redo”
<i>Undo list</i>	“Undo List”
<i>Clear all undos</i>	“Clear all Undos”

For some restrictions on the Undo/Redos, please continue to the section “Some Restrictions on Undo and Redo” .

Undo

If **undo** is selected from the **undo** menu, the **undo** panel showing the last operation to *undo* is displayed.

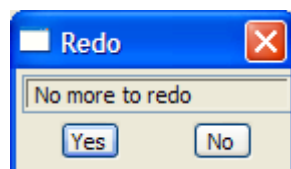


For some restrictions on the Undo/Redos, please continue to the section “Some Restrictions on Undo and Redo” .

Redo

redo

If **redo** is selected from the **undo** menu, the **redo** panel showing the last operation to *redo* is displayed.



For some restrictions on the Undo/Redos, please continue to the section “Some Restrictions on Undo and Redo” .

Undo List

undo_list

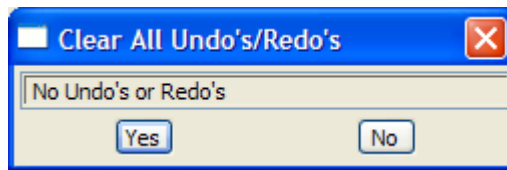
If **undo list** is selected from the **undo** menu, a list of all the items on the undo list is displayed in the **undo list** panel.



Clear all Undos

`clear_all_undo_s_redo_s`

Selecting **clear all undo** from the **undo** menu will bring up a **clear all undo's/redo's yes-no** panel.



If **yes** is selected, the main undo and redo lists will be cleared.

Some Restrictions on Undo and Redo

Undo and Redo are available for most of the **Strings** options and most of the **Utilities** options.

Undo is available for all **File=>Input** options but there are no Redos for these Undos.

Undo is available for all **Utilities=>Global** options that use the **Output** option with the **Mode** set to one of the three copy modes. There are no Redos with these Undos.

There are no Undos for **Models=>Delete** and **Models=>Clean**.

12 Models

models

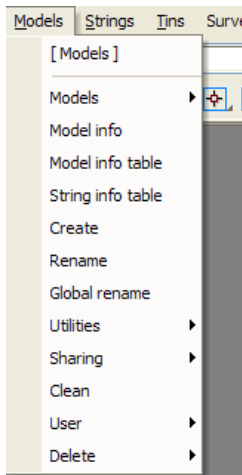
Position of menu: Model

In 12d Model, models contain all the terrain and design information in the form of strings and tins.

The models walk-right menu contains the options needed to create new models, rename models, report, clean models and delete models permanently from the computer disks.

The models walk-right menu is

on Main menu

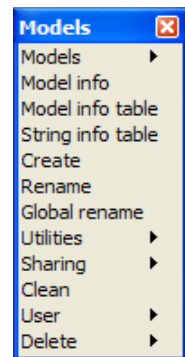


floating Models menu

list of models and model info information on models
 in table form, gives min, max x,y,z for each model
 " " gives min, max x,y,z for each string in model
 create a model
 rename a model
 rename many models
 options to add, remove and save models
 sharing models
 clean all items in a model

delete models from disk

on 12d Model menu and floating menu



For the option *Models*, go to section

Model info

Model info table

String info table

Create

Rename

Global rename

Utilities

Sharing

Clean

Delete

"Models"

"Model Info"

"Model Info Table"

"String Info Table"

"Create"

"Rename"

"Global Rename"

"Utilities"

"Sharing"

"Clean"

"Delete"

Models

model_list

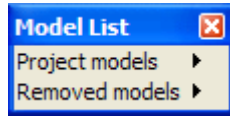
Position of menu: Model =>Models

The Models walk-right menu provides options to list all the models in the project and list all the

models in the project area but not added to the project (removed models).

If a model is selected from the project model list, then it is automatically loaded into the **Model Information** panel.

The models walk-right menu is



list of models in project
list of non-project models

Project Models

project_models

Position of option on menu: Model =>Models =>Project models

The project models walk-right menu provides a list of all the models in the project and if a model name is selected from the list, a model information panel is fired up with the selected model name already in the model field.

Removed Models

removed_models

Position of option on menu: Model =>Models =>Removed Models

The removed models walk-right menu provides a list of all the models in the project area that are not in the project.

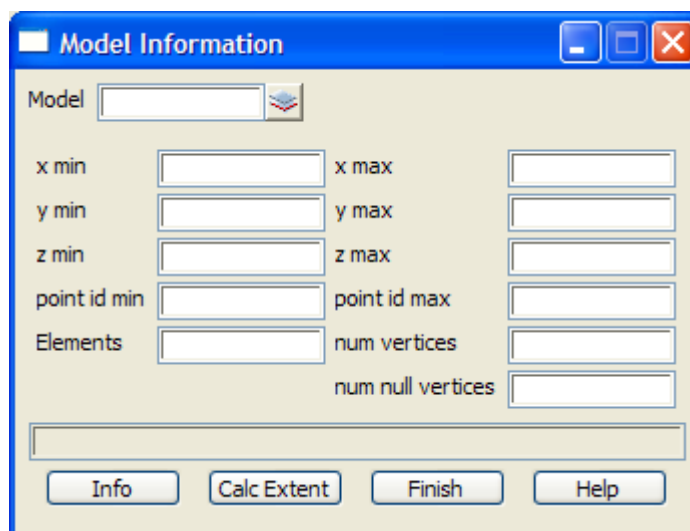
They would be mainly models that were in the project but have been removed from the project but not deleted from the disk.

Model Info

model_information

Position of option on menu: Model =>Model Info

Selecting model info fires up the **model information** panel.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Model	input	available models
	<i>input the name of the model to get information about</i>	
xmin/ymin/zmin, xmax/ymax/zmax	output	
	<i>returns the model limits</i>	
point id min/max	output	
	<i>minimum/maximum integer point id in the model</i>	
Elements	output	
	<i>returns the number of elements in the model</i>	
num vertices	output	
	returns the number of vertices in the model	
num null vertices	output	
	returns the number of null vertices in the model	
Info	button	
	<i>get the information for the model given in the Model field.</i>	
Calc Extent	button	
	<i>recalculate the x, y, z bounding box for the model given in the Model field.</i>	

How to Use the Panel

The model information for the model given in the model field is retrieved and placed in the appropriate panel fields when the model name is entered into the model field from the pop-ups, or a <return> is entered after entering the model name into the model field, or on selecting the **Info** button.

Model Info Table

model_information_table

Position of option on menu: Model =>Model Info Table

The Model info table option displays the minimum and maximum x, y and z values for every model in the project in one scrolling table.

The models and minimum and maximum columns can be sorted into ascending or descending order by using bringing up the sort menu on the column header fields.

Selecting Model info table fires up the **Model Information Table** panel.

Model Name	Read only	Loaded	Min X	Min Y	Min Z	Max X	Max Y	Max Z	Creat
2d	unknown	yes	-null	-null	-null				Fri Apr
3d	unknown	yes	0	0	0	0	0	0	Fri Apr
4d	unknown	yes	-null	-null	-null				Fri Apr
Alignment	unknown	yes	-null	-null	-null				Fri Apr
Arc	unknown	yes	-1	0	0	1	1	0	Fri Apr
Circle	unknown	yes	-1	-1	0	1	1	0	Fri Apr
Drainage	unknown	yes	-null	-null	-null				Fri Apr
Face	unknown	yes	0	0	0	0	0	0	Fri Apr
Feature	unknown	yes	-1	-1	0	1	1	0	Fri Apr
Interface	unknown	yes	0	0	0	0	0	0	Fri Apr
Pipe	unknown	yes	0	0	0	0	0	0	Fri Apr
Pipeline	unknown	yes	-null	-null	-null				Fri Apr
Polyline	unknown	yes	-null	-null	-null				Fri Apr

The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Model <i>all the models in the project are listed in the model column.</i>	column header		sort menu
Minimum x, Minimum y, Minimum z Maximum x, Maximum y, Maximum z <i>the minimum/maximum values for the model are displayed in the columns</i>	column header		sort menu
Created/Updated <i>date the model was first created/updated</i>	date		
Update <i>recalculate the minimum/maximum information in the table.</i>	button		

Note

This is a scrolling panel. If there is too much information to fit into the table, then the scrolling arrow on the right hand side of the table must be used to display the extra information.

String Info Table

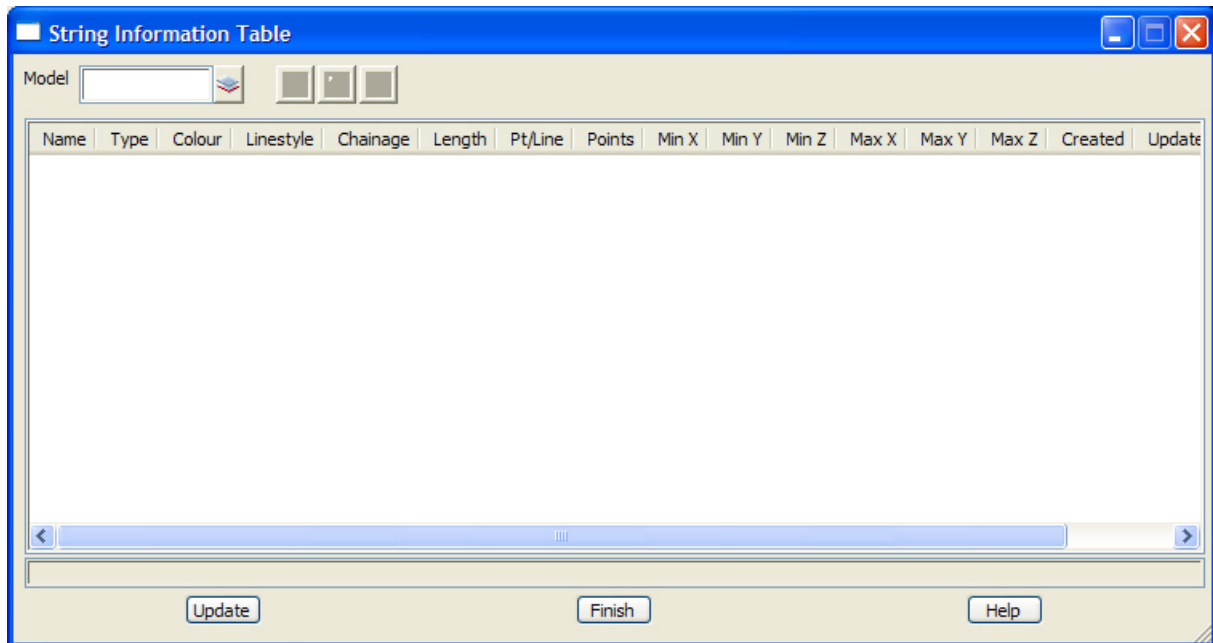
string_information_table

Position of option on menu: Model =>String info table

The string info table option displays the minimum and maximum x, y and z values for every string in a given model in one scrolling table.

The models and minimum and maximum columns can be sorted into ascending or descending order by using bringing up the sort menu on the column header fields.

Selecting string info table fires up the **string information table** panel.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Model <i>give the name of the model to calculate the minimum/maximum string information for the table.</i>	input		available models
Name <i>all the strings in the selected model are listed in the name column.</i>	column header		sort menu
Minimum x, Minimum y, Minimum z Maximum x, Maximum y, Maximum z <i>the minimum/maximum values for each string in the model are displayed in the columns</i>	column header		sort menu
Created/Updated <i>date the string was first created/updated</i>	date		
Update <i>recalculate the minimum/maximum information in the table.</i>	button		

Note

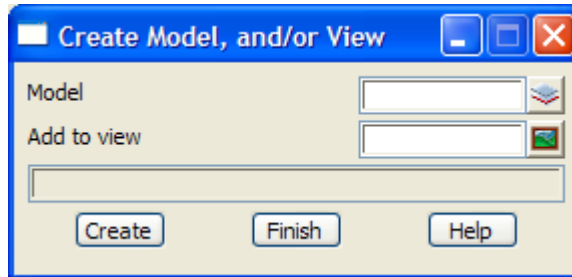
This is a scrolling panel. If there is too much information to fit into the table, then the scrolling arrow on the right hand side of the table must be used to display the extra information.

Create

create_model_and_or_view

Position of option on menu: Model =>Create

On selecting the create option, the **create model** panel is displayed. This panel can be used to create new models and add a model to a view.



The fields and buttons used in this panel have the following functions.

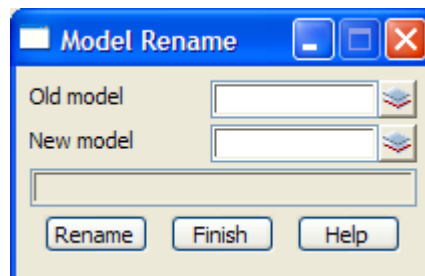
Field Description	Type	Defaults	Pop-Up
Model	input		
<i>name of the model to be created and/or added to a model and/or view.</i>			
Add to view	input		available views
<i>if non-blank, the name of the view to which the model given in the model-field will be added.</i>			
Create	button		
<i>If the model given in the Model field does not exist, it will be created.</i>			
<i>If the add to view field is non-blank, then the model given in the model field will be added to the view given in the add to view field.</i>			

Rename

model_rename

Position of option on menu: Model =>Rename

On selecting the rename option, the **model rename** panel is displayed. This panel can be used to change the names of existing models



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Old model	input		available models
<i>name of the model to be renamed.</i>			

New model input

new name for the model

Rename button

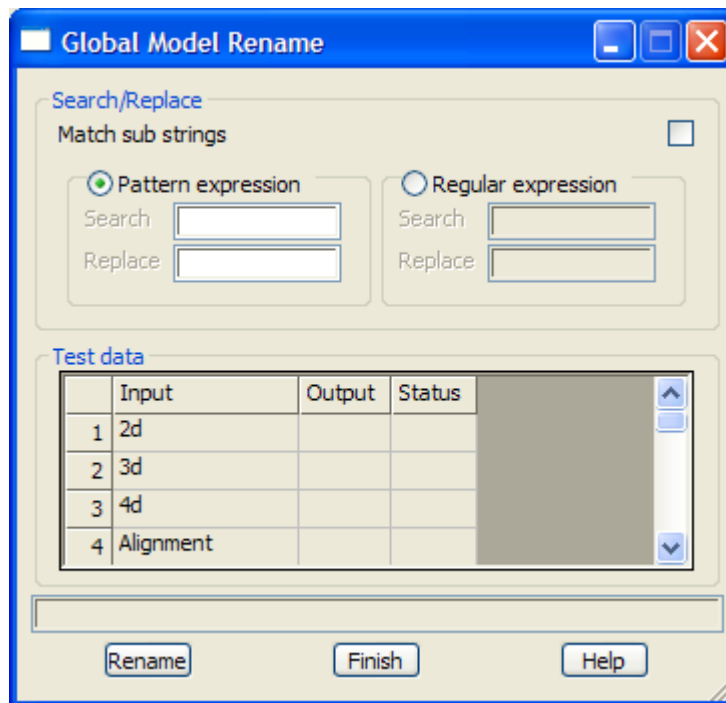
Change the name of the model in the old model field to the name given in the new model field.

Global Rename

global_model_rename

Position of option on menu: Model =>Global rename

On selecting the global rename option, the **Global Model Rename** panel is displayed. This panel is used to change the names of many existing models by matching according to a "pattern" expression or a "regular" expression.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Match sub strings	tick box		
--------------------------	----------	--	--

*if **tick**, the Search expression is used to match against part of each model name.
If **not tick**, the Search expression is used to match against the entire model name.*

Pattern expression	radio button		
---------------------------	--------------	--	--

*if set on, then **Pattern** expressions given in the Search and Replace fields are used to modify model names. Pattern expressions include the standard wild card * and wild character !.*

Search	input		
---------------	-------	--	--

pattern to search for in the model names. For example " tin" will select all models with a name ending with "tin "*

Replace	input		
----------------	-------	--	--

replacement for the search pattern found in the model name. For example, "tin " takes the matched part of the model name and adds " tin " to the front of it.

Hence the Search pattern " tin" and Replace pattern "tin *" finds all models with names ending in " tin" and renames them with the name starting with "tin " (and the " tin" at the end of the name is dropped off).*

Regular expression	radio button		
---------------------------	--------------	--	--

*if set on, then **Regular** expressions given in the Search and Replace fields are used to modify model names.*

Search input

regular expression to search for in the model names.

Replace input

replacement for the search expression found in the model name.

Test data grid

The Test data grid shows the effect of the Search and Replace on all the model names in the project.

*The **Input** column shows the existing model name.*

*The **Output** column shows the name after applying the Search and Replace.*

*The **Status** column displays if their has been a **match** or **no match**.*

Rename button

change the name of all the models in the project according to the selected Search and Replace fields.

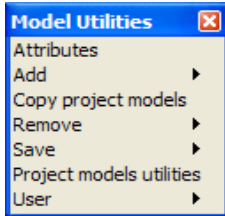
Utilities

model_utilities

Position of menu: Model =>Utilities

The utilities menu contains miscellaneous options involving models.

The utilities walk-right menu is



create/edit attributes for models
 add removed and other project models to project
 copy model from another project
 remove models from project
 save models to disk
 add/removes, saves, cleans, deletes models

For the option <i>Attributes</i> , go to	"Attributes"
<i>Add</i>	"Add"
<i>Copy project model</i>	"Copy Project Model"
<i>Remove</i>	"Remove"
<i>Save</i>	"Save"
<i>Project model utilities</i>	"Save"

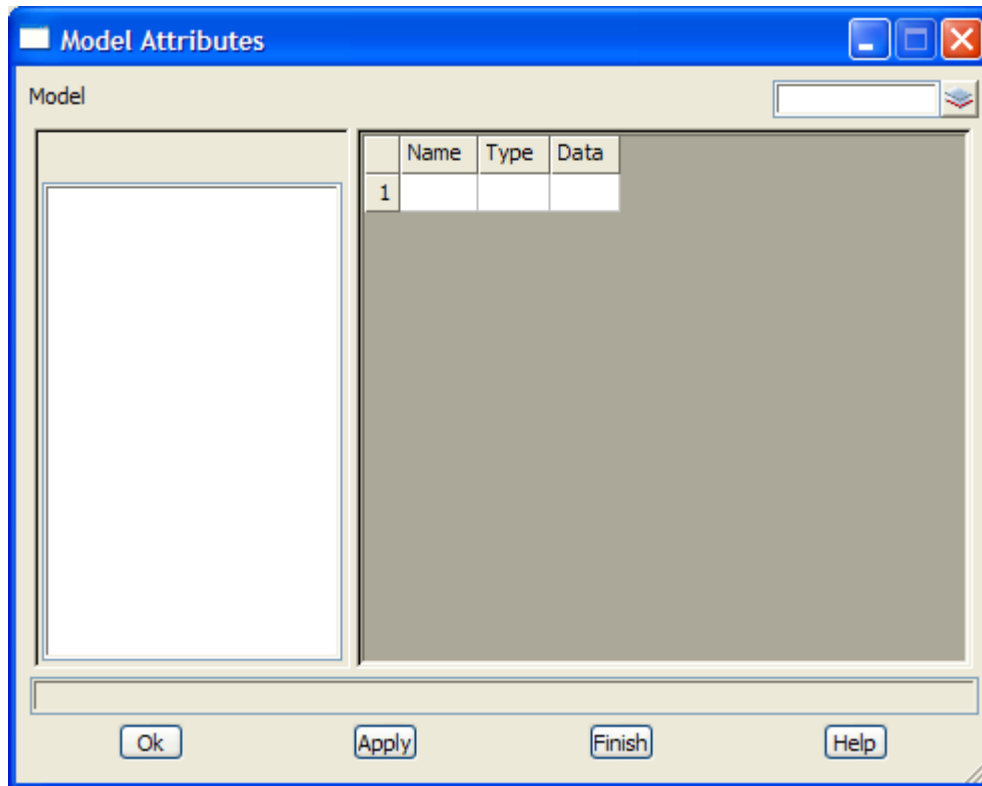
Attributes

model_attributes

Position of option on menu: Model =>Utilities =>Attributes

The Attributes options displays, creates and edits attributes for models.

On selecting Attributes, the **Model Attributes** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Model <i>model to create/edit attributes of</i>	model box		all available models
Name <i>name of the attribute</i>			
Type <i>type of attribute - integer, real or text</i>			integer, real, text
Data <i>value for the attribute</i>			
OK <i>set the attributes to the values in the panel and then exit the panel.</i>		button	
Apply <i>set the attributes to the values in the panel but don't exit the panel.</i>		button	

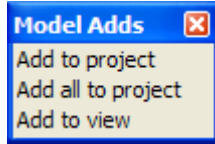
Add

model_adds

Position of menu: Model =>Utilities =>Add

Models can be added to the project and to views.

The model adds walk-right menu is



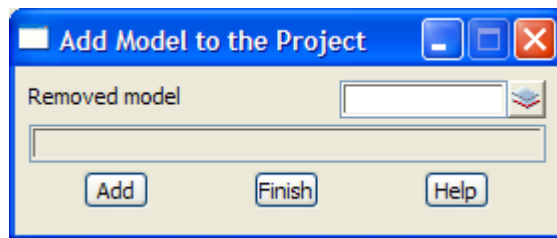
Add To Project

add_model_to_the_project

Position of option on menu: Model =>Utilities =>Add =>Add to project

The add to project option is used to add a removed model back into the project.

On selecting the add to project option, the **add model to the project** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Removed model	input		removed models
<i>name of the model not in the project that is to be added to the project.</i>			
Add	button		
<i>add the model given in the removed model field to the working project.</i>			

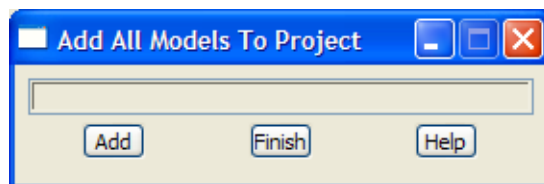
Add All To Project

add_all_models_to_project

Position of option on menu: Model =>Utilities =>Add => Add all to Project

The add all to project option is used to add all the removed models back into the project.

On selecting the add all to project option, the **add all models to project** panel is displayed.



The fields and buttons used in this panel have the following functions.

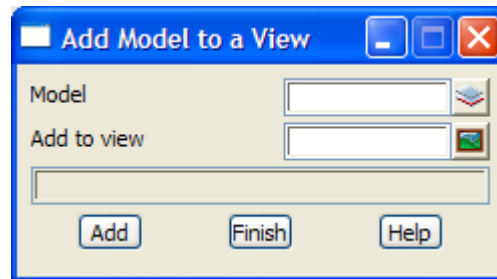
Field Description	Type	Defaults	Pop-Up
Add	button		
<i>after selecting this button, all removed models in the working project will be added to the project.</i>			

Add to View

add_model_to_a_view

Position of option on menu: Model =>Utilities =>Add =>Add to view

On selecting the add to view option, the **add model to a view** panel is displayed.



The fields and buttons used in this panel have the following functions.

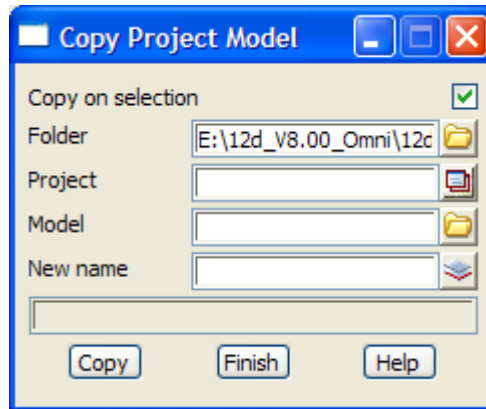
Field Description	Type	Defaults	Pop-Up
Model <i>name of the model to be added to a view.</i>	input		available models
Add to view <i>name of the view to which the model given in the model field will be added.</i>	input		available views
Add <i>add the model given in the model field to the view given by the add to view field.</i>	button		

Copy Project Model

copy_project_model

Position of option on menu: Model =>Utilities =>Copy Project Model

On selecting the copy project model option, the **copy project model** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Folder	input		current directories
<i>name of the folder that the project to get the model from, is in.</i>			
Project	input		current projects
<i>name of the project in the folder given in the folder field, that the model is to be copied from.</i>			
Model	input		available models
<i>name of the model to be copied.</i>			
New name	input		
<i>if non-blank, the new name to be given to the copied model</i>			
Copy	button		
<i>copy to this project, the model given in the model field from the project given in the project field.</i>			

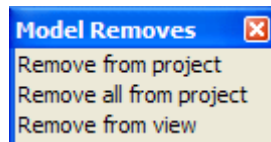
Remove

model_removes

Position of menu: Model =>Utilities =>Remove

Models can be removed from the project and from views.

The model removes walk-right menu is



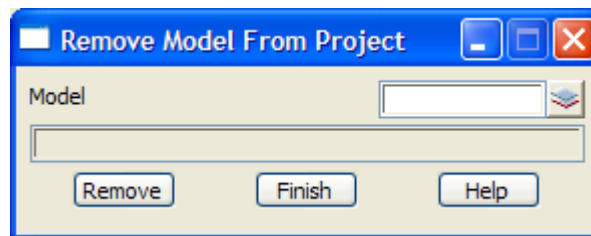
The options in the menu will now be described.

Remove Model from Project

remove_model_from_project

Position of option on menu: Model =>Utilities =>Remove =>Remove from project

On selecting the remove from project option, the **remove model from project** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Model	input		available models

name of the model to be remove from the working project.

Remove button

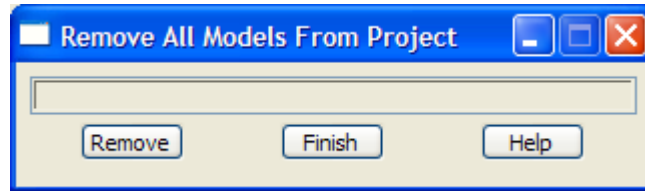
after selecting this button, the model given in the model field will be removed from the working project.

Remove All Models From Project

remove_all_models_from_project

Position of option on menu: Model =>Utilities =>Remove =>Remove from all projects

On selecting the remove all option, the **remove all models from project** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Remove	button		

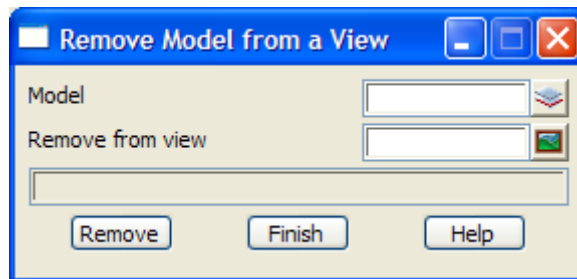
after selecting this button, all models in the working project will be removed. Next, all views will be refreshed. Finally, unless an error occurs, the panel will be removed.

Remove From View

[remove_model_from_a_view](#)

Position of option on menu: Model =>Utilities =>Remove =>Remove from view

On selecting the remove from view option, the **remove model from a view** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Model	input		available models

name of the model to be removed from a view.

Remove from view	input		available views
-------------------------	-------	--	-----------------

name of the view from which the model given in the model field will be removed.

Remove	button		
---------------	--------	--	--

remove the model given in the model field from the view given in the remove from view field.

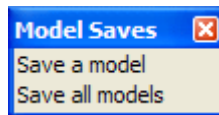
Save

model_saves

Position of menu: Model =>Utilities =>Save

Models can be saved on disk so that they can be used for future project work or in other projects.

The model saves walk-right menu is



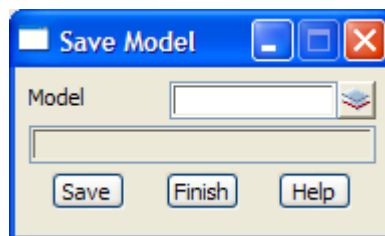
The options in the menu will now be described.

Save a Model

save_model

Position of option on menu: Model =>Utilities =>Save =>Save a model

On selecting the save a model option, the **save model** panel is displayed.



The fields and buttons used in this panel have the following functions.

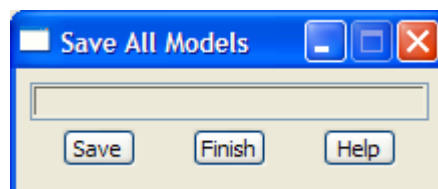
Field Description	Type	Defaults	Pop-Up
Model <i>name of the model to be saved.</i>	input		available models
Save <i>after selecting this button, the model given in the model field will be saved to disk.</i>	button		

Save All Models

save_all_models

Position of option on menu: Model =>Utilities =>Save =>Save all models

On selecting the save all models option, the **save all models** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up

Save button

after selecting this button, all models in the working project that have been modified since they were last saved, will be saved to disk. Unless an error occurs, the panel will be removed after the saving is completed.

Sharing

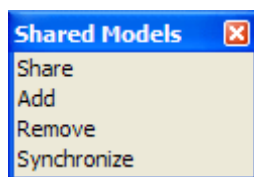
shared_models

Position of menu: Model =>Sharing

Sharing allows models from a project (the server project) to be added to other projects (client projects).

Before any models can be added to a client project, they must first be tagged in the server project as allowed to be shared.

The Sharing walk-right menu is



allow models in this project to used by other projects
 add a shared model from another project
 remove a shared model from another project
 updated shared models from other projects

For the option *Share*, go to

Add

Remove

Synchronize

“Share Models”

“Add Shared Models”

“Remove Shared Models”

“Synchronize Shared Models”

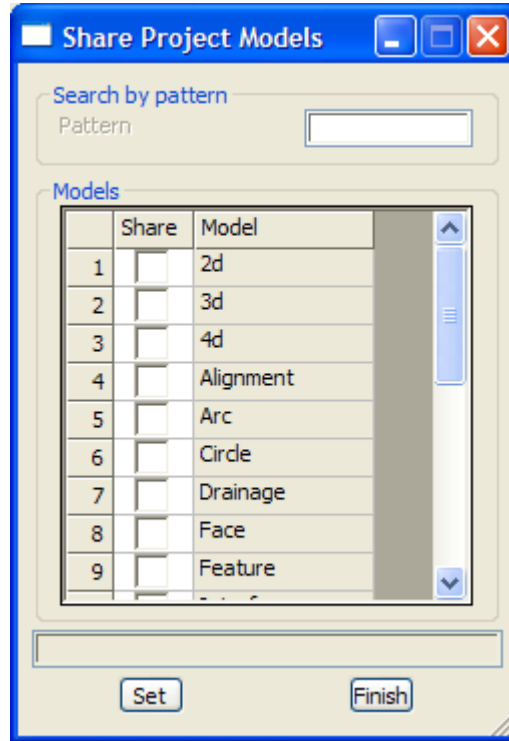
Share Models

share_project_models

Position of option on menu: Model =>Sharing =>Share

Before models in a server project can be added to client projects, the models must be made available for sharing in the server project by using the Share option.

Selecting Share displays the **Share Project Models** panel.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

*All the models in the project are listed in the **Share Project Models** panel and if a model has been tagged for Sharing, a tick will be displayed in the **Share** column of the grid.*

Pattern

*if a pattern is typed then all the models matching the pattern will have a tick placed in the **Share** column. If * is typed then all models are ticked for sharing.*

Share	grid column
--------------	-------------

*tick if the model is to be made available for sharing when the **Set** button is pressed.*

*Clicking RB on **Share** at the top of the column brings up a menu to **Toggle** the ticks, **Set** all the ticks on, **Clear** to turn all the ticks off.*

Model	grid column
--------------	-------------

this column lists all the models in the project

Set	button
------------	--------

*clicking **Set** tags all the models with a tick in the **Tick** column as being available for sharing. Those models without a tick will not be available for sharing.*

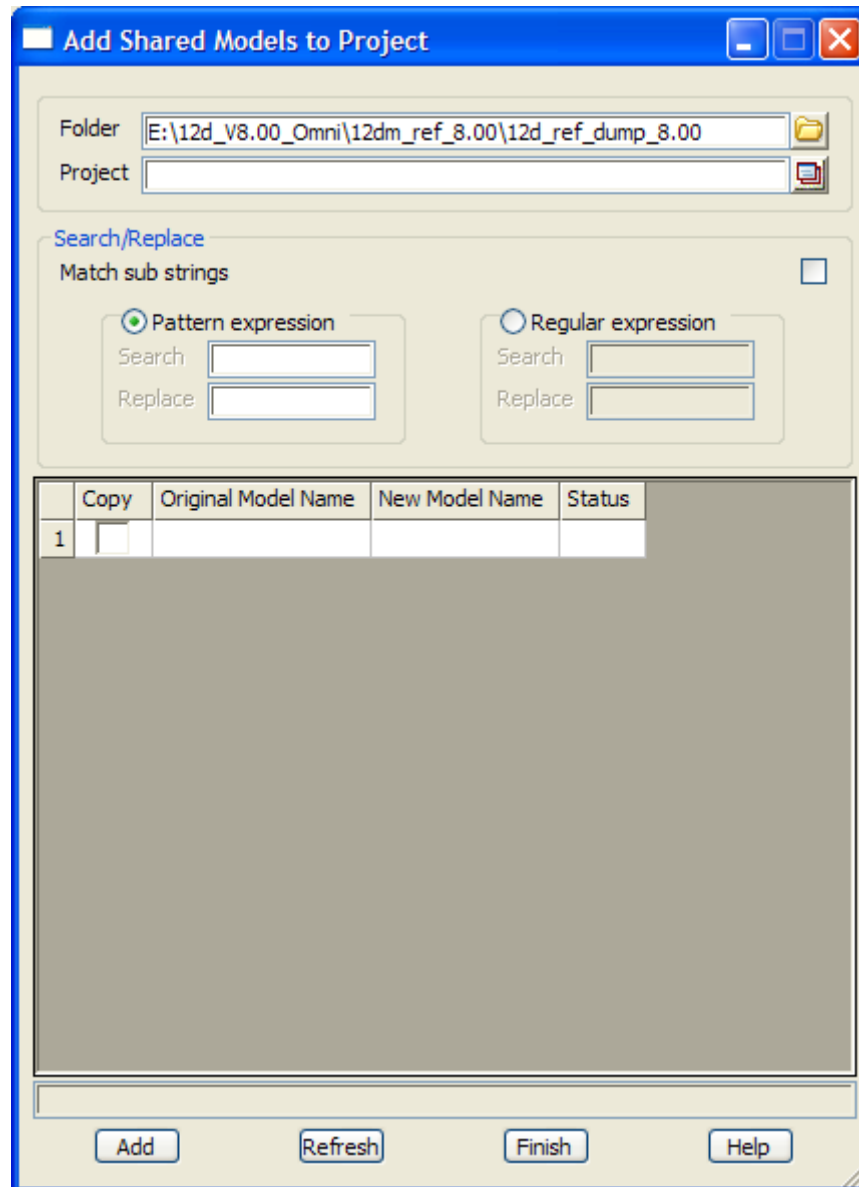
Add Shared Models

add_shared_models_to_project

Position of option on menu: Model =>Sharing =>Add

The Add option is used to add shared models (from a server project) to the project (a client project).

Selecting Add displays the **Add Shared Models to Project** panel.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Folder	folder box		select folder

*folder to look for 12d Model projects. When a folder is selected, all the 12d Model projects in the folder will be displayed in a **Projects** pop-up list.*

Project	folder box		select folder
----------------	------------	--	---------------

12d Model project to search for shared models

Search and Replace section:

Match sub strings	tick box
--------------------------	----------

*if **tick**, the Search expression is used to match against part of each model name.
If **not tick**, the Search expression is used to match against the entire model name.*

***Pattern expressions** or **Regular expressions** can be used to create New Model Names when a shared model is added to the project*

***Search** - type in the expression*

Replace - type in the expression to replace the **Search** expression.

Copy tick boxes in grid column

if tick, the model will be added to the project when the **Add** button is pressed.

Clicking RB on **Copy** at the top of the column brings up a menu to **Toggle** the ticks, **Set** all the ticks on, **Clear** to turn all the ticks off.

Note - a shared model that has been previously added can only be removed by using the Model =>Sharing =>Remove option.

Original Model Name grid column

this column lists all the models in the server project that are available for adding to this client project.

New Model Name grid column

if **non blank**, the name to use instead of the **Original Model Name** when the model is added to the project.

If **blank**, the **Original Model Name** is used for the model when it is added to the project.

Status output grid column

displays if there is a **match** or **no match** when a pattern or regular expression is used

Add button

clicking **Add** adds all the models with a tick to this project (a client project).

Refresh button

clicking **Refresh** refreshes the list of all models available for sharing in the selected 12d Model project

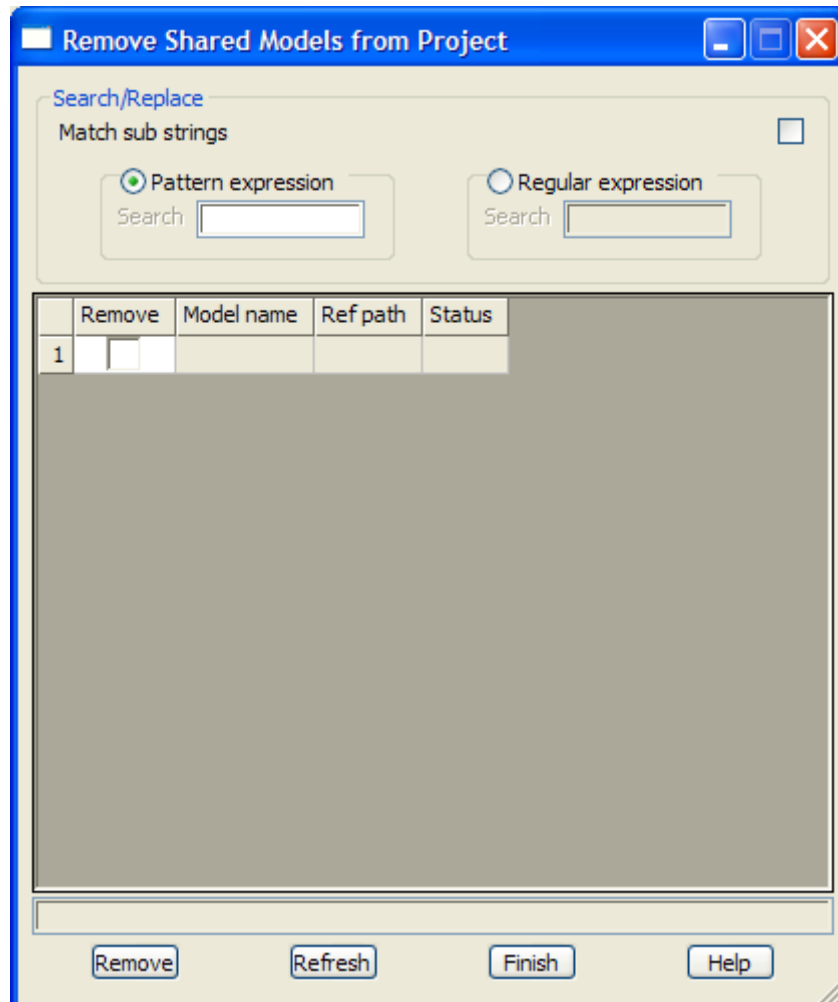
Remove Shared Models

remove_shared_models_from_project

Position of option on menu: Model =>Sharing =>Remove

The Remove option is used to remove shared models from the project. The shared models would have been previously added to the project with the Model =>Sharing =>Add option.

Selecting Remove displays the **Remove Shared Models from Project** panel.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Search and Replace section:

Match sub strings tick box

*if **tick**, the Search expression is used to match against part of each model name.*

*If **not tick**, the Search expression is used to match against the entire model name.*

***Pattern expressions** or **Regular expressions** can be used to select and tick shared models.*

Remove tick boxes in grid column

*if tick, the model will be removed from the project when the **Remove** button is pressed.*

*Clicking RB on **Copy** at the top of the column brings up a menu to **Toggle** the ticks, **Set all***

the ticks on, **Clear** to turn all the ticks off.

Model Name grid column

this column lists all the models in this project that have been added from other (server) projects

Ref path

this column lists the full path name to the server project and the original model name in the server project

Remove button

*clicking **Remove** removes all the models with a tick from this project (a client project).*

Refresh button

*clicking **Refresh** refreshes the list of all shared models previously added to the project*

Synchronize Shared Models

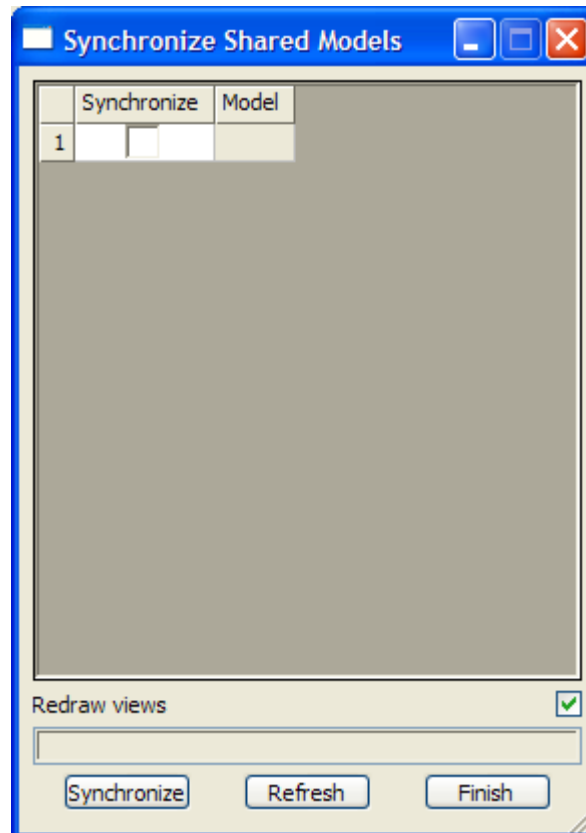
`synchronize_shared_models`

Position of option on menu: Model =>Sharing =>Synchronize

The **Synchronize** option is used to updated any added shared models. The shared models would have been previously added to the project with the Model =>Sharing =>Add option.

Three environment variables control the synchronization of updates of added shared models and tins. For more information on synchronizing, go to the section “Share Settings” .

Selecting **Synchronize** displays the **Synchronize Shared Models** panel.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Synchronize	tick boxes in grid column		
--------------------	---------------------------	--	--

*if tick and the model has changed in the server project, then it will be re-copied from the server project when the **Synchronize** button is pressed.*

*Clicking RB on **Copy** at the top of the column brings up a menu to **Toggle** the ticks, **Set** all the ticks on, **Clear** to turn all the ticks off.*

Model	grid column		
--------------	-------------	--	--

this column lists all the models in this project that have been added from other (server) projects

Synchronize	button		
--------------------	--------	--	--

*clicking **Synchronize** re-copies any models with a tick from the server projects*

Refresh	button		
----------------	--------	--	--

*clicking **Refresh** refreshes the list of all shared models previously added to the project*

Clean

clean_model

Position of option on menu: Model => Clean

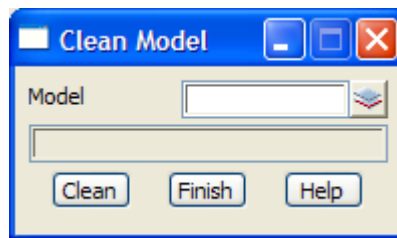
The clean option is used to delete all the strings in a model but the model itself is not deleted. The model is still attached to any views it had been added to.

To help protect the user against disasters, when a model is selected for cleaning, a **yes-no** pop-up menu is invoked to confirm that the user did intend cleaning out the model.

Wild cards (*) and wild characters (!) can be used to select the models to clean and then a list of selected models is displayed for confirmation.

If cleaning is confirmed, all the strings in the selected models are deleted.

On selecting the clean model option, the **clean model** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Model	input		available models

*name of the model to be cleaned out. Wild cards * and characters ? can be used to give a list of models to be cleaned.*

Clean	button
--------------	--------

*after selecting this button, all strings in the model given in the model field will be deleted. A **yes-no** pop-up is used to confirm that cleaning is required.*

Delete

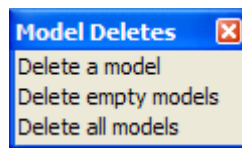
model_deletes

Position of menu: Model => Delete

Using the delete option, models can be deleted from disk so that they no longer can be accessed or take up disk space.

To help protect the user against disasters, when a model is selected for deletion, a **yes-no** pop-up menu is used to confirm that deleting the model is intended. If deletion is confirmed, the selected model is deleted from the project and the disk.

The model delete walk-right menu is



For the option *Delete a model*, please continue to the section “Delete a Model” .

Delete empty models, please continue to the section “Delete Empty Models” .

Delete all models, please continue to the section “Delete All Models” .

Delete a Model

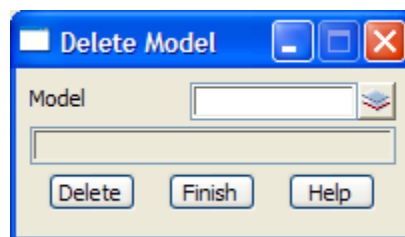
delete_model

Position of option on menu: Model =>Delete =>Delete a Model

The delete a model option can be used to delete a model in the working project.

Wild cards (*) and wild characters (!) can be used to select the models to delete and then a list of selected models is displayed for confirmation.

On selecting the delete a model option, the **delete model** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Model	input		available models

*name of the model to be deleted. Wild cards * and characters ? can be used to give a list of models to be deleted.*

Delete	button
---------------	--------

*after selecting this button, the model given in the model field will be deleted from the computer disk. A **yes-no** pop-up is used to confirm that deletion is required.*

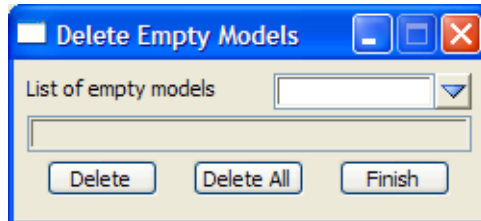
Delete Empty Models

del_empty_model_panel

Position of option on menu: Model =>Delete =>Delete Empty Models

The delete empty models option displays a list of all the empty models in the project and can delete selected empty models or all of them.

On selecting the delete empty models option, the **delete empty models** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
List of empty models	models		available models
<i>the pop-up brings up a list of all the empty models in the project. A model can be selected from the list and it will be deleted after selecting the delete button.</i>			
Delete	button		
<i>delete the model given in the list of empty models field.</i>			
Delete all	button		
<i>delete all the empty models in the project.</i>			

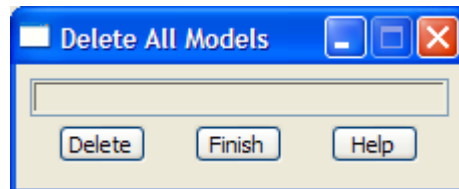
Delete All Models

delete_all_models

Position of option on menu: Model =>Delete =>Delete All Models

The delete all models option will delete all the models in the project. It does not delete models that are in the project area but not yet added to the project.

On selecting the delete all models option, the **delete all models** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Delete	button		
<i>after selecting this button, a yes-no pop-up is used to confirm that deletion is required. If it is, all models in the working project will be deleted from disk. All views will be refreshed and unless an error occurs, the panel will be removed.</i>			

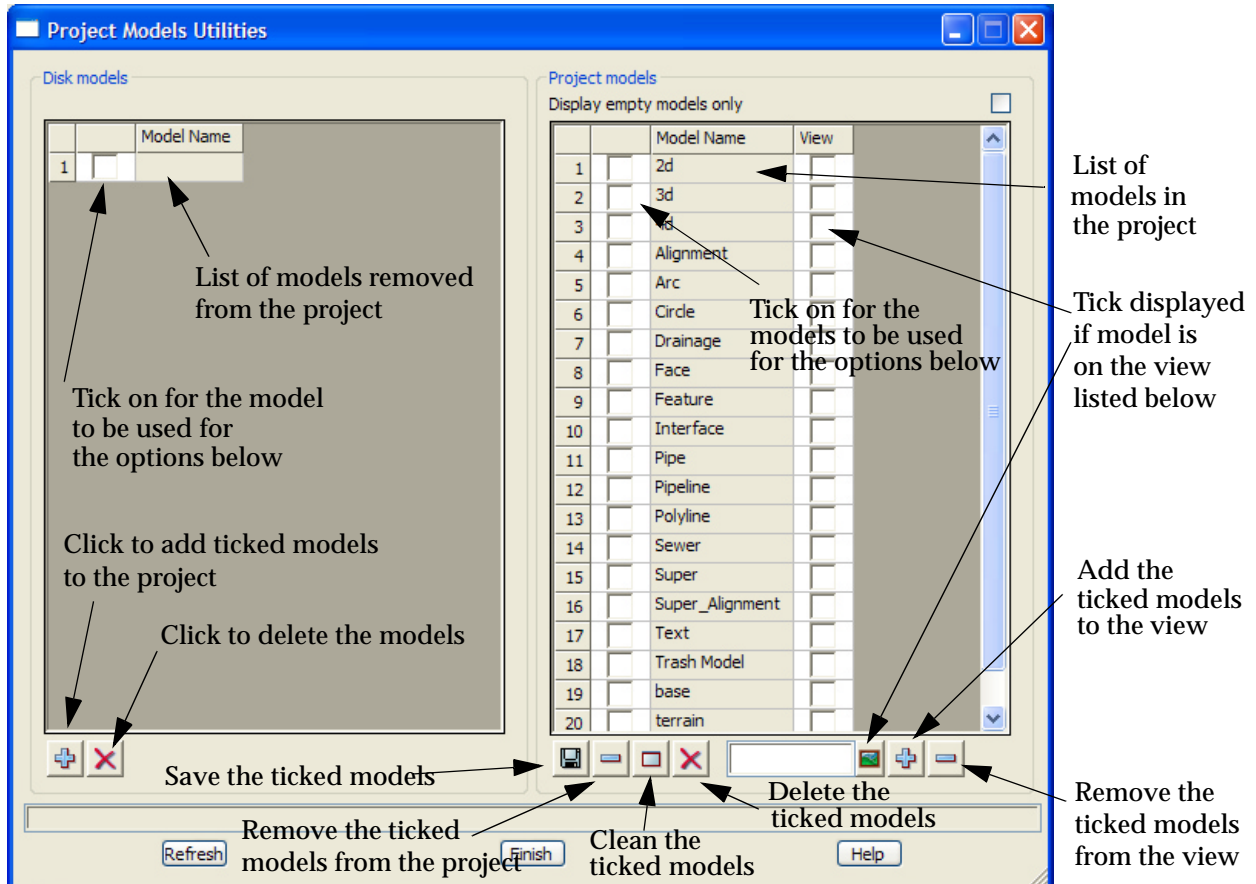
Project Model Utilities

project_models_utilities

Position of option on menu: Model =>Utilities =>Project model utilities

The Project Model Utilities panels can add/remove models from the project, clean and delete models, add/remove models from views.

On selecting Project model utilities, the **Project Model Utilities** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Disk Models section

options add removed models to the project and delete removed models

Project Models section

options to save/remove/clean/delete models, add/remove models from a view

Display empty models only tick box

if tick, only empty models are listed.

Refresh button

refresh the model properties displayed in the panel

13 Views

views

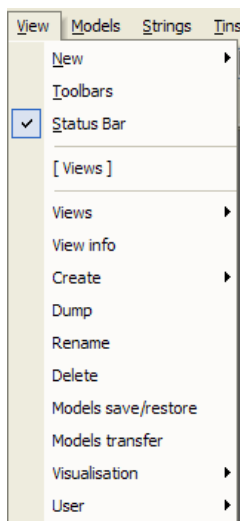
Position of menu: View

Views are the drawing display areas in 12d Model.

The views walk-right menu contains options to list existing views and create new views. The view drawing and manipulation options are in the View menus attached to each view.

The views walk-right menu is

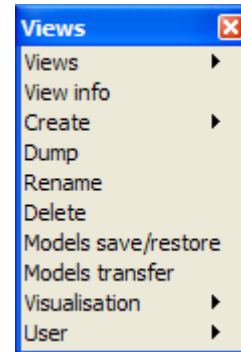
on Main menu



create new views
turn Toolbars on/off
toggle Status Bar on/off
create floating Views menu (see right)

list of defined views
info about the data on the view
create plan, perspective, section views
write out a view in raster format
rename a view
delete a view
save/restore list of models on view
transfer models between views
helpful visualisation options
User defined Views menu

on 12d Model menu
and floating menu



For the option *New*, go to the section

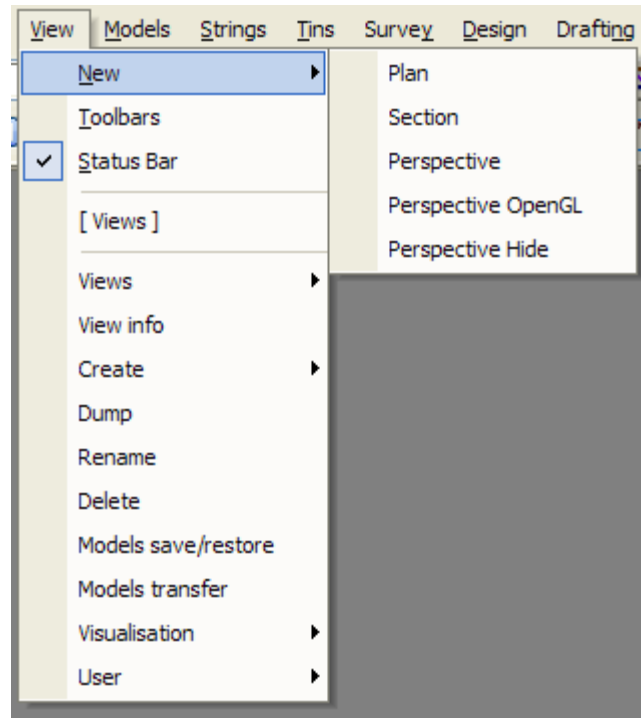
Toolbars
Status bar
Views
View info
Create
Dump
Rename
Delete
Models save/restore
Model transfer
Visualisation

"New"
"Toolbars"
"Status Bar"
"Views"
"View Info"
"Create"
"Dump"
"Rename"
"Delete"
"Models Save/Restore"
"Models Transfer"
"Visualisation"

New

Position of option on menu: View =>New

The New walk-right menu provides options to create views of type *Plan*, *Section*, *Perspective*, *Perspective OpenGL* and *Perspective Hide*.

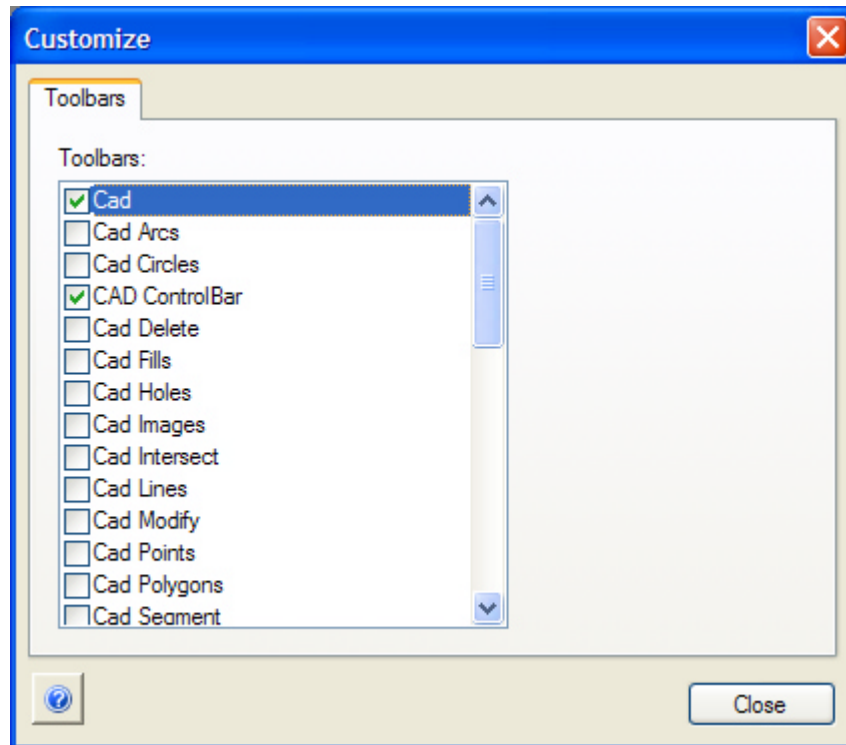


After selecting one of the options, a new view of the appropriate type with the next sequential view number is created in the Views Area.

Toolbars

Position of option on menu: View =>Toolbars

Clicking on Toolbars brings up the **Toolbars** panel



Clicking the tick on/off for a given toolbar or controlbar in the *Toolbars* list turns the toolbar or controlbar on/off.

Status Bar

Position of option on menu: View =>New

Toggles the *Status Bar* on/off.

Views

view_list

Position of option on menu: View =>Views

The Views walk-right menu provides a list of all the views defined in this session of **12d** Model.

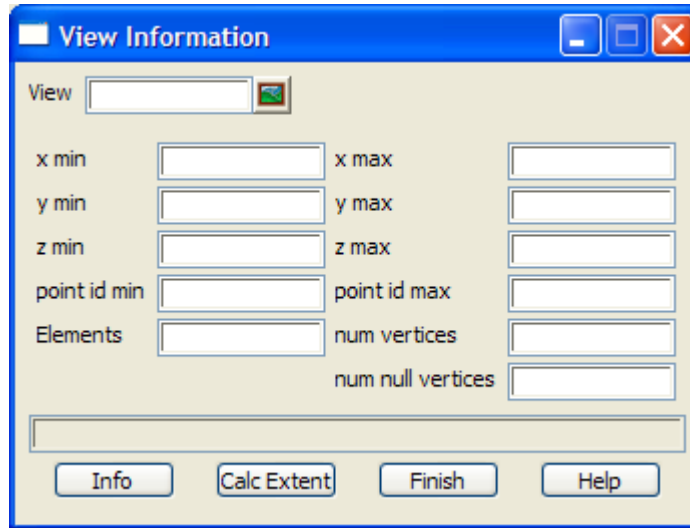
For each view in the list, a further walk-right menu lists all the models added to that view.

View Info

view_information

Position of option on menu: View =>View Info

Selecting view info fires up the **view information** panel.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
View	input		available views

input the name of the view to get information about

xmin/ymin/zmin, xmax/ymax/zmax	output		
---------------------------------------	--------	--	--

returns the limits of all the models on the view

point id min/max	output		
-------------------------	--------	--	--

minimum/maximum integer point id in the model

Elements	output		
-----------------	--------	--	--

returns the number of elements in all the models on the view

num vertices	output		
---------------------	--------	--	--

returns the number of points in all the models on the view

num null vertices	output		
--------------------------	--------	--	--

returns the number of null vertices in all the models on the view

Info	button		
-------------	--------	--	--

get the information for the view given in the view field.

Calc Extent	button		
--------------------	--------	--	--

recalculate the x, y, z bounding box for the models on the view given in the view field.

How to Use the Panel

The view information for the view given in the view field is retrieved and placed in the appropriate panel fields when the view name is entered into the view field from the pop-ups, or a <enter> is entered after entering the view name into the view field, or on selecting the **info** button.

Create

view_create

Position of menu: View =>Create

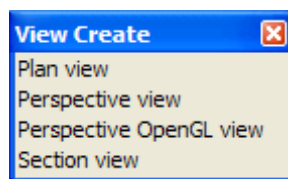
The floating Create menu item operates in two ways.

First, if Create itself is activated (by clicking LB when Create is highlighted), the **New View** panel appears. The **New View** panel can be used to create plan, perspective and sections views.

Secondly, the Create walk-right brings up a the View Create menu. This walk-right menu has separate options for creating plan, perspective and section views.

The Main menu option **View => Create** will only work the second way

The Create walk-right menu is



create a plan view
create a perspective view
create a perspective OpenGL view
create a section view

The **New View** panel obtained by clicking LB on the Create menu item and the three options on the View Create menu will now be described.

For the option *New view*, go to the section

Plan view

Perspective view

Perspective OpenGL view

Section view

“New View” .

“Plan, Perspective and Section Views”

“Plan, Perspective and Section Views”

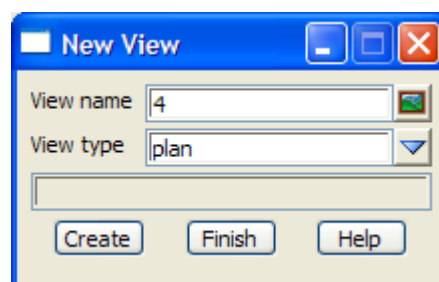
“Plan, Perspective and Section Views”

“Plan, Perspective and Section Views”

New View

new_view

On selecting the Create option, the **New View** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

View name	view box	next view number	
------------------	----------	------------------	--

name of the new view to be created.

View type	choice box	plan	plan, persp, section, persp OpenGL
------------------	------------	------	------------------------------------

type of the view to be created. There are three types of views - plan, perspective, perspective OpenGL and sections views.

Create button

after selecting this button, a new view of the name and type given in the panel is created in the Views Area. The panel then disappears.

Plan, Perspective and Section Views

`new_plan_view`

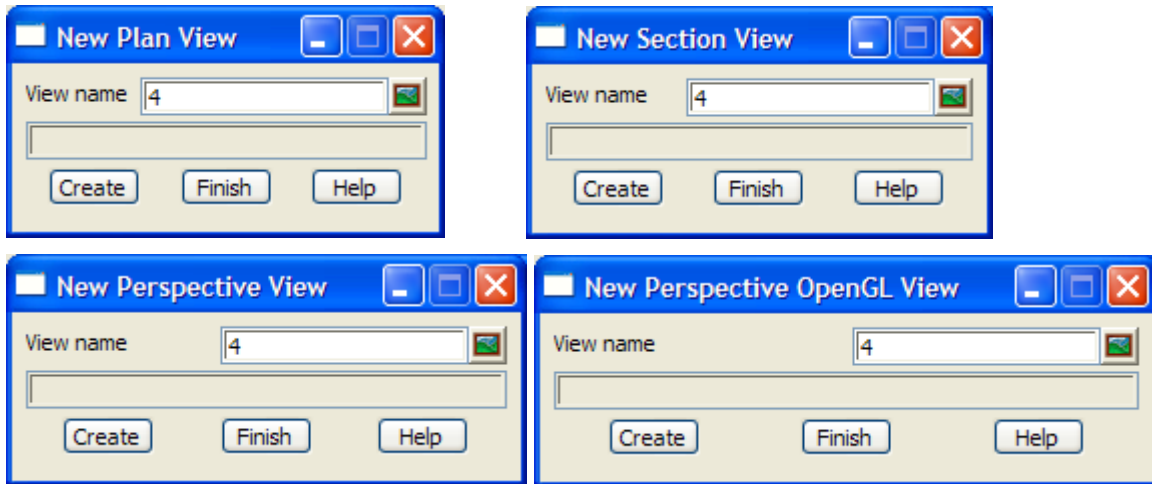
`new_section_view`

`new_perspective_opengl_view` `new_perspective_view`

Position of option on menu:

View =>Create =>Plan/Perspective/Perspective OpenGL/Section view

On the Plan/ Perspective/Perspective OpenGL/Section view option, the **New Plan/Perspective/Perspective OpenGL/ Section view** panel is displayed.



The fields and buttons used in this panels have the following functions.

Field Description	Type	Defaults	Pop-Up
View name	input	next view number	

name of the new plan/perspective/section view to be created.

Create button

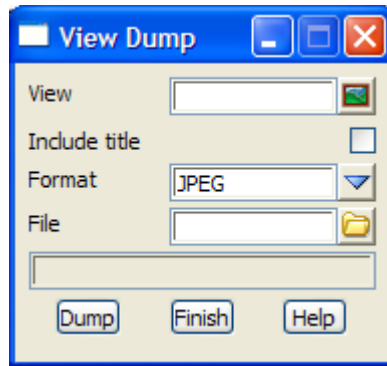
after selecting this button, the new view of the specified name is created in the Views Area. The panel then disappears.

Dump

`view_dump`

Position of option on menu: View =>Dump

This option is used to write the view out in a user selected raster format. The option is identical to the Dump option on the View System menu.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
View <i>name of the view to be dumped</i>	view box		available views
Include title <i>if tick, include the view title area in the dump</i>	tick box		
Format <i>format of the dump of the view</i>	choice box	jpeg	bmp, gif, jpeg, jpeg 2000, png, tga
File <i>name of the file for the dump of the view</i>	file box		
Dump <i>dump the view in the given format</i>	button		

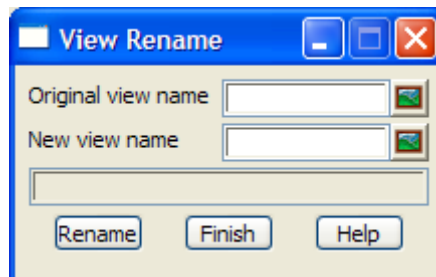
Rename

view_rename

Position of option on menu: View =>Rename

This option renames an existing view.

Selecting Rename brings up the **View Rename** panel:



The fields and buttons used in this panels have the following functions.

Field Description	Type	Defaults	Pop-Up

Original view name <i>current name of the view</i>	view box	available views
New view name <i>new name for the view</i>	view box	available views
Rename <i>rename the view</i>	button	

Delete

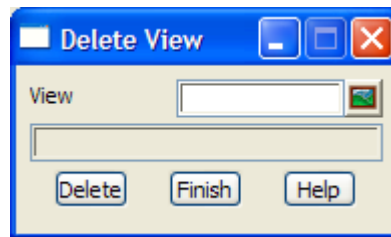
delete_view

Position of option on menu: View =>Delete

This option deletes an existing view.

Since the easiest method to delete a view is to use the **[X]** in the top right hand corner of the view, the *Delete View* option is mainly used in rare cases such as when the view is not responding due a graphics card problem.

Selecting Delete brings up the **Delete View** panel:



The fields and buttons used in this panels have the following functions.

Field Description	Type	Defaults	Pop-Up
View name <i>name of the view to delete</i>	view box		available views
Delete <i>delete the view</i>	button		

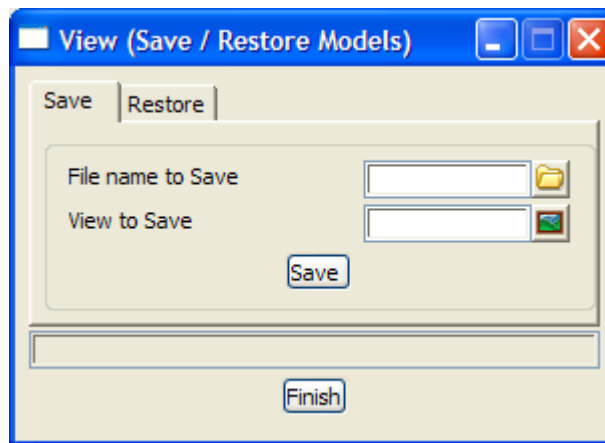
Models Save/Restore

view_res_panel

Position of option on menu: View =>Models save/restore

This option is used to write out a list of models on the view and also to read in a list of models and add them to a given view.

On selecting the Models save/restore option, the **view save/restore models** panel is displayed.



The fields and buttons used in this panels have the following functions.

Field Description	Type	Defaults	Pop-Up
Save tab	tab		
View to save <i>view to write out list of model for.</i>	view		available views
File name for save <i>file for model list.</i>	file		*.vml files
Save <i>after selecting this button, the names of all the model on the view are written out to the file.</i>	button		
Restore tab	tab		
File name to restore <i>file of model list.</i>	file		*.vml files
View to add <i>view to add the models in the model list to.</i>	view		available views
Read <i>read the list of models.</i>	button		
Restore <i>add the models in the list just read in to the given view.</i>	button		

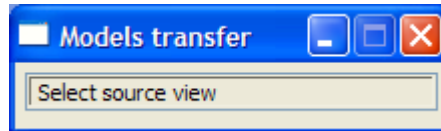
Models Transfer

view_model_transfer_panel

Position of option on menu: View =>Models transfer

This option is used to add all the models on one view to a different view.

On selecting the models transfer option, the **models transfer** panel is displayed.



The user is then asked to click in the view to get the models from (source view) and then to select the destination view where the models are to be added to.

Note - if the destination view is a new view, click on Fit first to give the new view a valid coordinate system.

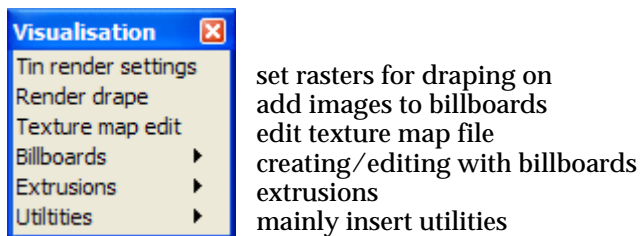
Visualisation

visualisation

Position of menu: View =>Visualisation

This is a chargeable module which uses the Perspective OpenGL view to create realistic 3d pictures using raster drapes, bitmaps and extrusions along super strings.

The Visualisation walk-right menu is



For the option *Tin render settings*, go to the section “Render Settings” in the chapter “Triangles”

<i>Render drape</i>	“Render Drape”
<i>Texture map edit</i>	“Texture Map Edit”
<i>Billboards</i>	“Billboards”
<i>Extrusions</i>	“Extrusions”
<i>Utilities</i>	“Utilities”

Tin Render Settings

Position of option on menu: View =>Visualisation => Tin render settings

This option sets texture mappings for triangles in a tin. It has already been documented as

Tins =>Edit =>Render settings

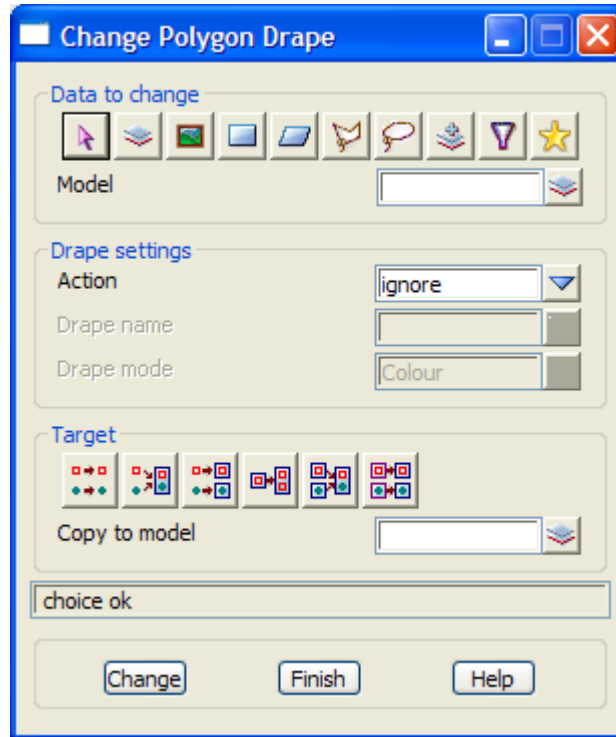
in the section “Render Settings” of the chapter “Triangles” .

Render Drape

change_polygon_drape

Position of option on menu: View =>Visualisation => Render drape

Selecting Render drape brings up the **Change Polygon Drape** panel.



The fields and buttons used in the panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Data source type		Model	
<i>data selection type - for a full description go to "Data Source" in the chapter "Tools and Concepts"</i>			
Data source	input		
<i>source of data is to be processed.</i>			
Action	choice box	ignore	set, clear, ignore
<i>if set, .</i>			
<i>If clear, .</i>			
<i>If ignore, .</i>			
Drape name			
Drape mode	choice box		colour, colour to texture
Target type			
<i>data target type - for a full description go to "Data Target" in the chapter "Tools and Concepts"</i>			
Target info	input		
<i>extra information required for the target.</i>			
Change	button		
<i>process the selected strings.</i>			

Texture Map Edit

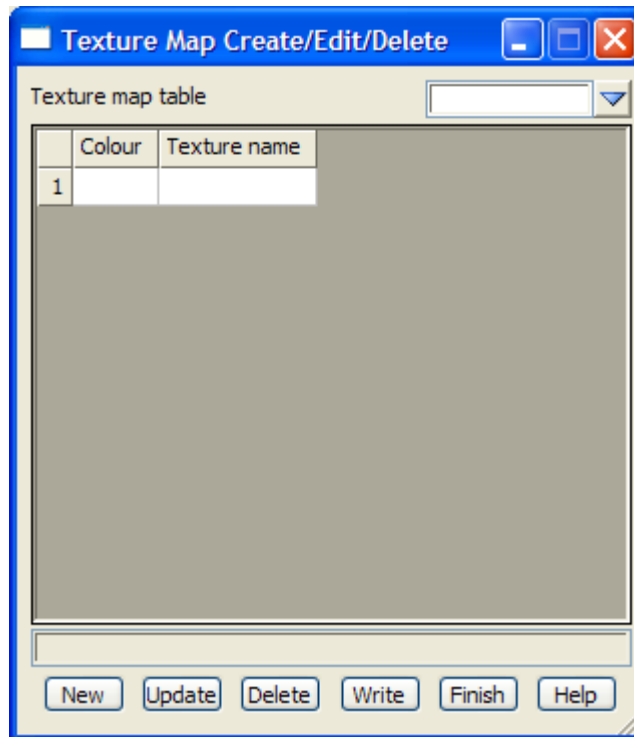
texture_map_create_edit_delete

Position of option on menu: Visualisation =>Texture map edit

This option edits the texture mapping file which contains the *texture map tables* that can be applied to the coloured triangles of a tin in renderings.

Each texture map table must have a unique name.

On selecting the Text map edit option, the **Texture Map Create/Edit/Delete** panel is displayed.



The fields and buttons used in the panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Texture map table <i>name of the texture map table inside the texture map file.</i>			
Colour <i>colour to apply the texture to.</i>	colour box		available colours
Texture name <i>texture to apply to all triangles with the specified colour</i>	texture box		available textures
New <i>to create a new texture map table, click on the New button and then type the texture map table name into the Texture map table field. Then start filling in the Colour and Texture name columns.</i>	button		
Update <i>update the given Texture map table with the values in the Colour and Texture name columns.</i>	button		
Delete <i>Delete the texture map table named in the Texture map table field.</i>	button		
Write <i>write out the texture map information to the texture map file.</i>	button		

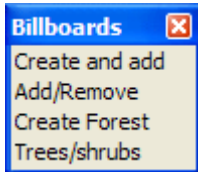
Billboards

billboards

Position of menu: View =>Visualisation =>Billboards

The billboard options plane an image onto a rectangular billboard. this can be used to display background scenes, signs etc.

The Billboard walk-right menu is



create a billboard and add an image to it
 add/remove a billboard to the vertices of a super string
 create a forest within a polygon
 place a billboard tree/shrub

- | | |
|----------------------|--|
| <i>Create</i> | “Create Billboards” . |
| <i>Add/Remove</i> | “Add and Remove Billboard from Super String” . |
| <i>Create forest</i> | “Create Forest” . |
| <i>Trees/shrubs</i> | “Trees/Shrubs as Faces and Billboards” |

Create Billboards

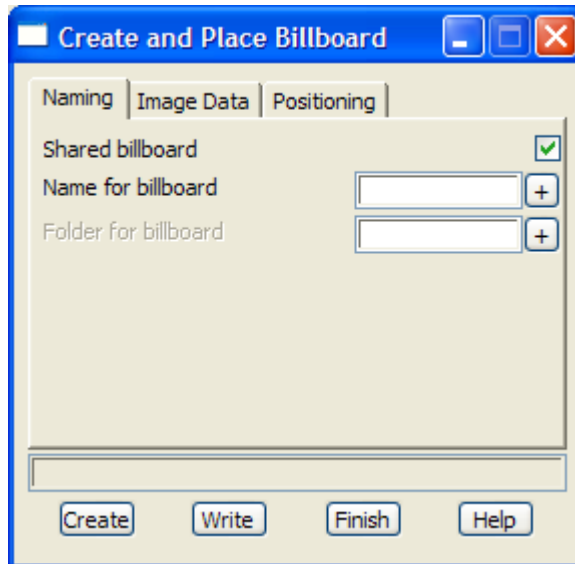
create_and_place_billboard

Position of option on menu: View =>Visualisation => Billboards =>Create and add

This option is under development.

This option creates billboards and adds images to them.

On selecting the Create and add option, the **Create and Place Billboards** panel is displayed.



The fields and buttons used in this panels have the following functions.

Field Description	Type	Defaults	Pop-Up
Naming tab	tab		
Image Data tab	tab		

Positioning tab

tab

Add and Remove Billboard from Super String

change_super_string_billboards

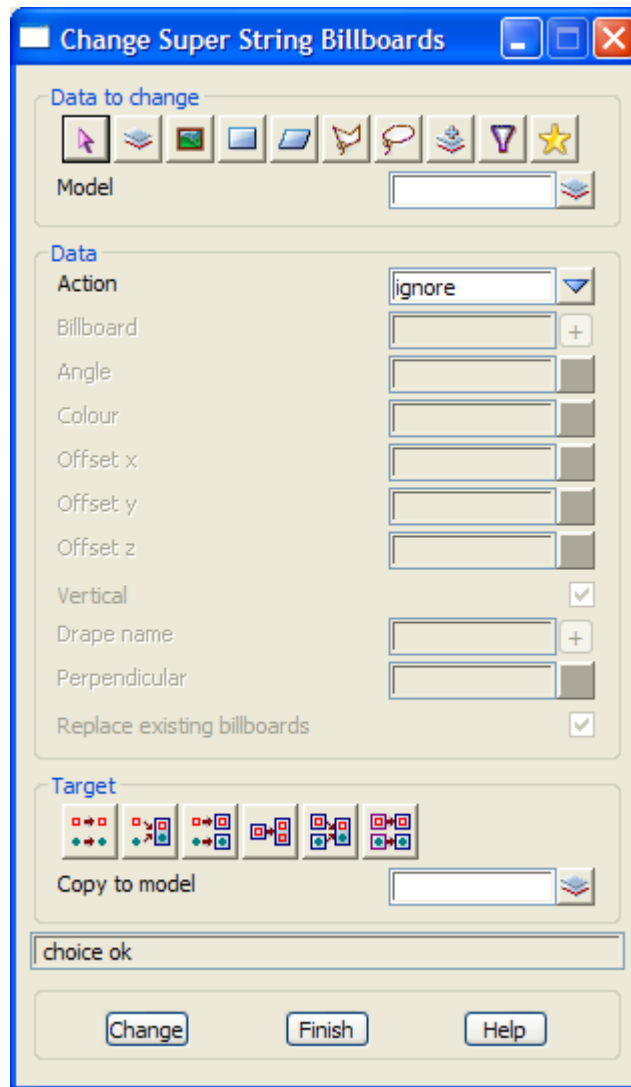
Position of option on menu: View =>Visualisation => Billboards =>Add/remove from super string

Each vertex of a super string can have its own billboard.

A billboard consists of an image and a width and height.

The **Add/remove from super string** option places a selected billboard in a vertical plane at a user given distance from each vertex of a super string. The vertical plane is at a given angle or perpendicular to a selected string. An example could be the image on a stop sign which is in the vertical plane.

Selecting Global Add/remove to ss brings up the **Change Super String Billboard** panel.



The fields and buttons used in the panel have the following functions.

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Data source type		Model	
-------------------------	--	-------	--

data selection type - for a full description go to "Data Source" in the chapter "Tools and Concepts"

Data source	input		
--------------------	-------	--	--

source of data is to be processed.

Action	choice box	ignore	set, clear, ignore
	<i>if set, the billboard is placed at each vertex in the super string.</i>		
	<i>If clear, the billboard information at each vertex is cleared.</i>		
	<i>If ignore, nothing is done to the billboard information.</i>		
Billboard	billboard box		
	<i>billboard to be used.</i>		
Angle	angle box		
	<i>angle to rotation the billboard - positive is counter clockwise. This is ignored if Perpendicular is used.</i>		
Size			
	<i>size of the symbol.</i>		
Colour	colour box		
	<i>colour for the back of the billboard.</i>		
Offset x, Offset y, Offset z			
	<i>x/y/z distance to place the billboard away from the super string vertex.</i>		
Vertical	tick box		
	<i>if tick, the string is placed vertically and nothing else is needed.</i>		
	<i>If not tick, .</i>		
Drape name	input		
	<i>if Vertical is not ticked, then</i>		
Perpendicular	string select box		
	<i>if a string is selected, then the billboard is placed on the line going through the vertex and perpendicular to the selected string. Angle is ignored.</i>		
Target type			
	<i>data target type - for a full description go to "Data Target" in the chapter "Tools and Concepts"</i>		
Target info	input		
	<i>extra information required for the target.</i>		
Change	button		
	<i>process the selected strings.</i>		

Create Forest

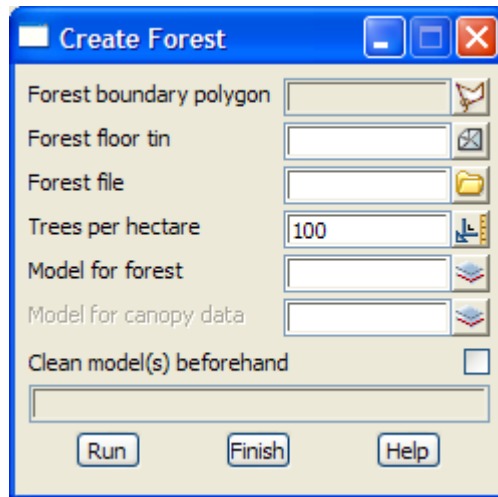
create_forest

Position of option on menu: Visualisation =>Billboards =>Create forest

Create forest creates randomly placed trees and shrubs in a selected polygon.

The forest make up is controlled by a user defined forest file which gives the types and distribution of trees, and variation in size and spread.

Selecting Create forest displays the **Create Forest** panel



The fields and buttons used in the panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Forest boundary polygon <i>polygon to create the forest within</i>	string select		
Forest floor tin <i>tin to use for the z-value for the base of the trees</i>	tin box		available tins
Forest file <i>file to give the make up of the forest. For more information, go to the section "Create Forest File"</i>	file box		.forests files
Trees per hectare <i>density of the forest given by the number of trees per hectare</i>	input		
Model for forest <i>model to place the trees in</i>	model box		available models
Model for canopy data <i>if non blank, points are created for the tops of the trees in the forest. These can be used to triangulated to give a top of trees tin.</i>	model box		available models
Clean model (s) beforehand <i>if tick, the forest and forest canopy models are cleaned before the option is run</i>	tick box		
Run <i>run the option</i>	button		

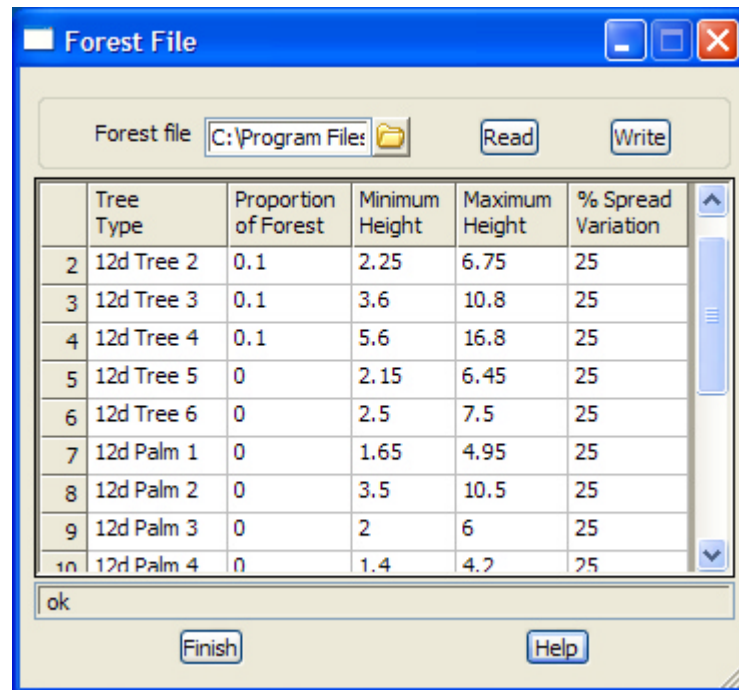
Create Forest File

forest_file

Position of option on menu: t

The Forest File gives the type and distribution of trees, and variation in size and spread.

Selecting brings up the **Forest File** panel



The fields and buttons used in the panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Forest file polygon <i>file for the forest definition</i>	file box		all .forest files

Read <i>read in a forest file</i>	button		
---	--------	--	--

Write <i>write out a forest file</i> <i>read in a forest file</i>	button		
--	--------	--	--

Forest file grid:

Tree type <i>name of the billboard to place as a tree</i>	billboard cell	available billboards
---	----------------	----------------------

Proportion of forest <i>relative density of this tree in the forest (the actual proportion is this value over the sum of all the proportions)</i>	input cell	
---	------------	--

Minimum height <i>minimum height for this tree</i>	input cell	
--	------------	--

Maximum height <i>maximum height for this tree</i>	input cell	
--	------------	--

% spread variation

input cell

Trees/Shrubs as Faces and Billboards

12d_block_panel

trees_and_shrubs_panel

Position of option on menu: View =>Visualisation => Billboards =>Trees/shrubs

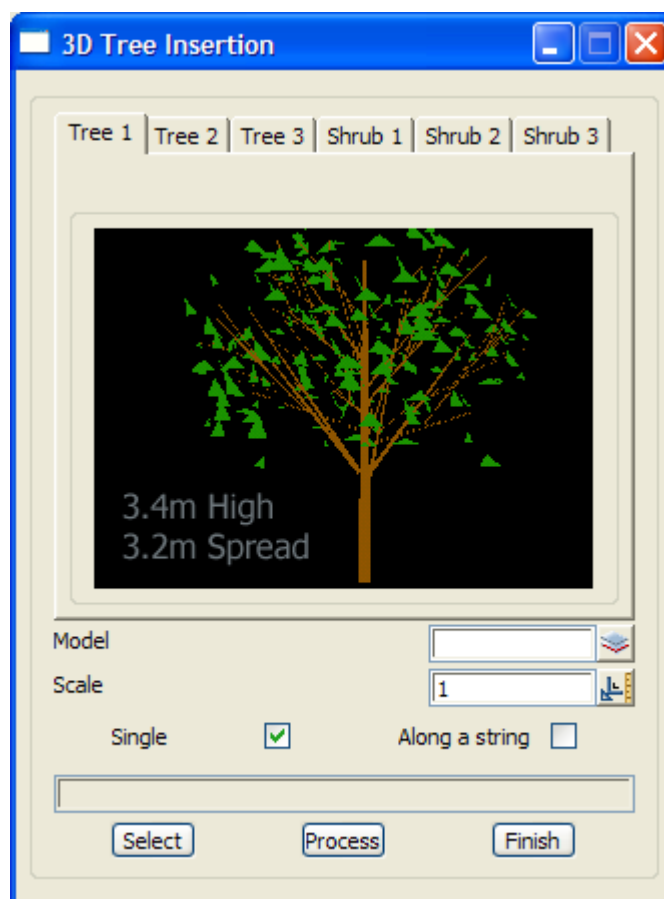
Position of option on menu: View =>Visualisation => Utilities =>Trees/shrubs faces

The Trees/shrubs - faces option inserts the trees and shrubs as face elements. This means that each tree may consist of hundreds or thousands of faces.

The Trees/shrubs option inserts the images of trees and shrubs as a fanned billboard. This means that each tree consists of only one points.

On selecting the Trees/shrubs faces option, the **3D Tree Insertion - Faces** panel is displayed.

On selecting the Trees/shrubs option, the **3D Tree Insertion** panel is displayed.





The fields and buttons used in these panels have the following functions.

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Tree and Shrub tabs

click on the tab to display the type of tree/shrub to be inserted. The picture shows the tree height and spread.

Model	model box		available models
--------------	-----------	--	------------------

model to add the tree/shrub to.

Scale - Factor	real value	1	measures
-----------------------	------------	---	----------

factor to blow the block up by.

Single	radio button		
---------------	--------------	--	--

if ticked then the tree is placed at the selected position.

Along a string	radio button		
-----------------------	--------------	--	--

if ticked then the tree is placed along a string. When the string is selected then a Tree Interval panel is

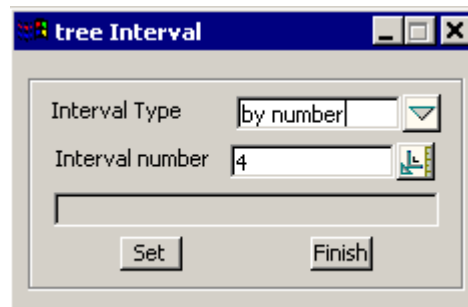
brought up to specify how the trees are placed along the string.

Select button
select the string or position for the tree.

Process button
insert the trees/shrubs.

tree_interval

Tree Interval



This panel is for specifying how often the trees/shrubs are to be inserted along the string.

Field Description	Type	Defaults	Pop-Up
Interval type	choice box	by number	by number by distance by special chg file by vertex

*if **by number**: an Interval number field is displayed on the panel and the tree is inserted that many times along the string.*

*if **by distance**: an Interval distance field is displayed on the panel and the tree is inserted with that distance separation along the string.*

*if **by special chg file**: a Special chg file field is displayed on the panel and the tree is inserted along the string at the chainages given in the file.*

*if **by vertex**: the tree is inserted at every vertex of the string.*

Set button
set the parameters for tree interval to those in the panel.

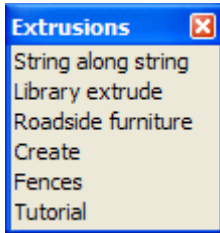
Extrusions

extrusions

Position of menu: View =>Visualisation =>Extrusions

The billboard options plane an image onto a rectangular billboard. this can be used to display background scenes, signs etc.

The Billboard walk-right menu is



extrude along s string
 add/remove a billboard to the vertices of a super string
 insert roadside furniture
 create a complicated extrusion
 extrude fences along strings
 tutorial on creating complicated extrusions

String along string	"Extrude string"
Library extrude	"Change Library Extrude"
Roadside furniture	"Roadside Furniture"
Create	"Create Group Extrusions"
Fences	"Fences"
Tutorial	"Tutorial to Create Group Extrusions"

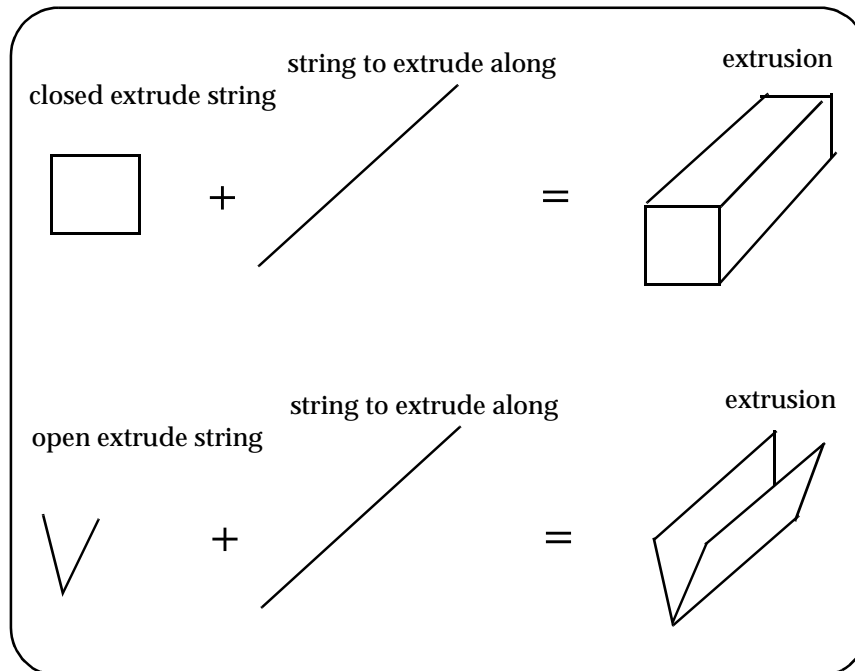
Extrude string

string_extrude

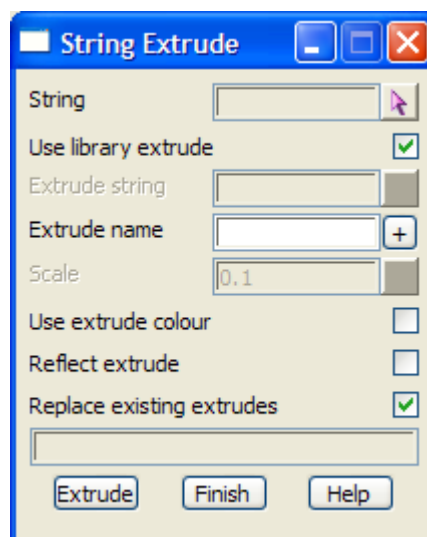
Position of option on menu: View =>Visualisation => Extrude string

The Extrude option extrudes a selected super string along a super string.

Only the (x,y) co-ordinates of the string used as the extrude as used and the (x,y) co-ordinates are then taken as (offset, height) in the plane perpendicular to the string to extrude along.



On selecting the Extrude option, the **String Extrude** panel is displayed.



The fields and buttons in this panel have the following functions.

Field	Description	Type	Defaults	Pop-Up
String	<i>super string to extrude along</i>	string select		
Extrude	<i>super string representing the extrude.</i>	string select		
Factor	<i>value to factor the extrude string by.</i>	input	0.1	
Extrude	<i>Create the extrusion.</i>	button		

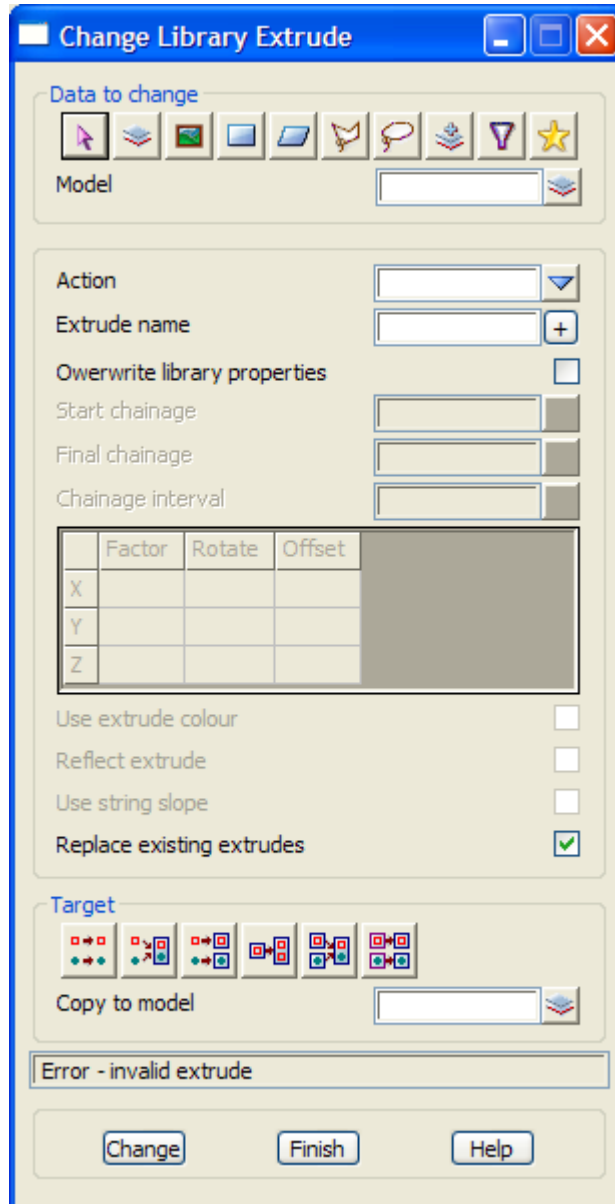
Change Library Extrude

change_library_extrude

Position of option on menu: Visualisation =>Library extrude

Apply or remove an extrusion from the library to a super string.

On selecting the Library extrude option, the **Change Library Extrude** panel is displayed.



The fields and buttons used in the panel have the following functions.

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Data source type		Model	
-------------------------	--	-------	--

data selection type - for a full description go to "Data Source" in the chapter "Tools and Concepts"

Data source	input		
--------------------	-------	--	--

source of data is to be processed.

Action	choice box	ignore	set, clear
---------------	------------	--------	------------

if set, the library extrude is applied to the super string.

If clear, all existing extrusions are removed from the super string.

- Extrude name** extrude box
extrude to be applied to the super string.
- Overwrite library properties** tick box
*if no tick, the placement properties are taken from the extrude in the library.
if tick, the placement uses the information in the grid on the panel.*
- Start/end chainage** chainage box
start/end chainage for applying the extrusion.
- Start/end chainage** chainage box
start/end chainage for applying the extrusion.
- Chainage interval**
only applicable when the extrusion in an interval extrude.
- Grid of X,Y,X against Factor, Rotate, Offset**
placement information for applying the extrude.
- Use extrude colour** tick box
*if tick, the placement uses the information in the grid on the panel.
if no tick, then the string segment colour is used for the extrusion.*
- Reflect extrude** tick box
if tick, the extrude is reflected in the local y axis before it is applied.
- Replace existing extrudes** tick box
if tick, all existing extrudes are cleared before the new one is applied.
- Target type**
data target type - for a full description go to “Data Target” in the chapter “Tools and Concepts”
- Target info** input
extra information required for the target.
- Change** button
process the selected string

Roadside Furniture

roadside_furniture_panel

Position of option on menu: View =>Visualisation => Extrusions =>Roadside furniture

This option is for inserting extruded objects that have been supplied by 12D Solutions Pty Ltd.

It includes street lights, log barriers, park bench, posts and columns, walls, timber fences, guard rails, signs etc.

The list of items that can be inserted is being continuously upgraded by 12D Solutions.

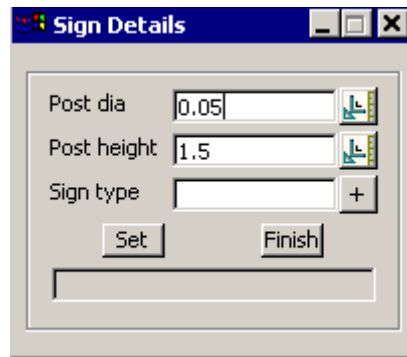
Selecting Roadside furniture brings up the **Roadside Furniture** panel.



Clicking on the tabs brings up the information required for that piece of roadside furniture.

For all the tabs other than *Park Bench*, *Street Light* and *Guard Rail*, once a tab had been selected, moving the cursor over the picture brings up a special panel for the extra information required. For example, for the *Sign* tab, moving the cursor over the picture brings up the **Sign Details** panel:

sign_details



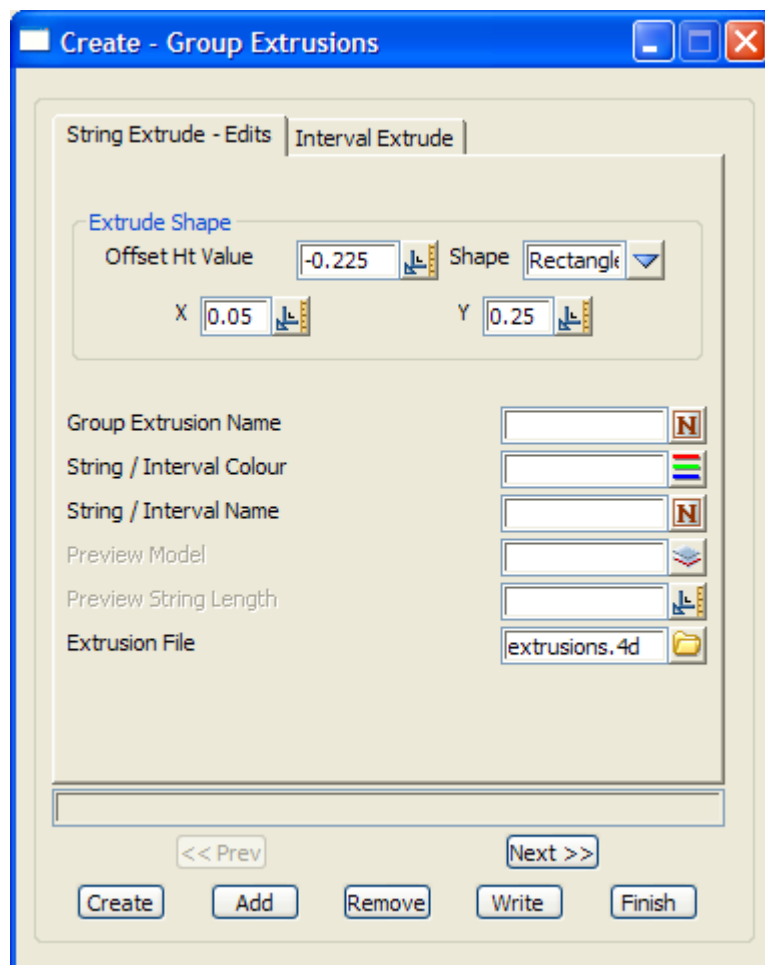
Create Group Extrusions

[extrusions_create_panel](#)

Position of option on menu: View =>Visualisation => Extrusions =>Create

The Create option creates groups extrusions.

Selecting Create brings up the **Create - Group Extrusions** panel.



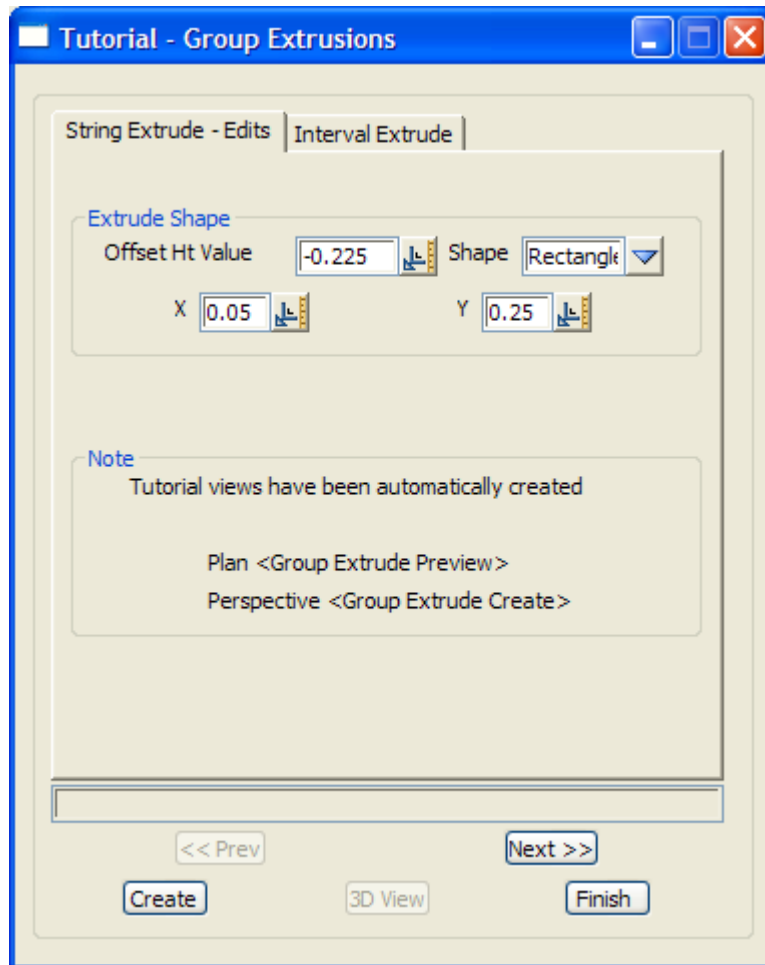
Tutorial to Create Group Extrusions

[extrusions_tutorial_panel](#)

Position of option on menu: View =>Visualisation => Extrusions =>Tutorial

The Tutorial option demonstrates how to create groups extrusions and will also create groups extrusions.

Selecting Tutorial brings up the **Tutorial - Group Extrusions** panel.



Fences

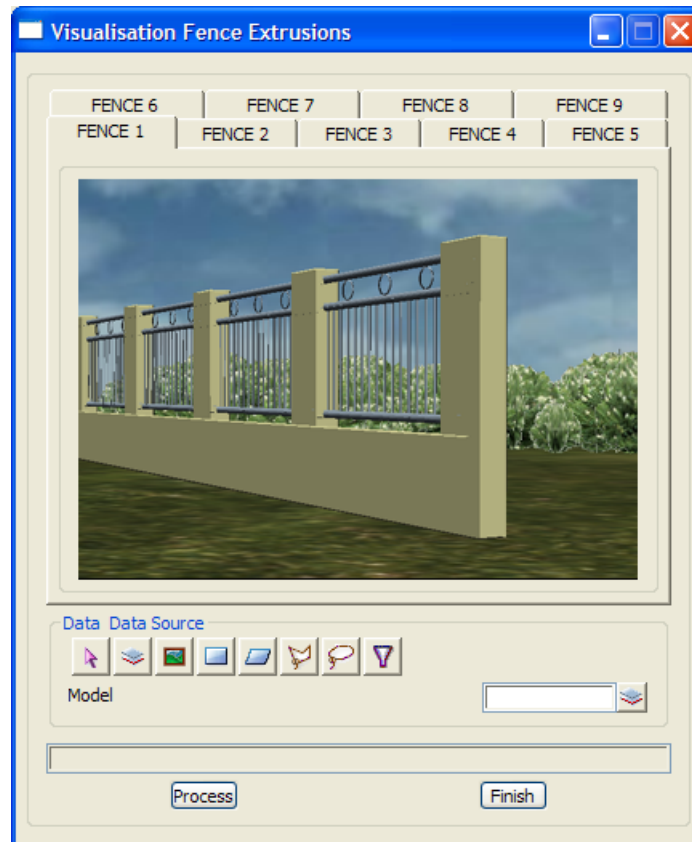
12d_vis_fences_panel

Position of option on menu: View =>Visualisation => Extrusions =>Fences

This option is for extruded 12d Sultans supplied fences along strings.

The list of fences is being continuously upgraded by 12D Solutions.

Selecting the Fences brings up the **Visualisation Fence Extrusions** panel.



The fields and buttons used in the panel have the following functions.

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Clicking on the tabs brings up the type of fence to be extruded along selected super strings.

Data source type	Model
------------------	-------

data selection type - for a full description go to "Data Source" in the chapter "Tools and Concepts"

Data source	input
-------------	-------

source of super string to extrude fences along

Process	button
---------	--------

apply the fence to the selected super strings

Houses

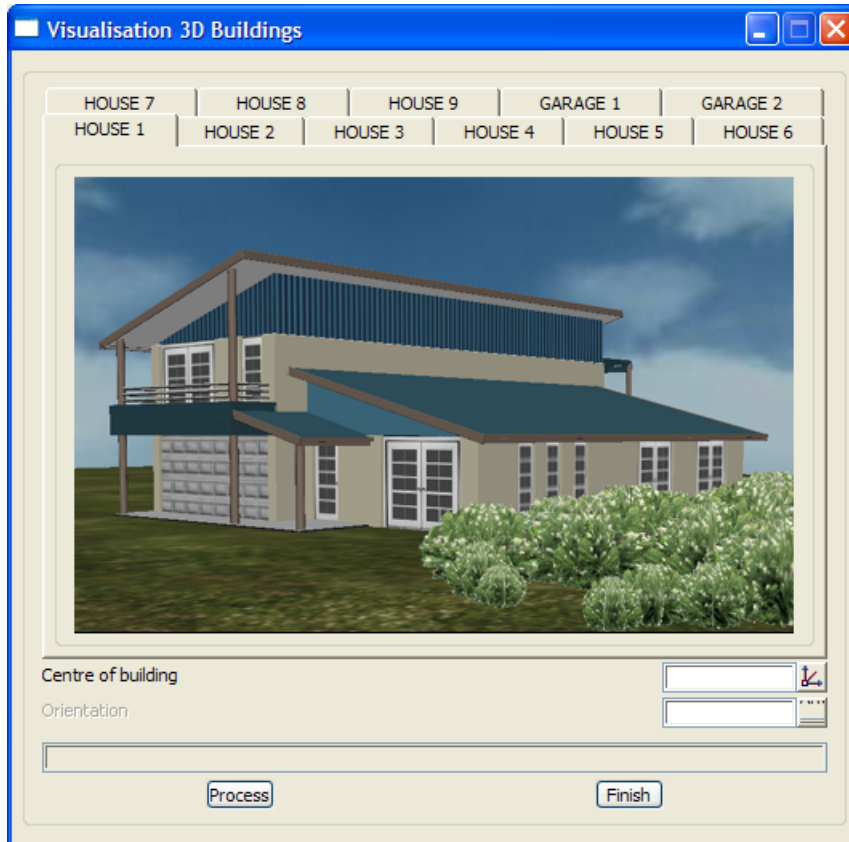
12d_vis_house_panel

Position of option on menu: View =>Visualisation => Utilities =>Houses

This option is for inserting 12d Sultans supplied houses.

The list of houses is being continuously upgraded by 12D Solutions.

Selecting the Houses brings up the **Visualisation 3D Buildings** panel.



The fields and buttons used in this panel have the following functions:

Clicking on the tabs brings up the type of house to be inserted.

Centre of building xyz box position select
give the x y z co-ordinates for the centre of the base of the inserted building

Orientation angle box angle select
give the angle to orient the building

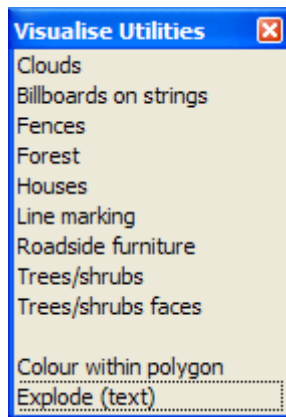
Process button
insert the selected building

Utilities

visualise_utilities

Position of menu: View =>Visualisation =>Utilities

The Utilities walk-right menu is



create clouds as background
 change billboards on super strings
 inserting fences
 create forest
 insert houses
 create strings for line marking
 insert fences, guard rails, signs, walls etc.
 insert trees and shrubs as billboards
 insert trees and shrubs as faces

 colour within a polygon
 explode text into vectors so it can be draped onto surface

For	<i>Clouds</i>	go to the section "Clouds"
	<i>Billboards on strings</i>	"Create Billboards"
	<i>Fences</i>	"Fences"
	<i>Forest</i>	"Create Forest"
	<i>Houses</i>	"Houses"
	<i>Line marking</i>	"Line Marking"
	<i>Roadside furniture</i>	"Roadside Furniture"
	<i>Trees/shrubs billboards</i>	"Trees/Shrubs as Faces and Billboards"
	<i>Trees/shrubs faces</i>	"Trees/Shrubs as Faces and Billboards"
	<i>Explode text</i>	"Explode Text" in the chapter "Utilities"
	<i>Colour within polygon</i>	"Colour Within Polygon" in the chapter "Triangles"

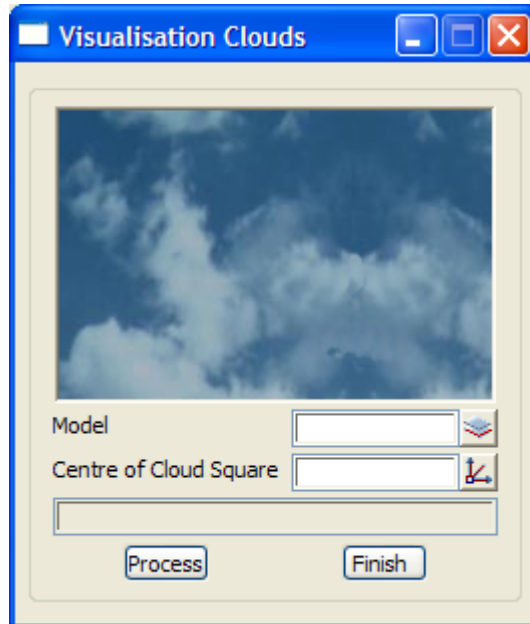
Clouds

clouds_panel

Position of option on menu: View =>Visualisation =>Utilities =>Clouds

This option is used to create a square box around the view with the cloud image on the inside of it. From within a scene, this will then appear as a sky with clouds as the background.

On selecting the Clouds option, the **Visualisation Clouds** panel is displayed:



The fields and buttons used in this panel have the following functions:

Model	model box	available models
	<i>model to place the cloud square in.</i>	
Centre of cloud square	xyz box	position select
	<i>give the x y z co-ordinates for the centre of the cloud square.</i>	
Process	button	
	<i>create the cloud square.</i>	

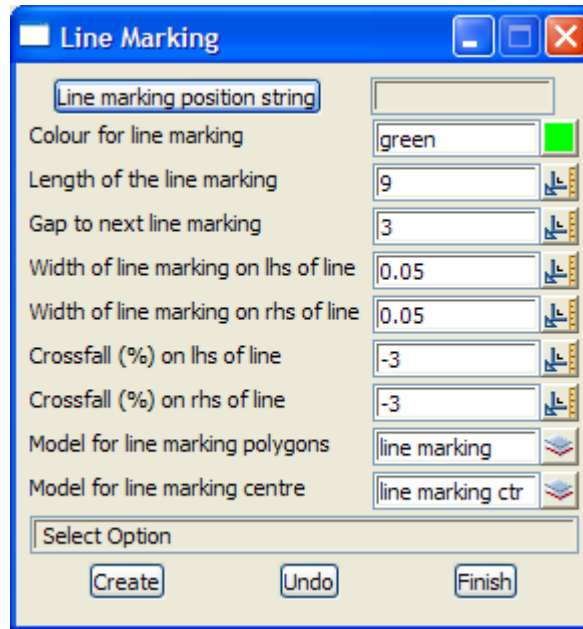
Line Marking

line_marking_panel

Position of option on menu: View =>Visualisation => Line marking

This option is used to create polygon data in 3d representing the line marking on a road. The polygons can then be included in the design tin for triangulating and the "Colour Triangles Within a Polygon" option used to colour the triangles for use in shades and renderings.

The line marking polygons created by the option represents a dashed line style centred around the selected line marking string marking the position of the dashed line. The length and separation of the dashed lines are user defined and the width of the dash is defined by a width to the left and a width to the right of the line marking string.



The fields and buttons used in this panel have the following functions:

Field Description	Type	Defaults	Pop-Up
line marking position string	string select		
<i>select the string to define the position of the line marking on the road. The string will also provide z-values for use in creating the line marking.</i>			
Colour for line marking	input box	green	available colours
<i>colour for the line marking polygons.</i>			
Length of the line marking	input box	9	
<i>length of each line mark dash.</i>			
Gap to next line marking	input box	3	
<i>distance between the line marking dashes.</i>			
Width of line marking on lhs of line	input box	0.05	
<i>width of the line marking on the left hand side of the line marking position string.</i>			
Width of line marking on rhs of line	input box	0.05	
<i>width of the line marking on the right hand side of the line marking position string.</i>			
Crossfall (%) on lhs of line	input box	-3	
<i>cross fall for the part of the line marking on the left hand side of the line marking position string (so z-values for the polygon can be calculated).</i>			
Crossfall (%) on rhs of line	input box	-3	
<i>cross fall for the part of the line marking on the right hand side of the line marking position string (so z-values for the polygon can be calculated).</i>			
Model for line marking polygons	model box	line marking	available models
<i>model for the polygons representing the line marking.</i>			
Model for line marking centre	model box	line marking ctr	available models
<i>model for a string with just the part of the line marking position string which is inside the line marking polygons.</i>			

Create button
run the option and create the line marking polygons.

Undo button
undo the last set of polygons created since the panel was up.

Explode Text

Position of option on menu: View =>Visualisation =>Utilities =>Explode text

This option explodes text into lines and arcs. It has already been documented as

Utilities =>A-G => Explode text

in the section "Explode Text" of the chapter "Utilities" .

Colour Within Polygon

Position of option on menu: View =>Visualisation =>Utilities =>Colour within polygon

This option colours triangles in a tin. It has already been documented as

Tins =>Colour =>Colour within polygon

in the section "Colour Within Polygon" of the chapter "Triangles" .

14 Strings

strings

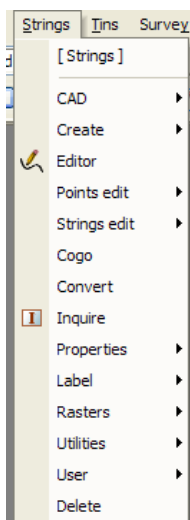
Position of menu: Strings

Strings are the basic modelling elements of 12d Model.

The strings walk-right menu contains options to create, edit and manipulate strings in a variety of ways including copying, moving strings between models and deleting strings.

The strings walk- right menu is

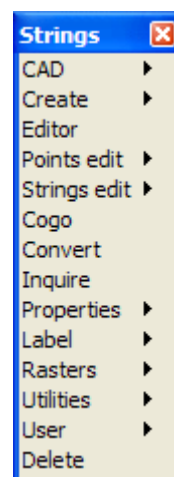
on Main menu



create floating menu Strings

CAD options
 create strings
 editing strings
 points edit
 whole string edits
 co-ordinate geometry
 convert between string types
 inquire on a string
 modifying string properties
 label strings
 rasters
 various string utilities
 user define string commands
 delete a string

on 12d Model menu and floating menu



For	<i>CAD</i>	"CAD"
	<i>Create</i>	"Create"
	<i>Editor</i>	"Editor"
	<i>Points edit</i>	"Points Edit"
	<i>Strings edit</i>	"Strings Edit"
	<i>Cogo</i>	"Cogo"
	<i>Convert</i>	"Convert"
	<i>Inquire</i>	"Inquire"
	<i>Properties</i>	"Properties"
	<i>Label</i>	"Label"
	<i>Rasters</i>	"Rasters"
	<i>Utilities</i>	"Utilities"
	<i>Delete</i>	"Delete"

Note

For the floating menu, the strings option has another mode of operation. Rather than moving onto the walk-right arrow, if LB is clicked when the strings button is highlighted on the 12d Model menu, the **string inquire** panel is displayed on the screen. Unfortunately this does not work on the *Main* menu.

CAD

cad

Position of option on menu: Strings =>CAD

In 12d Model there are CAD options which are available under both the Strings =>CAD menu and flyouts on the CAD Toolbar which by default, is on the left hand side of the 12d Model screen.

The CAD options create and edit strings using a variety of methods and are fully described in the section “CAD Options” .

The strings created by the CAD menu or CAD toolbars use values in the three controlbars (Cad Controlbar, Symbol Controlbar, and Text Controlbar) to define string attributes such as name, model and colour.

So the controlbars will be described in full in the section “CAD, Symbol and Text Controlbars” before the CAD options.

For basic information on toolbars and controlbars, see the section “Toolbars and Controlbars” in the chapter “Tools and Concepts” .

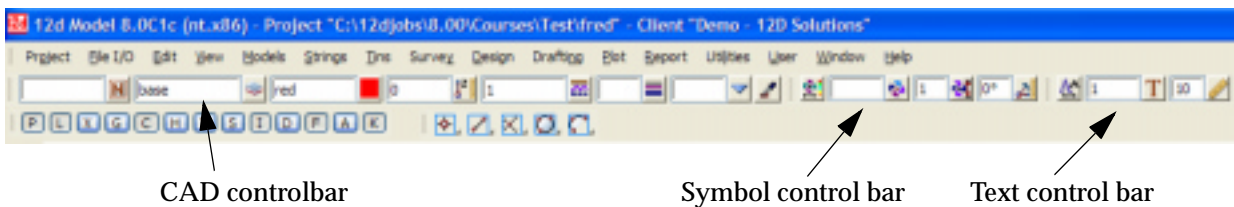
The CAD options create various elements using a number of methods. These options make use of Tool bars and Control bars. Tool bars just have icons on them but Control bars have icons and also controls such as a model box on them. The method groupings are shown on the toolbars (e.g. Points, Lines etc.).

For details on each of the walk rights menus on the CAD menu, go to the section “CAD Options”

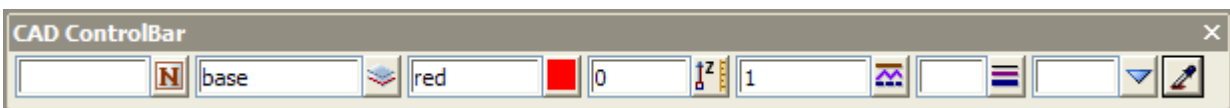
For details on the Controlbars go to the section “CAD, Symbol and Text Controlbars”

CAD, Symbol and Text Controlbars


This default position of the controlbars is on the top left hand side of the screen under the main menu.



CAD Controlbar



The fields and buttons used in CAD controlbar have the following functions.

Field Description	Type	Defaults	Pop-Up
 name of string. If a valid name already exists in names.4d, the + button can be used to bring up a choice box of available names. On selection of a valid name, the rest of the values in the control bar will be filled out. e.g. colour, linetype etc.	name box		names.4d names



model box

cogo

existing models

this field can be recognised by the model icon button on the right hand side of the field. The user can select an existing model by selecting the model icon. If a new model is to be used, the user simply types the model name into the field.



colour box

red

standard 12d colours

this field can be recognised by the colour icon button on the right hand side of the field. The user can select a 12d standard colour model by selecting the colour icon



input

height measures menu

this field allows a height or z value to be assigned to the created elements. If a valid value exists, this value will be applied to the created element. This is regardless if the z value was specified in an XYZ box. If blank, the null value is used.

If no value is specified, the level will be interpolated where possible. A value of null can be entered into the height field as well so that created points will be given a null height value.



linetype box

1

valid linetypes

this field can be recognised by the linetype icon button on the right hand side of the field. The user can select a valid linetype by selecting the linetype icon.



weight box

this field can be recognised by the weight icon button on the right hand side of the field. The user can type in the required weight (millimetres on the plot). If blank, no weight is assigned.



tinability box

no, yes, points

*the choices in this field set the tinability for the string.
If **no**, no vertices or segments in the string are tinable.
If **yes**, all vertices and segments in the string are tinable.
If **point**, all vertices in the string are tinable but not the segments.*






button

the eye dropper allows the user to select an existing element which will define the cad control bar values.

Symbol Controlbar



The fields and buttons used in Symbol controlbar have the following functions.

Field Description	Type	Defaults	Pop-Up
The  symbols data box allows a symbols favourite to be selected and fill the other boxes. The symbols data box will be described after the other controls.			
	symbols box		valid symbols
<i>this field can be recognised by the symbol icon button on the right hand side of the field. The user can select a valid symbol by selecting the symbol icon.</i>			
	input		size measures menu
<i>this field gives the size of the created symbols. If a valid value exists, this value will be applied to the created symbol.</i>			



input

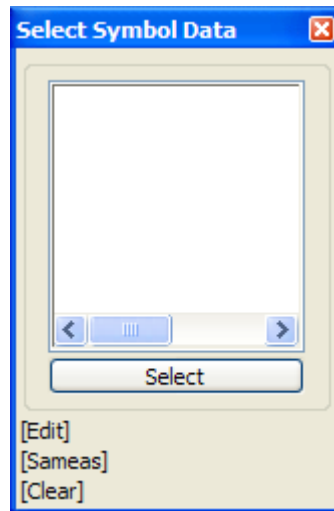
angle measures menu

this field gives the angle of the created symbols. If a valid value exists, this value will be applied to the created symbol.

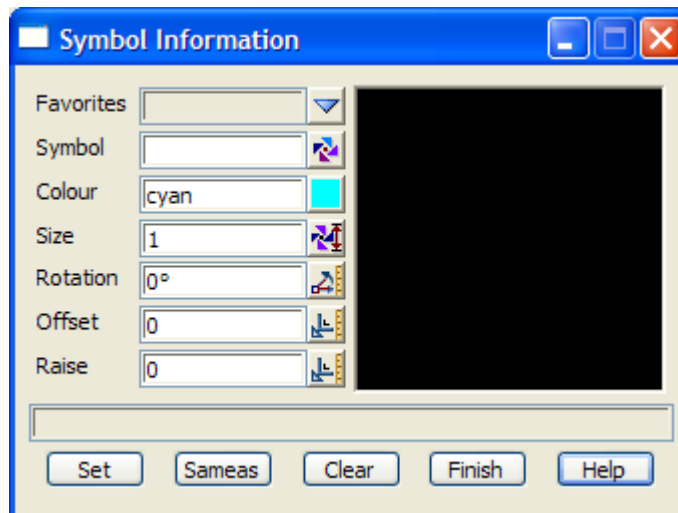


Symbols data box

*on pressing the button a list of available symbols data predefined names read from the **symbols_names.4d** file are displayed. If a symbols data is selected, the values are used for the other Symbol Controlbar fields.*



*If no names exist, the user can edit the current settings by selecting the edit button and bring up the **Symbols Information** panel. This allows for definition of symbol colour, sized, rotation, offset and raise.*



Text Controlbar

Text can occur as a text string, or on vertices and segments of a super string.

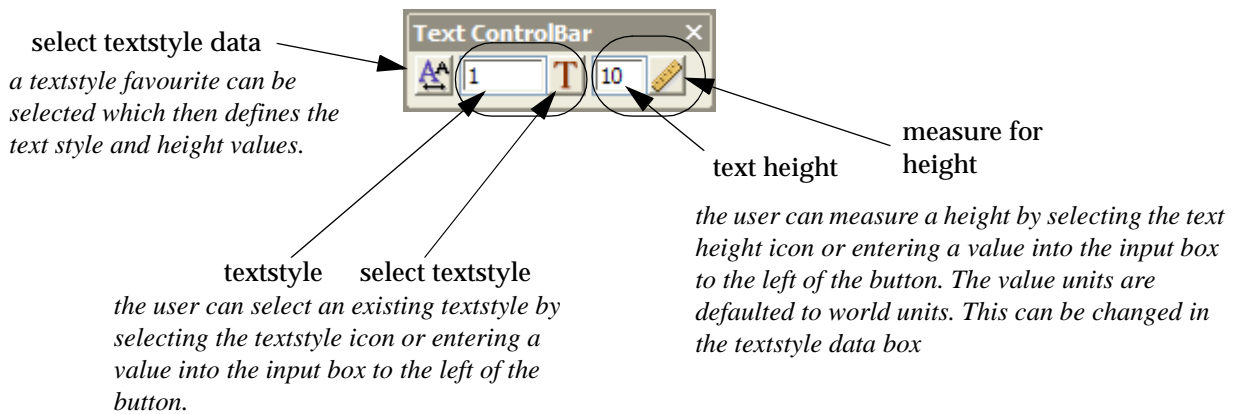
Each type of text has a vertex (these are displayed when Vertices are toggle on in a plan view), a justification point, a rotation, an offset and raise value.

The vertex and justification point only coincide if the offset and raise values are both zero. What parts of the text on a super string vertex or segment that can be independently modified depends

on the settings for the super string.

For the CAD text options, the created elements will have attributes as defined by the **Text Controlbar**. The default position of the Text Controlbar is in top middle of the screen under the main menu.

The **Text Controlbar** is

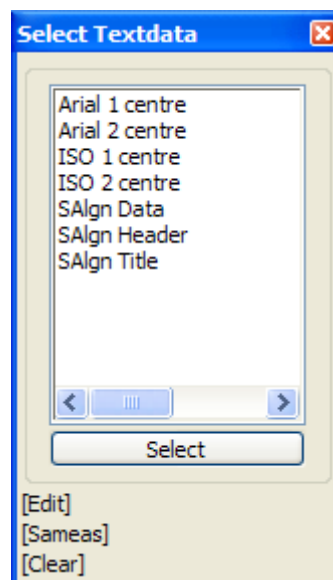


The operation of the Textstyle data box is as follows:

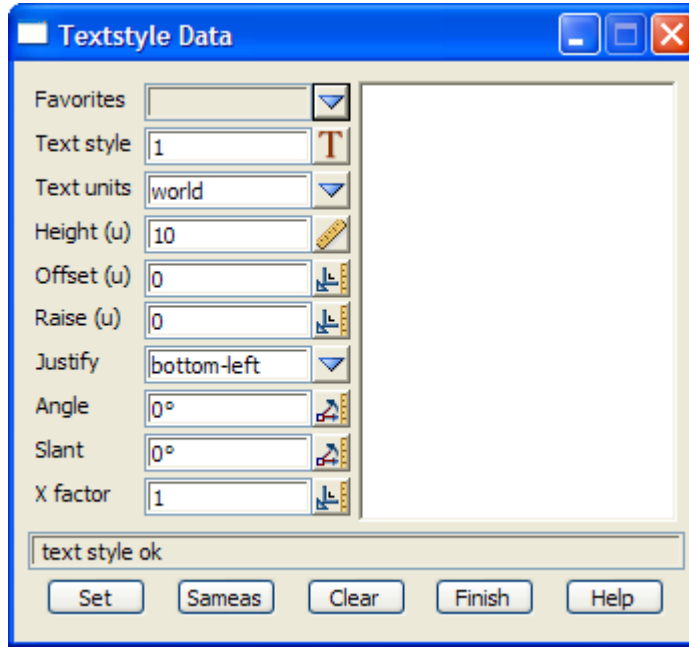


Textstyle data box

on pressing the button a list of available textdata predefined names read from the *textstyle_names.4d* file are displayed.



If no names exist, the user can edit the current settings by selecting the edit button and bring up the **Textstyle Data** panel. This allows for definition of textstyle, units, height offset raise etc.



CAD Options

The CAD options are available from the CAD menu or from the CAD toolbar. The CAD toolbar is a flyout toolbar.

The CAD walk-right menu is



and the CAD Toolbar is



The string creation process is similar for each string type and for editing strings as well. On selecting the appropriate option, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the 12d Model application window.

For the option *Points* please go to the section "CAD Points" .

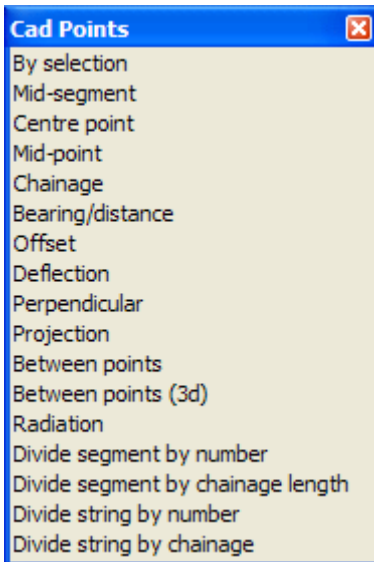
<i>Lines</i>	"CAD Lines" .
<i>Intersect</i>	"CAD Intersect"
<i>Circles</i>	"CAD Circles" .
<i>Arcs</i>	"CAD Arcs" .
<i>Polygons</i>	"CAD Polygons" .
<i>Text</i>	"CAD Text" .
<i>Symbols</i>	"CAD Symbol" .
<i>Fills</i>	"CAD Fills" .
<i>Images</i>	"CAD Images" .
<i>Modify</i>	"CAD Modify" .
<i>Change points</i>	"CAD Edit Points" .
<i>Change segments</i>	"CAD Segment Edits" .
<i>Change strings</i>	"CAD Edit Strings" .
<i>Delete</i>	"CAD Delete" .

CAD Points

cad_points

Position of option on menu: Strings =>CAD =>Points

The Points walk-right menu is



Menu of Options to Create New One Point Strings

at a user selected position
 at middle of a selected segment
 at the centre point of an arc
 at the position of a chainage along a selected string
 at a distance between two selected positions
 distance between two selected positions with interpolated z
 dropped perpendicularly onto a selected string
 projected a chainage distance along a selected string
 a given distance at right angles to a selected string
 a given distance at a given angle to a selected ring
 a given bearing and distance from a selected position
 many points at given brgs and dists from a selected position
 pts which divide selected seg into a number of equal segs
 pts which divide selected seg into segs of given length
 pts which divide selected string into a number of equal pieces
 pts which divide selected string into pieces of given length

For the option <i>By Selection</i> , please go to the section	"By Selection"
<i>Mid segment</i>	"Mid Segment"
<i>Centre point</i>	"Arc Centre"
<i>Mid point</i>	"Mid point"
<i>Chainage</i>	"Chainage"
<i>Bearing distance</i>	"Locate by Bearing/Distance"
<i>Offset</i>	"Create an Offset Point"
<i>Deflection</i>	"Create a Deflection Point"
<i>Drop perpendicular</i>	"Drop Perpendicular"
<i>Projection</i>	"Projection Locate"
<i>Between points</i>	"Between Points"
<i>Between points (3d)</i>	"Between Points (3d)"
<i>Radiation</i>	"Radiation"
<i>Divide segment by number</i>	"Divide Segment by Number"
<i>Divide segment by chainage length</i>	"Divide Segment by Chainage Length"
<i>Divide string by number</i>	"Divide String by Number"
<i>Divide string by chainage length</i>	"Divide String by Chainage Length"

By Selection

Cad_Point_Position

Position of option on menu: Strings =>CAD =>Points =>By selection

or by selection of appropriate icon from the toolbar. 

This option creates a single vertex (point) string.

On selecting By selection, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the 12d Model application window.

The user can select a position with the mouse and on accepting that point (Middle mouse button or enter) the point is created at the selected position. The model, colour, height etc. are defined in the **Cad Control Bar**.

The snap mode will influence the mouse selection. For example if cursor snap is on, the user can choose a position not yet defined. If point snap is on and the selection snaps to an existing point, the option will place another point at that location.

The user can also activate the selection menu used with the mouse (right button) that allows various positioning options.

Specification of a position can also be done by the direct input of the xyz coordinate of the point by pressing the space bar to bring up the enter XYZ panel or by typing of the value to bring up the XYZ panel. **NOTE:** The z value will default to the value entered into the **Cad Control Bar** whether or not it is specified in the XYZ box. If no height value exists in the **Cad Control Bar** then a value will be interpolated if possible, otherwise a null value will be assigned.

Mid Segment

Cad_Point_Middle_Segment

Position of option on menu: Strings =>CAD =>Points =>Mid segment

or by selection of appropriate icon from the toolbar. 

This option creates a point in the middle of a selected line or arc segment.

On selecting Mid segment, the user is prompted to select a segment and a vertex is created at the mid point of the segment. The model, colour, height etc. are defined in the **Cad Control Bar**.

Arc Centre

Cad_Point_Centre_Segment

Position of option on menu: Strings =>CAD =>Points =>Centre point

or by selection of appropriate icon from the toolbar. 

This option creates a point at the centre of a selected arc or circle.

On selecting Centre point, the user is prompted to select an arc and a vertex is created at the centre of the arc. The model, colour, height etc. are defined in the **Cad Control Bar**.

Mid point

Cad_Point_Middle

Position of option on menu: Strings =>CAD =>Points =>Mid point

or by selection of appropriate icon from the toolbar. 

This option creates a point in the middle of two selected positions.

On selecting Mid point, the user is prompted to select the first position and then the second position. A vertex is created at the mid point of the two selected positions. The model, colour, height etc. are defined in the **Cad Control Bar**.

Chainage

cad_locate_chainage

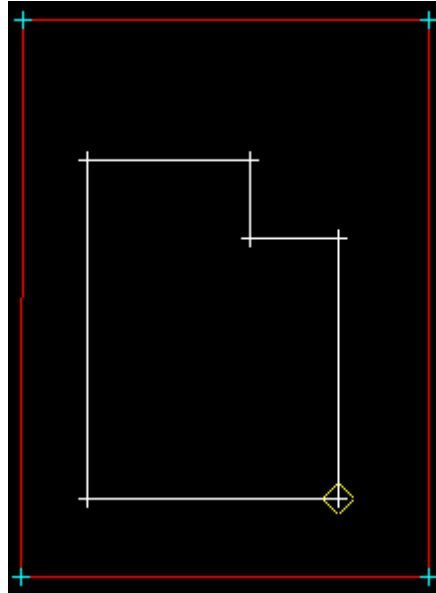
Position of option on menu: Strings =>CAD =>Points =>Chainage

or by selection of appropriate icon from the toolbar. 

This option creates a new point at the position of a user specified chainage of an existing string. On selecting Chainage, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the 12d Model application window.

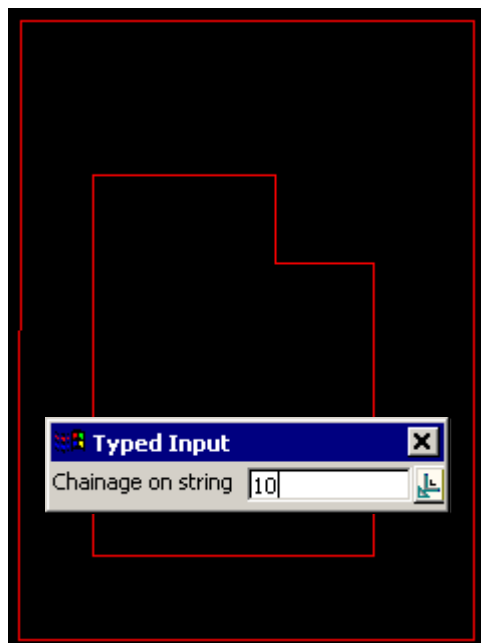
STEP 1:

The user selects a valid string (left mouse button) and accepts that string (Middle mouse button or enter).



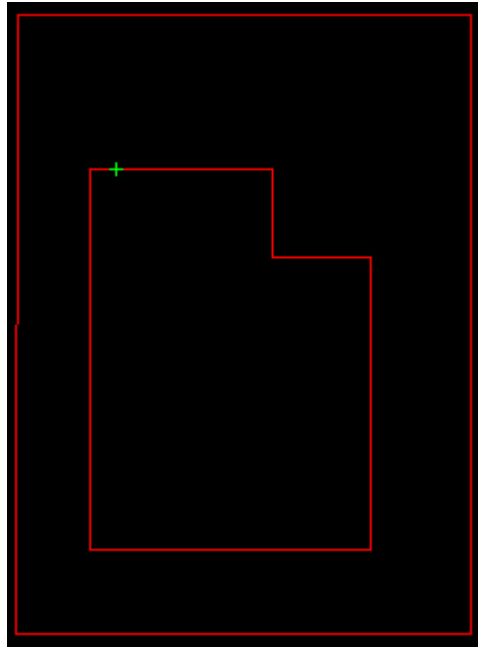
STEP 2:

The user enters a chainage value where a point should be placed followed by the enter key. This chainage is with respect to the selected string.



STEP 3:

A new one point string is created at the positioned on the string at the given chainage.



To create another point, the user is prompted for the string as per **STEP 1**.

Locate by Bearing/Distance

Cad_Point_Locate_Bearing_Distance

Position of option on menu: Strings =>CAD =>Points =>Bearing distance

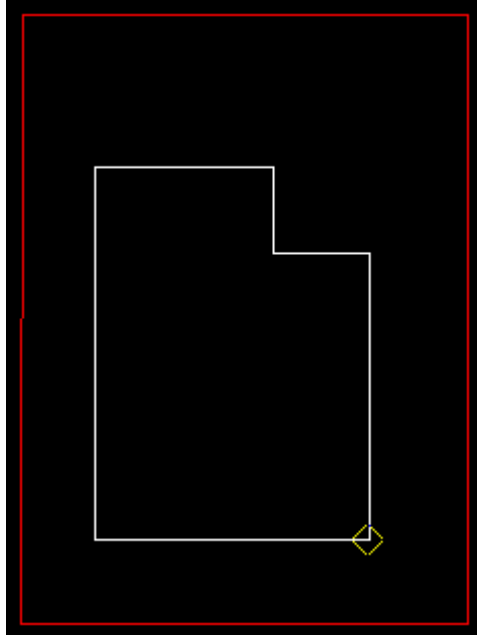
or by selection of appropriate icon from the toolbar. 

This option calculates a point string that is located a given bearing and distance from a start position.

On selecting Bearing/distance, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the 12d Model application window.

STEP 1:

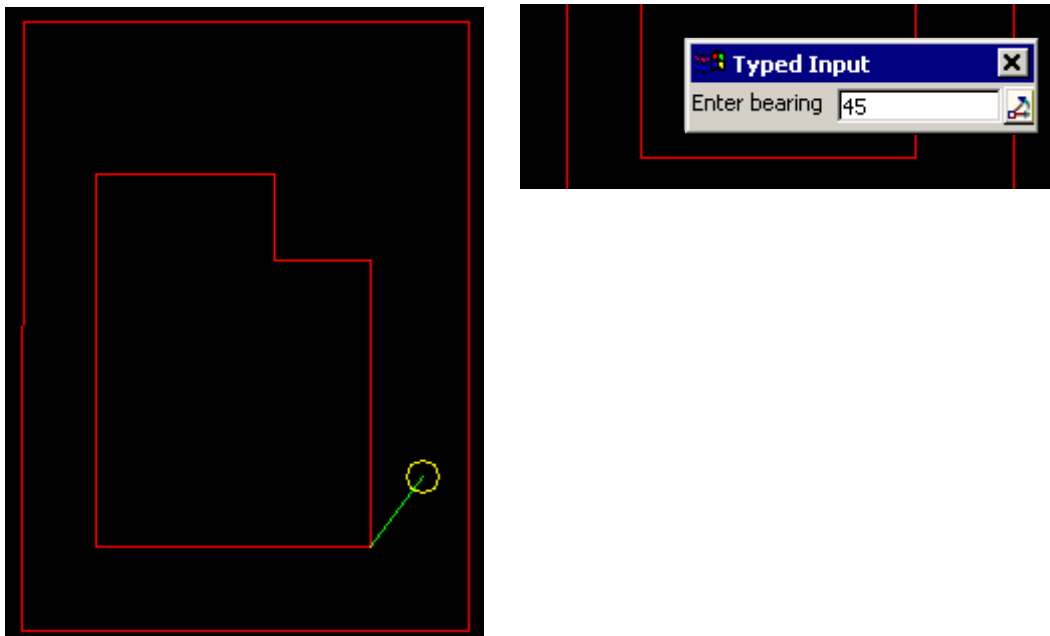
A start position is selected and accepted.

**STEP 2:**

A bearing is selected with the mouse or entered in via the keyboard. For typed entry, simply start typing or press the space bar to bring up the bearing entry box. The value is entered into the input box followed by the enter key.

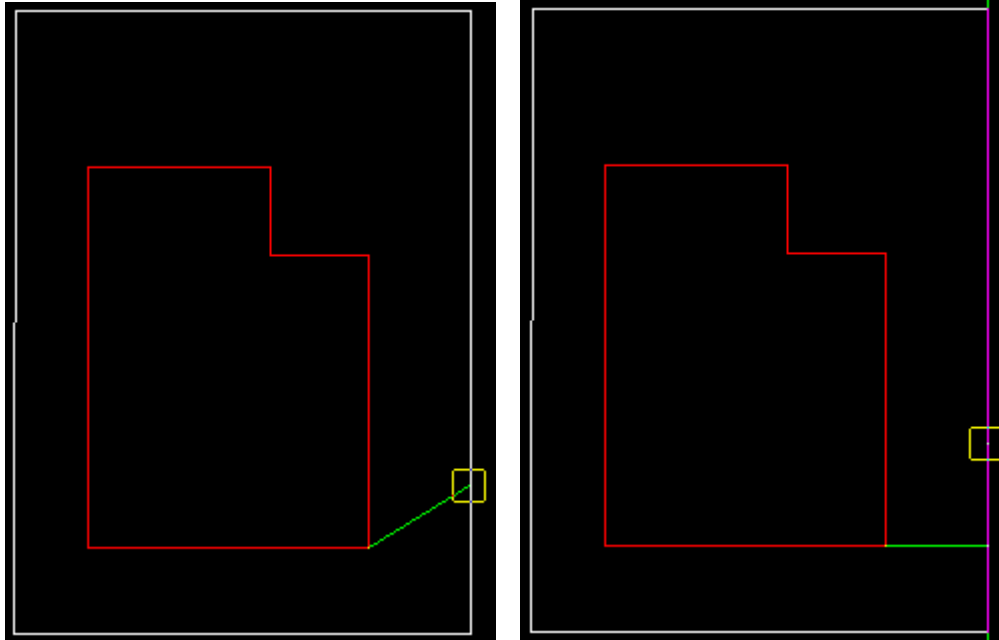
The line drawn represents the bearing value and changes with movement of the mouse. If the user wants to see what the current value of the bearing is, simply press the **D** key (dynamic value). This puts the value into the input box where it can be accepted to create the point or the input box can be closed and the rubber banding (graphically changing) of the bearing continued.

Note: The **Page up** and **page down** keys can be used when the input angle box comes up to add or subtract intervals of 90 degrees.



This option also allows the definition of the bearing by the selection of the 2nd point

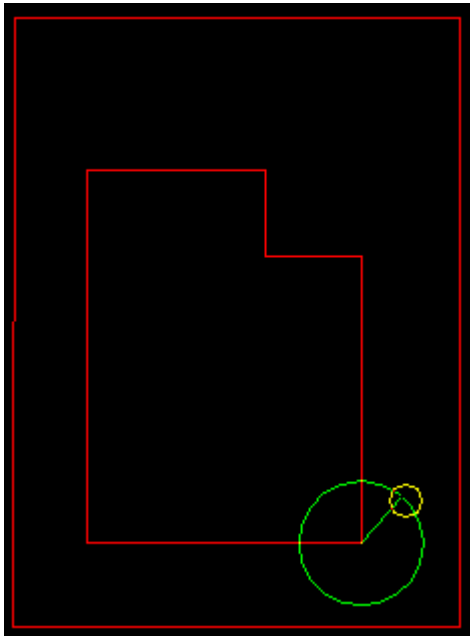
perpendicular or tangential to a selected segment. For this, the line snap should be on. The user selects the segment (line or arc) and then by pressing **P** for perpendicular or **T** for tangential a solution is shown. As there is often two solutions with respect to arcs, the user can move the mouse to change from one solution to the next. The example shown below is the perpendicular case.



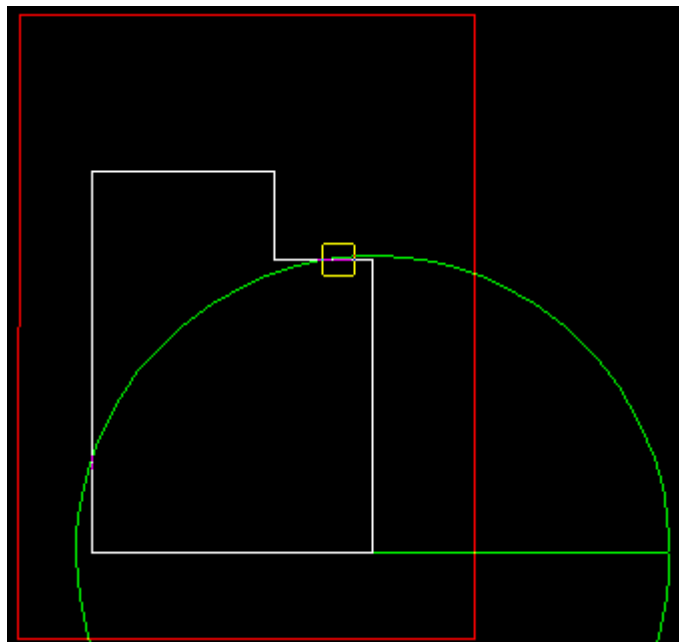
STEP 3:

A distance is selected and accepted with the mouse or entered in via the keyboard. For typed entry, simply start typing or press the space bar to bring up the distance entry box. The value is entered into the input box followed by the enter key.

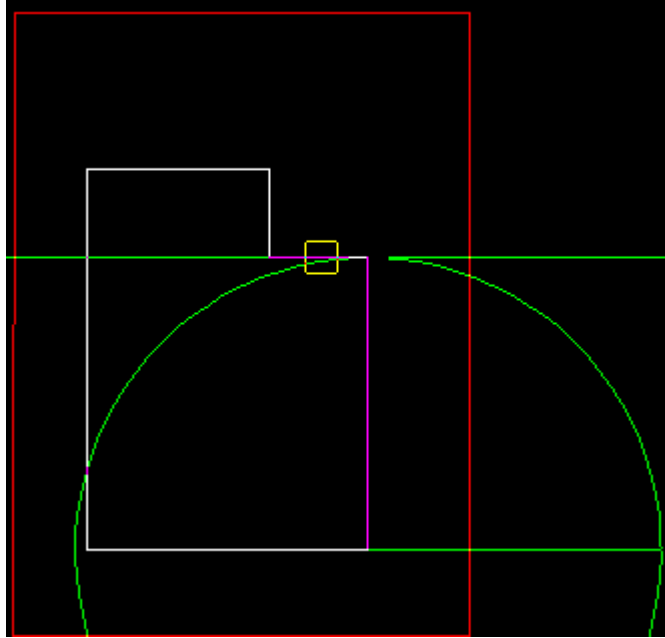
The circle drawn represents the distance value and changes with movement of the mouse. If the user wants to see what the current value of the distance is, simply press the **D** key (dynamic value). This puts the value into the input box where it can be accepted to create the point or the input box can be closed and the rubber banding (graphically changing) of the circle continued.



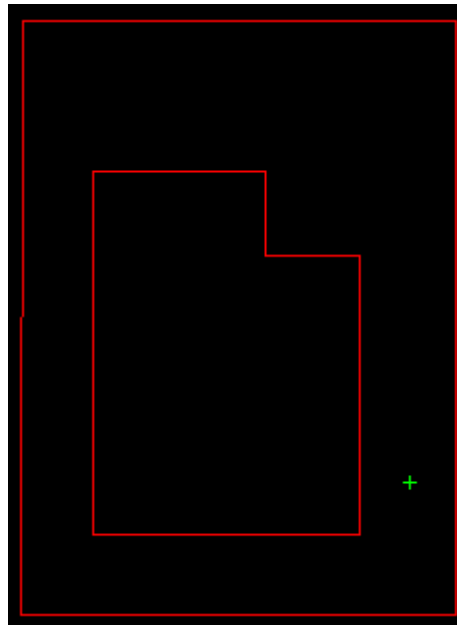
This option also allows the definition of the distance by the selection of the 2nd point perpendicular or tangential to a selected segment. For this, the line snap should be on. The user selects the segment (line or arc) and then by pressing **P** for perpendicular or **T** for tangential a solution is shown. As there is often two solutions with respect to arcs, the user can move the mouse to change from one solution to the next. The example shown below is the perpendicular case.



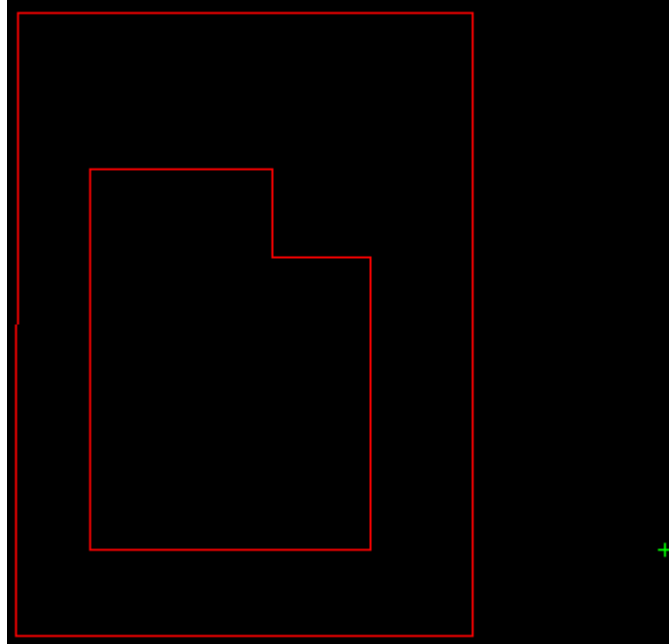
The perpendicular distance shown below by the purple line will be use at the defined bearing to create the point.

**STEP 4:**

A point string is created using the information supplied. By entry into the input boxes:



Or by using the perpendicular/tangential tools:



Create an Offset Point

Cad_Point_Locate_Offset

Position of option on menu: Strings =>CAD =>Points =>Offset

or by selection of appropriate icon from the toolbar. 

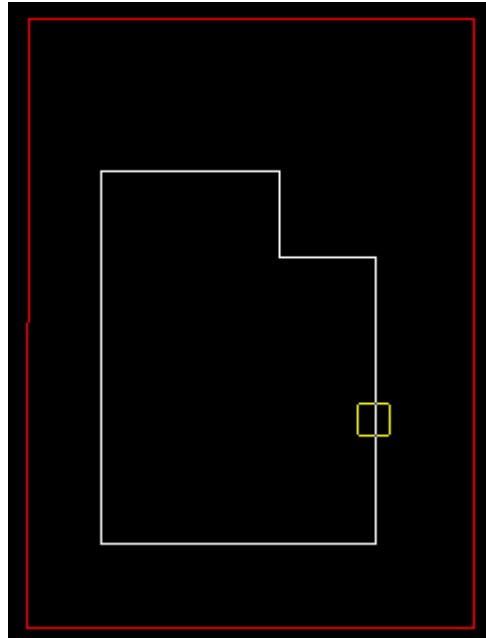
This option creates a one point string that is located by reference to a string, a control point, a chainage distance along the string from the control point and an offset to the selected string.

After selection and acceptance of a string, a control point is selected and accepted. This point is dropped perpendicular onto the string. The distance along the string is measured from this dropped point. Positive distances are in the direction that the string was picked. Finally a offset to the string can be specified for the placement of the new point string.

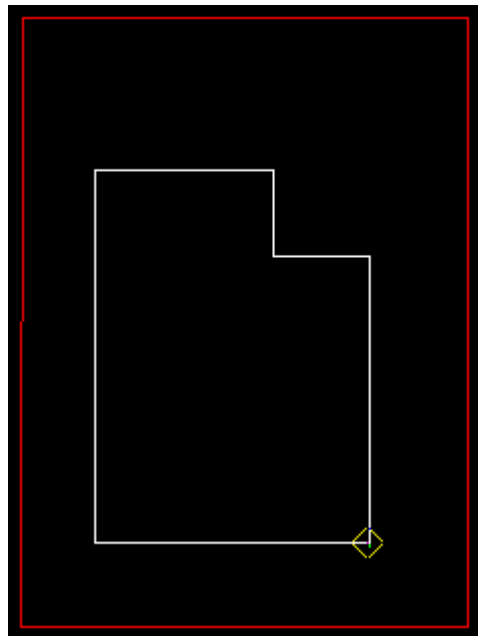
On selecting Offset, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the 12d Model application window.

STEP 1:

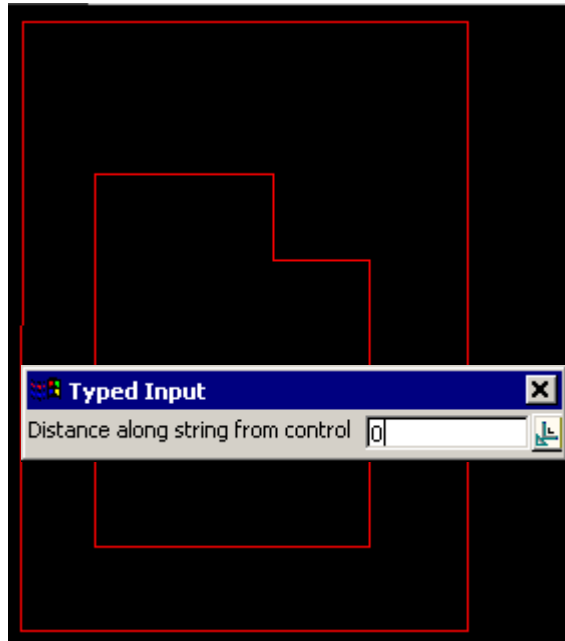
The user selects and accepts a string with direction. This defines what side the offset applies to.

**STEP 2:**

The user picks and accepts a control point to be dropped onto the selected string.

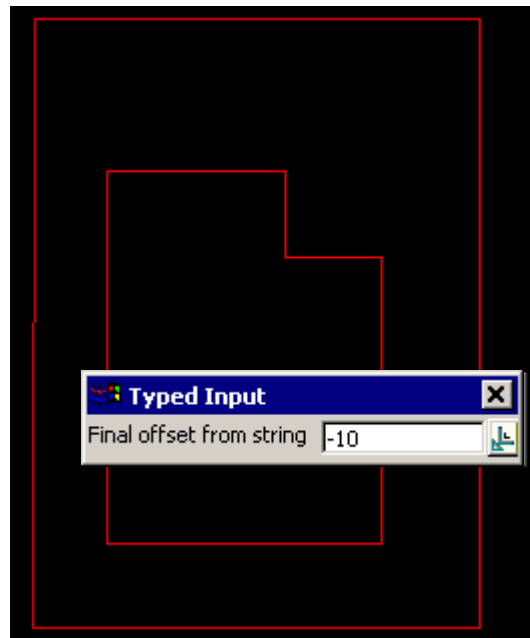
**STEP 3:**

A distance along from the dropped point is specified. Positive distances are in the direction of the string selection pick. The value is entered into the input box followed by the enter key.



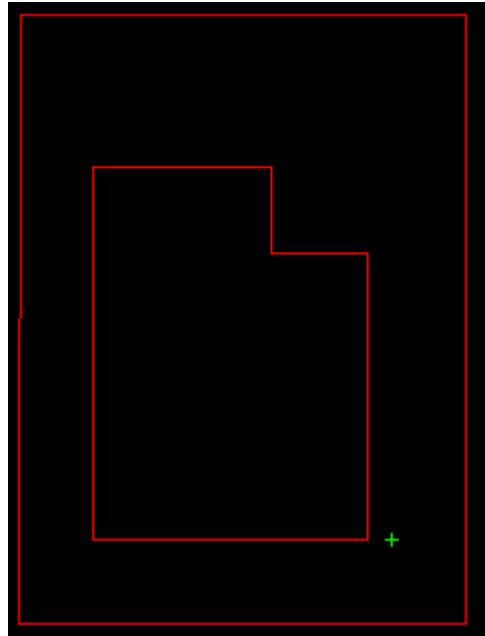
STEP 4:

An offset relative to the selected string (and direction) is specified in the input box followed by the enter key.



STEP 5:

A point string is created using the information supplied.



Create a Deflection Point

Cad_Point_Locate_Deflection

Position of option on menu: Strings =>CAD =>Points =>Deflection

or by selection of appropriate icon from the toolbar. 

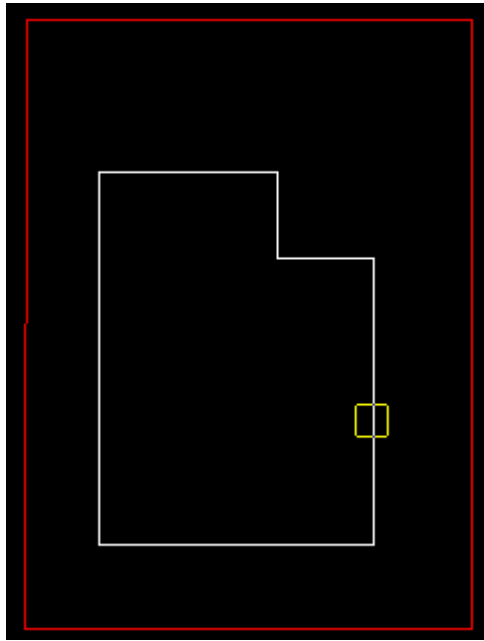
This option creates a one point string that is located by reference to a string, a control point, a distance along the string from the control point, a deflection angle and deflection distance.

After selection of a string, a control point is selected. This point is dropped perpendicular onto the string. A distance along the string can be entered to move the measure point. Positive distances are in the direction that the string was picked. A deflection angle is specified which is a clockwise angle from the measure point. The deflection distance is the distance from the measure point to the point which is to be created.

On selecting Deflection, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the 12d Model application window.

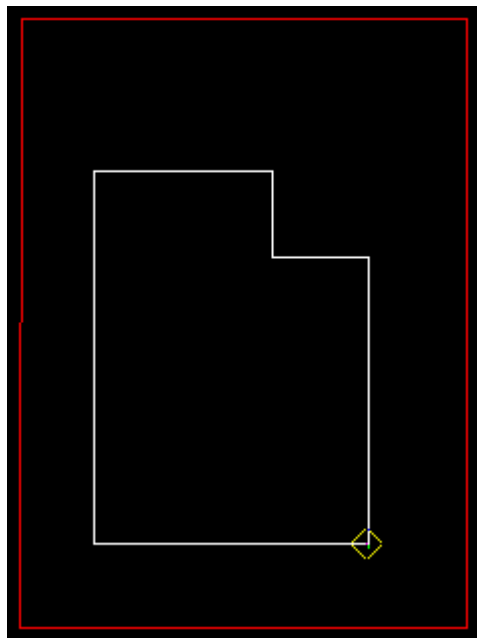
STEP 1:

The user selects and accepts a string with direction.



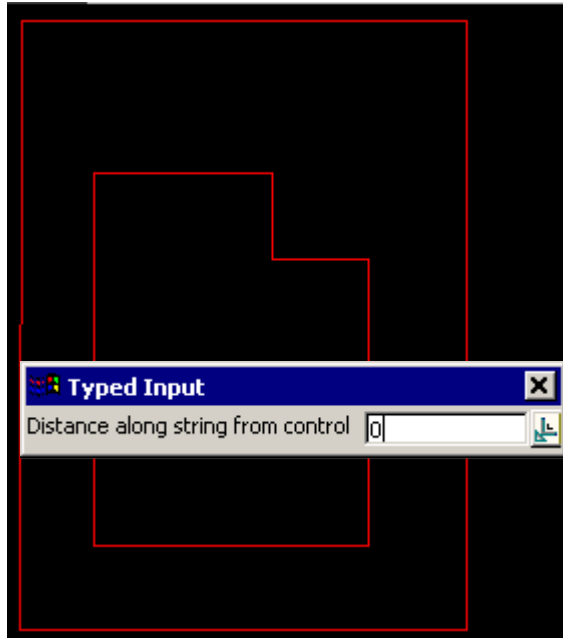
STEP 2:

The user picks and accepts a control point to be dropped onto the selected string.



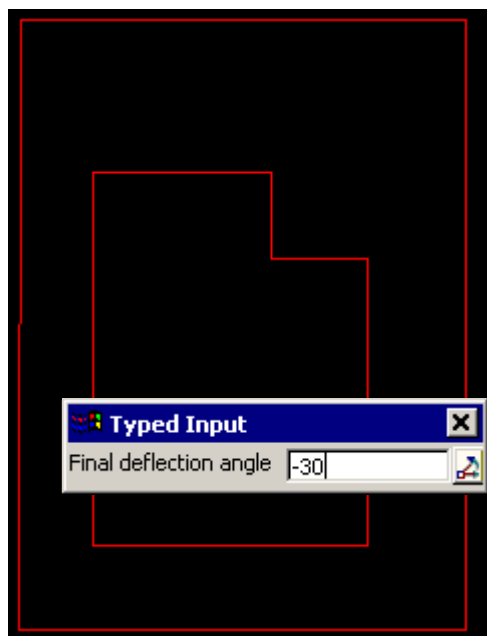
STEP 3:

A distance along from the dropped point is specified. Positive distances are in the direction of the string selection pick. The value is entered into the input box followed by the enter key.

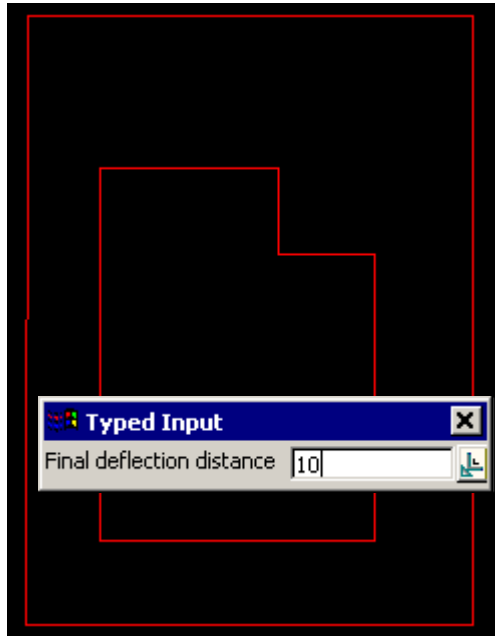
**STEP 4:**

A deflection angle is specified. This angle is clockwise, relative to the direction of the string selection pick. The value is entered into the input box followed by the enter key.

Note: The Page up and page down keys can be used when the input angle box comes up to add or subtract intervals of 90 degrees.

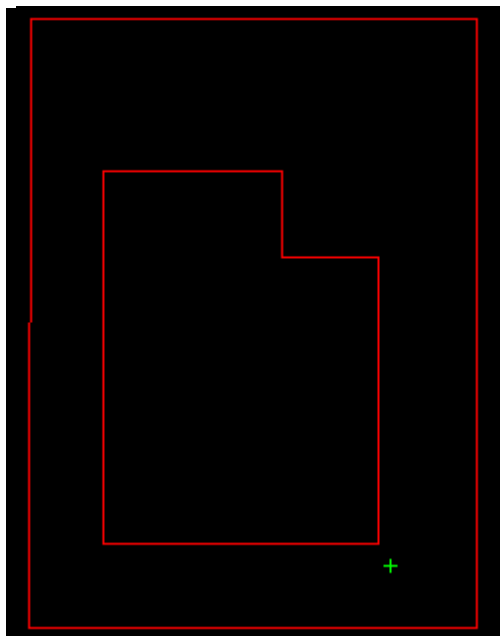
**STEP 5:**

A deflection distance is supplied. Positive is in the direction of the string selection pick. The value is entered into the input box followed by the enter key.



STEP 6:


A point string is created using the information supplied.



Drop Perpendicular

Cad_Point_Locate_Perpendicular

Position of option on menu: Strings =>CAD =>Points =>Perpendicular

or by selection of appropriate icon from the toolbar. 

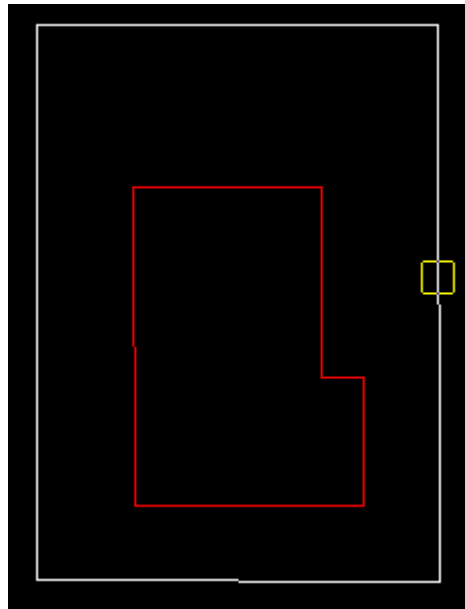
This option creates a one point string by dropping from a user selected position perpendicularly onto a user selected string.

On selecting Perpendicular, the user is prompted for the relevant data in the screen message box

located at the bottom left hand corner of the 12d Model application window.

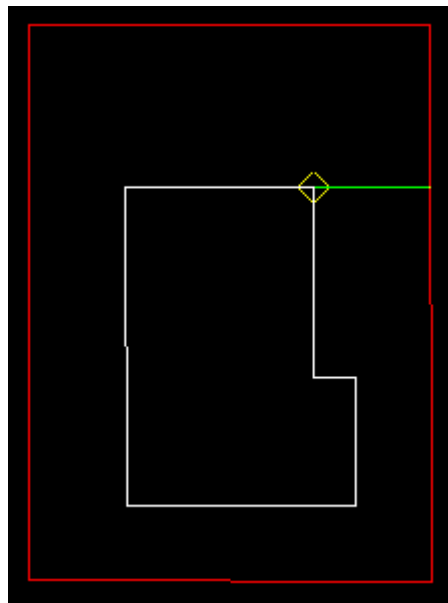
STEP 1:

The user selects a string and accepts (with direction) to have the point dropped onto.



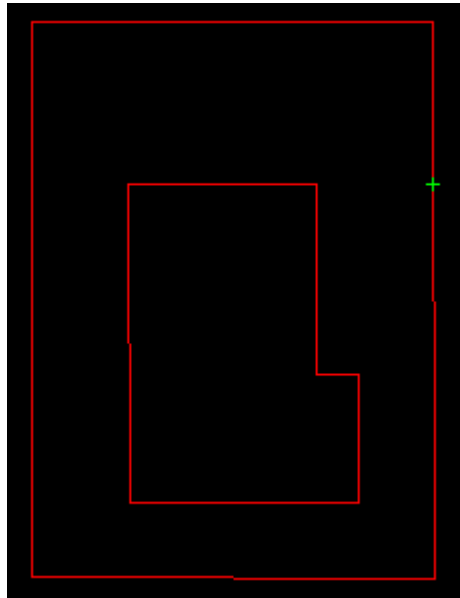
STEP 2:

The user picks and accepts a position to drop onto the nominated string



STEP 3:

A point string is created at the perpendicular drop point.



Projection Locate

Cad_Point_Locate_Projection

Position of option on menu: Strings =>CAD =>Points =>Projection

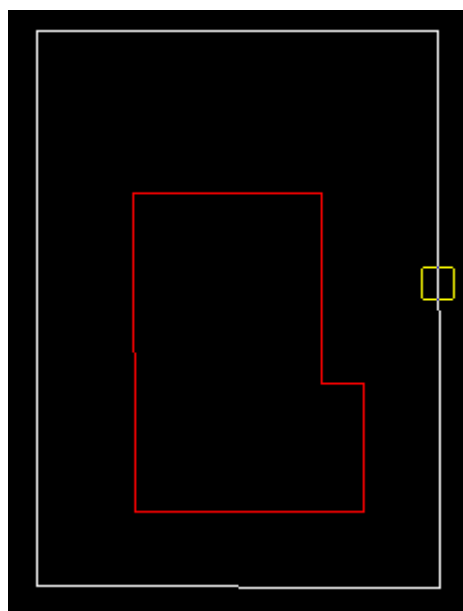
or by selection of appropriate icon from the toolbar. 

This option creates a one point string that is located by firstly dropping a point onto a string and then giving a distance along the string from the dropped point.

On selecting Projection, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the 12d Model application window.

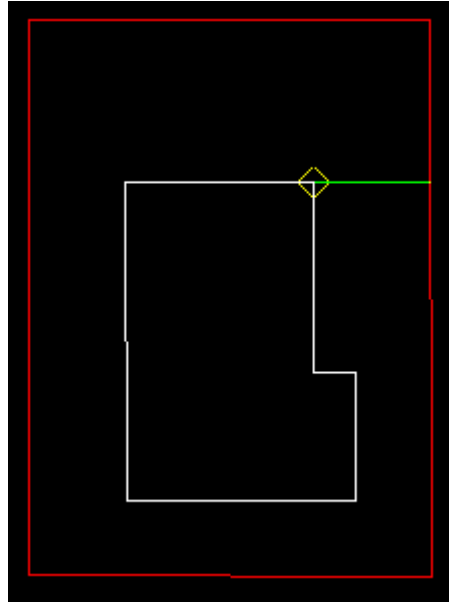
STEP 1:

The user selects and accepts a string (with direction) to have the point dropped onto

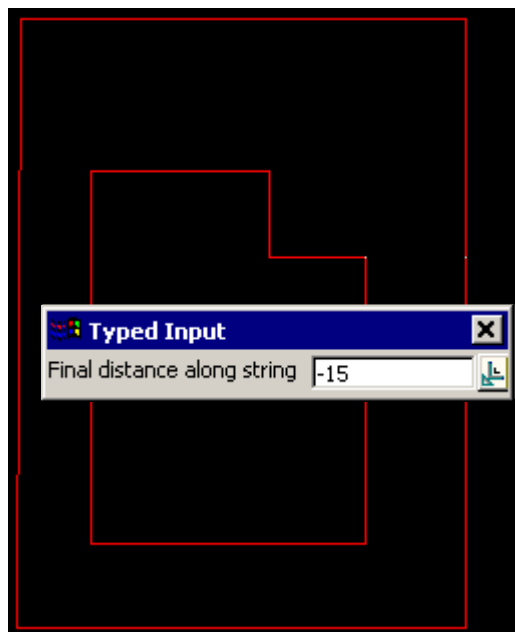


STEP 2:

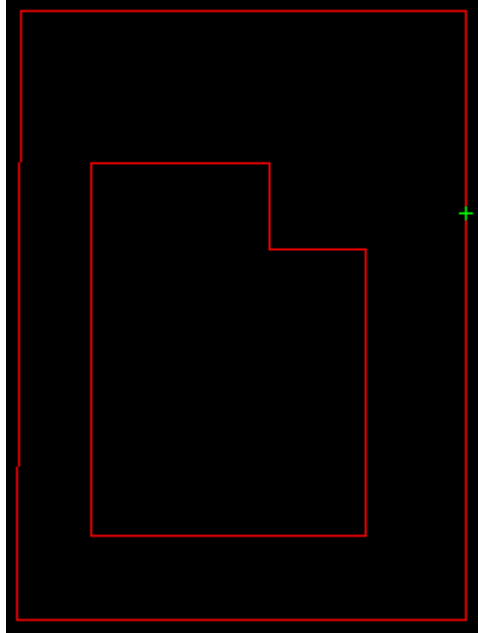
The user picks and accepts a position to drop onto the nominated string

**STEP 3:**

The user is prompted for the distance along the string. Positive distances are in the direction that the string was picked. A value is entered into the input box followed by the enter key.


**STEP 4:**

The point string is created the nominated distance along the string from the dropped point.



Between Points

Cad_Point_Between_Points

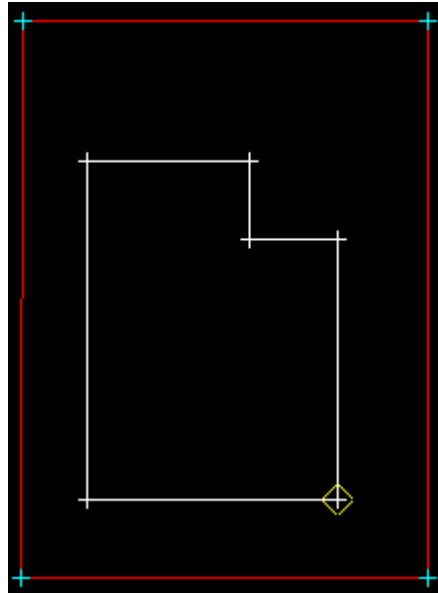
Position of option on menu: Strings =>CAD =>Points =>Between points
or by selection of appropriate icon from the toolbar. 

This option creates a one point string that is on the line between two selected positions and a given distance from the first point.

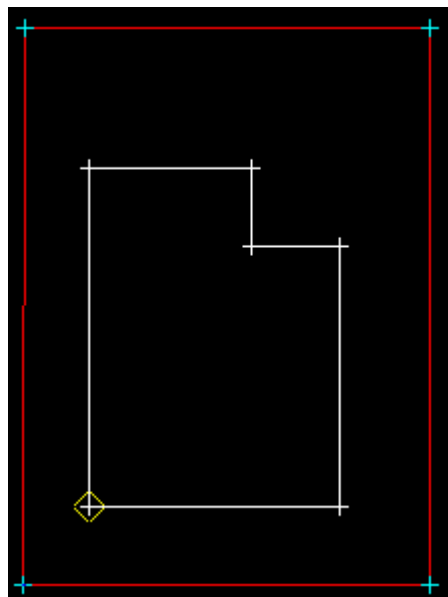
On selecting Between points, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the 12d Model application window.

STEP 1:

The user selects a start point. Specification of a position can be done by the direct input of the xyz coordinate of the point by pressing the space bar to bring up the enter XYZ panel or by typing of the value to bring up the XYZ panel. The user can also select a point with the mouse and accepts that point (Middle mouse button or enter).

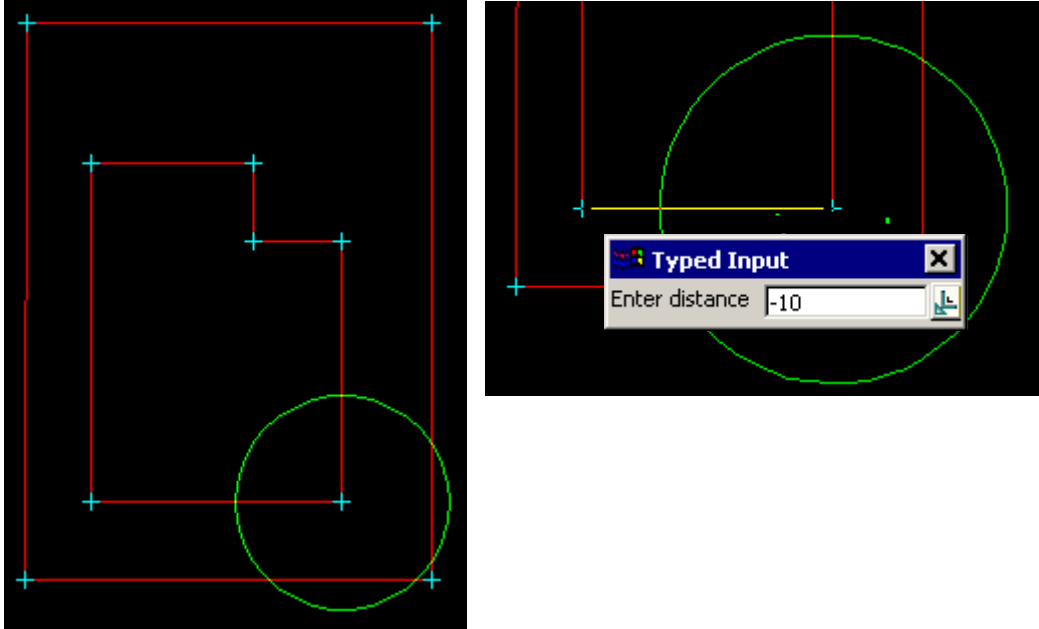
**STEP 2:**

The user picks a 2nd point and accepts that point (Middle mouse button or enter) to define the reference line.

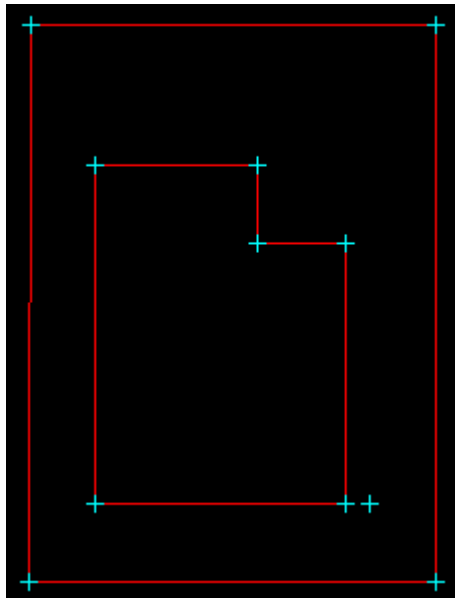
**STEP 3:**


A distance from the 1st point to create the point is given either by selection with the mouse or by typing a value. To type a value, simply start typing and the input box for the distance will appear. Alternatively you can press the space bar to bring up the input box. Enter the value and then the enter key.

The circle drawn represents the distance value and changes with movement of the mouse. If the user wants to see what the current value of the distance is, simply press the **D** key (dynamic value). This puts the value into the input box where it can be accepted to create the point or the input box can be closed and the rubber banding (graphically changing) of the circle continued.

**STEP 4:**

A point is created on the segment specified by the selection of the 1st and 2nd points, at the nominated distance. Negative distances can be entered as in this example.

**Between Points (3d)****Cad_Point_Between_Points_3d**

Position of option on menu: Strings =>CAD =>Points =>Between points
or by selection of appropriate icon from the toolbar. 

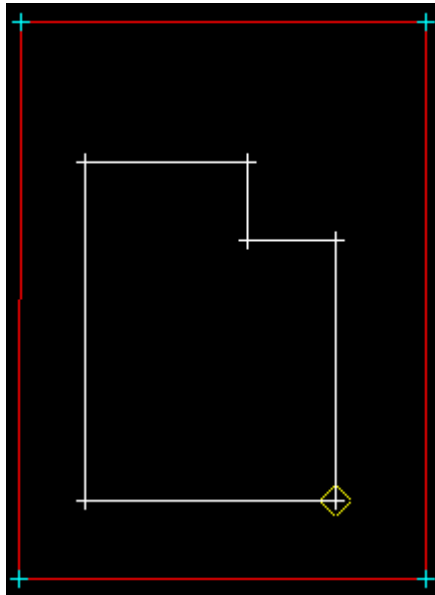
This option creates a one point string that is on the line between two selected positions and a given distance from the first point. The z-value of the string is interpolated from the two selected positions.

On selecting Between points (3d), the user is prompted for the relevant data in the screen

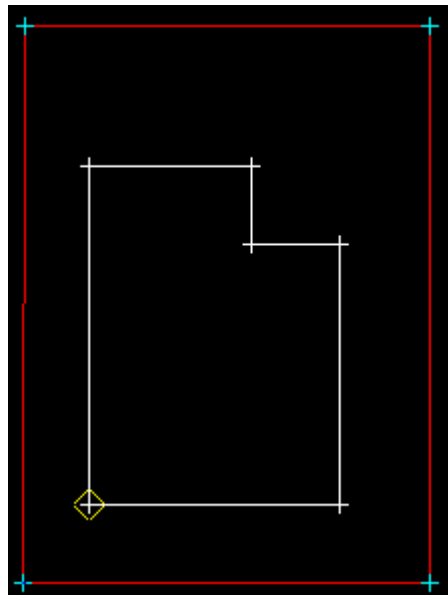
message box located at the bottom left hand corner of the 12d Model application window.

STEP 1:

The user selects a start point. Specification of a position can be done by the direct input of the xyz coordinate of the point by pressing the space bar to bring up the enter XYZ panel or by typing of the value to bring up the XYZ panel. The user can also select a point with the mouse and accepts that point (Middle mouse button or enter).

**STEP 2:**

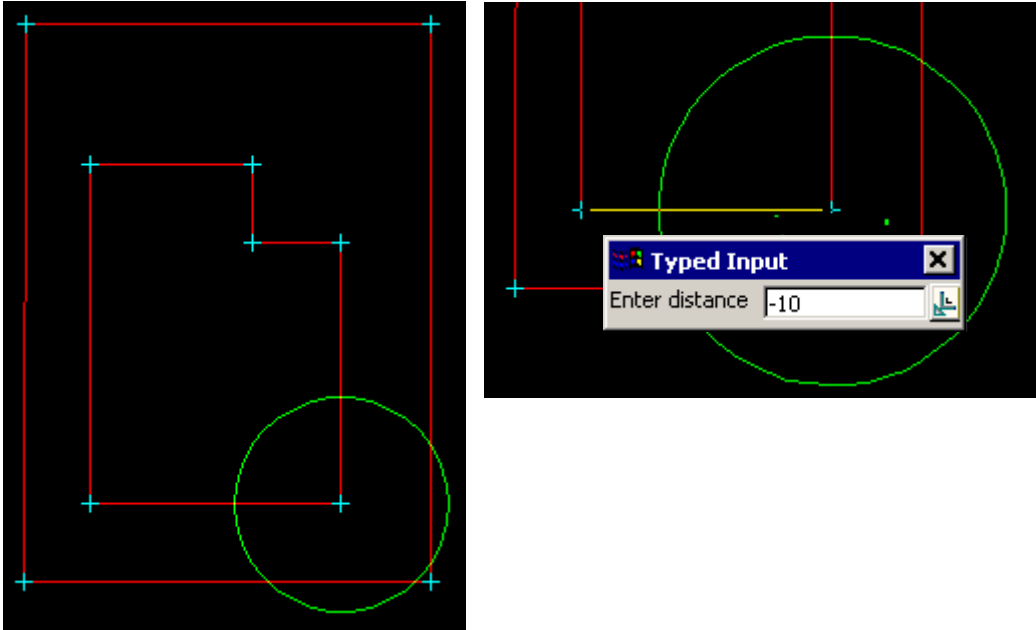
The user picks a 2nd point and accepts that point (Middle mouse button or enter) to define the reference line.

**STEP 3:**

A distance from the 1st point to create the point is given either by selection with the mouse or by typing a value. To type a value, simply start typing and the input box for the distance will appear. Alternatively you can press the space bar to bring up the input box. Enter the value and

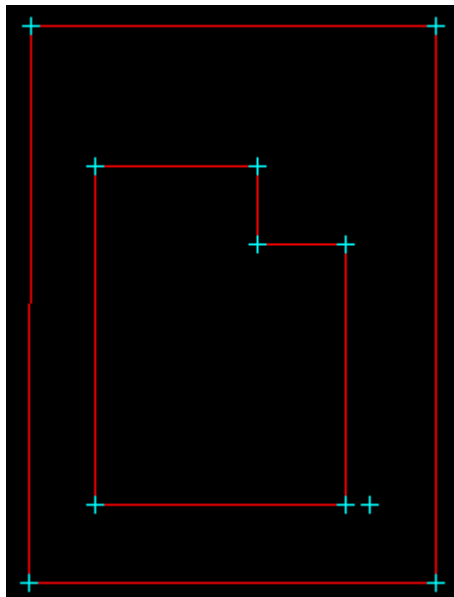
then the enter key.

The circle drawn represents the distance value and changes with movement of the mouse. If the user wants to see what the current value of the distance is, simply press the **D** key (dynamic value). This puts the value into the input box where it can be accepted to create the point or the input box can be closed and the rubber banding (graphically changing) of the circle continued.



STEP 4:


A point is created on the segment specified by the selection of the 1st and 2nd points, at the nominated distance. Negative distances can be entered as in this example.



Radiation

`cad_radiation`

Position of option on menu: Strings =>CAD =>Points =>Radiation

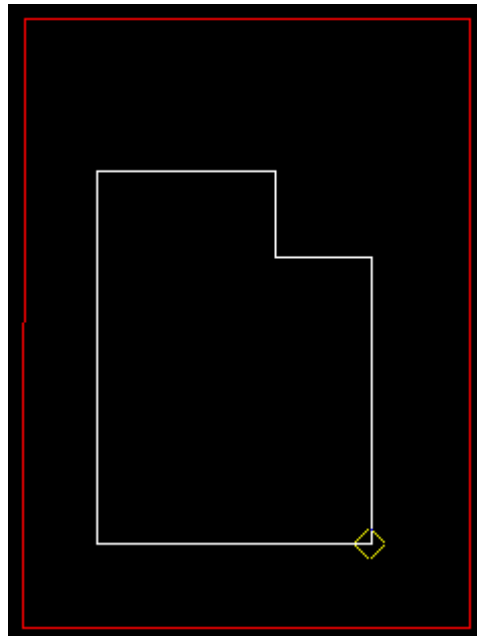
or by selection of appropriate icon from the toolbar. 

This option creates a series of one point strings that are located by given bearings and distances from a chosen start position.

On selecting Radiation, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the 12d Model application window.

STEP 1:

A start position is selected and accepted.

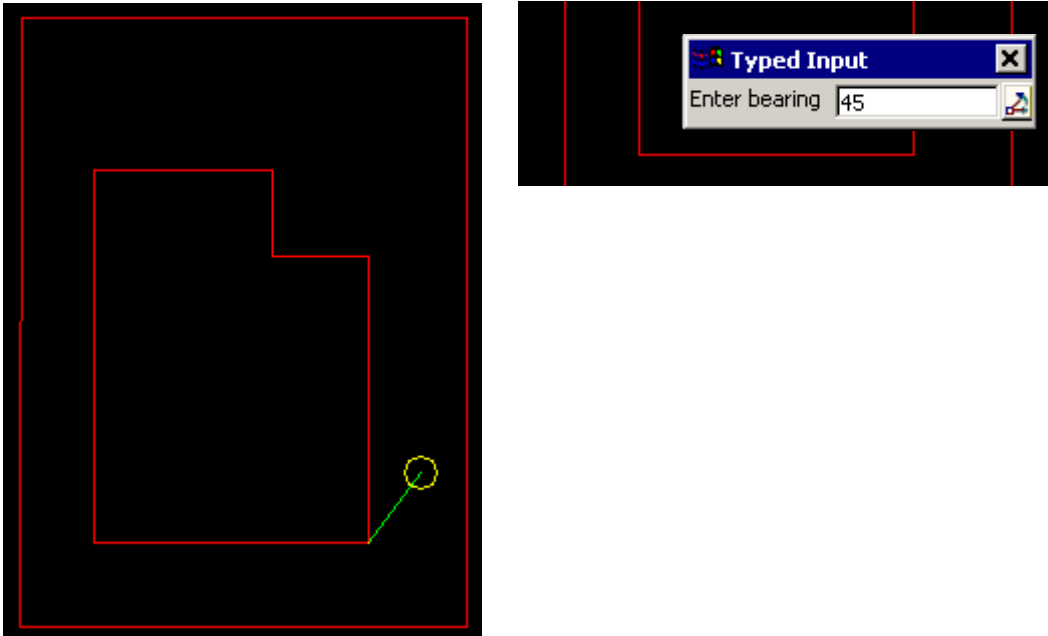


STEP 2:

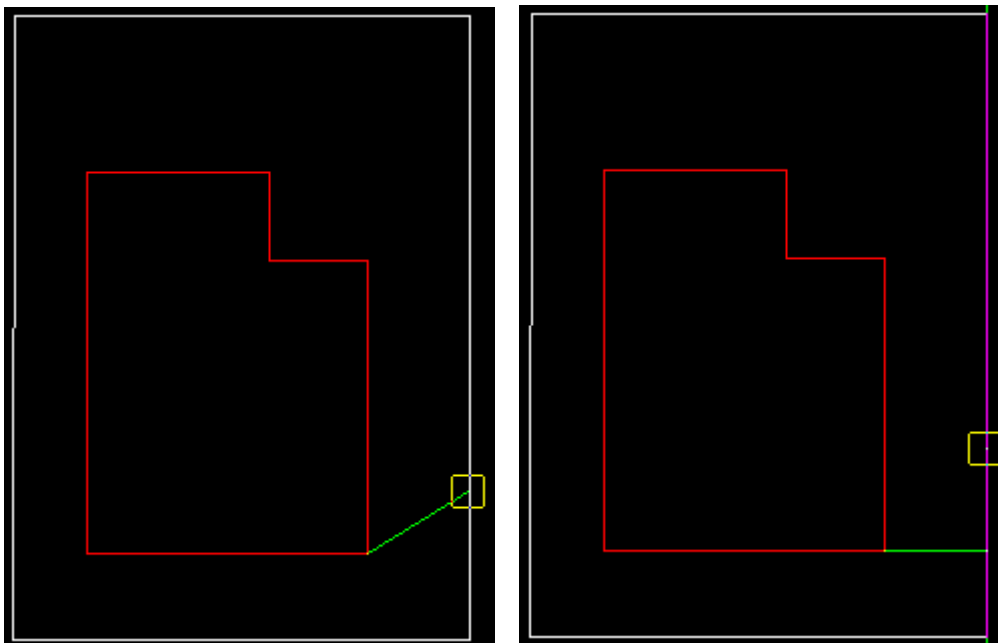
A bearing is selected with the mouse or entered in via the keyboard. For typed entry, simply start typing or press the space bar to bring up the bearing entry box. The value is entered into the input box followed by the enter key.

The line drawn represents the bearing value and changes with movement of the mouse. If the user wants to see what the current value of the bearing is, simply press the **D** key (dynamic value). This puts the value into the input box where it can be accepted to create the point or the input box can be closed and the rubber banding (graphically changing) of the bearing continued.

Note: The Page up and page down keys can be used when the input angle box comes up to add or subtract intervals of 90 degrees.



This option also allows the definition of the bearing by the selection of the 2nd point perpendicular or tangential to a selected segment. For this, the line snap should be on. The user selects the segment (line or arc) and then by pressing **P** for perpendicular or **T** for tangential a solution is shown. As there is often two solutions with respect to arcs, the user can move the mouse to change from one solution to the next. The example shown below is the perpendicular case.

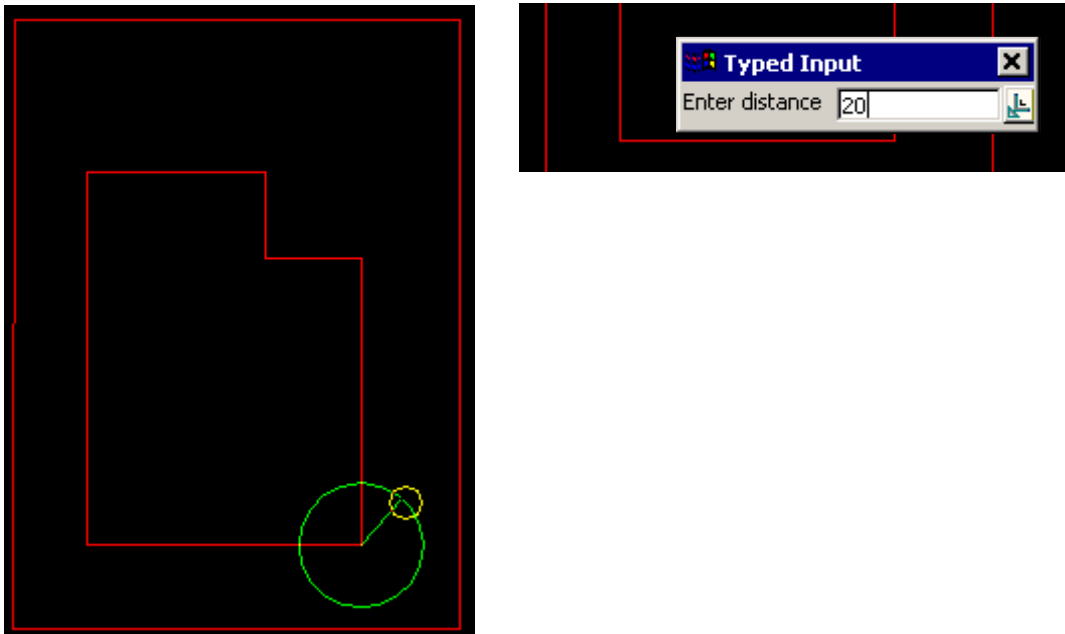


STEP 3:

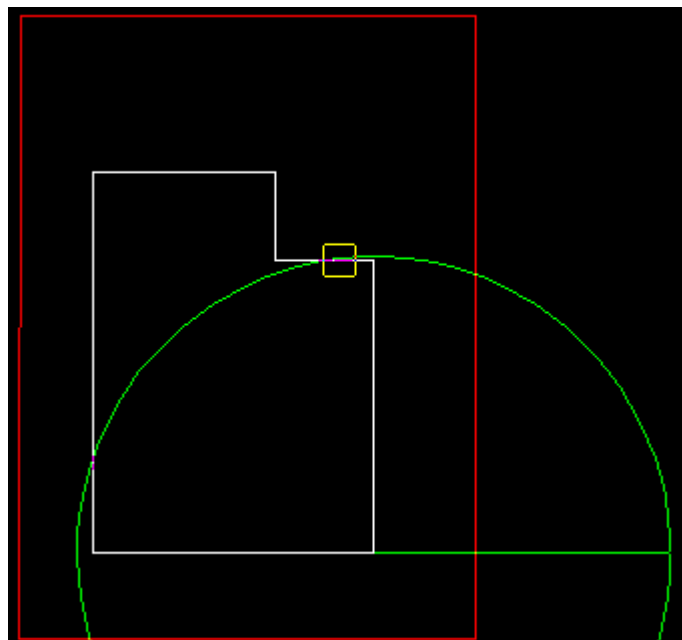
A distance from the start point to create the point is given either by selection with the mouse or by typing a value. To type a value, simply start typing and the input box for the distance will appear. Alternatively you can press the space bar to bring up the input box. The value is entered into the input box followed by the enter key.

The circle drawn represents the distance value and changes with movement of the mouse. If the user wants to see what the current value of the distance is, simply press the **D** key (dynamic

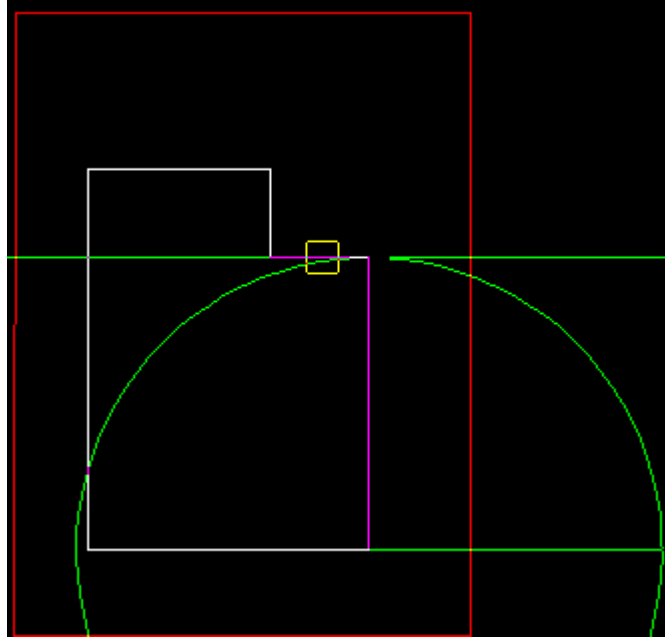
value). This puts the value into the input box where it can be accepted to create the point or the input box can be closed and the rubber banding (graphically changing) of the circle continued.



This option also allows the definition of the distance by the selection of the 2nd point perpendicular or tangential to a selected segment. For this, the line snap should be on. The user selects the segment (line or arc) and then by pressing **P** for perpendicular or **T** for tangential a solution is shown. As there is often two solutions with respect to arcs, the user can move the mouse to change from one solution to the next. The example shown below is the perpendicular case.

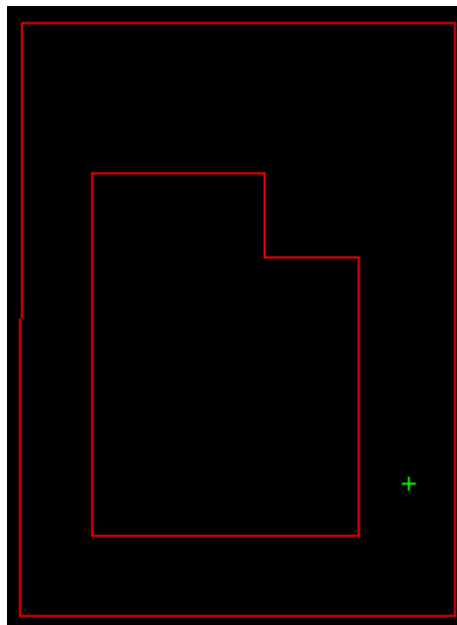


The perpendicular distance shown below by the purple line will be use at the defined bearing to create the point.



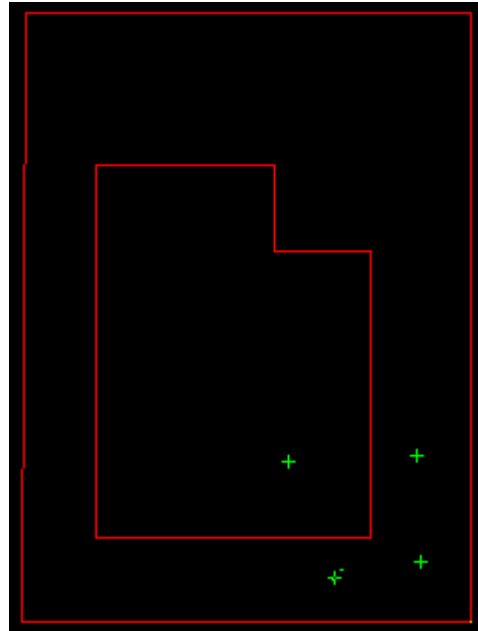
STEP 4:

A point string is created using the information supplied.




STEP 5

The next bearing and distance is prompted for as per step 3 and 4. Consequent points are created from the original start point selected.



Divide Segment by Number

`cad_divide_segment_by_number`

Position of option on menu: Strings =>CAD =>Points =>Divide segment by number
or by selection of appropriate icon from the toolbar. 

This option creates one point strings which will break up a super string *segment* into equal pieces based on a user given number of intervals. The first and last points are not created since they are taken to be the end points of the selected segment. So for five intervals, four new one point strings are created. The option works for line or arc segments of a super string.

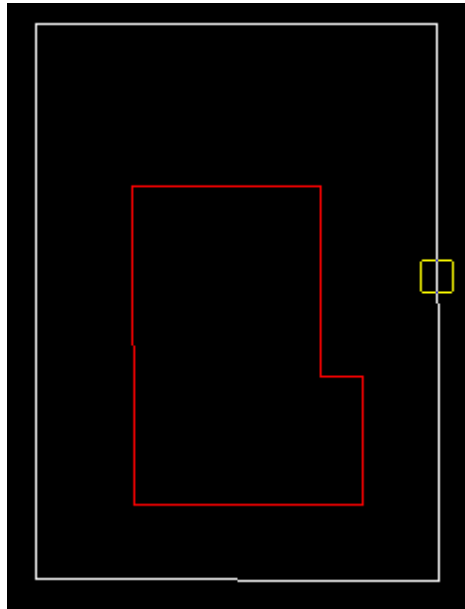
NOTES:

1. No vertices are inserted into the selected super string - the option *Strings =>Strings edits =>Segment strings* does that.
2. This option is for super strings only.

On selecting Divide segment by number, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the 12d Model application window.

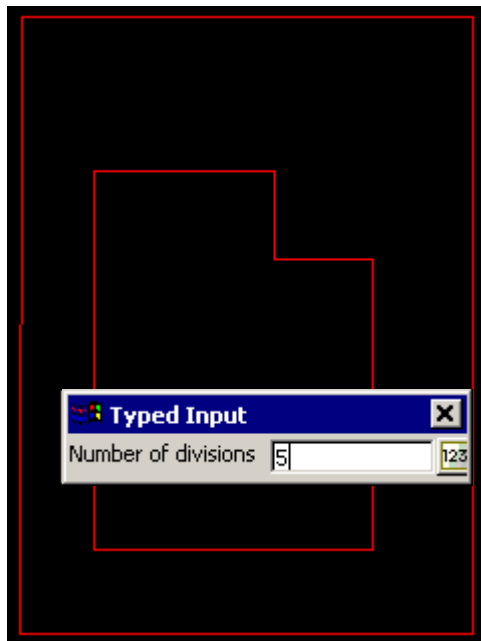
STEP 1:

A super string segment is selected and accepted.



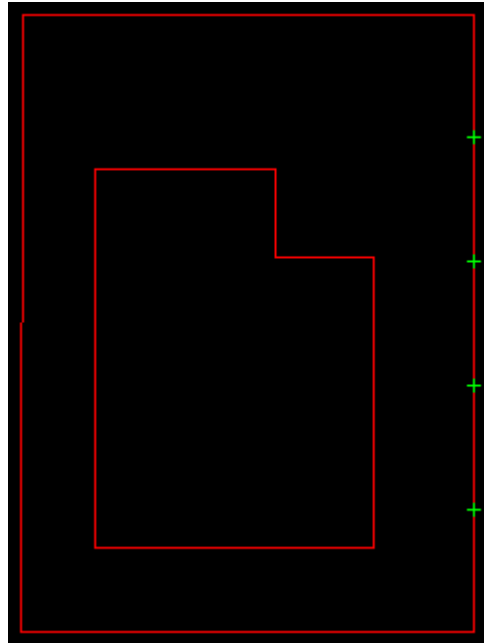
STEP 2:

The user is prompted for the number of divisions. The value is entered into the input box followed by the enter key.




STEP 3:

Given the above information, the new points are created.



Divide Segment by Chainage Length

`cad_divide_segment_by_chainage_length`

Position of option on menu: Strings =>CAD =>Points =>Divide segment by chainage length or by selection of appropriate icon from the toolbar. 

This option creates one point strings which will break up a super string **segment** into pieces based on a user given chainage length. The process starts from the 1st point of the segment and continues until no more pieces can be created without going past the last point of the segment (the last piece may not be the correct length). This options works for line or arc segments of a super string.

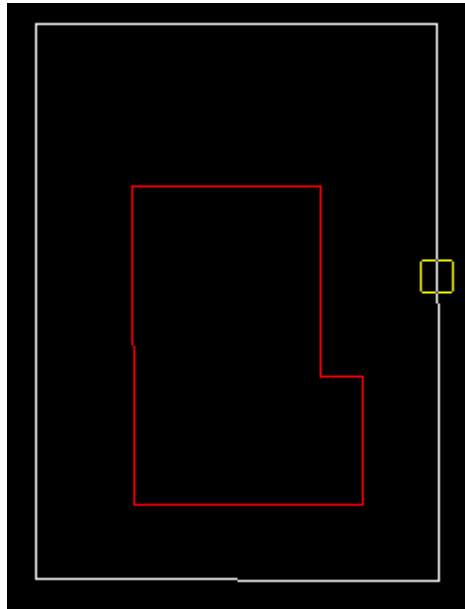
NOTES:

1. No vertices are inserted into the selected super string - the option *Strings =>Strings edits =>Segment strings* does that.
2. This option is for super strings only.

On selecting Divide segment by chainage length, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the 12d Model application window.

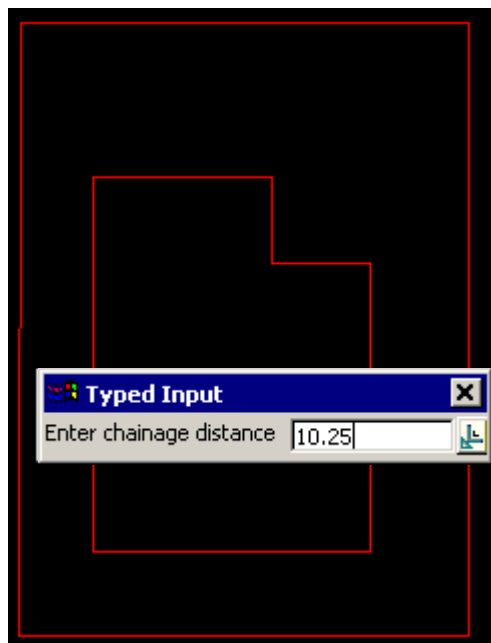
STEP 1:

A super string segment is selected and accepted.



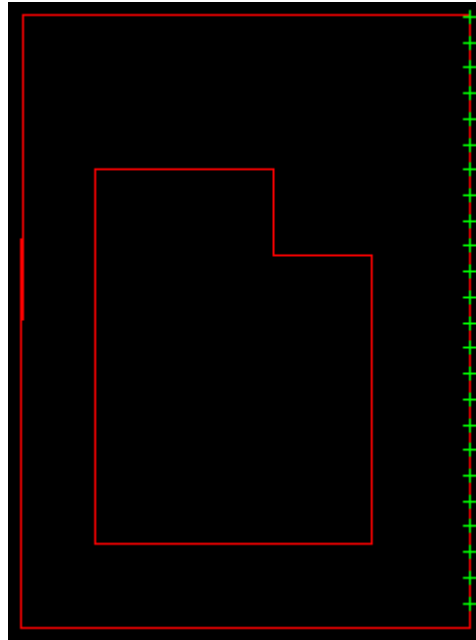
STEP 2:

The user is prompted for the chainage distance. The value is entered into the input box followed by the enter key.



STEP 3:

Given the above information, the new points are created.



Divide String by Number

Cad_Divide_String_by_Number

Position of option on menu: Strings =>CAD =>Points =>Divide string by number

or by selection of appropriate icon from the toolbar. 

This option creates one point strings which will break up a super string into equal pieces based on a user given number of divisions. The first and last points are not created since they are taken to be the end points of the selected string. So for five intervals, four new one point strings are created.

NOTES:

1. No vertices are inserted into the selected super string - the option *Strings =>Strings edits =>Segment strings* does that.
2. This option is for super strings only.

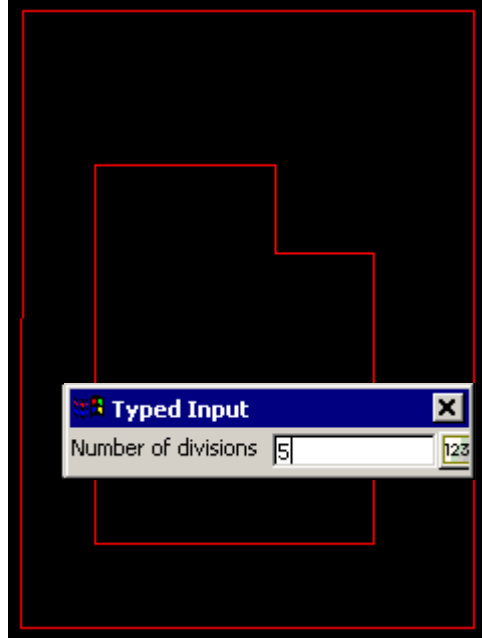
On selecting Divide string by number, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the 12d Model application window.

STEP 1:

A super string is selected and accepted.

STEP 2:


The user is prompted for the number of divisions. The value is entered into the input box followed by the enter key.

**STEP 3:**

Given the above information, the new points are created.

Divide String by Chainage Length

Cad_Divide_String_by_Chainage_Length

Position of option on menu: Strings =>CAD =>Points =>Divide string by chainage length
or by selection of appropriate icon from the toolbar. 

This option creates one point strings which will break up a *super string* into pieces based on a user given chainage length. The process starts from the 1st vertex of the strings and continues until no more pieces can be created without going past the last vertex of the string (the last piece may not be the correct length).

NOTES:

1. No vertices are inserted into the selected super string - the option *Strings =>Strings edits =>Segment strings* does that.
2. This option is for super strings only.

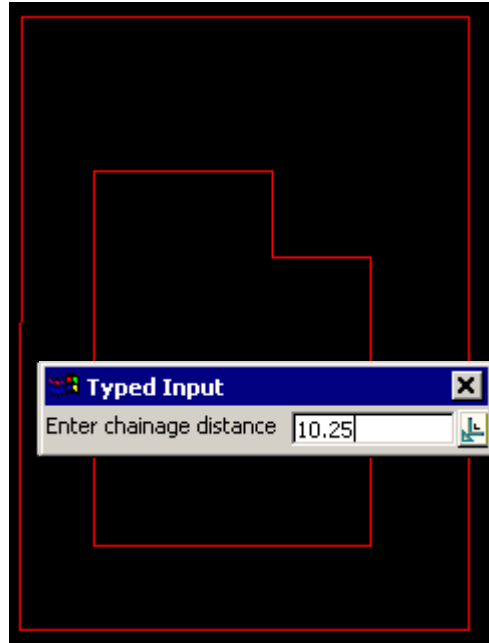
On selecting Divide string by chainage length, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the 12d Model application window.

STEP 1:

A super string is selected and accepted.

STEP 2:

The user is prompted for the chainage distance. The value is entered into the input box followed by the enter key.



STEP 3:

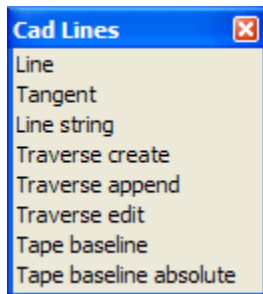
Given the above information, the new points are created.

CAD Lines

cad_lines

Position of option on menu: Strings =>CAD =>Lines

The Lines walk-right menu is



Menu of Options to Create Strings

create a two point (vertex) super string

create tangent to two selected items (points and/or arcs)

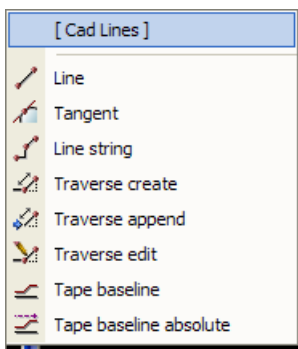
create a many point super string

create many pt super string by bearing distances from previous pt

append to a super string using bearing distance entry

modify the bear/distance of a selected segment

create many pt super str with pts a dist along and dist offset to a




For the option <i>Line</i> , go to the section	"Create Line"
<i>Tangent</i>	"Tangent"
<i>Line String</i>	"Line String"
<i>Traverse</i>	"Traverse"
<i>Traverse append</i>	"Traverse Append"
<i>Traverse edit</i>	"Traverse Edit"
<i>Tape baseline</i>	"Taped Baseline"
<i>Tape baseline absolute</i>	"Taped Baseline Absolute"

Create Line

Cad_Line_2_Positions

Position of option on menu: Strings =>CAD =>Lines =>Line

or by selection of appropriate icon from the toolbar. 

This option creates two vertex super strings with a line between the two vertices.

On selecting Line, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the 12d Model application window.

The user can select a position with the mouse and on accepting that point (Middle mouse button or enter) the point is created at the selected position. The model, colour, height etc. are defined in the **Cad Control Bar**.

The snap mode will influence the mouse selection. For example if cursor snap is on, the user can choose a position not yet defined. If point snap is on and the selection snaps to an existing point, the option will place another point at that location.

The user can also activate the selection menu used with the mouse (right button) that allows various positioning options.

Specification of a position can also be done by the direct input of the xyz coordinate of the point by pressing the space bar to bring up the enter XYZ panel. **NOTE:** The z value will default to the value entered into the **Cad Control Bar** whether or not it is specified in the XYZ box. If no height value exists in the **Cad Control Bar**

The 2nd point is selected in the same way as the 1st point. The line is created after successful selection and acceptance of the 2nd point. The option remains current so that a number of lines can be created.

Line String

Cad_Create_Line_String

Position of option on menu: Strings =>CAD =>Lines =>Line String

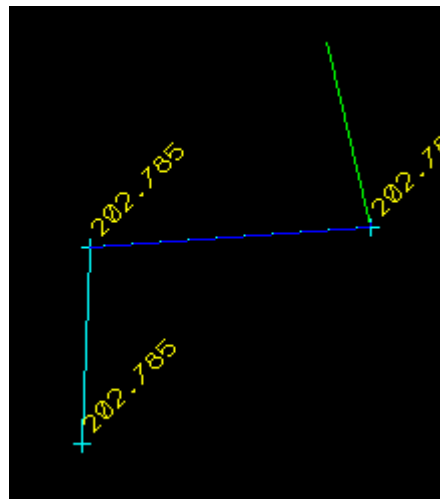
or by selection of appropriate icon from the toolbar. 

This option creates a string of many points.

On selecting Line String, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the 12d Model application window.

STEP 1:

The position of each vertex of the string is selected and accepted in order from the first to the last vertex.



Traverse

Cad_Traverse

Position of option on menu: Strings =>CAD =>Lines =>Traverse

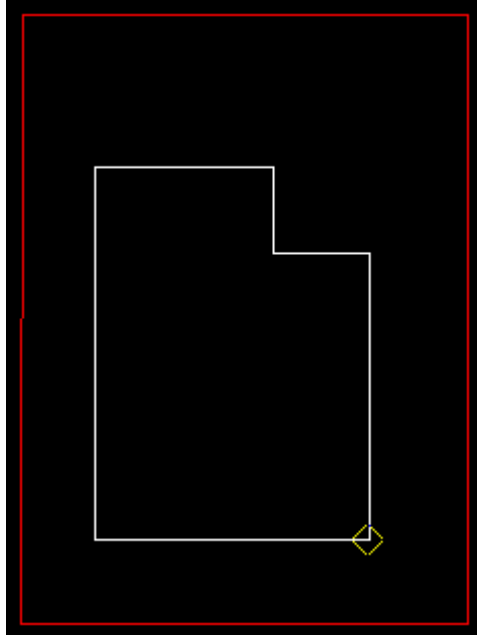
or by selection of appropriate icon from the toolbar. 

This option creates a string by giving the bearing and distance of each vertex from the previous vertex. The position of the first vertex is the start of the string and then the bearing and distance is given to define the position of the next vertex. The created vertex then become the position to take the next bearing and distance from.

On selecting Traverse, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the 12d Model application window.

STEP 1:

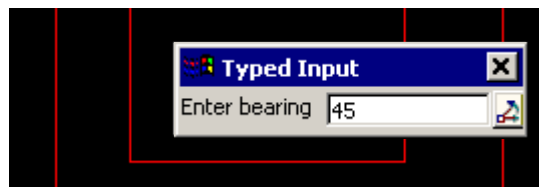
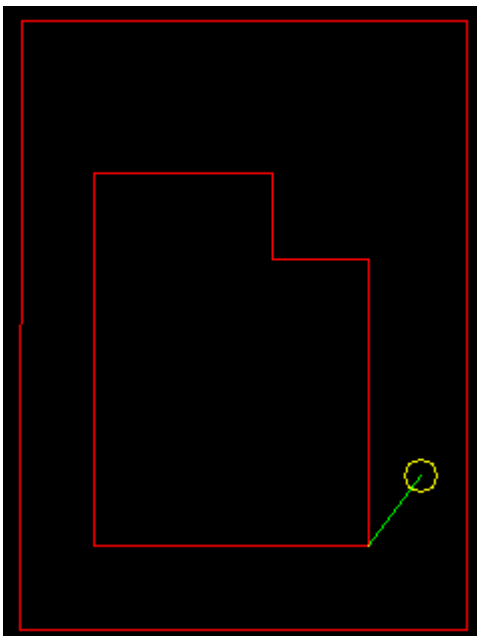
A start position is selected and accepted. This becomes the first vertex of the string.

**STEP 2:**

A line is drawn from the vertex to the current mouse position. If the user wants to see what the current value of the bearing is, simply press the **D** key (dynamic value). This puts the value into the input box where it can be accepted to create the point or the input box can be closed and the rubber banding (graphically changing) of the bearing continued.

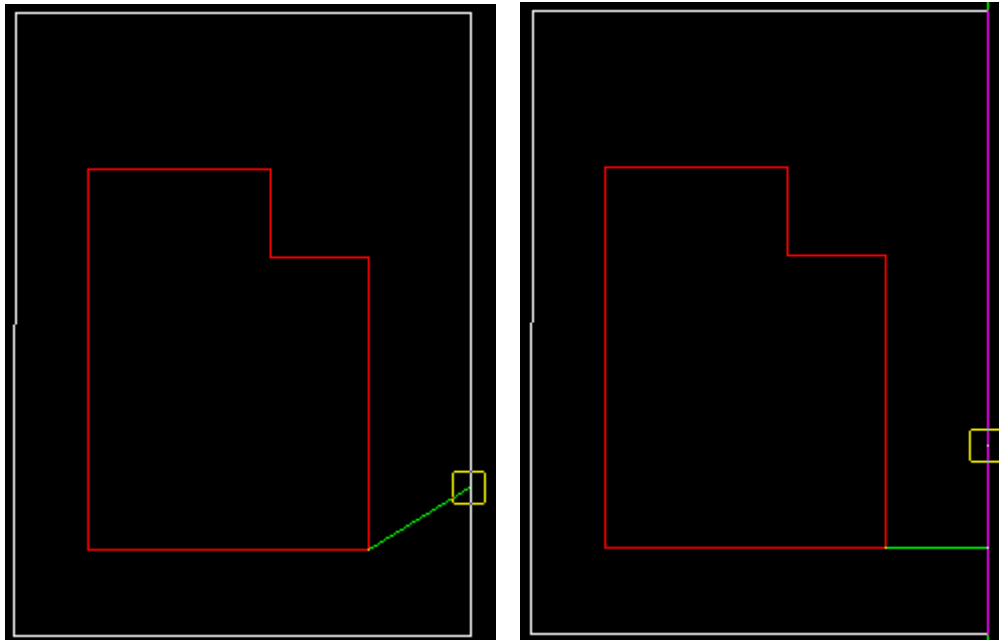
For typed entry, simply start typing or press the space bar to bring up the bearing entry box. The value is entered into the input box followed by the enter key.

Note: The **Page up** and **page down** keys can be used when the input angle box comes up to add or subtract intervals of 90 degrees.



This option also allows the definition of the bearing by the selection of the 2nd point perpendicular or tangential to a selected segment. For this, the line snap should be on. The user

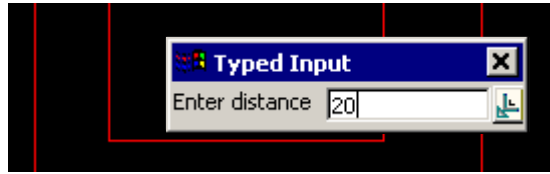
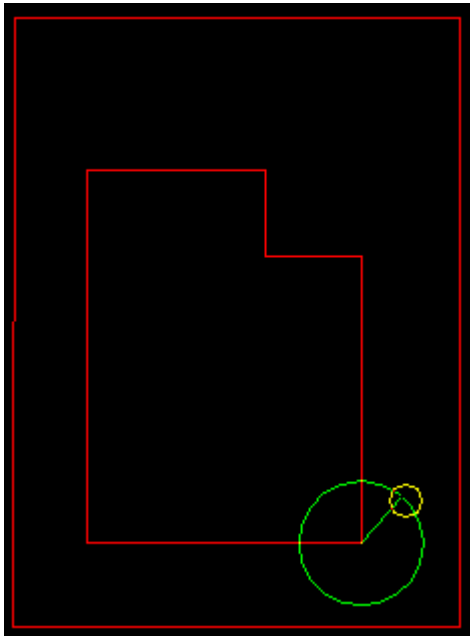
selects the segment (line or arc) and then by pressing **P** for perpendicular or **T** for tangential a solution is shown. As there is often two solutions with respect to arcs, the user can move the mouse to change from one solution to the next. The example shown below is the perpendicular case.



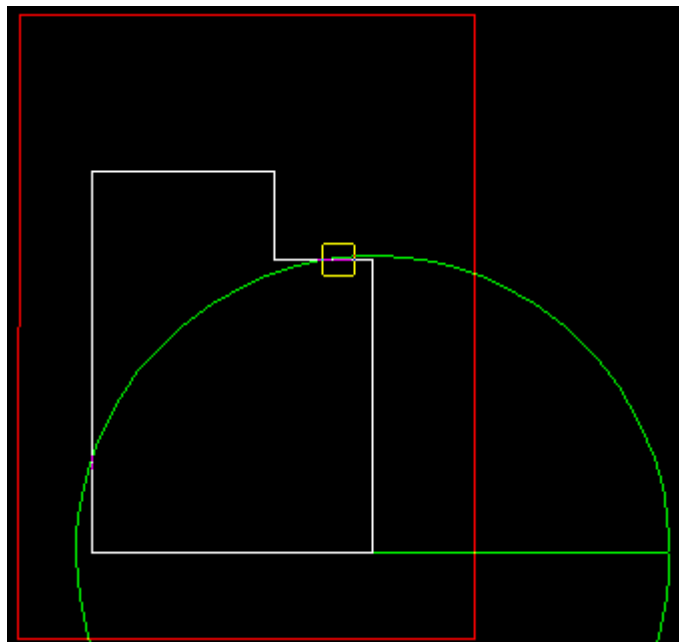
STEP 3:

A distance from the start point to create the point is given either by selection with the mouse or by typing a value. To type a value, simply start typing and the input box for the distance will appear. Alternatively you can press the space bar to bring up the input box. The value is entered into the input box followed by the enter key.

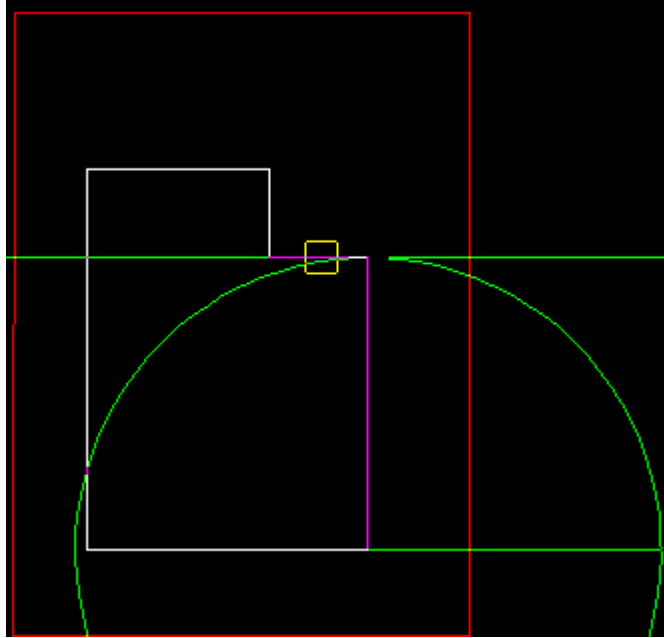
The circle drawn represents the distance value and changes with movement of the mouse. If the user wants to see what the current value of the distance is, simply press the **D** key (dynamic value). This puts the value into the input box where it can be accepted to create the point or the input box can be closed and the rubber banding (graphically changing) of the circle continued.



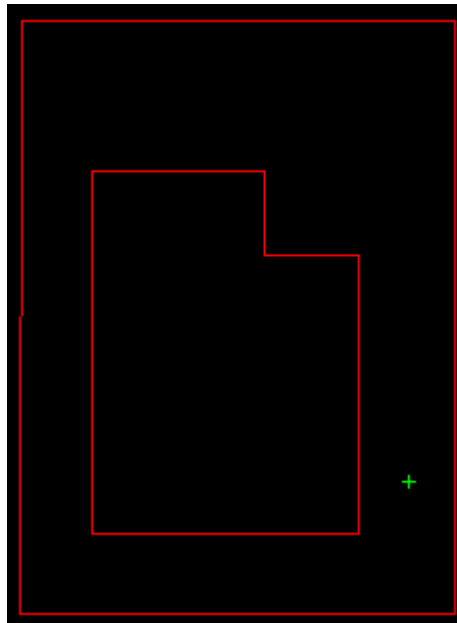
This option also allows the definition of the distance by the selection of the 2nd point perpendicular or tangential to a selected segment. For this, the line snap should be on. The user selects the segment (line or arc) and then by pressing **P** for perpendicular or **T** for tangential a solution is shown. As there is often two solutions with respect to arcs, the user can move the mouse to change from one solution to the next. The example shown below is the perpendicular case.



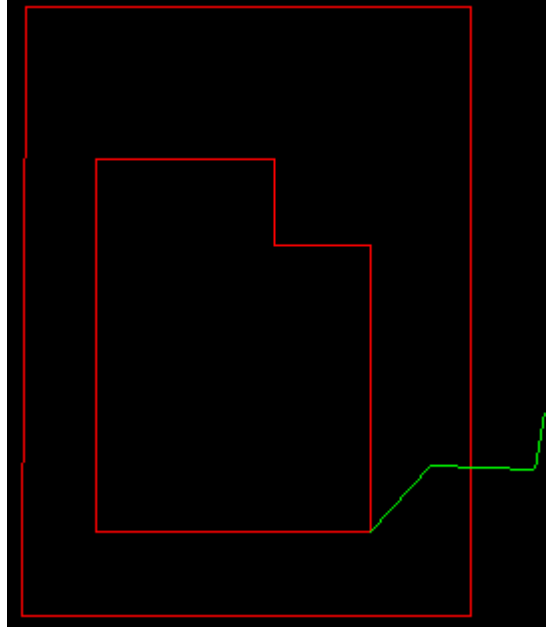
The perpendicular distance shown below by the purple line will be use at the defined bearing to create the point.

**STEP 4:**

A point string is created using the information supplied.

**STEPS 4-5:**

The next bearing and distance is prompted for as per step 4 and 5. The start point is now the last created point. A number of segments can be entered in this way.



Traverse Append

Cad_Traverse_Append

Position of option on menu: Strings =>CAD =>Lines =>Traverse append

or by selection of appropriate icon from the toolbar. 

This option adds vertices to the **end** of a super string by giving the bearing and distance of each vertex from the previous vertex. When a string is selected, the end of the string becomes the position that the bearing distance is taken from. The created vertex then become the position to take the next bearing and distance from.

On selecting Traverse append, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the 12d Model application window.

STEP 1:

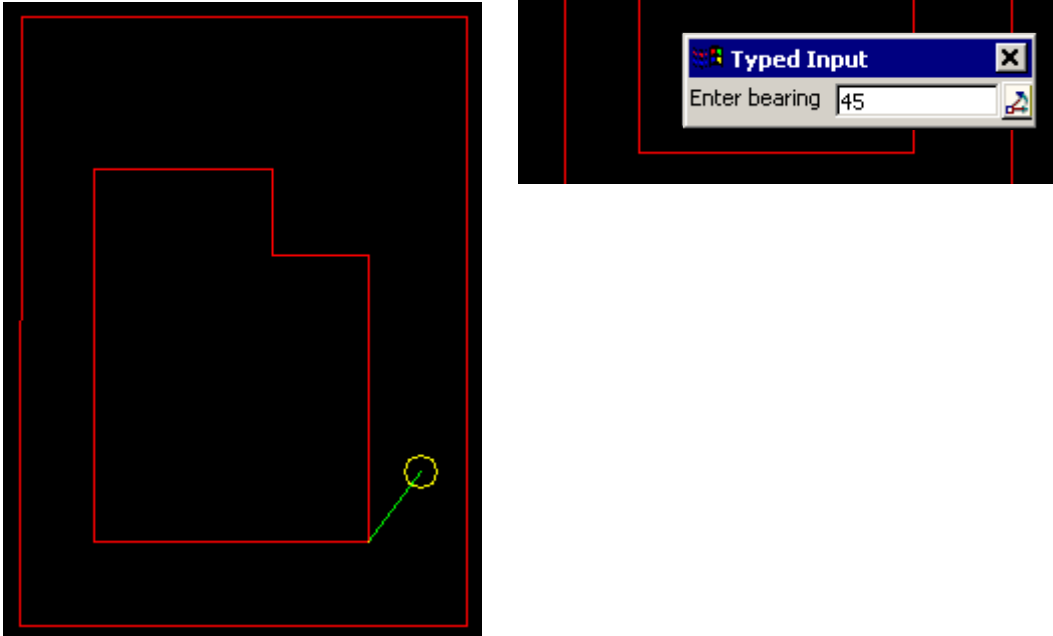
A string to append vertices to is selected and accepted. The end of this string becomes the position to define the first bearing distance from.

STEP 2:

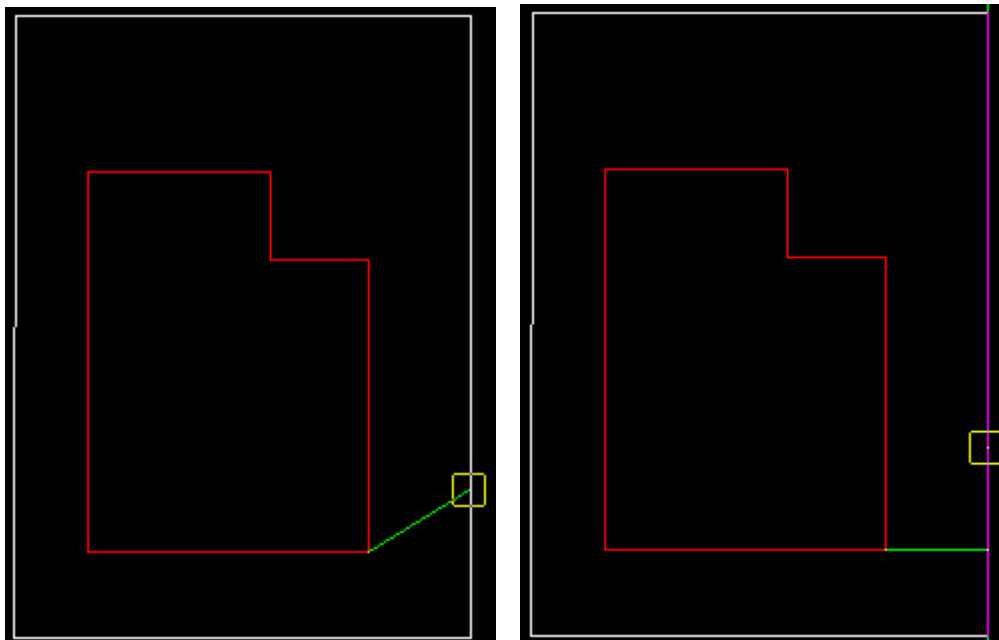
A line is drawn from the last vertex to the current mouse position. If the user wants to see what the current value of the bearing is, simply press the **D** key (dynamic value). This puts the value into the input box where it can be accepted to create the point or the input box can be closed and the rubber banding (graphically changing) of the bearing continued.

For typed entry, simply start typing or press the space bar to bring up the bearing entry box. The value is entered into the input box followed by the enter key.

Note: The Page up and page down keys can be used when the input angle box comes up to add or subtract intervals of 90 degrees.



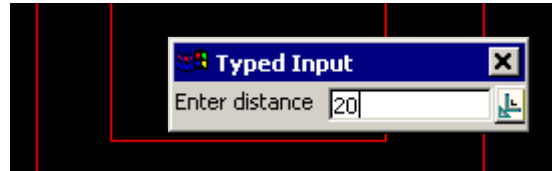
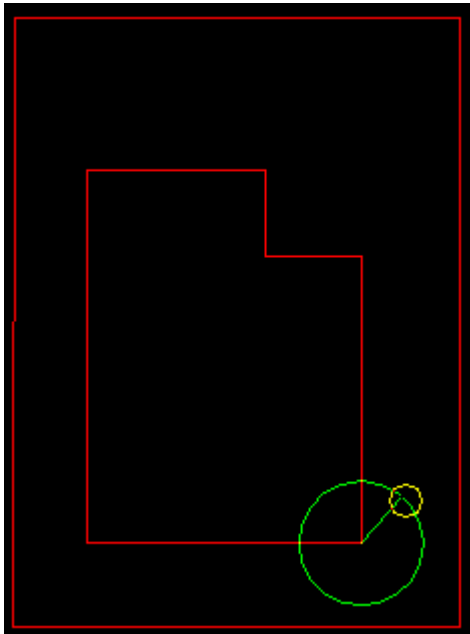
This option also allows the definition of the bearing by the selection of the 2nd point perpendicular or tangential to a selected segment. For this, the line snap should be on. The user selects the segment (line or arc) and then by pressing **P** for perpendicular or **T** for tangential a solution is shown. As there is often two solutions with respect to arcs, the user can move the mouse to change from one solution to the next. The example shown below is the perpendicular case.



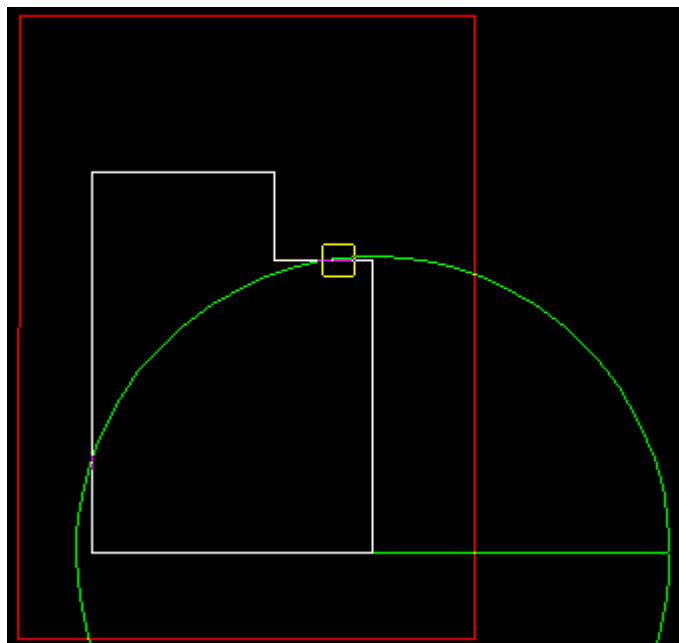
STEP 3:

A distance from the start point to create the point is given either by selection with the mouse or by typing a value. To type a value, simply start typing and the input box for the distance will appear. Alternatively you can press the space bar to bring up the input box. The value is entered into the input box followed by the enter key.

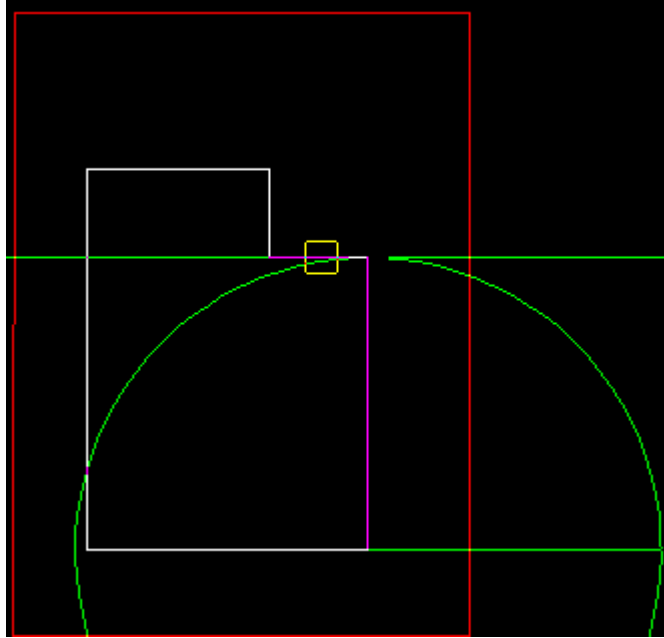
The circle drawn represents the distance value and changes with movement of the mouse. If the user wants to see what the current value of the distance is, simply press the **D** key (dynamic value). This puts the value into the input box where it can be accepted to create the point or the input box can be closed and the rubber banding (graphically changing) of the circle continued.



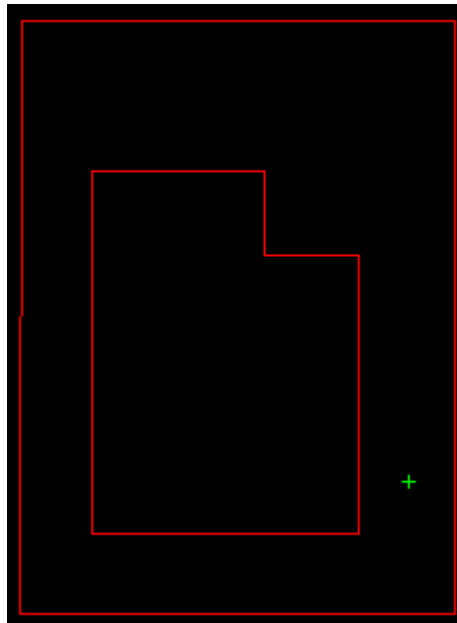
This option also allows the definition of the distance by the selection of the 2nd point perpendicular or tangential to a selected segment. For this, the line snap should be on. The user selects the segment (line or arc) and then by pressing **P** for perpendicular or **T** for tangential a solution is shown. As there is often two solutions with respect to arcs, the user can move the mouse to change from one solution to the next. The example shown below is the perpendicular case.



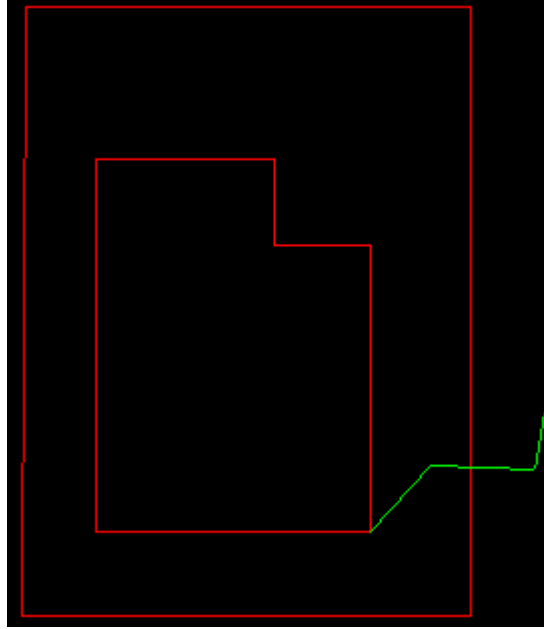
The perpendicular distance shown below by the purple line will be use at the defined bearing to create the point.

**STEP 4:**

A point string is created using the information supplied.


**STEPS 4-5:**

The next bearing and distance is prompted for as per step 4 and 5. The start point is now the last created point. A number of segments can be entered in this way.



Traverse Edit

Cad_Traverse_Edit

Position of option on menu: Strings =>CAD =>Lines =>Traverse edit
or by selection of appropriate icon from the toolbar. 

This option changes the bearing and length of a selected line segment of a super string.

On selecting Traverse edit, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the 12d Model application window.

STEP 1:

A line segment of a string is selected and accepted. This segment is the one to have its bearing distance redefined.


STEP 2:

A **Bearing** and then the **Distance** typed input boxes are presented with the current values for the line segment displayed. After new values are entered (or just <enter> if the original value is to be maintained) then the new bearing and distance values are applied to the start vertex of the segment to produce a new end vertex. The rest of the string keeps the same bearing/distances are in the original string.

Note: The Page up and page down keys can be used when the input bearing box comes up to add or subtract intervals of 90 degrees.

Taped Baseline

Cad_Tape_Baseline

Position of option on menu: Strings =>CAD =>Lines =>Taped baseline
or by selection of appropriate icon from the toolbar. 

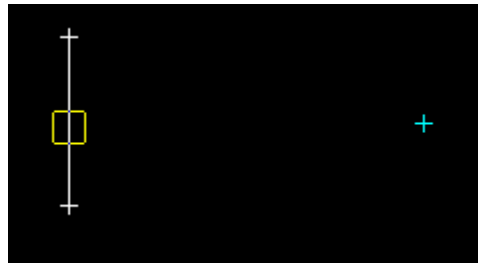
This option creates a line string by entering distances between points and the offset distance to a user defined reference line string.

On selecting Taped baseline, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the 12d Model application window.

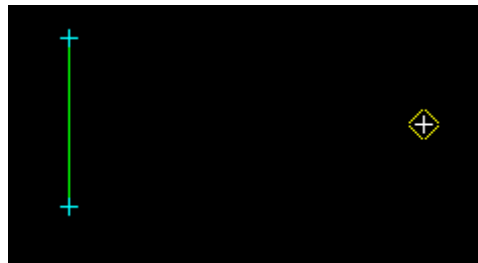
STEP 1:

A start position of the reference line is selected and accepted.

Note: Originating at the start point, the reference line will extend to infinity after intercepting the 2nd point. The offset values are made relative to this reference line. The reference line will be removed once the option has been terminated.

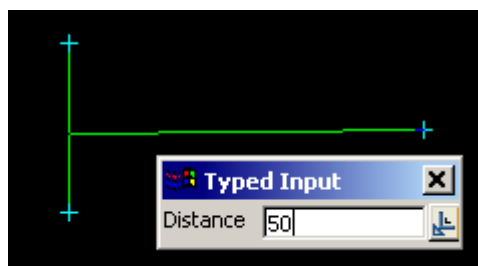
**STEP 2:**

The interception point for the reference line is selected and accepted.

**STEP 3:**

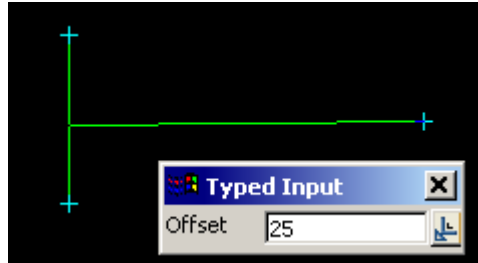
After the start and interception points are accepted, the reference line is constructed and the Distance Input box appears. A distance value is to be entered into the Input box, followed by the enter key. For the first point, the distance entered is relative to the start point of the reference line. A positive value means a distance towards the intercept point (from the start point).

Note: The distance is always relative to the previously entered vertex (positive is from start point to intercept point along the reference line).

**STEP 4:**

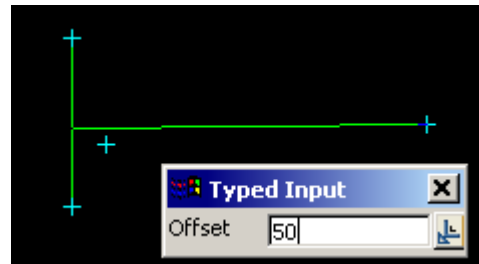
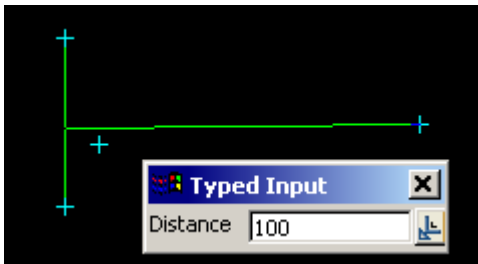
After the distance value has been entered, the Offset Input box will appear. Type the required offset value into the Input box and press the enter key.

Note: The offset distance is always relative to the reference line (negative is to the left).



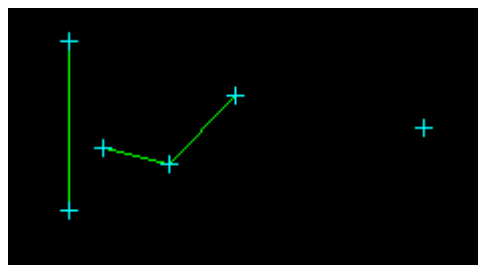
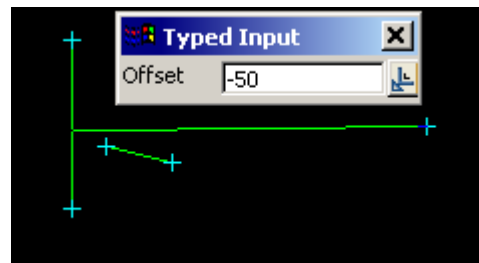
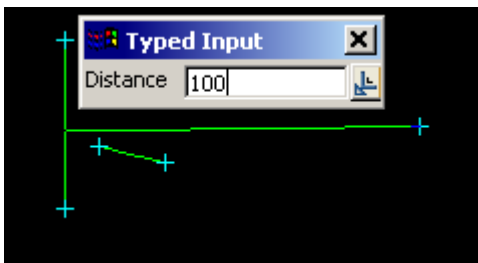
STEP 5:

Steps 3 and 4 should be repeated until the required number of vertices have been created in the line string.




STEP 6:

The option can be terminated by click on the close button **X** on the Input box, followed by the Esc key.



Taped Baseline Absolute

Cad_Tape_Baseline_Absolute

Position of option on menu: Strings =>CAD =>Lines =>Taped baseline absolute
 or by selection of appropriate icon from the toolbar. 

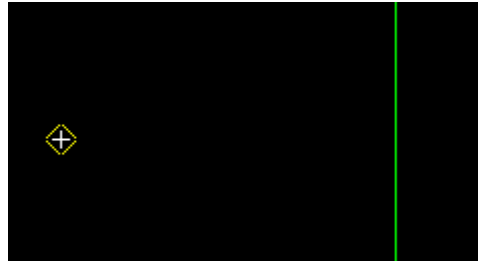
This option creates a line string by entering distances from the start point and the offset distance to a user defined reference line string.

On selecting Taped baseline absolute, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the 12d Model application window.

STEP 1:

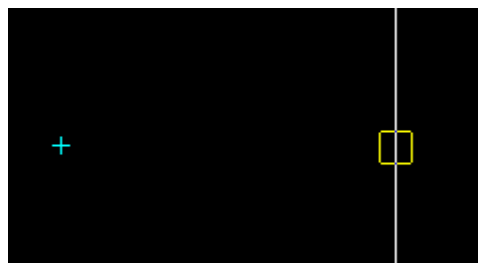
A start position of the reference line is selected and accepted.

Note: Originating at the start point, the reference line will extend to infinity after intercepting the 2nd point. The offset values are made relative to this reference line. The reference line will be removed once the option has been terminated.



STEP 2:

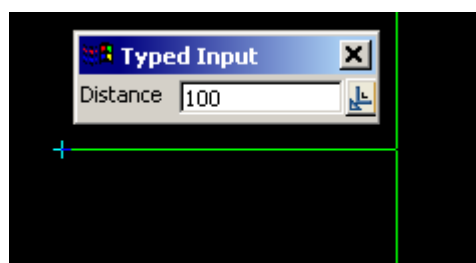
The interception point for the reference line is selected and accepted.



STEP 3:

After the start and interception points are accepted, the reference line is constructed and the Distance Input box appears. A distance value is to be entered into the Input box, followed by the enter key. For the absolute option, all distances entered are relative to the start point of the reference line. A positive value means a distance towards the intercept point (from the start point).

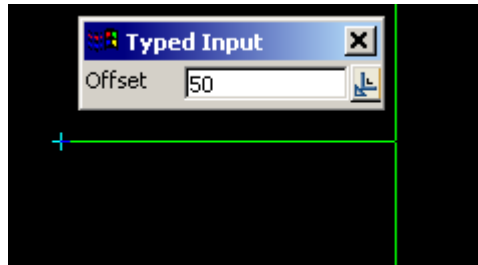
Note: For the absolute option, distances are always relative to the start point of the reference line (positive is from start point to intercept point along the reference line).



STEP 4:

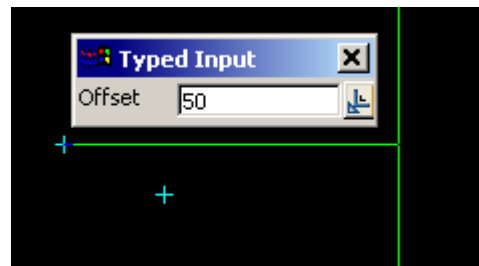
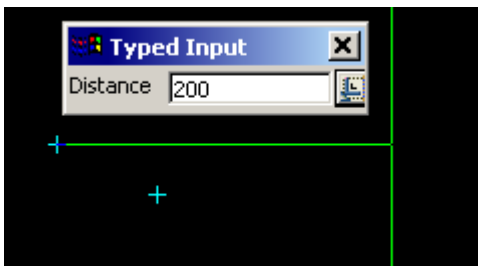
After the distance value has been entered, the Offset Input box will appear. Type the required offset value into the Input box and press the enter key.

Note: The offset distance is always relative to the reference line (negative is to the left).



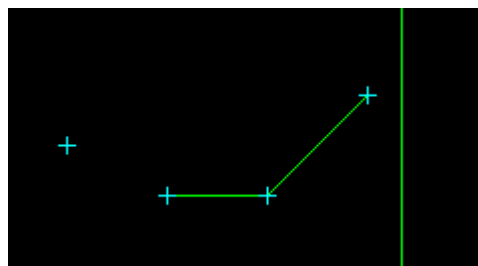
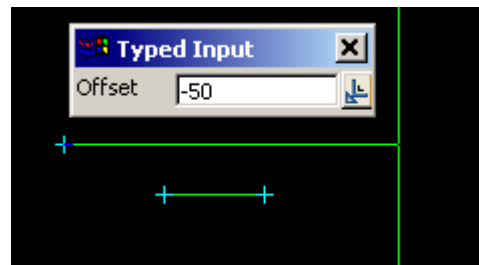
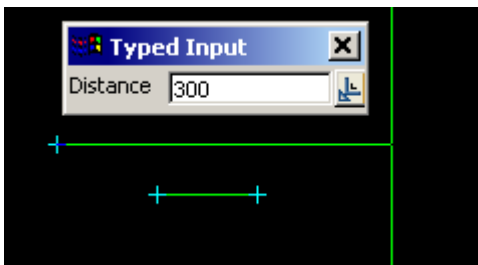
STEP 5:

Steps 3 and 4 should be repeated until the required number of vertices have been created in the line string.



STEP 6:

The option can be terminated by click on the close button **X** on the Input box, followed by the Esc key.



Tangent

Cad_Line_Tangent

Position of option on menu: Strings =>CAD =>Lines =>Tangent

or by selection of appropriate icon from the toolbar. 

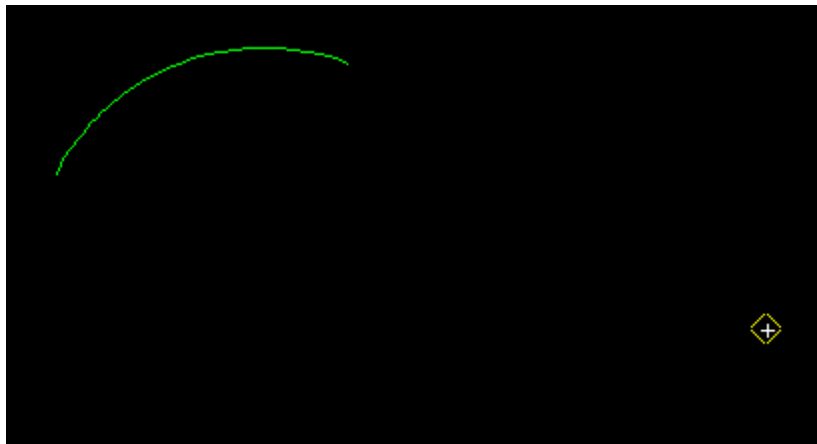
This option creates the tangential line between two elements.

NOTE: This option is for super strings only. When Selecting an arc or circle, the selection must be a line snap with direction. If a point is selected on the arc/circle the line will be draw between the selected points and not the tangent.

On selecting Tangent, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the 12d Model application window.

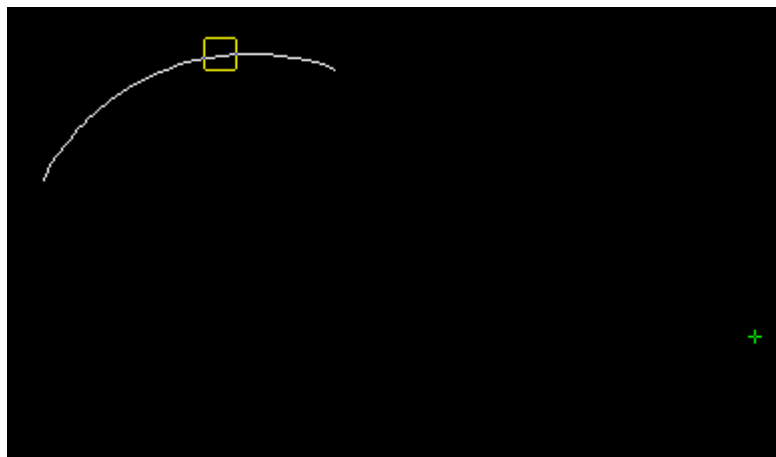
STEP 1:

A start position of the reference line is selected and accepted.



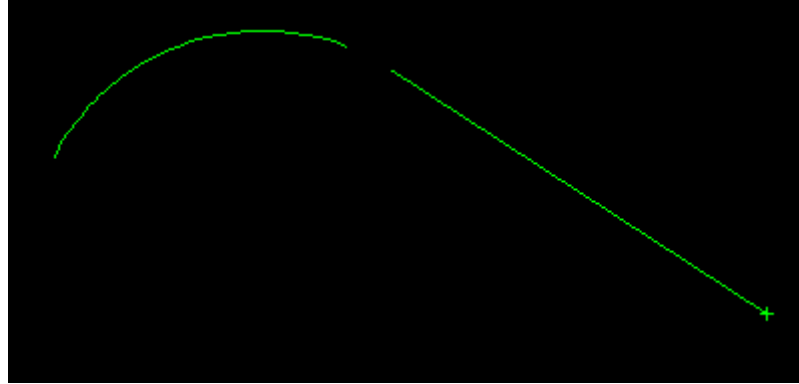
STEP 2:

The user selects and accepts the arc/circle segment with direction. The direction is required because there are two possible solutions. In this case, the direction was anti clockwise.



STEP 3:

After accepting the segment, a line is draw from the 1st selected point to the tangent point. Note that in this example, the arc is produced around so that a solution can be found.

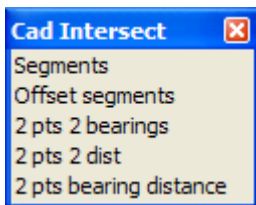


CAD Intersect

cad_intersect

Position of option on menu: Strings =>CAD =>Intersect

The Intersect walk-right menu is



Menu of Options to Create One Points Strings by Intersections

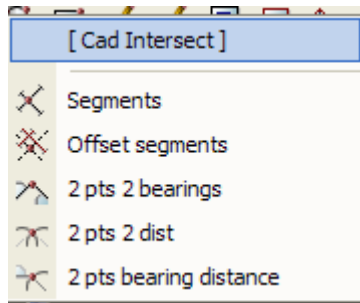
by intersecting two selected segments

by intersection two offsetted selected segments

by given bearings from two selected positions

create a point given distances from two selected positions

by select posn and bearing and another selected posn and dist



For the option *Segments*, go to the section "Intersect Segments"

Offset segments

"Intersect Offset Segments"

2 pts 2 bearings

"2 Points and 2 Bearings"

2 pts 2 dist

"2 Points and 2 Distances"

2 pts bearing distance

"2 Points, One Bearing and One Distance"

Intersect Segments

Cad_Intersect_Segments

Position of option on menu: Strings =>CAD =>Intersect =>Segments

or by selection of appropriate icon from the toolbar.

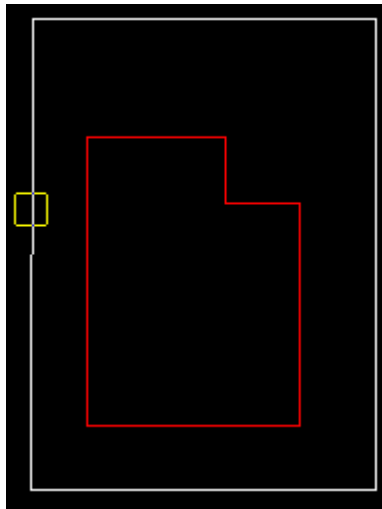
This option creates a point at the intersection of the projections of two line or arc segments.

On selecting Segments, the user is prompted for the relevant data in the screen message box

located at the bottom left hand corner of the 12d Model application window.

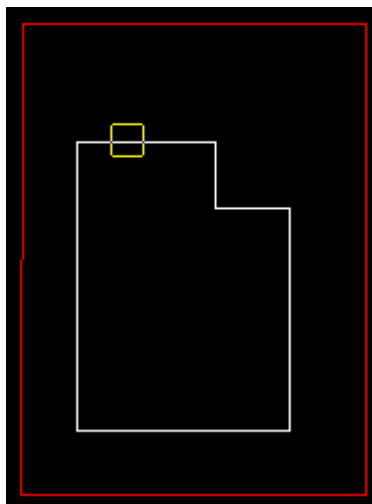
STEP 1:

The 1st segment is selected and accepted.



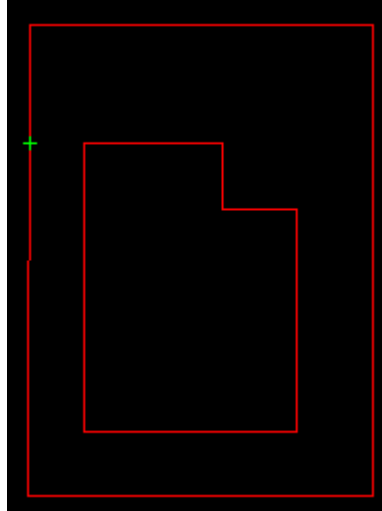
STEP 2:

The 2nd segment is selected and accepted.



STEP 3:


A point is created at the intersection of the two segments (if a solution exists). Note that the 2nd segment in this case has been projected to enable a solution to be calculated.



Intersect Offset Segments

Cad_Intersect_Segments_Offset

Position of option on menu: Strings =>CAD =>Intersect =>Offset segments

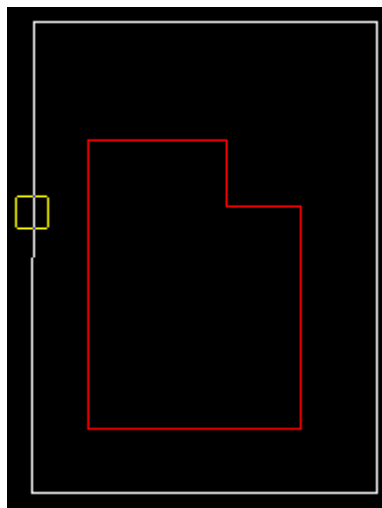
or by selection of appropriate icon from the toolbar. 

This option creates a point at the intersection of the offsets of two selected segments.

On selecting Offset segments, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the 12d Model application window.

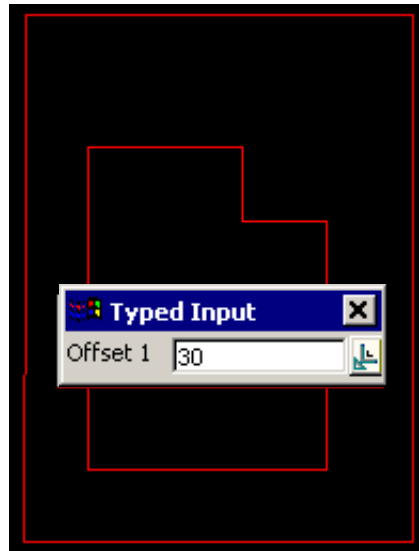
STEP 1:

The 1st segment is selected and accepted with direction. This sets the positive direction of the offset to the right of the direction of pick.

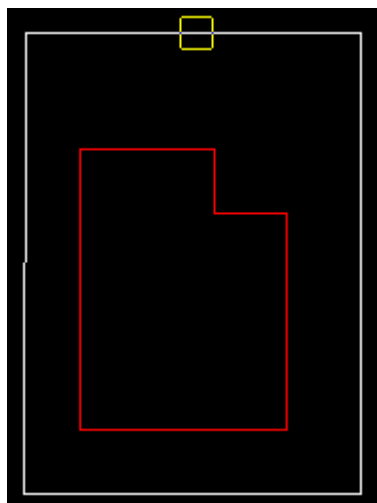


STEP 2:

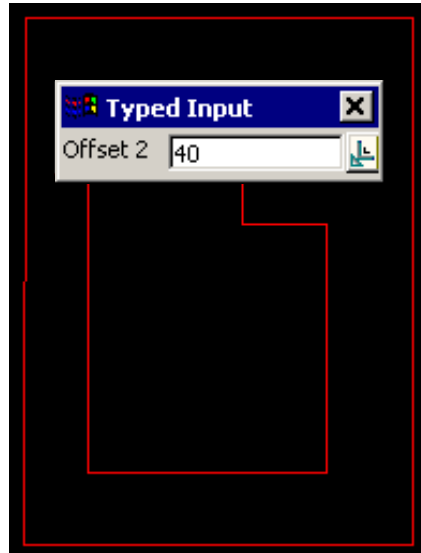
The offset is given by into an offset input box. The positive direction is at 90 degrees to the direction of pick for the segment. The value is entered into the input box followed by the enter key.

**STEP 3:**

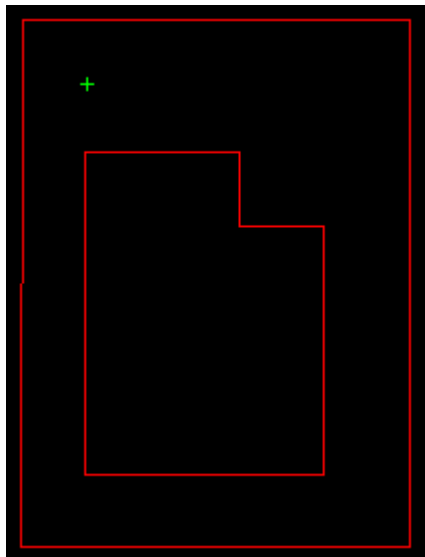
The 2nd segment is selected with direction and accepted. This sets the positive direction of the offset to the right of the direction of pick.

**STEP 4:**

The offset is given by into an offset input box. The positive direction is at 90 degrees to the direction of pick for the segment. The value is entered into the input box followed by the enter key.


**STEP 5:**

A point is created at the intersection of the projected lines offset to the segments (if a solution exists).



2 Points and 2 Bearings

Cad_Intersect_Bearings

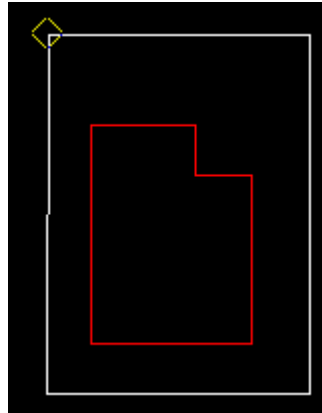
Position of option on menu: Strings =>CAD =>Intersect =>2 pts 2 bearings
or by selection of appropriate icon from the toolbar. 

This option creates a point by using two points and two bearings.

On selecting 2 pts 2 bearings, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the 12d Model application window.

STEP 1:

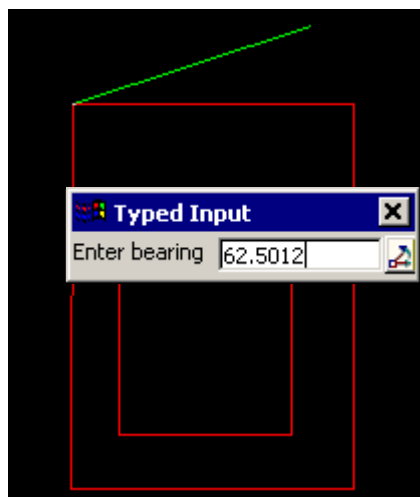
The 1st point is selected and accepted.

**STEP 2:**

A bearing from the 1st point to create the point is given either by selection with the mouse or by typing a value. To type a value, simply start typing and the input box for the bearing will appear. Alternatively you can press the space bar to bring up the input box. The value is entered into the input box followed by the enter key.

The line drawn represents the bearing value and changes with movement of the mouse. If the user wants to see what the current value of the bearing is, simply press the **D** key (dynamic value). This puts the value into the input box where it can be accepted to create the point or the input box can be closed and the rubber banding (graphically changing) of the line continued.

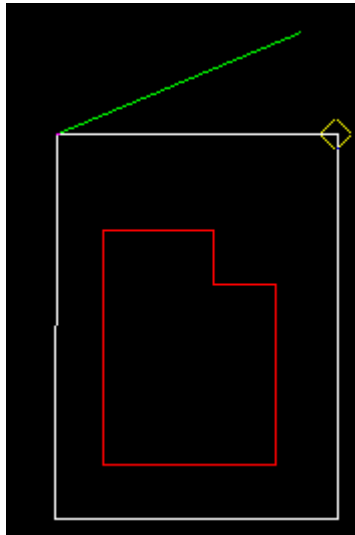
Note: The Page up and page down keys can be used when the input angle box comes up to add or subtract intervals of 90 degrees.



This option also allows the definition of the bearing by the selection of the 2nd point perpendicular or tangential to a selected segment. For this, the line snap should be on. The user selects the segment (line or arc) and then by pressing **P** for perpendicular or **T** for tangential a solution is shown. As there is often two solutions with respect to arcs, the user can move the mouse to change from one solution to the next.

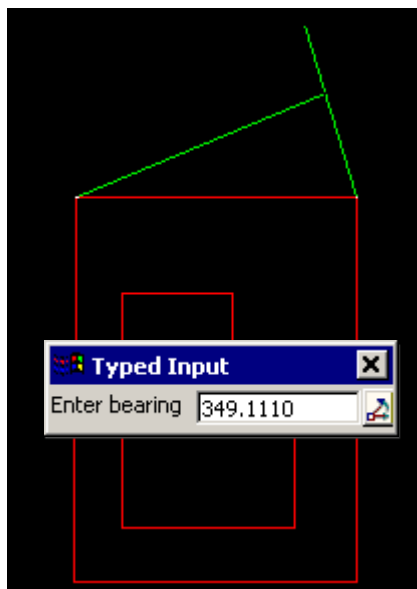
STEP 3:

The 2nd point to create the point from is selected and accepted.



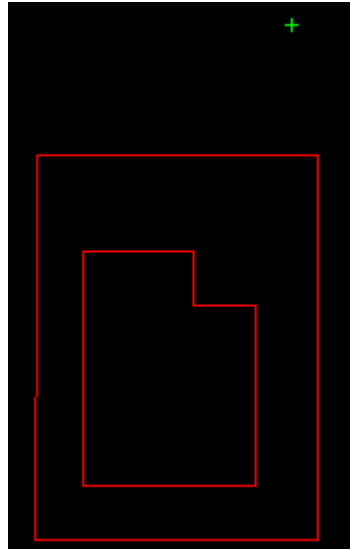
STEP 4:

A bearing from the 2nd point to create the point is given using the optional outlined in **STEP 2** above.




STEP 5:

The point is created if there is a valid solution.



2 Points and 2 Distances

Cad_Intersect_Distances

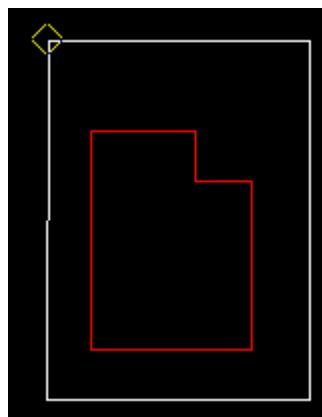
Position of option on menu: Strings =>CAD =>Intersect =>2 pts 2 dist
or by selection of appropriate icon from the toolbar. 

This option creates a point using two points and two distances.

On selecting 2 pts 2 dist, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the 12d Model application window.

STEP 1:

The 1st point is selected and accepted.

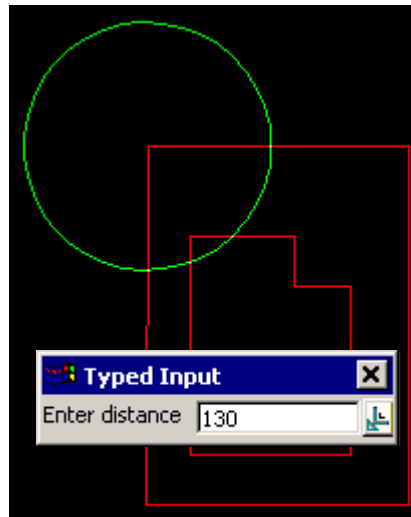


STEP 2:

A distance from the 1st point to create the point is given either by selection with the mouse or by typing a value. To type a value, simply start typing and the input box for the distance will appear. Alternatively you can press the space bar to bring up the input box. The value is entered into the input box followed by the enter key.

The circle drawn represents the distance value and changes with movement of the mouse. If the user wants to see what the current value of the distance is, simply press the **D** key (dynamic value). This puts the value into the input box where it can be accepted to create the point or the

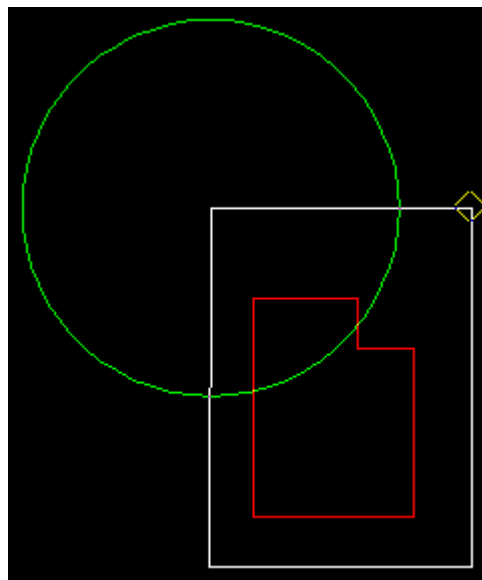
input box can be closed and the rubber banding (graphically changing) of the circle continued.



This option also allows the definition of the distance by the selection of the 2nd point perpendicular or tangential to a selected segment. For this, the line snap should be on. The user selects the segment (line or arc) and then by pressing **P** for perpendicular or **T** for tangential a solution is shown. As there is often two solutions with respect to arcs, the user can move the mouse to change from one solution to the next. The example shown below is the perpendicular case.

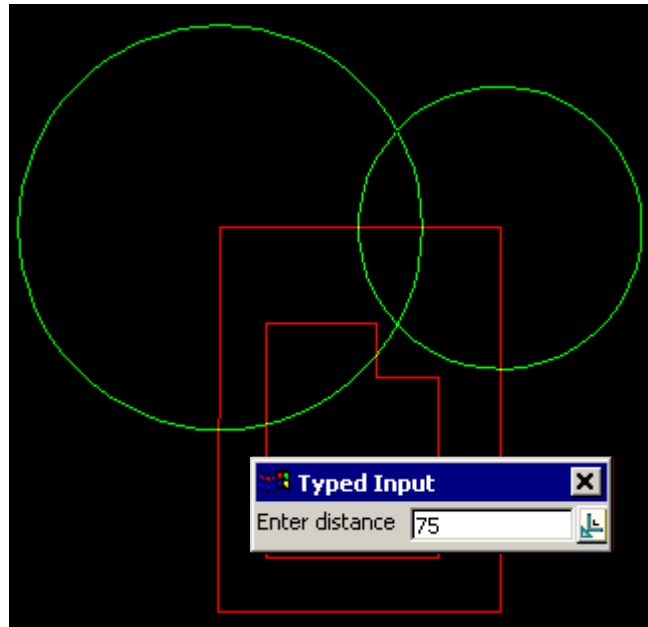
STEP 3:

The 2nd point to create the point from is selected.



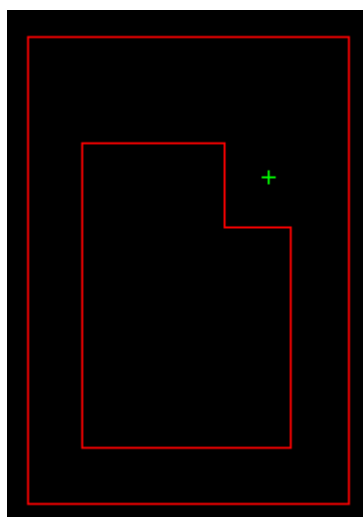
STEP 4:

A distance from the 2nd point to create the point is given using the optional outlined in **STEP 2** above.

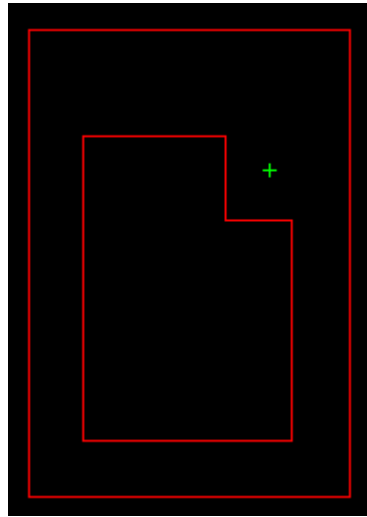
**STEP 5:**

As there is two solutions, the user can select the correct one depending on the method of construction. This can be done by the direct entry of distances or by use of the mouse.

1. Distance entry. After the entry of the 1st distance, the 2nd point is selected. Following the selection of the 2nd point, the 2nd radius is shown (rubber banding). The user can select one of the two solutions by choosing with a **LB** mouse click over the approximate position of the required solution. The solution chosen is the closest solution to the selected point. The final radius can then be entered via the keyboard by simply starting typing which brings up the radius entry panel automatically. This panel can also be activated by pressing the space bar.
2. Use of the mouse. The 1st point is selected and the radius entered by using the mouse or by direct entry from the keyboard. The 2nd point is then selected and the 2nd radius is displayed (rubber banding). A solution can be chosen by selecting with a **LB** mouse click over the required solution. The final solution will be the closest one to the selection. **MB** to accept the intersection and create the point.


**STEP 6:**

The point is created if there is a valid solution.



2 Points, One Bearing and One Distance

Cad_Intersect_Bearing_Distance

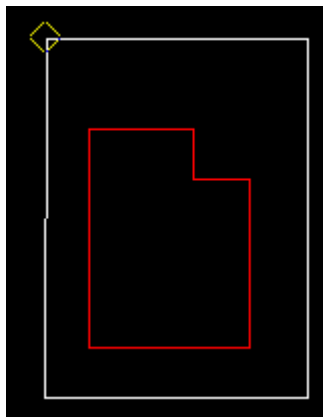
Position of option on menu: Strings =>CAD =>Intersect =>2 pts bearing distance
or by selection of appropriate icon from the toolbar. 

This option creates a point from a given point and a bearing, and a second point and a distance.

On selecting 2 pts 2 bearing distance, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the 12d Model application window.

STEP 1:

The 1st point is selected and accepted.

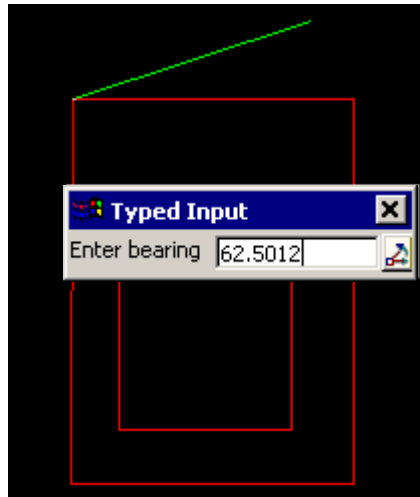


STEP 2:

A bearing from the 1st point to create the point is given either by selection with the mouse or by typing a value. To type a value, simply start typing and the input box for the bearing will appear. Alternatively you can press the space bar to bring up the input box. The value is entered into the input box followed by the enter key.

The line drawn represents the bearing value and changes with movement of the mouse. If the user wants to see what the current value of the bearing is, simply press the **D** key (dynamic value). This puts the value into the input box where it can be accepted to create the point or the input box can be closed and the rubber banding (graphically changing) of the line continued.

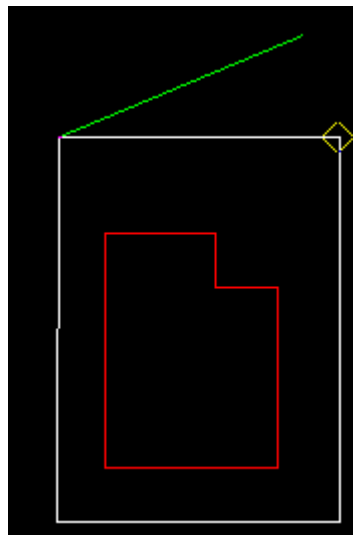
Note: The Page up and page down keys can be used when the input angle box comes up to add or subtract intervals of 90 degrees.



This option also allows the definition of the bearing by the selection of the 2nd point perpendicular or tangential to a selected segment. For this, the line snap should be on. The user selects the segment (line or arc) and then by pressing **P** for perpendicular or **T** for tangential a solution is shown. As there is often two solutions with respect to arcs, the user can move the mouse to change from one solution to the next.

STEP 3:

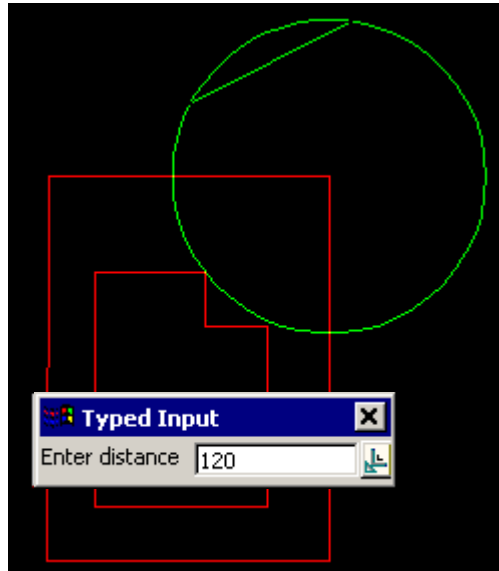
The 2nd point to create the point from is selected and accepted.



STEP 4:

A distance from the 2nd point to create the point is given either by selection with the mouse or by typing a value. To type a value, simply start typing and the input box for the distance will appear. Alternatively you can press the space bar to bring up the input box. The value is entered into the input box followed by the enter key.

The circle drawn represents the distance value and changes with movement of the mouse. If the user wants to see what the current value of the distance is, simply press the **D** key (dynamic value). This puts the value into the input box where it can be accepted to create the point or the input box can be closed and the rubber banding (graphically changing) of the circle continued.

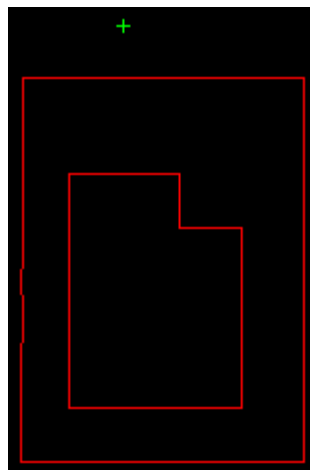


This option also allows the definition of the distance by the selection of the 2nd point perpendicular or tangential to a selected segment. For this, the line snap should be on. The user selects the segment (line or arc) and then by pressing **P** for perpendicular or **T** for tangential a solution is shown. As there is often two solutions with respect to arcs, the user can move the mouse to change from one solution to the next. The example shown below is the perpendicular case.

A line is drawn between the two possible solutions.

STEP 5:

As there is two solutions, the user can select the correct one with the mouse.

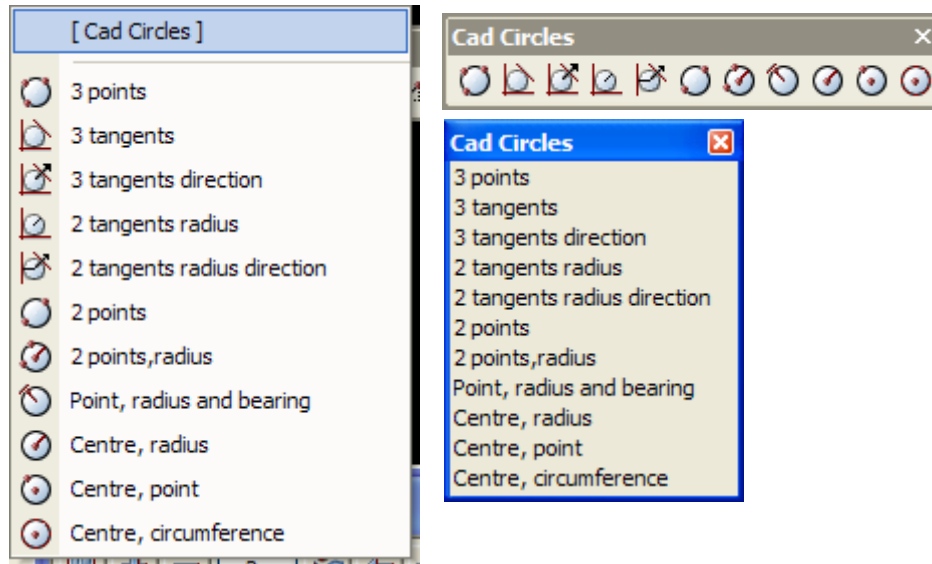


CAD Circles

cad_circles

Position of option on menu: Strings =>CAD =>Circles

The Circles walk-right menu is



For the option *3 points*, go to the section “3 Points on the Circle” .

3 tangents

3 tangents direction

2 tangents radius

2 tangents radius direction.

2 points

2 points, radius

Point, radius and Bearing

Centre, radius

Centre, point

Centre, circumference

“Circle by 3 Tangents” .

“Circle by 3 Tangents with Direction” .

“Circle by 2 Tangents and a Typed Radius” .

“Circle by 2 Tangents and a Typed Radius with Direction” .

“Circle by 2 Diametrically Opposed Points” .

“Circle by 2 Points on the Circle and a Typed Radius” .

“Circle by Point, Tangential Bearing at the Point and Typed Radius”

“Circle by Centre and Typed Radius” .

“Circle by Centre and Point on Circle” .

“Circle by Centre and Typed Circumference” .

3 Points on the Circle

Cad_Circle_3_Points

Position of option on menu: Strings =>CAD =>Circles =>3 points

or by selection of appropriate icon from the toolbar. 

This option creates the circle through three selected points.

On selecting 3 points, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the 12d Model application window.

STEP 1:

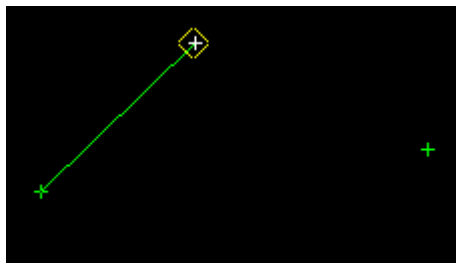
The 1st point is selected with the mouse or entered in via the keyboard. To specify the 1st point with the mouse, a point must be selected (Left Button) and accepted (Middle Button). To enter the 1st point with the keyboard, simply start typing or press the space bar to bring up the XYZ Input box. Type the coordinates into the XYZ Input box and press the enter key.



STEP 2:

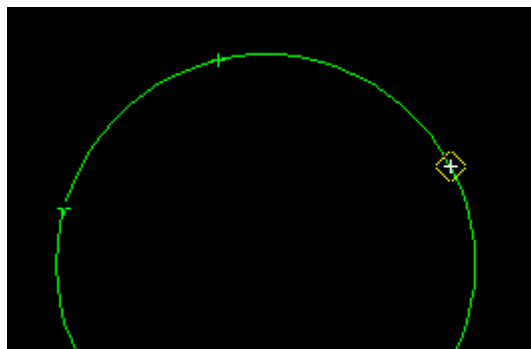
The 2nd point is selected and accepted.

After the 2nd point is accepted a circle will be displayed 'rubber banding' to the various solutions according to the position of the cursor. This will continue until the 3rd point is selected and accepted.



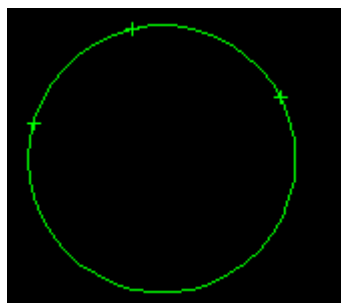
STEP 3:

The 3rd point is selected and accepted.



STEP 4:

A circle is constructed through the three selected points



Circle by 3 Tangents

Cad_Circle_3_Tangents_Logical

Position of option on menu: Strings =>CAD =>Circles =>3 Tangents

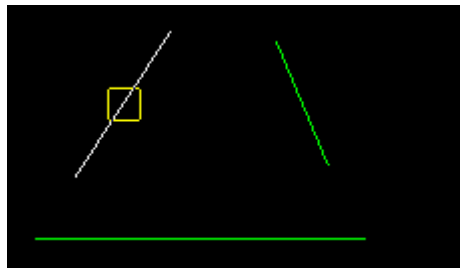
or by selection of appropriate icon from the toolbar. 

This option creates a circle that is tangential to three selected segments.

On selecting 3 tangents, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the 12d Model application window.

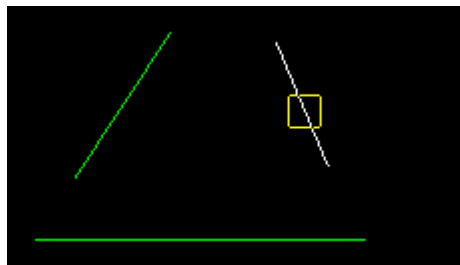
STEP 1:

The 1st tangent is selected with the mouse (Left Button) and accepted (Middle Button).



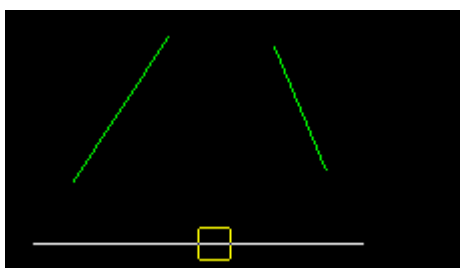
STEP 2:

The 2nd tangent is selected and accepted.



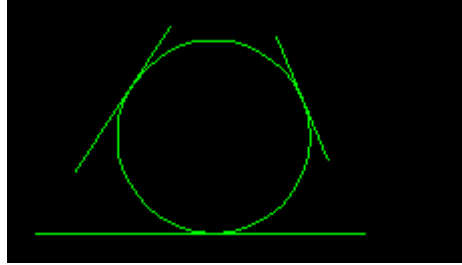
STEP 3:

The 3rd tangent is selected and accepted.




STEP 4:

A circle is constructed that touches each of the three selected tangents.



Circle by 3 Tangents with Direction

Cad_Circle_3_Tangents_Directional

Position of option on menu: Strings =>CAD =>Circles =>3 tangents direction
or by selection of appropriate icon from the toolbar. 

This option creates a circle that is tangential to three selected segments. The segments are selected in order and with direction and the circle is to the right of the direction of the selected segments.

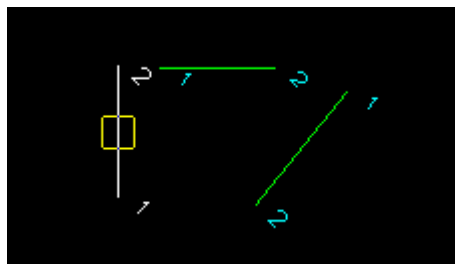
On selecting **3 tangents direction**, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the *12d Model* application window.

STEP 1:

Select and accept the 1st tangent.

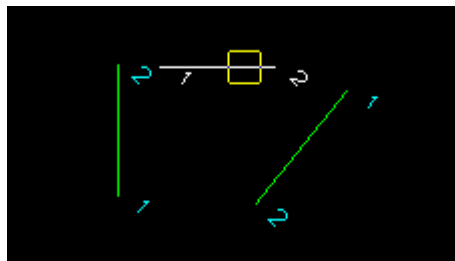
Note: For this option the direction of the selected tangents is important. The circle will be constructed to the right of a tangent. A user may reverse the direction of a tangent by selecting the tangent *with direction*. For further notes on picking tangents with direction, see 'Picking with Direction' in Chapter 3 - **Tools and Concepts** on page 77.

Note: The Vertex indices can be displayed by toggling the option on the Toggle Menu.



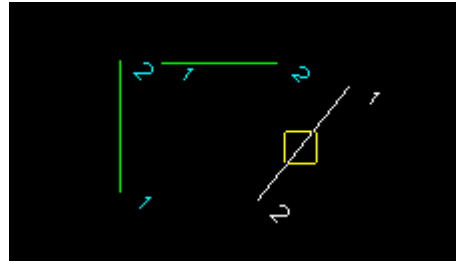
STEP 2:

The 2nd tangent is selected and accepted.



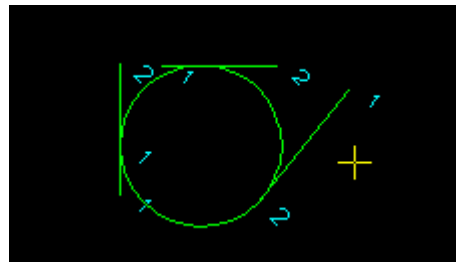
STEP 3:

The 3rd tangent is selected and accepted.



STEP 4:

If a solution exists, a circle is constructed using the given information.



Circle by 2 Tangents and a Typed Radius

Cad_Circle_2_Tangents_Radius_Logical

Position of option on menu: Strings =>CAD =>Circles =>2 tangents radius

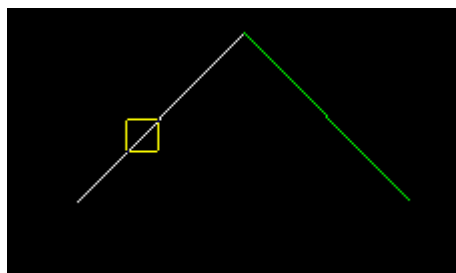
or by selection of appropriate icon from the toolbar. 

This option creates a circle with a given radius that is tangential to two selecting segments.

On selecting **2 tangents radius**, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the 12d Model application window.

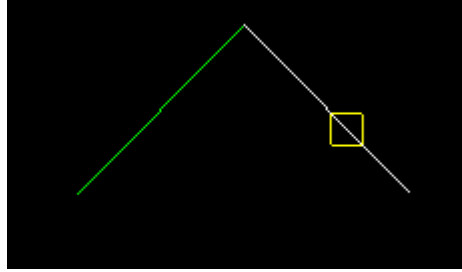
STEP 1:


Select the 1st tangent with the mouse (Left Button) and accept it (Middle Button).

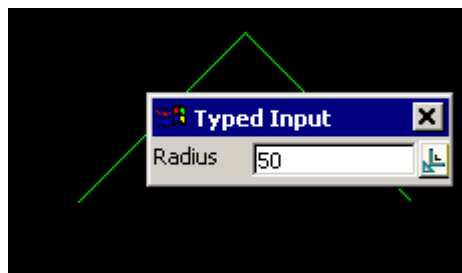


STEP 2:

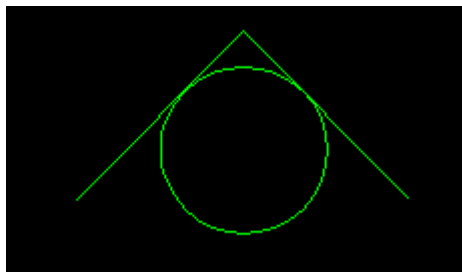
Select the 2nd tangent and accept it.

**STEP 3:**

After the 2nd tangent is accepted, the Radius Input box will appear. Type the radius value into the Input box and press the enter key. The browse button  on the Input box can be used to define the radius by measuring existing elements.

**STEP 4:**

If a solution exists, a circle is fitted touching the two selected tangents using the given radius and directions.



Circle by 2 Tangents and a Typed Radius with Direction

Cad_Circle_2_Tangents_Radius_Directional

Position of option on menu: Strings =>CAD =>Circles =>2 tangents radius direction

or by selection of appropriate icon from the toolbar. 

This option creates a circle with a given radius that is tangential to two selected segments that are picked with direction.

On selecting **2 tangents radius direction**, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the 12d Model application window.

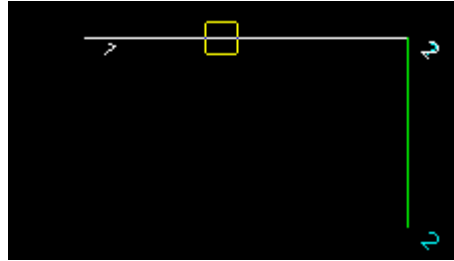
STEP 1:

Select and accept the 1st tangent.

Note: For this option the direction of the selected tangents is important. The circle will be constructed to the right of a tangent. A user may reverse the direction of a tangent by selecting the tangent *with direction*. For further notes on picking tangents with direction, see 'Picking with

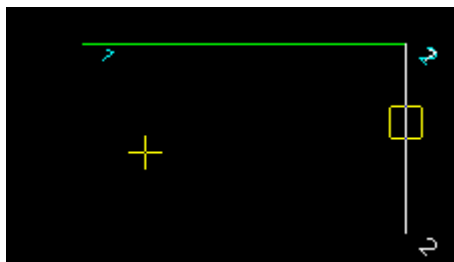
Direction' in Chapter 3 - **Tools and Concepts** on page 77.

Note: The Vertex indices can be displayed by toggling the option on the Toggle Menu.




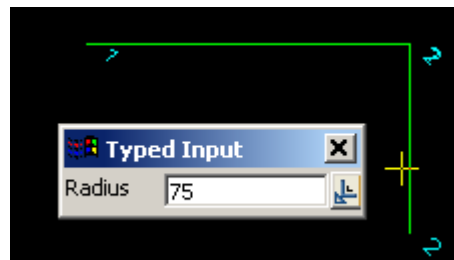
STEP 2:

The 2nd tangent is selected and accepted.



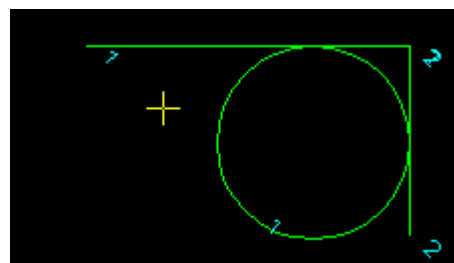
STEP 3:

After the 2nd tangent is accepted, the Radius Input box will appear. Type the radius value into the Input box and press the enter key. The browse button  on the Input box can be used to define the arc radius by measuring existing elements.



STEP 4:


If a solution exists, a circle is constructed using the given information.



Circle by 2 Diametrically Opposed Points

Cad_Circle_2_Points

Position of option on menu: Strings =>CAD =>Circles =>2 points

or by selection of appropriate icon from the toolbar. 

This option creates a circle by selecting two points that define the diameter of the circle.

On selecting 2 points, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the 12d Model application window.

STEP 1:

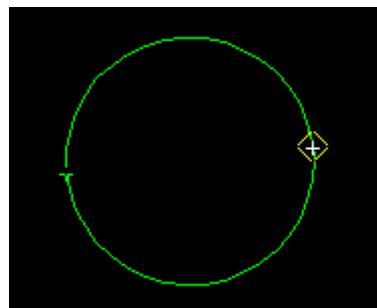
The 1st point is selected with the mouse or entered in via the keyboard. To specify the 1st point with the mouse, a point must be selected (Left Button) and accepted (Middle Button). To enter the 1st point with the keyboard, simply start typing or press the space bar to bring up the XYZ Input box. Type the coordinates into the XYZ Input box and press the enter key.

After the 1st point is accepted a circle will be displayed 'rubber banding' to the various solutions according to the position of the cursor (cursor position taken as the other end of a diameter). This will continue until the 2nd point is selected and accepted.



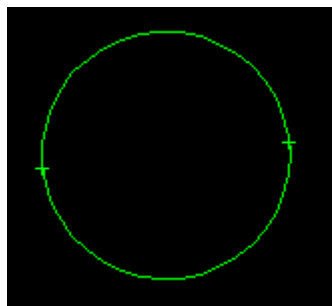
STEP 2:

The 2nd point is selected and accepted.



STEP 3:


The circle is constructed through the two selected points. The two points define the diameter.



Circle by 2 Points on the Circle and a Typed Radius

Cad_Circle_2_Points_Radius

Position of option on menu: Strings =>CAD =>Circles =>2 points, radius

or by selection of appropriate icon from the toolbar. 

This option creates a circle of a given radius that goes through two selected points.

On selecting 2 points, radius, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the 12d Model application window.

STEP 1:

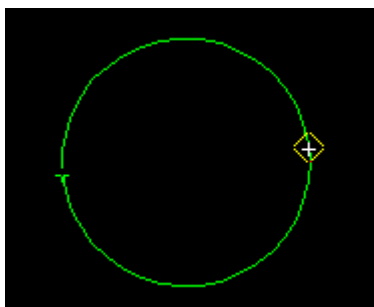
The 1st point is selected with the mouse or entered in via the keyboard. To specify the 1st point with the mouse, a point must be selected (Left Button) and accepted (Middle Button). To enter the 1st point with the keyboard, simply start typing or press the space bar to bring up the XYZ Input box. Type the coordinates into the XYZ Input box and press the enter key.

After the 1st point is accepted a circle will be displayed 'rubber banding' to the various solutions according to the position of the cursor. This will continue until the 2nd point is selected and accepted.



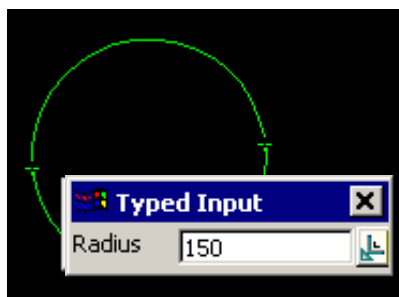
STEP 2:

The 2nd point is selected and accepted.



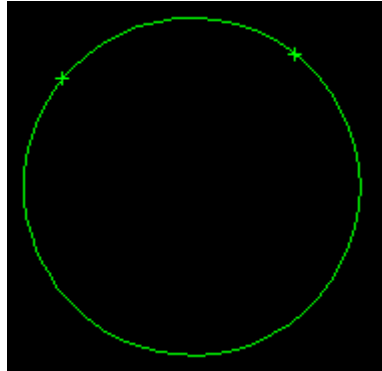
STEP 3:

After the 2nd point is accepted, the Radius Input box will appear. The radius value is entered into the input box followed by the enter key.




STEP 4:

If a solution exists, the circle is fitted through the two selected points using the given radius.



Circle by Point, Tangential Bearing at the Point and Typed Radius

Cad_Circle_Point_Radius_Bearing

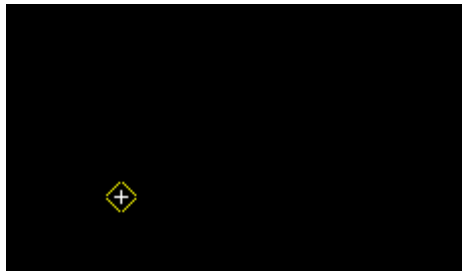
Position of option on menu: Strings =>CAD =>Circles =>Point, radius and bearing
or by selection of appropriate icon from the toolbar. 


This option creates a circle of a given radius, a selected point on the circle and the bearing of the tangent to the circle at that point.

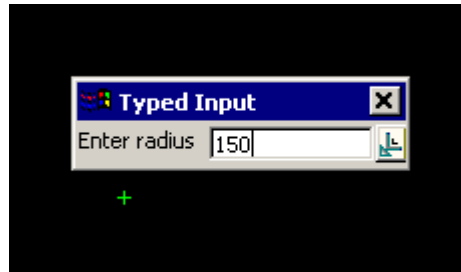
On selecting Point, radius and bearing, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the 12d Model application window.


STEP 1:

The 1st point is selected with the mouse or entered in via the keyboard. To specify the 1st point with the mouse, a point must be selected (Left Button) and accepted (Middle Button). To enter a 1st point with the keyboard, simply start typing or press the space bar to bring up the XYZ Input box. Type the coordinates into the XYZ Input box and press the enter key.

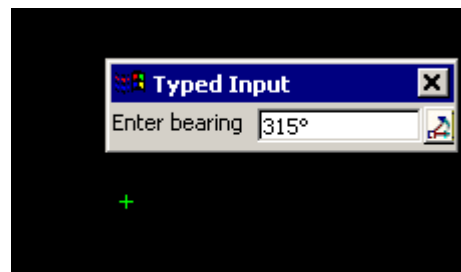
**STEP 2:**

After the 1st point is accepted, the **Enter radius** input box will appear. Type the radius value into the Input box and press the enter key. The browse button  on the Input box can be used to define the arc radius by measuring existing elements.

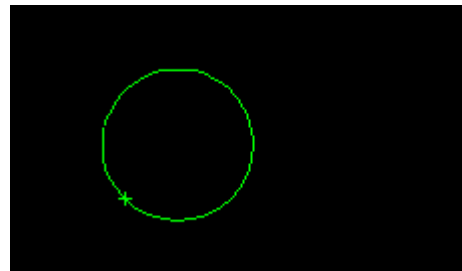
**STEP 3:**

After the radius has been entered, the **Enter bearing** input box will appear. Type the bearing into the Input box and press the enter key. The browse button  on the Input box can be used to define the bearing by measuring existing elements.

Note: The Page Up and Page Down keys can be used when the Enter Bearing input box comes up to add or subtract intervals of 90 degrees.


**STEP 4:**

If a solution exists, a circle is fitted from the given bearing at the selected point using the selected radius.



Circle by Centre and Typed Radius

Cad_Circle_Centre_Radius

Position of option on menu: Strings =>CAD =>Circles =>Centre, radius
or by selection of appropriate icon from the toolbar. 

This option creates a circle of a given radius and a selected centre point

On selecting **Centre, radius**, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the 12d Model application window.

STEP 1:


A centre point is selected with the mouse or entered in via the keyboard. To specify a centre point with the mouse, a point must be selected (Left Button) and accepted (Middle Button). To enter a centre point with the keyboard, simply start typing or press the space bar to bring up the XYZ Input box. Type the coordinates into the XYZ Input box and press the enter key.

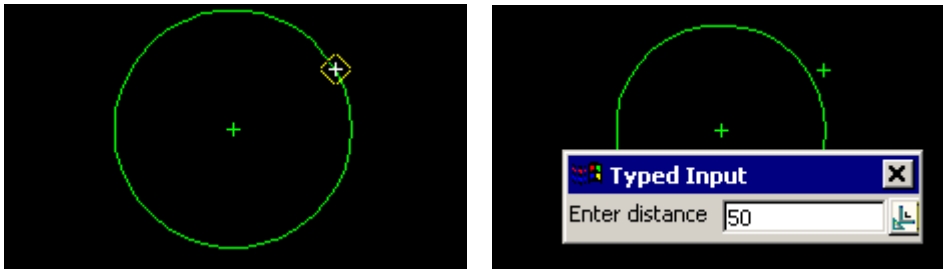
**STEP 2:**

After the centre point is accepted a circle will be displayed 'rubber banding' to the various solutions according to the position of the cursor. This will continue until a radius value is entered.

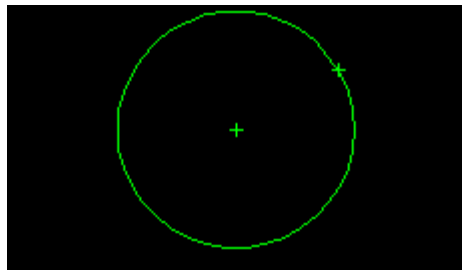
A radius value is selected with the mouse or entered in via the keyboard.

To specify a radius value with the mouse, a point must be selected (Left Button) and accepted (Middle Button). This option also allows the definition of the radius by the selection of the 2nd point perpendicular or tangential to a selected segment. For this, the line snap should be on. The user selects the segment (line or arc) and then by pressing **P** for perpendicular or **T** for tangential a solution is shown. As there is often two solutions with respect to arcs, the user can move the mouse to change from one solution to the next.

To enter a radius value with the keyboard, simply start typing or press the space bar to bring up the Radius Input box. Type the radius value into the Radius Input box and press the enter key. The browse button  on the Input box can be used to define the arc radius by measuring existing elements.

**STEP 3:**


The circle is constructed through the centre point using the specified radius.



Circle by Centre and Point on Circle

Cad_Circle_Centre_Point

Position of option on menu: Strings =>CAD =>Circles =>Centre, point

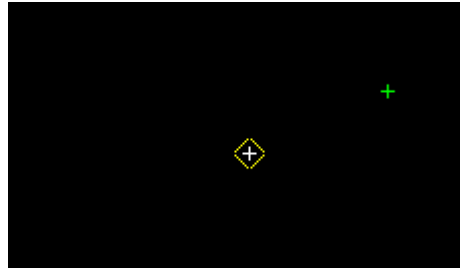
or by selection of appropriate icon from the toolbar. 

This option creates a circle by selecting a centre point and then using the cursor to select a second point that in on the circle.

On selecting Centre, point, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the 12d Model application window.

STEP 1:

A centre point is selected with the mouse or entered in via the keyboard. To specify a centre point with the mouse, a point must be selected (Left Button) and accepted (Middle Button). To enter a centre point with the keyboard, simply start typing or press the space bar to bring up the XYZ Input box. Type the coordinates into the XYZ Input box and press the enter key.



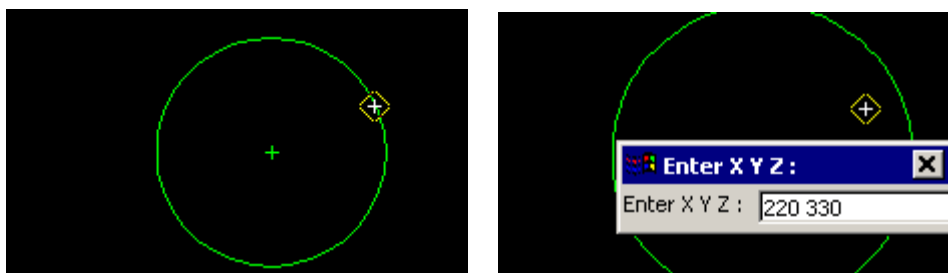
STEP 2:

After the centre point is accepted a circle will be displayed 'rubber banding' to the various solutions according to the position of the cursor. This will continue until a radius value is entered.

A radius value is selected with the mouse or entered in via the keyboard.

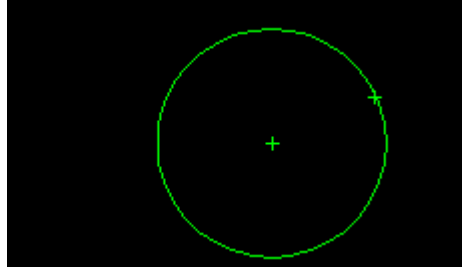
To specify a radius value with the mouse, a point must be selected (Left Button) and accepted (Middle Button). This option also allows the definition of the radius by the selection of the 2nd point perpendicular or tangential to a selected segment. For this, the line snap should be on. The user selects the segment (line or arc) and then by pressing **P** for perpendicular or **T** for tangential a solution is shown. As there is often two solutions with respect to arcs, the user can move the mouse to change from one solution to the next.

To enter a radius value with the keyboard, simply start typing or press the space bar to bring up the XYZ Input box. Type the point into the Input box and press the enter key.



STEP 3:


A circle is constructed using the two points defined by the user.



Circle by Centre and Typed Circumference

Cad_Circle_Centre_Circumference

Position of option on menu: Strings =>CAD =>Circles =>Centre, circumference

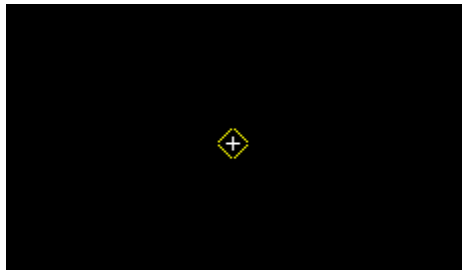
or by selection of appropriate icon from the toolbar. 

This option creates a circle by selecting the centre point and giving a circumference value.


On selecting Centre, circumference, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the 12d Model application window.

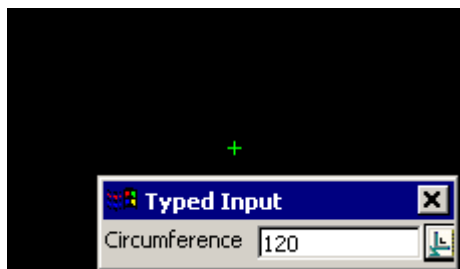
STEP 1:

A centre point is selected with the mouse or entered in via the keyboard. To specify a centre point with the mouse, a point must be selected (Left Button) and accepted (Middle Button). To enter a centre point with the keyboard, simply start typing or press the space bar to bring up the XYZ Input box. Type the coordinates into the XYZ Input box and press the enter key.



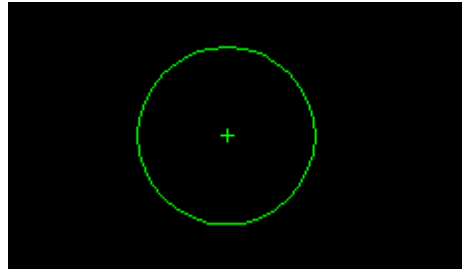
STEP 2:

After the centre point is accepted, the **Circumference** Input box will appear. Type the circumference length into the Input box and press the enter key. The browse button  on the Input box can be used to define the arc radius by measuring existing elements.



STEP 3:

A circle is constructed using the centre point and the given circumference.



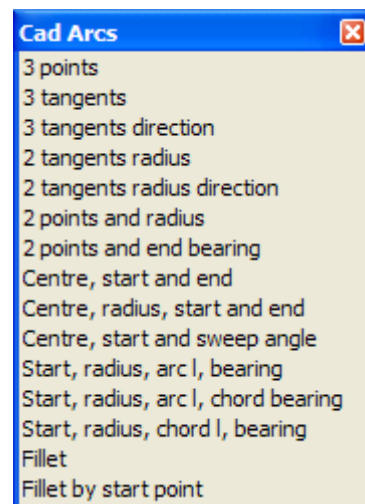
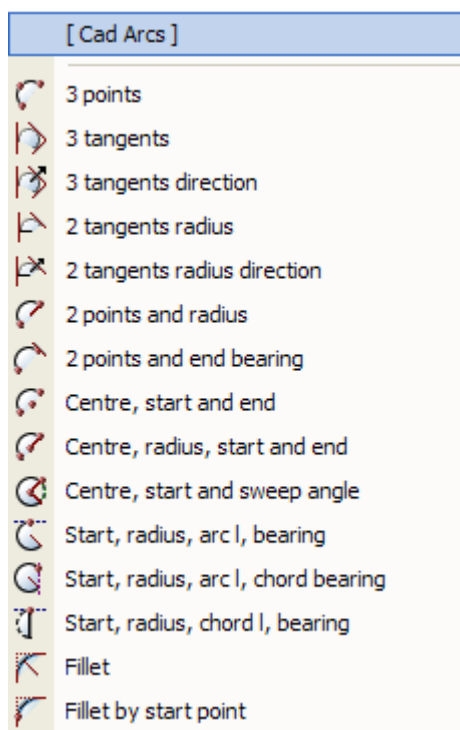
CAD Arcs

cad_arcs

Position of option on menu: Strings =>CAD =>Arcs

The arc options creates **super string arcs**, not arc strings. The options Strings =>Create =>Arcs create arc strings.

The Arcs walk-right menu is



For the option *3 points*, please go to the section. "Arc by 3 points"

3 tangents

"Arc by 3 Tangents"

3 tangents direction

"Arc by 3 Tangents with Direction"

2 tangents radius

"Arc by 2 Tangents and a Typed Radius"

2 tangents radius direction

"Arc by 2 Tangents and a Typed Radius with Direction"

2 points and radius

"Arc by 2 Points and a Typed Radius"

2 points and end bearing

"Arc by 2 Points and an End Bearing"

Centre, start and end

"Arc by Centre, Start and End Points"

<i>Centre, radius, start and end</i>	“Arc by Centre, Typed Radius, Start and End Points”
<i>Centre, start and sweep angle</i>	“Arc by Centre, Start point and Sweep Angle”
<i>Start, radius, arc l, bearing</i>	“Arc by Start Point, Typed Radius, Arc Length and Start Bearing”
<i>Start, radius, arc l, chord bear</i>	“Arc by Start Point, Typed Radius, Arc Length and Chord Bearing”
<i>Start, radius, chord len, bear</i>	“Arc by Start Point, Typed Radius, Chord length and a bearing”
<i>Fillet</i>	“Fillet by Typed Radius” .
<i>Fillet by start point</i>	“Fillet by Start Tangent Point” .

Arc by 3 points

Cad_Arc_3_Points

Position of option on menu: Strings =>CAD =>Arcs =>3 points

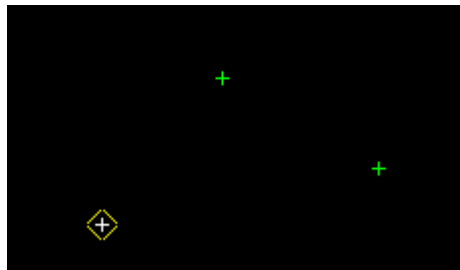
or by selection of appropriate icon from the toolbar. 

This option creates the arc through three selected points and the first and third points are the start and end of the arc.

On selecting 3 points, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the 12d Model application window.

STEP 1:

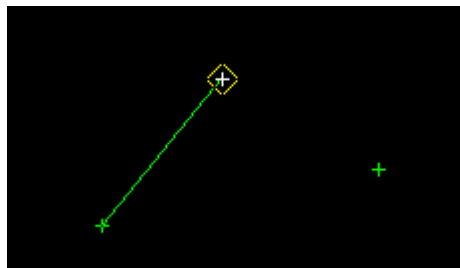
The 1st point is selected with the mouse or entered in via the keyboard. To specify the 1st point with the mouse, a point must be selected (Left Button) and accepted (Middle Button). To enter the 1st point with the keyboard, simply start typing or press the space bar to bring up the XYZ Input box. Type the coordinates into the XYZ Input box and press the enter key.



STEP 2:

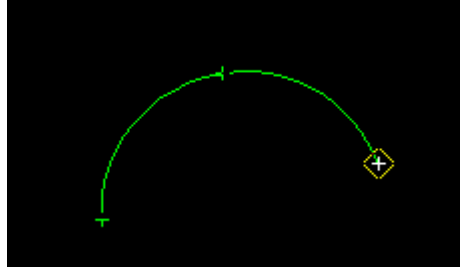
The 2nd point is selected and accepted.

After the 2nd point is accepted an arc will be displayed ‘rubber banding’ to the various solutions according to the position of the cursor. This will continue until the 3rd point is selected and accepted.

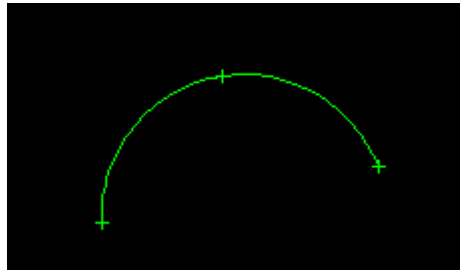


STEP 3:

The 3rd point is selected and accepted.

**STEP 4:**

An arc is constructed through the three selected points.



Arc by 3 Tangents

Cad_Arc_3_Tangents_Logical

Position of option on menu: Strings =>CAD =>Arcs =>3 tangents

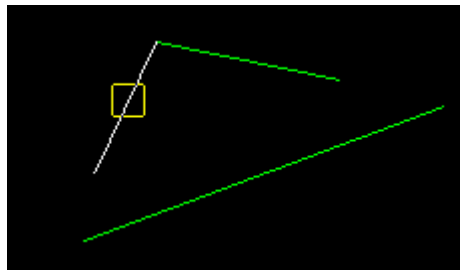
or by selection of appropriate icon from the toolbar. 

This option creates an arc that is tangential to three selected segments. The first and third segments are the start and end of the arc.

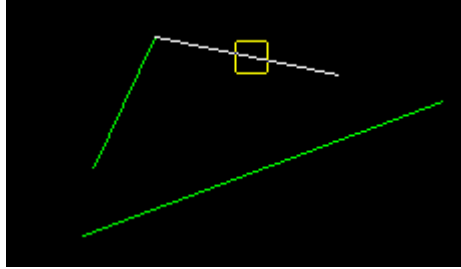
On selecting 3 tangents, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the 12d Model application window.

STEP 1:

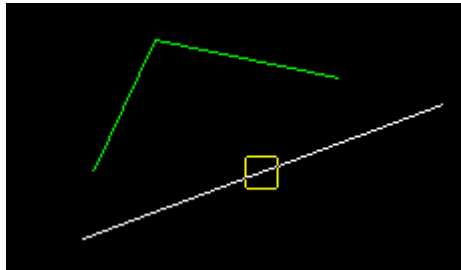
The 1st tangent is selected with the mouse (Left Button) and accepted (Middle Button).

**STEP 2:**

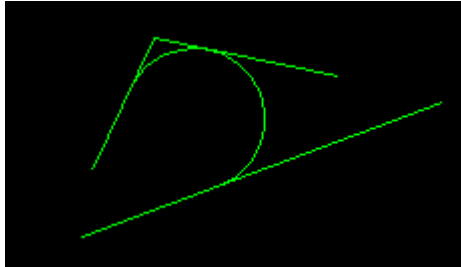
The 2nd tangent is selected and accepted.

**STEP 3:**

The 3rd tangent is selected and accepted.

**STEP 4:**

The arc is constructed touching the three selected tangents.



Arc by 3 Tangents with Direction

Cad_Arc_3_Tangents_Directional

Position of option on menu: Strings =>CAD =>Arcs =>3 tangents direction

or by selection of appropriate icon from the toolbar. 

This option creates an arc that is tangential to three selected segments. The segments are selected in order and with direction and the arc is to the right of the direction of the selected segments. The first and third segments are the start and end of the arc.

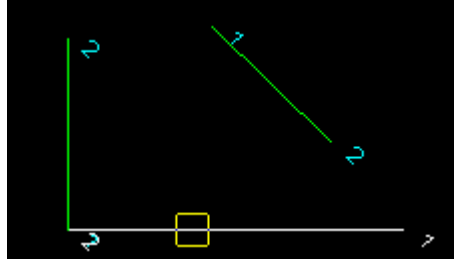
On selecting 3 tangents direction, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the 12d Model application window.

STEP 1:

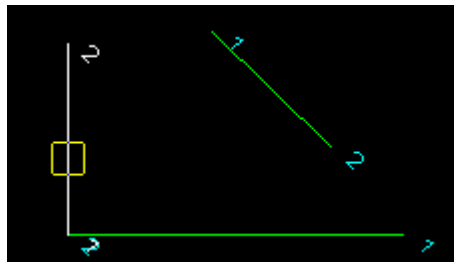
Select and accept the 1st tangent.

Note: For this option the direction of the selected tangents is important. The arc will be constructed to the right of the tangent. A user may reverse the direction of the tangent by selecting a tangent *with direction*. For further notes on picking tangents with direction, see 'Picking with Direction' in Chapter 3 - **Tools and Concepts** on page 77.

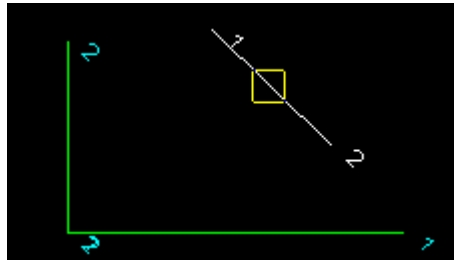
Note: The Vertex indices can be displayed by toggling the option on the Toggle Menu.

**STEP 2:**

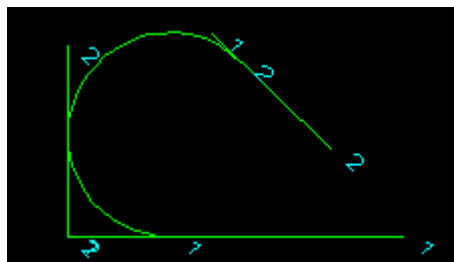
The 2nd tangent is selected and accepted.

**STEP 3:**

The 3rd tangent is selected and accepted.

**STEP 4:**

If a solution exists, an arc is constructed using the given information.



Arc by 2 Tangents and a Typed Radius

Cad_Arc_2_Tangents_Radius_Logical

Position of option on menu: Strings =>CAD =>Arcs =>2 tangents radius

or by selection of appropriate icon from the toolbar. 

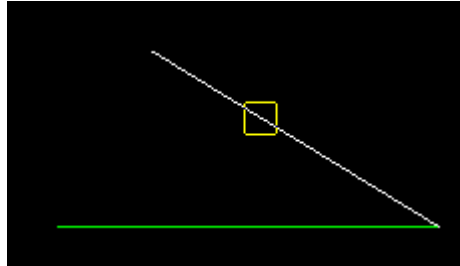
This option creates an arc with a given radius that is tangential to two selecting segments. This is

the same as a fillet.

On selecting 2 tangents radius, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the 12d Model application window.

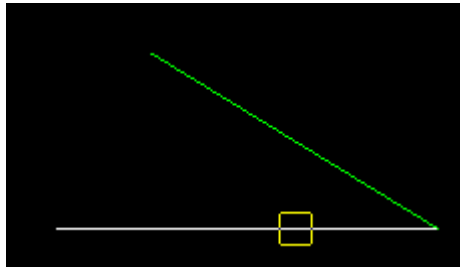
STEP 1:

The 1st tangent is selected with the mouse (Left Button) and accepted (Middle Button).




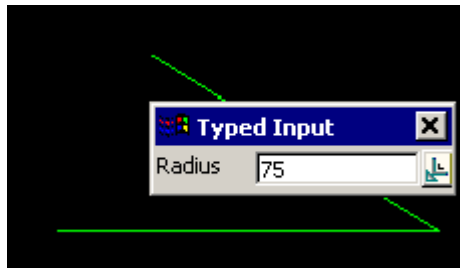
STEP 2:

The 2nd tangent is selected and accepted.



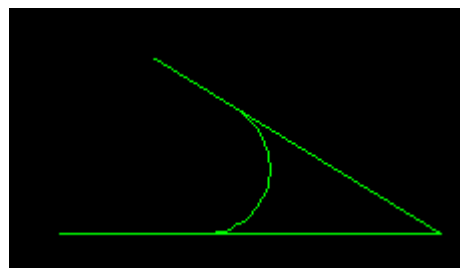
STEP 3:

After the start point is accepted, the Radius Input box will appear. Type the radius value into the Input box and press the enter key. The browse button  on the Input box can be used to define the arc radius by measuring existing elements.



STEP 4:

If a solution exists, the arc is fitted through the two selected tangents using the given radius.



Arc by 2 Tangents and a Typed Radius with Direction

Cad_Arc_2_Tangents_Radius_Directional

Position of option on menu: Strings =>CAD =>Arcs =>2 tangents radius direction

or by selection of appropriate icon from the toolbar. 

This option creates an arc with a given radius that is tangential to two selected segments that are picked with direction.

On selecting 2 tangents radius direction, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the 12d Model application window.

STEP 1:

Select and accept the 1st tangent.

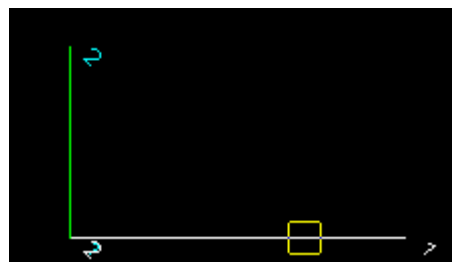
Note: For this option the direction of the selected tangents is important. The arc will be constructed to the right of a tangent. A user may reverse the direction of a tangent by selecting the tangent *with direction*. For further notes on picking tangents with direction, see 'Picking with Direction' in Chapter 3 - **Tools and Concepts** on page 77.

Note: The Vertex indices can be displayed by toggling the option on the Toggle Menu.




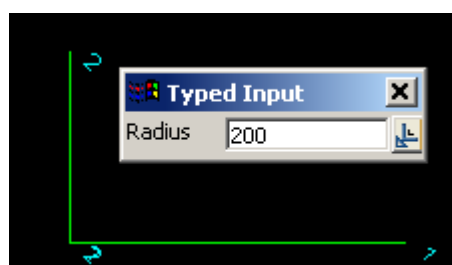
STEP 2:

The 2nd tangent is selected and accepted.



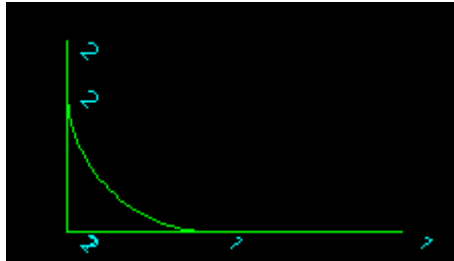
STEP 3:

After the start point is accepted, the Radius Input box will appear. Type the radius value into the Input box and press the enter key. The browse button  on the Input box can be used to define the arc radius by measuring existing elements.



STEP 4:

If a solution exists, the arc is fitted through the two selected tangents using the given radius.



Arc by 2 Points and a Typed Radius

Cad_Arc_2_Points_Radius

Position of option on menu: Strings =>CAD =>Arcs =>2 points and radius

or by selection of appropriate icon from the toolbar. 

This option creates an arc of a given radius that starts and ends on two selected points.

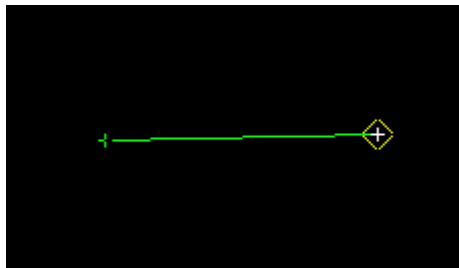
On selecting 2 points and radius, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the 12d Model application window.


STEP 1:

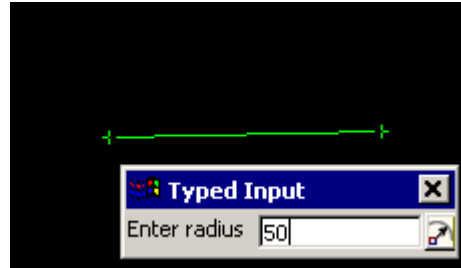
The 1st point is selected with the mouse or entered in via the keyboard. To specify the 1st point with the mouse, a point must be selected (Left Button) and accepted (Middle Button). To enter the 1st point with the keyboard, simply start typing or press the space bar to bring up the XYZ Input box. Type the coordinates into the XYZ Input box and press the enter key.

**STEP 2:**

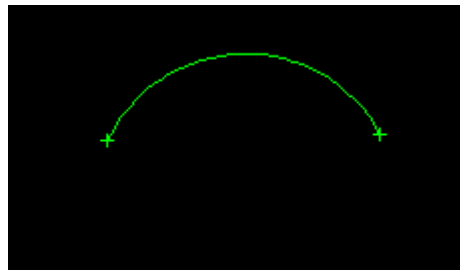
The 2nd point is selected and accepted.

**STEP 3:**

After the start point is accepted, the Arc Radius Input box will appear. Type the radius value into the Input box and press the enter key. The browse button  on the Input box can be used to define the arc radius by measuring existing elements.

**STEP 4:**

If a solution exists, an arc is constructed using the given information.



Arc by 2 Points and an End Bearing

Cad_Arc_2_Points_End_Bearing

Position of option on menu: Strings =>CAD =>Arcs =>2 points and end bearing

or by selection of appropriate icon from the toolbar. 

This option creates an arc that starts and end on two selected points and has a given bearing of the tangent at the end point (the end bearing).

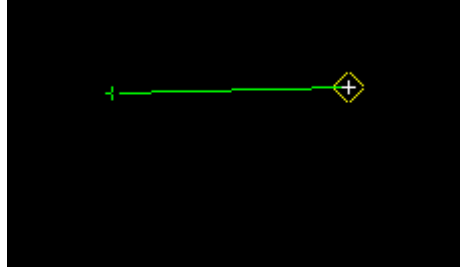
On selecting 2 points and end bearing, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the 12d Model application window.


STEP 1:

The 1st point is selected with the mouse or entered in via the keyboard. To specify the 1st point with the mouse, a point must be selected (Left Button) and accepted (Middle Button). To enter the 1st point with the keyboard, simply start typing or press the space bar to bring up the XYZ Input box. Type the coordinates into the XYZ Input box and press the enter key.

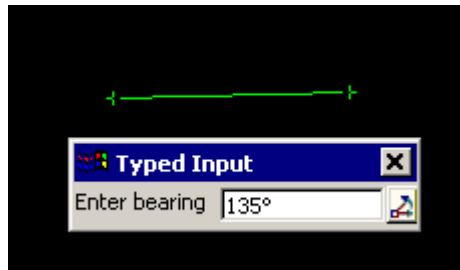
**STEP 2:**

The 2nd point is selected and accepted.

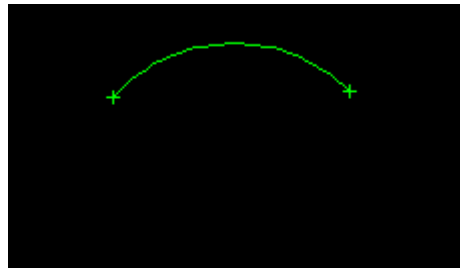
**STEP 3:**

After the 2nd point is accepted, the Enter bearing input box will appear. Type the bearing into the Input box and press the enter key. The browse button  on the input box can be used to define the bearing by measuring existing elements.

Note: The Page Up and Page Down keys can be used when the Enter Bearing input box comes up to add or subtract intervals of 90 degrees.


**STEP 4:**

If a solution exists, the arc is fitted through the two selected points with the end point of the given bearing.



Arc by Centre, Start and End Points

Cad_Arc_Centre_End_Points

Position of option on menu: Strings =>CAD =>Arcs =>Centre, start and end
or by selection of appropriate icon from the toolbar. 

This option creates an arc by selecting in order, the centre point and the start and end points. The radius of the arc is the distance between the centre and the start point.

On selecting Centre, start and end, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the 12d Model application window.

STEP 1:

A centre point is selected with the mouse or entered in via the keyboard. To specify a centre point with the mouse, a point must be selected (Left Button) and accepted (Middle Button). To enter a centre point with the keyboard, simply start typing or press the space bar to bring up the XYZ

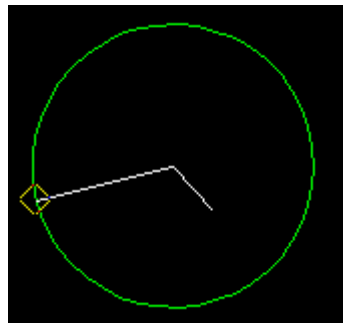
Input box. Type the coordinates into the XYZ Input box and press the enter key.

After the centre point is accepted a circle will be displayed 'rubber banding' to the various solutions according to the position of the cursor. This will continue until the start point is selected and accepted.



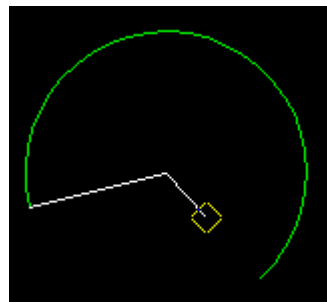
STEP 2:

Select and accept the start point. This point defines the radius and the start of the arc.



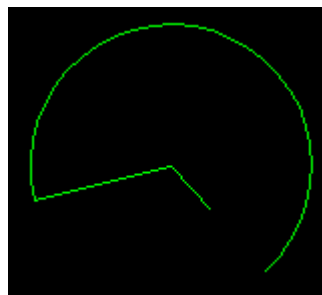
STEP 3:

The end point of the arc is specified.




STEP 4:

The arc is constructed using the given information.



Arc by Centre, Typed Radius, Start and End Points

Cad_Arc_Centre_Radius_End_Points

Position of option on menu: Strings =>CAD =>Arcs =>Centre, radius, start, end
or by selection of appropriate icon from the toolbar. 

This option allows the creation of an arc given a centre point, radius, start and end points.

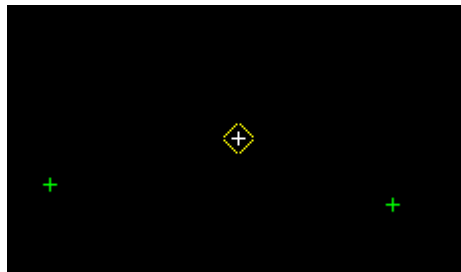
This option creates an arc of a given radius by selecting in the centre point and the start and end positions.

On selecting Centre, radius, start, end, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the 12d Model application window.


STEP 1:

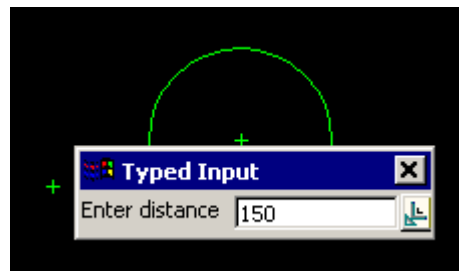
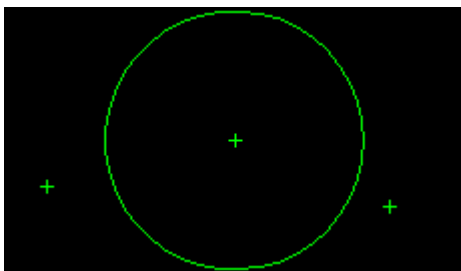
A centre point is selected with the mouse or entered in via the keyboard. To specify a centre point with the mouse, a point must be selected (Left Button) and accepted (Middle Button). To enter a centre point with the keyboard, simply start typing or press the space bar to bring up the XYZ Input box. Type the coordinates into the XYZ Input box and press the enter key.

After the centre point is accepted a circle will be displayed 'rubber banding' to the various solutions according to the position of the cursor. This will continue until the start point is selected and accepted.



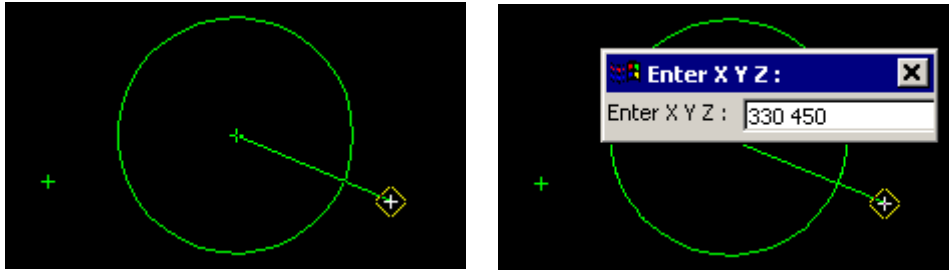
STEP 2:

A radius value is selected with the mouse or entered in via the keyboard. To specify a radius value with the mouse, a point must be selected (Left Button) and accepted (Middle Button). To enter radius value with the keyboard, simply start typing or press the space bar to bring up the Radius Input box. Type the radius value into the Radius Input box and press the enter key. The browse button  on the Input box can be used to define the arc distance by measuring existing elements.



STEP 3:

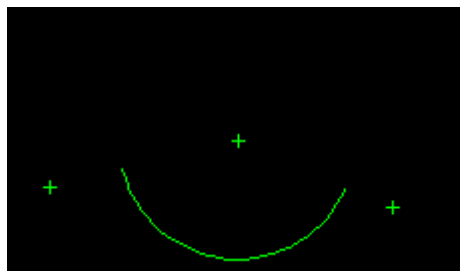
A start point defines the start of the sweep angle to define where to start the arc. It can be selected with the mouse or entered in via the keyboard. To specify a start point with the mouse, a point must be selected (Left Button) and accepted (Middle Button). To enter a start point with the keyboard, simply start typing or press the space bar to bring up the XYZ Input box. Type the coordinates into the XYZ Input box and press the enter key.

**STEP 4:**

The end point of the arc is specified. The start and end points define the sweep angle to define the arc. The rubber banding of the arc will use the cursor position as the end position until a end point is selected and accepted. It can be selected with the mouse or entered in via the keyboard. To specify a start point with the mouse, a point must be selected (Left Button) and accepted (Middle Button). To enter a start point with the keyboard, simply start typing or press the space bar to bring up the XYZ Input box. Type the coordinates into the XYZ Input box and press the enter key. The end point does not have to be on the arc itself. It is used to define the sweep angle.


**STEP 5:**

The arc is constructed using the given information.



Arc by Centre, Start point and Sweep Angle

Cad_Arc_Centre_Start_Sweep

Position of option on menu: Strings =>CAD =>Arcs =>Centre, start, sweep
or by selection of appropriate icon from the toolbar. 

This option creates an arc by selecting a centre point and a start point and giving a sweep angle. The radius of the arc is the distance between the centre and start point.

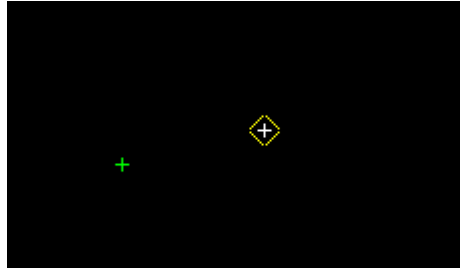
On selecting Centre, start, sweep, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the 12d Model application window.

STEP 1:

A centre point is selected with the mouse or entered in via the keyboard. To specify a centre point with the mouse, a point must be selected (Left Button) and accepted (Middle Button). To enter a

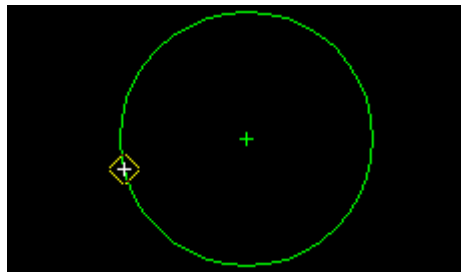
centre point with the keyboard, simply start typing or press the space bar to bring up the XYZ Input box. Type the coordinates into the XYZ Input box and press the enter key.

After the 1st point is accepted a circle will be displayed 'rubber banding' to the various solutions according to the position of the cursor. This will continue until the 2nd point is selected and accepted.




STEP 2:

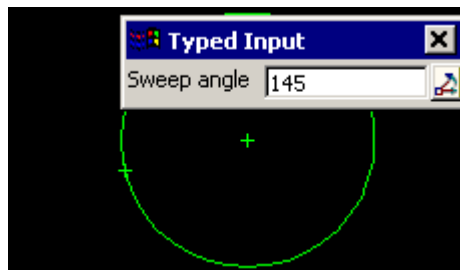
The 2nd point is selected with the mouse or entered in via the keyboard. This point defines the radius as well as the start point of the arc. To specify the 2nd point with the mouse, a point must be selected (Left Button) and accepted (Middle Button). To enter the 2nd point with the keyboard, simply start typing or press the space bar to bring up the XYZ Input box. Type the coordinates into the XYZ Input box and press the enter key.



STEP 3:

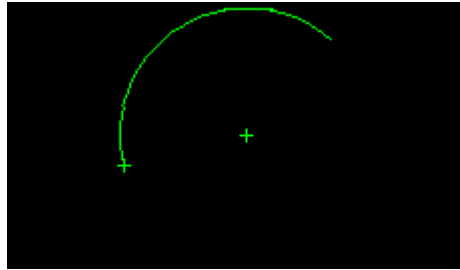
After the 2nd point is accepted, the **Sweep Angle** input box will appear. Type the sweep angle value into the input box and press the enter key. The browse button  on the Input box can be used to define the arc radius by measuring existing elements.

Note: The Page up and page down keys can be used when the input angle box comes up to add or subtract intervals of 90 degrees.




STEP 4:

The arc is created using the information supplied



Arc by Start Point, Typed Radius, Arc Length and Start Bearing

Cad_Arc_Start_Radius_Bearing

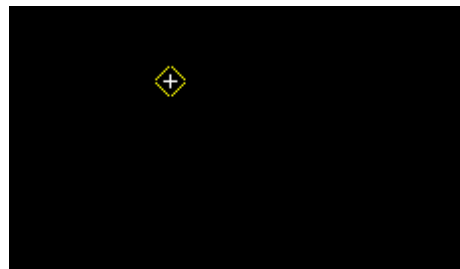
Position of option on menu: Strings =>CAD =>Arcs =>Start, radius, arc l, bearing
or by selection of appropriate icon from the toolbar. 

This option creates an arc of a given radius, starting at a selected point and bearing of the tangent at the start point and going for a given arc length.


On selecting the Start, radius, arc l, bearing option, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the 12d Model application window.

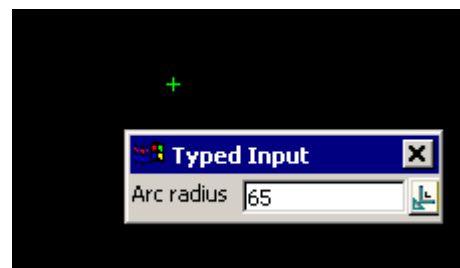
STEP 1:

A start point is selected with the mouse or entered in via the keyboard. To specify a start point with the mouse, a point must be selected (Left Button) and accepted (Middle Button). To enter a start point with the keyboard, simply start typing or press the space bar to bring up the XYZ Input box. Type the coordinates into the XYZ Input box and press the enter key.




STEP 2:

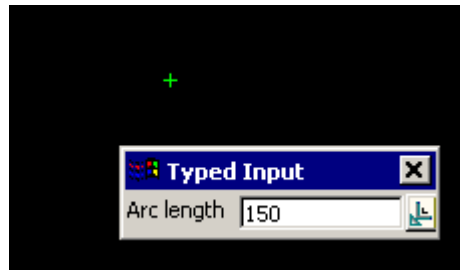
After the start point is accepted, the Arc Radius Input box will appear. Type the radius value into the Input box and press the enter key. The browse button  on the Input box can be used to define the arc radius by measuring existing elements.




STEP 3:

After the radius has been entered, the Arc Length Input box will appear. Type the arc length into the Input box and press the enter key. The browse button  on the Input box can be used to

define the arc distance by measuring existing elements.



STEP 4:

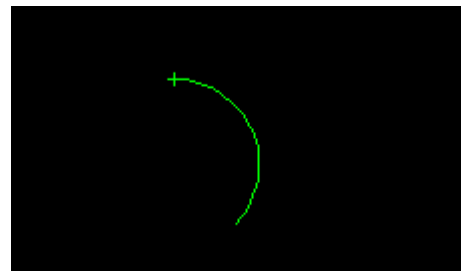
After the arc length is accepted, the Bearing Input box will appear. Type the bearing into the Input box and press the enter key. The browse button  on the Input box can be used to define the bearing by measuring existing elements.

Note: The Page Up and Page Down keys can be used when the Bearing Input box comes up to add or subtract intervals of 90 degrees.




STEP5:

The arc is created with the given information.



Arc by Start Point, Typed Radius, Arc Length and Chord Bearing

Cad_Arc_Start_Radius_Chord_Bearing

Position of option on menu: Strings =>CAD =>Arcs =>Start, radius, arc l, chord bearing
or by selection of appropriate icon from the toolbar. 

This option creates an arc of a given radius, starting from a selected point and with a given chord bearing at the start point and a given arc length.

On selecting Start, radius, arc l, chord bearing, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the 12d Model application window.


STEP 1:

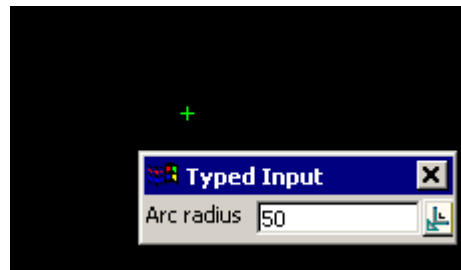
The start point is selected with the mouse or entered in via the keyboard. To specify the start point with the mouse, a point must be selected (Left Button) and accepted (Middle Button). To

enter the start point with the keyboard, simply start typing or press the space bar to bring up the XYZ Input box. Type the coordinates into the XYZ Input box and press the enter key.




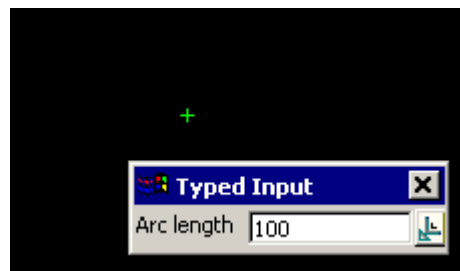
STEP 2:

After the start point is accepted, the **Arc Radius** Input box will appear. Type the radius value into the Input box and press the enter key. The browse button  on the Input box can be used to define the arc radius by measuring existing elements.




STEP 3:

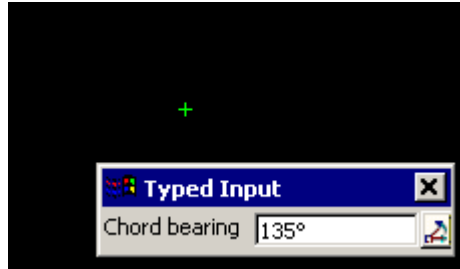
After the arc radius is entered, the **Arc Length** Input box will appear. Type the arc length into the Input box and press the enter key. The browse button  on the Input box can be used to define the arc distance by measuring existing elements.



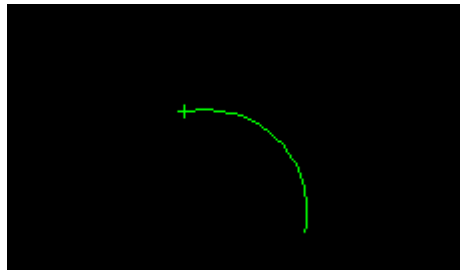
STEP 4:

After the arc length is entered, the **Chord Bearing** Input box will appear. Type the bearing into the Input box and press the enter key. The browse button  on the Input box can be used to define the bearing by measuring existing elements.

Note: The Page Up and Page Down keys can be used when the Chord Bearing Input box comes up to add or subtract intervals of 90 degrees.


**STEP 5:**

An arc is created with the given information.



Arc by Start Point, Typed Radius, Chord length and a bearing

Cad_Arc_Start_Radius_Chord_Length

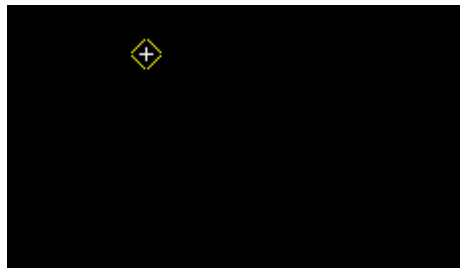
Position of option on menu: Strings =>CAD =>Arcs =>start, radius, chord length, bearing
or by selection of appropriate icon from the toolbar. 


This option creates an arc of a given radius, starting from a selected point, with a given bearing of the tangent at the start point and a given chord length from the start point.

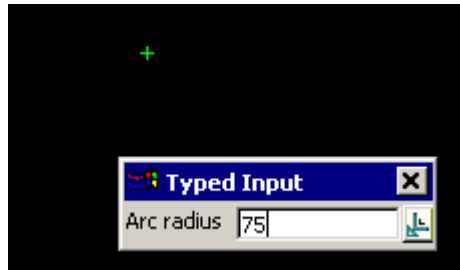
On selecting Start, radius, chord length, bearing, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the 12d Model application window.


STEP 1:

A start point is selected with the mouse or entered in via the keyboard. To specify a start point with the mouse, a point must be selected (Left Button) and accepted (Middle Button). To enter a start point with the keyboard, simply start typing or press the space bar to bring up the XYZ Input box. Type the coordinates into the XYZ Input box and press the enter key.


**STEP 2:**

After the start point is accepted, the **Arc Radius** Input box will appear. Type the radius value into the Input box and press the enter key. The browse button  on the Input box can be used to define the arc radius by measuring existing elements.

**STEP 3:**

After the radius has been entered, the **Chord Length** Input box will appear. Type the chord length into the Input box and press the enter key. The browse button  on the Input box can be used to define the chord length by measuring existing elements.

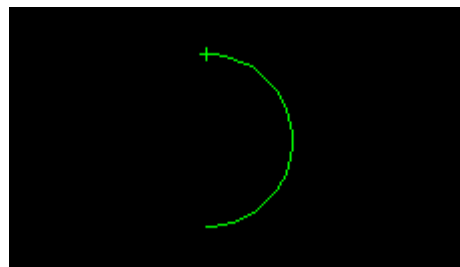
**STEP 4:**

After the chord length has been entered, the **Bearing** Input box will appear. Type the bearing of the start tangent into the Input box and press the enter key. The browse button  on the Input box can be used to define the bearing by measuring existing elements.

Note: The Page Up and Page Down keys can be used when the Bearing Input box comes up to add or subtract intervals of 90 degrees.

**STEP 5:**


The arc is created with the given information.



Fillet by Typed Radius

Cad_Create_Fillet_by_radius

Position of option on menu: Strings =>CAD =>Arcs =>Fillet

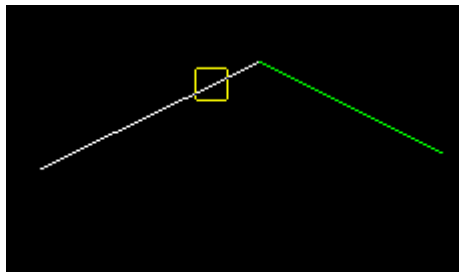
or by selection of appropriate icon from the toolbar. 

This option creates an arc given a fillet radius

On selecting Fillet, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the 12d Model application window.

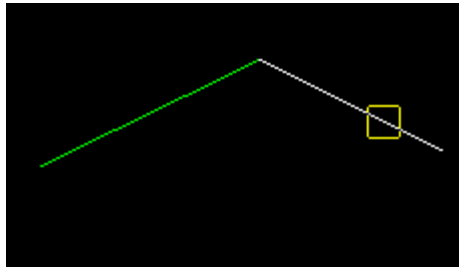
STEP 1:

The 1st segment where the fillet is to depart from is selected and accepted. This should be done by a pick with direction. The direction will influence the calculations as there are a number of solutions for intersecting segments. In the case shown, the direction was in a north-east direction.




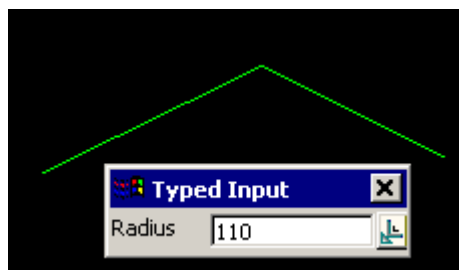
STEP 2:

The 2nd segment where the fillet is to arrive from is selected and accepted. This should be done by a pick with direction. The direction will again influence the calculations as there are a number of solutions for intersecting segments. In the case shown the direction was in a south-east direction.



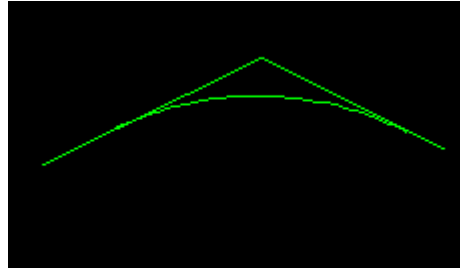
STEP 3:

After the 2nd segment is accepted, the Arc Radius Input box will appear. Type the radius of the fillet in the Input box (positive radius for curves curving to the right) and press the enter key. The browse button  on the Input box can be used to define the arc radius by measuring existing elements.



STEP 4:

The fillet arc is placed between the selected segments.



Fillet by Start Tangent Point

Cad_Create_Fillet_by_Start_Point

Position of option on menu: Strings =>CAD =>Arcs =>Fillet by start point

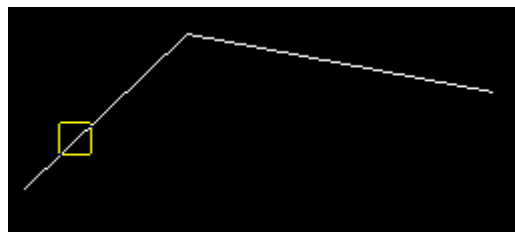
or by selection of appropriate icon from the toolbar. 

This option creates an arc that is a fillet between two selected sections and with a selected fillet start point (which will be a tangent point of the created arc).

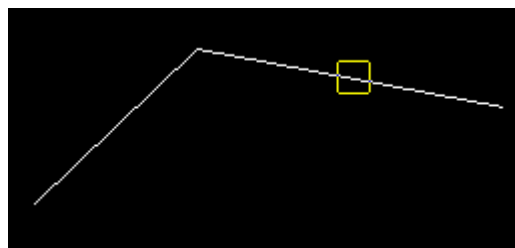
On selecting Fillet by start point, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the 12d Model application window.

STEP 1:

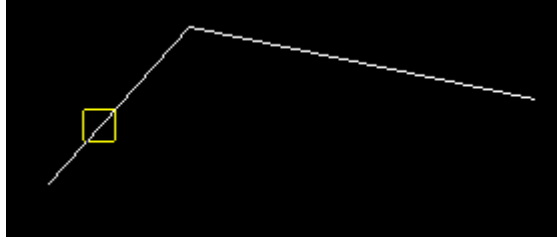
The 1st segment where the fillet is to depart from is selected and accepted. This should be done by a pick with direction. The direction will influence the calculations as there are a number of solutions for intersecting segments. In the case shown the direction was in a north-east direction.

**STEP 2:**

The 2nd segment where the fillet is to arrive from is selected and accepted. This should be done by a pick with direction. The direction will again influence the calculations as there are a number of solutions for intersecting segments. In the case shown the direction was in a south-east direction

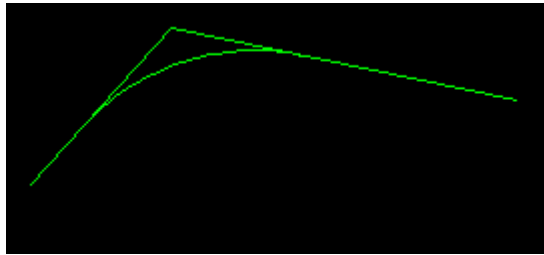
**STEP 3:**

The tangent start point of the fillet is selected and accepted.



STEP 4:

The fillet arc is placed between the selected segments.

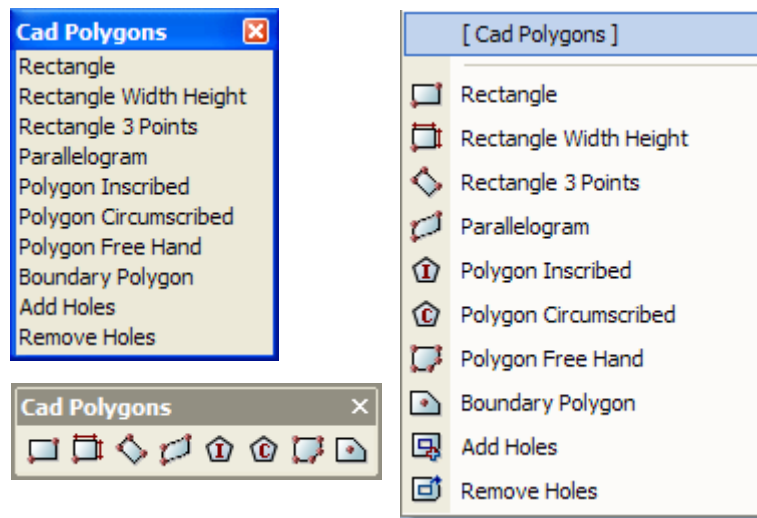


CAD Polygons

cad_polygons

Position of option on menu: Strings =>CAD =>Polygons

The Cad polygons walk-right menu is



For the option *Rectangles*, go to the section “Create Rectangle” .

<i>Rectangle width height</i>	“Rectangle by Width and Height” .
<i>Rectangle 3 points</i>	“Rectangle by 3 Points” .
<i>Parallelogram</i>	“Create Parallelogram” .
<i>Polygon inscribe</i>	“Polygon Inscribed in a Circle” .
<i>Polygon circumscribe</i>	“Polygon Circumscribed About a Circle” .
<i>Polygon freehand</i>	“Free Hand Polygon” .
<i>Boundary polygon</i>	“Create Boundary Polygon” .
<i>Add holes</i>	“Add Holes”
<i>Remove holes</i>	“Remove Holes”

Create Rectangle

Cad_Create_Rectangle

Position of option on menu: Strings =>CAD =>Polygons =>Rectangle

or by selection of appropriate icon from the toolbar. 

This option creates a rectangle parallel to the x and y axis by selecting two end points of the rectangle.

On selecting **Rectangle**, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the 12d Model application window.

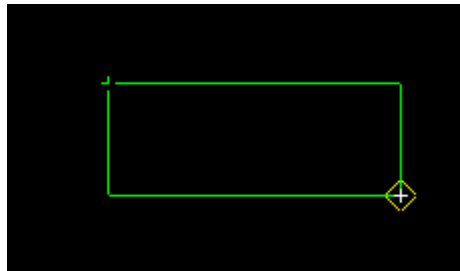
STEP 1:

The 1st point is selected with the mouse or entered in via the keyboard. To specify the 1st point with the mouse, a point must be selected (Left Button) and accepted (Middle Button). To enter the 1st point with the keyboard, simply start typing or press the space bar to bring up the XYZ Input box. Type the coordinates into the XYZ Input box and press the enter key.

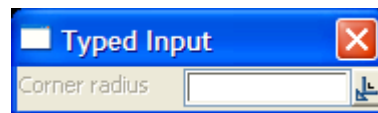
After the 1st point is accepted a rectangle will be displayed ‘rubber banding’ to the various solutions according to the position of the cursor. This will continue until the 2nd point is selected and accepted.

**STEP 2:**

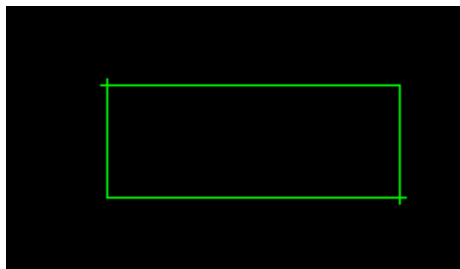
The 2nd point is selected with the mouse or entered in via the keyboard. To specify the 2nd point with the mouse, a point must be selected and accepted. To enter the 2nd point with the keyboard, simply start typing or press the space bar to bring up the XYZ Input box. Type the coordinates into the XYZ Input box and press the enter key.

**STEP 3:**

The **Corner radius** typed input panel is then displayed. If a radius is entered then it is used to fillet the four corners of the rectangle. To not fillet the rectangle corners, simply leave the **Corner radius** box empty and press the <enter> key.


**STEP 4:**

The rectangle is created with the given information.



Rectangle by Width and Height

Cad_Create_Rectangle_by_Width_and_Height

Position of option on menu: Strings =>CAD =>Polygons =>Rectangle Width Height
or by selection of appropriate icon from the toolbar. 

This option allows the creation of a rectangle given a start point, width and height.

This option creates a rectangle parallel to the x and y axis by selecting a start point and giving the width and height of the rectangle.

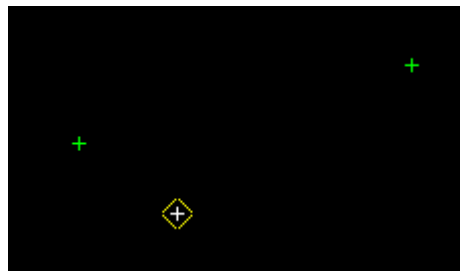
On selecting Rectangle Width Height, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the 12d Model application window.

STEP 1:


The start point is selected with the mouse or entered in via the keyboard. To specify the start point with the mouse, a point must be selected (Left Button) and accepted (Middle Button). To enter the start point with the keyboard, simply start typing or press the space bar to bring up the XYZ Input box. Type the coordinates into the XYZ Input box and press the enter key.


This point defines the bottom left point of the rectangle.

After the start point is accepted, the width will be displayed 'rubber banding' to right of the start point (positive distance). The width is equal to the distance from the start point to the position of the cursor. This will continue until the width is selected and accepted.

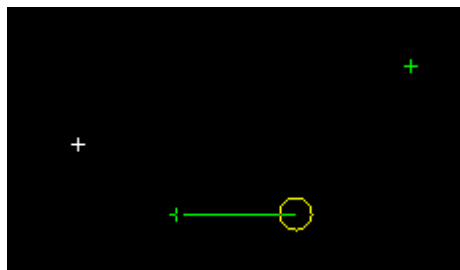


STEP 2:


The width is selected with the mouse or entered in via the keyboard. To specify the width with the mouse, a point must be selected and accepted. To enter the width with the keyboard, simply start typing or press the space bar to bring up the Distance Input box. Type the distance into the Distance Input box and press the enter key. The browse button  on the Input box can be used to define the distance by measuring existing elements.


A negative distance (to the left of the 1st point) can be entered via the Distance Input box in two ways. Either type a negative distance, or use the browse button  to select a distance, then place a minus "-" sign in front of the distance value.

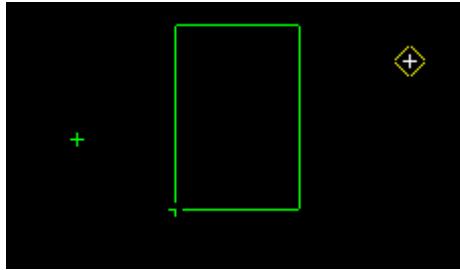
After the width is accepted, the width of the rectangle is confirmed and the height will be displayed 'rubber banding' upwards on the screen. The height is equal to the distance from the found width point to the position of the cursor. The rectangle will be created once the height is selected and accepted.



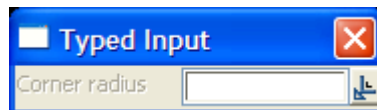
STEP 3:

The height is selected with the mouse or entered in via the keyboard. To specify the height with the mouse, a point must be selected and accepted. To enter the height with the keyboard, simply start typing or press the space bar to bring up the Distance Input box. Type the distance into the Distance Input box and press the enter key. The browse button  on the Input box can be used to define the distance by measuring existing elements.

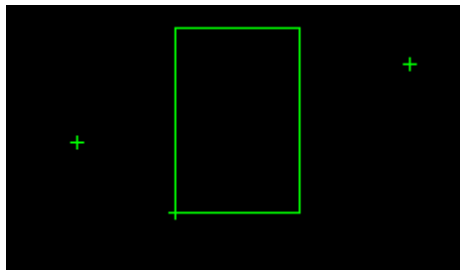
A negative distance (below of the 2nd point) can be entered via the Distance Input box in two ways. Either type a negative distance, or use the browse button  to select a distance, then place a minus "-" sign in front of the distance value.

**STEP 4:**

The **Corner radius** typed input panel is then displayed. If a radius is entered then it is used to fillet the four corners of the rectangle. To not fillet the rectangle corners, simply leave the **Corner radius** box empty and press the <enter> key.

**STEP 5:**

The rectangle is created with the given information.



Rectangle by 3 Points

Cad_Create_Rectangle_by_3_Points

Position of option on menu: Strings =>CAD =>Polygons =>Rectangle 3 Points

or by selection of appropriate icon from the toolbar. 

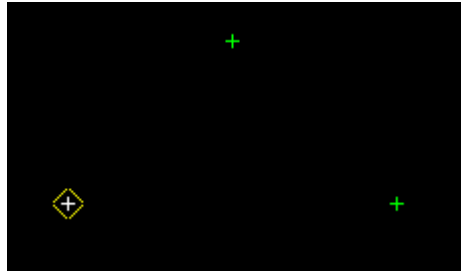
This option creates a rectangle by selecting three points. The first and second point define the base of the rectangle and the third point is on the opposite side of the rectangle.


On selecting **Rectangle 3 points**, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the 12d Model application window.

STEP 1:

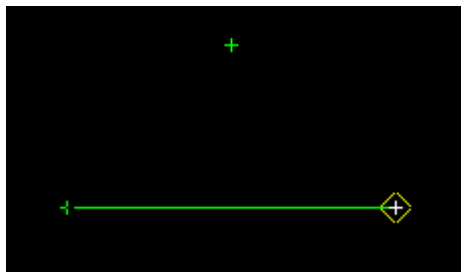
The 1st point is selected with the mouse or entered in via the keyboard. To specify the 1st point with the mouse, a point must be selected (Left Button) and accepted (Middle Button). To enter the 1st point with the keyboard, simply start typing or press the space bar to bring up the XYZ Input box. Type the coordinates into the XYZ Input box and press the enter key.


After the 1st point is accepted, the base of the rectangle will be displayed 'rubber banding' on the screen. The baseline length is equal to the distance from the 1st point to the position of the cursor. This will continue until the 2nd point is selected and accepted.

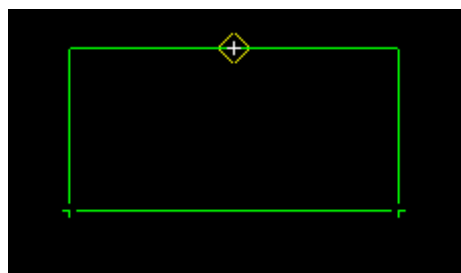
**STEP 2:**

The 2nd point is selected with the mouse or entered in via the keyboard. To specify the 2nd point with the mouse, a point must be selected and accepted. To enter the 2nd point with the keyboard, simply start typing or press the space bar to bring up the XYZ Input box. Type the coordinates into the XYZ Input box and press the enter key. The browse button  on the Input box can be used to define the distance by measuring existing elements.

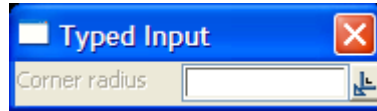
After the 2nd point is accepted, the baseline of the rectangle is confirmed and the height will be displayed 'rubber banding' on the screen. The height is equal to the distance from the 2nd point to the position of the cursor. The rectangle will be created once the height is selected and accepted.

**STEP 3:**

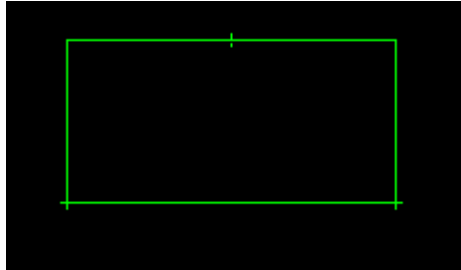
The height is selected with the mouse or entered in via the keyboard. To specify the height with the mouse, a point must be selected and accepted. To enter the 3rd point with the keyboard, simply start typing or press the space bar to bring up the XYZ Input box. Type the coordinates into the XYZ Input box and press the enter key. The browse button  on the Input box can be used to define the distance by measuring existing elements.

**STEP 4:**

The **Corner radius** typed input panel is then displayed. If a radius is entered then it is used to fillet the four corners of the rectangle. To not fillet the rectangle corners, simply leave the **Corner radius** box empty and press the <enter> key.


**STEP 5:**

The rectangle is created with the given information.



Create Parallelogram

Cad_Create_Parallelogram

Position of option on menu: Strings =>CAD =>Polygons =>Parallelogram
or by selection of appropriate icon from the toolbar. 

This option allows the creation of a parallelogram given 3 points.

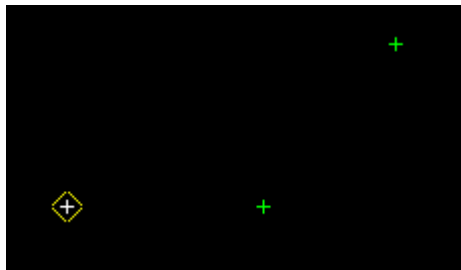
This option creates a parallelogram by selecting three points. The first and second point define the base of the parallelogram and the third point is the end point of the opposite side of the parallelogram.

On selecting **Parallelogram**, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the 12d Model application window.


STEP 1:

The 1st point is selected with the mouse or entered in via the keyboard. To specify the 1st point with the mouse, a point must be selected (Left Button) and accepted (Middle Button). To enter the 1st point with the keyboard, simply start typing or press the space bar to bring up the XYZ Input box. Type the coordinates into the XYZ Input box and press the enter key.

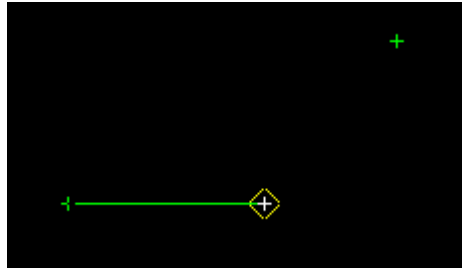
After the 1st point is accepted, the base of the rectangle will be displayed 'rubber banding' on the screen. The baseline length is equal to the distance from the 1st point to the position of the cursor. This will continue until the 2nd point is selected and accepted.

**STEP 2:**


The 2nd point is selected with the mouse or entered in via the keyboard. To specify the 2nd point with the mouse, a point must be selected and accepted. To enter the 2nd point with the keyboard,

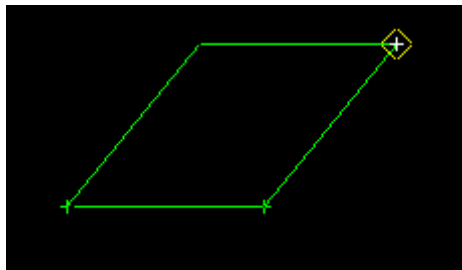
simply start typing or press the space bar to bring up the XYZ Input box. Type the coordinates into the XYZ Input box and press the enter key. The browse button  on the Input box can be used to define the distance by measuring existing elements.

After the 2nd point is accepted, the baseline of the parallelogram is confirmed and the height will be displayed 'rubber banding' on the screen. The height is equal to the distance from the 2nd point to the position of the cursor. The parallelogram will be created once the height is selected and accepted.



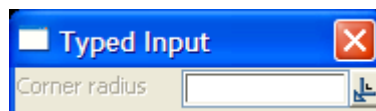
STEP 3:

The height is selected with the mouse or entered in via the keyboard. To specify the height with the mouse, a point must be selected and accepted. To enter the 3rd point with the keyboard, simply start typing or press the space bar to bring up the XYZ Input box. Type the coordinates into the XYZ Input box and press the enter key. The browse button  on the Input box can be used to define the distance by measuring existing elements.



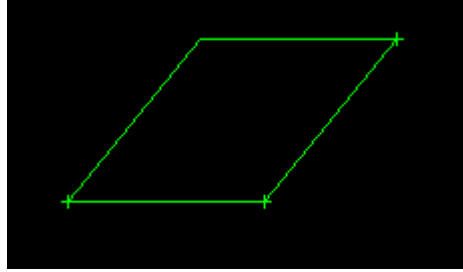
STEP 4:

The **Corner radius** typed input panel is then displayed. If a radius is entered then it is used to fillet the four corners of the rectangle. To not fillet the rectangle corners, simply leave the **Corner radius** box empty and press the <enter> key.



STEP 5:


The parallelogram is created with the given information.



Polygon Inscribed in a Circle

Cad_Create_Polygon_Inscribed_in_Circle

Position of option on menu: Strings =>CAD =>Polygons =>Polygon Inscribed

or by selection of appropriate icon from the toolbar. 

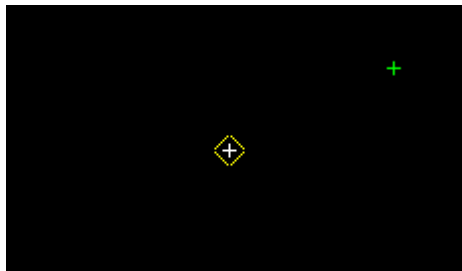
This option creates a polygon with a user defined number of sides on the inside of a circle.

The polygon is constructed inside a circle, thus each corner of the polygon touches the circumference of the circle defined by the user. Conversely using the **Polygon circumscribed** option, the midpoint of each side of the polygon touches the circumference of the circle creating a polygon outside the circle.

On selecting **Polygon inscribed**, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the 12d Model application window.

STEP 1:

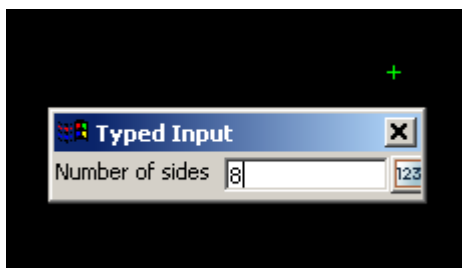
The centre point is selected with the mouse or entered in via the keyboard. To specify the centre point with the mouse, a point must be selected (Left Button) and accepted (Middle Button). To enter the centre point with the keyboard, simply start typing or press the space bar to bring up the XYZ Input box. Type the coordinates into the XYZ Input box and press the enter key.



STEP 2:

After the centre point is accepted, the Number of Sides Input box will appear. Type in the desired number of sides for the polygon into the Input box and press the enter key.

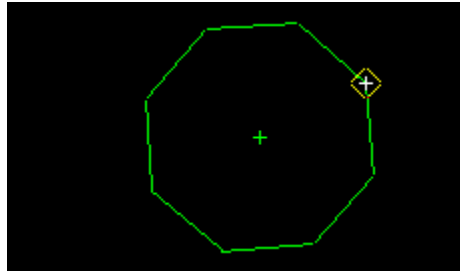
After the number of sides have been selected, the polygon will be displayed 'rubber banding' on the screen. The polygon will be created once the radius is selected and accepted.



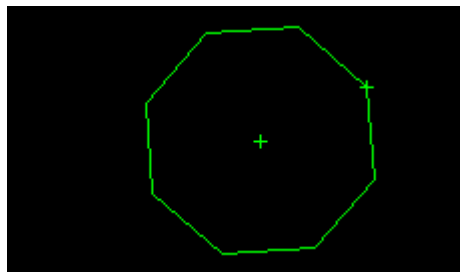
STEP 3:

Before a polygon can be created inside the circle, its radius must be defined by the user. To specify the radius with the mouse, a point must be selected and accepted. To enter the point with the keyboard, simply start typing or press the space bar to bring up the XYZ Input box. Type the coordinates into the XYZ Input box and press the enter key.

Note: One of the polygon's corners will be located on the point selected to defined the circle's radius

**STEP 4:**

A polygon is created inside a circle with a radius defined by the user.



Polygon Circumscribed About a Circle

Cad_Create_Polygon_Circumscribed_about_Circle

Position of option on menu: Strings =>CAD =>Polygons =>Polygon circumscribed

or by selection of appropriate icon from the toolbar. 

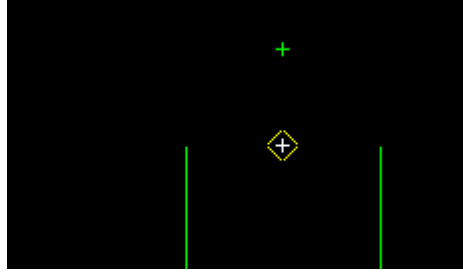
This option creates a polygon with a user defined number of sides on the outside a circle.

The polygon is constructed outside a circle, thus the midpoint of each side of the polygon touches the circumference of the circle defined by the user. Conversely using the **Polygon inscribed** option, each corner of the polygon touches the circumference of the circle creating a polygon inside the circle.

On selecting Polygon circumscribed, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the 12d Model application window.

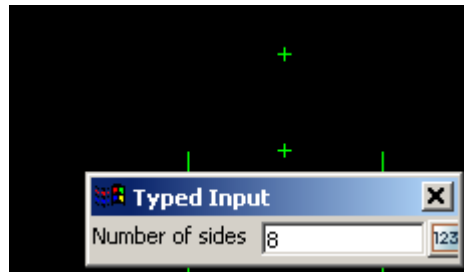
STEP 1:

The centre point is selected with the mouse or entered in via the keyboard. To specify the centre point with the mouse, a point must be selected (Left Button) and accepted (Middle Button). To enter the centre point with the keyboard, simply start typing or press the space bar to bring up the XYZ Input box. Type the coordinates into the XYZ Input box and press the enter key.

**STEP 2:**

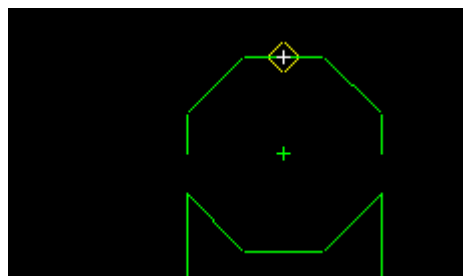
After the centre point is accepted, the Number of Sides Input box will appear. Type in the desired number of sides for the polygon into the Input box and press the enter key.

After the number of sides have been selected, the polygon will be displayed 'rubber banding' on the screen. The polygon will be created once the radius is selected and accepted.

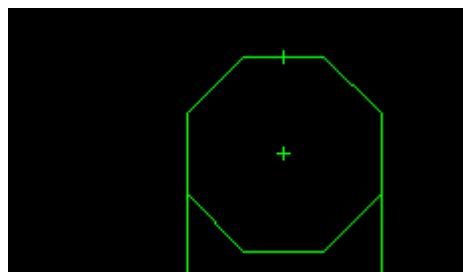
**STEP 3:**

Before a polygon can be created outside the circle, its radius must be defined by the user. To specify the radius with the mouse, a point must be selected and accepted. To enter the point with the keyboard, simply start typing or press the space bar to bring up the XYZ Input box. Type the coordinates into the XYZ Input box and press the enter key.

Note: One midpoint of the polygon's side will be located on the point selected to defined the circle's radius


**STEP 4:**

A polygon is created outside the circle with a radius defined by the user.



Free Hand Polygon

Cad_Create_Polygon

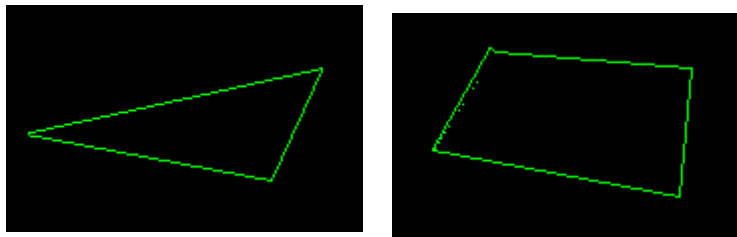
Position of option on menu: Strings =>CAD =>Polygons =>Polygon freehand
or by selection of appropriate icon from the toolbar. 

This option creates a closed polygon from selected vertices.

On selecting **Polygon freehand**, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the 12d Model application window.

STEP 1:

Pick and accept the position to form the vertices of the polygon. As each vertex is accepted, the polygon is automatically closed.




STEP 2:

The polygon is finished by pressing the <esc> key.

Create Boundary Polygon

Cad_Create_Boundary_Polygon

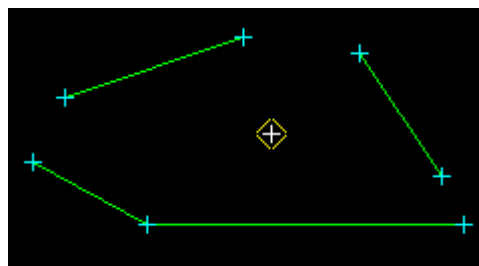
Position of option on menu: Strings =>CAD =>Polygons =>Boundary Polygon
or by selection of appropriate icon from the toolbar. 

This option tries to form a boundary from a selected set of segments.

On selecting **Boundary Polygon**, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the 12d Model application window.

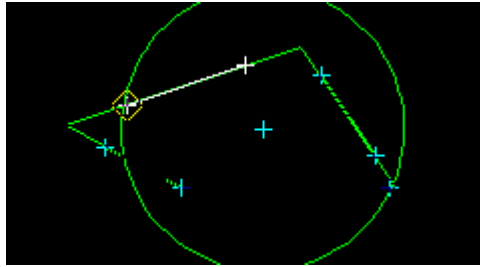
STEP 1:

Pick a position inside the lines to form a bounding polygon.



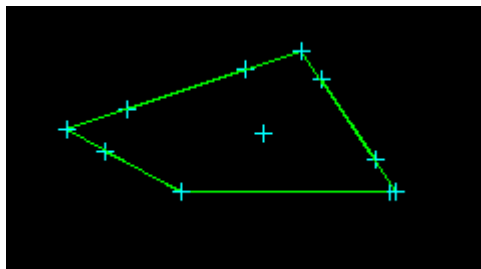
STEP 2:

A circle is then drawn centred on the selected position with circumference going through the position of the cursor. Drag the cursor out until it encloses all the data to be used to create the closest bounding polygon around the centre.



STEP 3:

On accepting the circle position, an attempt is made to create the inner polygon using all the lines inside the circle. Parts of lines will only be used if they can be joined to the centre by a straight line which doesn't cross any other side.

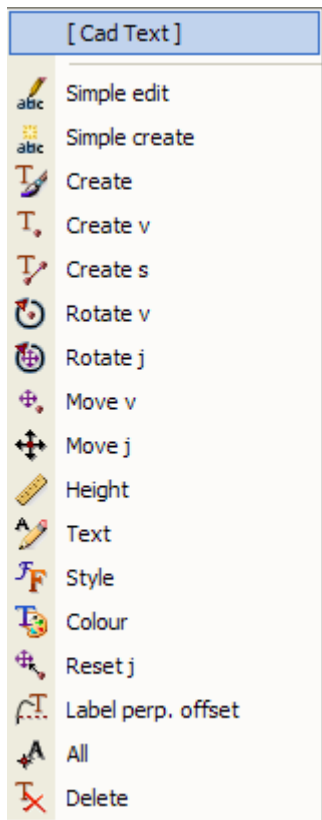


CAD Text

cad_text

Position of option on menu: Strings =>CAD =>Text

The Text walk-right menu is



Menu of Options to Create and Manipulate Text

edit text using grips

create text string and edit using grips

create text string at a selected position

create text at a user selected super string vertex

create text at a user selected super string segment

rotate text about its vertex

rotate text about its justification points (which may be offset from the vertex)

move text by its vertex

move text by its justification point (the vertex does not move)

change the height of text

change the characters of the text

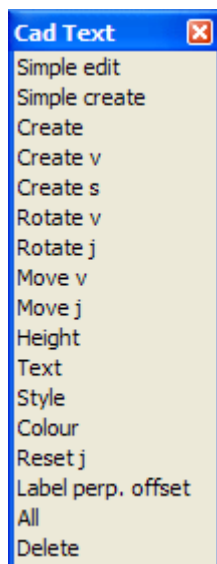
change the style of text

change the colour of text

reset the text justification point so that it is on top of the vertex position

menu to make most of the above changes to one selected text

delete text



Text can occur as a text string, on vertices of a 4d string, and on vertices and segments of a super string. Each type of text has a vertex (these are displayed when **Vertices** are toggle on in a plan view), a justification point, a rotation, an offset and raise value. The vertex and justification point

only coincide if the offset and raise values are both zero. All text on a 4d string must have the same height, colour, angle, offset and raise. What parts of the text on a super string vertex or super string segment can be independently modified depends on the settings for the super string.

For some text options, the created elements will have attributes defined by the **Text Controlbar** (text type and size) and **CAD Controlbar** (model and colour). For more information, go to the section “Text Controlbar” and “CAD Controlbar” .



For the option *Simple edit*, please go to the section. “Simple Text Edit”

<i>Simple create</i>	“Simple Text Create”
<i>Create</i>	“Text Create”
<i>Create v</i>	“Create Text on Vertex of Super String”
<i>Centre s</i>	“Text Create on Segment of Super Strings”
<i>Rotate v</i>	“Rotate Text around Vertex”
<i>Rotate j</i>	“Rotate Text about the Justification Point”
<i>Move v</i>	“Move the Text Vertex Point”
<i>Move j</i>	“Move the Text Justification Point”
<i>Height</i>	“Height of Text”
<i>Text</i>	“Change Text”
<i>Style</i>	“Style of Text”
<i>Colour</i>	“Text Colour”
<i>Reset j</i>	“Reset Text Justification Point”
<i>Label perp. offset</i>	“Label Perpendicular Offset”
<i>All</i>	“All Text Edits”
<i>Delete</i>	“Text Delete”

Simple Text Edit

Cad_Edit_Simple_Text

Position of option on menu: Strings =>CAD =>Text =>Simple edit

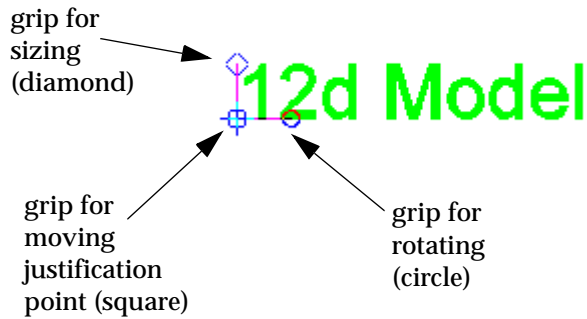
or by selection of appropriate icon from the toolbar. 

This option edits text strings, and text on super string vertices or segments, using grips to quickly define the mode of editing (sizing, rotating or moving the justification point).

On selecting Simple edit, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the 12d Model application window.

STEP 1:

When the text to be edited is selected, grips for size, rotating and moving the justification point are displayed. The appropriate grip is then selected for quick editing.



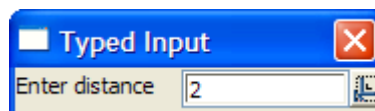
Size Grip (diamond):

If the **Size grip** is selected, the text size is dynamically adjusted by moving the cursor. The size of the text is displayed as part of the *Enter height* prompt in the message area.

The text size is set when a position is accepted.

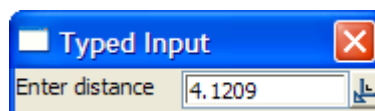


An **exact** text size can be entered by hitting the <space bar> or by starting to type a size. This brings up the **Enter distance** typed input box. The size is typed in and the <enter> key pressed.



To return to dynamic sizing without entering a distance, simply select the **X** on the top of the input box. The box will disappear and dynamic sizing will resume.

If the text is being dynamically sized, the **current** size of the text can be displayed by pressing the **d** key which brings up the **Enter distance** typed input box with the current text size in it.



The size can be modified and the value used by pressing the <enter> key.

To return to dynamic sizing without entering a distance, simply select the **X** on the top of the input box.

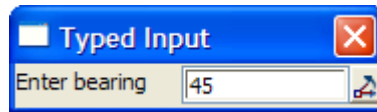
Rotate Grip (circle):

If the **Rotate grip** is selected, the text bearing is dynamically adjusted by moving the cursor. The bearing of the text is displayed as part of the *Enter bearing* prompt in the message area.

The text bearing is set when a position is accepted.

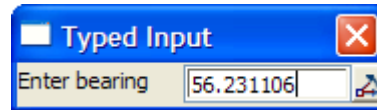


An **exact** bearing can be entered by hitting the <space bar> or by starting to type a bearing. This brings up the **Enter bearing** typed input box. The *bearing* is typed in and the <enter> key pressed.



To return to dynamic rotating without entering a bearing, simply select the **X** on the top of the input box. The box will disappear and dynamic sizing will resume.

If the text is being dynamically rotated, the **current** bearing of the text can be displayed by pressing the **d** key which brings up the **Enter bearing** typed input box with the *current* text bearing in it.



The *bearing* can be modified and the value used by pressing the <enter> key.

To return to dynamic rotation without entering a bearing, simply select the **X** on the top of the input box.

Justification Grip (square):

If the **Justification grip** is selected, the text justification point is dynamically adjusted by moving the cursor. The (x,y) position of the text is displayed in the message area.

The text justification point is set when a position is accepted.



An **exact** coordinate can be entered by hitting the <space bar> or by starting to type a coordinate. This brings up the **Enter X Y Z** typed input box. The *x* and *y* coordinates are typed in, separated by

a space, and the <enter> key pressed.



To return to dynamic moving without entering a coordinate, simply select the **X** on the top of the input box. The box will disappear and dynamic moving will resume.

Simple Text Create

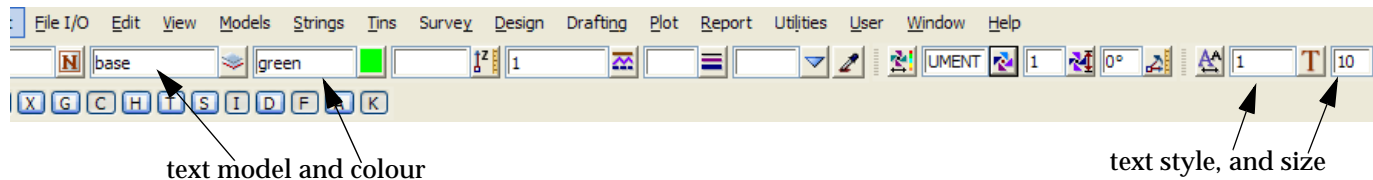
Cad_Create_Simple_Text

Position of option on menu: Strings =>CAD =>Text =>Simple create

or by selection of appropriate icon from the toolbar. 

This option creates text strings and then displays grips to quickly allow editing of text size, rotation and justification point.

The text style and height are taken from the **Text controlbar** and the model and colour from the **CAD controlbar** (see “CAD, Symbol and Text Controlbars”, “Symbol Controlbar” and “CAD Controlbar”).



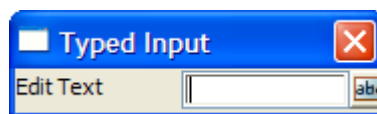
The text will be placed with the vertex and justification point at the selected position.

After defining one piece of text, the option restarts so that another of text can be defined. Picking Cancel from the Pick Ops menu, hitting <esc> or selecting another option terminates the option.

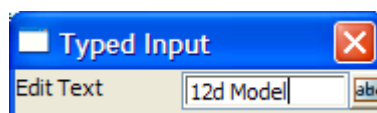
On selecting Simple create, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the 12d Model application window.

STEP 1:

An insertion point for the text is selected and accepted and an **Enter text** typed input box is then displayed on the screen.

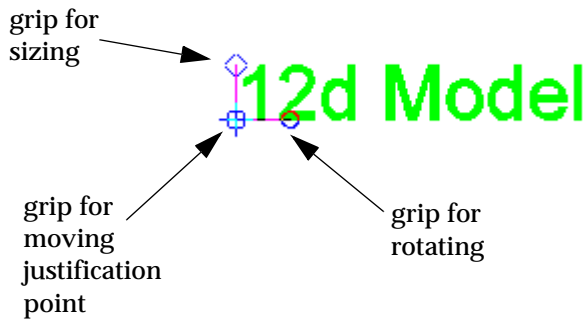


The text is typed into the box and the <enter> key pressed.



The text will be placed with the vertex and justification point at the selected position and using values such as colour, model, text height and text style given in the **CAD controlbar** and **Text controlbar** (See “CAD, Symbol and Text Controlbars”)

When the text is displayed, grips for quick editing of size, rotation and moving of the justification point are also shown. The appropriate grip can then selected for quick editing. For details on using the grips, go to the section “Simple Text Create”.



Text Create

Cad_Create_Text

Position of option on menu: Strings =>CAD =>Text =>Create

or by selection of appropriate icon from the toolbar. 

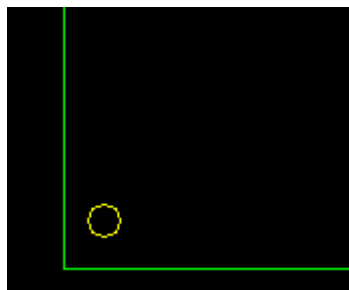
This option creates text strings at a selected insertion point (a cursor snap is valid).

After defining one piece of text, the option restarts so that another piece of text can be defined. Picking Cancel from the Pick Ops menu, hitting <esc> or selecting another option terminates the option.

On selecting Create, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the *12d Model* application window.

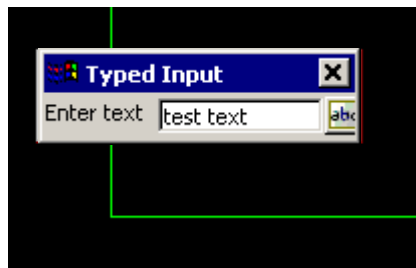
STEP 1:

An insertion point is selected and accepted. The text will be placed relative to the insertion point given other parameters such as justification, as defined in the textstyle data panel



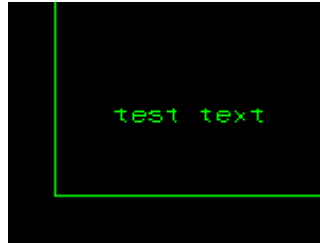
STEP 2:

The actual text is entered into the text input box followed by the enter key.



STEP 3:

The text is created using the specified settings.



Create Text on Vertex of Super String

Cad_Create_Text_on_Vertex

Position of option on menu: Strings =>CAD =>Text =>Create v

or by selection of appropriate icon from the toolbar. 

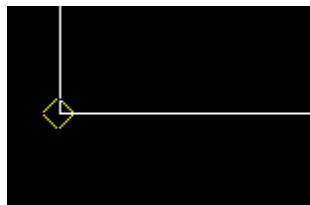
This option creates text at a vertex of a super string. One piece of text is allowed per super string vertex, so if this option is used on existing vertex text, the existing value is displayed in the text input box.

After defining one piece of text, the option restarts so that another piece of text can be defined. Picking Cancel from the Pick Ops menu, hitting <esc> or selecting another option terminates the option.

On selecting Create v, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the 12d Model application window.

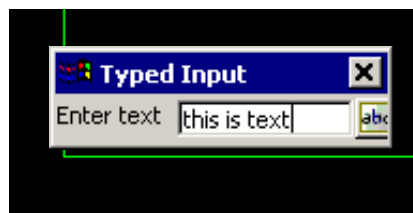
STEP 1:

An insertion point is selected and accepted. The point snap is forced on so that a vertex can be selected. The text will be placed relative to the insertion point given other parameters such as justification, as defined in the textstyle data panel



STEP 2:

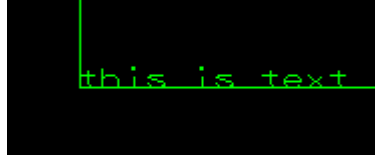
The actual text is entered into the text input box followed by the enter key.



STEP 3:

The text is created using the specified settings.

Picking Cancel from the Pick Ops menu, hitting <esc> or selecting another option terminates the option.



Text Create on Segment of Super Strings

Cad_Create_Text_on_Segment

Position of option on menu: Strings =>CAD =>Text =>Create s

or by selection of appropriate icon from the toolbar. 

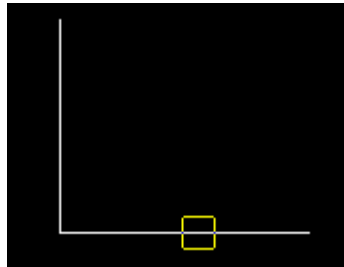
This option creates text at the mid point of a selected super string segment. One piece of text is allowed per super string segment, so if this option is used on existing segment text, the existing value is displayed in the text input box.

After defining one piece of text, the option restarts so that another piece of text can be defined. Picking Cancel from the Pick Ops menu, hitting <esc> or selecting another option terminates the option.

On selecting Create s, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the 12d Model application window.

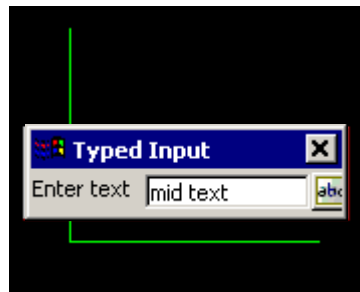
STEP 1:

A super string segment is selected and accepted. The line snap is forced on so that a segment can be selected. The text will be placed relative to the insertion point which is the midpoint of the segment given other parameters such as justification, as defined in the textstyle data panel



STEP 2:

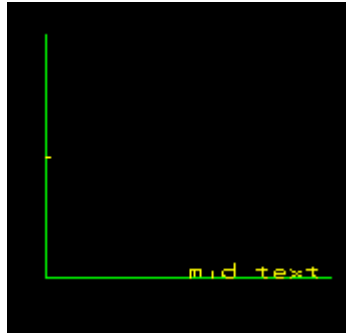
The actual text is entered into the text input box followed by the enter key.



STEP 3:

The text is created using the specified settings.


Picking Cancel from the Pick Ops menu, hitting <esc> or selecting another option terminates the option.



Rotate Text around Vertex

Cad_Rotate_Text_about_Vertex

Position of option on menu: Strings =>CAD =>Text =>Rotate v

or by selection of appropriate icon from the toolbar. 

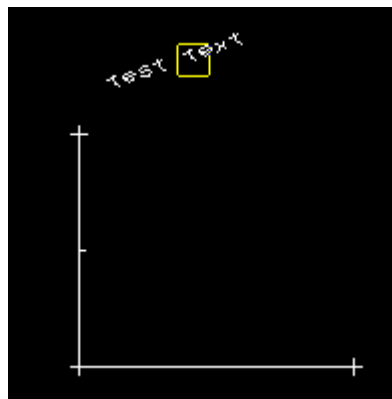
This option rotates text about its vertex. This applies to text strings, super string segment or vertex text and 4d string vertex text. For super string segment text, the vertex is taken to be the mid point of the segment.

After defining one piece of text, the option restarts so that another piece of text can be defined. Picking Cancel from the Pick Ops menu, hitting <esc> or selecting another option terminates the option.

On selecting Rotate v, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the 12d Model application window.

STEP 1:

A text string to be rotated is selected and accepted.



STEP 2:

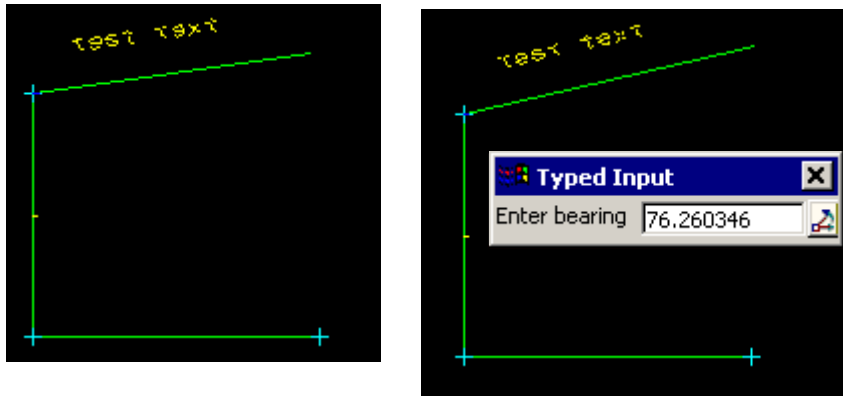
The rotation bearing (the final bearing of the text) is specified by selection and acceptance of a point with the mouse or by entry into an input box followed by the enter key. To bring up the input box start typing or press the space bar. The value is entered into the input box followed by the enter key.

Note: The typed bearing is not relative but absolute. i.e. the value given will not rotate the existing text by that amount, rather it will reposition the text at that bearing.

The line drawn represents the bearing value and changes with movement of the mouse. If the user wants to see what the current value of the bearing is, simply press the **D** key (dynamic value). This puts the value into the input box where it can be accepted to specify the bearing or the input box can be closed and the rubber banding (graphically changing) of the angle

continued.

Note: The Page up and page down keys can be used when the input angle box comes up to add or subtract intervals of 90 degrees.

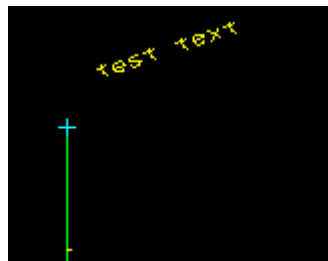


This option also allows the definition of the bearing by the selection of the 2nd point perpendicular or tangential to a selected segment. For this, the line snap should be on. The user selects the segment (line or arc) and then by pressing **P** for perpendicular or **T** for tangential a solution is shown. As there is often two solutions with respect to arcs, the user can move the mouse to change from one solution to the next. The example shown below is the perpendicular case.

STEP 3:

The text is rotated to the specified bearing.

Picking Cancel from the Pick Ops menu, hitting <esc> or selecting another option terminates the option.



Rotate Text about the Justification Point

Cad_Rotate_Text_about_Justify

Position of option on menu: Strings =>CAD =>Text =>Rotate j

or by selection of appropriate icon from the toolbar. 

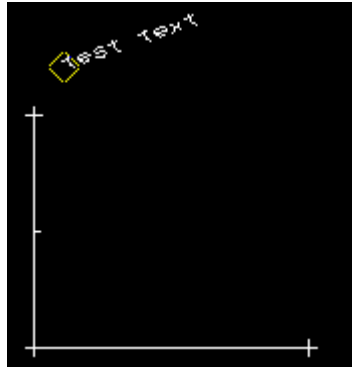
This option rotates text about its justification point. Note that the vertex point and the justification point do not coincide when either the raise or offset for the text is not zero.

Note: The typed bearing is not relative but absolute. i.e. the value given will not rotate the existing text by that amount, rather it will reposition the text at that bearing.

On selecting Rotate j, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the 12d Model application window.

STEP 1:

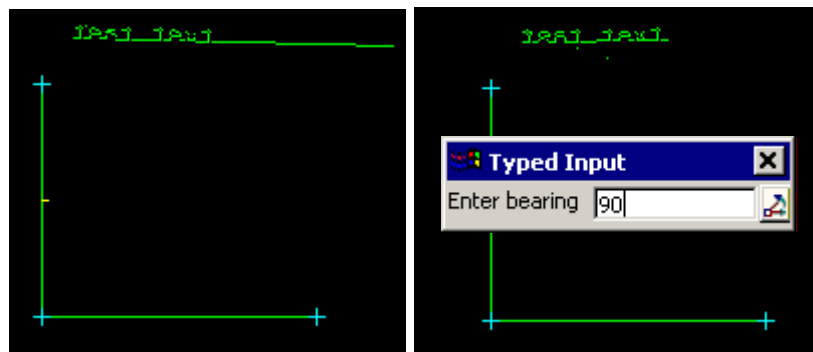
The text to be rotated is selected and accepted.

**STEP 2:**

The rotation bearing (the final bearing of the text) is specified by selection and acceptance of a point with the mouse or by entry into an angle box followed by the enter key. To bring up the angle box start typing or press the space bar. The value is entered into the input box followed by the enter key.

The line drawn represents the bearing value and changes with movement of the mouse. If the user wants to see what the current value of the bearing is, simply press the **D** key (dynamic value). This puts the value into the input box where it can be accepted to specify the bearing or the input box can be closed and the rubber banding (graphically changing) of the bearing continued.

Note: The Page up and page down keys can be used when the bearing input box comes up to add or subtract intervals of 90 degrees.

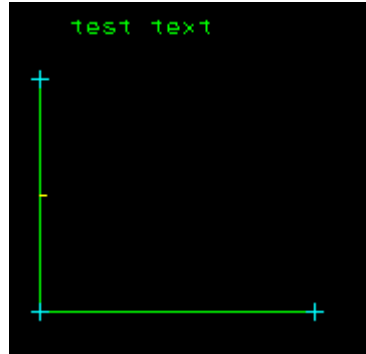


This option also allows the definition of the bearing by the selection of the 2nd point perpendicular or tangential to a selected segment. For this, the line snap should be on. The user selects the segment (line or arc) and then by pressing **P** for perpendicular or **T** for tangential a solution is shown. As there is often two solutions with respect to arcs, the user can move the mouse to change from one solution to the next. The example shown below is the perpendicular case.

STEP 3:

The text is rotated to the specified bearing.


Picking Cancel from the Pick Ops menu, hitting <esc> or selecting another option terminates the option.



Move the Text Justification Point

Cad_Move_Text_Justify_Point

Position of option on menu: Strings =>CAD =>Text =>Move j

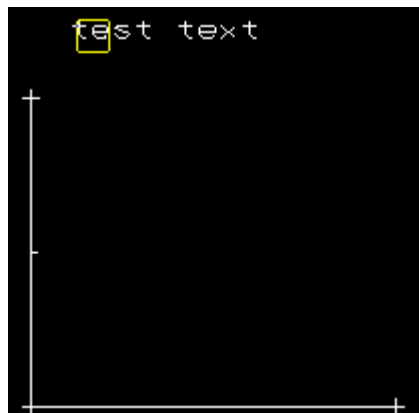
or by selection of appropriate icon from the toolbar. 

This option moves the text justification point, and hence the text with it.

On selecting Move j, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the 12d Model application window.

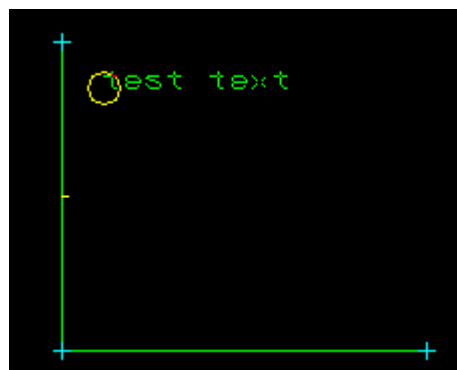
STEP 1:

The text to be moved is selected and accepted.



STEP 2:

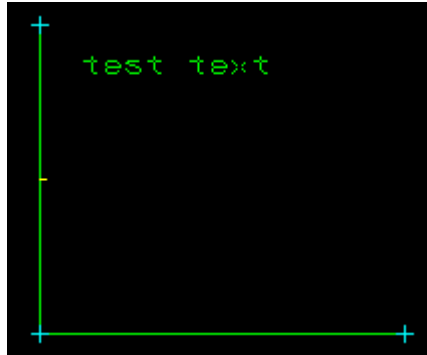
The new position for the text is selected and accepted.



STEP 3:


The text is moved to the new position.

Picking Cancel from the Pick Ops menu, hitting <esc> or selecting another option terminates the option.



Move the Text Vertex Point

Cad_Move_Text_Vertex

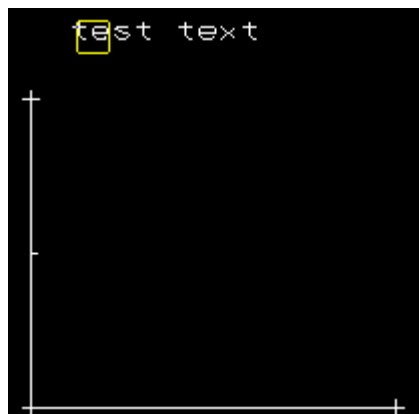
Position of option on menu: Strings =>CAD =>Text =>Move v
or by selection of appropriate icon from the toolbar. 

This option moves the vertex that vertex text is attached to, and hence moves the text with it. The option works for text strings, vertex text for super strings and 4d string but will **not** work for segment text where there is no actual vertex at the mid segment position where the segment text is initially placed.

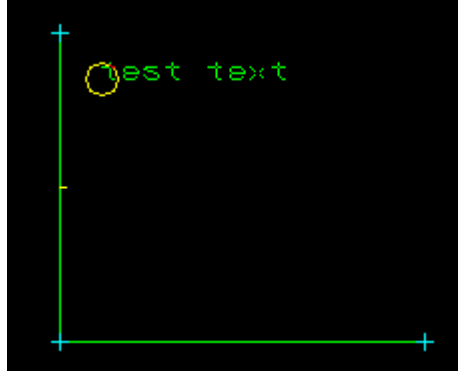
On selecting Move v, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the 12d Model application window.

STEP 1:

The vertex text to be moved is selected and accepted.

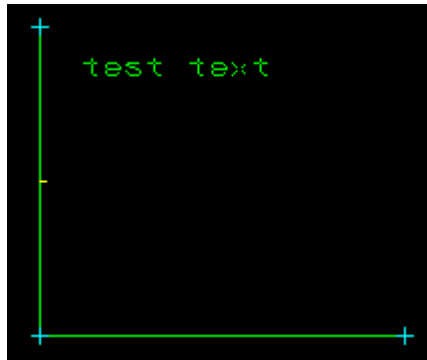
**STEP 2:**

The new position for the vertex and the text is selected and accepted.

**STEP 3:**

The vertex and the vertex text is moved to the new position.

Picking Cancel from the Pick Ops menu, hitting <esc> or selecting another option terminates the option.



Height of Text

Cad_Height_of_Text

Position of option on menu: Strings =>CAD =>Text =>Height

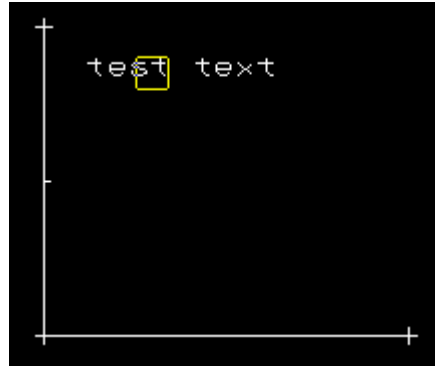
or by selection of appropriate icon from the toolbar. 

This option changes the height of text.

On selecting Height, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the 12d Model application window.

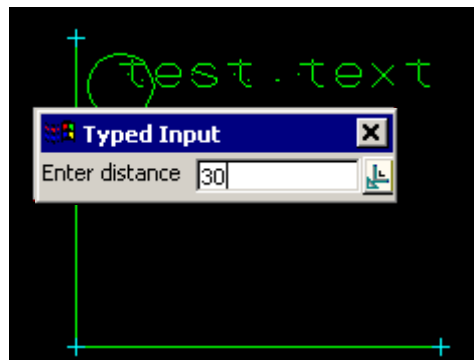
STEP 1:

The text of which the height is to be changed is selected and accepted.

**STEP 2:**

A height for the text is given either by selection with the mouse or by typing a value. To type a value, simply start typing and the input box for the height will appear. Alternatively you can press the space bar to bring up the input box. The value is entered into the input box followed by the enter key.

The circle drawn represents the height value and changes with movement of the mouse. If the user wants to see what the current value of the height is, simply press the **D** key (dynamic value). This puts the value into the input box where it can be accepted to create the point or the input box can be closed and the rubber banding (graphically changing) of the circle continued.

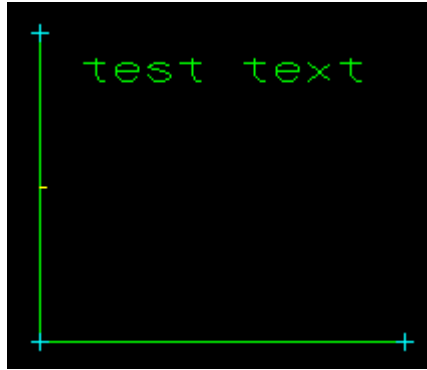


This option also allows the definition of the distance by the selection of the 2nd point perpendicular or tangential to a selected segment. For this, the line snap should be on. The user selects the segment (line or arc) and then by pressing **P** for perpendicular or **T** for tangential a solution is shown. As there is often two solutions with respect to arcs, the user can move the mouse to change from one solution to the next.

STEP 3:


The text height is changed.

Picking Cancel from the Pick Ops menu, hitting <esc> or selecting another option terminates the option.



Change Text

Cad_Change_Text

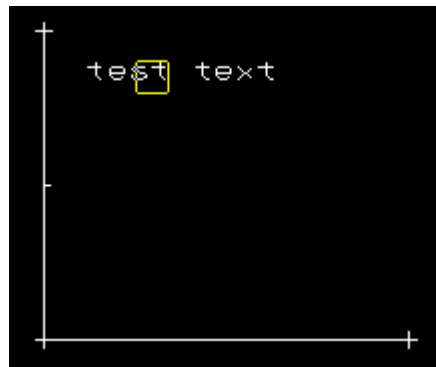
Position of option on menu: Strings =>CAD =>Text =>Text
or by selection of appropriate icon from the toolbar. 

This option edits the characters of selected text.

On selecting Text, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the 12d Model application window.

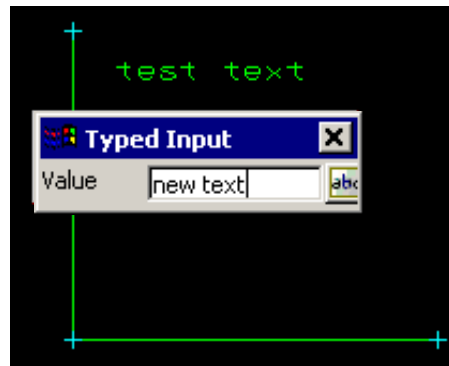
STEP 1:

The text to be changed is selected and accepted.



STEP 2:

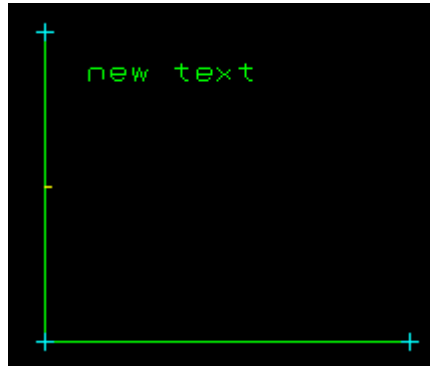
The new text is entered into the text input box followed by the enter key.



STEP 3:

The text is changed.

Picking Cancel from the Pick Ops menu, hitting <esc> or selecting another option terminates the option.



Style of Text

Cad_Style_of_Text

Position of option on menu: Strings =>CAD =>Text =>Style

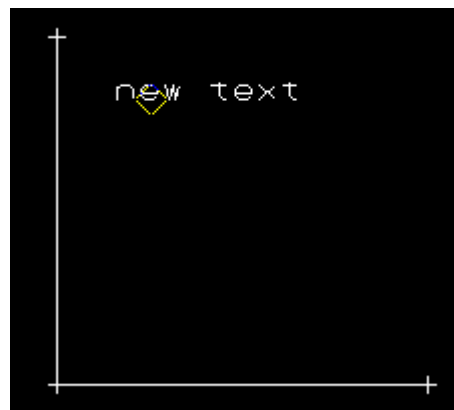
or by selection of appropriate icon from the toolbar. 

This option changes the textstyle of selected text.

On selecting Style, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the 12d Model application window.

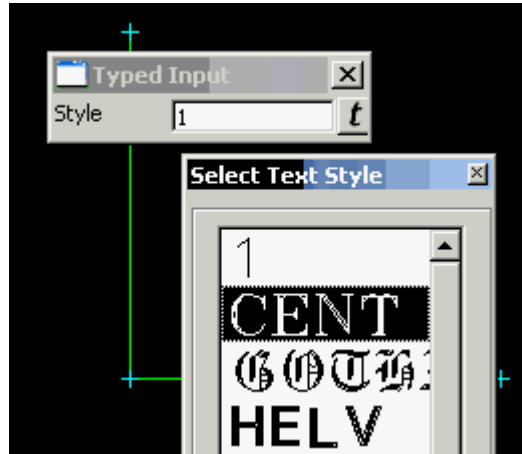
STEP 1:

The text to be changed is selected and accepted.



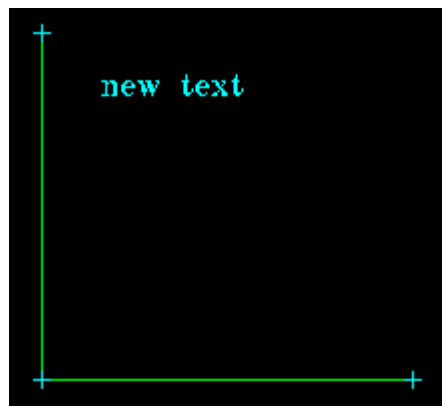
STEP 2:

The new textstyle is selected from the style pop-up list.

**STEP 3:**

The textstyle is changed.

Picking Cancel from the Pick Ops menu, hitting <esc> or selecting another option terminates the option.



Text Colour

Cad_Colour_of_Text

Position of option on menu: Strings =>CAD =>Text =>Colour

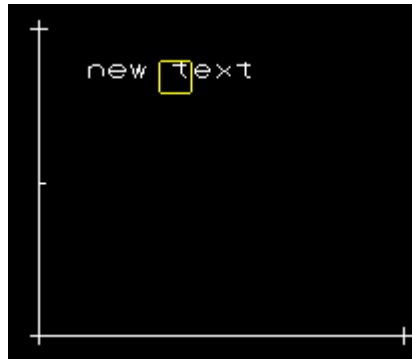
or by selection of appropriate icon from the toolbar. 

This option changes the colour of selected text.

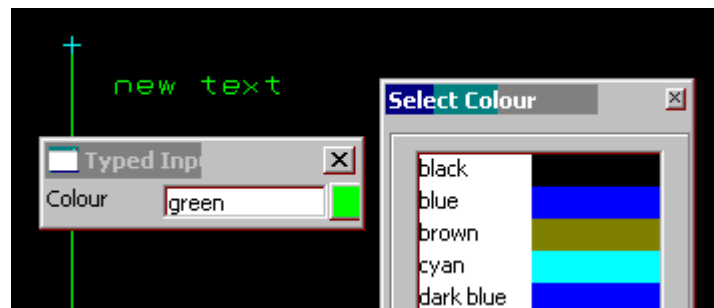
On selecting Colour, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the 12d Model application window.

STEP 1:

The text to be changed is selected and accepted.

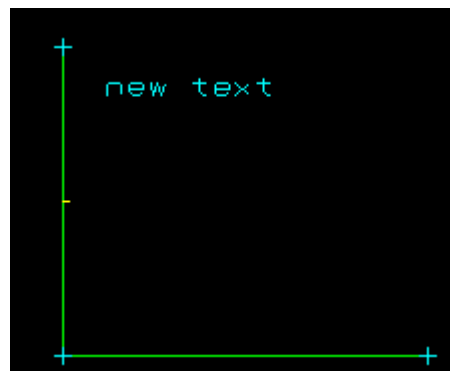
**STEP 2:**

The new colour for the text is entered into the text input box or by selecting the colour square on the input box to bring up the select colour choice box followed by the enter key.

**STEP 3:**

The text colour is changed.


Picking Cancel from the Pick Ops menu, hitting <esc> or selecting another option terminates the option.



Reset Text Justification Point

Cad_Reset_Text_Justify_Point

Position of option on menu: Strings =>CAD =>Text =>Reset j

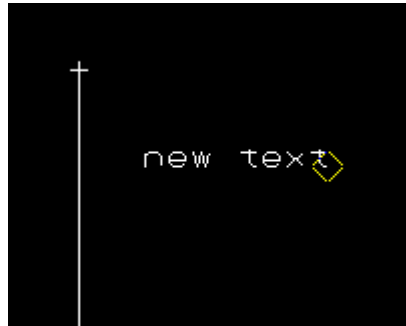
or by selection of appropriate icon from the toolbar. 

This option resets the text justification point back to being the same as the vertex for vertex text, and to the segment mid point for segment text. That is, the offset and raise for the selected text are both set to zero.

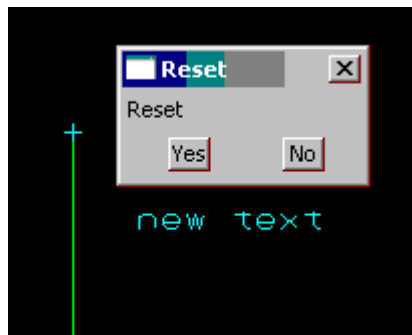
On selecting Reset j, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the 12d Model application window.

STEP 1:

The text to be changed is selected and accepted.

**STEP 2:**

A warning message is shown giving the user the option of resetting the justification point or not.


**STEP 3:**

The text is reset if accepted.



Label Perpendicular Offset

Cad_Label_Perpendicular_Offset

Position of option on menu: Strings =>CAD =>Text =>Label perp. Offset
or by selection of appropriate icon from the toolbar. 

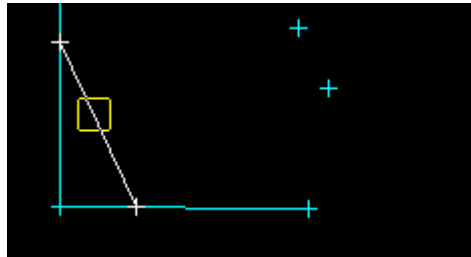
This option creates a perpendicular line from a selected segment to a selected position, and creates text with the value of the perpendicular distance between the segment and the selected position, on the line.

On selecting Label perp. Offset, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the 12d Model application window.

STEP 1:

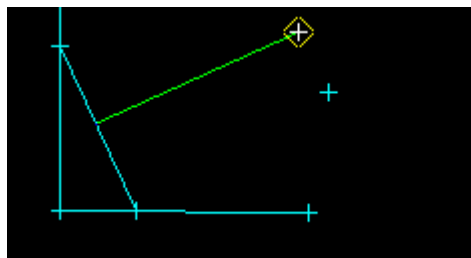
A string is selected and accepted.

After the string is accepted a perpendicular line will be displayed 'rubber banding' to the various solutions according to the position of the cursor. This will continue until a 2nd point is selected and accepted.



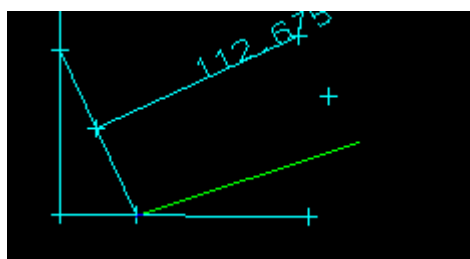
STEP 2:

Select a 2nd point and accept it.



STEP 3:

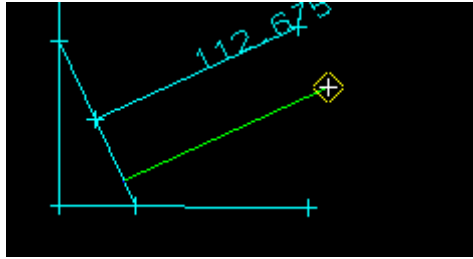
A perpendicular line is constructed between the accepted string and point. The length value of this line will be displayed in text. This text can be modified or changed using the other CAD Text options.



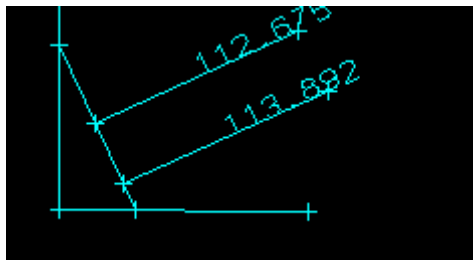
STEP 4:

After the labelled perpendicular line is constructed, another perpendicular 'rubber banding' line will be displayed. This will continue until the option is terminated (via the Esc key).

To create another labelled perpendicular line, select another point and accept it.

**STEP 5:**


Another labelled perpendicular line is constructed. Another perpendicular 'rubber banding' line will be displayed. This will continue until the option is terminated (via the Esc key).

**All Text Edits**

Cad_All_Text_Edits

All_Text_Edits

Position of option on menu: Strings =>CAD =>Text =>All

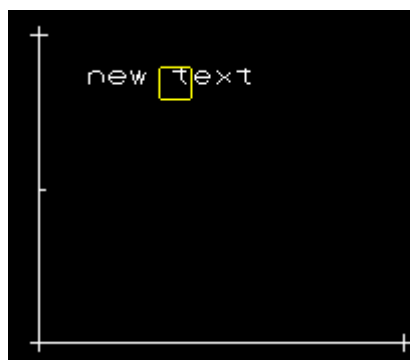
or by selection of appropriate icon from the toolbar. 

This option positions text using a menu made up of most of text edits already described.

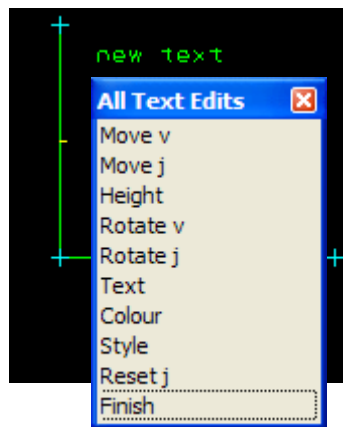
On selecting All, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the 12d Model application window.

STEP 1:

The text to be changed is selected and accepted.

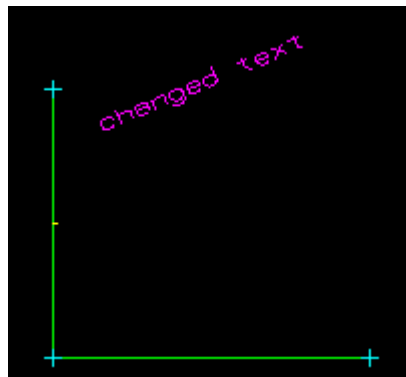
**STEP 2:**

After the selection and acceptance of a piece of text, the positioning menu is shown. This also allows various other text editing functions such as colour, height and text.

**STEP 3:**


The user can select the appropriate option from the menu and make the changes. The menu remains active allowing a number of operations to be made in succession.

Picking Cancel from the Pick Ops menu, hitting <esc> or selecting another option terminates the option.



Text Delete

Cad_Delete_Text

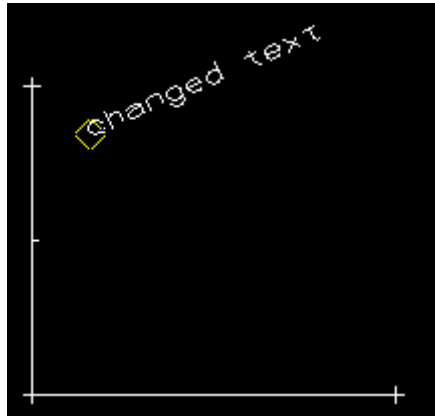
Position of option on menu: Strings =>CAD =>Text =>Delete
or by selection of appropriate icon from the toolbar. 

This option deletes selected text.

On selecting Delete, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the 12d Model application window.

STEP 1:

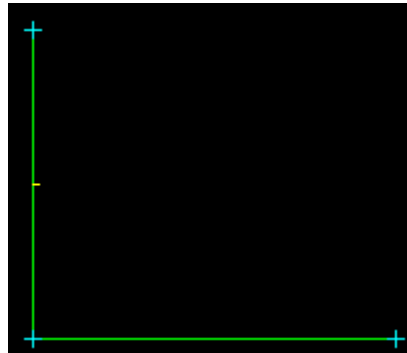
The text to be deleted is selected and accepted.



STEP 2:

The selected text is deleted.

Picking Cancel from the Pick Ops menu, hitting <esc> or selecting another option terminates the option.

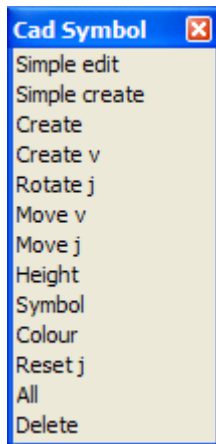


CAD Symbol

cad_symbol

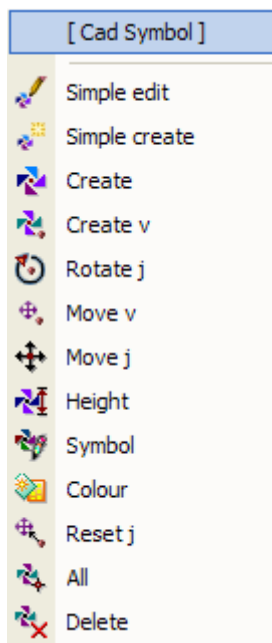
Position of option on menu: Strings =>CAD =>Symbol

The Symbol walk-right menu is



Menu of Options to Create and Manipulate Symbols

edit symbols using grips
 create symbols and edit using grips
 create a symbol at a selected position - a one point string is created
 create a symbol at a user selected super string vertex
 rotate symbol about its justification pt (which may be offset from the vertex)
 move symbol by its justification point (the vertex does not move)
 change the height of a symbol
 change the symbol
 change the colour of a symbol
 reset the symbol justification point so that it is on top of the vertex posn
 menu to make most of the above changes to one selected symbol
 delete a symbol



12d Model symbols are world styles at a vertex of a super string. The symbol is attached to a vertex (these are displayed when *Vertices* are toggle on in a plan view) and has a justification point, a rotation, a delta x and a delta y. The vertex and justification point only coincide if the delta x and delta y values are both zero.

In some symbol options, the symbol *type*, *size* and *angle* are defined by the **Symbol Controlbar** and *model* and *colour* from the **CAD Controlbar** (for more information, go to the section “Symbol Controlbar”).



The *symbols* are defined in the **symbols.4d** file.


For more information on the control bars, go to the sections “Symbol Controlbar” and “CAD Controlbar” .

For the option <i>Simple edit</i> , go to the section	“Simple Symbol Edit”
<i>Simple create</i>	“Simple Symbol Create”
<i>Create</i>	“Create Symbol”
<i>Create v</i>	“Create Symbol at the Vertex of a Super String”
<i>Rotate j</i>	“Rotate Symbol about the Justification Point”
<i>Move v</i>	“Move the Symbol Justification Point”
<i>Move j</i>	“Move the Symbol Justification Point”
<i>Height</i>	“Height of Symbol”
<i>Symbol</i>	“Change Symbol”
<i>Colour</i>	“Symbol Colour”
<i>Reset j</i>	“Reset the Symbol Justification Point”
<i>All</i>	“All Symbol Edits”
<i>Delete</i>	“Symbol Delete”

Simple Symbol Edit

Cad_Edit_Simple_Symbol

Position of option on menu: Strings =>CAD =>Text =>Simple edit

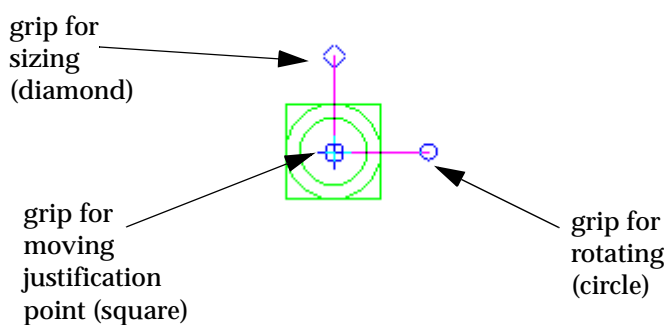
or by selection of appropriate icon from the toolbar. 

This option edits symbols using grips to quickly define the mode of editing (sizing, rotating or moving the justification point).

On selecting Simple edit, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the 12d Model application window.

STEP 1:

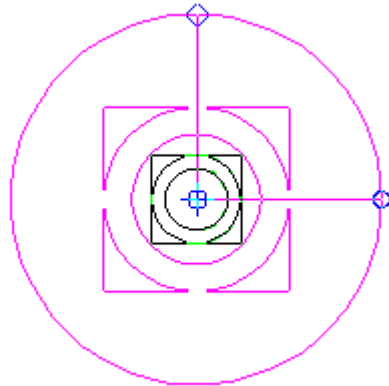
When the symbol to be edited is selected, grips for size, rotating and moving the justification point are displayed. The appropriate grip is then selected for quick editing.



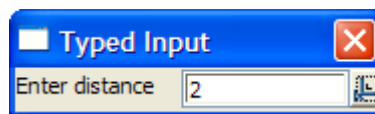
Size Grip (diamond):

If the **Size grip** is selected, the symbol size is dynamically adjusted by moving the cursor. The size of the symbol is displayed as part of the *Enter height* prompt in the message area.

The symbol size is set when a position is accepted.

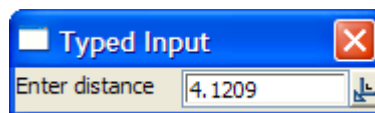


An **exact** symbol size can be entered by hitting the <space bar> or by starting to type a size. This brings up the **Enter distance** typed input box. The size is typed in and the <enter> key pressed.



To return to dynamic sizing without entering a distance, simply select the **X** on the top of the input box. The box will disappear and dynamic sizing will resume.

If the symbol is being dynamically sized, the **current** size of the text can be displayed by pressing the **d** key which brings up the **Enter distance** typed input box with the current dynamic symbol size in it.



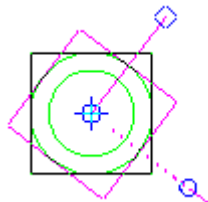
The size can be modified and the value used by pressing the <enter> key.

To return to dynamic sizing without entering a distance, simply select the **X** on the top of the input box.

Rotate Grip (circle):

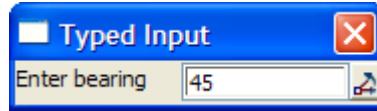
If the **Rotate grip** is selected, the symbol bearing is dynamically adjusted by moving the cursor. The bearing of the symbol is displayed as part of the *Enter bearing* prompt in the message area.

The symbol bearing is set when a position is accepted.



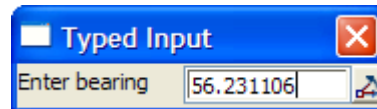
An **exact** bearing can be entered by hitting the <space bar> or by starting to type a bearing. This

brings up the **Enter bearing** typed input box. The *bearing* is typed in and the <enter> key pressed.



To return to dynamic rotating without entering a bearing, simply select the **X** on the top of the input box. The box will disappear and dynamic sizing will resume.

If the symbol is being dynamically rotated, the **current** bearing of the symbol can be displayed by pressing the **d** key which brings up the **Enter bearing** typed input box with the *current* symbol bearing in it.



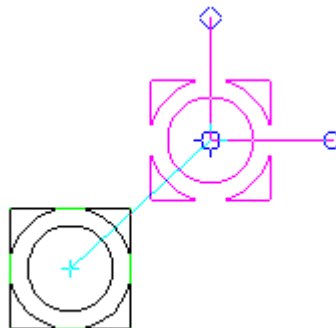
The *bearing* can be modified and the value used by pressing the <enter> key.

To return to dynamic rotation without entering a bearing, simply select the **X** on the top of the input box.

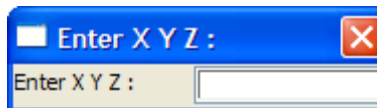
Justification Grip (square):

If the **Justification grip** is selected, the symbol justification point is dynamically adjusted by moving the cursor. The (x,y) position of the symbol is displayed in the message area.

The symbol justification point is set when a position is accepted.



An **exact** coordinate can be entered by hitting the <space bar> or by starting to type a coordinate. This brings up the **Enter X Y Z** typed input box. The *x* and *y* coordinates are typed in, separated by a space, and the <enter> key pressed.



To return to dynamic moving without entering a coordinate, simply select the **X** on the top of the input box. The box will disappear and dynamic moving will resume.

Simple Symbol Create

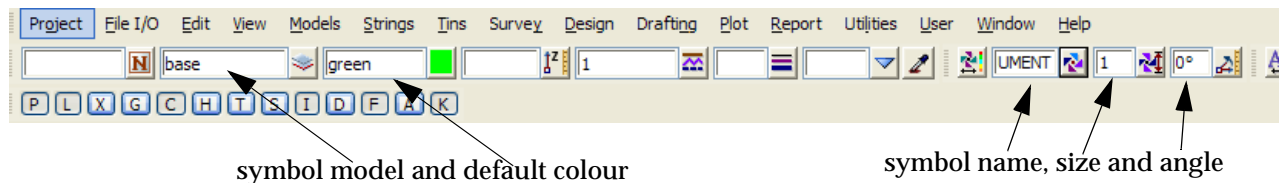
Cad_Create_Simple_Symbol

Position of option on menu: Strings =>CAD =>Text =>Simple create

or by selection of appropriate icon from the toolbar. 

This option creates symbols and then displays grips to allow quick editing of symbol size, rotation and justification point.

The symbol and symbol height and symbol angle are taken from the **Symbol controlbar** (See “CAD, Symbol and Text Controlbars”) and the model and colour (if the symbol does not have an inbuilt colour) from the **CAD controlbar** (see “CAD, Symbol and Text Controlbars”, “Symbol Controlbar” and “CAD Controlbar”).



The symbol will be placed with the vertex and justification point at the selected position.

After defining one symbol, the option restarts so that another symbol can be defined. Picking **Cancel** from the Pick Ops menu, hitting <esc> or selecting another option terminates the option.

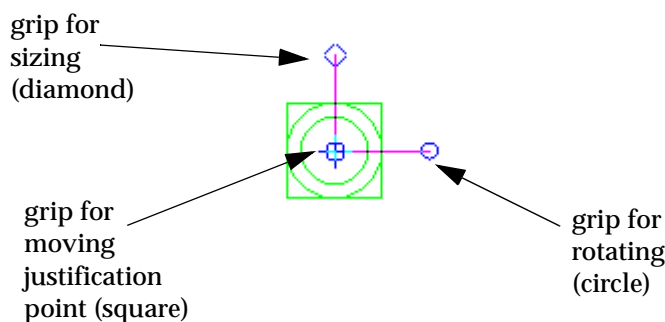
On selecting Simple create, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the 12d Model application window.

STEP 1:

An insertion point for the symbol is selected and accepted, the symbol is displayed on the screen.

Warning - if no symbol appears, then there is probably no symbol selected in the **Symbol controlbar**.

When the symbol is displayed, grips for quick editing of size, rotation and moving of the justification point are also shown. The appropriate grip can then be selected for quick editing. For details on using the grips, go to the section “Simple Symbol Edit”.



Create Symbol

Cad_Create_Symbol

Position of option on menu: Strings =>CAD =>Symbols =>Create

or by selection of appropriate icon from the toolbar.

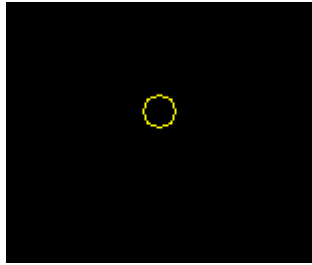
This option creates a symbol (as a one vertex super string) at a selected point (a cursor snap is valid).

After defining a symbol, the option restarts so that another symbol can be defined. Picking **Cancel** from the Pick Ops menu, hitting <esc> or selecting another option terminates the option.

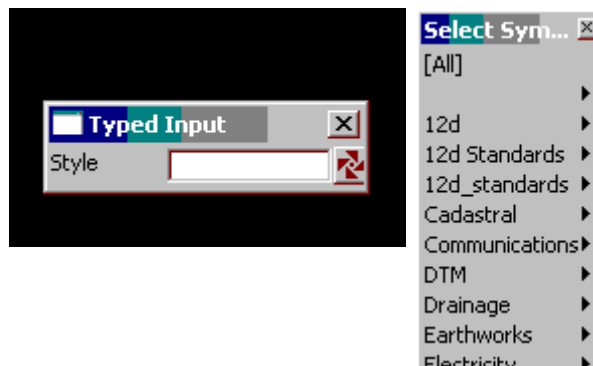
On selecting Create, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the 12d Model application window.

STEP 1:

An insertion point is selected and accepted. A one vertex super string is created and the symbol placed at that vertex. The symbol is placed relative to the insertion point given in the symbol definition (See symbols.4d file).

**STEP 2:**

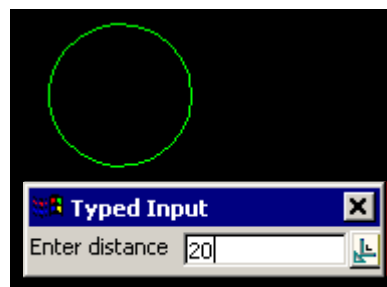
The symbol style (name) is entered into the input box or selected from the select symbol choice box. The choice box is opened by pressing the symbol icon on the right of the input box. A valid symbol type can be found by walking right on the symbol menu

**STEP 3:**

A symbol size is given either by selection with the mouse or by typing a value. To type a value, simply start typing and the input box for the size will appear. The user can also press the space bar to bring up the input box. The value is entered into the input box followed by the enter key.

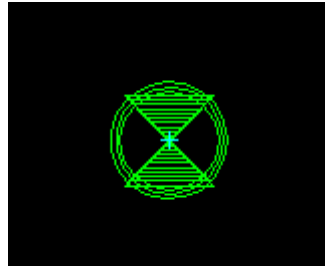
The circle drawn represents the size value and changes with movement of the mouse. If the user wants to see what the current value of the height is, simply press the **D** key (dynamic value). This puts the value into the input box where it can be accepted to create the symbol or the input box can be closed and the rubber banding (graphically changing) of the circle continued.

This option also allows the definition of the size by the selection of a point perpendicular or tangential to a selected segment. For this, the line snap should be on. The user selects the segment (line or arc) and then by pressing **P** for perpendicular or **T** for tangential a solution is shown. As there is often two solutions with respect to arcs, the user can move the mouse to change from one solution to the next.




STEP 4:

The symbol is created together with a point super string at the selected point.



Create Symbol at the Vertex of a Super String

Cad_Create_Symbol_on_Vertex

Position of option on menu: Strings =>CAD =>Symbols=> Create v
or by selection of appropriate icon from the toolbar. 

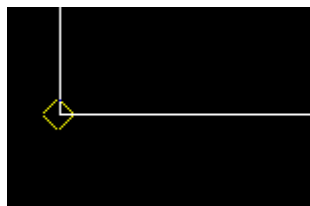
This option creates a symbol at a vertex of a super string. One symbol is allowed per super string vertex, so if this option is used on existing vertex symbol, the existing value is displayed in the symbol input box.

After defining a symbol, the option restarts so that another symbol can be defined. Picking Cancel from the Pick Ops menu, hitting <esc> or selecting another option terminates the option.

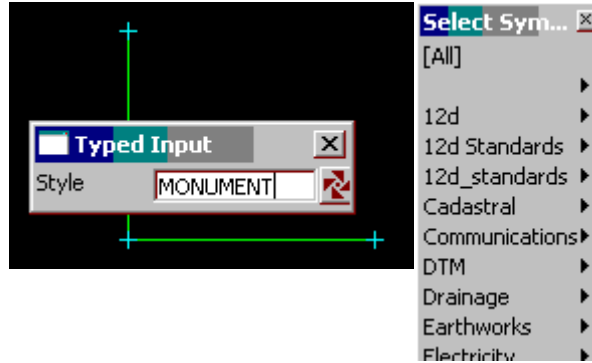
On selecting Create v, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the 12d Model application window.

STEP 1:

An insertion point is selected and accepted. The point snap is forced on so that a vertex can be selected. The Symbol will be placed relative to the insertion point given other parameters such as justification, as defined in the symbol definition.

**STEP 2:**

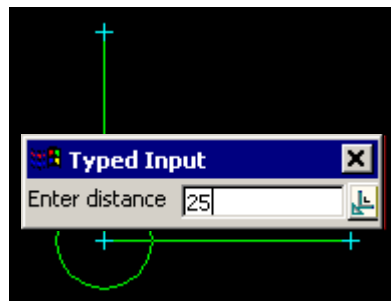
The symbol style is entered into the input box or selected from the select symbol choice box. The choice box is opened by pressing the symbol icon on the right of the input box. A valid symbol type can be found by walking right on the symbol menu

**STEP 3:**

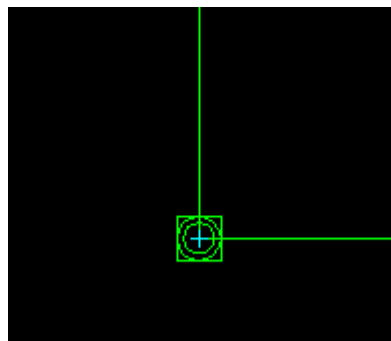
A symbol size is given either by selection with the mouse or by typing a value. To type a value, simply start typing and the input box for the size will appear. The user can also press the space bar to bring up the input box. The value is entered into the input box followed by the enter key.

The circle drawn represents the size value and changes with movement of the mouse. If the user wants to see what the current value of the height is, simply press the **D** key (dynamic value). This puts the value into the input box where it can be accepted to create the symbol or the input box can be closed and the rubber banding (graphically changing) of the circle continued.

This option also allows the definition of the size by the selection of a point perpendicular or tangential to a selected segment. For this, the line snap should be on. The user selects the segment (line or arc) and then by pressing **P** for perpendicular or **T** for tangential a solution is shown. As there is often two solutions with respect to arcs, the user can move the mouse to change from one solution to the next.

**STEP 4:**

The symbol is created at the vertex of the super string.



Rotate Symbol about the Justification Point

Cad_Rotate_Symbol_about_Justify

Position of option on menu: Strings =>CAD =>Symbols =>Rotate j

or by selection of appropriate icon from the toolbar. 

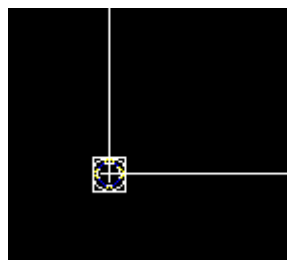
This option rotates a symbol about its justification point. The vertex point and the justification point often do not coincide. This occurs when non zero value is specified for either the x or y offset.

Note: The typed bearing is not relative but absolute. i.e. the value given will not rotate the existing symbol by that amount, rather it will reposition the symbol at that bearing.

On selecting Rotate j, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the 12d Model application window.

STEP 1:

The Symbol to be rotated is selected and accepted.

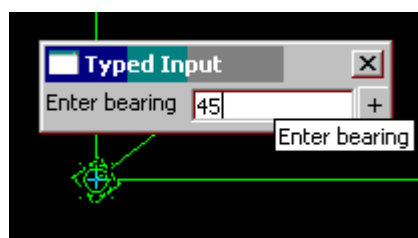


STEP 2:

The rotation bearing (the final bearing of the symbol) is specified by selection and acceptance of a point with the mouse or by entry into an angle box followed by the enter key. To bring up the angle box start typing or press the space bar. The value is entered into the input box followed by the enter key.

The line drawn represents the bearing value and changes with movement of the mouse. If the user wants to see what the current value of the bearing is, simply press the **D** key (dynamic value). This puts the value into the input box where it can be accepted to specify the bearing or the input box can be closed and the rubber banding (graphically changing) of the bearing continued.

Note: The Page up and page down keys can be used when the bearing input box comes up to add or subtract intervals of 90 degrees.

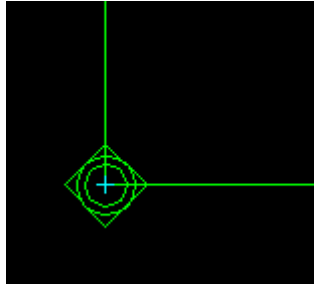


This option also allows the definition of the bearing by the selection of the 2nd point perpendicular or tangential to a selected segment. For this, the line snap should be on. The user selects the segment (line or arc) and then by pressing **P** for perpendicular or **T** for tangential a solution is shown. As there is often two solutions with respect to arcs, the user can move the mouse to change from one solution to the next. The example shown below is the perpendicular case.

STEP 3:

The Symbol is rotated to the specified bearing.

Picking Cancel from the Pick Ops menu, hitting <esc> or selecting another option terminates the option.



Move the Symbol Justification Point

Cad_Move_Symbol_Justify_Point

Position of option on menu: Strings =>CAD =>Symbols =>Move j

or by selection of appropriate icon from the toolbar. 

This option moves a symbol by moving its justification point.

On selecting Move j, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the 12d Model application window.

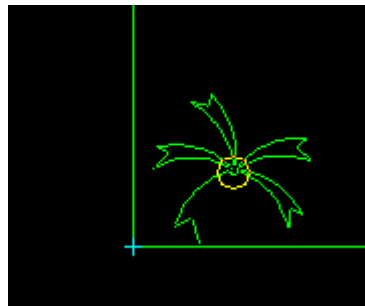
STEP 1:

The Symbol to be moved is selected and accepted.



STEP 2:

The new position for the Symbol is selected and accepted.




STEP 3:

The Symbol moves to the new position.

Picking Cancel from the Pick Ops menu, hitting <esc> or selecting another option terminates the option.

Move the Symbol Vertex Point

Cad_Move_Symbol_Vertex

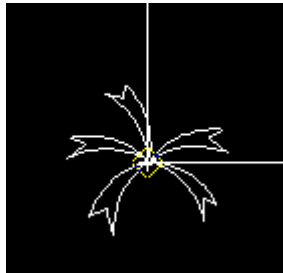
Position of option on menu: Strings =>CAD =>Symbols =>Move v
or by selection of appropriate icon from the toolbar. 

This option moves a symbol by moving the vertex that the symbol is attached to. Hence the symbol and the justification point for the symbol will move.

On selecting Move V, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the 12d Model application window.

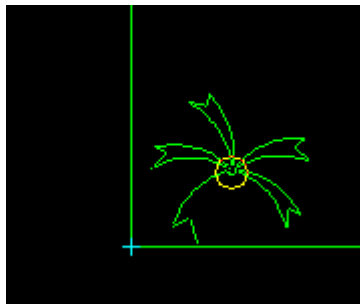
STEP 1:

The Symbol to be moved is selected and accepted.



STEP 2:

The new position for the vertex of the Symbol is selected and accepted.




STEP 3:

The Symbol moves to the new position.

Picking Cancel from the Pick Ops menu, hitting <esc> or selecting another option terminates the option.

Height of Symbol

Cad_Height_of_Symbol

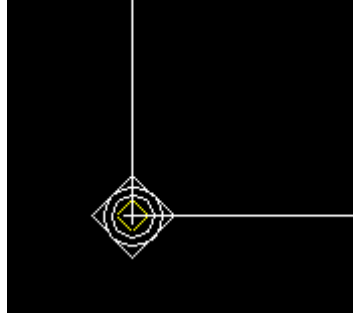
Position of option on menu: Strings =>CAD =>Symbols =>Height
or by selection of appropriate icon from the toolbar. 

This option changes the height of a symbol.

On selecting Height, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the 12d Model application window.

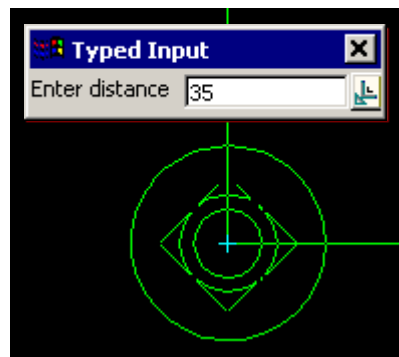
STEP 1:

The Symbol of which the height is to be changed is selected and accepted.

**STEP 2:**

A height for the Symbol is given either by selection with the mouse or by typing a value. To type a value, simply start typing and the input box for the height will appear. Alternatively you can press the space bar to bring up the input box. The value is entered into the input box followed by the enter key.

The circle drawn represents the height value and changes with movement of the mouse. If the user wants to see what the current value of the height is, simply press the **D** key (dynamic value). This puts the value into the input box where it can be accepted to create the point or the input box can be closed and the rubber banding (graphically changing) of the circle continued.

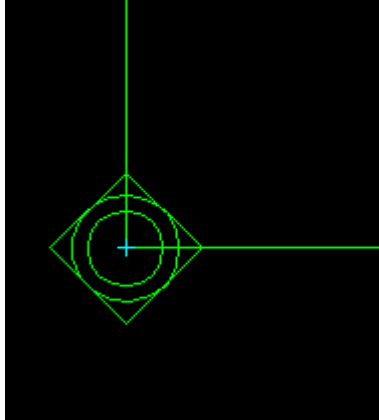


This option also allows the definition of the distance by the selection of the 2nd point perpendicular or tangential to a selected segment. For this, the line snap should be on. The user selects the segment (line or arc) and then by pressing **P** for perpendicular or **T** for tangential a solution is shown. As there is often two solutions with respect to arcs, the user can move the mouse to change from one solution to the next.

STEP 3:

The Symbol height is changed.


Picking Cancel from the Pick Ops menu, hitting <esc> or selecting another option terminates the option.



Change Symbol

Cad_Change_Symbol

Position of option on menu: Strings =>CAD =>Symbols =>Symbol

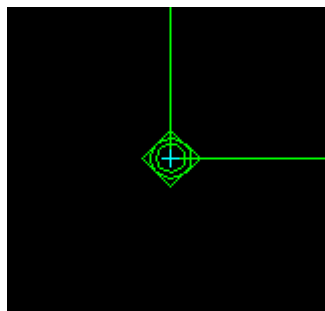
or by selection of appropriate icon from the toolbar. 

This option changes the actual symbol defined at a super string vertex.

On selecting Symbol, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the 12d Model application window.

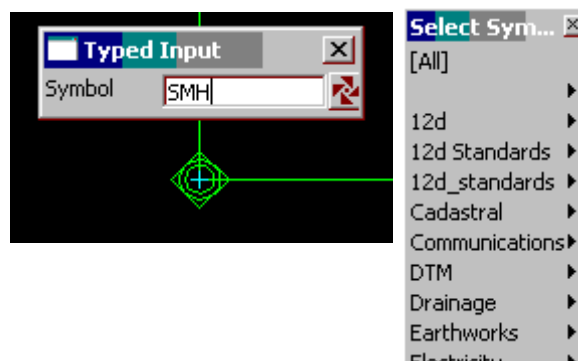
STEP 1:

The Symbol to be changed is selected and accepted.



STEP 2:

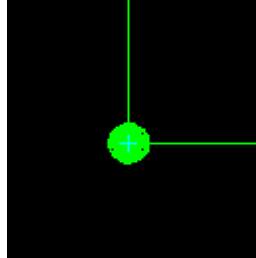
The symbol style is entered into the input box or selected from the select symbol choice box. The choice box is opened by pressing the symbol icon on the right of the input box. A valid symbol type can be found by walking right on the symbol menu



STEP 3:

The Symbol is changed.

Picking Cancel from the Pick Ops menu, hitting <esc> or selecting another option terminates the option.



Symbol Colour

Cad_Colour_of_Symbol

Position of option on menu: Strings =>CAD =>Symbol =>Colour

or by selection of appropriate icon from the toolbar. 

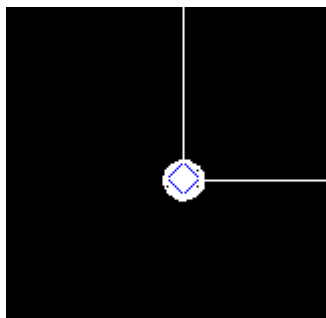
This option changes the default colour of a symbol.

Important Note: if the symbol has inbuilt colours, changing the default colour will not change the symbols displayed colours. For this case, the definition of the symbol itself will need to be changed.

On selecting Colour, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the 12d Model application window.

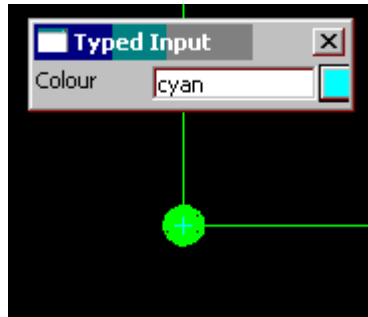
STEP 1:

The symbol to have the default colour changed is selected and accepted.



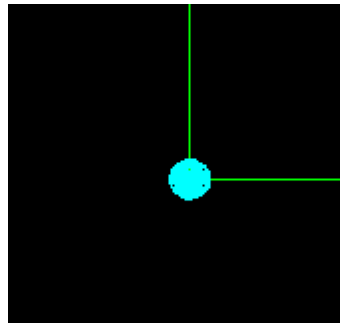
STEP 2:

The new colour for the Symbol is entered into the Symbol input box or by selecting the colour square on the input box to bring up the select colour choice box followed by the enter key.

**STEP 3:**

The Symbol colour is changed.

Picking Cancel from the Pick Ops menu, hitting <esc> or selecting another option terminates the option.



Reset the Symbol Justification Point

Cad_Reset_Symbol_Justify_Point

Position of option on menu: Strings =>CAD =>Symbol =>Reset j

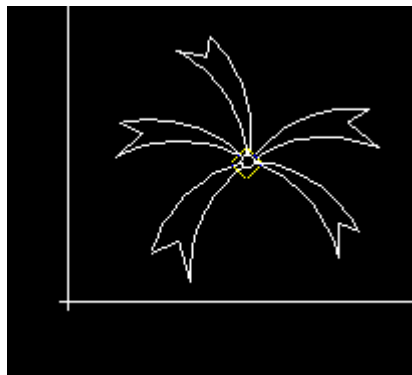
or by selection of appropriate icon from the toolbar. 

This option resets justification point of a selected symbol. That is, the x and y offsets for the justification point are set to zero.

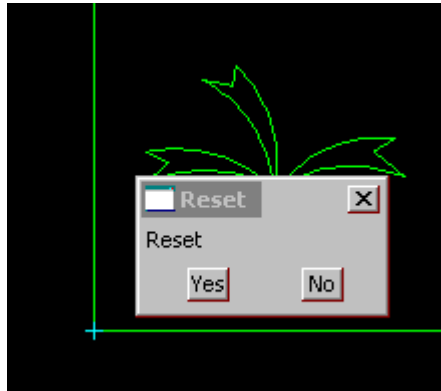
On selecting Reset j, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the 12d Model application window.

STEP 1:

The Symbol to be changed is selected and accepted.

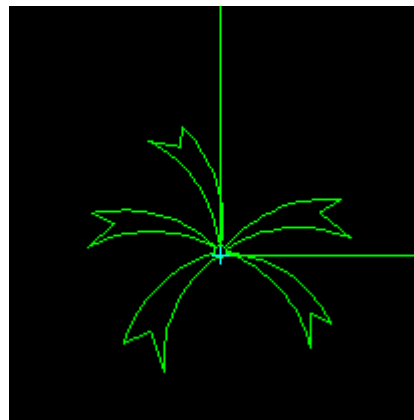
**STEP 2:**

A warning message is shown giving the user the option of resetting the justification point or not.



STEP 3:

The symbol is reset if accepted.



All Symbol Edits

Cad_All_Symbol_Edits

All_Symbol_Edits

Position of option on menu: Strings =>CAD =>Symbol =>All

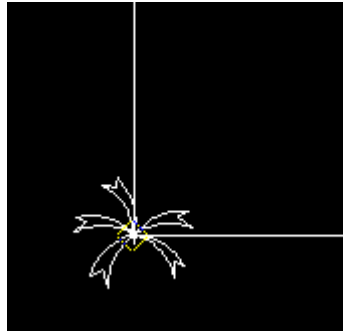
or by selection of appropriate icon from the toolbar. 

This option allows a number of symbol editing options to be done in succession using a menu made up of many of the options defined above.

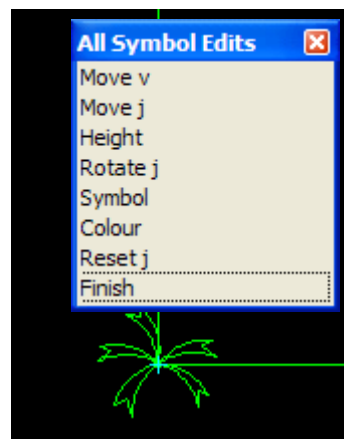
On selecting All, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the 12d Model application window.

STEP 1:

The Symbol to be changed is selected and accepted.

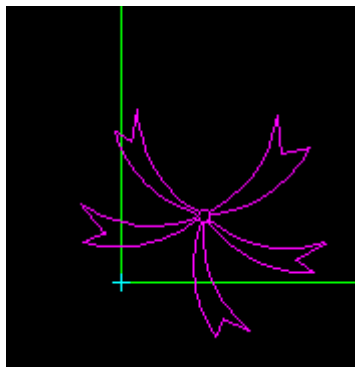
**STEP 2:**

After the selection and acceptance of a symbol, the positioning menu is shown. This also allows various other symbol editing functions such as colour, height and rotate.

**STEP 3:**

The user can select the appropriate option from the menu and make the changes. The menu remains active allowing a number of operations to be made in succession.

Picking Cancel from the Pick Ops menu, hitting <esc> or selecting another option terminates the option.



Symbol Delete

Cad_Delete_Symbol

Position of option on menu: Strings =>CAD =>Symbol =>Delete

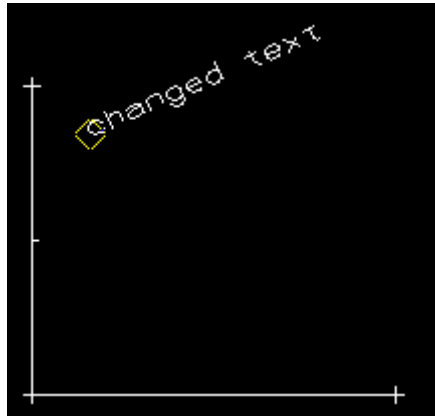
or by selection of appropriate icon from the toolbar. 

This option deletes symbols.

On selecting Delete, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the 12d Model application window.

STEP 1:

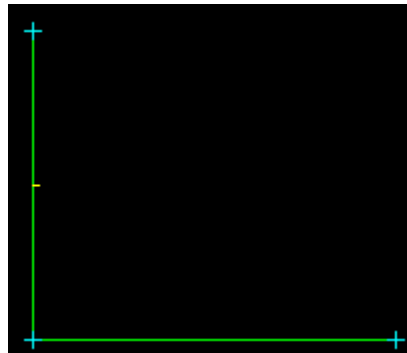
The Symbol to be deleted is selected and accepted.



STEP 2:

The selected Symbol is deleted.

Picking Cancel from the Pick Ops menu, hitting <esc> or selecting another option terminates the option.

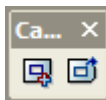


CAD Holes

cad_fills

Position of option on menu: Strings =>CAD =>Holes

The Holes walk-right menu is




For the option *Add holes*, go to the section
Remove holes

"Add Holes"
"Remove Holes"

Add Holes

Cad_Add_Holes

Position of option on menu: Strings =>CAD =>Polygons =>Add holes

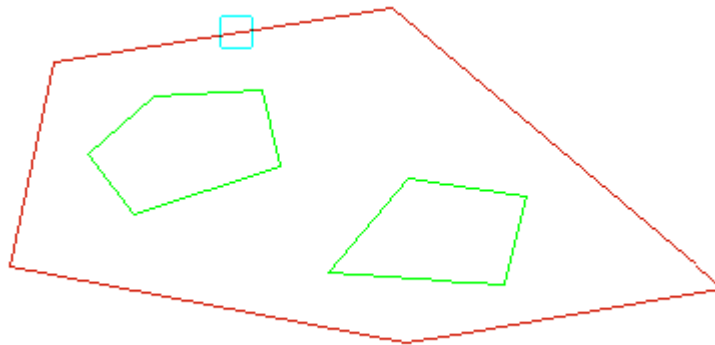
or by selection of appropriate icon from the toolbar. 

This option adds holes to a polygon.

On selecting **Add holes**, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the 12d Model application window.

STEP 1:

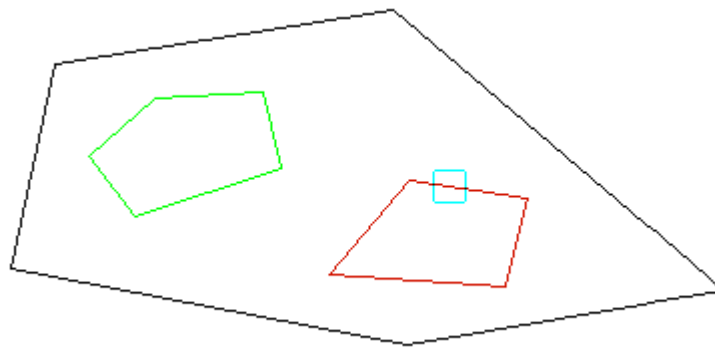
First select the parent string. That is the polygon that is to have holes added to it.



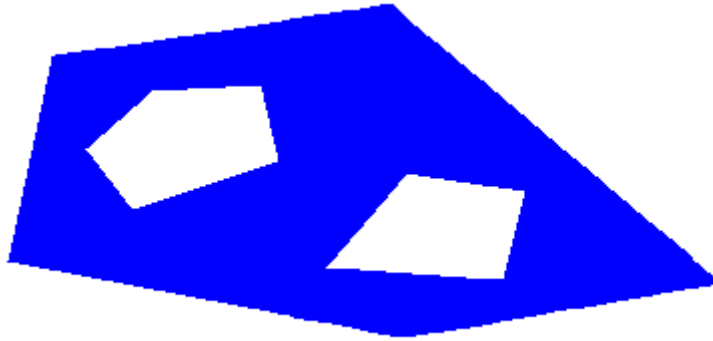
STEP 2:

Then select the polygons that are to be the holes in the parent polygon (the child strings).

The selection of holes is terminated by pressing the <esc> key.



It is easier to see the result by colour filling the parent polygon.



Remove Holes

Cad_Remove_Holes

Position of option on menu: Strings =>CAD =>Polygons =>Remove holes

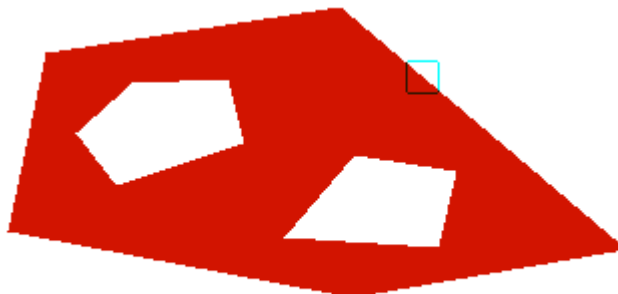
or by selection of appropriate icon from the toolbar. 

This option removes all holes from a polygon with holes.

On selecting **Remove holes**, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the 12d Model application window.

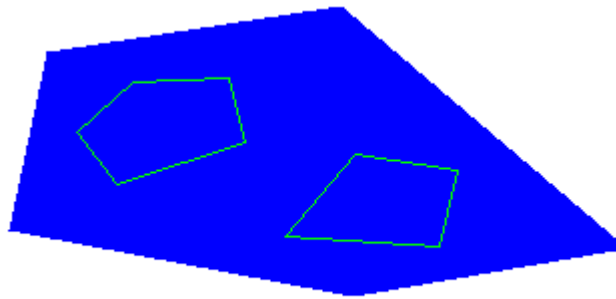
STEP 1:

Select the parent string. That is the polygon that contains holes.



STEP 2:

On selecting and accepting the string, all holes are removed from the string. Super strings are created for each of the hole boundaries.

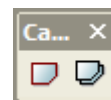
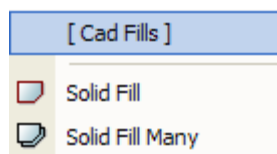


CAD Fills

cad_fills

Position of option on menu: Strings =>CAD =>Fills

The Fills walk-right menu is



For the option *Solid fill*, go to the section
Solid fill many

“Solid Fill”
“Solid Fill Many Strings”

Solid Fill

Cad_Solid_Fill

Position of option on menu: Strings =>CAD =>Fills =>Solid Fill

or by selection of appropriate icon from the toolbar. 

This option fills a super string with a user defined colour and blend.

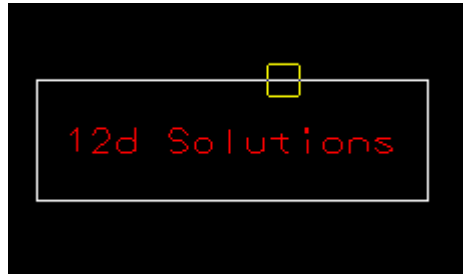
On selecting Solid Fill, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the 12d Model application window.

STEP 1:


Select and accept a string.

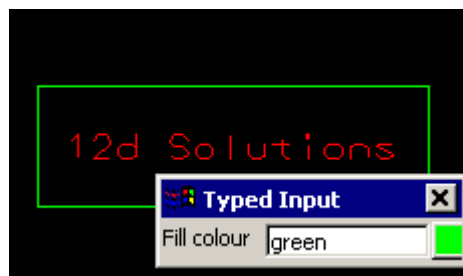
If the string selected is an enclosed shape, then the filled area is simply the closed shape. If the string isn't closed (such as two perpendicular lines), for the purposes of this option, the string will be temporarily closed and closed area coloured.

Note: If the string selected is a straight line, then its area is zero. When the colour fill of a line is completed, the line will simply disappear. This is because there is no area to colour.



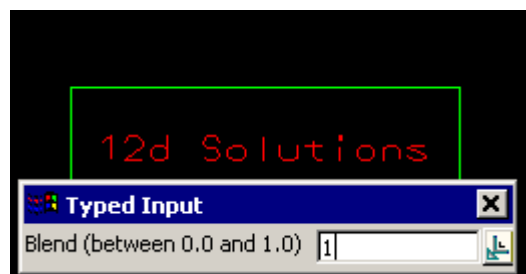
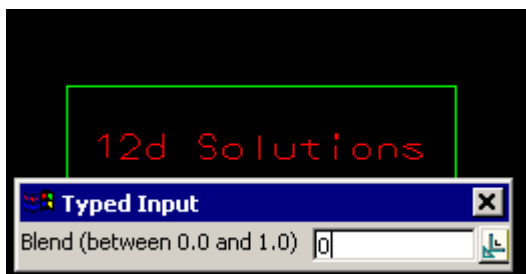
STEP 2:

After the string is accepted, the **Fill Colour** Input box will appear. Type the name of the required colour into the Input box and press the enter key. The browse button  on the Input box can be used to define the blend by measuring existing elements.



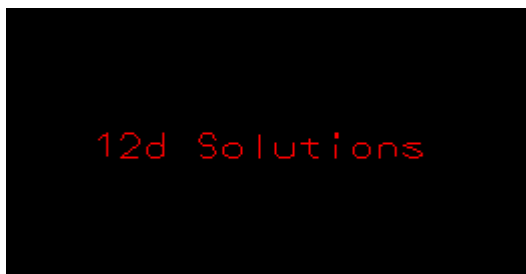
STEP 3:

After the colour is accepted, the Blend Input box will appear. This selection determines the transparency of the filled colour. A value between 0 (totally opaque) and 1 (totally transparent) must be selected.



STEP 4:

The selected super string is then filled.



Blend 0



Blend 1

Solid Fill Many Strings

Cad_Solid_Fill_Many

Position of option on menu: Strings =>CAD =>Fills =>Solid fill many


or by selection of appropriate icon from the toolbar. 

This option fills many selected super strings with the same user defined colour and blend.

On selecting Solid fill many, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the 12d Model application window.

STEP 1:

After selecting the option, the **Fill Colour** Input box is displayed.

Type the name of the required colour into the Input box and press the enter key. The browse button  on the Input box can be used to define the blend by measuring existing elements.



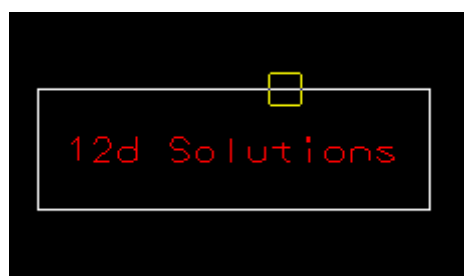
STEP 2:

After the colour is accepted, the **Blend** Input box will appear. This selection determines the transparency of the filled colour. A value between 0 (totally opaque) and 1 (totally transparent) must be selected.

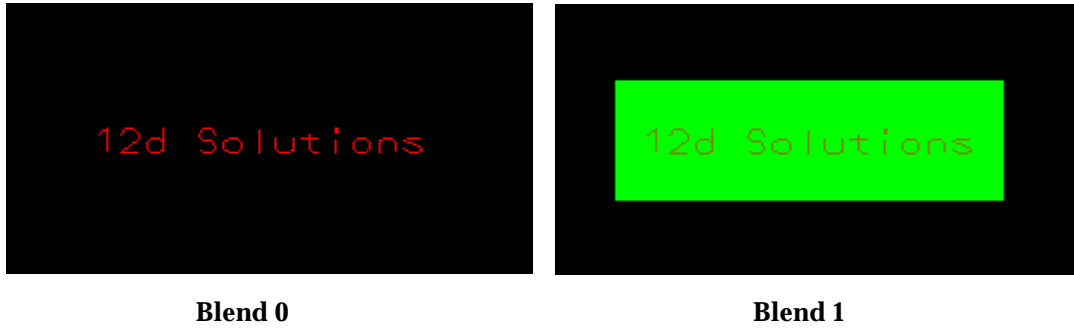


STEP 3:

Select and accept a string and the string is coloured filled.



The selected super string is then filled.



Then select and accept the next string to fill and the same colour and blend is used to colour fill the next string

If the string selected is an enclosed shape, then the filled area is simply the closed shape. If the string isn't closed (such as two perpendicular lines), for the purposes of this option, the string will be temporarily closed and closed area coloured.

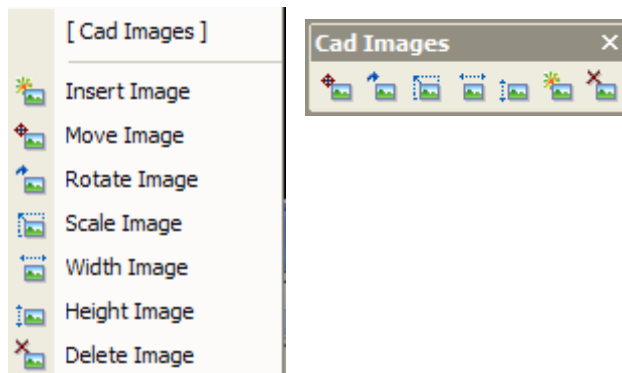
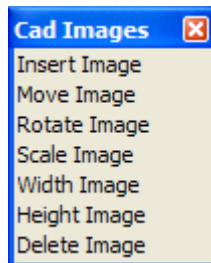
Note: If the string selected is a straight line, then its area is zero. When the colour fill of a line is completed, the line will simply disappear. This is because there is no area to colour.

CAD Images

cad_images

Position of option on menu: Strings =>CAD =>Images

The Fills walk-right menu is



For the option *Insert Image*, go to the section
Move Image
Rotate Image

"Insert Image"
 "Move Image"
 "Rotate Image"

<i>Scale Image</i>	"Scale Image"
<i>Width Image</i>	"Width Image"
<i>Height Image</i>	"Height Image"
<i>Delete Image</i>	"Delete Image"

Insert Image

Cad_Insert_Plan_Image

Position of option on menu: Strings =>CAD =>Images =>Insert Image

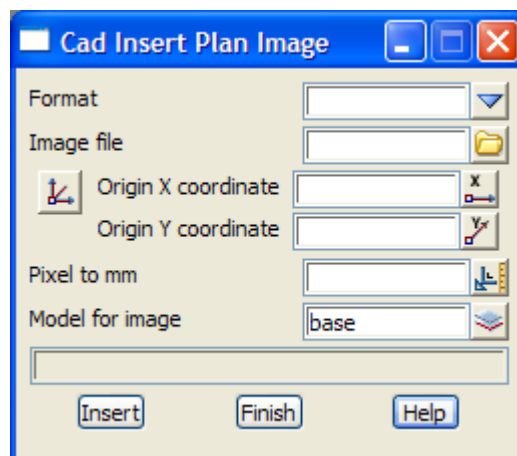
or by selection of appropriate icon from the toolbar. 

This option creates a on vertex super strings and inserts an images at the vertex.

On selecting **Insert Image**, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the 12d Model application window.

STEP 1:

On selecting **Insert Image**, the **Cad Insert Plan Image** panel is displayed.



The fields and buttons used in the panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Format	Input box		BMP, DIB, ECW, GIF, JPEG JPEG 2000, PNG, TGA TIFF, 12D

Select the type of image file to insert.

Image file Input box

Select the image filename to be inserted into the project.

X/Y co-ordinate XY Pick button

Select the x/y co-ordinate for origin (bottom left corner) of the image.

Origin X coordinate Input box

Enter the x coordinate for the bottom left of the image.

Origin Y coordinate Input box

Enter the y coordinate for the bottom left of the image.

Pixel to mm Input box

This determines the scale of the image.

Model for image Input box

Select the model for the image to be inserted into.

Insert button

When all the fields have been entered, the **insert** button will display the image into the defined model.

Move Image

Cad_Move_Plan_Image

Position of option on menu: Strings =>CAD =>Images =>Move Image

or by selection of appropriate icon from the toolbar. 

This option moves an inserted image by modifying the x and y offset for the image. The vertex that the image is attached to does not move.

On selecting Move Image, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the 12d Model application window.

STEP 1:

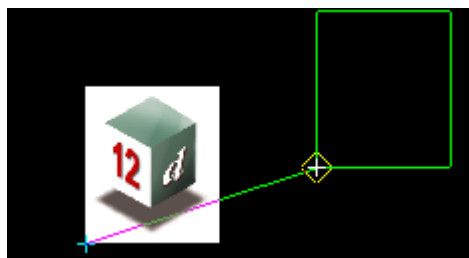
Select the vertex that the image is attached to.

Note: The position of the image is defined **relative to the vertex**. To select the image, the **vertex** that the image is attached to **must be selected**. The image itself can not be picked.



STEP 2:

After a vertex of an image is accepted, an outline of the image is displayed and moves with the position of the cursor. This will continue until the new position is selected and accepted.



Select the new position and accept it.

The cursor position can be selected with the mouse or entered via the keyboard. To enter a position with the keyboard, simply start typing or press the space bar to bring up the XYZ Input box. Type the coordinates into the XYZ Input box and press the <enter> key.

STEP 3:

The image is then displayed at its new position.



Note: The *CAD Move Image* option only moves **the image offset relative to the vertex**. Use the option *CAD Move* to **move the vertex** (and the corresponding image moves with it).

Rotate Image

Cad_Rotate_Plan_Image

Position of option on menu: Strings =>CAD =>Images =>Rotate Image

or by selection of appropriate icon from the toolbar. 

This option rotates an image around its justification point.

On selecting **Rotate Image**, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the 12d Model application window.

STEP 1:

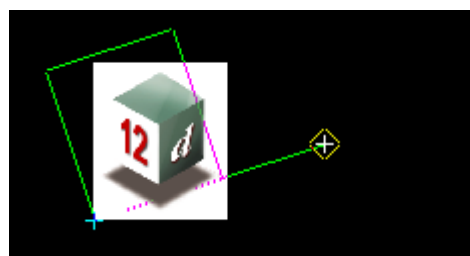
Select the vertex that the image is attached to.

Note: The position of the image is defined **relative to the vertex**. To select the image, the **vertex** that the image is attached to **must be selected**. The image itself can not be picked.



STEP 2:

After the vertex of an image is accepted, an outline of the image is displayed. The outline is rotated dynamically as the position of the cursor changes. This will continue until a final position is selected and accepted.



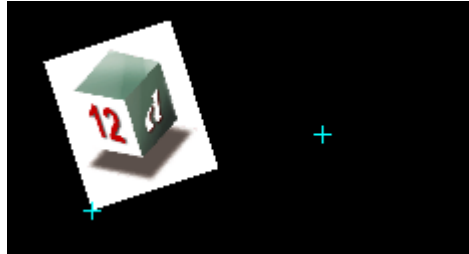
Select the new rotated position and accept it.

The cursor position can be selected with the mouse or entered via the keyboard. To enter a position with the keyboard, simply start typing or press the space bar to bring up the XYZ Input

box. Type the coordinates into the XYZ Input box and press the <enter> key.

STEP 3:

The rotated image is then displayed.



Scale Image

Cad_Scale_Plan_Image

Position of option on menu: Strings =>CAD =>Images =>Scale Image

or by selection of appropriate icon from the toolbar. 

This option changes the size of an image.

On selecting **Scale Image**, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the 12d Model application window.

STEP 1:

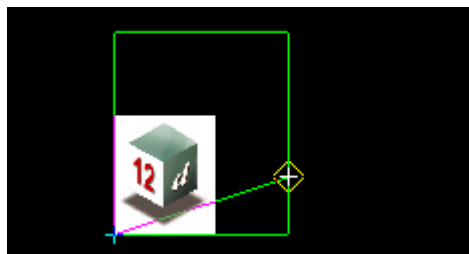
Select the **vertex** that the image is attached to.

Note: The position of the image is defined **relative to the vertex**. To select the image, the **vertex** that the image is attached to **must be selected**. The image itself can not be picked.



STEP 2:

After the vertex of an image is accepted, an outline of the image is displayed. The size of the outline is determined by the position of the cursor. Both the height and the width of the image increase/decrease in the same ratio so that the image is not distorted.



Select the new size as given by the cursor position, and accept it.

The cursor position can be selected with the mouse or entered via the keyboard. To enter a position with the keyboard, simply start typing or press the space bar to bring up the XYZ Input box. Type the coordinates into the XYZ Input box and press the <enter> key.

STEP 3:

The scaled image is then displayed.



Width Image

Cad_Width_Plan_Image

Position of option on menu: Strings =>CAD =>Images =>Width Image

or by selection of appropriate icon from the toolbar. 

This option is user to increase or decrease the width of an image. The height of the image is not changed so the images will be stretched.

On selecting **Width Image**, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the 12d Model application window.

STEP 1:

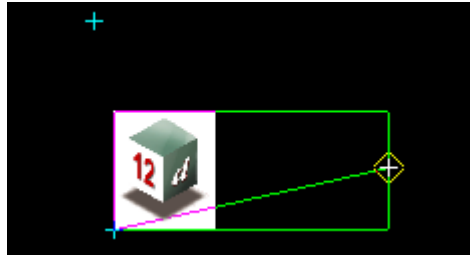
Select the **vertex** that the image is attached to.

Note: The position of the image is defined **relative to the vertex**. To select the image, the **vertex** that the image is attached to **must be selected**. The image itself can not be picked.



STEP 2:

After the vertex of an image is accepted, the outline of the image is displayed. The width of the outline is determined by the position of the cursor. Whilst the height remains constant, the width of the outline increases and decreases dynamically as the position of the cursor changes.



Select the new width as given by the cursor position, and accept it.

The cursor position can be selected with the mouse or entered in via the keyboard. To enter a position with the keyboard, simply start typing or press the space bar to bring up the XYZ Input box. Type the coordinates into the XYZ Input box and press the <enter> key.


STEP 3:

The image with the new width is then displayed.



Height Image

Cad_Height_Plan_Image

Position of option on menu: Strings =>CAD =>Images =>Height Image
or by selection of appropriate icon from the toolbar. 

This option allows the user to increase or decrease the height of an image. The width of the image is not changed so the images will be stretched.

On selecting **Height Image**, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the 12d Model application window.

STEP 1:

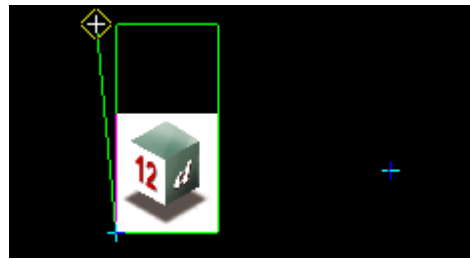
Select the **vertex** that the image is attached to.

Note: The position of the image is defined **relative to the vertex**. To select the image, the **vertex** that the image is attached to **must be selected**. The image itself can not be picked.



STEP 2:

After the vertex of an image is accepted, the outline of the image is displayed. The height of the outline is determined by the position of the cursor. Whilst the width remains constant, the height of the outline increases and decreases dynamically as the position of the cursor changes.



Select the new height as given by the cursor position, and accept it.

The cursor position can be selected with the mouse or entered in via the keyboard. To enter a position with the keyboard, simply start typing or press the space bar to bring up the XYZ Input box. Type the coordinates into the XYZ Input box and press the <enter> key.

STEP 3:


The image with the new height is then displayed.



Delete Image

Cad_Delete_Plan_Image

Position of option on menu: Strings =>CAD =>Images =>Delete Image

or by selection of appropriate icon from the toolbar. 

This option deletes an image.

On selecting **Delete Image**, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the 12d Model application window.

STEP 1:

Select the **vertex** that the image is attached to.

Note: The position of the image is defined **relative to the vertex**. To select the image, the **vertex** that the image is attached to **must be selected**. The image itself can not be picked.



STEP 2:

When the selected image is accepted, it is then deleted.

Note that the **vertex** that the image was attached to is not deleted.

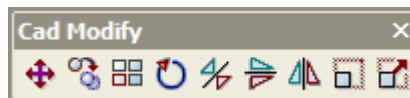
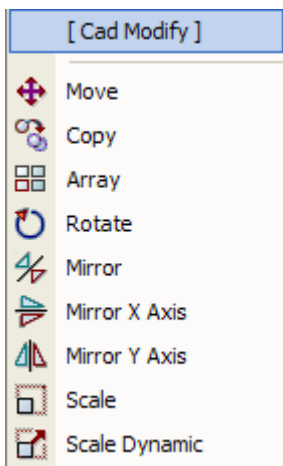
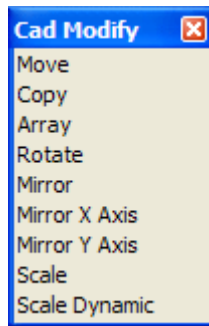


CAD Modify

cad_modify

Position of option on menu: Strings =>CAD =>Modify

The Modify walk-right menu is




For the option *Move*, please go to the section “Move” .

- | | |
|----------------------|-----------------|
| <i>Copy</i> | “Copy” |
| <i>Array</i> | “Array” |
| <i>Rotate</i> | “Rotate” |
| <i>Mirror</i> | “Mirror” |
| <i>Mirror X axis</i> | “Mirror X Axis” |

<i>Mirror Y axis</i>	"Mirror Y Axis"
<i>Scale</i>	"Scale"
<i>Scale dynamic</i>	"Scale Dynamic"

Move

Cad_Move

Position of option on menu: Strings =>CAD =>Modify =>Move
or by selection of appropriate icon from the toolbar. 

This option moves a selected string.

On selecting **Move**, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the 12d Model application window.

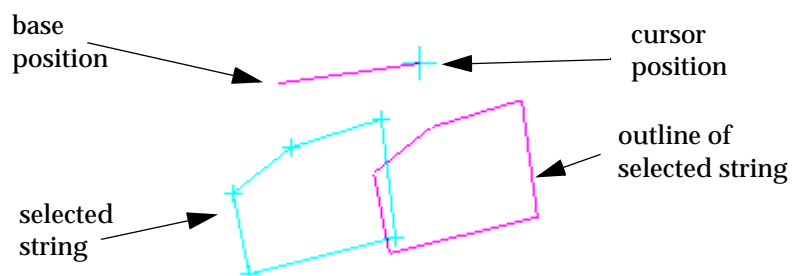
STEP 1:

A super string or circle is picked.

STEP 2:

A base position is picked and then an outline of the selected string will be drawn and moved with the cursor, plus a line will be drawn from the base position to the current cursor position.

Note: The base position is not required to lie on the string itself.



STEP 3:


A final cursor position is selected which defines a distance and direction from the base position to the final position.

STEP 4:

On accepting the final position, selected super string is moved by the determined distance and direction.

Copy

Cad_Copy

Position of option on menu: Strings =>CAD =>Modify =>Copy
or by selection of appropriate icon from the toolbar. 

This option copies a super string.

On selecting **Copy**, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the 12d Model application window.

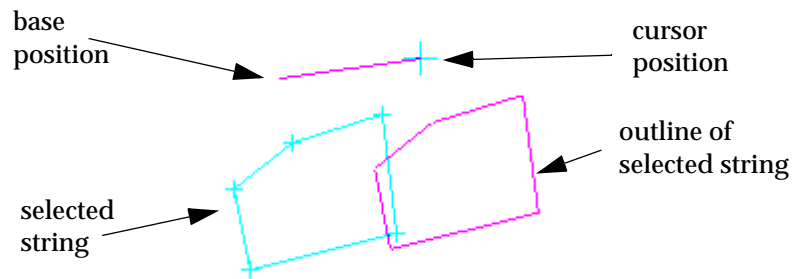
STEP 1:

Select a super string.

STEP 2:

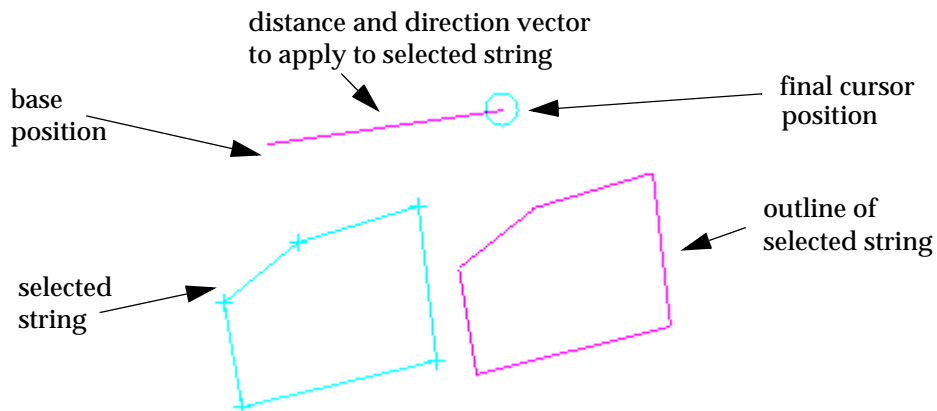
A base position is picked and then an outline of the selected string will be drawn and moved with the cursor, plus a line will be drawn from the base position to the current cursor position.

Note: The base position is not required to lie on the string itself.



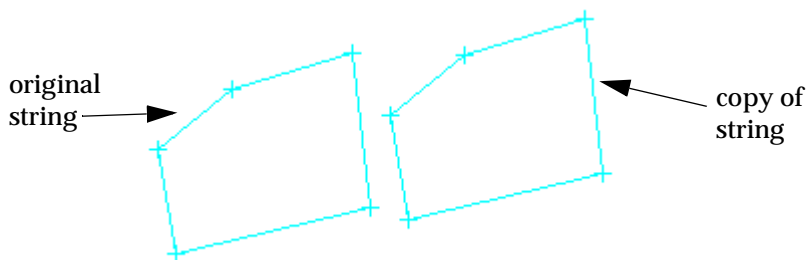
STEP 3:

A final cursor position is selected which defines a distance and direction from the base position to the final position.



STEP 4:


On accepting the final position, a copy of the selected super string is moved by the determined distance and direction.



Array

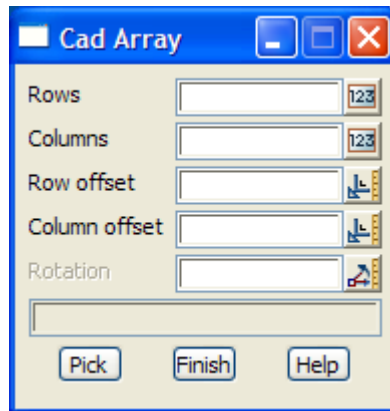
Cad_Array

Position of option on menu: Strings =>CAD =>Modify =>Array

or by selection of appropriate icon from the toolbar. 

This option copies a super string a number of times.

On selecting **Array**, the **Cad Array** panel is displayed.

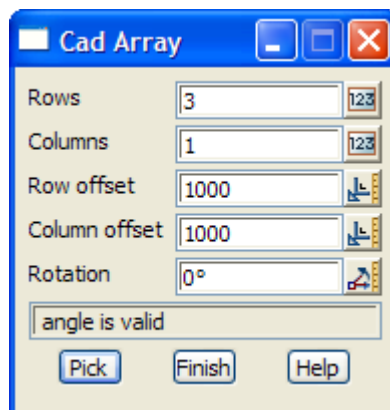


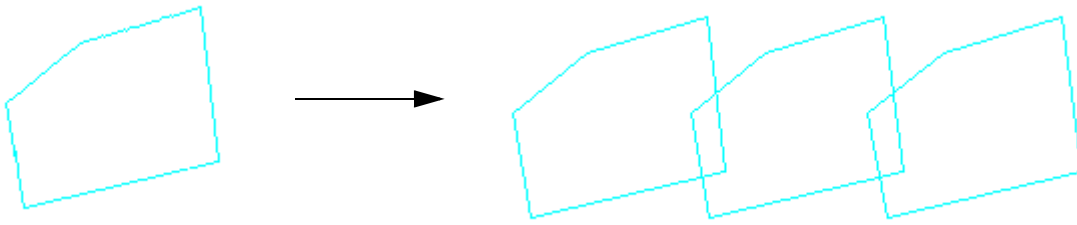
The fields and buttons used in the panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Rows <i>number of rows</i>	Input box		
Columns <i>number of columns</i>	Input box		
Row offset <i>distance between the rows</i>	Input box		
Column offset <i>distance between the columns</i>	Input box		
Rotation <i>the angle to use for the rows and columns of copies</i>	angle box		
Pick <i>pick the super string to copy and when it is accepted the super string is copied</i>	button		

STEPS:


Fill in the fields in the **Cad Array** panel, click on **Pick** and select the super string to copy.





Rotate

Cad_Rotate

Position of option on menu: Strings =>CAD =>Modify =>Rotate
 or by selection of appropriate icon from the toolbar. 

This option rotates a super string.

On selecting **Rotate**, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the 12d Model application window.

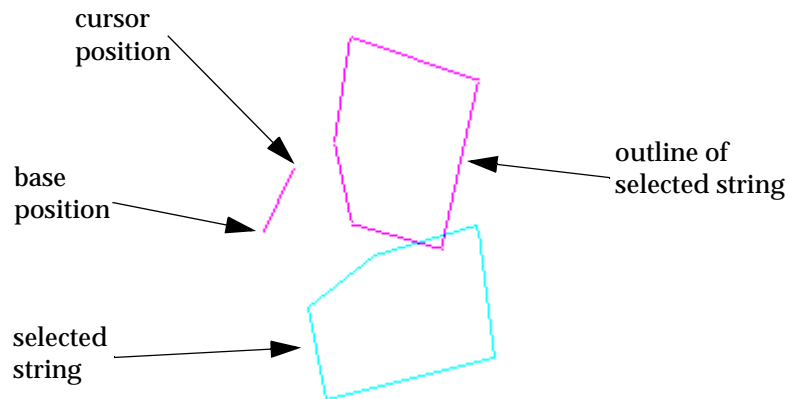
STEP 1:

Select the super string to rotate.

STEP 2:

A base position is picked and then an outline of the selected string is drawn and rotated around the base position with the cursor, plus a line will be drawn from the base position to the current cursor position.

Note: The base position is not required to lie on the string itself.

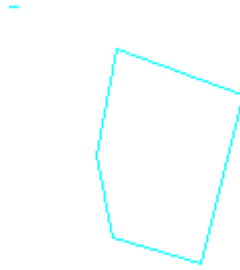


When the line has a bearing of 90 degrees, the outline will be on top of the selected string (i.e. there is no rotation). As the line rotates around the base position, the outline rotates around the base position. This rotation will continue until the final point is selected and accepted.

STEP 3:

A final cursor position is selected which defines the rotation about the base position.

On accepting the final position, the selected string is rotated around the base position through the defined angle.



Mirror

Cad_Mirror

Position of option on menu: Strings =>CAD =>Modify =>Mirror

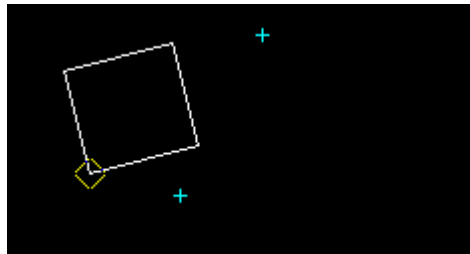
or by selection of appropriate icon from the toolbar. 

This option creates a mirrored image of a selected string.

On selecting **Mirror**, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the 12d Model application window.

STEP 1:

Select a super string to mirror.

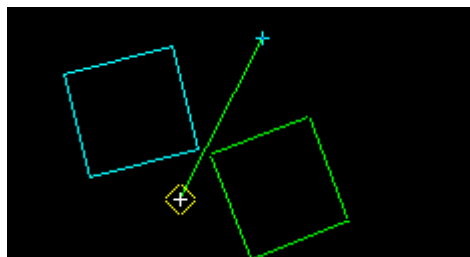


STEP 2:

Select the 1st point of the mirror axis.

The 1st point is selected with the mouse or entered in via the keyboard. To enter a point with the keyboard, simply start typing or press the space bar to bring up the XYZ Input box. Type the coordinates into the XYZ Input box and press the enter key.

After the 1st point is accepted a line will be drawn from the 1st point to the position of the cursor. This line forms the mirroring axis. The outline of the reflected image will be dynamically displayed according to the changing cursor position.



STEP 3:

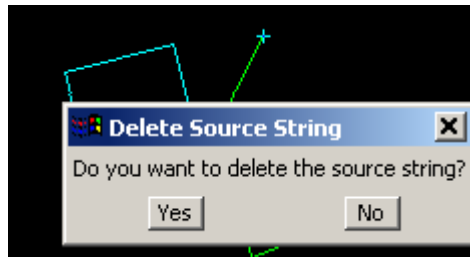
Select and accept the 2nd point of the mirror axis.

STEP 4:

After the base point is accepted, the **Delete Source String** box will appear.

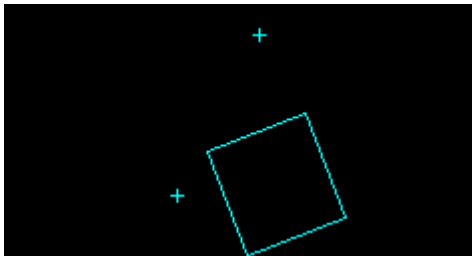
Select **yes** if you want the original super string to be deleted when the new mirrored string is constructed.

Select **no** if you want the original super string to remain when the new mirrored string is constructed.

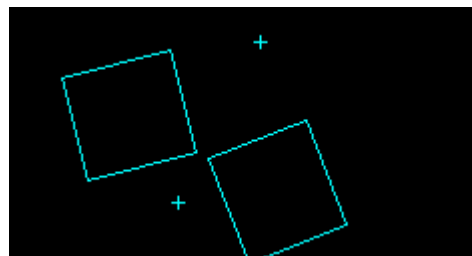


STEP 5:

The selected super string will be mirrored using the information given.



Delete the source string



Don't delete the source string

Mirror X Axis

Cad_Mirror_X_Axis

Position of option on menu: Strings =>CAD =>Modify =>Mirror X axis

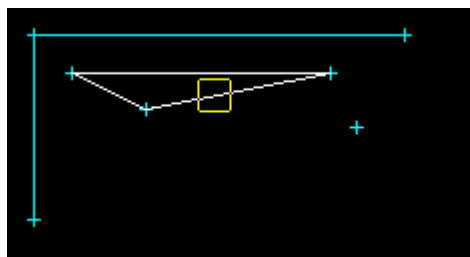
or by selection of appropriate icon from the toolbar. 

This option mirrors a string through the x axis.

On selecting Mirror X Axis, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the 12d Model application window.

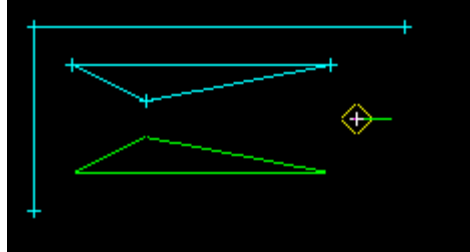
STEP 1:

Select a super string to mirror through the x axis.



STEP 2:

After the string is accepted the position of the cursor on the y axis determines the position of the mirror (which runs parallel to the x axis). As the cursor moves along the y axis, a reflection of the selected string will be dynamically displayed. This will continue until a final position is selected, thus determining the mirror axis.



Select the final y-position of the mirror x-axis.

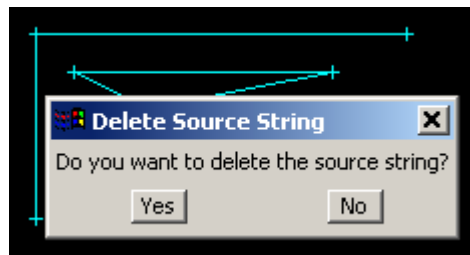
The final position is selected with the mouse or entered in via the keyboard. To enter a base point with the keyboard, simply start typing or press the space bar to bring up the XYZ Input box. Type the coordinates into the XYZ Input box and press the enter key.

STEP 3:

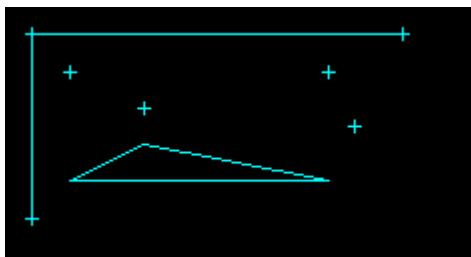
After the final position is accepted, a **Delete Source String** box will appear.

Select **yes** if you want the original super string to be deleted when the new mirrored string is constructed.

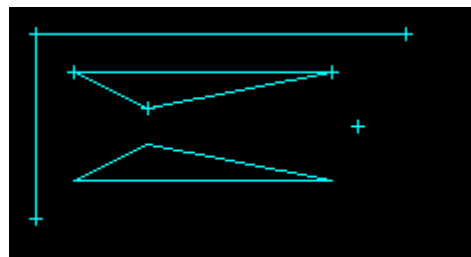
Select **no** if you want the original super string to remain when the new mirrored string is constructed.

**STEP 4:**

The selected super string will be mirrored using the information given.




Delete the source string



Don't delete the source string

Mirror Y Axis

Cad_Mirror_Y_Axis

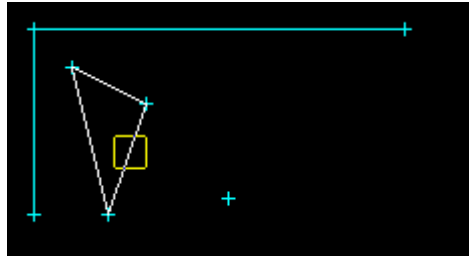
Position of option on menu: Strings =>CAD =>Modify =>Mirror Y Axis
 or by selection of appropriate icon from the toolbar. 

This option mirrors a string through the y axis.

On selecting Mirror Y Axis, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the 12d Model application window.

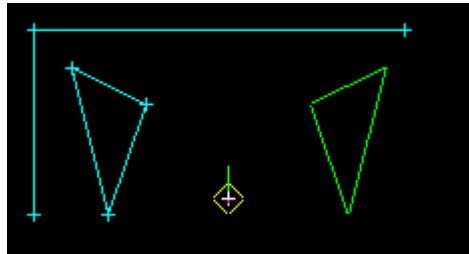
STEP 1:

Select a super string to mirror through the y axis.



STEP 2:

After the string is accepted the position of the cursor on the x axis determines the position of the mirror (which runs parallel to the y axis). As the cursor moves along the x axis, a reflection of the selected string will be dynamically displayed. This will continue until a final position is selected, thus determining the mirror axis.



Select the final x-position of the mirror y-axis.

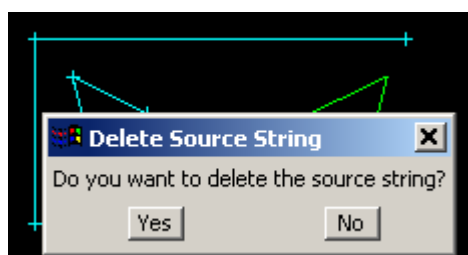
The final position is selected with the mouse or entered in via the keyboard. To enter a base point with the keyboard, simply start typing or press the space bar to bring up the XYZ Input box. Type the coordinates into the XYZ Input box and press the enter key.

STEP 3:

After the final position is accepted, a **Delete Source String** box will appear.

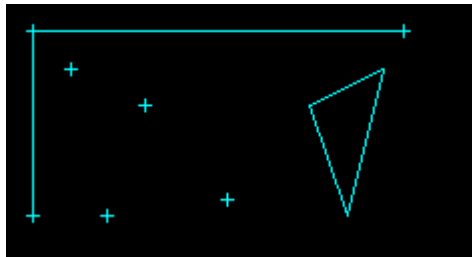
Select **yes** if you want the original super string to be deleted when the new mirrored string is constructed.

Select **no** if you want the original super string to remain when the new mirrored string is constructed.

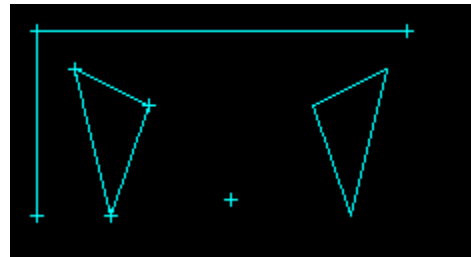


STEP 4:

The selected super string will be mirrored using the information given.



Delete the source string



Don't delete the source string

Scale**Cad_Scale**

Position of option on menu: Strings =>CAD =>Modify =>Scale

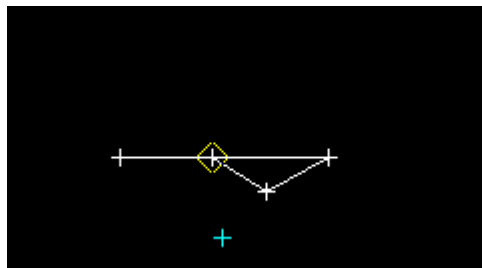
or by selection of appropriate icon from the toolbar. 

This option increases or decreases the size of a string by a given scale.

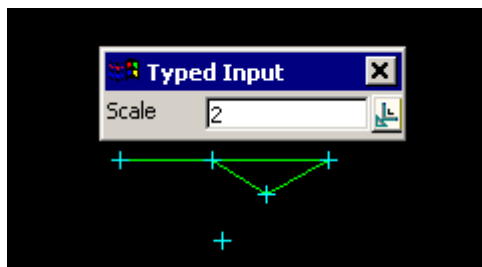
On selecting Scale, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the 12d Model application window.

STEP 1:

Select a super string to scale.

**STEP 2:**

After a string is accepted, the **Scale** Input box will appear. Type the desired scale into the input box and press the enter key. The browse button  on the Input box can be used to define the scale by measuring existing elements.

**STEP 3:**

After a scale value has been entered the user is required to select an origin position.

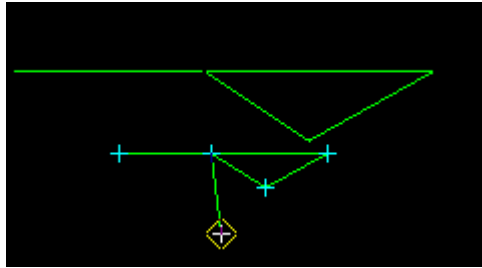
An origin position can be selected with the mouse or entered in via the keyboard. To enter a start

position with the keyboard, simply start typing or press the space bar to bring up the XYZ Input box. Type the coordinates into the XYZ Input box and press the enter key.

The dimensions of the highlight string are defined by the scale value.

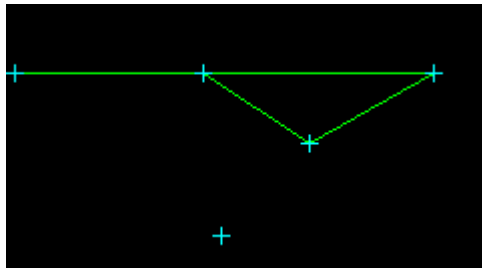
The position of the scaled highlight string moves dynamically as the position of the cursor moves. The origin position establishes the location of the scaled string relative to the original selected string.

For example, if you selected a scale of "2", the distance between the cursor and a point on the highlight string would be double the distance between the cursor and the corresponding point on the original super string.



STEP 4:

After the final position has been accepted, the original string will be removed and the newly scaled highlight string constructed.



Scale Dynamic

Cad_Scale_Dynamic

Position of option on menu: Strings =>CAD =>Modify =>Scale Dynamic

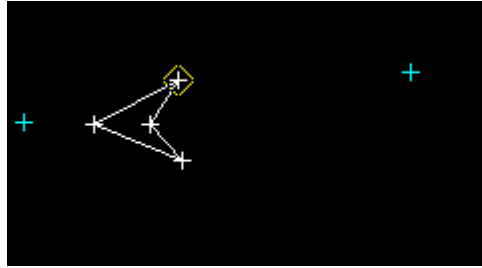
or by selection of appropriate icon from the toolbar. 

This option dynamically increases or decreases the size of a string.

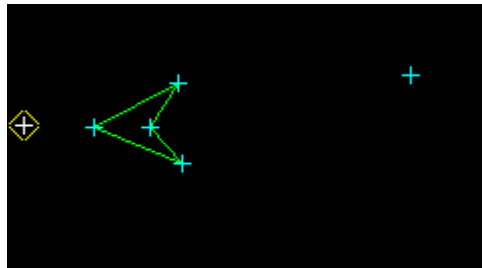
On selecting Scale Dynamic, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the 12d Model application window.

STEP 1:

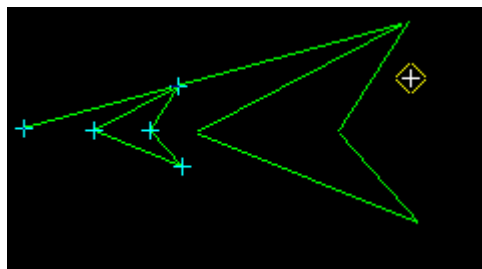
Select a super string to scale.

**STEP 2:**

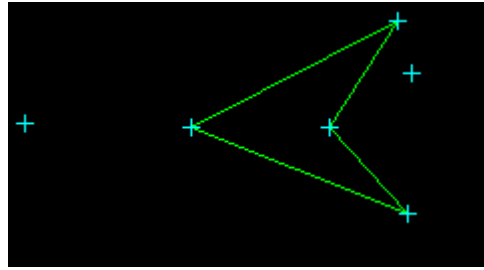
An origin point is required to be defined. An origin point can be selected with the mouse or entered in via the keyboard. To enter a start point with the keyboard, simply start typing or press the space bar to bring up the XYZ Input box. Type the coordinates into the XYZ Input box and press the enter key.

**STEP 3:**

After an origin point has been accepted, a projection point needs to be defined. The highlight string will be projected from the origin point. The size and position of the highlight string will move dynamically as the position of the cursor moves. The highlight string will increase in size if the cursor moves further from the origin point. Conversely, the highlight string will decrease in size if the cursor moves closer to the origin point. This will continue until a projection point is accepted.

**STEP 4:**

After the projection point has been accepted, the original string will be removed and the newly scaled highlight string will be constructed.

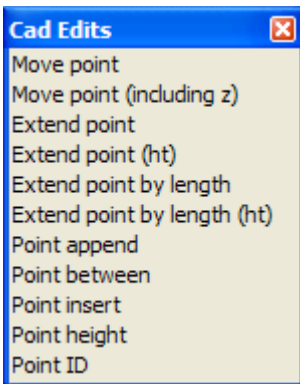


CAD Edit Points

cad_edits

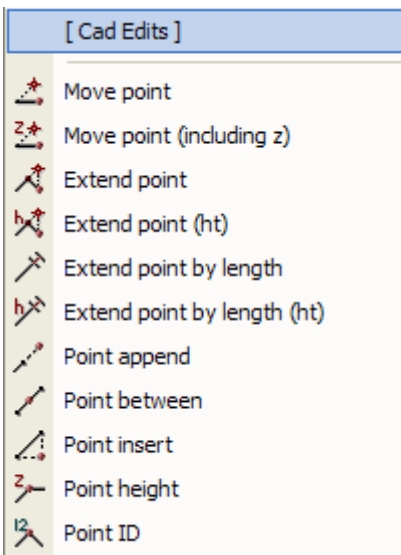
Position of option on menu: Strings =>CAD =>Change points

The Change points walk-right menu is



Menu of Options to Move Vertices

- move a vertex
- move a vertex along its segment - keep the same height
- move a vertex along its segment - interpolate/extrapolate the height
- move a vertex by a given chainage distance along a segment - keep ht
- move a vertex a given chainage dist along a segment - extrapolate ht
- append a vertex to an existing string
- create a vertex on the segment joining two adjacent vertices of a string
- insert a vertex between two adjacent vertices of a string
- edit the height of a vertex
- edit the point (vertex) id



These option allow the editing of vertices on super strings.

For the option *Move point*, go to the section "Move a Vertex Keeping its Height"
Move point (including ht) "Extend a Vertex and Keeping its Height"

<i>Extend point</i>	“Extend a Vertex and Keeping its Height”
<i>Extend point (ht)</i>	“Extend Segment and Extrapolating Heights”
<i>Extend point by length</i>	“Extend Segment by Length and Keeping Height”
<i>Extend point by length (ht)</i>	“Extend Segment by Length and Extrapolating Heights”
Point append	“Append a Vertex”
Point between	“New Vertex on a Segment (Between Two Vertices)”
Point Insert	“Insert a Vertex”
Point Height	“Change Height of a Vertex”
Point id	“Point Id”

Move a Vertex Keeping its Height

Cad_Move_Point_on_Super_String

Position of option on menu: Strings =>CAD =>Change points =>Move point

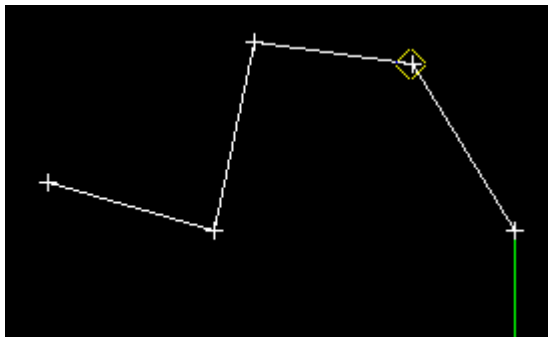
or by selection of appropriate icon from the toolbar. 

This option moves the vertex of a super string. The height of the vertex is not modified.

On selecting Move point, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the 12d Model application window.

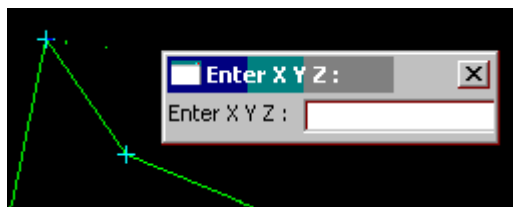
STEP 1:

A vertex on a super string is selected and accepted.



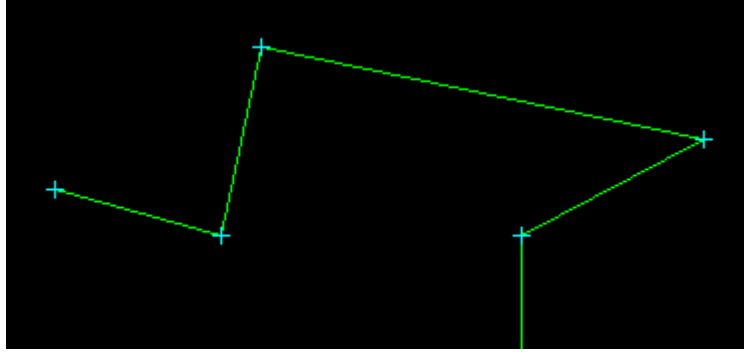
STEP 2:

The position of the selected vertex moves with the cursor until the final position of the vertex is selected and accepted. Alternatively, the user can type in the final coordinate of the vertex by the using the **Enter XYZ** box. This box is brought up by simply typing a value or by pressing the space bar.




STEP 3:

The selected vertex is moved to the new position.



Move a Vertex and Modify its Height

Cad_Move_Point_on_Super_String_including_z_

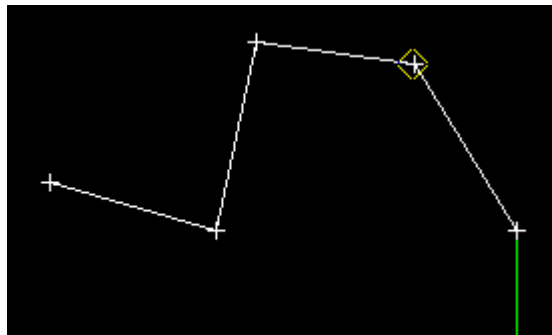
Position of option on menu: Strings =>CAD =>Change points =>Move point (including z)
or by selection of appropriate icon from the toolbar. 

This option moves the vertex of a super string and the height of the vertex is taken from the height of the final selected position.

On selecting Move point (including ht), the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the 12d Model application window.

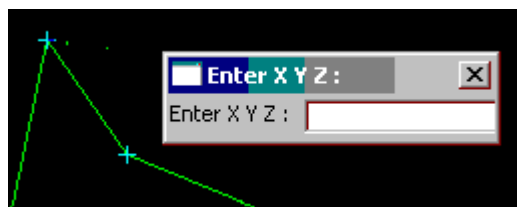
STEP 1:

A vertex on a super string is selected and accepted.



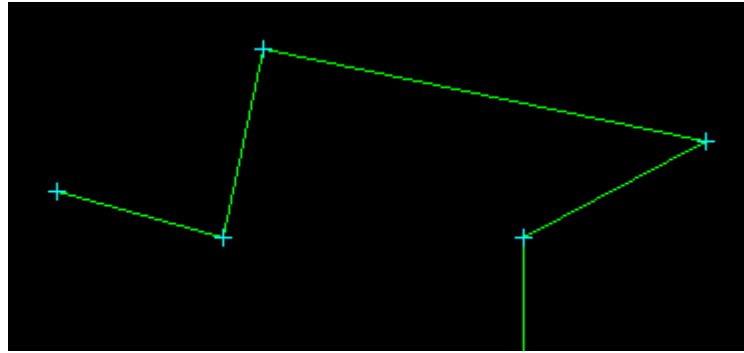
STEP 2:

The position of the selected vertex moves with the cursor until the final position of the vertex is selected and accepted. Alternatively, the user can type in the final coordinate of the vertex by the using the **Enter XYZ** box. This box is brought up by simply typing a value or by pressing the space bar.




STEP 3:

The selected vertex is moved to the new position and takes on the height of the string it is snapped to, or the Z value entered into the **Enter XYZ** box.



Extend a Vertex and Keeping its Height

Cad_Extend_Point_on_Super_String

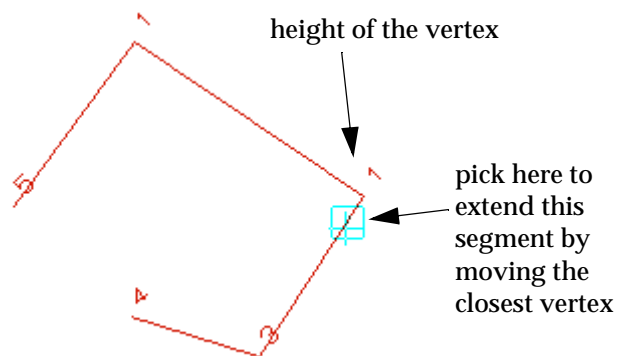
Position of option on menu: Strings =>CAD =>Change points =>Extend point
or by selection of appropriate icon from the toolbar. 

This option extends (or shortens) a segment by moving a vertex along the segment joining the vertex to its neighbouring vertex. The height of the vertex is not modified.

On selecting Extend point, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the 12d Model application window.

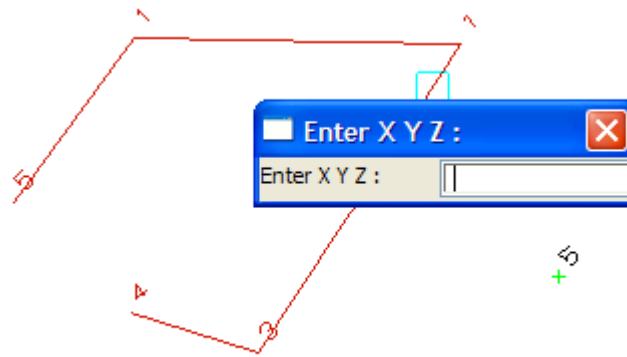
STEP 1:

Most vertices are on two segments so it is necessary to indicate which segment is to be extended. This is done by selecting **not the vertex**, but by selecting **on the segment** that is to be extended, close to the vertex to be moved.

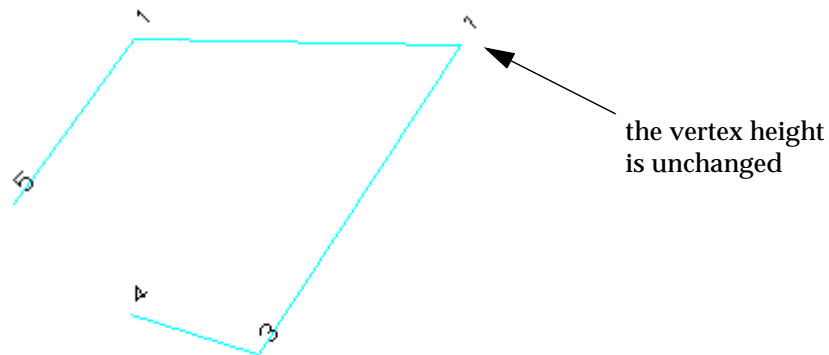


STEP 2:

As the cursor is moved, the string is redrawn reflecting the changing position of the moved vertex. The final position of the vertex is selected and accepted. Alternatively, the user can type in the final coordinate of the moved vertex into the **Enter XYZ** box. This box is brought up by simply typing a value or by pressing the space bar.

**STEP 3:**


The selected vertex is moved to the new position. The height of the vertex is not changed.



Extend Segment and Extrapolating Heights

Cad_Extend_Point_on_Super_String_ht_

Position of option on menu: Strings =>CAD =>Change points =>Extend point (ht)

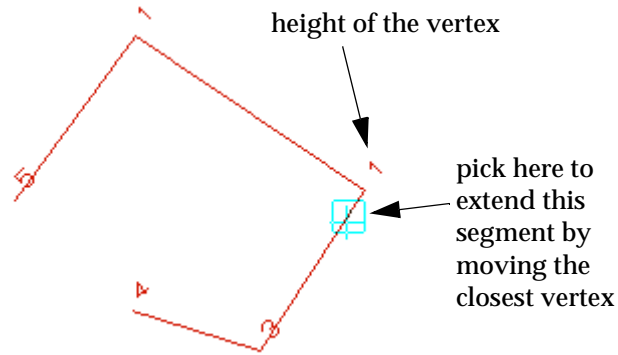
or by selection of appropriate icon from the toolbar. 

This option extends (or shortens) a segment by moving a vertex along the segment joining the vertex to its neighbouring vertex. The height of the vertex is extrapolated.

On selecting Extend point (ht), the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the 12d Model application window.

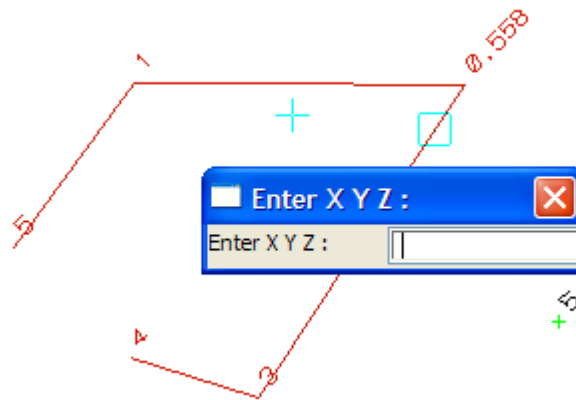
STEP 1:

Most vertices are on two segments so it is necessary to indicate which segment is to be extended, This is done by selecting **not the vertex**, but by selecting **on the segment** that is to be extended, close to the vertex to be moved.

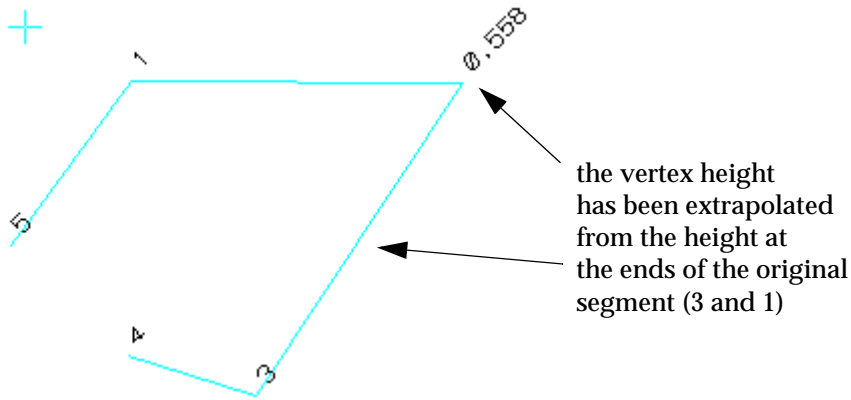
**STEP 2:**

As the cursor is moved, the string is redrawn reflecting the changing position of the moved vertex. The final position of the vertex is selected and accepted. Alternatively, the user can type in the final coordinate of the moved vertex into the **Enter XYZ** box. This box is brought up by simply typing a value or by pressing the space bar.

The point selected is moved to the cursor position in a rubber banding fashion. The final position of the point is selected and accepted. Alternatively, the user can enter the final coordinate value of the moved point by the enter XYZ box. This box can be brought into view by simply typing a value or by pressing the space bar.


**STEP 3:**

The selected vertex is moved to the new position. The height of the vertex has been extrapolated from the heights at either end of the original segment.



Extend Segment by Length and Keeping Height

Cad_Extend_Point_by_Length

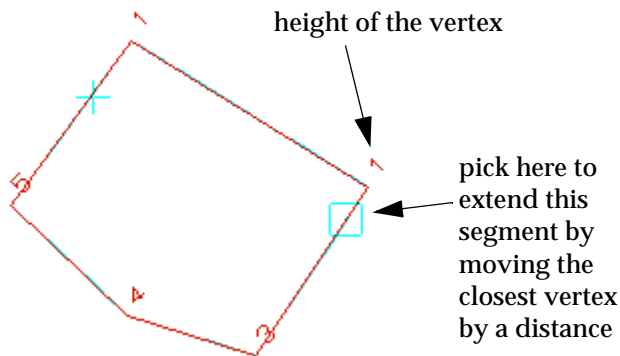
Position of option on menu: Strings =>CAD =>Change points =>Extend point by length
 or by selection of appropriate icon from the toolbar. 

This option extends (or shortens) a segment by moving a vertex along the segment joining the vertex to its neighbouring vertex by a user defined distance. The height of the vertex is not modified.

On selecting Extend point by length, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the 12d Model application window.

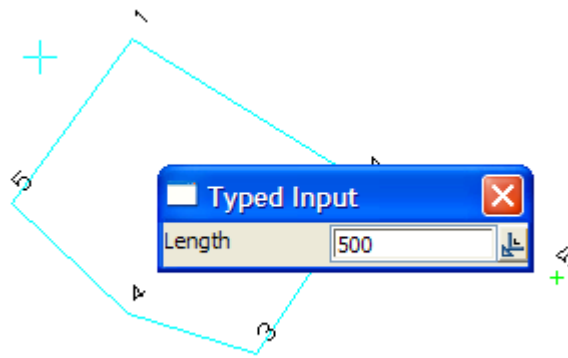
STEP 1:

Most vertices are on two segments so it is necessary to indicate which segment is to be extended, This is done by selecting **not the vertex**, but by selecting **on the segment** that is to be extended, close to the vertex to be moved.

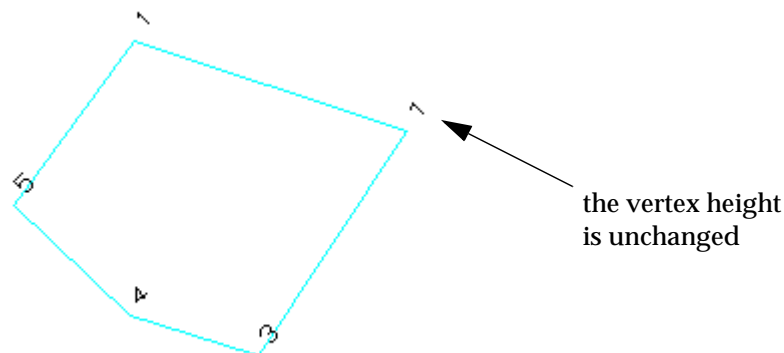


STEP 2:

The user enters the distance to extend the segment. This value is positive in the direction that the string was created.

**STEP 3:**

The point selected is moved to the new position and the string topology maintained.



Extend Segment by Length and Extrapolating Heights

Cad_Extend_Point_by_Length_ht_

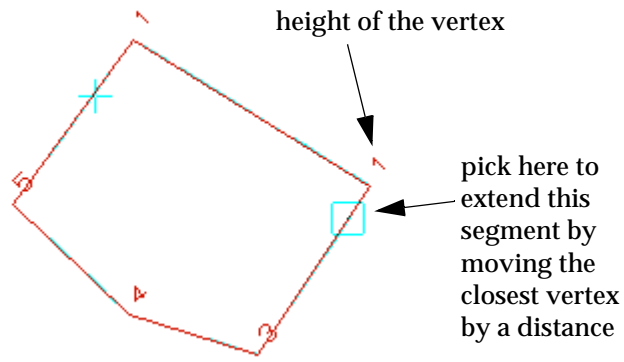
Position of option on menu: Strings =>CAD =>Change points =>Extend point by length (ht)
or by selection of appropriate icon from the toolbar.

This option extends (or shortens) a segment by moving a vertex along the segment joining the vertex to its neighbouring vertex by a user defined distance. The height of the vertex is extrapolated modified.

On selecting Extend point by length (ht), the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the 12d Model application window.

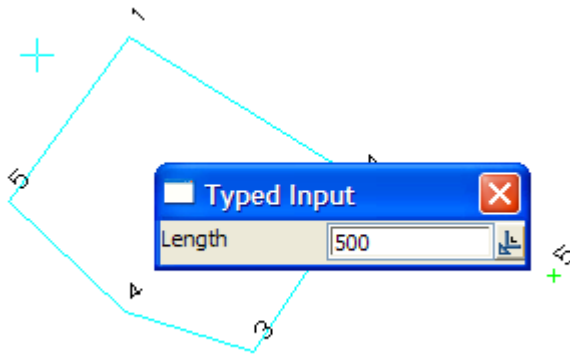
STEP 1:

Most vertices are on two segments so it is necessary to indicate which segment is to be extended, This is done by selecting **not the vertex**, but by selecting **on the segment** that is to be extended, close to the vertex to be moved.



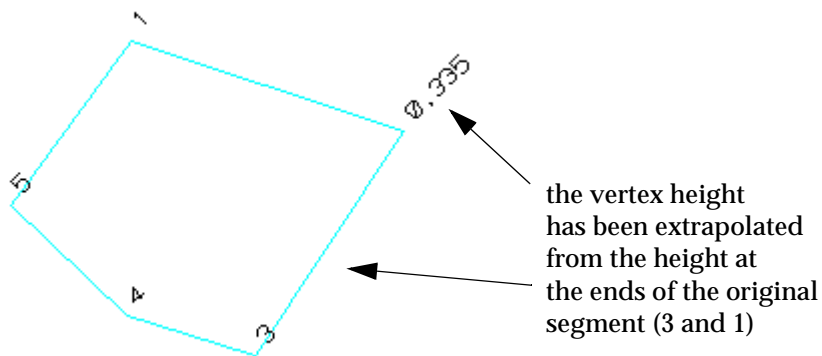
STEP 2:

The user enters the length value for which the point is to be extended by. This value is positive in the direction that the string was created.




STEP 3:

The point selected is moved to the new position and the height adjusted according to the grade of the extended segment.



Append a Vertex

Cad_Append

Position of option on menu: Strings =>CAD =>Change Points =>Point append
 or by selection of appropriate icon from the toolbar. 

This option adds vertices to an existing super string.

On selecting **Point append**, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the 12d Model application window.

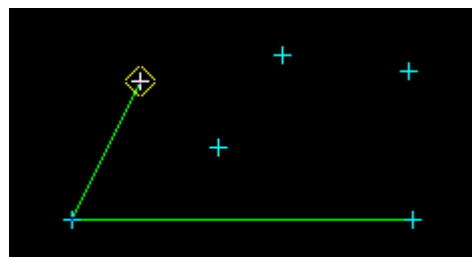
STEP 1:

Select a string by picking near the end of the string that vertices are to be added to (added to the beginning of the string - prepend, or added to the end of the string - append).



STEP 2:

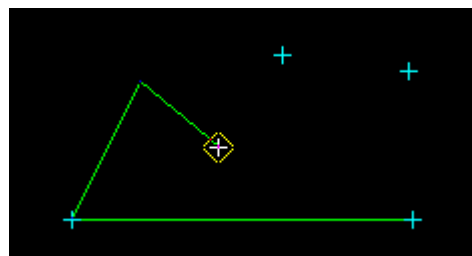
After the string is accepted, a line is drawn from the end of the string to the current cursor position.



Select the position for the new vertex.

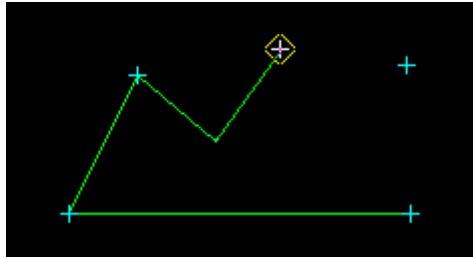
STEP 3:

After the new vertex is accepted, a line is drawn from that vertex to the current cursor position. That is, the process of adding points is repeated.

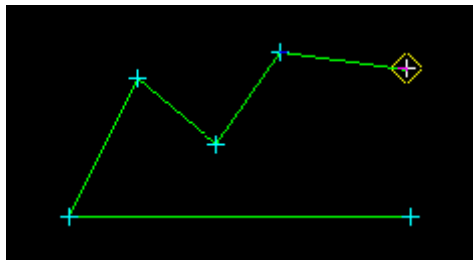


STEP 4:

This step should be repeated until the required number of vertices has been added.



STEP 5:




STEP 6:

After the required number of vertices have been added, the option is terminated for this string by pressing the <Esc> key.

New Vertex on a Segment (Between Two Vertices)

Cad_Between

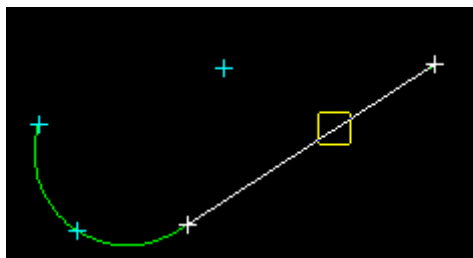
Position of option on menu: Strings =>CAD =>Change Points =>Point between
or by selection of appropriate icon from the toolbar. 

This option adds a vertex to a string but it is constrained to be on an existing segment of the string. The height of the vertex is interpolated from the heights at the end of the segment.

On selecting **Point between**, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the 12d Model application window.

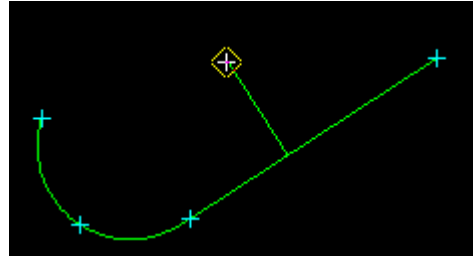
STEP 1:

Select the string on the segment of the string that is to have a vertex added to it. The new vertex will be constrained to be on the segment.



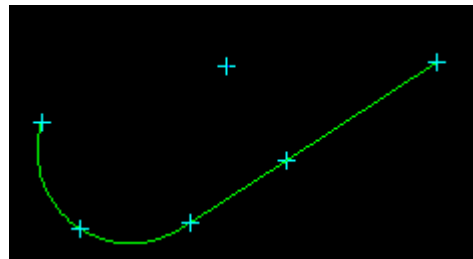
STEP 2:

After the segment is accepted, a perpendicular line is drawn from the selected segment of the string to the position of the cursor.

**STEP 3:**

A position is selected with the mouse or typed in via the keyboard and the new vertex is created by **dropping** the position **perpendicularly** onto the segment.

Note - to enter via the keyboard, simply start typing or press the space bar to bring up the **Enter XYZ** Input box. Type the coordinates into the XYZ Input box and press the enter key.



Insert a Vertex

Cad_Insert

Position of option on menu: Strings =>CAD =>Change Points =>Point insert

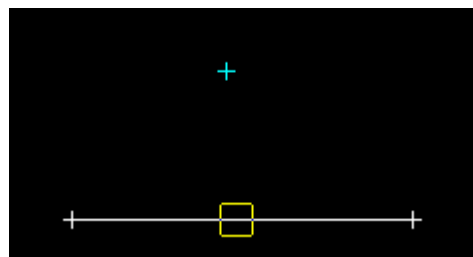
or by selection of appropriate icon from the toolbar. 

This option inserts a vertex into to a string between two adjacent vertices but it is constrained to be on the existing segment joining the vertices. The height of the vertex is taken from the final selected position.

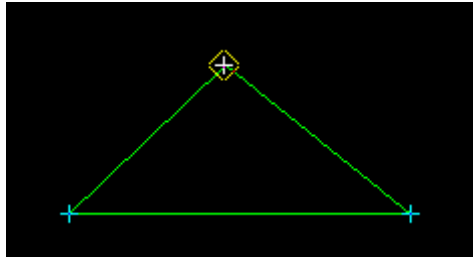
On selecting **Point insert**, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the 12d Model application window.

STEP 1:

Select the string on the segment of the string that is to have a vertex added to it. The new vertex is **not** constrained to be on the segment.

**STEP 2:**

After a string is accepted, two lines will be drawn from the cursor position to either end of the selected segment.

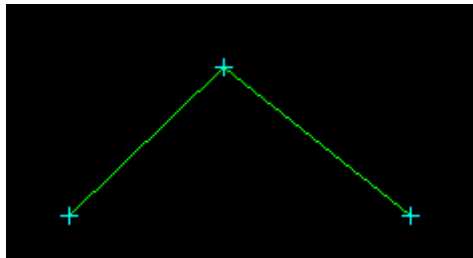


STEP 3:

A final position is selected with the mouse or typed in via the keyboard and the new vertex is created at the final position.


Once the new vertex is created the original segment is no longer drawn.

Note - to enter via the keyboard, simply start typing or press the space bar to bring up the **Enter XYZ** Input box. Type the coordinates into the XYZ Input box and press the enter key.



Change Height of a Vertex

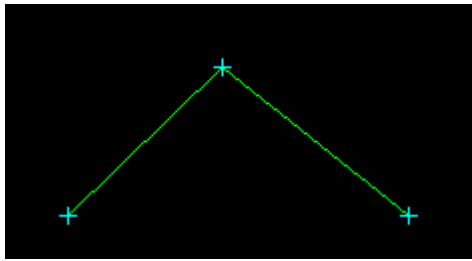
Cad_Height

Position of option on menu: Strings =>CAD =>Change Points =>Point height
or by selection of appropriate icon from the toolbar. 

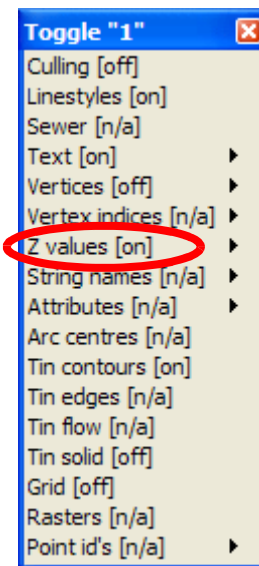
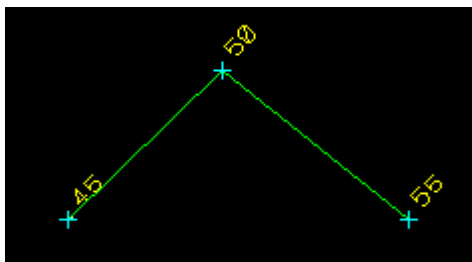
This option changes the height (z value) of a vertex.

On selecting **Point height**, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the 12d Model application window.

STEP 1:



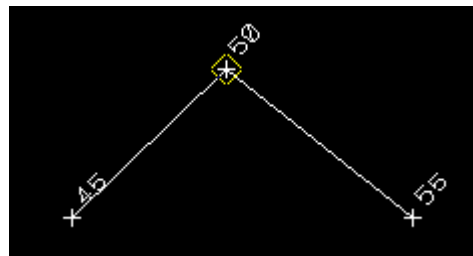
To see the effects of this option, use the **Toggle** menu to toggle on **Z values**. The height of each vertex (z value) is then displayed on the plan view so any modification to the height will be visible.



STEP 2:


Select a vertex with either the mouse or via the keyboard.

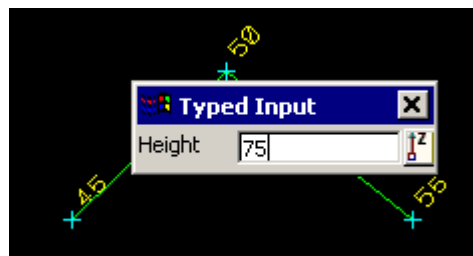
Note - to enter via the keyboard, simply start typing or press the space bar to bring up the **Enter XYZ** Input box. Type the coordinates into the **Enter XYZ** Input box and press the enter key.



STEP 3:

After a point is accepted, the **Height** input box will appear with the current height displayed in it.

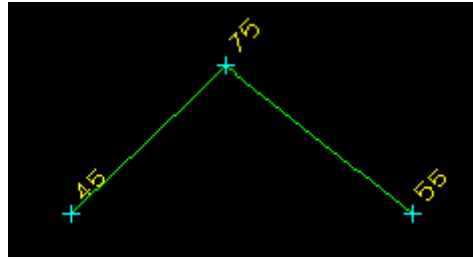
Type the new height (z value) of the vertex into the **Height** input box and press the enter key. The browse button  on the Input box can also be used to define the point's height.



STEP 4:


The height (z value) of selected point will have changed to the new value.

If z values have been turned on, the new value will be displayed in the view.



Point Id

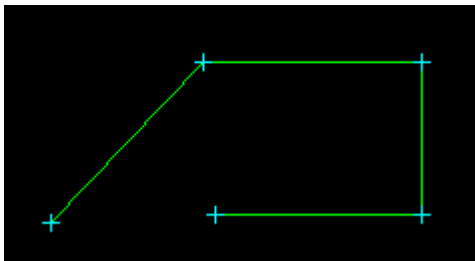
Cad_Point_ID

Position of option on menu: Strings =>CAD =>Change Points =>Point id
 or by selection of appropriate icon from the toolbar. 

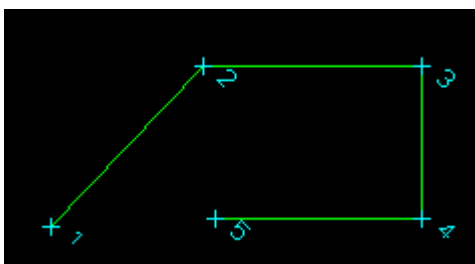
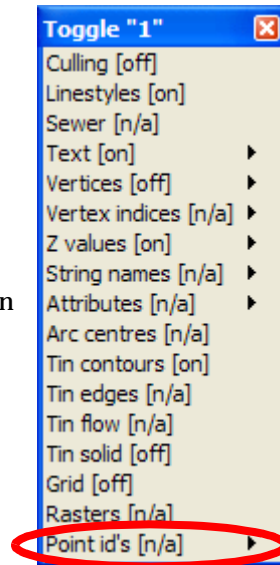
This option changes the point id of the vertex of a super string.

On selecting **Point id**, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the 12d Model application window.

STEP 1:



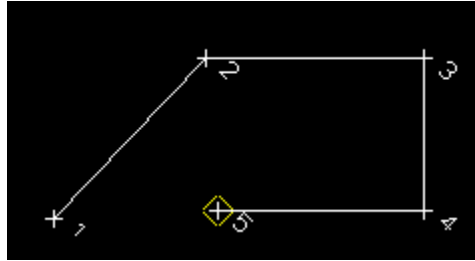
To see the effects of this option, use the Toggle menu to toggle on **Point id's**. The Point id of each vertex is then displayed on the plan view so any modification to the point id will be visible.



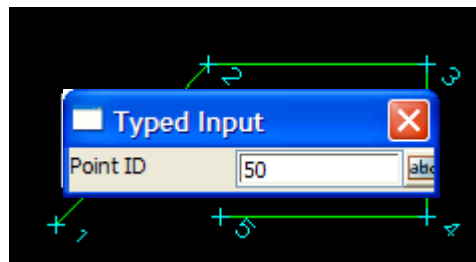
STEP 2:

Select a vertex with either the mouse or via the keyboard.

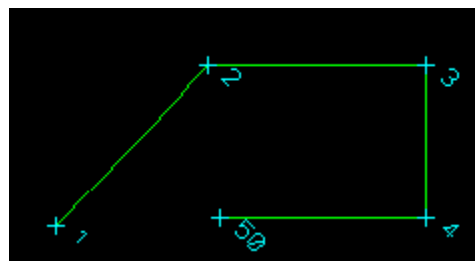
Note - to enter via the keyboard, simply start typing or press the space bar to bring up the **Enter XYZ** Input box. Type the coordinates into the **Enter XYZ** Input box and press the enter key.

**STEP 3:**

After the vertex is accepted, the **Point id** input box will appear. Type the point id into the input box and press the enter key.

**STEP 4:**

The point id of selected vertex is changed to the new value. If Point id's have been turned on, the new value will be displayed in the view.

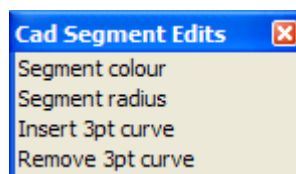


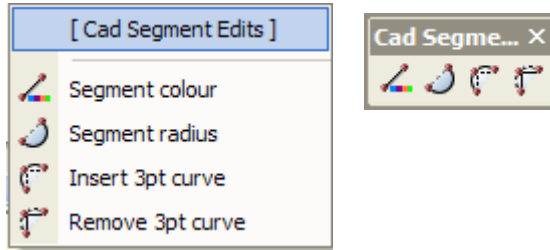
CAD Segment Edits

cad_segment_edits

Position of option on menu: Strings =>CAD =>Change segments

The Change segments walk-right menu is






For the option <i>Segment colour</i> , go to the section	“Segment Colour”
<i>Segment radius</i>	“Segment Radius”
<i>Insert 3pt curve</i>	“Insert 3pt Curve”
<i>Remove 3pt curve</i>	“Remove 3pt Curve”

Segment Colour

Cad_Segment_Colour

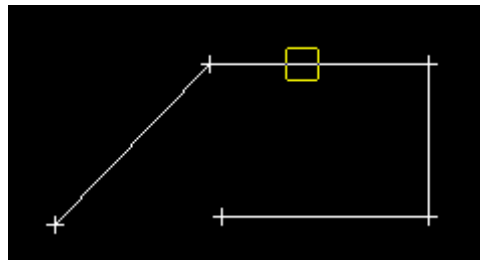
Position of option on menu: Strings =>CAD =>Change segments =>Segment colour
 or by selection of appropriate icon from the toolbar. 

This option changes the colour of a selected segment.


On selecting **Segment colour**, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the 12d Model application window.

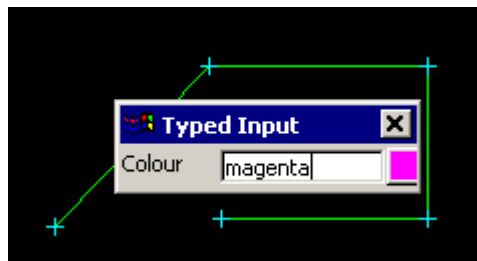
STEP 1:

Select the segment of the super string that is to have a colour change.



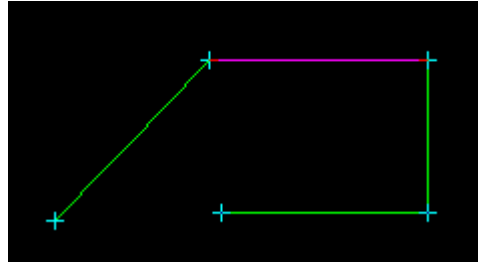
STEP 2:

After the segment is accepted, the **Colour** Input box will appear. Type the desired colour into the Input box and press the enter key. Alternatively you can select a colour from a list by clicking the browse button  on the Input box.



STEP 3:

The colour of the selected segment is drawn in the new colour.



Segment Radius

Cad_Segment_Radius

Position of option on menu: Strings =>CAD =>Change segments =>Segment radius

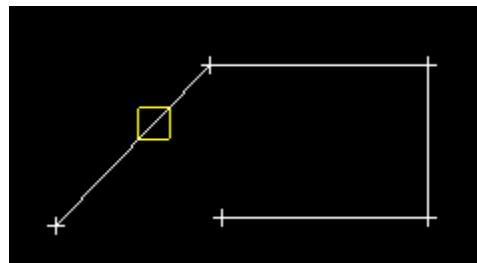
or by selection of appropriate icon from the toolbar. 

This option changes the radius of a segment.

On selecting **Segment radius**, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the 12d Model application window.

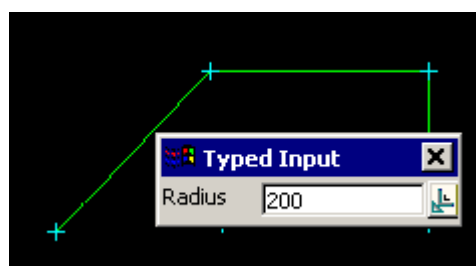
STEP 1:

Select the segment of the super string that is to have a change of radius.



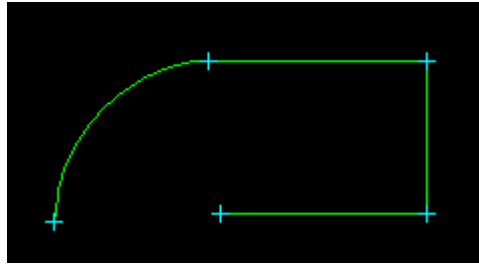
STEP 2:

After the segment is accepted, the **Radius** box will appear. Type the desired radius into the Input box and press the enter key. The browse button  on the Input box can be used to define the radius by measuring existing elements.



STEP 3:

The selected segment is then drawn with the new radius.



Insert 3pt Curve

Cad_Insert_3pt_Curve

Position of option on menu: Strings =>CAD =>Change segments =>Insert 3pt curve

or by selection of appropriate icon from the toolbar. 

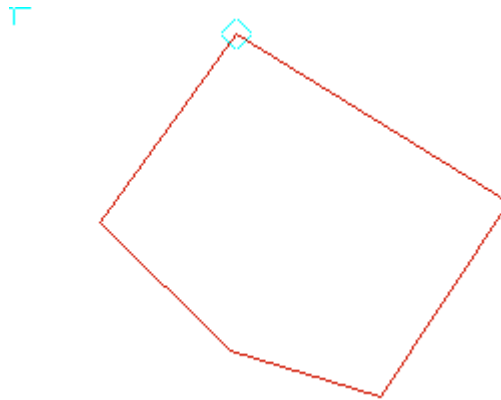
This option allows the creation of a 3 point curve using 2 existing segments.

On selecting **Insert 3pt curve**, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the 12d Model application window.

STEP 1:

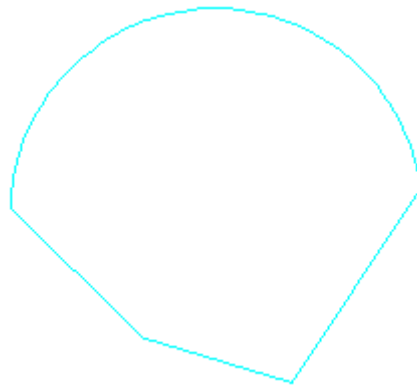
Select a vertex of a super string a vertex with a segment on either side, or segment of a super string.

If a **vertex** is selected, that vertex will be the middle vertex of the constructed 3 point curve. If a **segment** is selected, the closest vertex will become the **middle** vertex of the 3 point curve.



STEP 2:


After the vertex or segment is selected and accepted, an arc is through the three vertices is calculated and its radius used for the tow segments on either side of the vertex.



Remove 3pt Curve

Cad_Remove_3pt_Curve

Position of option on menu: Strings =>CAD =>Change segments =>Remove 3pt curve

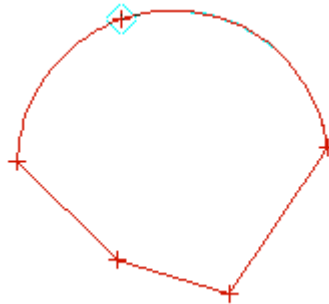
or by selection of appropriate icon from the toolbar. 

This option removes the arcs from either side of a selected vertex. If a segment is selected, the closest vertex is used and the arcs removed from either side of the vertex,

On selecting **Remove 3pt curve**, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the 12d Model application window.

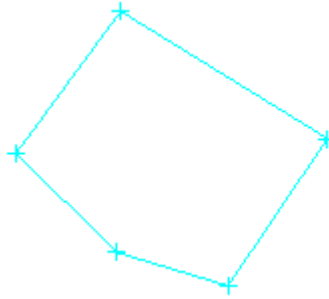
STEP 1:

Select a vertex of a super string with arcs on one or two sides of the vertex.



STEP 2:

After the vertex is selected and accepted, arc on either side will removed (the radius is set to zero). Two line segments are then drawn.



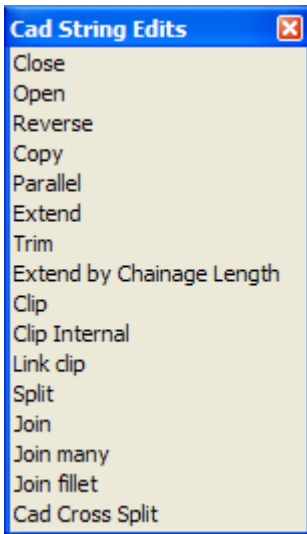
CAD Edit Strings

cad_string_edits

Position of option on menu: Strings =>CAD =>Change strings

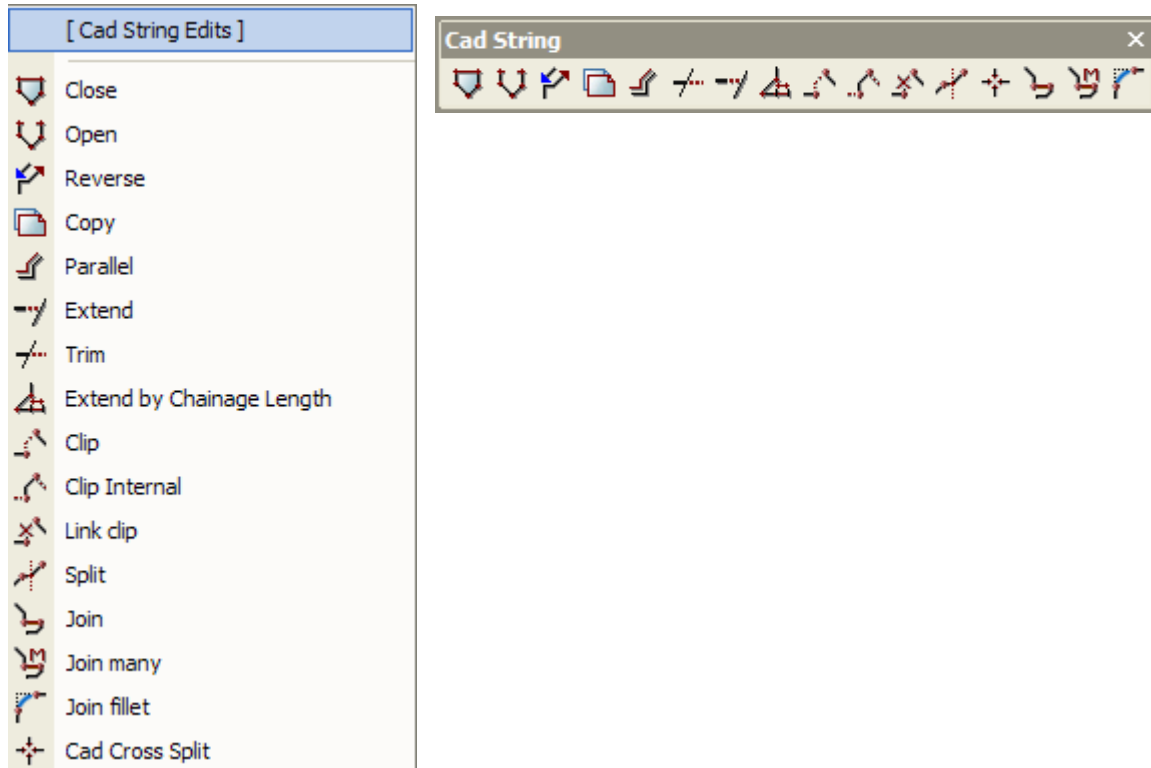
These option are currently under development.

The Change strings walk-right menu is



Menu of Options to Edit Strings

- close a string
- open a string
- reverse the direction of a string
- copy a string
- parallel a string
- extend a string until it cuts a selected string
- trim a string back to a selected string
- extend a string by a typed chainage distance
- clip a string
- delete a segment from string
- split a string
- join two strings
- join many strings
- fillet and join



For the option <i>Close</i> , go to the section	"Close String"
<i>Open</i>	"Open String"
<i>Reverse</i>	"Reverse a String"
<i>Copy</i>	"Copy a String"
<i>Parallel</i>	"Parallel a String"
<i>Extend</i>	"Extend a String"
<i>Trim</i>	"Trim a String"
<i>Extend by chainage length</i>	"Extend String by Chainage Length"
<i>Clip</i>	"Clip String"
<i>Clip internal</i>	"Delete an Internal Section of a String"
<i>Link clip</i>	"Delete a Segment"
<i>Split</i>	"Split String"
<i>Join</i>	"Join String"
<i>Join many</i>	"Join String Many"
<i>Join fillet</i>	"Join Fillet"
<i>Cad cross split</i>	"Split Crossing Strings"

Close String

Cad_String_Close

Position of option on menu: Strings =>CAD =>Change strings =>Close

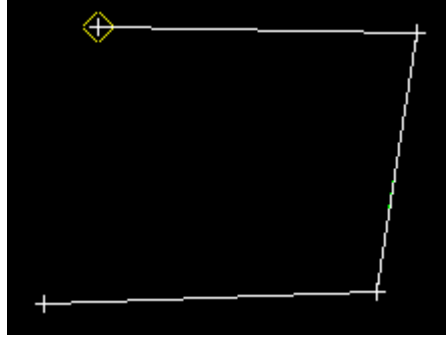
or by selection of appropriate icon from the toolbar. 

This option closes an open string.

On selecting Close, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the 12d Model application window.

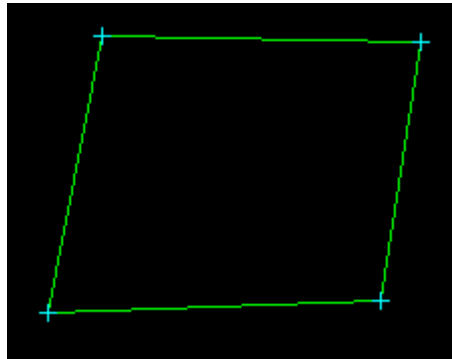
STEP 1:

An open string is selected and accepted.

**STEP 2:**

The string is closed

After closing of a string, the option restarts so that another string can be selected. Picking Cancel from the Pick Ops menu, hitting <esc> or selecting another option terminates the option.



Open String

Cad_String_Open

Position of option on menu: Strings =>CAD =>Change strings =>Open

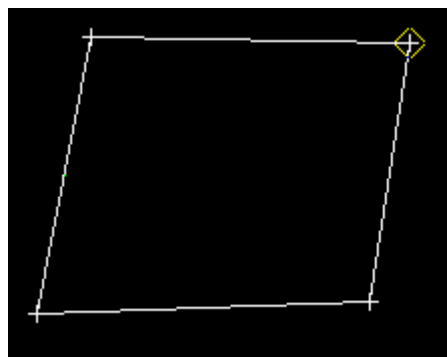
or by selection of appropriate icon from the toolbar. 

This option opens a closed string.

On selecting Open, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the 12d Model application window.

STEP 1:

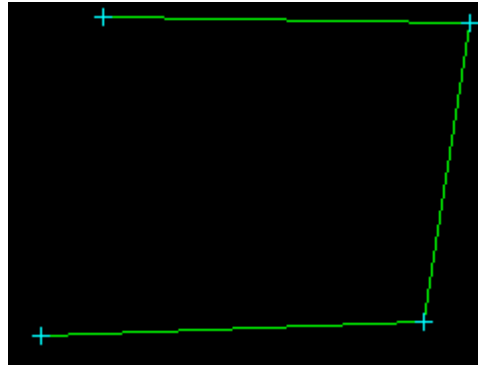
A closed string is selected and accepted.

**STEP 2:**

The string is opened by deleting the last segment of the closed string.

Note - this may not be where the string was selected.

After opening of a string, the option restarts so that another string can be selected. Picking Cancel from the Pick Ops menu, hitting <esc> or selecting another option terminates the option.



Reverse a String

Cad_String_Reverse

Position of option on menu: Strings =>CAD =>Change strings =>Reverse

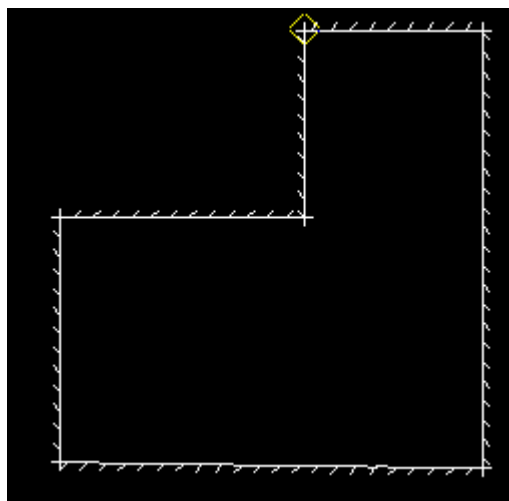
or by selection of appropriate icon from the toolbar. 

This option reverses the direction of a string

On selecting Reverse, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the 12d Model application window.

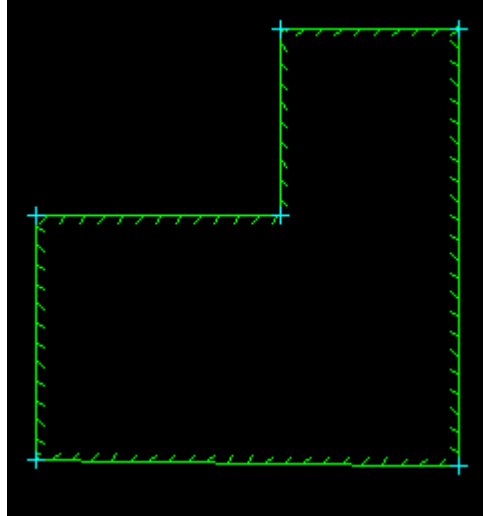
STEP 1:

A string is selected and accepted.



STEP 2:

The string is reversed.




After reversing of a string, the option restarts so that another string can be selected. Picking Cancel from the Pick Ops menu, hitting <esc> or selecting another option terminates the option.

Copy a String

Cad_String_Copy

Position of option on menu: Strings =>CAD =>Change strings =>Copy

or by selection of appropriate icon from the toolbar. 

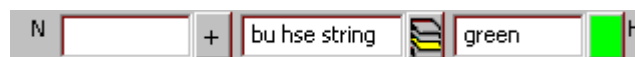
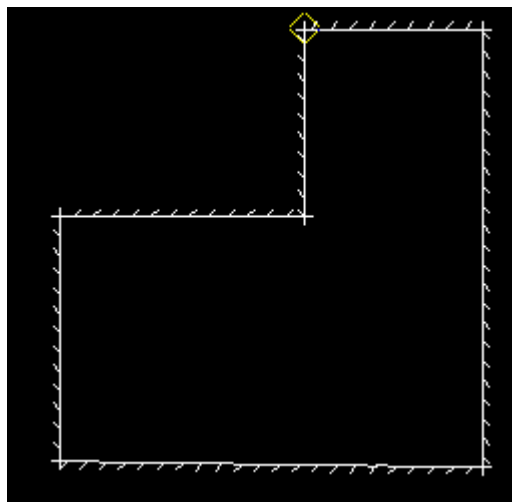
This option copies a string. The copied strings takes its attributes from the **Cad Control Bar**.

Copy is particularly helpful in backing up strings.

On selecting Copy, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the 12d Model application window.

STEP 1:

A string is selected and accepted. The copied string will take on the values in the control bar at the time of accepting.




STEP 2:

A copy of the original string will be saved into the model **bu hse string**.

Parallel a String

Cad_String_Parallel

Position of option on menu: Strings =>CAD =>Change strings =>Parallel

or by selection of appropriate icon from the toolbar. 

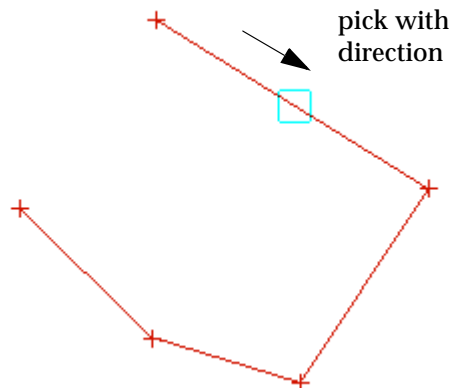
This option parallel a string by a given to a selected string.

Note that if there are arcs in the string, the string can not be paralleled by a distance that would collapse the arcs.

On selecting Parallel, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the 12d Model application window.

STEP 1:

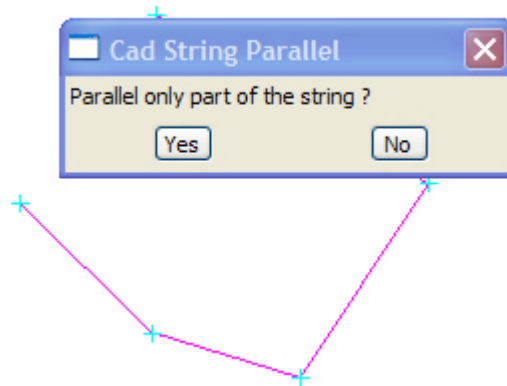
The string to parallel is picked with direction. The direction determines what it means to parallel to the right or left of the string.

**STEP 2:**

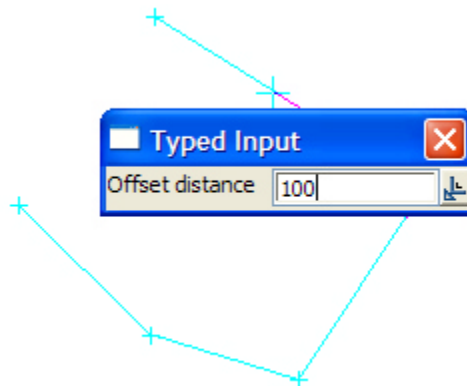
The parallel option can be applied to **all** of the selected string or only **part** of the string.

After the string is selected, a panel is displayed asking if only part of the string is to be paralleled.

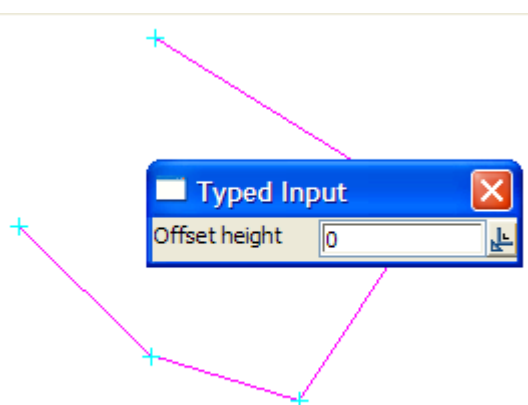
If only part of the string is to be paralleled (i.e. **yes** selected) the user picks the start and end positions of where the string is to be paralleled. This does not necessarily have to be at the end of the segments as the user can select a position anywhere on the segment to define these values. If the whole string is to be paralleled the user should select **no**.

**STEP 3:**

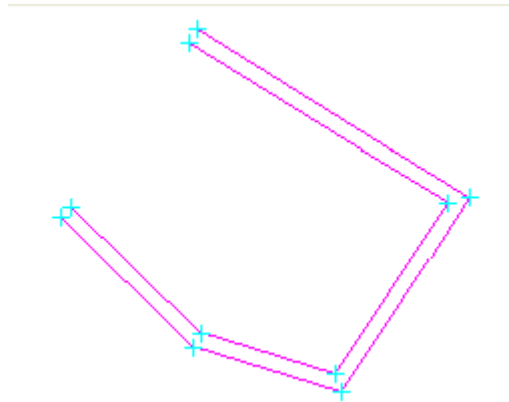
The user is prompted for the parallel distance. Positive distance is to the right of the selected string. Negative to the left.

**STEP 4:**

The user is prompted for the offset height. This height value will be added to the selected string values to produce the heights for the paralleled string.


**STEP 5:**

The paralleled string is then generated using the supplied information.



Extend a String

Cad_String_Extend

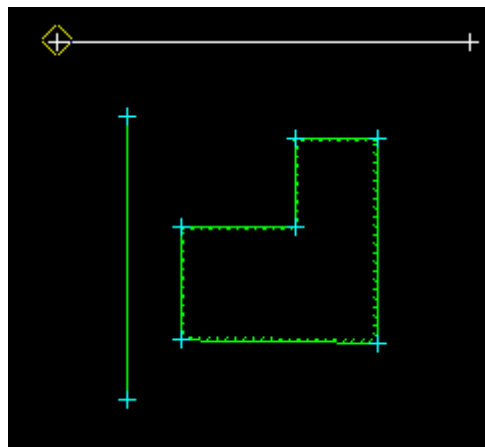
Position of option on menu: Strings =>CAD =>Change strings =>Extend
or by selection of appropriate icon from the toolbar. 

This option extends a string to a another nominated string.

On selecting Extend, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the 12d Model application window.

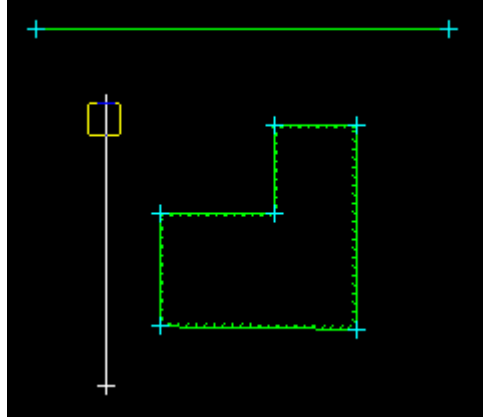
STEP 1:

The string to extend to is selected and accepted.



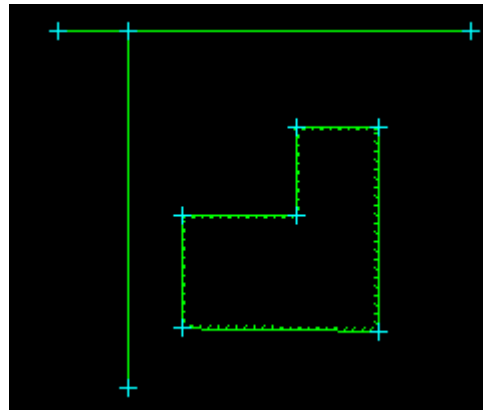
STEP 2:

The string to extend to selected and accepted



STEP 3:

The string is extended.



Trim a String

Cad_String_Trim

Position of option on menu: Strings =>CAD =>Change strings =>Trim

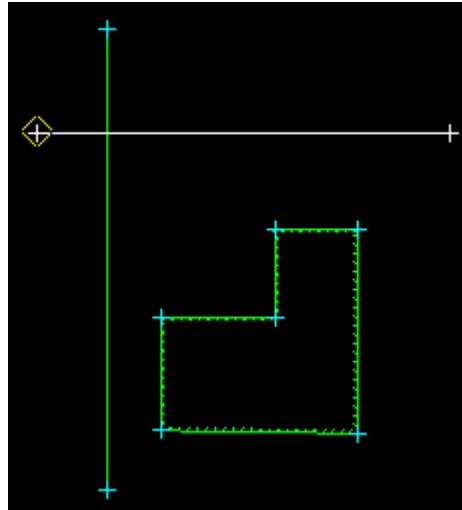
or by selection of appropriate icon from the toolbar. 

This option trims a string to another nominated cutting string.

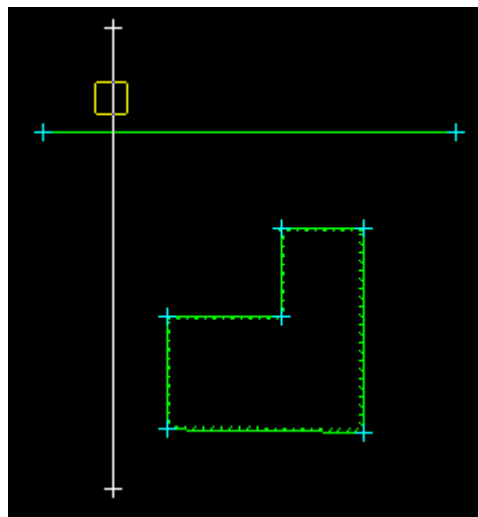
On selecting Trim, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the 12d Model application window.

STEP 1:

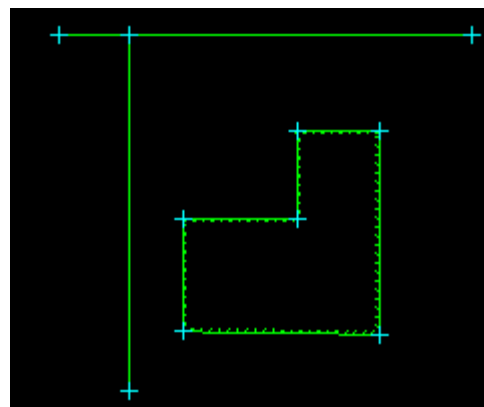
The cutting string which will be used to define the trim extent is selected and accepted.

**STEP 2:**

The string to trim is selected. The position of the pick relative to the cutting string will dictate which part of the string will be trimmed. In this case, the selection is above the cutting string and so the trim will be of the top part of the string.


**STEP 3:**

The string is trimmed.



Extend String by Chainage Length

Cad_String_Extend_by_Chainage_Length

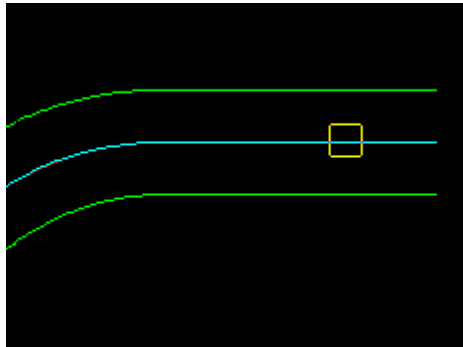
Position of option on menu: Strings =>CAD =>Change strings =>Extend by chainage length
or by selection of appropriate icon from the toolbar. 

This option extends a string by a given chainage value.

On selecting Extend by chainage length, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the 12d Model application window.

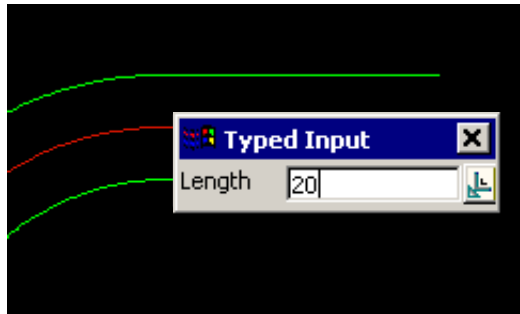
STEP 1:

The string to extend is selected and accepted.



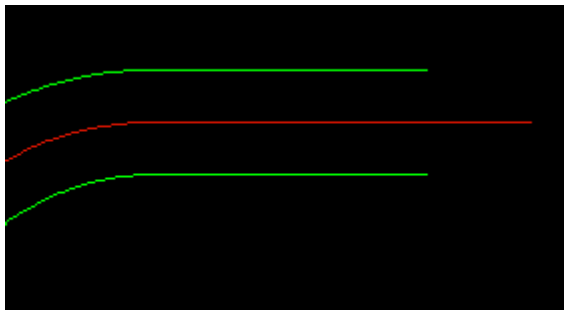
STEP 2:

The chainage length to extend the string is entered into the **Length** input Box. Positive is in the direction of the string. Negative in the opposite direction of the string.




STEP 3:

The string is extended by the given chainage amount.



Clip String

Cad_String_Clip

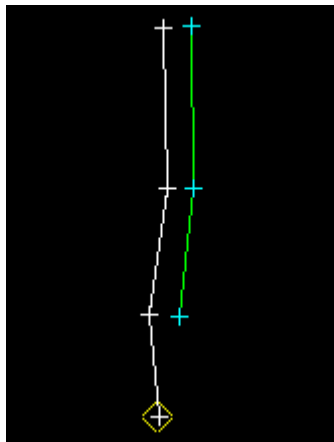
Position of option on menu: Strings =>CAD =>Change strings =>Clip
or by selection of appropriate icon from the toolbar. 

This option deletes part of a string.

On selecting Clip, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the 12d Model application window.

STEP 1:

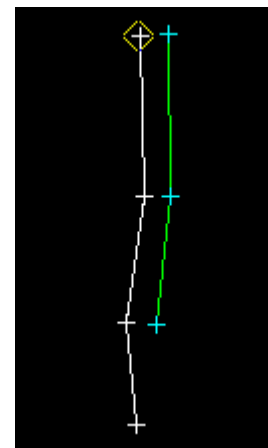
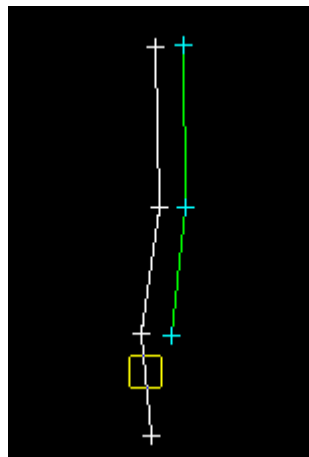
The string to be clipped is selected and accepted.



STEP 2:

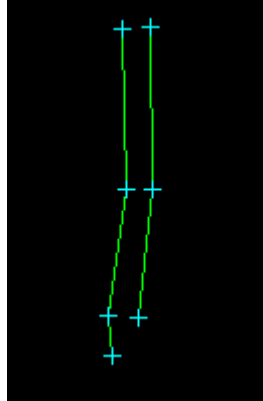
The first and second positions defining what part of the string is to **remain** are selected and accepted.

The positions do not have to be at vertices but can be anywhere on segments




STEP 3:

The string is clipped.



Delete an Internal Section of a String

Cad_String_Clip_Internal

Position of option on menu: Strings =>CAD =>Change strings =>Clip internal
or by selection of appropriate icon from the toolbar. 

This option deletes an internal part of a string and leaves the two end sections.

On selecting Clip internal, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the 12d Model application window.

STEP 1:

The string to be clipped is selected and accepted.

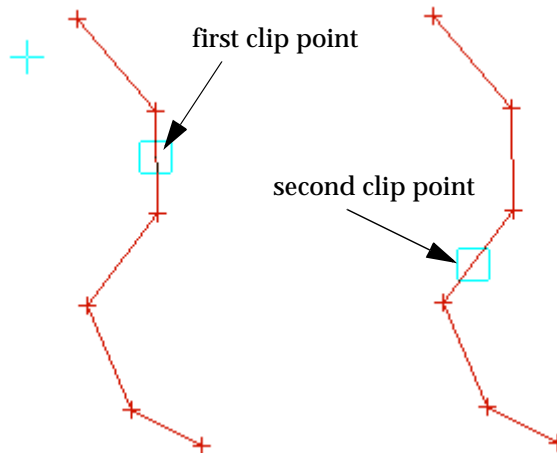


STEP 2:

The first and second position defining what part of the string is to **remain** is selected and accepted. This does not necessarily have to be at the end of the segments as the user can select a position anywhere on the segment to define these values.

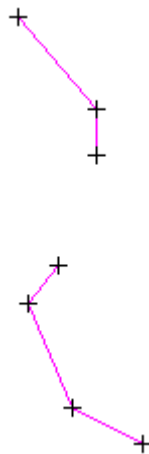
The first and second positions defining what part of the string is to be **deleted** are selected and accepted.

The positions do not have to be at vertices but can be anywhere on the segments




STEP 3:

The part of the string between the two selected clip points is deleted leaving two strings.



Delete a Segment

Cad_String_Link_Clip

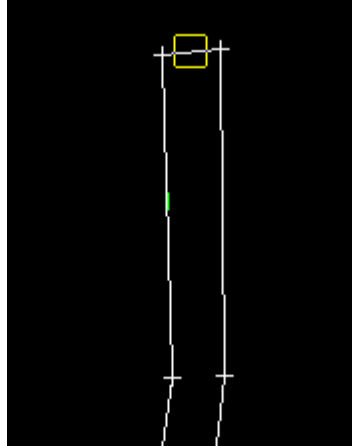
Position of option on menu: Strings =>CAD =>Change strings =>Link clip
or by selection of appropriate icon from the toolbar. 

This option deletes a segment from a string.

On selecting Link clip, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the 12d Model application window.

STEP 1:

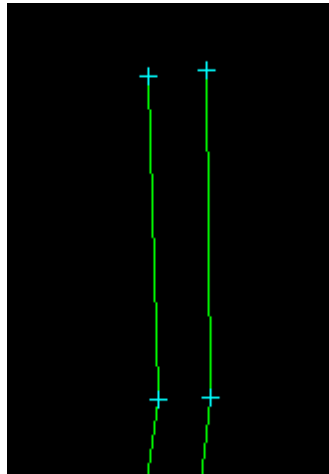
The **segment** to be deleted is selected and accepted.



STEP 2:

The selected segment is deleted.

Note - unless the selected string was a closed string, two strings are produced.



Split String

Cad_String_Split

Position of option on menu: Strings =>CAD =>Change strings =>Split

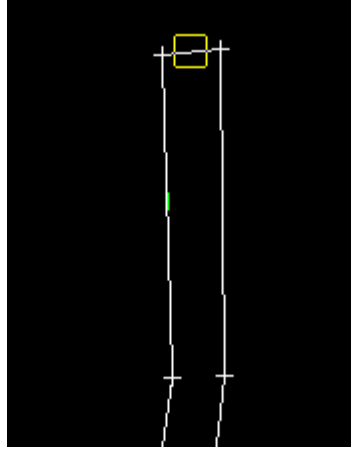
or by selection of appropriate icon from the toolbar. 

This option splits one string into two strings at a given split position.

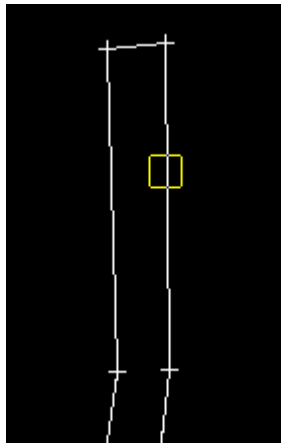
On selecting Split, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the 12d Model application window.

STEP 1:

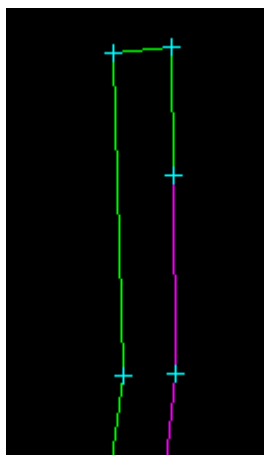
The string to be split is selected and accepted.

**STEP 2:**


The split position is selected and accepted.

**STEP 3:**

The split is made at the position selected. If no vertex exists at that position, a vertex is created.

**Join String**

Cad_String_Join

Position of option on menu: Strings =>CAD =>Change strings =>Join
 or by selection of appropriate icon from the toolbar. 

This option joins two super strings together at their end points.

There are four possible ways of joining the strings and the required case is determined by picking the strings with direction.

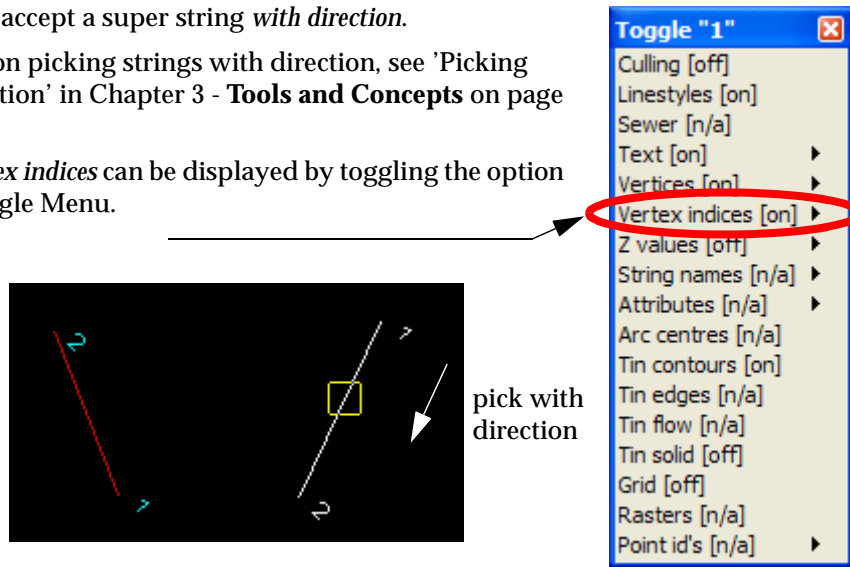
On selecting the **Join** option, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the 12d Model application window.

STEP 1:

Select and accept a super string *with direction*.

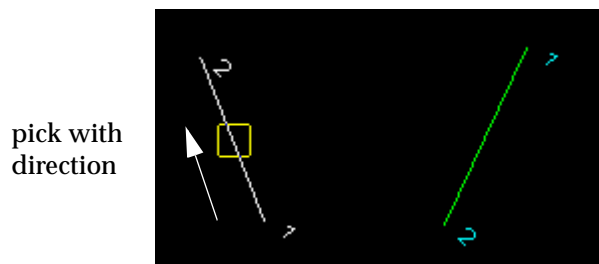
For notes on picking strings with direction, see 'Picking with Direction' in Chapter 3 - **Tools and Concepts** on page 77.

Note: *Vertex indices* can be displayed by toggling the option on the Toggle Menu.



STEP 2:

Select and accept another super string *with direction*.



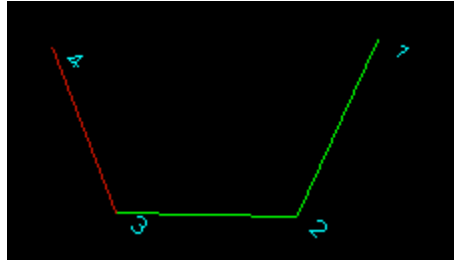
STEP 3:

The head of the first string (as determined by the picking direction) is then joined to the tail of the second string (as determined by the picking direction).

After the strings are joined, the vertex indices will change since the order of the vertices in the string is now different.


The colour of the constructed line is adopted from first selected super string. The colour of the second string will remain unchanged.

Note: The constructed line and selected strings are stored in the model of the first selected string.



Join String Many

Cad_String_Join_Many

Position of option on menu: Strings =>CAD =>Change strings =>Join many
or by selection of appropriate icon from the toolbar. 

This option joins many strings together. Picking with direction is used to specify which ends of the strings are joined.

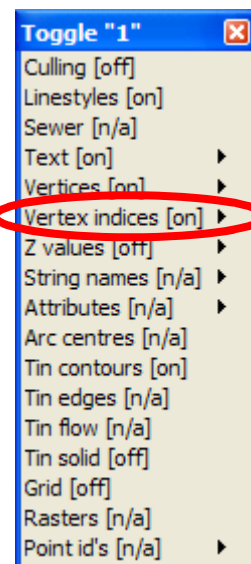
On selecting the **Join many** option, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the 12d Model application window.

STEP 1:

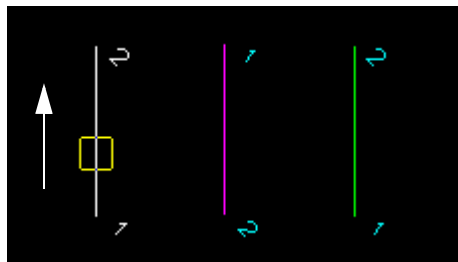
Pick a super string *with direction*.

For notes on picking strings with direction, see 'Picking with Direction' in Chapter 3 - **Tools and Concepts** on page 77.

Note: The *Vertex indices* can be displayed by toggling the option on the Toggle Menu.



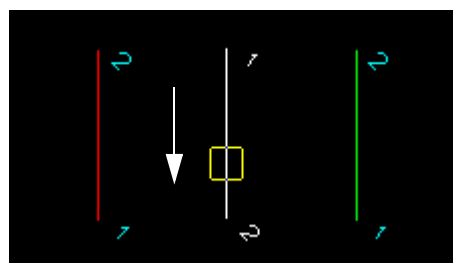
pick with
direction



STEP 2:

Select and accept another super string, again picking *with direction*.

pick with
direction

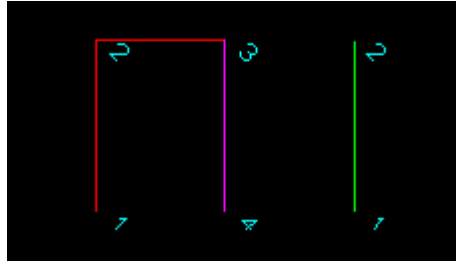


STEP 3:

The **head** of the first string is then joined to the **tail** of the second string. What is the head or tail of the strings is determined by the *picking direction*.

After the strings are joined, the vertex indices to reflect the new order of the vertices in the string. The colour of the constructed segment will be the same as that of the first selected super string. The colour of the second string will remain unchanged.

Note: The constructed segment and selected strings are stored in the model which contains the 1st selected string.

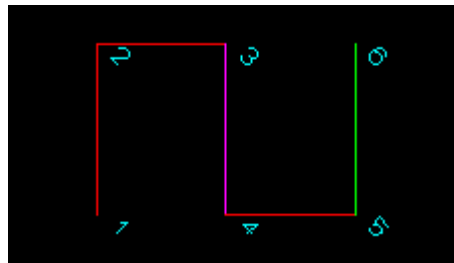
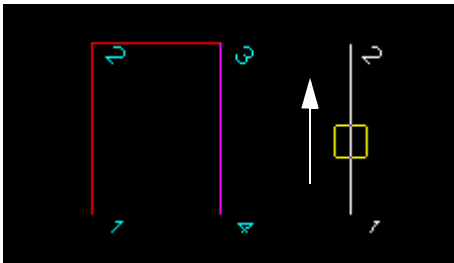


STEP 4:

The *Join Many* option joins extra strings to the already selected (and joined) strings. The user may continue selecting additional strings to join together by select and accept additional super strings by picking with direction.

This option can be terminated by the user with the **Esc** key.

Note: Each further construction line adopts the same colour as the 1st selected string. Both the constructed line and selected strings are stored in the model which contains the first selected string.



Join Fillet

Cad_Join_Fillet

Position of option on menu: Strings =>CAD =>Change strings =>Join fillet

or by selection of appropriate icon from the toolbar. 

This option fillets, trims and joins strings.

There are eight possible ways of filleting the strings and the required case is determined by picking the strings with direction and by the sign of the radius.

On selecting the **Join strings** option, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the 12d Model application window.

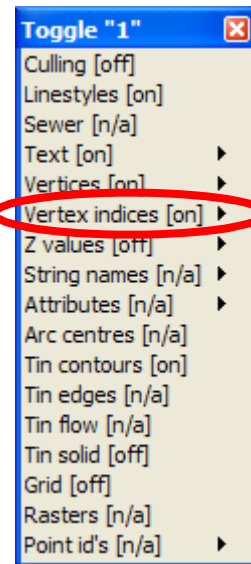
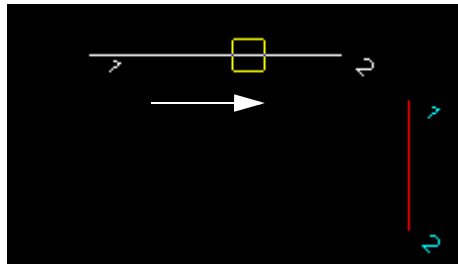
STEP 1:

Pick a super string *with direction*.

For notes on picking strings with direction, see 'Picking with Direction' in Chapter 3 - **Tools and Concepts** on page 77.

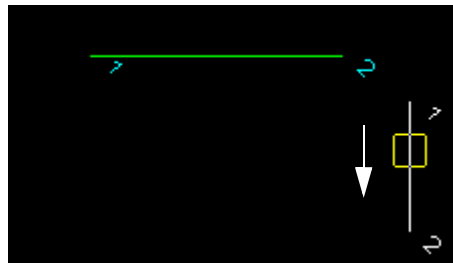
Note: The Vertex indices can be displayed by toggling the option on the Toggle Menu.


pick with
direction

**STEP 2:**

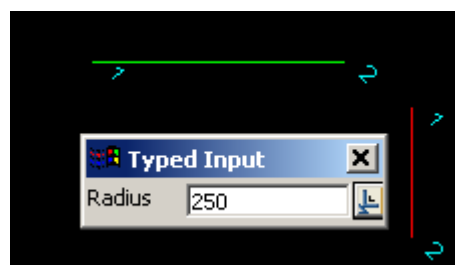
Select and accept another super string, again picking *with direction*.

pick with
direction

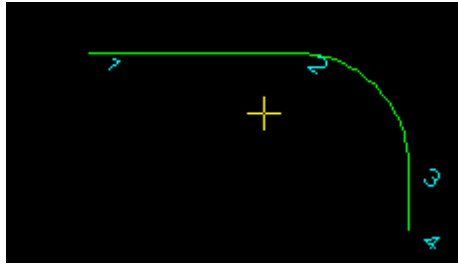
**STEP 3:**

After the second super string is accepted, the **Radius** input box will appear. Type the *fillet radius* into the input box and press the enter key. The browse button  on the input box can be used to define the fillet radius by measurement of existing elements.

Note: A **positive** fillet radius value will curve to the right, where as a **negative** fillet radius will curve to the left.



A fillet arc with the radius is constructed and joined to the two strings and the ends of the two strings are automatically trimmed back to the arc.




The vertex indices will change to accommodate the new vertices in the string. The colour of the constructed line and 2nd selected string adopts the colour of the 1st selected super string.

Note: The constructed arc and selected strings are stored in the model of the first selected string.

Split Crossing Strings

Cad_String_Cross_Split

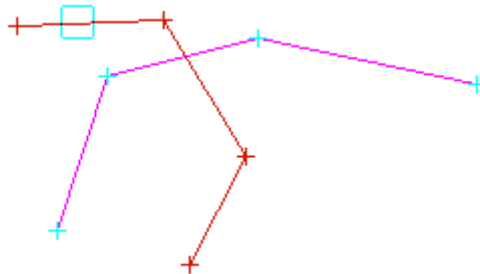
Position of option on menu: Strings =>CAD =>Change strings =>Cad cross split
or by selection of appropriate icon from the toolbar. 

This option splits two crossing strings at the position of their crossing.

On selecting Cad cross split, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the 12d Model application window.

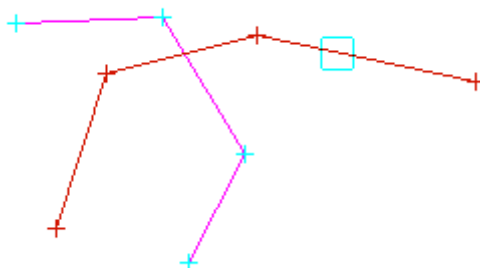
STEP 1:

Pick the first string.



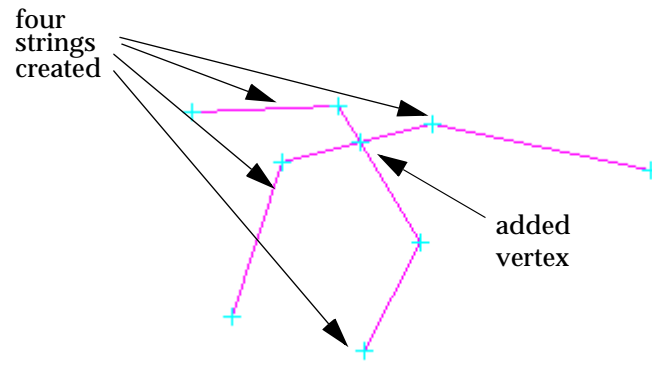
STEP 2:

Pick the second string.



STEP 3:

The two strings are then split where the strings crossed. This will create four strings.

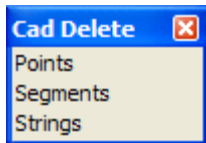


CAD Delete

cad_delete

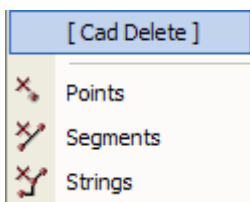
Position of option on menu: Strings =>CAD =>Delete

The Delete walk-right menu is



Menu of Options to Delete Vertices, Segments and Strings

delete a vertex
delete a segment
delete a string



For the option *Points*, please go to the section. "Delete Vertices" .

Segments

"Delete Segments" .

Strings

"Delete String" .

Delete Vertices

Cad_Vertex_Delete

Position of option on menu: Strings =>CAD =>Delete =>Points

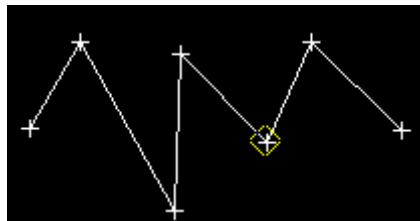
or by selection of appropriate icon from the toolbar. 

This option deletes vertices of super strings.

On selecting Points, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the 12d Model application window.

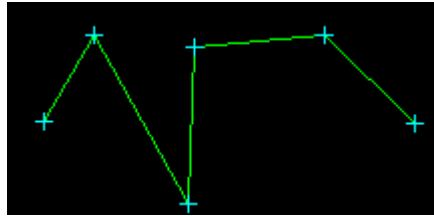
STEP 1:

The vertex to be deleted is selected and accepted (This must be a super string).




STEP 2:

The vertex point is deleted and the string redrawn.



Delete Segments

Cad_Segment_Delete

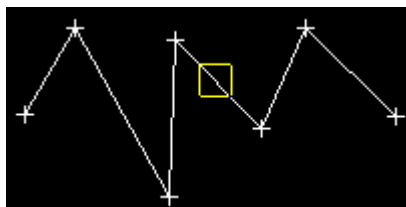
Position of option on menu: Strings =>CAD =>Delete =>Segments
or by selection of appropriate icon from the toolbar. 

This option deletes segments of super strings.

On selecting Segments, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the 12d Model application window.

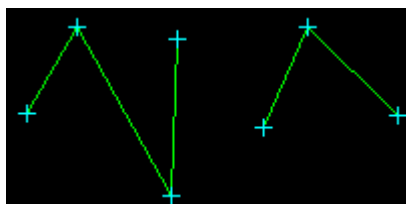
STEP 1:

The segment to be deleted is selected and accepted.




STEP 2:

The segment is deleted leaving two separate strings in this case.



Delete String

Cad_String_Delete

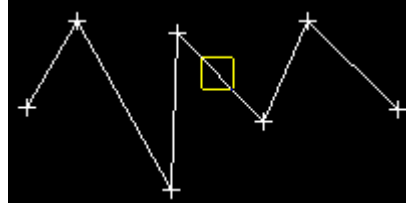
Position of option on menu: Strings =>CAD =>Delete =>Strings
or by selection of appropriate icon from the toolbar. 

This option deletes selected strings. The string type does not specifically have to be a super string.

On selecting Strings, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the 12d Model application window.

STEP 1:

The string to be deleted is selected and accepted.



STEP 2:

The string is deleted.

Delete Selection of Strings

Position of option on menu: Strings =>CAD =>Delete =>Selection

or by selection of appropriate icon from the toolbar. 

This option allows the deleting of selected objects specified in a source box. For help on this option see "Delete".

On selecting the **Delete** option, the user is prompted for the relevant data in the screen message box located at the bottom left hand corner of the 12d Model application window.

Create

string_create

Position of option on menu: Strings =>Create

The Create option is used to produce **new** strings. If a string already exists, the Editor option is used to modify it.

The Create walk-right menu contains options to create 2d, 3d, 4d, alignment, super alignment, circles, arcs, feature, pipe, polyline, super and text strings.

Each string type has its own special information so by choosing the appropriate type to be created, only information needed for that type of string is asked for.

Once a string has been created, it can be converted to most of the other string types using the string Convert option.

To create a new string of the same type and with similar header information as an existing string, the same as option is selected from the String Create menu.

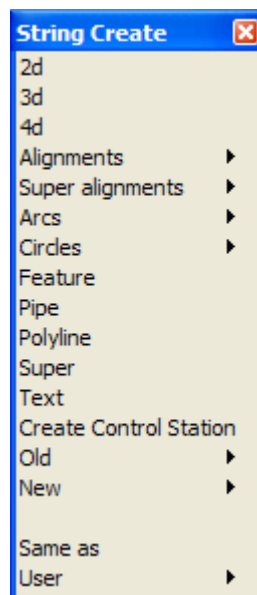
Notes

1. Depending on its breakline (point-line) type, a string with default style ("1") is displayed with crosses at each of its vertex (point type) or with straight lines joining the vertices (line type).

Linestyles can be defined that drawn lines between the points even though the breakline type is **point**.

2. The string vertices are also called intersection points (IP's).

The String Create walk-right menu is



The string creation process is similar for each string type and for editing strings as well.

For	<i>Create 2d</i>	go to	"Create - 2d Super"
	<i>3d</i>		"Create - 3d Super"
	<i>4d</i>		"Create - 4d Super"
	<i>Alignment</i>		"Alignments"
	<i>Super alignment</i>		"Super Alignments"
	<i>Arcs</i>		"Create Arcs"
	<i>Circles</i>		"Create - Circles"

<i>Feature</i>	"Create - Feature"
<i>Pipe</i>	"Create - Pipe"
<i>Polyline</i>	"Create - Polyline"
<i>Super</i>	"Create - Super"
<i>Text</i>	"Create - Text"
<i>Control stations</i>	"Create - Control Stations"
<i>Old</i>	"Old"
<i>Same as</i>	"Create - Same As"

Create - 2d Super

create_super_2d_string

Position of option on menu: Strings =>Create =>2d

A 2d string consists of a series of (x,y) vertices all with the same z-value (height). 2d strings are often referred to as “contour strings” because contours are the most common example of a string with a constant height.

The **Many strings** tick-box is used when more than one string of the same type is to be created, If many strings is set to *tick*, when the current string creation is Finished or Quit, a new **Create 2d Super String** panel is placed on the screen with the same information in it as the string just created. If any of the information needs to be modified for the new string, simply change it in the **Create 2d Super String** panel fields before selecting the **Create** button for the new string. Hence a new string of the same type can be created without going back to the Create menu.

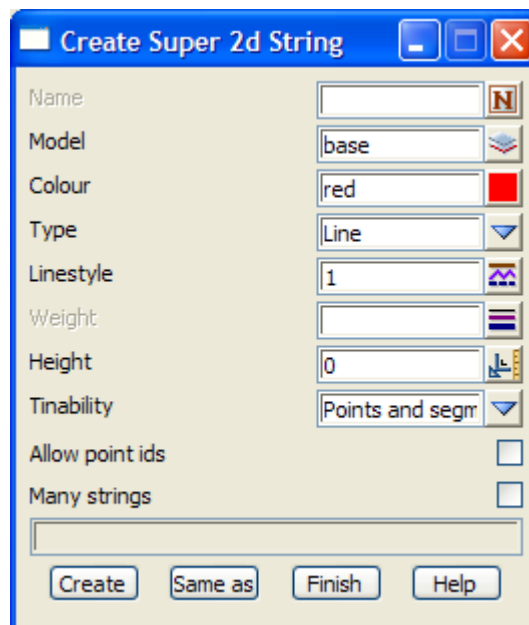
The **Same as** button is used to obtain information from an existing string (not necessarily of the same type) and pipe it into the name, colour, model, style, breakline type and height field of the **Create 2d Super String** panel.

From **12d Model 8** onwards, the default is to create **2d super strings** rather than the **2d strings** used up to **12d Model 7**. A **2d super string** is a **super string** with **Constant height**. That is, there is only one z-value for the entire string. The advantage of using a **2d super string** is that all the CAD options will work for it, vertices and segments can be assigned tinability and it can have point id's for setout.

The older **2d string** create options are still available under

Strings =>Create =>Old

On selecting 2d string, the **Create Super 2d String** panel is displayed.



The default values for the panel fields are taken from the **CAD Controlbar** (see “**CAD, Symbol and Text Controlbars**”)

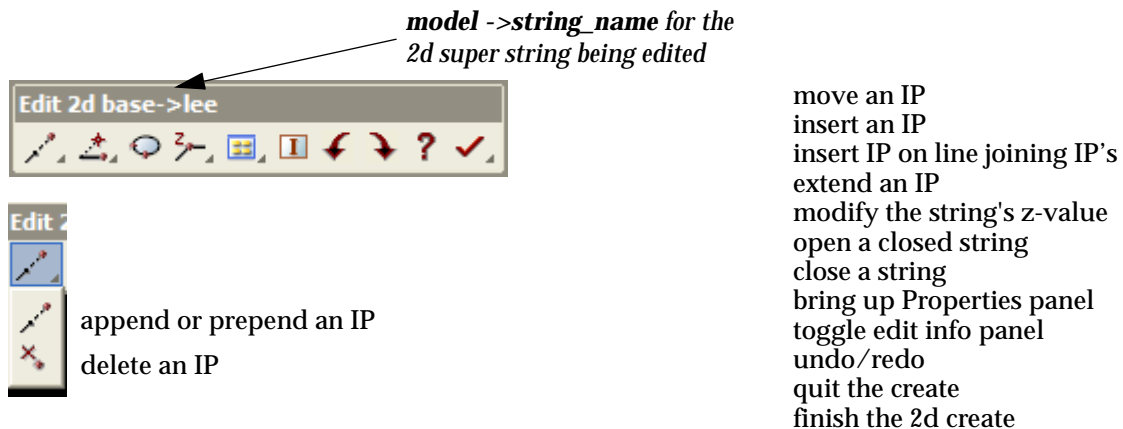
To create a **new 2d super string** (a **2d super string** is a **super string** with the **constant height** flag set on), the panel fields are filled in and the **Create** button selected.

The fields and buttons used in the **Create 2d Super String** panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Name <i>the name of the new string</i>	input	from CAD controlbar	
Model <i>name of the model that the new string is in</i>	model box	from CAD controlbar	available models
Colour <i>the colour of the new string</i>	colour box	from CAD controlbar	available colours
Type <i>breakline type (point-line type) of the string</i>	choice box	line	line, point
Linestyle <i>line style of the string</i>	input	from CAD controlbar	available line styles
Weight <i>thickness of the string</i>	input	from CAD controlbar	
Height <i>for a 2d super string, there is only one height (z-value) for the entire string.</i>	input	from CAD controlbar	
Tinability <i>if Vertices and segments, all the vertices and segments of the string are set to tinable. If Vertices only, all the vertices are set to tinable and the segments to not tinable. If Not tinable, all the vertices or segments are set to not tinable.</i>	choice box	Points and segments	Points and segments Points only Not tinable
Allow point ids <i>if tick, the 2d super string can have point ids for each vertex. If not tick, the 2d super string will not have point ids. This can be reversed if point ids are required in the future.</i>	tick box		
Many strings <i>if tick then after the current string is finished, a new create panel is placed on the screen with all the same values for the panel fields as the current string.</i>	tick box		
Create <i>After the Create button is chosen, the Edit 2d menu is displayed.</i>	button		
Same as <i>After the Same as button is chosen, another string is selected and information about it is used for the fields in this panel.</i>	button		
Finish <i>end the option, don't proceed to the edit stage.</i>	button		

Edit 2d Super

On selecting the **Create** button in the **Create 2d Super String** panel the Edit 2d menu is placed on the screen. The Edit 2d menu for a *2d super string* is



To create a new *2d super string*, select the **Append** icon.

The **Append** option is used to add vertices to either end of an existing string, or in the case of a new string, places the first vertex and then begins appending vertices to the first vertex.

For all 2d strings, a cross is then drawn in each plan view that the string's model is on, and the cross follows the cursor around the screen. If the string's model is **not** added to any plan view, the model is automatically added to **all** plan views.

After the cross is on the screen (moving with the cursor), clicking LB and accepting with MB selects the **first** vertex of the string (using the appropriate snaps).

The string is then drawn from the first vertex to the cursor position, which represents the second vertex of the string. Clicking LB and accepting with MB selects the second string vertex and the process repeats for subsequent string vertices.

Now that the string is created, all the edit option on the string's Edit 2d menu are usable.

The options in the Edit 2d menu are not only used for placing the initial vertices of the string, but for editing the string once it is created. Since the **Append** and other options in the Edit 2d menu are identical to the options used when editing an existing string, they will be discussed in detail in the string Editor section.

For full information in the 2d Editor, go to the section

Create - 3d Super

[create_super_3d_string](#)

Position of option on menu: Strings =>Create =>3d

A 3d string consists of a series of (x,y,z) vertices.

The difference between a 2d and a 3d string is that for a 3d string, the z-value (height) can vary at each string vertex, whereas a 2d string has a constant height for the entire string. Hence a 2d string is simply a special case of a 3d string where the heights at all the vertices are the same.

Creating and editing a 3d string is very similar to a 2d string. The only major difference is that a height is required at each string point.

The **Many strings** tick-box is used when more than one string of the same type is to be created, If many strings is set to *tick*, when the current string creation is Finished or Quit, a new **Create 3d Super String** panel is placed on the screen with the same information in it as the string just created. If any of the information needs to be modified for the new string, simply change it in the **Create 3d Super String** panel fields before selecting the **Create** button for the new string. Hence a new string of the same type can be created without going back to the Create menu.

The **Same as** button is used to obtain information from an existing string (not necessarily of the same type) and pipe it into the name, colour, model, style breakline type and height field of the

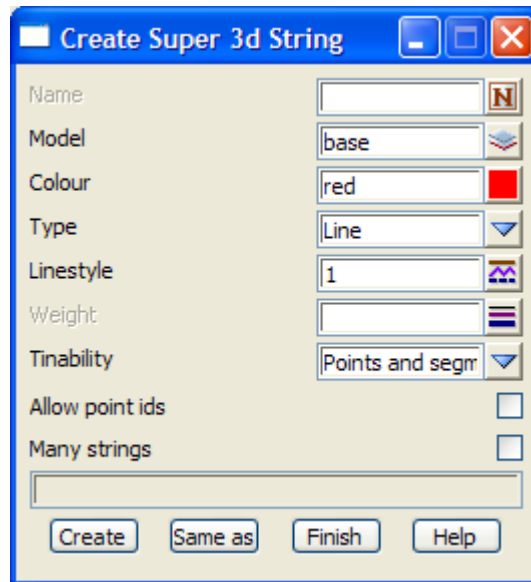
Create 3d Super String panel.

From **12d Model 8** onwards, the default is to create **3d super strings** rather than the **3d strings** used up to **12d Model 7**. The advantage is using a **3d super string** is that all the CAD options will work for it, vertices and segments can be assigned tinability and it can have point id's for setout.

The older **3d string** create option is still available under

Strings =>Create =>Old

On selecting the 3d string option, the **Create 3d Super String** panel is displayed.



The default values for the panel fields are taken from the **CAD Controlbar** (see “**CAD, Symbol and Text Controlbars**”)

To create a **new 3d super string**, the panel fields are filled in and the **Create** button selected.

The fields and buttons used in the **Create 3d Super String** panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Name <i>the name of the new string</i>	input	from CAD controlbar	
Model <i>name of the model that the new string is in</i>	model box	from CAD controlbar	available models
Colour <i>the colour of the new string</i>	colour box	from CAD controlbar	available colours
Type <i>breakline type (point-line type) of the string</i>	choice box	line	line, point
Linestyle <i>line style of the string</i>	input	from CAD controlbar	available line styles
Weight <i>thickness of the string</i>	input	from CAD controlbar	
Tinability <i>if Vertices and segments, all the vertices and segments of the string are set to tinable.</i>	choice box	Points and segments	Points and segments Points only Not tinable

If **Vertices only**, all the vertices are set to tinnable and the segments to not tinnable.

If **Not tinnable**, all the vertices or segments are set to **not tinnable**.

Allow point ids tick box

if **tick**, the super string can have point ids for each vertex.

If **not tick**, the super string will not have point ids. This can be reversed if point ids are required in the future.

Many strings tick box

if tick then after the current string is finished, a new create panel is placed on the screen with all the same values for the panel fields as the current string.

Create button

after the **Create** button is chosen, the **Edit 3d** menu is displayed

Same as button

after the **Same as** button is chosen, another string is selected and information about it is used for the fields in this panel

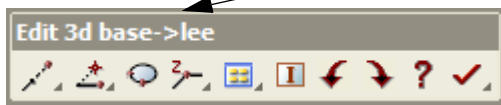
Finish button

end the option, **don't** proceed to the edit stage


Edit 3d Super

On selecting the **Create** button in the **Create 3d Super String** panel the Edit 3d menu is placed on the screen. The Edit 3d menu for a *3d super string* is

model ->string_name for the 3d super string being edited



move an IP
insert an IP
insert IP on line joining IP's
extend an IP
modify the string's z-value
open a closed string
close a string
bring up Properties panel
toggle edit info panel
undo/redo
quit the create
finish the 2d create



append or prepend an IP
delete an IP

To create a new *3d super string*, select the **Append** icon.

The **Append** option is used to add vertices to either end of an existing string, or in the case of a new string, places the first vertex and then begins appending vertices to the first vertex.

For all 3d strings, a cross is then drawn in each plan view that the string's model is on, and the cross follows the cursor around the screen. If the string's model is **not** added to any plan view, the model is automatically added to **all** plan views.

After the cross is on the screen (moving with the cursor), clicking LB and accepting with MB selects the **first** vertex of the string (using the appropriate snaps).

The string is then drawn from the first vertex to the cursor position, which represents the second vertex of the string. Clicking LB and accepting with MB selects the second string vertex and the process repeats for subsequent string vertices.

Now that the string is created, all the edit option on the string's Edit 3d menu are usable.

The options in the Edit 3d menu are not only used for placing the initial vertices of the string, but

for editing the string once it is created. Since the **Append** and other options in the **Edit 3d** menu are identical to the options used when editing an existing string, they will be discussed in detail in the string Editor section.

For full information in the 3d Editor, go to the section

Create - 4d Super

create_super_4d_string

Position of option on menu: Strings =>Create =>3d

A 4d string consists of a series of (x,y,z) points and a text label at each point.

Creating and editing a 4d string is very similar to a 3d string.- the major difference is that a height **and** a text label is required at each string point.

The **Many strings** tick-box is used when more than one string of the same type is to be created, If many strings is set to *tick*, when the current string creation is Finished or Quit, a new **Create 4d Super String** panel is placed on the screen with the same information in it as the string just created. If any of the information needs to be modified for the new string, simply change it in the **Create 4d Super String** panel fields before selecting the **Create** button for the new string. Hence a new string of the same type can be created without going back to the Create menu.

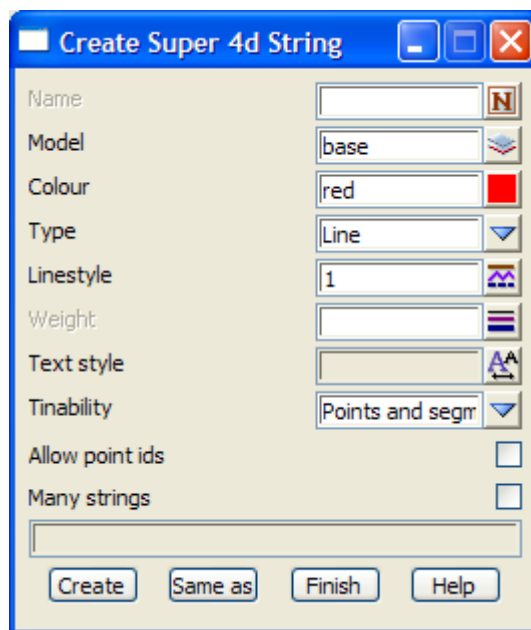
The **Same as** button is used to obtain information from an existing string (not necessarily of the same type) and pipe it into the name, colour, model, style breakline type and height field of the **Create 4d Super String** panel.

From **12d Model 8** onwards, the default is to create **4d super strings** rather than the **4d strings** used up to **12d Model 7**. The advantage is using a **4d super string** is that all the CAD options will work for it, vertices and segments can be assigned tinability and it can have point id's for setout.

The older **4d string** create option is still available under

Strings =>Create =>Old

On selecting the 4d string option, the **Create 4d Super String** panel is displayed.



The default values for the panel fields are taken from the **CAD Controlbar** (see "**CAD, Symbol and Text Controlbars**")

To create a **new 4d super string**, the panel fields are filled in and the **Create** button selected.

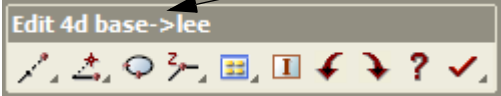

The fields and buttons used in the **Create 4d Super String** panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Name <i>the name of the new string</i>	input	from CAD controlbar	
Model <i>name of the model that the new string is in</i>	model box	from CAD controlbar	available models
Colour <i>the colour of the new string</i>	colour box	from CAD controlbar	available colours
Type <i>breakline type (point-line type) of the string</i>	choice box	line	line, point
Linestyle <i>line style of the string</i>	linestyle box	from CAD controlbar	available line styles
Weight <i>thickness of the string</i>	input	from CAD controlbar	
Text style <i>textstyle to use for text</i>	textstyle box		
Tinability <i>if Vertices and segments, all the vertices and segments of the string are set to tinable. If Vertices only, all the vertices are set to tinable and the segments to not tinable. If Not tinable, all the vertices or segments are set to not tinable.</i>	choice box	Points and segments	Points and segments Points only Not tinable
Allow point ids <i>if tick, the super string can have point ids for each vertex. If not tick, the super string will not have point ids. This can be reversed if point ids are required in the future.</i>	tick box		
Many strings <i>if tick then after the current string is finished, a new create panel is placed on the screen with all the same values for the panel fields as the current string.</i>	tick box		
Create <i>after the Create button is chosen, the Edit 4d menu is displayed</i>	button		
Same as <i>after the Same as button is chosen, another string is selected and information about it is used for the fields in this panel</i>	button		
Finish <i>end the option, don't proceed to the edit stage</i>	button		

Edit 4d Super

On selecting the **Create** button in the **Create 4d Super String** panel the Edit 4d menu is placed on the screen. The Edit 4d menu for a *4d super string* is

model ->string_name for the 4d super string being edited

- move an IP
- insert an IP
- insert IP on line joining IP's
- extend an IP
- modify the string's z-value
- open a closed string
- close a string
- bring up Properties panel
- toggle edit info panel
- undo/redo
- quit the create
- finish the 2d create

- append or prepend an IP
- append or prepend an IP plus text
- delete an IP

To create a new *4d super string*, select the **Append** or **Append + Text** icon.

The **Append** and or **Append + Text** option are used to add vertices to either end of an existing string, or in the case of a new string, places the first vertex and then begins appending vertices to the first vertex. **Append + Text** also asks for text at each vertex.

For all 4d strings, a cross is then drawn in each plan view that the string's model is on, and the cross follows the cursor around the screen. If the string's model is **not** added to any plan view, the model is automatically added to **all** plan views.

After the cross is on the screen (moving with the cursor), clicking LB and accepting with MB selects the **first** vertex of the string (using the appropriate snaps).

If **Append + text** was selected, the user will then be prompted for the text to be placed at that vertex.

The string is then drawn from the first vertex to the cursor position, which represents the second vertex of the string. Clicking LB and accepting with MB selects the second string vertex and the process repeats for subsequent string vertices.

Now that the string is created, all the edit option on the string's **Edit 4d** menu are usable.

The options in the **Edit 4d** menu are not only used for placing the initial vertices of the string, but for editing the string once it is created. Since the **Append** and other options in the **Edit 4d** menu are identical to the options used when editing an existing string, they will be discussed in detail in the string Editor section.

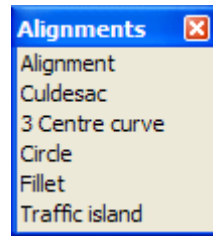
For full information in the 4d Editor, go to the section

Alignments

alignments

Position of menu: Strings =>Create =>Alignment

The alignment walk-right menu contains options to create an alignment string, plus quick methods of creating an alignment string with horizontal geometry already created for culdesacs, circles and fillets.



create alignment
 create culdesac
 create three centred curve
 create alignment forming a circle
 create alignment fillet
 create alignment for traffic island

For	<i>Alignment</i>	go to	"Create - Alignment" .
	<i>Culdesac</i>		"Create - Culdesac"
	<i>3 centre curve</i>		"Create - three centre curve"
	<i>Circle</i>		"Create - circle"
	<i>Fillet</i>		"Create - fillet"
	<i>Traffic island</i>		"Create - Traffic Island"

Create - Alignment

[create_alignment_string](#)

Position of option on menu: Strings =>Create =>Alignment =>Alignment

An alignment string is defined by specifying both its horizontal and vertical geometry.

The horizontal geometry consists of a series of (x,y) points (called horizontal intersection points) with circular curves and transition spirals applied to the intersection points.

Vertical geometry also consists of a series of points but they are defined with respect to the plan length of the string (chainage) and height. Hence, the vertical geometry is defined by a series of (chainage,height) points (called vertical intersection points) and either parabolic or circular curves applied to the vertical intersection points.

The horizontal geometry is defined in a plan view and the vertical geometry in a section view.

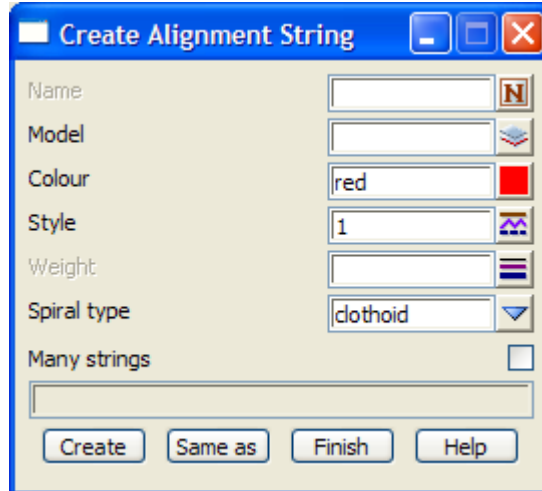
Alignment strings are often referred to as "centre-line strings" because road centre-lines are common examples of alignment strings.

Note vertical geometry can only be added to an **existing** string.

The **Many strings** tick-box is used when more than one string of the same type is to be created, If many strings is set to *tick*, when the current string creation is Finished or Quit, a new **Create Alignment String** panel is placed on the screen with the same information in it as the string just created. If any of the information needs to be modified for the new string, simply change it in the **Create Alignment String** panel fields before selecting the **Create** button for the new string. Hence a new string of the same type can be created without going back to the Create menu.

The **Same as** button is used to obtain information from an existing string (not necessarily of the same type) and pipe it into the name, colour, model, style breakline type and height field of the **Create Alignment String** panel.

On selecting the alignment string option, the **Create Alignment String** panel is displayed.



To create a new alignment string, the name, model, colour, style and transition spiral type of the new string are entered into the appropriate fields and the **Create** button selected.

The new fields and buttons used in the **Create Alignment String** panel have the following functions.

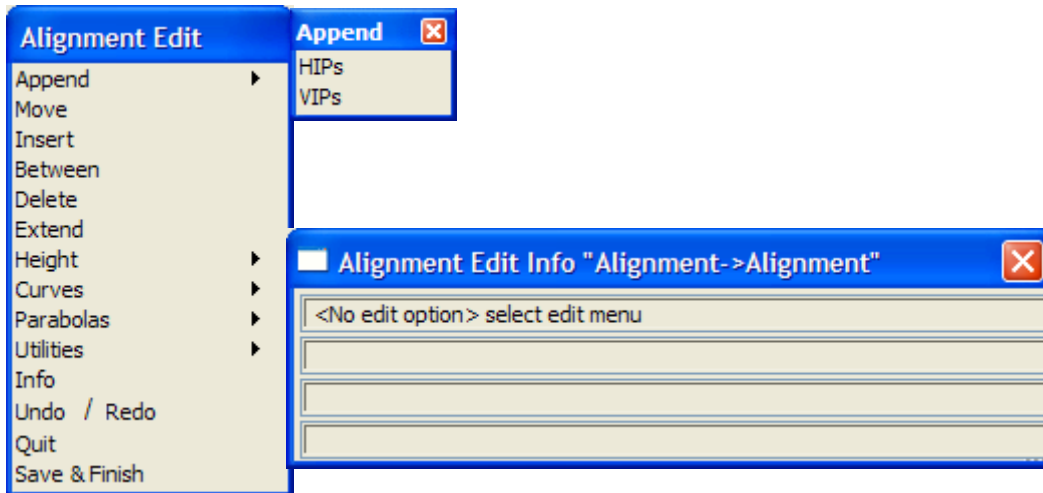
Field Description	Type	Defaults	Pop-Up
Name <i>the name of the new string.</i>	input		
Model <i>name of the model that the new string is in.</i>	input		available models
Colour <i>the colour of the new string.</i>	input	default colour	available colours
Style <i>line style of the string.</i>	input	1	available line styles
Weight <i>thickness of the string.</i>	input	0	
Spiral type <i>transition spiral type to be used for this alignment string.</i>	input	clothoid	available spirals
Many strings <i>if tick then after the current string is finished, a new create panel is placed on the screen with all the same values for the panel fields as the current string.</i>	tick		
Create <i>After the create button is chosen, the alignment edit menu and alignment edit info panel are displayed.</i>	button		
Same as <i>After the same as button is chosen, another string is selected and information about it is used for the fields in this panel.</i>	button		

Alignment Edit

Selecting the create button in the **create alignment string** panel the alignment edit menu and

alignment edit info panel are placed on the screen.

The alignment edit menu and alignment edit info panel for an alignment string are



To begin creating an alignment string, the user must select the `append=>HIPs` option from the Alignment Edit menu and start placing points in a plan view.

To create a new alignment string, select the `Append => HIPs` option from the Alignment Edit menu.

The `Append =>HIPs` option is used to add horizontal intersection points to either end of an existing alignment string, or in the case of a new string, places the 1st point and then begins appending points to the 1st point.

For all alignment strings, a cross is then drawn in each plan view that the string's model is on, and the cross follows the cursor around the screen. If the string's model is **not** added to any plan view, the model is automatically added to **all** plan views.

After the cross is on the screen (moving with the cursor), clicking LB and accepting with MB selects the **1st** vertex of the string (using the appropriate snaps).

The string is then drawn from the 1st vertex to the cursor position, which represents the second vertex of the string. Clicking LB and accepting with MB selects the second string vertex and the process repeats for subsequent string vertices.

Now that the string is created, all the edit option on the string's Alignment Edit menu are usable.

The options in the Alignment Edit menu are not only used for placing the initial vertices of the string, but for editing the string once it is created. Since the `Append` and other options in the Alignment edit menu are identical to the options used when editing an existing string, they will be discussed in detail in the string Editor section.

For full information in the Alignment Editor, go to the section "Alignment Edit"

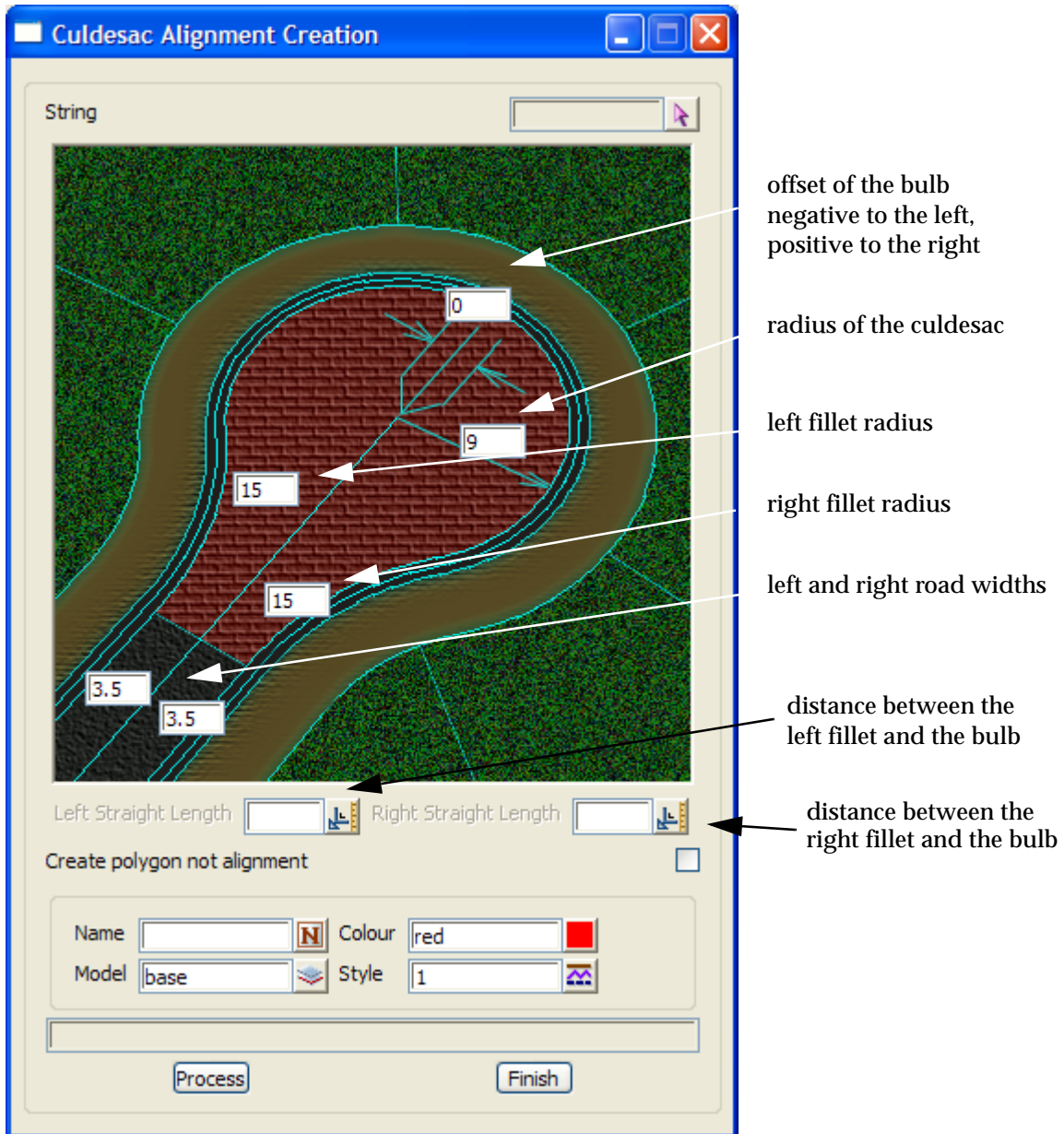
Create - Culdesac

culdesac_alignment_creation

Position of option on menu: Strings =>Create =>Alignment =>Culdesac

Create an alignment string for a culdesac for user defined road widths, culdesac radius and offset. No vertical geometry is defined.

On selecting the Culdesac option, the **Culdesac Alignment Creation** panel is displayed.



The position of the panel fields indicate what the values are for. Tool tips appear when the cursor is passed over the panel fields.

The fields and buttons used in this panel have the following functions:

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Offset	input box		
---------------	-----------	--	--

offset of the centre of the culdesac bulb. Use a negative value if the offset is to the left, positive if the

offset is to the right.

Radius input box

radius of the culdesac bulb

Left/Right fillet radii input box

radii for the left and right fillets from the roads to the culdesac bulb.

Left/Right road widths input box

left and right widths of the road.

Name/Model/Colour/Style input box

name/model/colour/style of the created alignment string.

Select string select

select with direction the string to create the culdesac for.

Preview string select

draw the culdesac with the given parameters in the panel draw box.

Process button

create the alignment string

Undo button

undo the last alignment string created whilst the panel has been active.

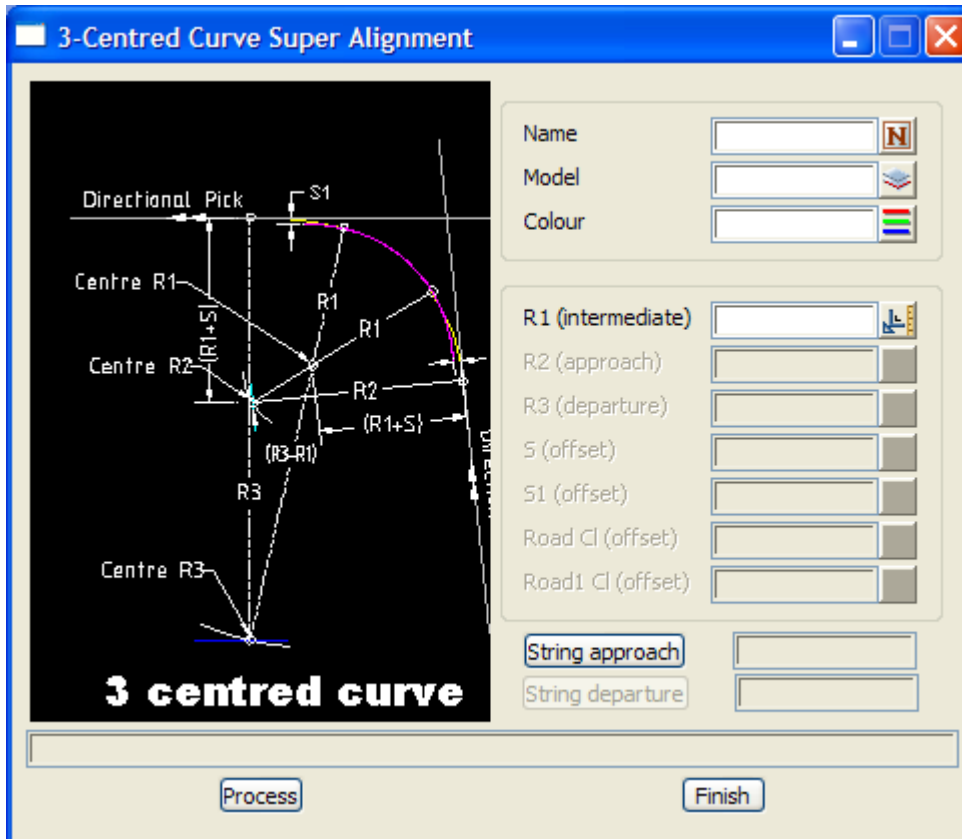
Create - three centre curve

3centre_curve_panel

Position of option on menu: Strings =>Create =>Alignment =>3 Centre Curve

Create an alignment string for a three centred curve for user defined parameters and selected strings.

On selecting the 3 centre curve option, the **3 centred curve construction** panel is displayed.



The fields and buttons used in this panel have the following functions:

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Name/Model/Colour/Style	input box		
<i>name/model/colour/style of the created alignment string.</i>			

R1 (intermediate)	input box		
<i>radius of the intermediate curve. If a value is entered and <enter> typed, values for R2, R3, S and S1 are computed and place in the appropriate fields</i>			

R2 (approach)	input box		
<i>radius of the approach curve.</i>			

R3 (departure)	input box		
<i>radius of the departure curve.</i>			

S (offset)	input box		
<i>approach offset.</i>			

S1 (offset)	input box		
<i>departure offset.</i>			

- Kerb line approach** string select
select the approach string
- Kerb line departure** string select
select the departure string
- Process** button
create the alignment string
- Undo** button
undo the last alignment string created whilst the panel has been active.

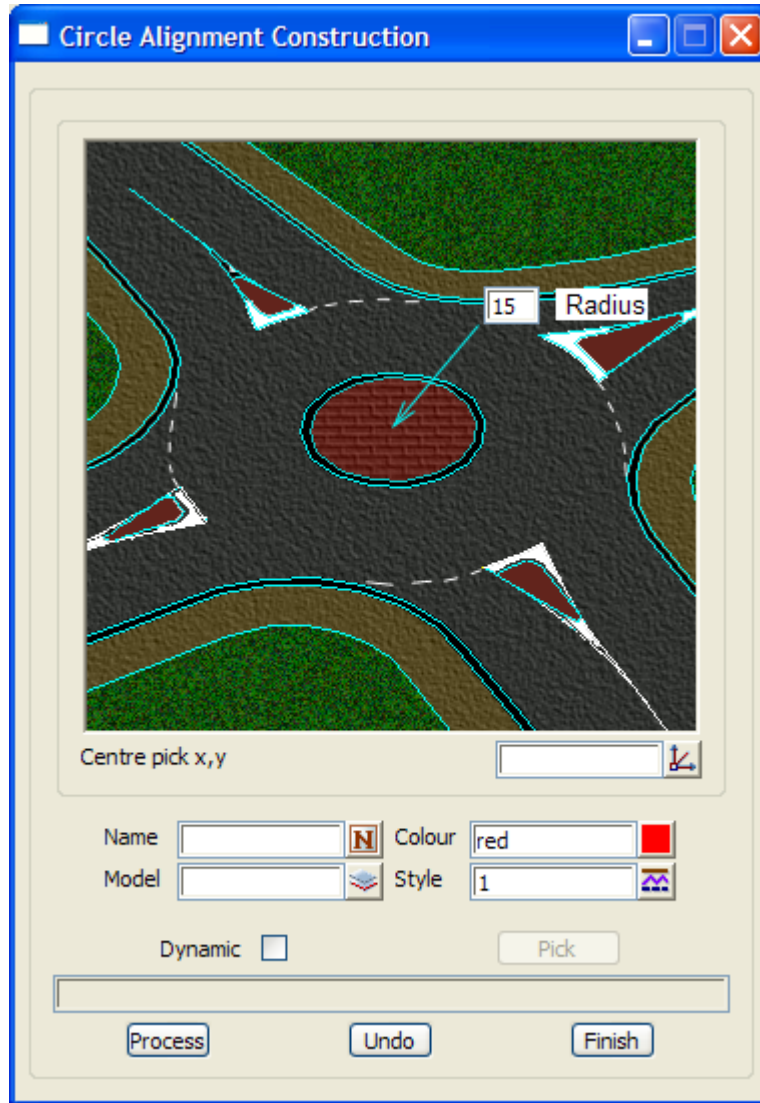
Create - circle

circle_align_panel

Position of option on menu: Strings =>Create =>Alignment =>Circle

Create an alignment string for a circle with a for user radius and selected centre or with a dynamic mode set, selected centre and interactively positioned circumference.

On selecting the curve option, the **circle alignment construction** panel is displayed.



The diagram indicates what the panel fields are for. Tool tips appear when the cursor is passed over the panel fields.

The fields and buttons used in this panel have the following functions:

Field Description	Type	Defaults	Pop-Up
Radius <i>the radius of the circle.</i>	input box		
Centre pick x,y <i>if Dynamic in not ticked, select the centre of the circle.</i>	x,y,z box		

Name/Model/Colour/Style input box

name/model/colour/style of the created alignment string.

Dynamic tick box

if not tick, then the Centre pick x,y and radius fields are used to define the circle.

if tick, then the Pick button is used to select the centre and then the cursor is taken to be on the circle to dynamically define the radius.

Pick button

pick the circle centre when in dynamic mode.

Process button

create the alignment string.

Undo button

undo the last alignment string created whilst the panel has been active.

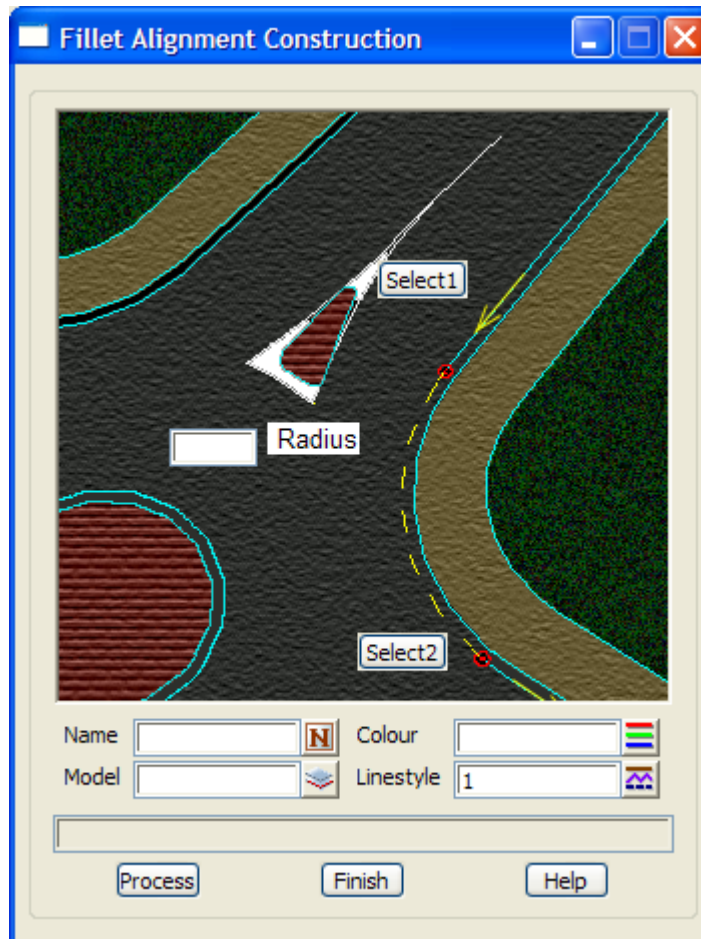
Create - fillet

fillet_alignment_construction

Position of option on menu: Strings =>Create =>Alignment =>Fillet

Create an alignment string for a fillet with a for user radius and selected in and out strings.

On selecting the fillet option, the **fillet alignment construction** panel is displayed.



The diagram indicates what the panel fields are for. Tool tips appear when the cursor is passed over the panel.fields.

The fields and buttons used in this panel have the following functions:

Field Description	Type	Defaults	Pop-Up
Select 1 <i>select the approach string. Pick with direction.</i>	string select		
Radius <i>the radius of the fillet.</i>	input box		
Select 2 <i>select the departure string. Pick with direction.</i>	string select		
Name/Model/Colour/Style <i>name/model/colour/style of the created alignment string.</i>	input box		
Process	button		

create the alignment string.

Undo button

undo the last alignment string created whilst the panel has been active.

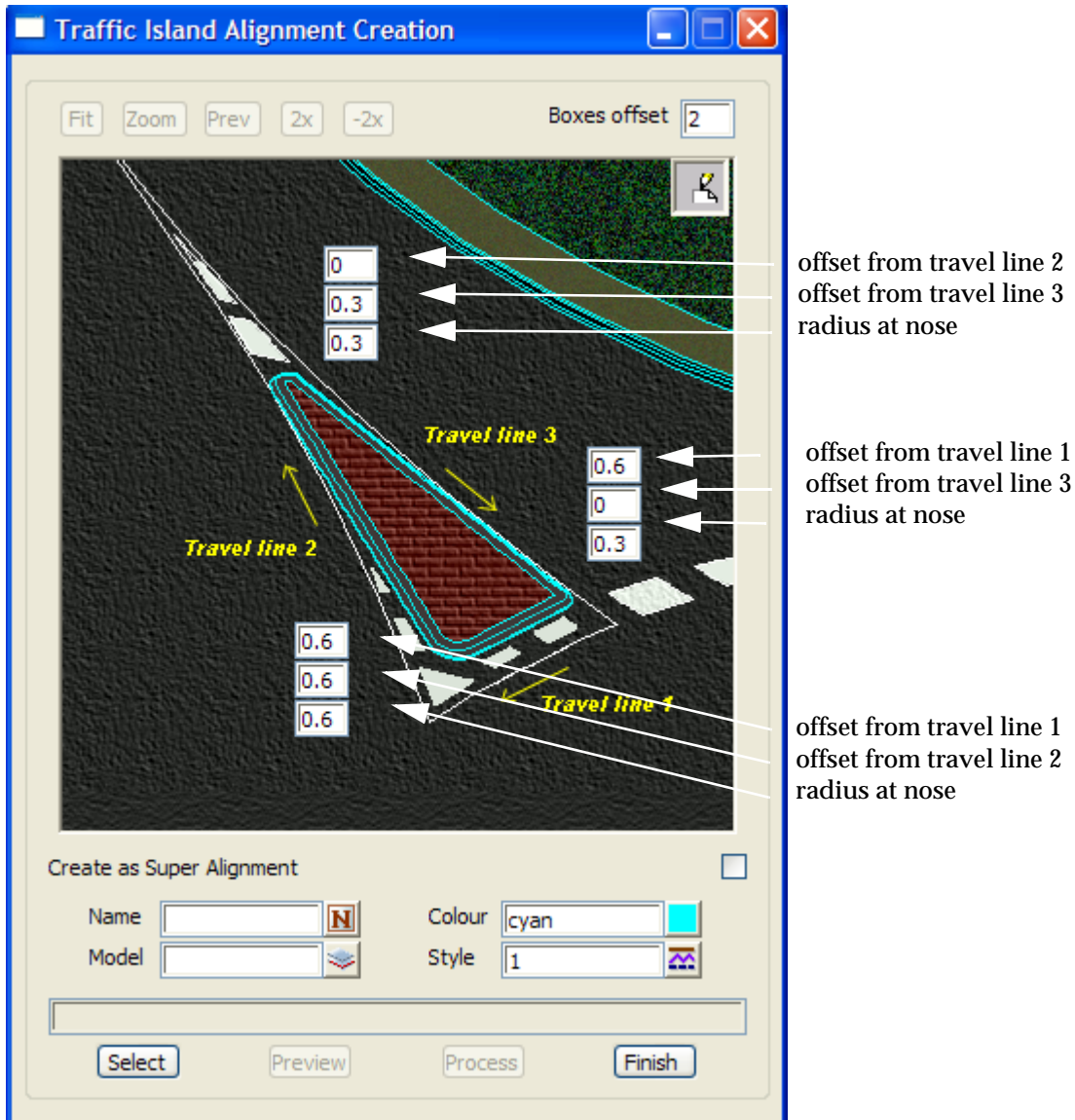
Create - Traffic Island

island_drawbox_panel

Position of option on menu: Strings =>Create =>Alignment =>Traffic Island

Create an alignment string for a traffic island between user selected strings and with user defined offsets from the strings and nose radii. No vertical geometry is defined.

On selecting the traffic island option, the traffic island alignment creation panel is displayed.



The position of the panel fields indicate what the values are for. Tool tips appear when the cursor is passed over the panel fields.

The fields and buttons used in this panel have the following functions:

Field Description	Type	Defaults	Pop-Up
Offset from travel lines <i>offset distance from the selected travel lines.</i>	input box		
Radius at nose	input box		

radius of the corner of the traffic island between the selected travel lines.

Name/Model/Colour/Style input box

name/model/colour/style of the created alignment string.

Select strings select

select in order and with direction, the three strings to use in creating the traffic island. Terminate by clicking RB and selecting cancel from the pick ops menu.

Preview string select

draw the traffic island with the given parameters in the panel draw box.

Process button

create the alignment string

Undo button

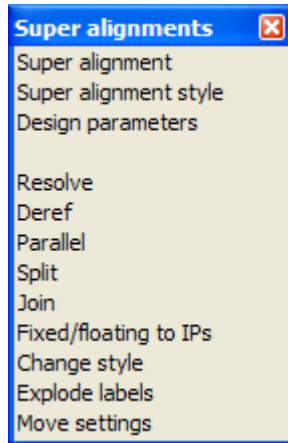
undo the last alignment string created whilst the panel has been active.

Super Alignments

super_alignments

Position of menu: Strings =>Create =>Super alignment

The Super Alignment walk-right menu contains options to create an alignment string, plus quick methods of creating an alignment string with horizontal geometry already created for culdesacs, circles and fillets.



create super alignment
create super alignment style
create design parameter file

resolve a super alignment
dereference a super alignment
parallel a super alignment
split a super alignment
join two super alignments
convert fixed/floating to IP's
change the style for super alignments
explode the labelling to text and lines
setting to lock the movement of IP's

For	<i>Super alignment</i> , go to	"Create - Super Alignment"
	<i>Super alignment style</i>	"Super Alignment Style"
	<i>Design parameters</i>	"Define Design Parameters"
	<i>Resolve</i>	"Resolve a Super Alignment"
	<i>Deref</i>	"Dereference a Super Alignment"
	<i>Parallel</i>	"Parallel a Super Alignment"
	<i>Split</i>	"Split a Super Alignment"
	<i>Join</i>	"Joining Two Super Alignments"
	<i>Fixed/floating to IP's</i>	"Convert Fixed/Floating Elements to IP's"
	<i>Change style</i>	"Change the Styles for Selected Super Alignments"
	<i>Explode labels</i>	"Explode the Super Alignments Labelling"
	<i>Move settings</i>	"Constrain the Movement of Super Alignment Points"

Create - Super Alignment

`create_super_alignment`

Position of option on menu: Strings =>Create =>Alignment =>Super alignment

An super alignment string, like the alignment string, is defined by specifying both its horizontal and vertical geometry.

For an **alignment** string, the alignment consists of only horizontal and vertical intersection points with parametrically defined objects consisting of transition spiral-arc-transition spiral for the horizontal geometry and parabolas or arcs for vertical geometry. The resultant elements are linked tangentially to form the horizontal and vertical geometry. The intersection points can be moved and the

The **super alignment** includes IP constructions but also allows much more complicated parametric design. Elements such as straights and arcs as well as intersection points can be defined and then joined by parametrically defined objects (consisting of combinations of transition spirals, arcs and straights in the horizontal geometry and parabolas, arcs and straights for the vertical geometry) which link tangentially to form the horizontal and vertical geometry.

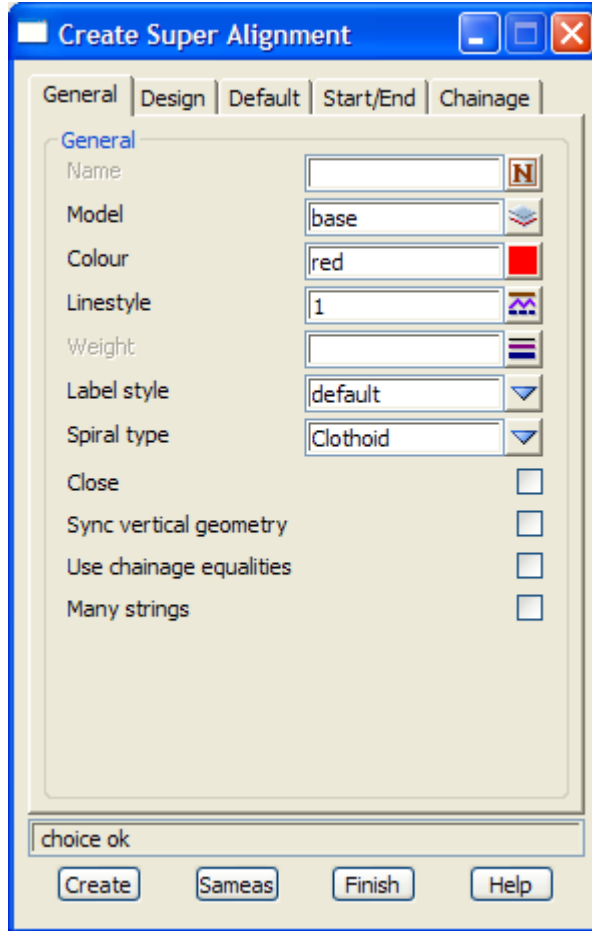
For both the alignment and super alignment, the horizontal geometry is defined in a **plan** view and the vertical geometry in a **section** view.

Note: vertical geometry can only be added to an **existing** super alignment string. That is, to a string with some horizontal geometry.

The **Many strings** tick-box is used when more than one string of the same type is to be created, If many strings is set to *tick*, when the current string creation is Finished or Quit, a new **Create Super Alignment** panel is placed on the screen with the same information in it as the string just created. If any of the information needs to be modified for the new string, simply change it in the **Create Super Alignment** panel fields before selecting the **Create** button for the new string. Hence a new string of the same type can be created without going back to the Create menu.

The **Same as** button is used to obtain information from an existing string (not necessarily of the same type) and pipe it into the name, colour, model, style breakline type and height field of the **Create Super Alignment** panel.

On selecting the Super Alignment option, the **Create Super Alignment** panel is displayed.



To create a new super alignment string, the name, model, colour, style and transition spiral type of the new string are entered into the appropriate fields and the **Create** button selected.

The fields and buttons used in the **Create Super Alignment** panel have the following functions.

Field Description	Type	Defaults	Pop-Up
General tab			
Name <i>the name of the new string</i>	input	from CAD controlbar	
Model <i>name of the model that the new string is in</i>	input	from CAD controlbar	available models
Colour <i>the colour of the new string</i>	input	from CAD controlbar	available colours
Linestyle <i>line style of the string</i>	linestyle box	from CAD controlbar	available line styles
Weight <i>thickness of the string</i>	input	0	
Spiral type <i>transition spiral type to be used for this alignment string</i>	choice box	clothoid	available spirals
Close <i>if tick, the super alignment is automatically closed.</i>	tick box		

Sync vertical geometry tick box

if **tick**, when the horizontal geometry is modified, an attempt is made to modify the chainage position of the vertical geometry so that remains locked to the same parts of the horizontal geometry as before the horizontal geometry was modified.

If **not tick**, after horizontal geometry is modified, the vertical will possibly be moved in relation to the horizontal geometry because the (x,y) position for a given chainage will change.

Use chainage equalities tick box

if **tick**, chainage equalities can be defined and the automatic labelling of the string will use the equalities. The use of equalities is still under development.

Many strings tick

if **tick** then after the current string is finished, a new create panel is placed on the screen with all the same values for the panel fields as the current string

Design tab

the **Design** tab is only used if a design table has been set up and is to be used for automatically inserting curves and transition curves in horizontal, vertical curves in the vertical and super elevation and widening.

Use design table tick box

if **tick**, the given design table is used when creating horizontal and vertical geometry.

If **not tick**, no design table is used with **Alignment speed** elements.

Design table

*.design files

design table to use when creating horizontal and vertical geometry

Design speed

*.design files

the general design speed for the road. This is used with the design table when creating horizontal and vertical geometry

Horz speed curve choice box

minimum radius
maximum radius

For **Alignment speed** and **Curve speed HIPs**.

If **minimum radius**, when an arc is automatically placed on an HIP using the design table, the arc with the smallest radius for the design speed is used.

If **maximum radius**, when an arc is automatically placed on an HIP using the design table, the arc with the largest radius for the design speed is used.

Vert speed curve choice box

minimum kvalue
maximum kvalue

For **Alignment speed** and **Speed VIPs**.

If **minimum kvalue**, when a parabola is automatically placed on an VIP using the design table, the parabola with the smallest kvalue for the design speed is used.

If **maximum kvalue**, when a parabola is automatically placed on an VIP using the design table, the parabola with the largest kvalue for the design speed is used.

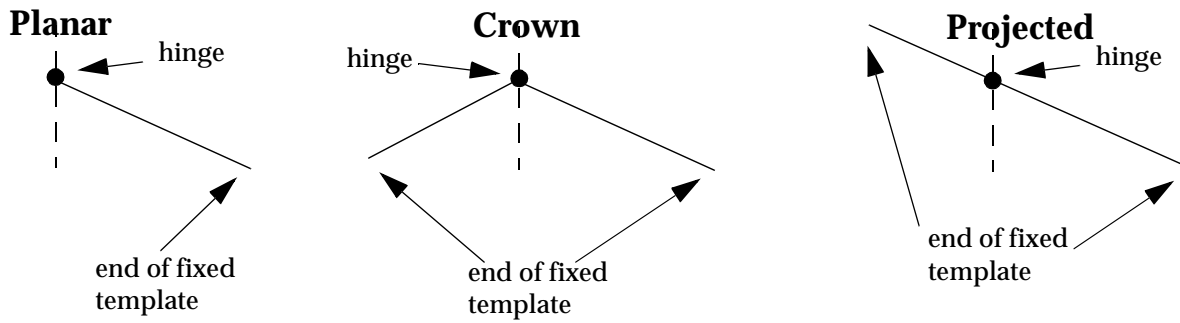
Slope type choice box

planar
crowned
projected

If **planar**, then the design table is only applied for half of the road (from the hinge string to the end of the fixed template). The side used is given by **Highside**.

If **crowned**, then the design table is used for each side of the roads (from the left most fixed template to the hinge string, and from the hinge string to the right most fixed template).

If **projected**, then the design table is first applied to half of the road given by **Highside** (from the hinge string to the end of the fixed template). Then the grade from the **Highside** is projected through the hinge string and used on the other side of the road.



Section View

Highside	choice box	left edge	left edge, right edge
<i>used if the Slope type is planar or projected.</i>			
Speed lookup	choice box		ceiling floor round up round down
Radius lookup	choice box		ceiling floor round up round down interpolate

*For non speed HIP's only (that is, not Alignment speed or Curve speed HIPs).
The radius has been defined by the user and*

Ease off	choice box	none maximum by length
-----------------	------------	------------------------------

method of transitioning between minimum and maximum super elevation.

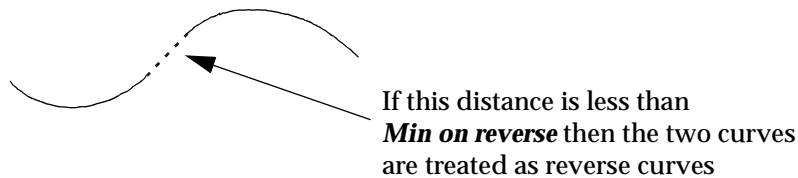
If none, no transition is done.

If maximum, maximum back to back curves are added to the super diagram between the minimum and maximum super elevation and are used to transition the super.

*If by length, the ease off distance is given by the **Ease off length** value.*

Ease off length	input
<i>the length of the ease off for the transition of super elevation when the by length method is selected</i>	

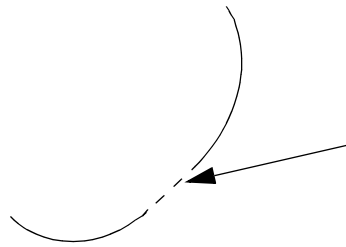
Min on reverse	input
<i>if the chainage distance between two curves of opposite sign is less than the Minimum on reverse value then the two curves are treated as reverse curves when applying the design rules.</i>	



Plan View

Min on broken back input

if the chainage distance between two curves of the same sign is less than the **Minimum on broken-back** value then the two curves are treated as broken-back curves when applying the design rules.



If this distance is less than **Min on broken-back** then the two curves are treated as broken back curves

Plan View**Default tab**

the **Default** tab defines the type of HIP's and VIP's that are place when laying down horizontal and vertical geometry.

HIP type

choice box

No curve
Alignment speed
Curve speed
Curve length
Curve radius
Curve spiral

The default HIP type given to any placed HIP's.

If **Curve speed**, the HIP is also given the speed from the **Speed** field on the **Default** tab.

If **Curve length**, the HIP is also given the curve length from the **Curve length** field on the **Default** tab.

If **Curve radius**, the HIP is also given the curve radius from the **Curve radius** field on the **Default** tab.

If **Curve spiral**, the HIP is also given the curve radius, leading and trailing spiral lengths from the **Curve radius**, **Leading spiral length** and **Trailing spiral length** fields on the **Default** tab.

Note on HIP types:

if an **HIP** is of type **No curve**, no arc is automatically placed on the HIP.

If an **HIP** is of type **Alignment speed**, arcs and spirals are automatically placed on HIP's using the **Design speed** for the super alignment.

If an **HIP** is of type **Curve speed**, arcs and spirals are automatically placed on the HIP using the design table, and the speed set for the HIP.

If an **HIP** is of type **Curve length**, arcs are placed on the HIP using the length for the HIP.

If an **HIP** is of type **Curve radius**, arcs are placed on the HIP using the radius for the HIP.

If an **HIP** is of type **Curve spiral**, arcs are placed on the HIP using the curve radius, and leading and trailing spiral length for the HIP.

VIP type

choice box

No VC
Alignment speed
Speed
Length
Radius
Kvalue
Maximum length
Asymmetric
Circular arc

The default VIP type given to any placed VIP's.

If **Speed**, the VIP is also given the speed from the **Speed** field on the **Default** tab.

If **Length**, the VIP is also given the parabolic length from the **Length** field on the **Default** tab.

If **Radius**, the VIP is also given the effective parabolic radius from the **Radius** field on the **Default** tab.
 If **Kvalue**, the VIP is also given the K value from the **K value** field on the **Default** tab.
 If **Asymmetric**, the VIP is also given the first and second parabolic length for the **Length** and **Length 2** field on the **Default** tab.
 If **Circular arc**, the VIP is also given the arc radius from the **Radius** field on the **Default** tab.

Note on VIP types:

if an **VIP** is of type **No VC**, no vertical curve is placed on the VIP.
 If an **VIP** is of type **Alignment speed**, parabolic curves are automatically placed on VIP's using the **Design speed** for the super alignment.
 If an **VIP** is of type **Speed**, parabolic curves are automatically placed on the VIP using the design table, and the speed set for the VIP.
 If an **VIP** is of type **Length**, a parabolic curve is placed on the VIP using the length for the VIP.
 If an **VIP** is of type **Radius**, a parabolic curve is placed on the VIP using the effective radius for the VIP.
 If an **VIP** is of type **Kvalue**, a parabolic curve is placed on the VIP using the kvalue for the VIP.
 If an **VIP** is of type **Max length**, a parabolic curve of maximum length is placed on the VIP.
 If an **VIP** is of type **Asymmetric**, two parabolic curve using lengths **Length** and **Length 2** for the VIP are placed on the VIP.
 If an **VIP** is of type **Circular arc**, an arc is placed on the VIP using the radius for the VIP.

Start/End tab

the **Start/End** tab defines where the usable horizontal and vertical geometry starts and ends for the super alignment. Note that the super alignment can have more horizontal and vertical geometry than is actually used.

Start Horizontal mode choice box default
 segment
 point

specifies how the start of the usable horizontal geometry is defined.
 If **default**, the beginning of the first non invisible horizontal part is the start of the usable horizontal geometry.
 If **segment**, a user selected segment of the horizontal geometry is the start of the usable horizontal geometry.
 If **point**, a user selected position is dropped perpendicularly onto the super alignment to define the start of the usable horizontal geometry.

Start Control X/Y coordinate select x, y box

used in the **segment** and **point** cases of the **Start Horizontal mode**.

Start Vertical mode choice box default
 relative
 chainage

specifies how the start of the usable vertical geometry is defined.
 If **default**, the beginning of the first non invisible vertical part is the start of the usable vertical geometry.
 If **relative**, the chainage of the start of the usable horizontal geometry is used as the start of the usable vertical geometry. If the beginning of the defined vertical geometry is **after** this chainage, then the first segment is extrapolated back to the required chainage.
 If **chainage**, a user given chainage defines the start of the usable vertical geometry.

Start Chainage input

used in the **chainage** case of the **Start Vertical mode**.

End Horizontal mode choice box default
 segment

point

specifies how the end of the usable horizontal geometry is defined.

If **default**, the end of the last non invisible horizontal part is the end of the usable horizontal geometry.

If **segment**, a user selected segment of the horizontal geometry is the end of the usable horizontal geometry.

If **point**, a user selected position is dropped perpendicularly onto the super alignment to define the end of the usable horizontal geometry.

End Control X/Y coordinate select x, y box

used in the **segment** and **point** cases of the **End Horizontal mode**.

End Vertical mode choice box

default
relative
chainage

specifies how the end of the usable vertical geometry is defined.

If **default**, the end of the last non invisible vertical part is the end of the usable vertical geometry.

If **relative**, the chainage of the end of the usable horizontal geometry is used as the end of the usable vertical geometry. If the end of the defined vertical geometry is **before** this chainage, then the last segment is extrapolated to the required chainage.

If **chainage**, a user given chainage defines the end of the usable vertical geometry.

Start Chainage input

used in the **chainage** case of the **End Vertical mode**.

Chainage tab

defines the chainage for the string

Horizontal Chainage input

0

the user given chainage value. Where it is applied depends on the **Horizontal mode**

Horizontal Model choice box

start point
end point
control point
start part
end part

if **start point**, the **Chainage** value is applied to the start of the usable horizontal geometry,

If **end point**, the **Chainage** value is applied to the end of the usable horizontal geometry,

If **control point**, a user given control point is dropped perpendicularly onto the horizontal geometry and that position is given the **Chainage** value.

If **start part**, the **Chainage** value is applied to the start of the first part of horizontal geometry, even if it is invisible.

If **end part**, the **Chainage** value is applied to the end of the last part of horizontal geometry, even if it is invisible.

Horizontal Control X/Y coordinate select x, y box

used in the **control point** cases of the **Horizontal mode**

Horizontal Chainage interval input

10

horizontal chainage interval for the string

Horizontal Chord to arc tol input

0.1

horizontal chord to arc tolerance to use for any arcs

Vertical Chainage interval input

10

vertical chainage interval for the string

Vertical Chord to arc tol input

0.1

vertical chord to arc tolerance to use for any parabolas

Note: the horizontal and vertical intervals and chord to arc tolerances are used when the super alignment is approximated by straights in three dimensions.

Label Major Chainage interval	input	10
<i>major chainage interval to use for labelling</i>		
Label Minor Chainage interval	input	
<i>minor chainage interval to use for labelling</i>		
Label Reference chainage interval	input	0
<i>reference value for the chainage labelling intervals</i>		
Label Special chainage file	file box	*.spc file
<i>file of special chainages for labelling</i>		

*Note: the labelling of the super alignment is given by the **Label style** on the **General** tab.*

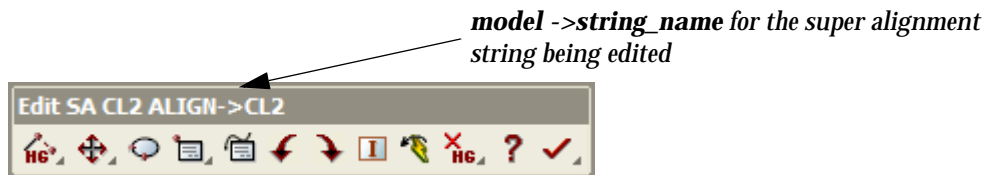
Buttons at Bottom

Create button
*After the **Create** button is chosen, the super alignment toolbar is created. The **Super Alignment Edit** toolbar is displayed*

Same as button
*After the **Same as** button is chosen, another string is selected and information about it is used for the fields in this panel*

Super Alignment Edit

After selecting the **Create** button the **Super Alignment** toolbar is created and placed on the screen.



The Super Alignment Edit menu is still under development and for more information on creating and editing the super alignment, please play the 12d Training DVD's.

For definitions of the horizontal and vertical elements, go to "Placing Elements for Super Alignments"

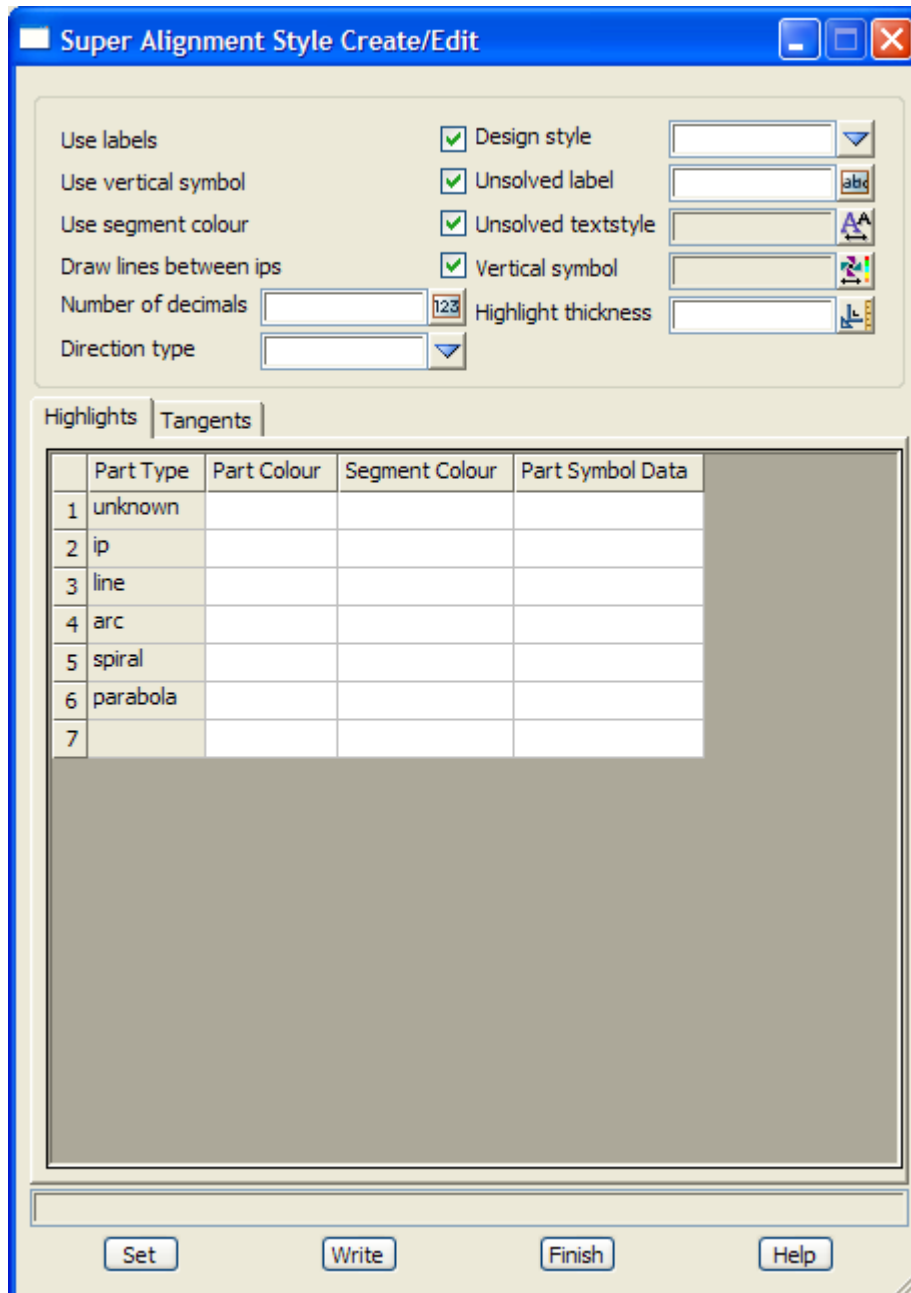
Super Alignment Style

[super_alignment_style_create_edit](#)

Position of option on menu: Strings =>Create =>Super alignment =>Super alignment style

The super alignment styles control the way that the super alignment draws and highlights on the screen.

Selecting Super alignment style displays the **Super Alignment Style Create/Edit** panel.



Highlights		Tangents				
	Tangent Type	Use	Symbol Data	Prefix*postfix	Textstyle Data	Decimals
1	unknown	<input type="checkbox"/>				
2	curve-spiral	<input type="checkbox"/>				
3	spiral-curve	<input type="checkbox"/>				
4	tangent-curve	<input type="checkbox"/>				
5	curve-tangent	<input type="checkbox"/>				
6	tangent-spiral	<input type="checkbox"/>				
7	spiral-tangent	<input type="checkbox"/>				
8	common tangent	<input type="checkbox"/>				
9	spiral-spiral	<input type="checkbox"/>				
10	interval	<input type="checkbox"/>				
11	vert. unknown	<input type="checkbox"/>				
12	vert. tangent-curve	<input type="checkbox"/>				
13	vert. curve-tangent	<input type="checkbox"/>				
14	vert. common-tangent	<input type="checkbox"/>				
15	crest	<input type="checkbox"/>				
16	sag	<input type="checkbox"/>				
17	special chainages	<input type="checkbox"/>				
18	horz. direction	<input type="checkbox"/>				
19	minor interval	<input type="checkbox"/>				
20	kpost equality	<input type="checkbox"/>				
21	internal equality	<input type="checkbox"/>				
22	segment radius	<input type="checkbox"/>				
23	segment length	<input type="checkbox"/>				
24		<input type="checkbox"/>				

The fields and buttons used in the **Super Alignment Style Create/Edit** panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Design style	choice box		design styles defined in astyles.4d <i>all the information in the panel refers to the selected design style. Note - the design styles are stored in the file astyles.4d.</i>
Use labels	tick box		<i>if tick, labels are automatically drawn when the super alignment is on a Plan view.</i>
Use vertical symbols	tick box		<i>if tick, vertical symbols are when the super alignment is profiled on a Section view.</i>
Draw lines between ips	tick box		<i>if tick, lines are drawn between intersection points (IP's).</i>
Number of decimals	input		<i>the number of decimal places to use in the chainage labels</i>

Direction type	choice box	none, at start, each segment
Unsolved label	input	
	<i>the label to use when a part is not solved</i>	
Unsolved textstyle	input	textstyle datas
	<i>the textstyle to use for the label when a part is not solved</i>	
Vertical symbol	input	all available symbols
Highlight thickness	input	

Highlights tab

the definition of how to highlight horizontal and vertical parts of the super alignment

Tangents tab

the definition of what text, symbols and decimal places should be used in labelling tangent points, crest and sag points, major and minor intervals, segment radii and lengths, and special chainages.

Buttons at Bottom

Set button

*clicking the **Set** button means that for this session, all the definitions in the panel will be used for the design style given in the **Design style** field. Unless the **Write** button is used to write the values out to the **astyles.4d** file, the values will be lost when the project is exited.*

Write button

*clicking the **Set** button writes out all the values in this panel to the **astyles.4d** file as the design style given in the **Design style** field*

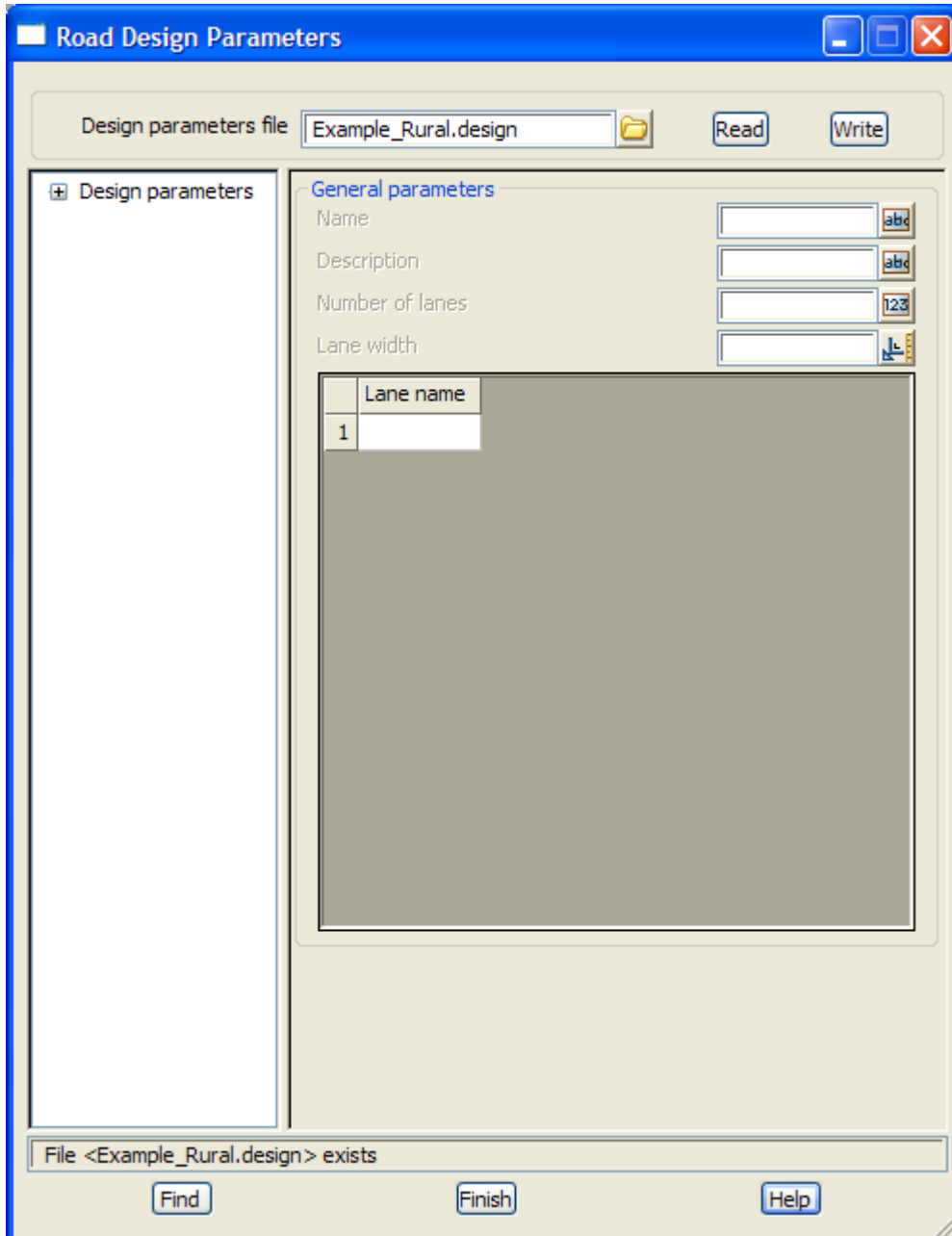
Define Design Parameters

road_design_parameters

Position of option on menu: Strings =>Create =>Super alignment =>Design parameters

The **design parameters table** defines the use arcs, transition curves, parabolas, super elevation and road widening for given design speeds. The table is used to use by a super alignment in conjunction with user supplied information given in the **Design** tab of the super alignment.

Selecting Design parameters displays the **Road Design Parameters** panel.



Resolve a Super Alignment

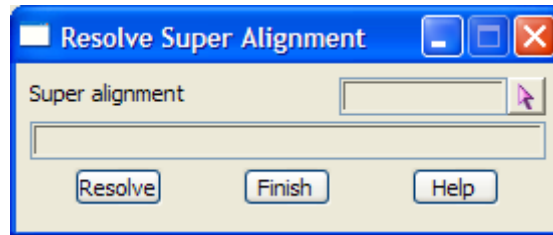
`resolve_super_alignment`

Position of option on menu: Strings =>Create =>Super alignment =>Resolve

When a super alignment is created using *computators*, the super alignment is defined with **references** to other strings. If the referenced strings are modified, then the super alignment will not automatically reflect the changes in the referenced strings.

Resolve forces the string to be resolved using the current position and properties of any referenced strings.

Selecting Resolve displays the **Resolve Super Alignment** panel.



The new fields and buttons used in the panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Super alignment <i>select a super string to resolve.</i>	string select		
Resolve <i>after the Resolve button is clicked, the super alignment is resolved using the new position and properties of any referenced strings.</i>	button		

Dereference a Super Alignment

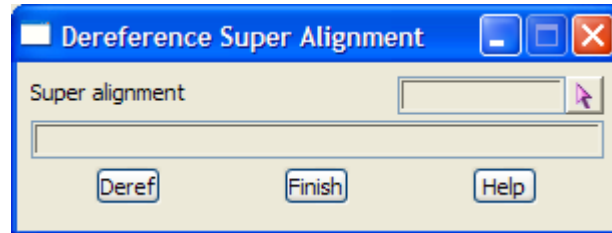
dereference_super_alignment

Position of option on menu: Strings =>Create =>Super alignment =>Deref

When a super alignment is created using *computators*, the super alignment is defined with *references* to other strings.

Deref copies any referenced strings and inserts the copies into the super alignment in place of the referenced string. So after running Deref that there is no longer any references to other strings in the super alignment.

Selecting Deref displays the **Dereference Super Alignment** panel.



The new fields and buttons used in the panel have the following functions.

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Super alignment	string select		
------------------------	---------------	--	--

select a super string to dereference.

Deref	button		
--------------	--------	--	--

*after the **Deref** button is clicked, any referenced strings are copied and inserted into the super alignment in place of the referenced strings.*

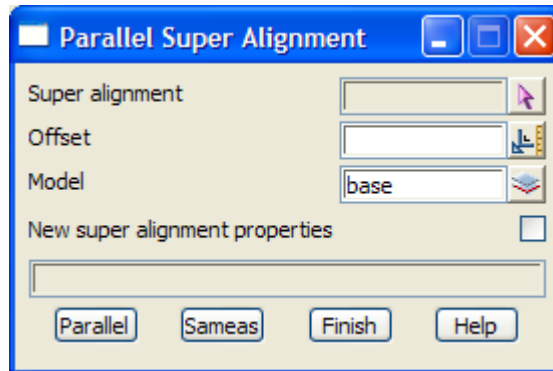
Parallel a Super Alignment

parallel_super_alignment

Position of option on menu: Strings =>Create =>Super alignment =>Parallel

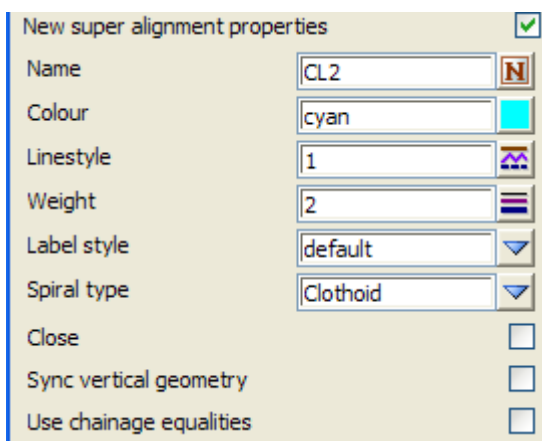
Parallel parallels the horizontal geometry of a super alignment by a user given offset.

Selecting Parallel displays the **Parallel Super Alignment** panel.



The new fields and buttons used in the panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Super alignment <i>select a super alignment to parallel</i>	string select		
Offset <i>distance to offset the selected super alignment</i>	input		
Model <i>model for the paralleled string</i>	model box		available models
New super alignment properties <i>if tick, the panel is expanded to show all the properties that can be set for the new paralleled string.</i>	tick box		



Extra panel fields when **New super alignment properties** is ticked on

Parallel button

after the **Parallel** button is clicked, a dereferenced copy of the horizontal geometry of the super alignment is paralleled. The vertical geometry is deleted.

Same as button

*after clicking **Same as** and then select a string. All the picked string properties will be loaded into the panel fields.*

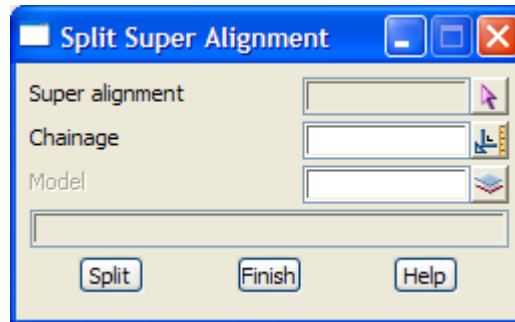
Split a Super Alignment

`split_super_alignment`

Position of option on menu: Strings =>Create =>Super alignment =>Split

Split splits super alignment at a given chainage.

Selecting Split displays the **Split Super Alignment** panel.



The new fields and buttons used in the panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Super alignment <i>select a super alignment to split</i>	string select		
Chainage <i>chainage to split the super alignment at</i>	input		
Model <i>model for the split string</i>	model box		available models
Split <i>after the Split button is clicked, the super alignment is split at the given chainage.</i>	button		

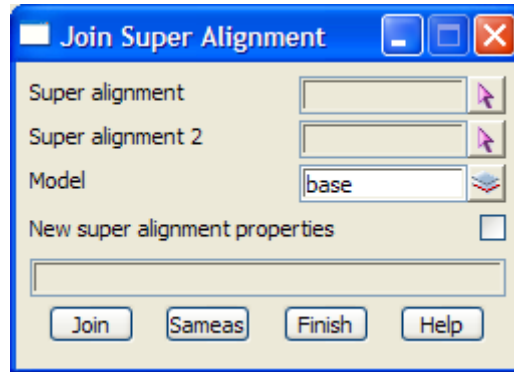
Joining Two Super Alignments

join_super_alignment

Position of option on menu: Strings =>Create =>Super alignment =>Join

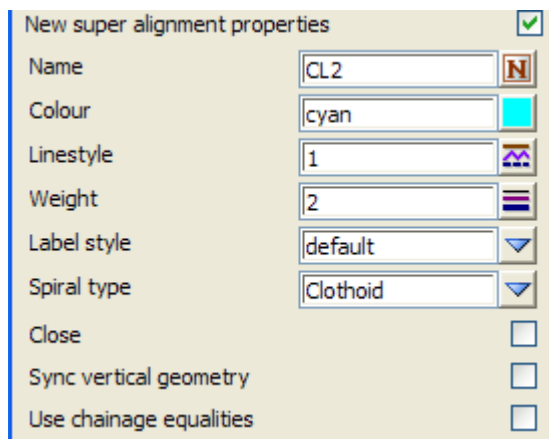
Join joins two super alignments at their ends.

Selecting Join displays the **Join Super Alignment** panel.



The new fields and buttons used in the panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Super alignment <i>select a super alignment to join</i>	string select		
Super alignment 2 <i>select a super alignment to join to the first selected super alignment</i>	string select		
Model <i>model for the joined string</i>	model box		available models
New super alignment properties <i>if tick, the panel is expanded to show all the properties that can be set for the new joined string.</i>	tick box		



Extra panel fields when **New super alignment properties** is ticked on

Join button
after the **Join** button is clicked, a new super alignments is created by joining the two super alignments

Same as button
after clicking **Same as** and then select a string. All the picked string properties will be loaded into the panel fields.

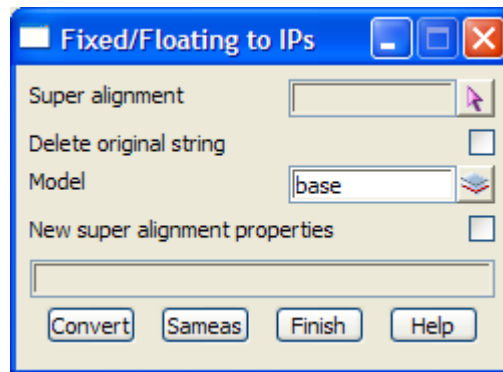
Convert Fixed/Floating Elements to IP's

[fixed_floating_to_ips](#)

Position of option on menu: Strings =>Create =>Super alignment =>Fixed/floating to IPs

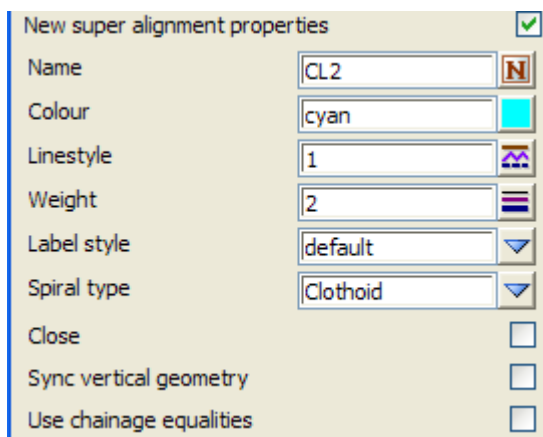
Fixed/floating to IP's converts the fixed and floating elements of the horizontal and vertical geometry to horizontal and vertical intersection points joins with arcs and transitions and parabolas or vertical arcs respectively.

Selecting Fixed/floating to IPs displays the **Fixed/floating to IPs** panel.



The new fields and buttons used in the panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Super alignment <i>select a super alignment to convert</i>	string select		
Delete original string <i>if tick, the original super alignment is deleted after the conversion is successful</i>	tick box		
Model <i>model for the converted string</i>	model box		available models
New super alignment properties <i>if tick, the panel is expanded to show all the properties that can be set for the new converted string.</i>	tick box		



Extra panel fields when
New super alignment properties
is ticked on

Convert button

*after the **Convert** button is clicked, a new super alignments is created by converting all the elements to IPs*

Same as button

*after clicking **Same as** and then select a string. All the picked string properties will be loaded into the panel fields.*

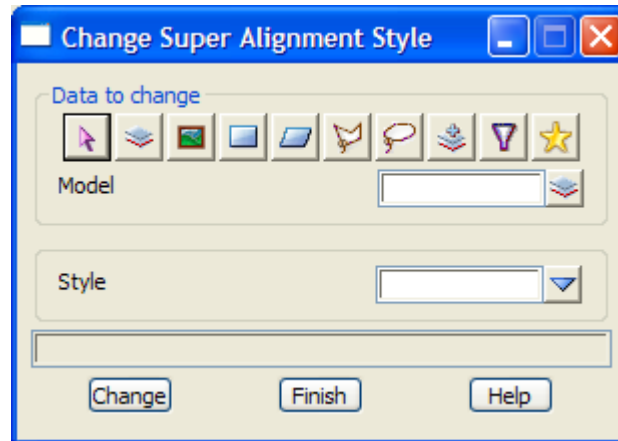
Change the Styles for Selected Super Alignments

`change_super_alignment_style`

Position of option on menu: Strings =>Create =>Super alignment =>Change style

Change style changes the super alignment style for all the selected super alignments.

Selecting Change style displays the **Change Super Alignment Style** panel.



The new fields and buttons used in the panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Data source type		Model	
<i>data selection type - for a full description go to "Data Source" in the chapter "Tools and Concepts"</i>			
Data source	input		
<i>source of data is to be processed.</i>			
Style	SA style box		available SA styles
<i>super alignment style to apply to all the selected super alignments</i>			
Change	button		
<i>after the Change button is clicked, all the selected super alignments are given the super alignment style</i>			

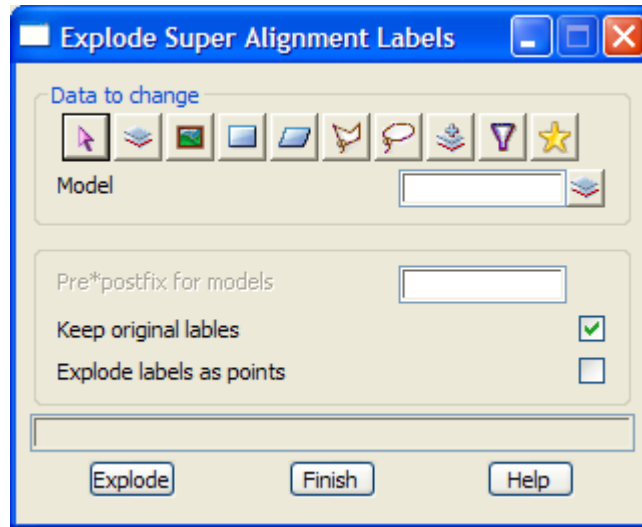
Explode the Super Alignments Labelling

explode_super_alignment_labels

Position of option on menu: Strings =>Create =>Super alignment =>Explode labels

Explode labels creates text and lines from the automatic labelling of the selected super alignments.

Selecting Explode labels displays the **Explode Super Alignment Labels** panel.



The new fields and buttons used in the panel have the following functions.

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Data source type		Model	
-------------------------	--	-------	--

data selection type - for a full description go to "Data Source" in the chapter "Tools and Concepts"

Data source	input		
--------------------	-------	--	--

source of data is to be processed.

Keep original lables	tick box		
-----------------------------	----------	--	--

Explode labels as points	tick box		
---------------------------------	----------	--	--

Explode	button		
----------------	--------	--	--

create text strings for all the text in the automatic labels of the selected super alignments

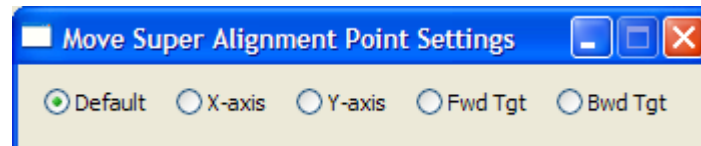
Constrain the Movement of Super Alignment Points

move_super_alignment_point_settings

Position of option on menu: Strings =>Create =>Super alignment =>Move settings

Explode labels creates The move settings constrains the movement of horizontal and vertical intersection points for any super alignment being edited.

Selecting Move settings displays the **Move Super Alignment Point Settings** panel.



The buttons are radio buttons - that is, only one can be selected:

Default

allows any movement in the selected HIP or VIP point

X-axis

constrains an HIPs to only move along the x-axis. That is, the y coordinate is fixed.

Constrains a VIPs to only move along the chainage-axis. That is, the height coordinate is fixed.

Y-axis

constrains an HIPs to only move along the y-axis. That is, the x coordinate is fixed.

Constrains a VIPs to only move along the height-axis. That is, the chainage coordinate is fixed.

Fwd Tgt

constrains an HIPs to only move along the incoming straight to the HIP.

Constrains a VIPs to only move along the incoming straight to the VIP.

Bwd Tgt

constrains an HIPs to only move along the outgoing straight from the HIP.

Constrains a VIPs to only move along the outgoing straight from the VIP.

Create Arcs

create_arcs

Position of menu: Strings =>Create =>Arcs

The create arcs option is used to create 12d Model arcs.

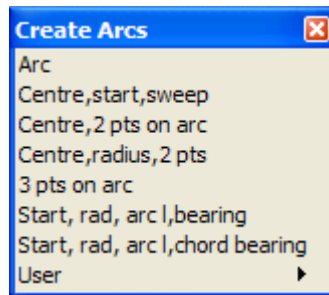
A 12d Model arc consists of a radius, a centre point, and a start and end point on the arc.

The radius can be positive or negative. If the radius is positive, the arc is drawn from the start-point to the end-point in a clockwise direction. If the radius is negative, the arc is drawn from the start-point to the end-point in counter-clockwise direction.

The height at the start point and at the end point can be different. In that case, the arc is still a plan arc but the z- value varies linearly from the start point to the end point as one moves around the arc. Hence the 12d Model arc string is actually a **helix** with its centre-line perpendicular to the xy-plane.

For convenient 12d Model includes a variety of methods for creating arcs.

On selecting the arcs option, the create arcs menu is displayed giving all the different methods for creating arcs.



Each option in the create arcs menu fires up its own special panel to collect the necessary information for defining the arc.

The mouse is used to select the special points required for the arc and circle definitions. For example, in the arc - 3 points on arc option, the three points are selected using the mouse.

Unlike the other strings created under **strings=>create**, the arc can be created immediately without needing any options from the arc editors.

Consequently, after an arc is defined, the create panel is not removed and is left on the screen to create another arc. Any information that needs modifying is changed in the **arc** panel and is used for the new create.

New arcs are created until either the panel is removed by selecting the **finish** or **[X]** button, or the create terminated by selecting **cancel** from the **pick ops** menu in which case the panel will be left on the screen. In the last case, the **arc** button is then used to begin a new create sequence.

Each of the methods for creating arcs will now be described.

Create - Arc

create_arc_string

Position of option on menu: Strings =>Create =>Arcs =>Create Arcs

Arcs and circles are normally created using the **strings=>create=> arcs** or **strings=>create=> circles** menu. Please see the documentation on that option for creating arcs and circles.

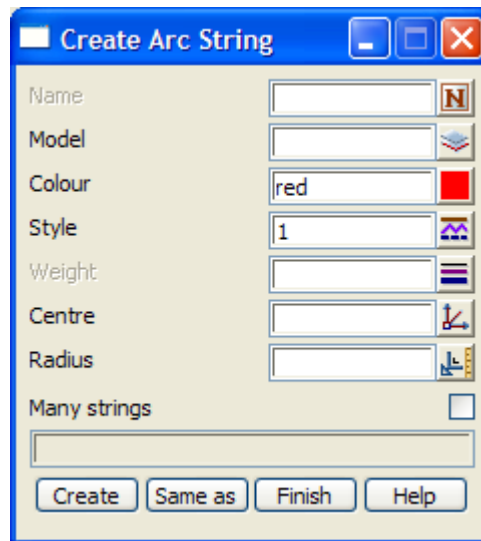
This option is a special arc creator so that a menu exists if the **strings=>create=>same** as option is used on an arc. It creates an arc with an initial sweep angle of 360 degrees.

The **Many strings** tick-box is used when more than one string of the same type is to be created, If

many strings is set to *tick*, when the current string creation is Finished or Quit, a new **Create Arc String** panel is placed on the screen with the same information in it as the string just created. If any of the information needs to be modified for the new string, simply change it in the **Create Arc String** panel fields before selecting the **Create** button for the new string. Hence a new string of the same type can be created without going back to the Create menu.

The **Same as** button is used to obtain information from an existing string (not necessarily of the same type) and pipe it into the name, colour, model, style, breakline type and height field of the **Create Arc String** panel.

After selecting the option, the **create arc string** panel is displayed.



The new fields and buttons used in the **create arc string** panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Name <i>the name of the new string.</i>	input		
Model <i>name of the model that the new string is in.</i>	input		available models
Colour <i>the colour of the new string.</i>	input	default colour	available colours
Style <i>line style of the string.</i>	input	1	available line styles
Weight <i>thickness of the string.</i>	input	0	
Centre <i>co-ordinates of the centre of the arc.</i>	input		xyz ops menu
Radius <i>the radius for the arc.</i>	input		
Many strings <i>if tick then after the current string is finished, a new create panel is placed on the screen with all the same values for the panel fields as the current string.</i>	tick		
Create <i>After the create button is chosen, the arc edit menu and arc edit info panel are displayed.</i>	button		

Same as button

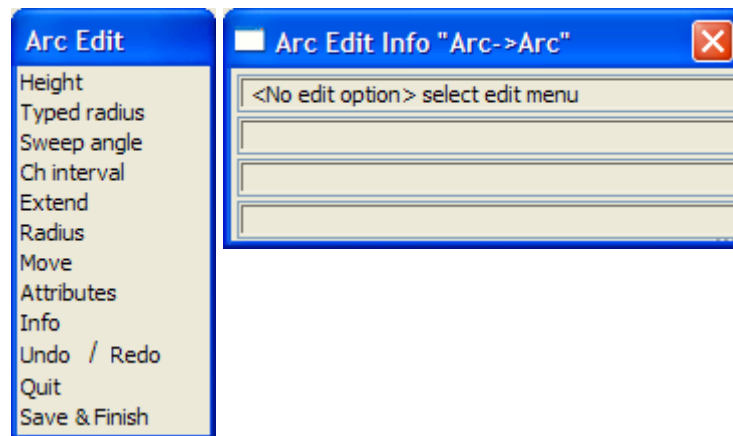
*After the **same as** button is chosen, another string is selected and information about it is used for the fields in this panel.*

Note - the centre co-ordinates can either be typed into the centre panel field, or if LB is clicked on [+] for the centre panel field, the xyz ops menu comes up and the pick xyz option used to select a point as the arc centre.

Arc Edit

Unlike the other string creates, on selecting the **Create** button the arc string is immediately created with a sweep angle of 360 degrees. The arc edit menu and **arc edit info** panel are also placed on the screen at the same time

The arc edit menu and **arc edit info** panel for an arc string are



For full information in the Arc Editor, go to the section “Arc Edit”

Create Arc - Centre Point, Start Point and Sweep

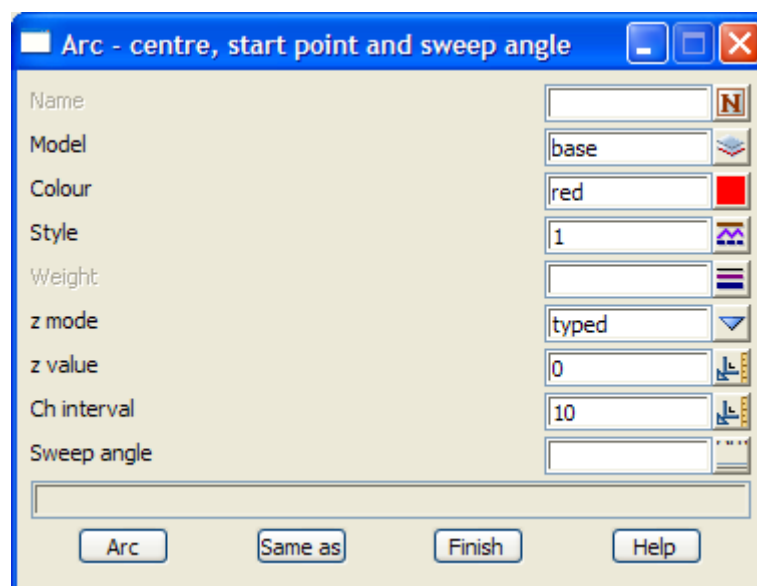
[arc__centre__start_point_and_sweep_angle](#)

Position of option on menu: Strings =>Create =>Arcs =>Centre,Start,Sweep

This option defines an arc by selecting a centre point, the start point of the arc and the sweep angle of the arc. The sweep angle is measured in the **clockwise** direction.

The radius is calculated by the option and is simply the distance between the centre and start points. The arc end point is also automatically calculated using the known points, radius and sweep angle.

After selecting the option, the **arc - centre, start point and sweep angle** panel is displayed.



To **create** an arc, the name, colour, model, chainage interval and sweep angle are entered into the

appropriate fields and then the centre point and start point of the arc are selected with the cursor. The arc is then created using the information provided in the panel.

The new fields and buttons used in the **arc - centre, start point and sweep angle** panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Name <i>the name of the new string.</i>	input		
Model <i>name of the model that the new string is in.</i>	input		available models
Colour <i>the colour of the new string.</i>	input	default colour	available colours
Style <i>line style of the string.</i>	input	1	available line styles
Weight <i>thickness of the string.</i>	input	0	
z mode <i>the method of specifying the z-value for the end points of the arc. It can be typed in or taken from the z-value of the selected end points.</i>	input	typed	snap, typed
z value <i>if the z mode method is typed, then the height (z-value) of the end points is the value in the field.</i>	input	0	
Ch interval <i>the chainage interval used when a chord approximation is needed for the arc.</i>	input	10	
Sweep angle <i>sweep angle for the arc - Note: clockwise is positive for sweep angles</i>	input		
Arc <i>The arc button is used to begin a new create if the previous one was cancelled.</i>	button		
Same as <i>After the same as button is chosen, another string is selected and information about it is used for the fields in this panel.</i>	button		

Panel Messages

Next step messages sent to the screen message area when selecting and accepting the centre point

```
<Arc centre> [picks][ ][menu]
<Arc centre> [picks][accepts][menu]
```

When selecting the start point of the arc

```
<Arc start> [picks][ ][menu]
<Arc start> [picks][accepts][menu]
```

Create Arc - Centre Point, Start and End Points

arc__centre_start_and_end_points

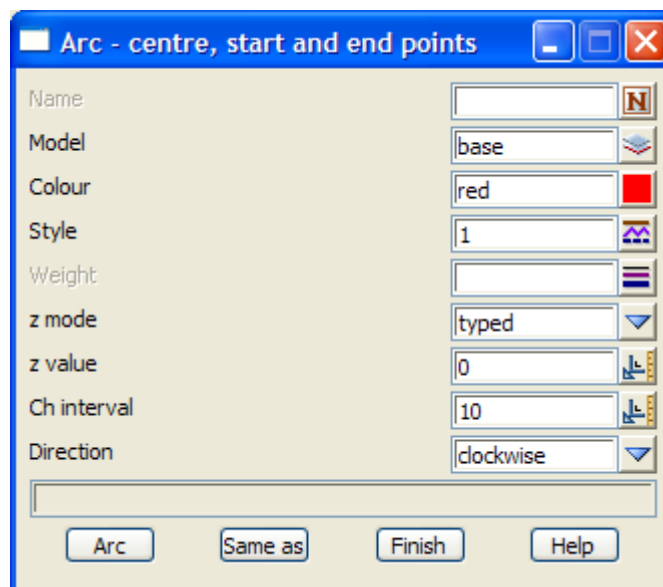
Position of option on menu: Strings =>Create =>Arcs =>Centre, 2 pts on arc

This option defines an arc by selecting a centre point, a start and end points for the arc and the direction (clockwise, anti-clockwise) that the arc travels in. The radius is calculated by the option and is simply the distance between the centre and start points.

It is difficult to choose the end point correctly so that it lies exactly on the arc since it only occurs when the distance between the centre and selected end point is exactly the radius of the arc.

Hence, the selected end point and arc direction is used to determine the sweep angle from the start point to the "end point to centre point" line. This is enough information to define the arc. The real end point is then calculated so that it **lies** on the arc.

After selecting the option, the **arc - centre, start and end points** panel is displayed.



To **create** an arc, the name, colour, model, chainage interval and direction are entered into the appropriate fields and then the centre point, start and end points of the arc selected with the cursor. The arc is then created using the information provided in the panel.

The fields and buttons used in the **arc - centre, start and end points** panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Name <i>the name of the new string.</i>	input		
Model <i>name of the model that the new string is in.</i>	input		available models
Colour <i>the colour of the new string.</i>	input	default colour	available colours
Style <i>line style of the string.</i>	input	1	available line styles
Weight <i>thickness of the string.</i>	input	0	

Create Arc - Centre, Radius, Start and End Points

arc__radius__centre__start_and_end_points

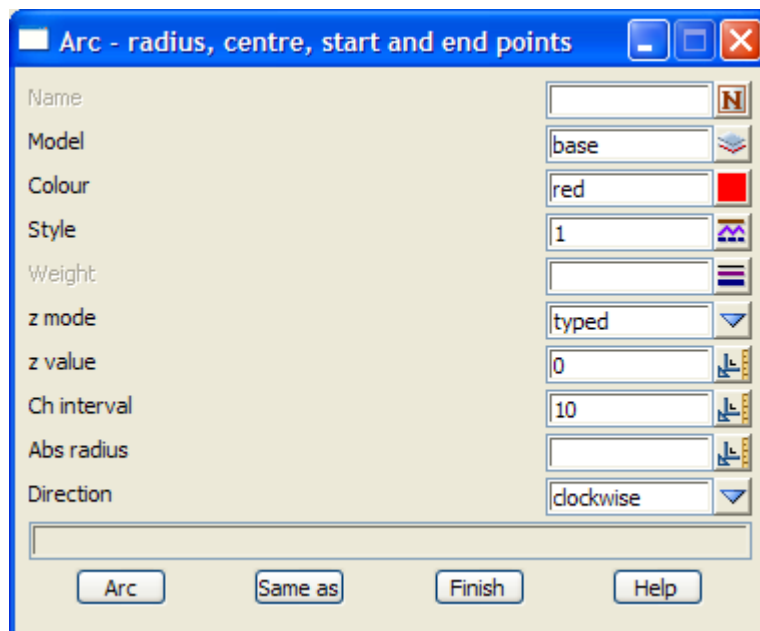
Position of option on menu: Strings =>Create =>Arcs =>Centre, radius, 2pts

This option defines an arc by the user setting a radius and direction of arc and then selecting the centre, start and end points for the arc.

Since the radius is given exactly, it is difficult to choose the start and end points so that they lie exactly on the arc. This only occurs when the distance between the centre and selected start and end points is exactly the radius of the arc.

Hence, the selected start point is dropped perpendicularly onto the arc to give the real start point. Similarly, for the real end point.

After selecting the option, the **arc - radius, centre, start and end points** panel is displayed.



To **create** an arc, the name, colour, model, chainage interval, radius and direction are entered into the appropriate fields and then the centre point, start and end points of the arc selected with the cursor. The arc is then created using the information provided in the panel.

The fields and buttons used in the **arc - radius, centre, start and end points** panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Name <i>the name of the new string.</i>	input		
Model <i>name of the model that the new string is in.</i>	input		available models
Colour <i>the colour of the new string.</i>	input	default colour	available colours
Style <i>line style of the string.</i>	input	1	available line styles
Weight <i>thickness of the string.</i>	input	0	

z mode	input	typed	snap, typed
	<i>the method of specifying the z-value for the end points of the arc. It can be typed in or taken from the z-value of the selected end points.</i>		
z value	input	0	
	<i>if the z mode method is typed, then the height (z-value) of the end points is the value in the field.</i>		
Ch interval	input	10	
	<i>the chainage interval used when a chord approximation is needed for the arc.</i>		
Abs radius	input		
	<i>the absolute radius of the arc.</i>		
Direction	input	clockwise	clockwise, anti-clockwise
	<i>the direction for the arc</i>		
Arc	button		
	<i>The arc button is used to begin a new create if the previous one was cancelled.</i>		
Same as	button		
	<i>After the same as button is chosen, another string is selected and information about it is used for the fields in this panel.</i>		

Panel Messages

Next step messages sent to the screen message area when selecting and accepting the centre point

```
<Arc centre> [picks][ ][menu]
<Arc centre> [picks][accepts][menu]
```

When selecting the start point of the arc

```
<Arc start> [picks][ ][menu]
<Arc start> [picks][accepts][menu]
```

When selecting the end point of the arc

```
<Arc end> [picks][ ][menu]
<Arc end> [picks][accepts][menu]
```

Create Arc - Three Points on Arc

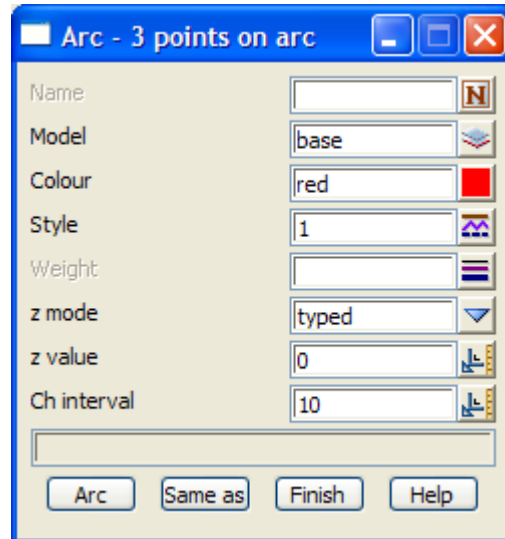
arc__3_points_on_arc

Position of option on menu: Strings =>Create =>Arcs =>3 pts on arc

This option defines an arc by selecting three points that lie on the arc.

The selected arc points are the start point, a point between the start and end point, and the end point. The three points must be selected in that order.

After selecting the option, the **arc - 3 points on arc** panel is displayed.



To **create** an arc, the name, colour, model and chainage interval are entered into the appropriate fields and then three points - start point, point between the start and end point, and the end point- which lie on the arc are selected with the cursor.

After the three points are picked, the arc is created using the information provided in the panel.

After a arc is defined, the option does not terminate. Another arc can be created by simply modifying any of the information that needs changing in the **arc - 3 points on arc** panel and then selecting three points on a new arc.

The fields and buttons used in the **arc - 3 points on arc** panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Name <i>the name of the new arc.</i>	input		
Model <i>name of the model that the new arc is in.</i>	input		available models
Colour <i>the colour of the new arc.</i>	input	default colour	available colours
Style <i>line style of the arc.</i>	input	1	available line styles
Weight <i>thickness of the string.</i>	input	0	
z mode <i>the method of specifying the z-value for the arc. It can be typed in or taken from the z-value of the selected end points.</i>	input	typed	snap, typed
z value <i>if the z mode method is typed, then the height (z-value) of the end points is the value in the field.</i>	input	0	
Ch interval <i>the chainage interval used when a chord approximation is needed for the arc.</i>	input	10	
Arc <i>The arc button is used to begin a new create if the previous one was cancelled.</i>	button		

Same as button

*After the **same as** button is chosen, another string is selected and information about it is used for the fields in this panel.*

Panel Messages

Next step messages sent to the screen message area when selecting and accepting the start point

<Arc start> [picks][][menu]
<Arc start> [picks][accepts][menu]

When selecting and accepting the second point

<Point on arc> [picks][][menu]
<Point on arc> [picks][accepts][menu]

When selecting and accepting the end point

<End of arc> [picks][][menu]
<End of arc> [picks][accepts][menu]

Create Arc - Start Point, Radius, Arc Length and Start Bearing

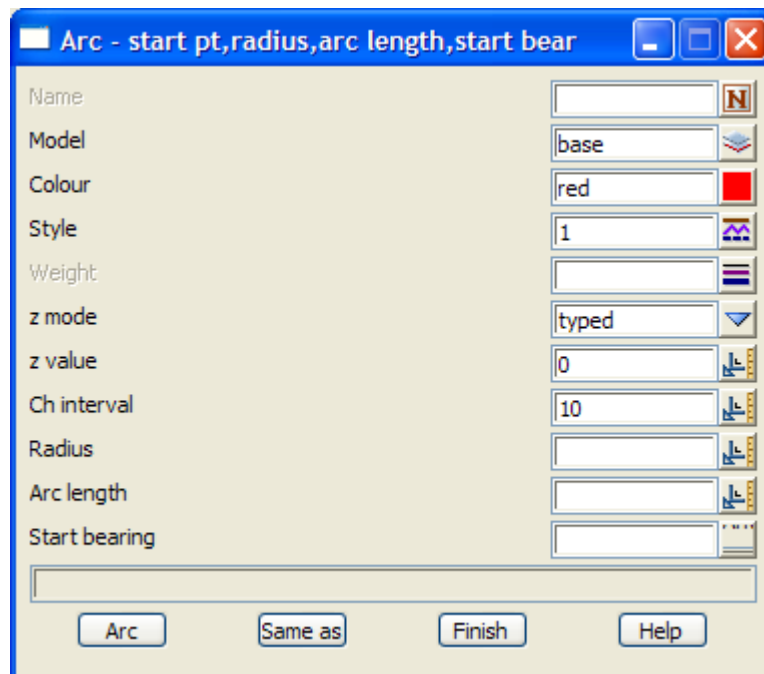
arc__start_pt_radius_arc_length_start_bear

Position of option on menu: Strings =>Create =>Arcs =>Start, rad, arc, bear

This option defines an arc by giving the radius, the arc length and start bearing and then selecting a start point for the arc.

This is enough information for the option to calculate the centre and end points and the direction of the arc, and hence, fully define the arc.

After selecting the option, the **arc - start pt, radius, arc length, start bear** panel is displayed.



To **create** an arc, the name, colour, model, chainage interval, radius, arc length and start bearing are entered into the appropriate fields and then the start point of the arc selected with the cursor. The arc is then created using the information provided in the panel.

The new fields and buttons used in the **arc - start pt, radius, arc length, start bear** panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Name <i>the name of the new string.</i>	input		
Model <i>name of the model that the new string is in.</i>	input		available models
Colour <i>the colour of the new string.</i>	input	default colour	available colours
Style <i>line style of the string.</i>	input	1	available line styles
Weight <i>thickness of the string.</i>	input	0	
z mode <i>the method of specifying the z-value for the end points of the arc. It can be typed in or taken from the z-</i>	input	typed	snap, typed

value of the selected end points.

z value input 0

if the z mode method is typed, then the height (z-value) of the end points is the value in the field.

Ch interval input 10

the chainage interval used when a chord approximation is needed for the arc.

Radius input

radius of the arc.

Arc length input

length of the arc from the start to the end point.

Start bearing input

bearing of the tangent to the arc at the start point.

Arc button

*The **arc** button is used to begin a new create if the previous one was cancelled.*

Same as button

*After the **same as** button is chosen, another string is selected and information about it is used for the fields in this panel.*

Panel Messages

Next step messages sent to the screen message area when selecting the start point of the arc

<Arc start> [picks][][menu]

<Arc start> [picks][accepts][menu]

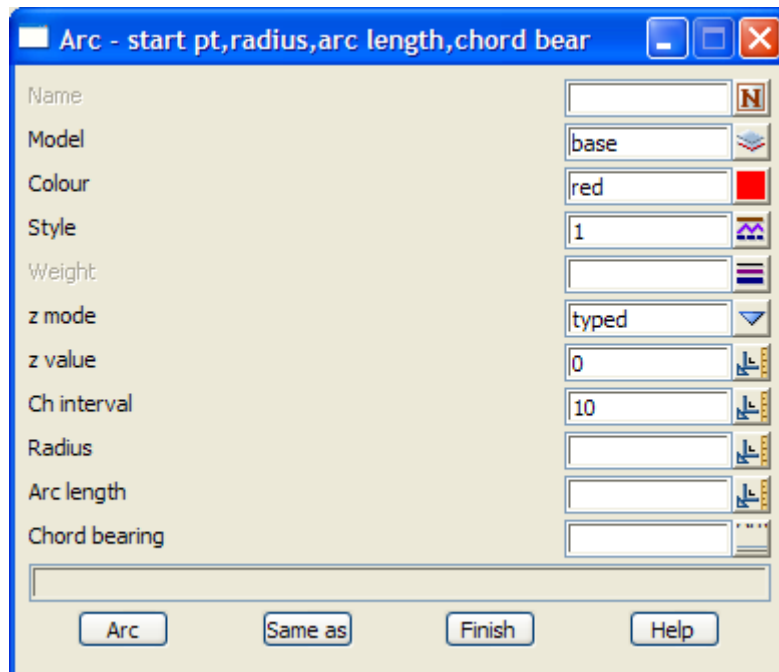
Create Arc - Start Point, Radius, Arc Length and Chord Bearing

arc__start_pt_radius_arc_length_chord_bear

Position of option on menu: Strings =>Create =>Arcs =>Start, rad, arc, ch bear

This option defines an arc by giving the radius, the arc length and chord bearing and then selecting a start point for the arc. This is enough information for the option to calculate the centre and end points and the direction of the arc, and hence, fully define the arc.

After selecting the option, the **arc - start pt, radius, arc length, chord bear** panel is displayed.



To **create** an arc, the name, colour, model, chainage interval, radius, arc length and chord bearing are entered into the appropriate fields and then the start point of the arc selected with the cursor. The arc is then created using the information provided in the panel.

The new fields and buttons used in the panel have the following functions.

Field	Description	Type	Defaults	Pop-Up
Name	<i>the name of the new string.</i>	input		
Model	<i>name of the model that the new string is in.</i>	input		available models
Colour	<i>the colour of the new string.</i>	input	default colour	available colours
Style	<i>line style of the string.</i>	input	1	available line styles
Weight	<i>thickness of the string.</i>	input	0	
z mode	<i>the method of specifying the z-value for the end points of the arc. It can be typed in or taken from the z-value of the selected end points.</i>	input	typed	snap, typed

z value input 0
if the z mode method is typed, then the height (z-value) of the end points is the value in the field.

Ch interval input 10
the chainage interval used when a chord approximation is needed for the arc.

Radius input
radius of the arc.

Arc length input
length of the arc from the start to the end point.

Chord bearing input
bearing of the chord to the arc at the start point.

Arc button
The arc button is used to begin a new create if the previous one was cancelled.

Same as button
*After the **same as** button is chosen, another string is selected and information about it is used for the fields in this panel.*

Panel Messages

Next step messages sent to the screen message area when selecting the start point of the arc

<Arc start> [picks][][menu]

<Arc start> [picks][accepts][menu]

Create - Circles

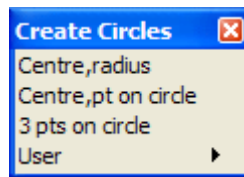
create_circles

Position of menu: Strings =>Create =>Circles

The create circles option is used to create **12d** Model circles.

A **12d** Model **circle** has no start and end points but is defined by a centre point and a radius. The circle has a constant height (z-value).

For convenient **12d** Model includes a variety of methods for creating circles. On walking-right on the circles option, the create circles menu is displayed giving all the different methods for creating circles.



Each option in the create circles menu fires up its own special panel to collect the necessary information for defining the circle.

The mouse is used to select the special points required for the circle definitions. For example, the circle - centre, radius option required the value of the radius to be entered into the **circle - centre point, radius** panel and the centre point is selected using the cursor.

Unlike the other strings created under **strings=>create**, the circles can be created immediately without needing any options from the circle editor. Consequently, after a circle is defined, the create panel is not removed and is left on the screen to create another circle. Any information that needs modifying is changed in the **circle** panel and is used for the new create.

New circles are created until either the panel is removed by selecting the **finish** or **[X]** button, or the create terminated by selecting **cancel** from the **pick ops** menu in which case the panel will be left on the screen. In the last case, the **circle** button is then used to begin a new create sequence.

Each of the methods for creating circles and arcs will now be described.

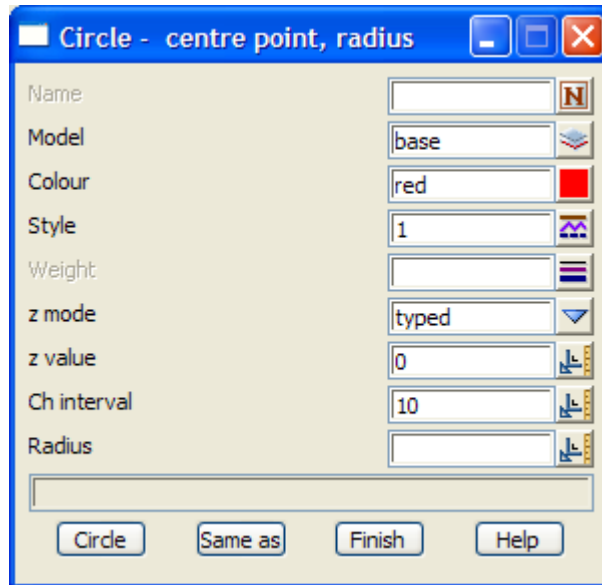
Create Circle - Centre Point, Radius

circle__centre_point__radius

Position of option on menu: Strings =>Create =>Circles =>Centre, radius

This option defines a circle by supplying a typed radius and selecting a centre point with the mouse

After selecting the option, the **circle - centre point, radius** panel is displayed.



To **create** a circle, the name, colour, model, chainage interval and radius are entered into the appropriate fields and the centre point selected with the cursor. The circle is then created using the information provided in the panel.

The new fields and buttons used in the **circle - centre point, radius** panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Name <i>the name of the new string.</i>	input		
Model <i>name of the model that the new string is in.</i>	input		available models
Colour <i>the colour of the new string.</i>	input	default colour	available colours
Style <i>line style of the string.</i>	input	1	available line styles
Weight <i>thickness of the string.</i>	input	0	
z mode <i>the method of specifying the z-value for the circle. It can be typed in or taken from the z-value of the selected centre point.</i>	input	typed	snap, typed
z value <i>if the z mode method is typed, then the height (z-value) of the circle is the value in the field.</i>	input	0	

Ch interval input 10

the chainage interval used when a chord approximation is needed for the circle.

Radius input 10

the radius for the circle.

Circle button

*The **circle** button is used to begin a new create if the previous one was cancelled.*

Same as button

*After the **same as** button is chosen, another string is selected and information about it is used for the fields in this panel.*

Panel Messages

Next step messages sent to the screen message when selecting and accepting the centre point are

<Circle centre> [picks][][menu]

<Circle centre> [picks][accepts][menu]

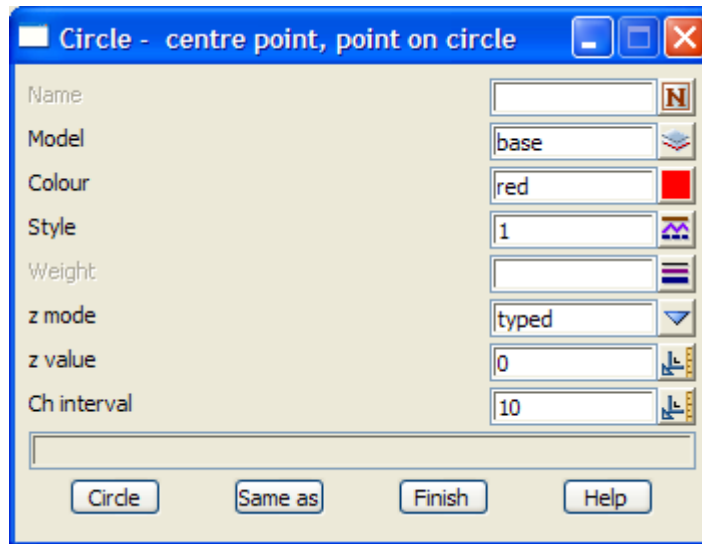
Create Circle - Centre Point, Point on Circle

circle__centre_point__point_on_circle

Position of option on menu: Strings =>Create =>Circles =>Centre, pt on circle

This option defines a circle by selecting a centre point and a point on the circle. The radius is automatically calculated by the option and is simply the distance between the two selected points.

After selecting the option, the **circle - centre point, point on circle** panel is displayed.



To **create** a circle, the name, colour, model and chainage interval are entered into the appropriate fields and the centre point and a point on the circle selected with the cursor. Then the circle is created using the information provided in the panel.

The new fields and buttons used in the **circle - centre point, point on circle** panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Name <i>the name of the new string.</i>	input		
Model <i>name of the model that the new string is in.</i>	input		available models
Colour <i>the colour of the new string.</i>	input	default colour	available colours
Style <i>line style of the string.</i>	input	1	available line styles
Weight <i>thickness of the string.</i>	input	0	
z mode <i>the method of specifying the z-value for the circle. It can be typed in or taken from the z-value of the selected centre point.</i>	input	typed	snap, typed
z value <i>if the z mode method is typed, then the height (z-value) of the circle is the value in the field.</i>	input	0	

Ch interval input 10

the chainage interval used when a chord approximation is needed for the circle.

Circle button

*The **circle** button is used to begin a new create if the previous one was cancelled.*

Same as button

*After the **same as** button is chosen, another string is selected and information about it is used for the fields in this panel.*

How to Use the Panel to Create a Circle

- (a) The panel fields are filled in with the appropriate data for use in defining the circle.
- (b) The mouse is then used to select the centre point for the circle.

Messages sent to the screen message area when selecting and accepting the centre point

<Circle centre> [picks][][menu]

<Circle centre> [picks][accepts][menu]

When selecting a point on the circle

<Point on circle> [picks][][menu]

<Point on circle> [picks][accepts][menu]

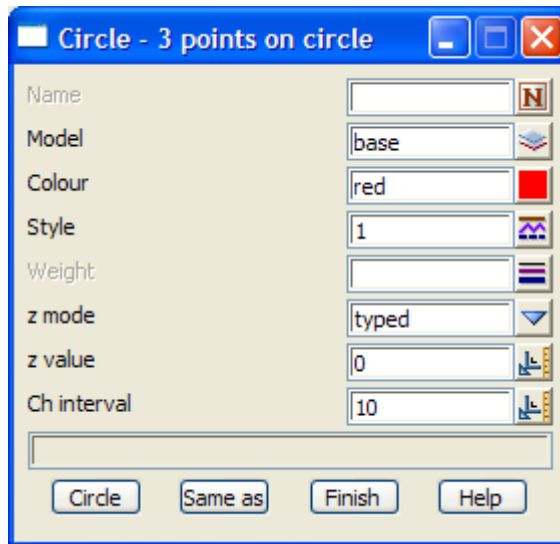
Create Circle - Three Points on Circle

circle__3_points_on_circle

Position of option on menu: Strings =>Create =>Circles =>3 pts on circle

This option defines a circle by selecting three points that all lie on the circle. The radius and centre point are automatically calculated by the option.

After selecting the option, the **circle - 3 points on circle** panel is displayed.



To **create** a circle, the name, colour, model and chainage interval are entered into the appropriate fields and then three points which lie on the circle are selected with the cursor. The circle is then created using the information provided in the panel.

The fields and buttons used in the **circle - 3 points on circle** panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Name <i>the name of the new string.</i>	input		
Model <i>name of the model that the new string is in.</i>	input		available models
Colour <i>the colour of the new string.</i>	input	default colour	available colours
Style <i>line style of the string.</i>	input	1	available line styles
Weight <i>thickness of the string.</i>	input	0	
z mode <i>the method of specifying the z-value for the circle. It can be typed in or taken from the z-value of the selected centre point.</i>	input	typed	snap, typed
z value <i>if the z mode method is typed, then the height (z-value) of the circle is the value in the field. if the z mode method is typed, then the height (z-value) of the circle is the value in the field.</i>	input	0	
Ch interval <i>the chainage interval used when a chord approximation is needed for the circle.</i>	input	10	

Circle button

The **circle** button is used to begin a new create if the previous one was cancelled.

Same as button

After the **same as** button is chosen, another string is selected and information about it is used for the fields in this panel.

Panel Messages

Next step messages sent to the screen message area when selecting and accepting the 1st point

<First point on circle> [picks][][menu]

<First point on circle> [picks][accepts][menu]

When selecting and accepting the second point

<Second point on circle> [picks][][menu]

<Second point on circle> [picks][accepts][menu]

When selecting and accepting the third point

<Third point on circle> [picks][][menu]

<Third point on circle> [picks][accepts][menu]

Create - Feature

create_feature_string

Position of option on menu: Strings =>Create =>Feature

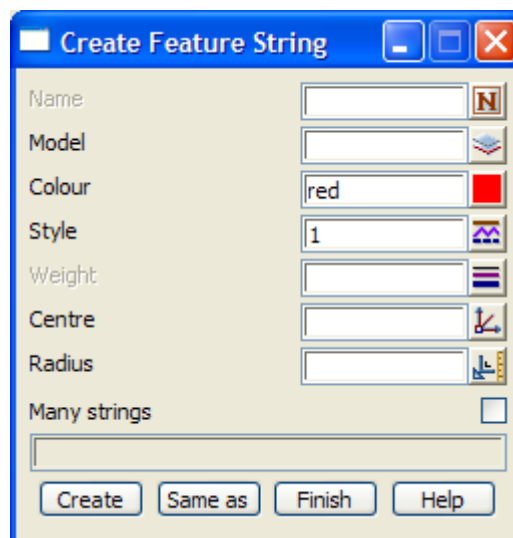
A feature string consists of a centre point (x,y,z) and a user given radius.

The difference between a circle and a feature string is that for a feature string the **centre point** is considered to be a valid (x,y,z) point but all the points on the circumference of the feature string are null values. Feature strings can be used to represent objects such as trees.

The **Many strings** tick-box is used when more than one string of the same type is to be created, If many strings is set to *tick*, when the current string creation is **Finished** or **Quit**, a new **Create Feature String** panel is placed on the screen with the same information in it as the string just created. If any of the information needs to be modified for the new string, simply change it in the **Create Feature String** panel fields before selecting the **Create** button for the new string. Hence a new string of the same type can be created without going back to the Create menu.

The **Same as** button is used to obtain information from an existing string (not necessarily of the same type) and pipe it into the name, colour, model, style, breakline type and height field of the **Create Feature String** panel.

After selecting the option, the **create feature string** panel is displayed.



The new fields and buttons used in the **create feature string** panel have the following functions.

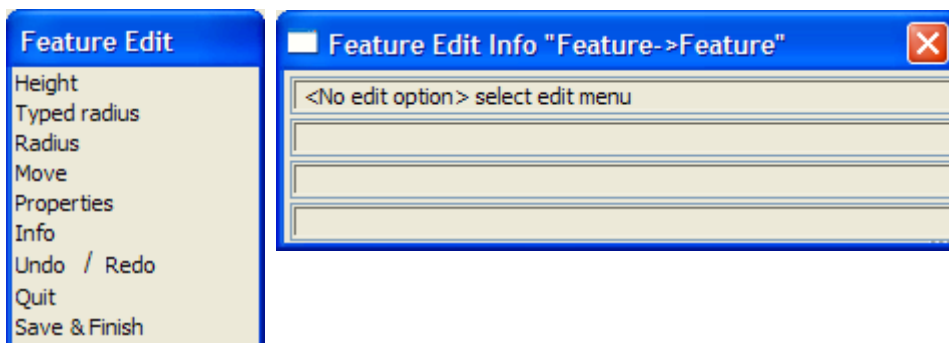
Field Description	Type	Defaults	Pop-Up
Name <i>the name of the new string.</i>	input		
Model <i>name of the model that the new string is in.</i>	input		available models
Colour <i>the colour of the new string.</i>	input	default colour	available colours
Style <i>line style of the string.</i>	input	1	available line styles
Weight <i>thickness of the string.</i>	input	0	
Centre <i>co-ordinates of the centre of the feature.</i>	input		xyz ops menu
Radius <i>the radius for the feature.</i>	input		
Many strings <i>if tick then after the current string is finished, a new create panel is placed on the screen with all the same values for the panel fields as the current string.</i>	tick		
Create <i>After the create button is chosen, the feature edit menu and feature edit info panel are displayed.</i>	button		
Same as <i>After the same as button is chosen, another string is selected and information about it is used for the fields in this panel.</i>	button		

Note - the centre co-ordinates can either be typed into the centre panel field, or if LB is clicked on [+]
for the centre panel field, the xyz ops menu comes up and the pick xyz option can be used from it to select a point as the arc centre.

Feature Edit

Like the arc creates, on selecting the **Create** button the feature string is immediately created. The feature edit menu and **feature edit info** panel are also placed on the screen at the same time

The feature edit menu and panel for a feature string are



For full information in the Feature Editor, go to the section “Feature Edit”

Create - Pipe

create_pipe_string

Position of option on menu: Strings =>Create =>Pipe

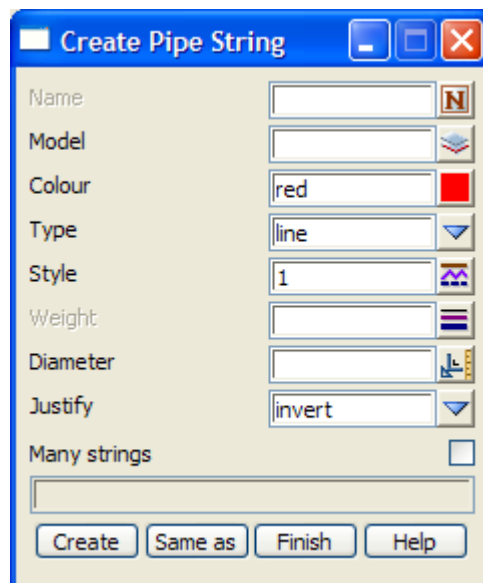
A pipe string is the same as a 3d string except that the pipe string also has a diameter hence the options for creating and editing a pipe string are almost the same as for a 3d string.

The main difference is that there are no options to open and close a pipe string and there is an additional option for modifying the pipe diameter.

The **Many strings** tick-box is used when more than one string of the same type is to be created, If many strings is set to *tick*, when the current string creation is Finished or Quit, a new **Create Pipe String** panel is placed on the screen with the same information in it as the string just created. If any of the information needs to be modified for the new string, simply change it in the **Create Pipe String** panel fields before selecting the **Create** button for the new string. Hence a new string of the same type can be created without going back to the Create menu.

The **Same as** button is used to obtain information from an existing string (not necessarily of the same type) and pipe it into the name, colour, model, style breakline type and height field of the **Create Pipe String** panel.

On selecting the Pipe string option, the **Create Pipe String** panel is displayed.



To **create** a new pipe string, the name, colour, model, point-line type and diameter of the new string are entered into the appropriate fields and the **create** button selected.

The new fields and buttons used in the **create pipe string** panel have the following functions.

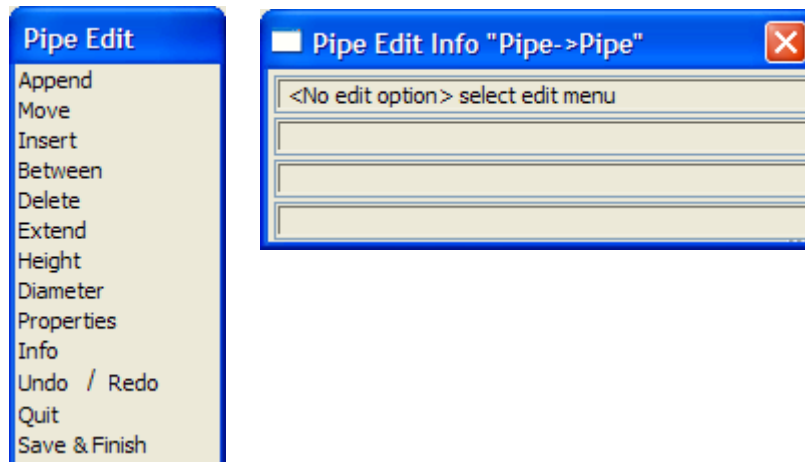
Field Description	Type	Defaults	Pop-Up
Name <i>the name of the new string.</i>	input		
Model <i>name of the model that the new string is in.</i>	input		available models
Colour <i>the colour of the new string.</i>	input	default colour	available colours
Style <i>line style of the string.</i>	input	1	available line styles

Weight	input	0	
	<i>thickness of the string.</i>		
Diameter	input	0	
	<i>diameter of the pipe</i>		
Justify	input	invert	invert, centre, overt
	<i>justification of the pipe with respect to the co-ordinates given for the pipe string.</i>		
Many strings	tick		
	<i>if tick then after the current string is finished, a new create panel is placed on the screen with all the same values for the panel fields as the current string.</i>		
Create	button		
	<i>After the create button is chosen, the pipe edit menu and pipe edit info panel are displayed.</i>		
Same as	button		
	<i>After the same as button is chosen, another string is selected and information about it is used for the fields in this panel.</i>		

Pipe Edit

On selecting the **Create** button in the **Create Pipe String** panel the **Pipe Edit** menu and **Pipe Edit info** panel are placed on the screen.

The **Pipe Edit** menu and panel for a pipe string are



To create a new pipe string, select the **Append** option from the **Pipe Edit** menu.

The **Append** option is used to add points to either end of an existing string, or in the case of a new string, places the 1st point and then begins appending points to the 1st point.

For all pipe strings, a cross is then drawn in each plan view that the string's model is on, and the cross follows the cursor around the screen. If the string's model is **not** added to any plan view, the model is automatically added to **all** plan views.

After the cross is on the screen (moving with the cursor), clicking LB and accepting with MB selects the **1st** vertex of the string (using the appropriate snaps).

The string is then drawn from the 1st vertex to the cursor position, which represents the second vertex of the string. Clicking LB and accepting with MB selects the second string vertex and the process repeats for subsequent string vertices.

Now that the string is created, all the edit option on the string's **Pipe Edit** menu are usable.

The options in the **Pipe Edit** menu are not only used for placing the initial vertices of the string,

but for editing the string once it is created. Since the **Append** and other options in the **Pipe Edit** menu are identical to the options used when editing an existing string, they will be discussed in detail in the **string Editor** section.

For full information in the **Pipe Editor**, go to the section “**Pipe Edit**”

Create - Polyline

create_polyline_string

Position of option on menu: Strings =>Create =>Polyline

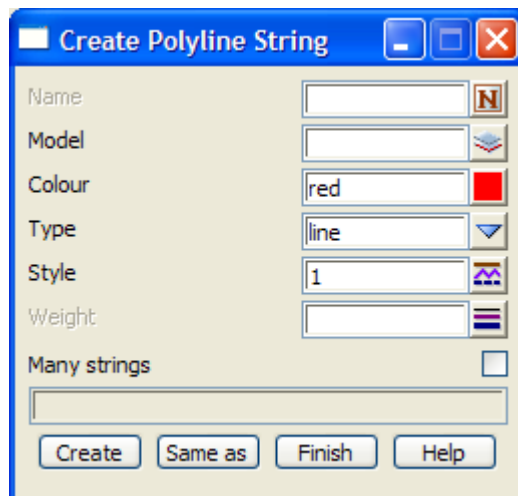
A polyline string is similar to a 3d string except that it can have either straight lines or arcs joining the (x,y,z) points of the string. The arcs are plan arcs with possibly a different z at either end and the z values are linearly interpolated between the end points. Hence in a long section, the end points are joined by a straight lines for both line and arc segments of the polyline.

Creating and editing a polyline string is very similar to a 3d string. The only major difference is that a radius is required at each string segment (a radius of 0 means no arc, just a straight line).

The **Many strings** tick-box is used when more than one string of the same type is to be created, If many strings is set to *tick*, when the current string creation is Finished or Quit, a new **Create Polyline String** panel is placed on the screen with the same information in it as the string just created. If any of the information needs to be modified for the new string, simply change it in the **Create Polyline String** panel fields before selecting the **Create** button for the new string. Hence a new string of the same type can be created without going back to the Create menu.

The **Same as** button is used to obtain information from an existing string (not necessarily of the same type) and pipe it into the name, colour, model, style breakline type and height field of the **Create Polyline String** panel.

On selecting the polyline string option, the **create polyline string** panel is displayed.



To **create** a new polyline string, the name, colour, model, point-line type and linestyle of the new string are entered into the appropriate fields and the **create** button selected.

The new fields and buttons used in the **create pipe string** panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Name <i>the name of the new string.</i>	input		
Model <i>name of the model that the new string is in.</i>	input		available models
Colour <i>the colour of the new string.</i>	input	default colour	available colours
Style <i>line style of the string.</i>	input	1	available line styles

Weight input 0

thickness of the string.

Many strings tick

if tick then after the current string is finished, a new create panel is placed on the screen with all the same values for the panel fields as the current string.

Create button

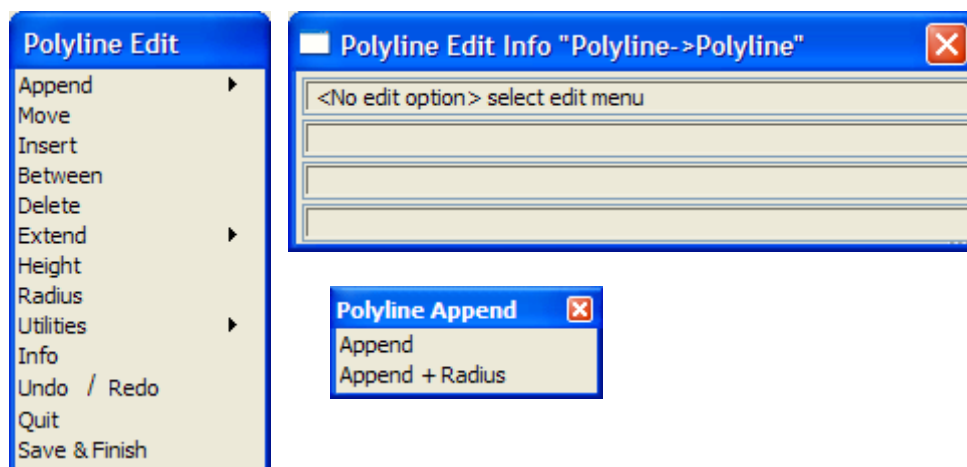
*After the **create** button is chosen, the **polyline edit menu** and **polyline edit info** panel are displayed.*

Same as button

*After the **same as** button is chosen, another string is selected and information about it is used for the fields in this panel.*

Polyline Edit

Selecting the **create** button in the **create polyline string** panel the **polyline edit menu** and **polyline edit info** panels are placed on the screen.



To create a new polyline string, the user must select one of the two append options (**Append** or **Append + radius**) on the **Append** walk-right of the **Polyline Edit** menu. The which **Append** option to simply creates points which are joined by a straight segment whereas the **Append + radius** create points with a radius for the segment.

The **Append** options are used to add points to either end of an existing string, or in the case of a new string, places the 1st point and then begins appending points to the 1st point.

For all polyline strings, a cross is then drawn in each plan view that the string's model is on, and the cross follows the cursor around the screen. If the string's model is **not** added to any plan view, the model is automatically added to **all** plan views.

After the cross is on the screen (moving with the cursor), clicking LB and accepting with MB selects the **1st** vertex of the string (using the appropriate snaps).

If **Append + radius** was selected, the user will then be prompted for the radius of the segment being placed.

The string is then drawn from the 1st vertex to the cursor position, which represents the second vertex of the string. Clicking LB and accepting with MB selects the second string vertex and the process repeats for subsequent string vertices.

Now that the string is created, all the edit option on the string's **Polyline Edit** menu are usable.

The options in the **Polyline Edit** menu are not only used for placing the initial vertices of the string, but for editing the string once it is created. Since the **Append** and other options in the

Polyline Edit menu are identical to the options used when editing an existing string, they will be discussed in detail in the string Editor section.

For full information in the Polyline Editor, go to the section “Polyline Edit”

Create - Super

`create_super_string`

Position of option on menu: Strings =>Create =>Super

A super string is a combination and generalisation of a 4d string, a pipe string and a polyline string.

A super strings consists of a series of (x,y) vertices, plus it can have either straight lines or arcs joining the vertices of the string.

At each vertex, the super string has:

- height
- text
- visibility
- tinability (contourability)
- point number
- symbol
- user defined attributes

For each segment, the super string has:

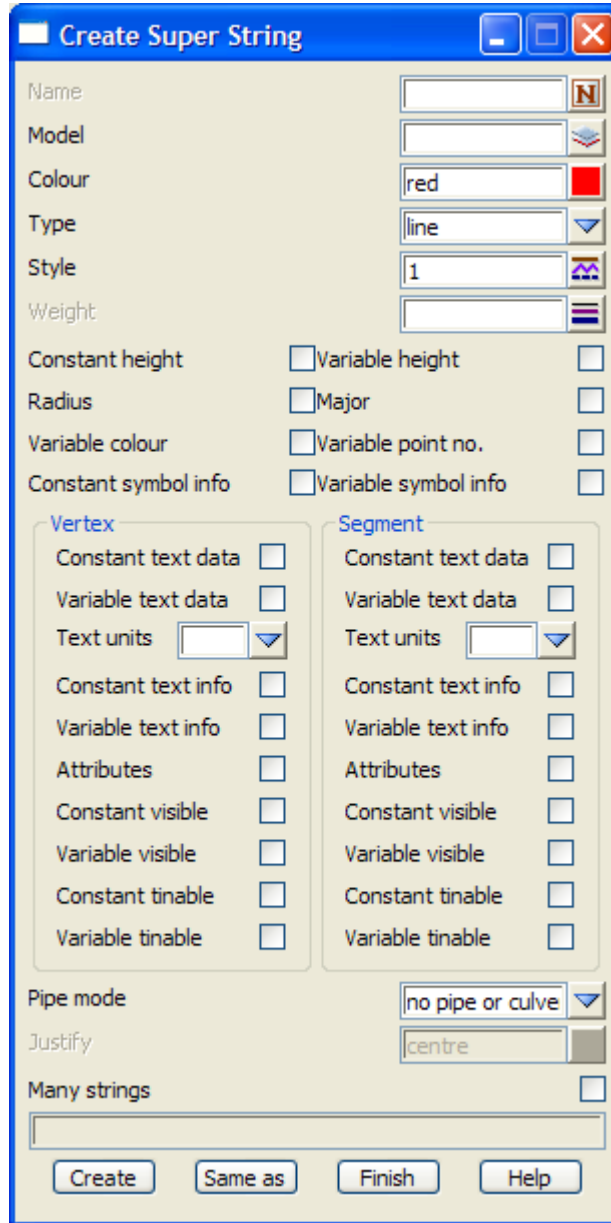
- plan radius
- colour
- text
- tinability (breakline)
- pipe diameter or box dimensions
- visibility
- user defined attributes

Creating and editing a super string is very similar to a polyline string in that a radius is required at each string segment (a radius of 0 means no arc, just a straight line). However there are many more choices about what is defined for each vertex and segment of the super string.

The **Many strings** tick-box is used when more than one string of the same type is to be created, If many strings is set to *tick*, when the current string creation is Finished or Quit, a new **Create Super String** panel is placed on the screen with the same information in it as the string just created. If any of the information needs to be modified for the new string, simply change it in the **Create Super String** panel fields before selecting the **Create** button for the new string. Hence a new string of the same type can be created without going back to the Create menu.

The **Same as** button is used to obtain information from an existing string (not necessarily of the same type) and pipe it into the name, colour, model, style breakline type and height field of the **Create Super String** panel.

On selecting the super string option, the **Create Super String** panel is displayed.



To **create** a new super string, the name, colour, model, point-line type and linestyle of the new string are entered into the appropriate fields, plus settings any required settings in the tick boxes, and the **create** button selected.

The new fields and buttons used in the **create pipe string** panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Name <i>the name of the new string.</i>	input		
Model <i>name of the model that the new string is in.</i>	input		available models
Colour <i>the colour of the new string.</i>	input	default colour	available colours
Style <i>line style of the string.</i>	input	1	available line styles

Weight input 0

thickness of the string.

Many strings tick

if tick then after the current string is finished, a new create panel is placed on the screen with all the same values for the panel fields as the current string.

Create button

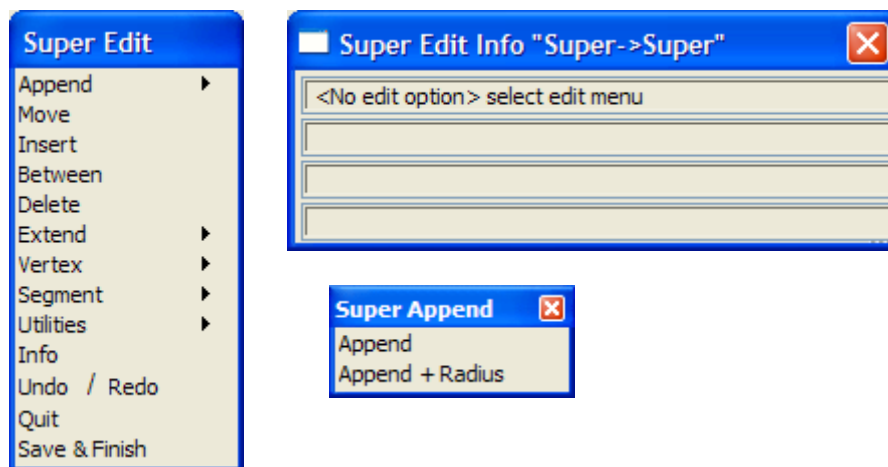
*After the **create** button is chosen, the **super edit menu** and **super edit info panel** are displayed.*

Same as button

*After the **same as** button is chosen, another string is selected and information about it is used for the fields in this panel.*

Super Edit

On selecting the **Create** button in the **Create Super String** panel the Super Edit menu and Super Edit Info panels are placed on the screen.



To create a new super string, the user must select one of the two append options (**Append** or **Append + radius**) on the **Append** walk-right of the Super Edit menu. The **Append** option simply creates points which are joined by a straight segment whereas the **Append + radius** create points with a radius for the segment.

For all super strings, a cross is then drawn in each plan view that the string's model is on, and the cross follows the cursor around the screen. If the string's model is **not** added to any plan view, the model is automatically added to **all** plan views.

After the cross is on the screen (moving with the cursor), clicking LB and accepting with MB selects the **1st** vertex of the string (using the appropriate snaps).

If **Append + radius** was selected, the user will then be prompted for the radius of the segment being placed.

The string is then drawn from the 1st vertex to the cursor position, which represents the second vertex of the string. Clicking LB and accepting with MB selects the second string vertex and the process repeats for subsequent string vertices.

Now that the string is created, all the edit option on the string's Super Edit menu are usable.

The options in the Super Edit menu are not only used for placing the initial vertices of the string, but for editing the string once it is created. Since the **Append** and other options in the Super Edit menu are identical to the options used when editing an existing string, they will be discussed in detail in the string Editor section.

For full information in the Super Editor, go to the section “Super Edit”

Create - Text

create_text_string

Position of option on menu: Strings =>Create =>Text

A text string consists of

- (a) the text
- (b) an (x,y) position for the text
- (c) a text style
- (d) a justification
- (e) the height of the text in pixels or world units
- (f) the x factor and slant of the text
- (g) the colour of the text
- (h) the angle to write the text at

The default text style uses a non-proportional font but user defined fonts can be proportional or non-proportional.

The justification of the text with respect to text string's (x,y) position is user specified.

The text angle is measured in a counter- clockwise direction with respect to the horizontal axis.

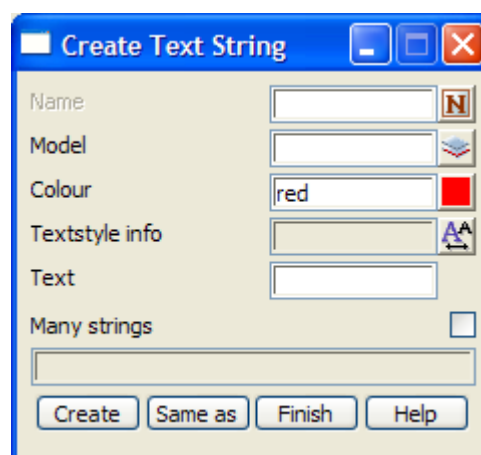
Note - deleting text

Text is deleted as a normal string with the picking point at the text string's definition point. The relationship of the definition point and the text depends on the text offset and justification

The **Many strings** tick-box is used when more than one string of the same type is to be created, If many strings is set to *tick*, when the current string creation is Finished or Quit, a new **Create Text String** panel is placed on the screen with the same information in it as the string just created. If any of the information needs to be modified for the new string, simply change it in the **Create Text String** panel fields before selecting the **Create** button for the new string. Hence a new string of the same type can be created without going back to the Create menu.

The **Same as** button is used to obtain information from an existing string (not necessarily of the same type) and pipe it into the name, colour, model, style breakline type and height field of the **Create Text String** panel.

On selecting the text string option, the **create text string** panel is displayed.



To **create** a new text string, the name, colour, model, size, offset, justification, angle and actual text of the new string are entered into the appropriate fields and the **create** button selected.

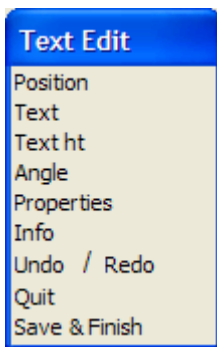
The new fields and buttons used in the **create text string** panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Name <i>the name of the new string.</i>	input		
Model <i>name of the model that the new string is in.</i>	input		available models
Colour <i>the colour of the new string.</i>	input	default colour	available colours
Textstyle info <i>textstyle information.</i>	input		
Text <i>the actual text.</i>	input		
Many strings <i>if tick then after the current string is finished, a new create panel is placed on the screen with all the same values for the panel fields as the current string.</i>	tick		
Create <i>After the create button is chosen, the text edit menu and text edit info panel are displayed.</i>	button		
Same as <i>After the same as button is chosen, another string is selected and information about it is used for the fields in this panel.</i>	button		

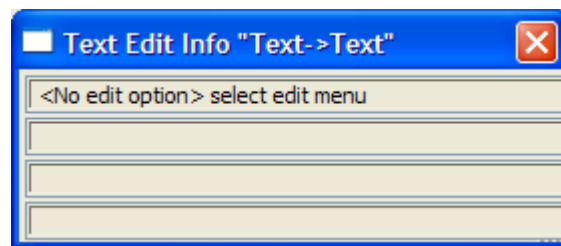
Text Edit

On selecting the **create** button in the **create text string** panel the text edit menu and text edit info panel are placed on the screen.

The text edit menu for a text string is and the **text edit** panel is



(x,y) position of text
define the actual text
text height
text angle
bring up attribute panel
toggle edit info panel
undo/redo
quit the create
finish the text edit



To creating a new text string, the user must first select the Position option from the Text edit menu. Then after selecting a position, the text is created and displayed (if the model is on the view).

For full information in the Text Editor, go to the section "Text Edit"

Create - Control Stations

Position of option on menu: Strings =>Create =>Create Control Stations

This option is documented in Survey =>Extras =>Create Control stations in the section "Create Control Stations" in the Chapter "Survey"

Old

string_create_old

Position of option on menu: Strings =>Create =>Old

These old options are the string creation options that were available before *12d Model 8* was released.

The Create option is used to produce **new** strings. If a string already exists, the Editor option is used to modify it.

The Create walk-right menu contains options to create 2d, 3d, 4d, alignment, super alignment, circles, arcs, feature, pipe, polyline, super and text strings.

Each string type has its own special information so by choosing the appropriate type to be created, only information needed for that type of string is asked for.

Once a string has been created, it can be converted to most of the other string types using the string Convert option.

To create a new string of the same type and with similar header information as an existing string, the same as option is selected from the String Create menu.

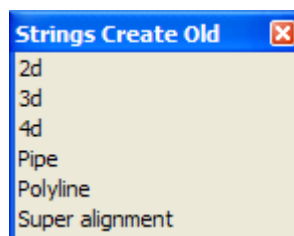
Notes

1. Depending on its breakline (point-line) type, a string with default style ("1") is displayed with crosses at each of its vertex (point type) or with straight lines joining the vertices (line type).

Linestyles can be defined that drawn lines between the points even though the breakline type is **point**.

2. The string vertices are also called intersection points (IP's).

The String Create Old walk-right menu is



The string creation process is similar for each string type and for editing strings as well.

For	2d	"Create - 2d (pre V8)"
	3d	"Create - 3d (pre V8)"
	4d	"Create - 4d (Pre V8)"

Create - 2d (pre V8)

create_2d_string

Position of option on menu: Strings =>Create =>Old =>2d

A 2d string consists of a series of (x,y) vertices all with the same z-value (height). 2d strings are often referred to as "contour strings" because contours are the most common example of a string with a constant height.

The **Many strings** tick-box is used when more than one string of the same type is to be created, If many strings is set to *tick*, when the current string creation is Finished or Quit, a new **Create 2d String** panel is placed on the screen with the same information in it as the string just created. If any of the information needs to be modified for the new string, simply change it in the **Create 2d**

String panel fields before selecting the **Create** button for the new string. Hence a new string of the same type can be created without going back to the Create menu.

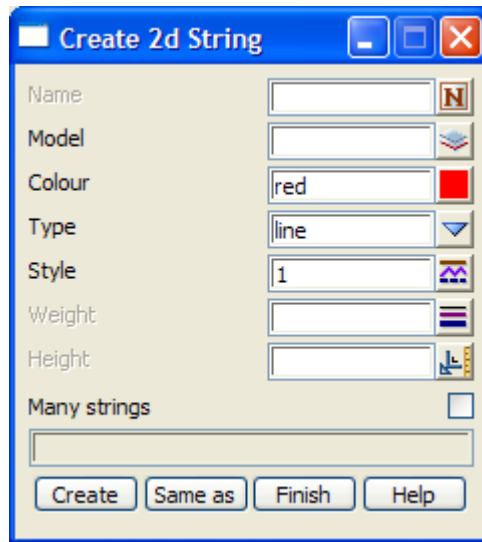
The **Same as** button is used to obtain information from an existing string (not necessarily of the same type) and pipe it into the name, colour, model, style, breakline type and height field of the **Create 2d String** panel.

From **12d Model 8** onwards, the default is to create **2d super strings** rather than the **2d strings** used up to **12d Model 7**. A **2d super string** is a **super string** with **Constant height**. That is, there is only one z-value for the entire string. The advantage of using a **2d super string** is that all the CAD options will work for it and it can be given point id's for setout.

The older 2d string create options are still available under

Strings =>Create =>Old

On selecting the 2d string option, the **create 2d string** panel is displayed.



The default values for the panel fields are taken from the **CAD Controlbar** (see “**CAD, Symbol and Text Controlbars**”)

To **create a new** 2d string, the name, colour, model, point-line type and height of the new string are entered into the appropriate fields and the **Create** button selected.

The new fields and buttons used in the **create 2d string** panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Name <i>the name of the new string.</i>	input		
Model <i>name of the model that the new string is in.</i>	input		available models
Colour <i>the colour of the new string.</i>	input	default colour	available colours
Type <i>breakline type (point-line type) of the string.</i>	input	line	line, point
Style <i>line style of the string.</i>	input	1	available line styles
Weight <i>thickness of the string.</i>	input	0	

Height input

height (z-value) of the entire string.

Many strings tick

if tick then after the current string is finished, a new create panel is placed on the screen with all the same values for the panel fields as the current string.

Create button

*After the **create** button is chosen, the 2d edit menu and 2d edit info panel are displayed.*

Same as button

*After the **same as** button is chosen, another string is selected and information about it is used for the fields in this panel.*

Finish button

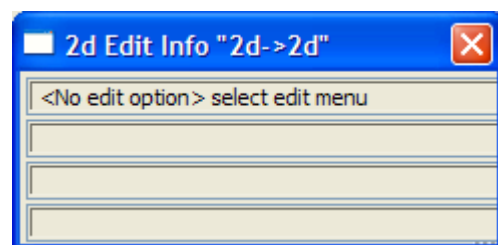
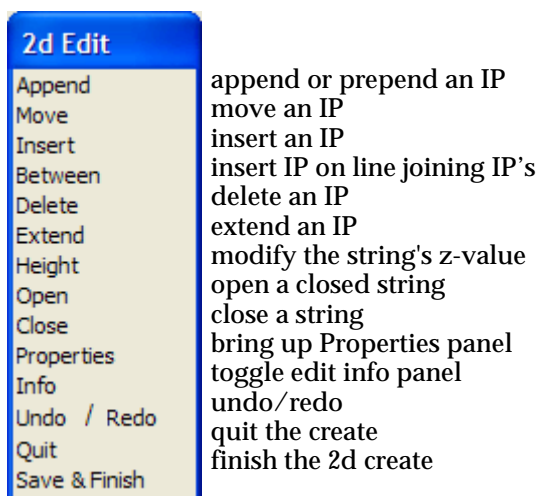
*end the option, **don't** proceed to the edit stage.*

2d Edit

On selecting the **Create** button in the **Create 2d String** panel the 2d edit menu and **2d Edit Info** panel are placed on the screen.

The 2d edit menu for a 2d string is

and the **2d edit info** panel is



To create a new 2d string, select the **Append** option from the 2d Edit menu.

The **Append** option is used to add points to either end of an existing string, or in the case of a new string, places the 1st point and then begins appending points to the 1st point.

For all 2d strings, a cross is then drawn in each plan view that the string's model is on, and the cross follows the cursor around the screen. If the string's model is **not** added to any plan view, the model is automatically added to **all** plan views.

After the cross is on the screen (moving with the cursor), clicking LB and accepting with MB selects the **1st** vertex of the string (using the appropriate snaps).

The string is then drawn from the 1st vertex to the cursor position, which represents the 2nd vertex of the string. Clicking LB and accepting with MB selects the second string vertex and the process repeats for subsequent string vertices.

Now that the string is created, all the edit option on the string's 2d Edit menu are usable.

The options in the 2d Edit menu are not only used for placing the initial vertices of the string, but for editing the string once it is created. Since the **Append** and other options in the 2d Edit menu are identical to the options used when editing an existing string, they will be discussed in detail

in the string Editor section.

For full information in the 2d Editor, go to the section “2d Edit”

Create - 3d (pre V8)

create_3d_string

Position of option on menu: Strings =>Create =>Old =>3d

A 3d string consists of a series of (x,y,z) points.

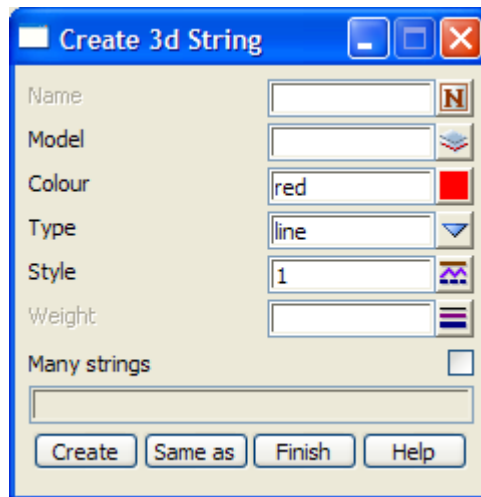
The difference between a 2d and a 3d string is that for a 3d string, the z-value (height) can vary at each string point, whereas a 2d string has a constant height for the entire string. Hence a 2d string is simply a special case of a 3d string where the heights at all the points are the same.

Creating and editing a 3d string is very similar to a 2d string. The only major difference is that a height is required at each string point.

The **Many strings** tick-box is used when more than one string of the same type is to be created, If many strings is set to *tick*, when the current string creation is Finished or Quit, a new **Create 3d String** panel is placed on the screen with the same information in it as the string just created. If any of the information needs to be modified for the new string, simply change it in the **Create 3d String** panel fields before selecting the **Create** button for the new string. Hence a new string of the same type can be created without going back to the Create menu.

The **Same as** button is used to obtain information from an existing string (not necessarily of the same type) and pipe it into the name, colour, model, style breakline type and height field of the **Create 3d String** panel.

On selecting the 3d string option, the **create 3d string** panel is displayed.



To **create** a new 3d string, the name, colour, model and point-line type of the new string are entered into the appropriate fields and the **create** button selected.

To **create** a new 2d string, the name, colour, model, point-line type and height of the new string are entered into the appropriate fields and the **Create** button selected.

The new fields and buttons used in the **create 3d string** panel have the following functions.

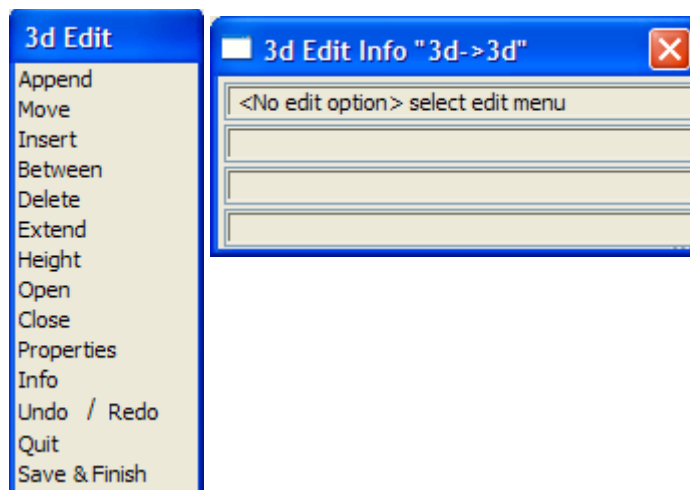
Field Description	Type	Defaults	Pop-Up
Name	input		
			<i>the name of the new string.</i>

Model	input		available models
	<i>name of the model that the new string is in.</i>		
Colour	input	default colour	available colours
	<i>the colour of the new string.</i>		
Type	input	line	line, point
	<i>breakline type (point-line type) of the string.</i>		
Style	input	1	available line styles
	<i>line style of the string.</i>		
Weight	input	0	
	<i>thickness of the string.</i>		
Many strings	tick		
	<i>if tick then after the current string is finished, a new create panel is placed on the screen with all the same values for the panel fields as the current string.</i>		
Create	button		
	<i>After the create button is chosen, the 3d edit menu and 3d edit info panel are displayed.</i>		
Same as	button		
	<i>After the same as button is chosen, another string is selected and information about it is used for the fields in this panel.</i>		

3d Edit

Selecting the **create** button in the **create 3d string** panel the 3d edit menu and **3d edit info** panel are placed on the screen.

The 3d edit menu and panel for a 3d string are



To create the new 3d string, select the **Append** option from the 3d Edit menu.

The **Append** option is used to add points to either end of an existing string, or in the case of a new string, places the 1st point and then begins appending points to the 1st point.

For all 3d strings, a cross is then drawn in each plan view that the string's model is on, and the cross follows the cursor around the screen. If the string's model is **not** added to any plan view, the model is automatically added to **all** plan views.

After the cross is on the screen (moving with the cursor), clicking LB and accepting with MB selects the **1st** vertex of the string (using the appropriate snaps).

The string is then drawn from the 1st vertex to the cursor position, which represents the second vertex of the string. Clicking LB and accepting with MB selects the second string vertex and the process repeats for subsequent string vertices.

Now that the string is created, all the edit option on the string's 3d Edit menu are usable.

The options in the 3d Edit menu are not only used for placing the initial vertices of the string, but for editing the string once it is created. Since the **Append** and other options in the 3d edit menu are identical to the options used when editing an existing string, they will be discussed in detail in the string Editor section.

For full information in the 3d Editor, go to the section "3d Edit"

Create - 4d (Pre V8)

create_4d_string

Position of option on menu: Strings =>Create =>4d

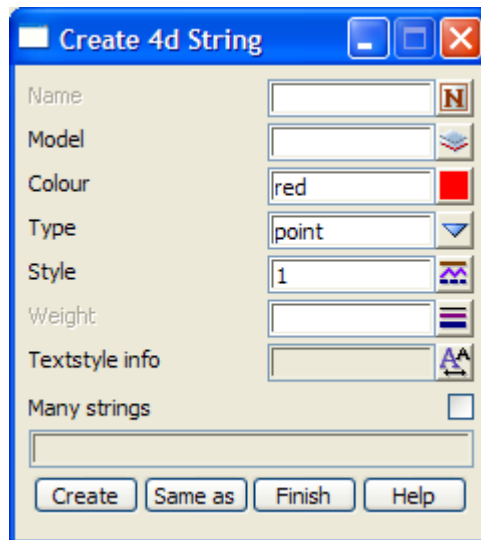
A 4d string consists of a series of (x,y,z) points and a text label at each point.

Creating and editing a 4d string is very similar to a 3d string.- the major difference is that a height **and** a text label is required at each string point.

The **Many strings** tick-box is used when more than one string of the same type is to be created, If many strings is set to *tick*, when the current string creation is Finished or Quit, a new **Create 4d String** panel is placed on the screen with the same information in it as the string just created. If any of the information needs to be modified for the new string, simply change it in the **Create 4d String** panel fields before selecting the **Create** button for the new string. Hence a new string of the same type can be created without going back to the Create menu.

The **Same as** button is used to obtain information from an existing string (not necessarily of the same type) and pipe it into the name, colour, model, style breakline type and height field of the **Create 4d String** panel.

On selecting the 4d string option, the **create 4d string** panel is displayed.



To **create** a new 4d string, the name, colour, model, point-line type, text size and units, offset, justification and angle for the new string are entered into the appropriate fields and the **create** button selected.

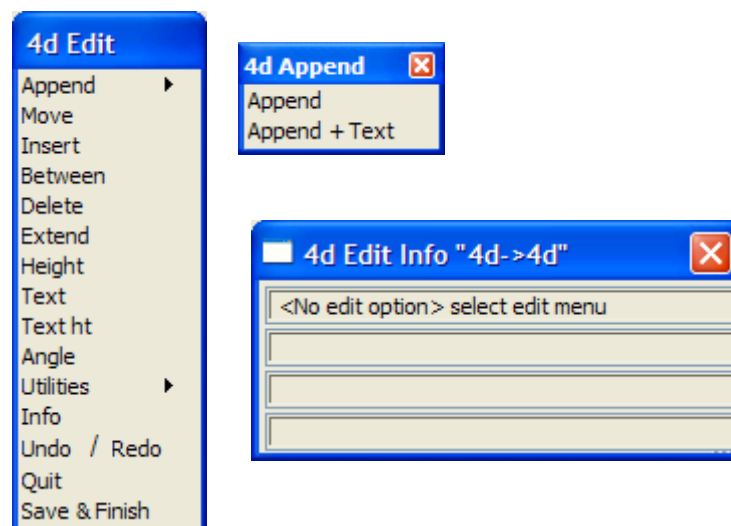
The new fields and buttons used in the **create 4d string** panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Name <i>the name of the new string.</i>	input		
Model <i>name of the model that the new string is in.</i>	input		available models
Colour <i>the colour of the new string.</i>	input	default colour	available colours
Type <i>breakline type (point-line type) of the string.</i>	input	line	line, point
Style <i>line style of the string.</i>	input	1	available line styles
Weight <i>thickness of the string.</i>	input	0	
Textstyle info <i>textstyle information.</i>	input		
Many strings <i>if tick then after the current string is finished, a new create panel is placed on the screen with all the same values for the panel fields as the current string.</i>	tick		
Create <i>After the create button is chosen, the 4d edit menu and 4d edit info panel are displayed.</i>	button		
Same as <i>After the same as button is chosen, another string is selected and information about it is used for the fields in this panel.</i>	button		

4d Edit

Selecting the **create** button in the **create 4d string** panel the 4d edit menu and 4d edit info panel are placed on the screen.

The 4d edit menu and panel for a 4d string are



To create a new 4d string, the user must select one of the two Append options on the Append

walk-right of the 4d Edit menu which has options to simply create points or to create points and text at the points.

The **Append** and **Append + text** options are used to add points and text (in a plan view) to either end of an existing string, or in the case of a new string, places the 1st point and text and then begins appending points and text to the 1st point.

For all 4d strings, a cross is then drawn in each plan view that the string's model is on, and the cross follows the cursor around the screen. If the string's model is **not** added to any plan view, the model is automatically added to **all** plan views.

After the cross is on the screen (moving with the cursor), clicking LB and accepting with MB selects the **1st** vertex of the string (using the appropriate snaps).

If **Append + text** was selected, the user will then be prompted for the text to be placed at that points.

The string and text is then drawn from the 1st vertex to the cursor position, which represents the second vertex of the string. Clicking LB and accepting with MB selects the second string vertex and the process repeats for subsequent string vertices.

Now that the string is created, all the edit option on the string's 4d Edit menu are usable.

The options in the 4d Edit menu are not only used for placing the initial vertices of the string, but for editing the string once it is created. Since the **Append** and other options in the 4d edit menu are identical to the options used when editing an existing string, they will be discussed in detail in the string Editor section.

For full information in the 4d Editor, go to the section "4d Edit"

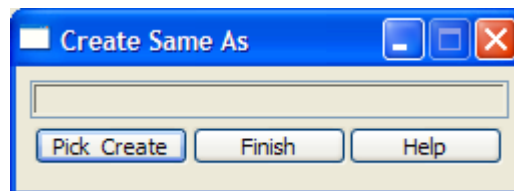
Create - Same As

`create_same_as`

Position of option on menu: Strings =>Create =>Same as

The same as option is used to create a new string of the same type and with similar header information as an existing string.

On selecting the same as create option, the **create same as** panel is displayed.



After selecting the option, the option is already running and waiting for a string to be selected.

Once a string is selected from a view, a new **create nd string** panel of the same type as the selected string and with all the header information from the selected string, is displayed on the screen.

The user then proceeds as a normal create string option.

If the pick is terminated by clicking RB to get up the pick ops menu and selecting cancel from it, the option can be started again by selecting the **pick & create** button.

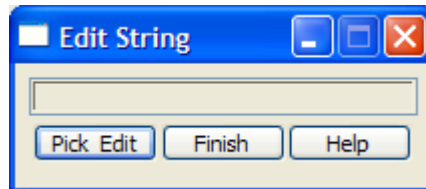
Editor

edit_string

Position of option on menu: Strings =>Editor

The string editor is used for modifying any of the 12d Model strings.

After selecting the editor option, the **edit string** panel is placed on the screen to record any error messages.



The option is already in pick mode (the **pick & edit** button only needs to be selected if the pick was cancelled) and the user simply picks and accepts the string to be edited. From the picked string's type, the editor is able to determine the appropriate editor and placed on the screen.

Each string type has its own edit operations which will now be discussed in detail.

Note - if the edit menu is deleted from the screen using the menu delete option, it can be raised again by clicking RB in any view.

Please continue to the next section "Editor - Common Information" .

For the option Edit 2d, please go to the section "2d Edit" .

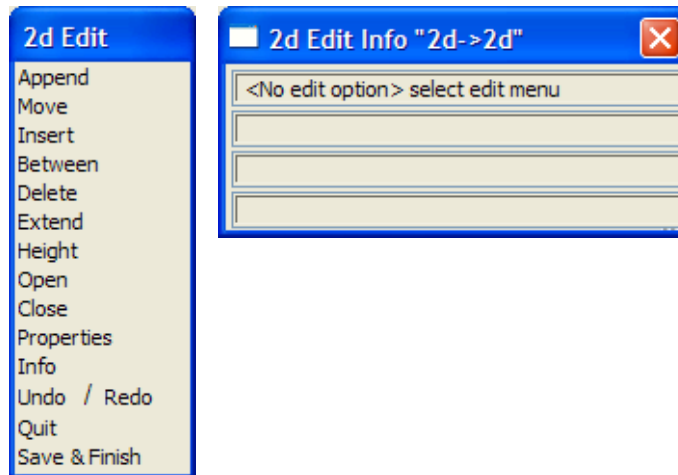
<i>3d</i>	"3d Edit"
<i>4d</i>	"4d Edit"
<i>Alignment</i>	"Alignment Edit"
<i>Arcs</i>	"Arc Edit"
<i>Circles</i>	"Circle Edit"
<i>Feature</i>	"Feature Edit"
<i>Pipe</i>	"Pipe Edit"
<i>Polyline</i>	"Polyline Edit"
<i>Super</i>	"Super Edit"
<i>Text</i>	"Text Edit"

Editor - Common Information

nd edit menu

After selecting the string to be edited, the menu containing the list of available edit options (the string's nd edit menu) and an information panel, (the string's **nd edit info** panel) are placed on the screen.

For example, the string edit menu and **string edit info** panel for a 2d string are



Most of the options chosen from the **nd edit** menus repeat until cancelled by the user. That is, the option remains in force and can be applied repeatedly until terminated by the user.

For example, if the delete option is selected, any number of points can be deleted from the chosen string without re-selecting the delete option.

To select a new **nd edit** option, simply select the option from the **nd edit** menu. The current option is automatically terminated and the new option begun.

An option is also terminated when the entire string editing option is ended by selecting either the **Quit** or **Finish** button in the **nd edit** menu.

Info

Toggles the **nd edit info** panel on/off for the string.

Undo/Redo

An **undo** and **redo** list is defined for each editor on the screen. That is, each editor has its own undo/redo lists. If an option is **undone**, it is added to the **redo** list so that it can be **redone**.

When the editor is exited by either **Quit** or **Finish**, the undo and redo lists are deleted and are no longer usable.

Undo

Undoes the last editor operation for this string and adds it to the top of the redo list.

Redo

Redo the last editor operation that was undone for this string. Add the undone operation to the top of the undo list.

Quit

Even after points are created for the new string, the create process can be **aborted** by selecting the **Quit** option from the **nd Edit** menu. The option then terminates and **no** string is created.

The **Quit** option is used to terminate the **nd string edit session** **without** storing any of the edits. That is, the string is left as it was *before* the edit was begun.

After selecting the **Quit** option, a **Yes-No-Cancel** panel is displayed to confirm that the edit is to be ended. If **yes** is selected, the edits will be ignored and the unedited string kept.

Note that if it was a new string being created, the option is terminated by **Quit** and **no** string is created.

Finish

The edit process is completed and the modified string stored in the given model when the **Finish** option is chosen from the **nd Edit** menu.

After selecting the **Finish** option, a **Yes-No-Cancel** panel is displayed to confirm that the edit is to be ended. If **Yes** is selected, the edits will be stored.

Notes

1. Depending on its breakline (point-line) type, a string with default style ("1") is displayed with crosses at each of its point (point type) or with straight lines joining the points (line type).

Linestyles can be defined that drawn lines between the points even though the breakline type is **point**.

2. The string points are called intersection points (IP's).
3. The string **nd Edit Info** panel will not automatically appear if **Display edit info** is set to **off** in the System Settings tab of the **Utilities =>Defaults** panel.

Typed input

Typed input can be used wherever a select is required to obtain a co-ordinate. For example an (x,y), (x, y, z) or (chainage, height).

To start typed input, simply press <F7> and a special typed-input box appears on the screen

If the focus is on a Plan or Perspective view, then an **Enter X Y Z** box comes up. If the focus is on a Section view, then a **Enter Ch Ht** box appears. These are also called the *XYZ typed input* box and the *Chainage Height typed input* box respectively.



An <enter> terminates the typed input and the entered values taken as the position of the required point. The typed-input box then disappears.

If the user wishes to **abort** the typed input and return to mouse input, simply select the **[X]** button on the typed input box or type <enter> with no values in the typed input box.

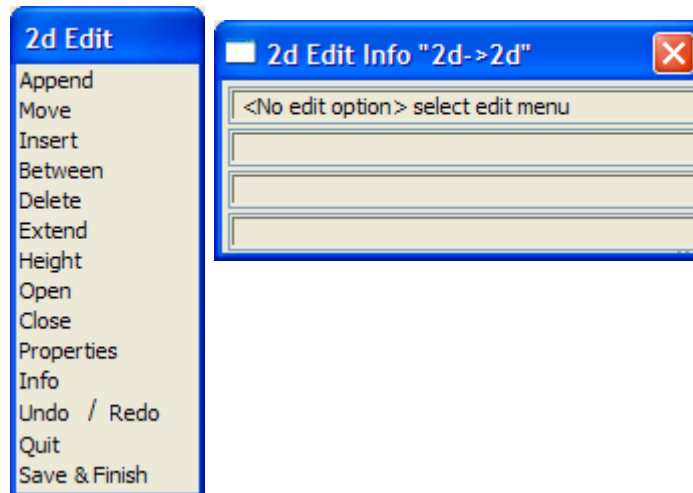
Please continue to the next section "2d Edit" .

2d Edit

2d_edit

Position of option on menu: Strings =>Editor

On **2d_edit_info** picking a 2d string, the 2d edit menu and the 2d edit info panel are placed on the screen.



See the earlier section “Editor - Common Information” for general information about editing strings.

Each option in the 2d edit menu will now be described.

Append

The **append** option is used to create the 1st point in a new string, to append a new intersect point to the end of the string or to prepend a new intersection point to the beginning of the string. In this option, both appending and prepending will be referred to as appending.

Existing 2d Strings

Appending a point is a two step process.

Step (a) - selecting the end to append the point to.

After the **append** option has been selected, the end of the string to append the point to is selected. Once the string end is selected, the new intersection point is assumed to be at the current cursor position. As the cursor is moved, the string is redrawn reflecting the changing position of the appended intersection point

message area 1	<Append Points>
message area 2	IP point number, x, y, z co-ords of IP
message area 3	bearing-in, bearing out, bearing difference for an IP
message area 4	select final position- after pick
Screen message area	
	<Select string end to append to> [picks][][menu]
	<Select string end to append to> [picks][accepts][menu]

Step (b) - selecting the position for the new appended point.

A cross indicates where the cursor currently is. The position of the new appended point is set to the current cursor position by picking (LB) and accepting (MB).

message area 1	<Append Points>
message area 2	IP point number, x, y, z co-ords of IP

message area 3	bearing-in, bearing out, bearing difference for closest IP
message area 4	select final position- before pick
Screen message area	
	<Select final position of point> [picks][][menu]
	<Select final position of point> [picks][accepts][menu]

Once a point has been appended to the string, the appended point is considered to be the selected string end and a new append cycle begins. That is, stage (a) is already set up. The current cursor position indicates the new position for the next appended point.

Hence a **series** of string points is easily entered by first selecting the string end that the new points are to be appended to (step (a)) and then moving the cursor to the position of each new point and selecting them in turn.

Typed input can be used in either step.

The append option is terminated by either bringing up the pick ops menu and selecting **cancel** or by selecting a new option from the 2d edit menu.

If, after bringing up the pick ops menu, it is decided to continue with the append option, simply select the restart option from the pick ops menu and the pick ops menu will disappear leaving the append option still current.

New 2d String

For creating a new string, the cursor is used to select the 1st point of the string. The option then continues as if appending to an existing 2d string where the end point has already been selected.

Move

The move option is for moving individual points (intersection points - IP's) of the string.

The move cycle consists of two steps:

- (a) selecting the point to be moved
- (b) selecting the new position for the point.

Step (a)

First the point to be moved is selected. The selected point will then move around the view and the string redrawn to show the change as the cursor is moved.

message area 1	<Move Point>
message area 2	IP point number, x, y, z co-ords of IP
message area 3	bearing-in, bearing out, bearing difference for the closest IP
message area 4	select final position- after pick
Screen message area	
	<Select point to move> [picks][][menu]
	<Select point to move> [picks][accepts][menu]

Step (b)

The current cursor position is selected as the new position for the point by selecting (LB) and accepting (MB). The point being moved is then anchored at the cursor position for the IP, and the string redrawn.

message area 1	<Move Point>
message area 2	IP point number, x, y, z co-ords of IP
message area 3	bearing-in, bearing out, bearing difference for the moved IP
message area 4	select final position- before pick, edit finished- after pick
Screen message area	
	<Select final position of point> [picks][][menu]
	<Select final position of point> [picks][accepts][menu]

Typed input can be used in either step.

Once the move cycle is completed and the point moved, the move option is still current and can be repeated for other points without having to re-select the move option.

The move option is terminated by selecting cancel from the pick ops menu or by selecting a new 2d edit option.

Insert

The insert option is designed to place a new intersection point in a string between two adjacent intersection points (note that the inserted point **does not** have to be on the line joining the two intersection points).

Inserting a point, like moving a point, is a two step process.

Step (a) - selecting the IP's to be on either side of the new intersection point

The two adjacent intersection points are chosen by selecting the **line** connecting the two intersection points. Once the line is selected, the new IP is assumed to be at the current cursor position. As the cursor is moved, the string is redrawn reflecting the changing position of the inserted IP.

message area 1	<Insert Point>
message area 2	IP point number, x, y, z co-ords of IP
message area 3	bearing-in, bearing out, bearing difference for closest IP
message area 4	select final position- after pick
Screen message area	
	<Select line to insert on> [picks][][menu]
	<Select line to insert on> [picks][accepts][menu]

Step (b) - selecting the position for the new intersection point

The position of the new intersection point is selecting

message area 1	<Insert Point>
message area 2	IP point number, x, y, z co-ords of IP
message area 3	bearing-in, bearing out, bearing difference for the inserted IP
message area 4	select final position - before pick, edit finished - after pick
Screen message area	
	<Select final position of point> [picks][][menu]
	<Select final position of point> [picks][accepts][menu]

Once the insert cycle is completed and the point inserted, the insert option is still current and can be repeated for other insertions without having to re-select the insert option.

The insert option is terminated by selecting cancel from the pick ops menu or by selecting a new option from the 2d edit menu.

Typed input can be used in either step.

Between

The between option is similar to the insert option except that the inserted point **does** have to be on the line joining the two intersection points. To accomplish this, the cursor position is projected onto the IP-IP line to give the new IP point position.

The between option is terminated by selecting cancel from the pick ops menu or by selecting a new option from the 2d edit.

Delete

The delete option is used to delete selected intersection points from the string.

The point to be deleted is picked (LB) and accepted (MB). When the point is accepted, it is **deleted**. The string, minus the deleted point, is then redrawn.

Once a point has been deleted, another point in the string can then be selected and deleted. Hence any number of points from the string can be deleted one after another.

```

message area 1 <Delete Points>
message area 2          IP point number, x, y, z co-ords of IP
message area 3          bearing-in, bearing out, bearing difference for closest IP
message area 5
Screen message area
    <Select point to delete> [picks][][menu]
    <Select point to delete> [picks][accepts][menu]

```

The delete option is terminated by selecting cancel from the pick ops menu or by selecting a new option from the 2d edit menu.

Typed input can be used to select a point for deletion.

Extend

The extend option is used to move an intersection point along the line joining the intersection point to its neighbouring intersection point.

That is, the bearing of the IP-IP line is kept constant and the intersection point is moved along that line either **towards** or **away** from its neighbouring intersection point on the IP-IP line.

Extending, like moving a point, is a two step process.

Step (a) - selecting the IP-IP line and the IP to be moved along that line

The IP-IP line and the intersection point to be moved are chosen in the one operation by picking (LB) and accepting (MB) a co-ordinate point near the IP-IP line and close to the intersection point to be moved along that line.

Once the line and intersection point (IP) are selected, the new position of the selected IP is assumed to be at the current cursor position projected perpendicularly onto the IP-IP line.

As the cursor is moved, the string is redrawn reflecting the changing position of the moved IP.

```

message area 1          <Extend Point>
message area 2          IP point number, x, y, z co-ords of IP
message area 3          bearing-in, bearing out, bearing difference for closest IP
message area 4          select final position- after pick
Screen message area
    <Select line to extend> [picks][][menu]
    <Select line to extend> [picks][accepts][menu]

```

Step (b) - selecting the final position for the intersection point

The final position for the intersection point is set to the projection of the selected cursor position onto the IP-IP line.

```

message area 1          <Extend Points>
message area 2          IP point number, x, y, z co-ords of IP
message area 3          bearing-in, bearing out, bearing difference for closest IP
message area 4          select final position - before pick, edit finished - after pick
Screen message area
    <Select final position of point> [picks][][menu]
    <Select final position of point> [picks][accepts][menu]

```

Once the extend is completed, the extend option is still current and can be repeated without re-

selecting the extend option.

The extend option is terminated by selecting **cancel** from the pick ops menu or by selecting a new option from the 2d edit menu.

Typed input can be used in either step.

Note - Extend can be used on the end points of the string

Height

The height option is used to modify the height (z value) of the 2d string.

After the height option is chosen, an **enter value** typed-input box is displayed on the screen with the string's current height (z value).

The enter value typed-input box looks like:



The height is entered into the typed-input box, terminated by <enter>. The entered value is taken as the height of the 2dstring and the string redrawn with the new height. The typed-input box then disappears.

The height option automatically terminates and a new option is selected from the 2d edit.

Note - all the points in a 2d string have the same height.

Open

If the string is closed (that is, the end points have the same x and y values), selecting the open option removes the last point of the string.

If the string is not closed, the open option does nothing.

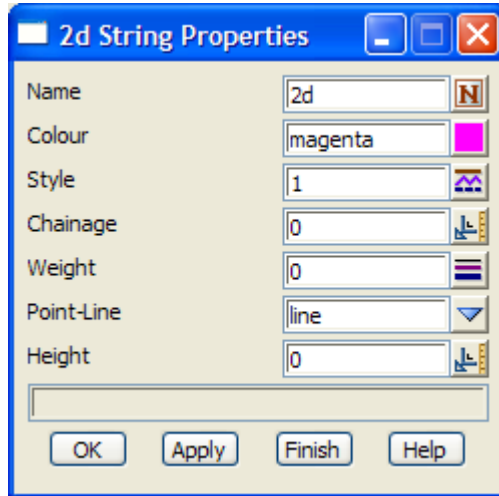
Close

Selecting the close option adds a point to the end of the string with the same co-ordinate values as the 1st point in the string.

Properties

[2d_string_properties](#)

Selecting **Properties** brings up the **2d String Properties** panel which is used to modify the string's header information.



The fields in this panel are similar to those in the **Create 2d String** panel and the 2d string editor options. The only new field is

Field Description	Type	Defaults	Pop-Up
Set	button		

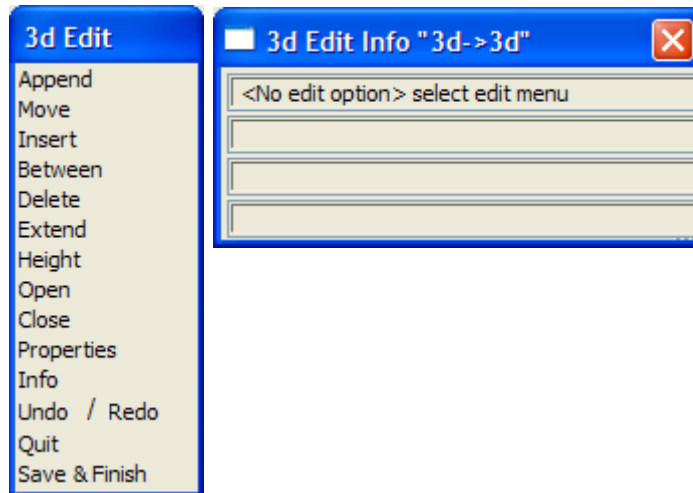
*for the 2d string being edited, set all the items in the **2d String Properties** panel to the values given in the panel.*

3d Edit

3d_edit

Position of option on menu: Strings =>Editor

On **3d_edit_info** picking a 3d string, the 3d edit menu and **3d edit info** panel are placed on the screen.



The difference between a 2d and a 3d string is that all points in a 2d string have the same z-value, whereas for a 3d string, each point can have a different z-value.

Hence most of the options in the 3d edit menu are similar to the 2d edit options of the same name, and only the differences for each option will be discussed. The *2d Edit* options are given in the section “2d Edit”

See the earlier section “Editor - Common Information” for general information about editing strings.

Append

The **append** operation for a 3d string is similar to that for a 2d string except that a height (z-value) is required for each new point.

Since in most cases, it would be tiresome to ask for a height every time a point is added, the entry of a new height is controlled by the height toggle in the **snaps** menu. If **height** is toggled to on, then every time a point is placed or moved an **enter height** typed-input box is displayed on the screen.

The enter height typed-input box looks like:



The height is entered into the typed-input box, terminated with <enter>. The entered value is taken as the height of the 3d string point and the string redrawn with the new height at the point. The typed-input box then disappears.

When the enter height box is placed on the screen, it will already have a value in it depending on the circumstances preceding the operation.

For example, if a point or line was snapped to, the height at that point or line will be displayed in the box.

Height

The height option is used to modify the height (z value) of any point in the string.

After the height option is chosen, the user must select which point is going to have its height modified.

After the point has been selected, a **New height** typed-input box is displayed on the screen with the point's current height (z value).



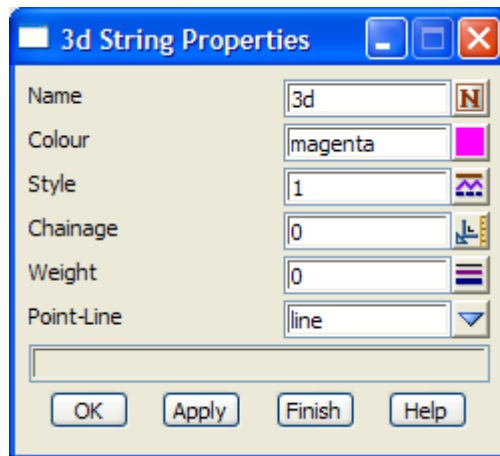
The height is entered into the typed-input box, terminated with <enter>. The entered value is taken as the height of the point in the 3d string and the string redrawn with the new height at that point. The typed-input box then disappears.

The height option is terminated on selecting cancel from the pick ops menu or by selecting a new option from the 3d edit menu.

Properties

3d_string_properties

Selecting **Properties** brings up the **3d String Properties** panel which is used to modify the string's header information.



The fields in this panel are similar to those in the **create 3d string** panel and the 3dd string editor options. The only new field is

Field Description	Type	Defaults	Pop-Up
OK/Apply	button		

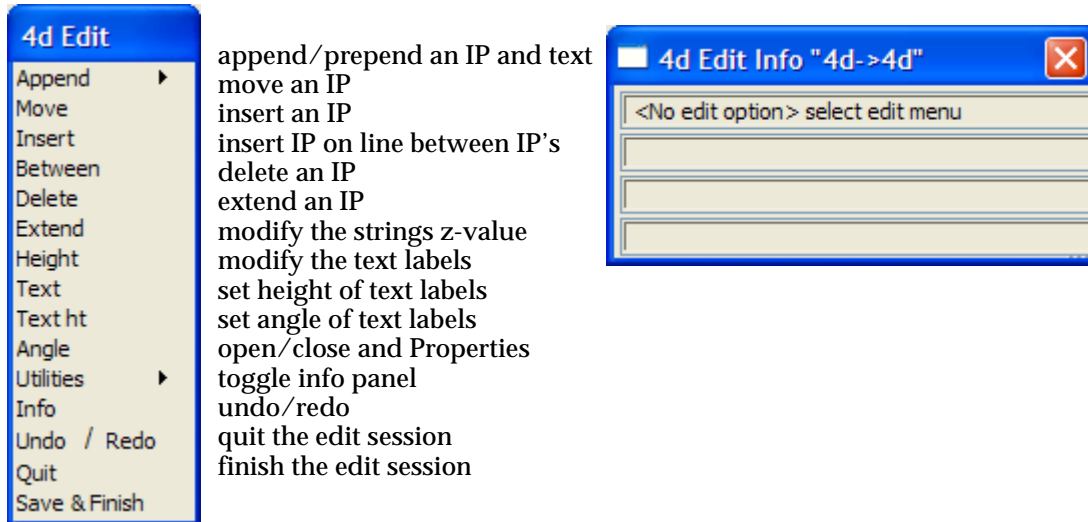
*for the string being edited, **OK** sets the string with the values in the panel fields and removes the panel. **Apply** sets the 3d string with the values in the panel fields and leaves the panel on the screen.*

4d Edit

4d_edit

Position of option on menu: Strings =>Editor

On picking `4d_edit_info` a 4d string, the 4d edit menu and 4d edit info panel are placed on the screen.



append/prepend an IP and text
 move an IP
 insert an IP
 insert IP on line between IP's
 delete an IP
 extend an IP
 modify the strings z-value
 modify the text labels
 set height of text labels
 set angle of text labels
 open/close and Properties
 toggle info panel
 undo/redo
 quit the edit session
 finish the edit session

Only the options append, text, size and angle will be described in detail since all the other options are similar to the equivalent 3d string option (see the section "3d Edit").

See the earlier section "Editor - Common Information" for general information about editing strings.

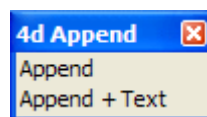
Append

4d_append

The append operation for a 4d string is similar to the 3d string case except that a height and an optional text label is required for each new point.

Since in many cases a text label is not required at every point of a 4d string, there is an append option that asks for text at every point and another that does not ask.

The 4d append walk-right is



The **height** question for each point is toggled on or off in the snaps menu just as it was for a 3d string.

The append option is terminated on selecting cancel from the pick ops menu or by selecting a new option from the 4d edit menu.

Text

The text option is used to modify the text label of any point in the 4d string.

After the text option is chosen, the user must select which point is going to have its text label modified. Once the point has been selected, an **enter text** typed-input box is displayed on the screen with the point's current text label placed in it.

The new text label is entered into the typed-input box, terminated with <enter>. The entered value is taken as the text label of the point in the 4d string and the string redrawn with the new text at that point. The typed-input box then disappears.

The text option is terminated on selecting **cancel** from the pick ops menu or by selecting a new option from the 4d edit menu.

Text ht

All the text labels in the 4d string have the same height (given in pixel or world units). The text ht option is used to modify this text label height.

After selecting the option, an **enter value** typed-input box is displayed on the screen with the string's current text label height placed in it.

The new text label height is entered into the typed-input box, terminated with <enter>.

The entered value is taken as the text label height for all the points in the 4d string and the string redrawn using the new height. The typed-input box then disappears.

The text ht option automatically terminates after use.

Angle

All the text labels in the 4d string are drawn rotated about their defining string point with the same rotation angle. The angle, in degrees, is measured in a counter-clockwise direction about the horizontal axis.

The angle option is used to modify the text rotation angle.

After selecting the option, an **enter value** typed-input box is displayed on the screen with the string's current text rotation angle placed in it.

The new text rotation angle is entered into the typed-input box, terminated with <enter>.

The entered value is taken as the text rotation angle for all the points in the 4d string and the string redrawn using the new angle. The typed-input box then disappears.

The angle option automatically terminates after use.

Utilities

Position of option on menu: Strings =>Editor

4d_utilities

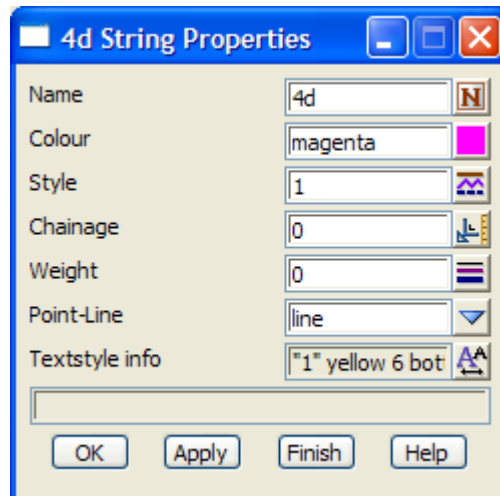
The 4d utilities walk-right is



Properties

4d_string_properties

Selecting **Properties** brings up the **4d String Properties** panel which is used to modify the string's header information.



The fields in this panel are similar to those in the **create 4d string** panel and the 4d string editor options. The only new field is

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

OK/Apply	button		
-----------------	--------	--	--

*for the string being edited, **OK** sets the string with the values in the panel fields and removes the panel.*

***Apply** sets the string with the values in the panel fields and leaves the panel on the screen.*

Alignment Edit

alignment_edit

Alignment_edit_info

Position of option on menu: Strings =>Editor

An alignment string is defined by specifying the horizontal and vertical geometry as separate operations.

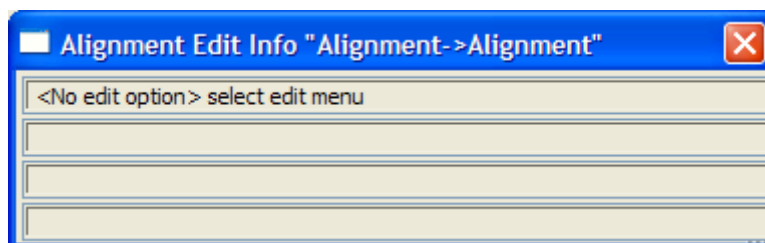
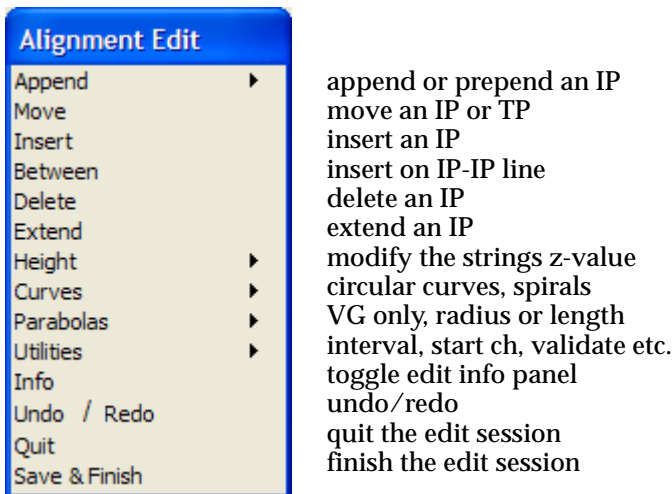
The **horizontal geometry** consists of a series of (x,y) points (called horizontal intersection points, **HIP**'s) and circular curves and spirals applied to the intersection points.

Vertical geometry also consists of a series of points but they are defined with respect to the plan length of the string (chainage) and height. Hence, the vertical geometry is defined by a series of (chainage,height) points called vertical intersection points (**VIP**'s) and parabolic or circular curves applied to the vertical intersection points.

The horizontal geometry is defined in a plan view and the vertical geometry in a section view. Hence the alignment string editor can edit information for the string on both plan and section views.

Since a section view is only defined in relation to a specific string (called the primary string for the section view), the vertical geometry of the picked string can only be edited in a section view if the string is the primary string for that section view. That is, the string can only be edited on a section view if the string being edited is profiled on that section view.

On selecting an alignment string, the alignment edit menu and the **alignment edit info** are placed on the screen.



Most of the options are applicable to either horizontal or vertical geometry. The meaning of the option depends on whether the string is being edited in a plan or a section view. Hence the description of the option will often need to be split into its separate action on horizontal or vertical geometry.

See the earlier section “Editor - Common Information” for general information about editing strings.

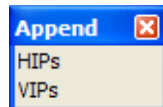
Each option will now be discussed in detail.

append

Append

The **append** operation for an alignment string is similar to the 3d string case except that there are separate append options for the horizontal and vertical geometry of the string.

The **append walk-right** is



Append HIPs - Horizontal Geometry

The **append=>HIPs** option in a plan view is used to create the 1st horizontal point in a new alignment string, to append a new horizontal intersect point to the end of the string or to prepend a new horizontal intersection point to the beginning of the string. In this option, both appending and prepending will be referred to as appending.

Existing Alignment String

Appending a point is a two step process.

Step (a) - selecting the end to append the point to.

After picking **append=>HIPs**, the end of the string to append the point to is selected. Once the string end is selected, the new intersection point is assumed to be at the current cursor position. As the cursor is moved, the string is redrawn reflecting the changing position of the appended intersection point

message area 1	<Append Points>
message area 2	IP point number, x, y, z co-ords of IP
message area 3	bearing-in, bearing out, bearing difference for an IP
message area 4	select final position - after pick
Screen message area	

<Select string end to append to> [picks][][menu]
 <Select string end to append to> [picks][accepts][menu]

Step (b) - selecting the position for the new appended point.

A cross indicates where the cursor currently is. The position of the new appended point is set to the current cursor position by picking (LB) and accepting (MB).

message area 1	<Append Points>
message area 2	IP point number, x, y, z co-ords of IP
message area 3	bearing-in, bearing out, bearing difference for closest IP
message area 4	select final position - before pick
Screen message area	

<Select final position of point> [picks][][menu]
 <Select final position of point> [picks][accepts][menu]

Once an intersection point has been appended to the string, the appended intersection point is considered to be the selected string end and a new append cycle begins. That is, stage (a) is already set up. The current cursor position indicates the new position of the next appended intersection point.

Hence a **series** of string points is easily entered by first selecting the string end that the new

points are to be appended to (step (a)) and then moving the cursor to the position of each new point in turn and selecting them in turn.

Typed input can be used in either step.

The **append** option is terminated by either bringing up the pick ops menu and selecting cancel or by selecting a new option from the alignment edit menu.

If, after bringing up the pick ops menu, it is decided to continue with the append option, simply select the restart option from the pick ops menu and the pick ops menu will disappear leaving the append option still current.

New Alignment String

When the **append=>HIPs** option is selected, a cross will appear on any plan views that have the alignment string's model on them.

The first horizontal intersection point is then selected by the standard pick (LB) and accept (MB).

The option then continues as if appending to an existing alignment string where the end point has already been accepted.

Append VIPs - Vertical Geometry

The `append=>VIPs` option is used to create and edit the vertical geometry of the picked string if the string is a **primary** string on any section view. This can be achieved by using either the `VG edit` or the `profile` option from the section view `view=>utilities` menu.

Vertical geometry can only be defined for a string with **existing** horizontal geometry.

On a section view, `Append=>VIPs` is used to create the first vertical intersection point in an existing string, to append a new vertical intersect point to the end of the string or to prepend a new vertical intersection point to the beginning of the string. In this option, both appending and prepending will be referred to as appending.

Existing Vertical Geometry

Appending a vertical point is the same as for a horizontal intersection point except that the coordinate system is (chainage,height) rather than (x,y) values and the information messages displayed in the **alignment edit info** panel show chainage, height and percentage grade rather than x,y,z and bearings.

For example -

message area 1	<Append Points>
message area 2	VIP point number, chainage,height of VIP
message area 3	curve length, %grade-in, %grade-out, grade difference for an VIP
message area 4	edit finished - before pick select final position - after pick

New Vertical Geometry

Creating the **1st vertical intersection point** (VIP) in a string is similar to the 1st horizontal IP.

When the `append=>VIPs` option is selected, a cross will appear on any section views that have the alignment string profiled on them.

The 1st vertical intersection point is then selected by the standard pick (LB) and accept (MB).

The option then continues as if appending to an existing vertical geometry where the end point has already been accepted.

Typed input can be used at any stage of the append.

Move

The move option allows the user to move

- individual horizontal intersection points (HIPs)
- individual tangent points (HTPs) if their is no spiral on the HIP.
- individual vertical intersection points or tangent points (VIPs or VTPs).

move acts on the horizontal geometry if the point to move is selected in a plan view, or the vertical geometry if the point to move is selected in a section view.

Move - Horizontal Geometry

The move option in a plan view is for moving individual horizontal intersection points (HIP's) or horizontal tangent points (HTPs) of the string.

The move cycle consists of two steps:

- selecting the point to be moved
- selecting the new position for the point.

Step (a)

First the horizontal intersection or tangent point to be moved is selected. The selected point will then move around the view as the cursor is moved.

If a **horizontal intersection point** is selected, the string will be redrawn with the intersection point moved to the cursor position and the circular curve radius and spiral lengths left constant.

A **horizontal tangent point** only occurs on a line connecting two adjacent horizontal intersection points (the HIP-HIP line). Hence, a horizontal tangent point can only move along its HIP-HIP line. Moving a horizontal tangent point actually means that the **radius** of the circular curve at the tangent point is **modified** so that the new position of the point is still a tangent point on the HIP-HIP line for the new circular curve.

To guarantee that the new position for the tangent point is on the HIP-HIP line, the cursor position is automatically projected perpendicularly onto the HIP-HIP line to give the new tangent point.

message area 1	<Move Point>
message area 2	IP point number, x, y co-ords of IP, radius, start spiral, end spiral
message area 3	bearing-in, bearing out, bearing difference for the inserted IP
message area 4	select final position - after pick
Screen message area	
	<Select point to move> [picks][][menu]
	<Select point to move> [picks][accepts][menu]

Step (b)

The current cursor position (or its projection for a HTP) is selected as the new position for the point by picking (LB) and accepting (MB). The point being moved is then anchored at the cursor position for the HIP (or at the projected point for a HTP), and the string redrawn.

message area 1	<Move Point>
message area 2	IP point number, x, y co-ords of IP, radius, start spiral, end spiral
message area 3	bearing-in, bearing out, bearing difference for the inserted IP
message area 4	select final position - before pick, edit finished - after pick
Screen message area	
	<Select final position of point> [picks][][menu]
	<Select final position of point> [picks][accepts][menu]

Typed input can be used in either step

Once the move cycle is completed and the point moved, the move option is still current and can be repeated for other points without having to re-select the move option.

move is terminated by selecting cancel from the pick ops menu or by selecting a new alignment edit option.

Move - Vertical Geometry

The move option is used in a section view to move individual vertical intersection points (VIP's) or vertical tangent points (VTP's).

The move cycle consists of two steps:

- (a) selecting the point to be moved
- (b) selecting the new position for the point.

Step (a)

First the vertical intersection or tangent point to be moved is selected. The selected point will then move around the view as the cursor is moved.

If a **vertical intersection point** (VIP) is selected, the string will be redrawn with the vertical intersection point moved to the cursor position and the parabolic curve length or the circular curve radius left constant.

A **vertical tangent point** (VTP) only occurs on a line connecting two adjacent vertical

intersection points (the VIP-VIP line). Hence, a vertical tangent point can only move along its VIP-VIP line. Moving a vertical tangent point actually means that the **length** of the parabolic curve at the vertical tangent point is **modified** so that the new position of the point is still a vertical tangent point on the VIP-VIP line for the new parabolic curve.

To guarantee that the new position for the vertical tangent point is on the VIP-VIP line, the cursor position is automatically projected perpendicularly onto the VIP-VIP line to give the new vertical tangent point.

message area 1	<Move Point>
message area 2	VIP point number, ch, ht co-ords of VIP
message area 3	VC length, %grade-in, %grade-out, grade diff for the moved VIP
message area 4	select final position - after pick
Screen message area	
	<Select point to move> [picks][][menu]
	<Select point to move> [picks][accepts][menu]

Step (b)

The current cursor position (or its projection for a VTP) is selected as the new position for the point by selecting (LB) and accepting (MB). The point being moved is then anchored at the cursor position for an VIP (or at the projected point for a VTP), and the string redrawn.

message area 1	<Move Point>
message area 2	VIP point number, ch, ht co-ords of VIP
message area 3	VC length, %grade-in, %grade-out, grade diff for the moved VIP
message area 4	select final position - before pick, edit finished - after pick
Screen message area	
	<Select final position of point> [picks][][menu]
	<Select final position of point> [picks][accepts][menu]

Typed input can be used in either step.

Once the move cycle is completed and the point moved, the move option is still current and can be repeated for other points without having to re-select the move option.

The move option is terminated by selecting cancel from the pick ops menu or by selecting a new alignment edit option.

Insert

The insert option is designed to place a new intersection point in a string between two adjacent intersection points. The inserted point does not have to be on the line joining the two intersection points - the between option is used to guarantee that the IP is on the IP-IP line.

Inserting a point, like moving a point, is a two step process.

Step (a) - selecting the IP's to be on either side of the new intersection point

The two adjacent intersection points are chosen by selecting the **line** connecting the two intersection points. Once the line is selected, the new IP is assumed to be at the current cursor position. As the cursor is moved, the string is redrawn reflecting the changing position of the inserted IP.

Like the move option, the insert works on the horizontal or the vertical geometry depending on whether a plan or section view is used to select the connecting line.

For horizontal inserts

message area 1	<Insert Point>
message area 2	IP point number, x, y co-ords of IP, radius, start spiral, end spiral
message area 3	bearing-in, bearing out, bearing difference for the inserted IP
message area 4	select final position - after pick
Screen message area	

<Select line to insert on> [picks][][menu]
 <Select line to insert on> [picks][accepts][menu]

For vertical inserts

message area 1	<Insert Point>
message area 2	VIP point number, Ch, Ht co-ords of VIP
message area 3	VC length, %grade-in, %grade-out, grade diff for the moved VIP
message area 4	select final position - after pick
Screen message area	
	<Select line to insert on> [picks][][menu]
	<Select line to insert on> [picks][accepts][menu]

Step (b) - selecting the position for the new intersection point

The position of the new intersection point is set to the current cursor position by picking (LB) and accepting (MB).

horizontal

message area 1	<Insert Point>
message area 2	IP point number, x, y co-ords of IP, radius, start spiral, end spiral
message area 3	bearing-in, bearing out, bearing difference for the inserted IP
message area 4	select final position - before pick, edit finished - after pick
Screen message area	
	<Select final position of point> [picks][][menu]
	<Select final position of point> [picks][accepts][menu]

vertical

message area 1	<Insert Point>
message area 2	VIP point number, Ch, Ht co-ords of VIP
message area 3	VC length, %grade-in, %grade-out, grade diff for the moved VIP
message area 4	select final position - before pick, edit finished - after pick
Screen message area	
	<Select final position of point> [picks][][menu]
	<Select final position of point> [picks][accepts][menu]

Once the insert cycle is completed and the point inserted, the insert option is still current and can be repeated for other insertions without having to re-select the insert option.

The insert option is terminated by selecting cancel from the pick ops menu or by selecting a new option from the alignment edit menu.

Typed input can be used in either step.

Between

The **between** option is similar to the **insert** option except the inserted point **does** have to be on the line joining the two intersection points. To accomplish this, the cursor position is automatically projected onto the IP-IP line to give the new IP point position.

The **between** option is terminated by selecting cancel from the pick ops menu or by selecting a new option from the alignment edit menu.

Delete

The delete option is used to delete intersection points from the string.

After picking the delete option, any selected intersection point in the string is deleted. The string, minus the deleted point, is redrawn after each deletion.

Once an intersection point has been deleted, another intersection point in the selected string can be selected for deletion. Hence any number of the string points can be deleted one after another.

A horizontal intersection point is deleted if the point is chosen from a plan view and a vertical intersection point deleted if the point is selected from a vertical view.

For horizontal deletes

message area 1	<Delete Points>
message area 2	IP point number, x, y co-ords of IP, radius, start spiral, end spiral
message area 3	bearing-in, bearing out, bearing difference for the inserted IP
Screen message area	
	<Select point to delete> [picks][][menu]
	<Select point to delete> [picks][accepts][menu]

For vertical deletes

message area 2	VIP point number, Ch, Ht co-ords of VIP
message area 3	VC length, %grade-in, %grade-out, grade diff for the moved VIP
Screen message area	
	<Select point to delete> [picks][][menu]
	<Select point to delete> [picks][accepts][menu]

The delete option is terminated by selecting cancel from the pick ops menu or by selecting a new option from the alignment edit menu.

Typed input can be used to select a point for deletion.

Extend

The extend option is used to move an intersection point along the line joining the intersection point to its neighbouring intersection point.

That is, in a plan view, the bearing of the HIP-HIP line is kept constant and the intersection point is moved along that line either **towards** or **away** from its neighbouring intersection point on the HIP-HIP line.

In a section view, the grade of the VIP-VIP line is kept constant and the vertical intersection point is moved along that line either **towards** or **away** from its neighbouring intersection point on the VIP-VIP line.

Extending, like moving a point, is a two step process.

Step (a) - selecting the IP-IP line and the IP to be moved along that line

The IP-IP line and the intersection point to be moved are chosen in the one operation by selecting a co-ordinate point near the IP-IP line and close to the intersection point to be moved along that line.

Once the line and IP are selected, the new position of the selected IP is assumed to be at the current cursor position projected perpendicularly onto the IP-IP line. As the cursor is moved, the string is redrawn reflecting the changing position of the moved IP.

For horizontal extends

message area 1	<Extend Point>
message area 2	IP point number, x, y co-ords of IP, radius, start spiral, end spiral
message area 3	bearing-in, bearing out, bearing difference for the inserted IP
message area 4	select final position - after pick
Screen message area	
	<Select line to extend> [picks][][menu]
	<Select line to extend> [picks][accepts][menu]

For vertical extends

message area 1	<Extend Point>
message area 2	VIP point number, Ch, Ht co-ords of VIP
message area 3	VC length, %grade-in, %grade-out, grade diff for the moved VIP

message area 4 select final position - after pick
 Screen message area
 <Select line to extend> [picks][][menu]
 <Select line to extend> [picks][accepts][menu]

Step (b) - selecting the final position for the intersection point

The final position for the intersection point is set to the projection of the current cursor position onto the IP-IP line.

horizontal -

message area 1 <Extend Points>
 message area 2 IP point number, x, y co-ords of IP, radius, start spiral, end spiral
 message area 3 bearing-in, bearing out, bearing difference for the inserted IP
 message area 4 select final position - before pick, edit finished- after pick
 Screen message area
 <Select final position of point> [picks][][menu]
 <Select final position of point> [picks][accepts][menu]

vertical

message area 1 <Extend Points>
 message area 2 VIP point number, Ch, Ht co-ords of VIP
 message area 3 VC length, %grade-in, %grade-out, grade diff for the moved VIP
 message area 4 select final position - before pick, edit finished- after pick
 Screen message area
 <Select final position of point> [picks][][menu]
 <Select final position of point> [picks][accepts][menu]

Once the extend is completed, the extend option is still current and can be repeated without re-selecting the extend option.

The extend option is terminated by selecting cancel from the pick ops menu or by selecting a new option from the alignment edit menu.

Typed input can be used in either step.

Note - Extend can be used on the end points of the string

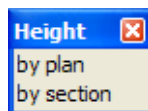
height

Height

The height option is used to insert and/or modify the height of a vertical intersection point in a plan view, or to modify the height of a vertical intersection point in a section view.

Hence the height option is unique - it only affects the vertical geometry of the string but can be used in a plan or section view.

The height walk-right is



By Plan - Height in a Plan View

In a plan view, the height=>by plan option is used to create a **vertical intersection point** of a given height, or modify the height of an existing vertical point, at a selected plan position on the string.

After the height option is chosen, the user selects a position on the string in a plan view. The use

of point and line snap will important for selecting the correct position.

If a vertical intersection point already exists at the chainage of the selected position, it will be selected for modification. Otherwise a new vertical intersection point will be inserted into the vertical geometry at the chainage of the selected position.

A new height typed-input box is then displayed on the screen with the vertical intersection point's current height (z value).

The new height typed-input box looks like:



The height is entered into the typed-input box, terminated with <enter>. The entered value is taken as the new height of the vertical intersection point in the alignment.

The typed-input box then disappears.

By Section - Height in a Section View

In a section view, the height=>by section option can only be used to modify the height of an **existing** vertical intersection point.

After the height option is chosen, the user selects the vertical intersection point that will have its height modified from a section view. After selecting the VIP, a new height typed-input box is displayed on the screen with the point's current height (z value).

The new height typed-input box looks like:



The height is entered into the typed-input box, terminated with <enter>. The entered value is taken as the new height of the vertical intersection point in the alignment string and the string redrawn with the new height at that point.

The typed-input box then disappears.

For either height=>by plan or height=>by section, the height option is terminated on selecting cancel from the pick ops menu or by selecting a new option from the alignment edit menu.

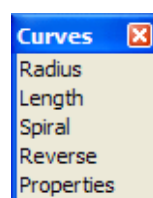
curves

Curves

The curves option allows the user to

- add a circular curve of a specified radius or curve length to a horizontal intersection point
- add start and end transition spirals to an intersection point with an existing circular curve
- add a circular curve of a specified radius or curve length to a vertical intersection point

The Curves walk-right menu is



The radius option is used to create or modify the radius of a circular curve at a horizontal or vertical intersection point. radius acts on the horizontal geometry if the point is selected in a plan

view, or the vertical geometry if the point is selected in a section view.

Similarly the **length** option is used to set a circular curve by giving its total curve length rather than the radius. **length** acts on the horizontal geometry if the point is selected in a plan view, or the vertical geometry if the point is selected in a section view.

The **spiral** option is for adding transition spirals to a **horizontal intersection point with a curve already on it**.

Radius

In a plan view, the radius option is used to **add** a circular curve to an intersection point with no curve or to **modify** the radius of the circular curve if one already exists.

In a section view, the radius option is used to **add** a circular curve to an intersection point with no curve or to **modify** the radius of a circular curve if one already exists.

Radius is a two step process.

Step (a) - selecting the intersection point

First the intersection point whose curve is to be modified is selected.

For horizontal radius

message area 1	<Radius>
message area 2	IP point number, x, y co-ords of IP, radius, start spiral, end spiral
message area 3	bearing-in, bearing out, bearing difference for the inserted IP

For vertical radius

message area 1	<Radius>
message area 2	VIP point number, Ch, Ht co-ords of VIP
message area 3	radius, % grade-in, % grade-out, grade diff for the moved VIP
message area 4	enter value- after pick

Screen message area

<Select point to change radius> [picks][][menu]
<Select point to change radius> [picks][accepts][menu]

Step (b) - entering the new radius

after an intersection point is chosen, a **new radius typed-input box** is displayed on the screen with either the intersection point's current curve radius or, if no curve exists, zero.

The new radius typed-input box looks like:



The radius is entered into the typed-input box, terminated with <enter>. The entered value is taken as the radius of the curve at that intersection point and the string redrawn with the new curve. The typed-input box then disappears.

If an existing curve is to be **removed** from an intersection point, enter the value zero into the new radius typed-input box.

horizontal

message area 1	<Radius>
message area 2	IP point number, x, y co-ords of IP, radius, start spiral, end spiral
message area 3	bearing-in, bearing out, bearing diff for the inserted IP
message area 4	enter value - before value entered edit finished- after value entered

vertical

message area 1	<Radius>
message area 2	VIP point number, Ch, Ht co-ords of VIP

message area 3	radius, %grade-in, %grade-out, grade diff for the moved VIP
message area 4	enter value - before value entered edit finished- after value entered

Like most of the other alignment edit options, after a radius has been modified the option is still current and another intersection point can be chosen to have its curve radius modified.

The radius option is terminated by selecting a different alignment edit option.

Length

Although the circular curve on an intersection point is stored as a radius, it is possible to define the radius indirectly by giving the total curve length by using the length option.

The option works in plan or section views.

To use length, first select the intersection point to add a new circular curve to, or to modify the existing curve.

A new length **typed-input box** is then displayed on the screen with either the current curve length, or if no curve exists, zero.

The new length typed-input box looks like:



The total curve length is entered into the typed-input box, terminated with <enter>. The entered value is taken as the new curve length. The typed-input box then disappears.

If an existing circular curve is to be **removed**, zero is entered into the new length typed-input box.

Like most of the other alignment edit options, after the length has been modified the option is still current and another IP can be chosen to have its curve modified.

The length option is terminated by selecting a different alignment edit option.

WARNING - when length is used, the equivalent radius is computed and stored with the curve. If the IP is moved, the **radius** is kept **constant** and the total curve **length** is **modified**.

Spiral

In a plan view, the spiral option is used to **add** a start or end transition spiral (transition curve) to a curve on an intersection point, or to **modify** an existing spiral. Spiral does not work on a section view.

After picking spiral, select the end of the curve to add a new spiral to, or the existing spiral to be modified. A new length **typed-input box** is displayed on the screen with either the current spiral length, or if no spiral exists, zero.

The new length typed-input box looks like:



The spiral length is entered into the typed-input box, terminated with <enter>. The entered value is taken as the new spiral length. The typed-input box then disappears.

If an existing spiral is to be **removed**, zero is entered into the new length typed-input box.

Like most of the other alignment edit options, after the spiral has been modified the option is still current and another curve can be chosen to have its spirals modified.

The spiral option is terminated by selecting a different alignment edit option.

[reverse_ip](#)

Reverse

12d Model normally creates a curve on the side of the IP that has the smallest angle. The sign of the radius (positive or negative) is automatically determined by 12d Model.

The Reverse option creates a circular curve that is the part left over from the standard curve.

On selecting Reverse, the **Reverse IP** panel is displayed.



The HIP is chosen by either typing in the HIP number in the IP number field, or by clicking on the 123 button and then selecting the HIP.

To change the curve from reversed/not reversed, simply tick on/off the Reversed tick box and then click on **Set**.

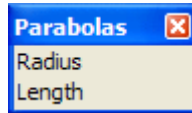
parabolas

Parabolas

The **parabolas** option is for adding, removing or modifying parabolic curves to the **vertical geometry**. It allows the user to

- (a) add a parabolic curve of a given curve length to a vertical intersection point
- (b) add a parabolic curve of a given effective radius to a vertical intersection point

The parabolas walk-right menu is



The **radius** option is used to set a parabolic curve of given effective radius to a vertical intersection point.

The **length** option is used to set a parabolic curve of a given curve length to a vertical intersection point.

Note - the option only works on the vertical geometry if the VIP is selected in a section view. Points cannot be selected in any other view.

Radius

In a section view, the radius option is used to **add** a parabolic curve to an intersection point with no curve or to **modify** the radius of the parabolic curve if one already exists.

Radius is a two step process.

Step (a) - selecting the intersection point

First the intersection point whose parabola is to be modified is selected.

message area 1	<Radius>
message area 2	VIP point number, Ch, Ht co-ords of VIP
message area 3	VC length, %grade-in, %grade-out, grade diff for the moved VIP
message area 4	enter value- after pick
Screen message area	
	<Select point to change radius> [picks][][menu]
	<Select point to change radius> [picks][accepts][menu]

Step (b) - entering the new radius

After an intersection point is chosen, a **new radius typed-input box** is displayed on the screen with either the intersection point's current parabolic radius or, if no parabola exists, the last value entered into the radius typed-input box.

The new radius typed-input box looks like:



The radius is entered into the typed-input box, terminated with <enter>. The entered value is taken as the radius of the parabola at that intersection point and the string redrawn with the new parabola. The typed-input box then disappears.

If an existing parabola is to be **removed** from an intersection point, enter the value zero into the radius typed-input box.

message area 1	<Radius>
message area 2	VIP point number, Ch, Ht co-ords of VIP
message area 3	VC length, %grade-in, %grade-out, grade diff for the moved VIP
message area 4	enter value - before value entered edit finished- after value entered

Like most of the other alignment edit options, after the radius has been modified the option is still current and another intersection point can be chosen to have its parabolic radius modified. The radius option is terminated by selecting a different alignment edit option.

WARNING - when radius is used, the equivalent parabolic length is computed and stored with the curve. If the VIP is moved, the **parabolic length** is kept **constant** and the **effective radius** is **modified**.

Length

The length option is used to **add** a parabolic curve to a vertical intersection point with no curve or to **modify** the length of the parabolic curve if one already exists.

Adding or modifying curve length is a two step process.

Step (a) - selecting the vertical intersection point

First the vertical intersection point whose parabola is to be modified is selected.

message area 1	<Length>
message area 2	VIP point number, Ch, Ht co-ords of VIP
message area 3	VC length, %grade-in, %grade-out, grade diff for the moved VIP
message area 4	edit finished - before pick enter value - after pick
Screen message area	
	<Select point to change length> [picks][][menu]
	<Select point to change length> [picks][accepts][menu]

Step (b) - entering the new curve length

After a VIP is selected, a **new length typed-input box** is displayed on the screen with the point's current parabolic curve length.

The new length typed-input box looks like



The curve length is entered into the typed-input box, terminated with <enter>. The entered value is taken as the length of the parabolic curve at that vertical intersection point and the string redrawn with the new curve. The typed-input box then disappears.

If an existing parabola is to be **removed** from a vertical intersection point, enter the value zero into the curve length typed-input box.

message area 1	<Length>
message area 2	VIP point number, Ch, Ht co-ords of VIP
message area 3	VC length, %grade-in, %grade-out, grade diff for the moved VIP
message area 4	enter value- before value entered edit finished- after value entered

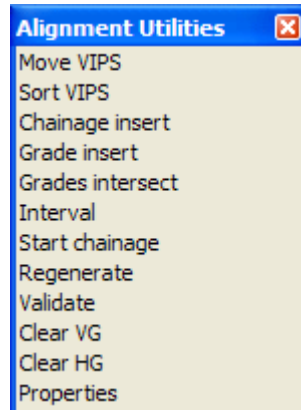
Like most of the other alignment edit options, after the parabolic curve length has been modified the option is still current and another vertical intersection point can be chosen to have its parabola modified.

The length option is terminated by selecting a different alignment edit option.

alignment_utilities

Utilities

The **utilities** walk-right menu contains a number of useful miscellaneous option for the alignment string. The menu is



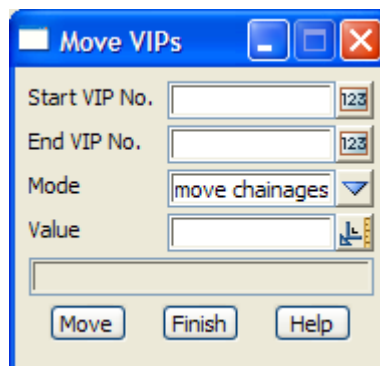
Each of the options will now be discussed.

Move VIPs

`move_vips`

The move VIPs option is for moving a range of vertical intersection points (VIP's) by a chainage or an elevation increment.

After selecting the option, the **move VIPs** panel is displayed.



The fields and buttons used in the panel have the following functions.

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Start VIP No.	input		
----------------------	-------	--	--

the VIP number of the 1st VIP in the range to be moved. If blank, then 1.

End VIP No.	input		
--------------------	-------	--	--

the VIP number of the last VIP in the range to be moved. If blank, then the last VIP.

Mode	input	move chainage	move chainage move hts
-------------	-------	---------------	---------------------------

*if **move chainage**, the chainage of all the points in the specified range are incremented by the given value. If **move hts**, the heights (elevations) of all the points in the specified range are incremented by the given value.*

Value	input	0	
--------------	-------	---	--

value to increment either the chainage or the height for all the VIPs in the specified range.

Move	button		
-------------	--------	--	--

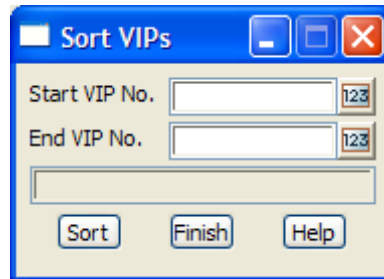
move the VIPs in the range given by the start and end ip field by the chainage or height given in the value field.

Sort VIPs

sort_vips

The sort VIPs option is for sorting VIP's into increasing chainage order.

After selecting the option, the **sort VIPs** panel is displayed.



The fields and buttons used in the panel have the following functions.

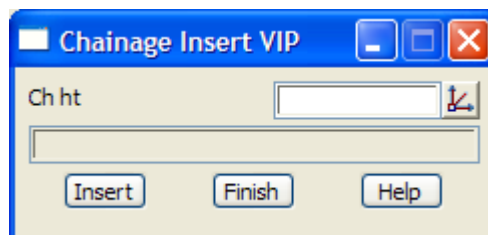
Field Description	Type	Defaults	Pop-Up
Start VIP No.	input		
<i>if non-blank, the VIP number of the 1st VIP in the range to be sorted. If blank, then 1.</i>			
End VIP No.	input		
<i>the VIP number of the last VIP in the range to be sorted. If blank, then the last VIP.</i>			
Sort	button		
<i>sort the VIPs in the range given by the start and end ip field into chainage order.</i>			

Chainage Insert

chainage_insert_vip

The chainage insert option inserts a vertical intersection point (VIP) at a given chainage and height.

After selecting the option, the **chainage insert VIP** panel is displayed.



The fields and buttons used in the panel have the following functions.

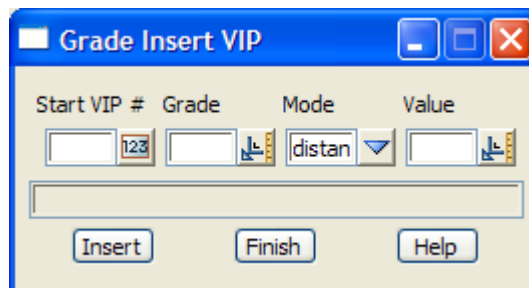
Field Description	Type	Defaults	Pop-Up
Ch ht	input		
<i>the chainage and height of the VIP to insert - separate values by spaces.</i>			
Insert	button		
<i>insert the VIP point given in the Ch ht field into the alignment string.</i>			

Grade Insert

grade_insert_vip

The **grade insert** option inserts a VIP at a given grade from an existing VIP. The new VIP position is given by either a distance from the picked VIP or at given chainage.

After selecting the option, the **grade insert VIP** panel is displayed.



The fields and buttons used in the panel have the following functions.

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Start VIP #	input		
<i>the VIP number whose position is used to start the grade insert from.</i>			

Grade	input		
<i>percent grade to be used.</i>			

Note **positive is up** when going in the direction of **increasing chainage** and **negative is up** when going in the direction of **decreasing chainage**.

Mode	choice	distance	distance, chainage
<i>if distance, the new VIP is inserted at the given grade and distance (given in the value field) from the start VIP.</i>			
<i>if chainage, the new VIP is inserted at the chainage (given in the value field but having the given grade from the start VIP.</i>			

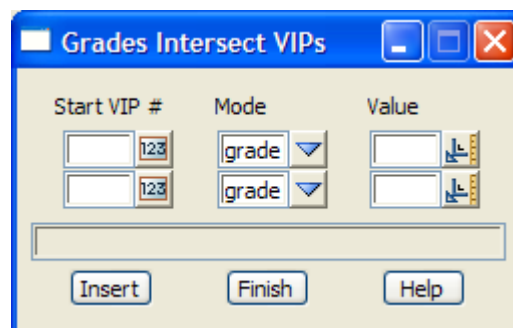
Insert	button		
<i>insert the new VIP into the alignment string.</i>			

Grades Intersect

grade_intersect_vips

The **grades intersect** option inserts a VIP which is given by intersecting lines of given grades from two existing VIPs. The grades are either typed in or calculated by giving another VIP that the line goes through.

After selecting the option, the **grades intersect VIPs** panel is displayed.



The fields and buttons used in the panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Start VIP # <i>the VIP number which is used in defining a line.</i>	input		
Mode <i>if grade, the field value is a percent grade and a line is defined as going through the start VIP and with the given grade.</i> <i>if VIP #, the field value is the number of a VIP and a line is defined as going through the start VIP and this VIP.</i> <i>Note for grades positive is up when going in the direction of increasing chainage and negative is up when going in the direction of decreasing chainage.</i>	choice	grade	grade, VIP #
Value <i>if mode is grade, value is a percent grade.</i> <i>if mode is VIP #, value is the number of a VIP.</i>	input		
Insert <i>calculate the point which is the intersection of the two lines and insert it as a new VIP into the alignment string.</i>	button		

Interval

Each alignment string has a chainage interval that is used to define regular points along the string. The chainage interval is used for approximation the alignment in operations such as triangulating and applying templates to an alignment string.

After selecting the option, an **enter value** typed-input box is displayed on the screen with the string's current chainage interval placed in it.

The new chainage interval is entered into the typed-input box, terminated with <enter>. The typed-input box then disappears.

The interval option terminates after use.

Start Chainage

Each alignment string has a start chainage which can be positive, negative or zero.

After selecting the option, an **enter value** typed-input box is displayed on the screen with the string's current start chainage in it.

The new start chainage is entered into the typed-input box, terminated with <enter>. The typed-input box then disappears.

When a new start chainage is entered, the vertical intersection points are automatically moved so that they retain their same relative chainage with respect to the start point on the alignment.

The start chainage option terminates after use.

Regenerate

If the horizontal geometry of an alignment string is modified, then the profile through any triangulations would also change. Hence, if the alignment string being edited was profiled on any section views, then the profile would be need to be recalculated after any horizontal geometry changes.

On selecting the regenerate option, **any** section view that has the alignment string being edited as its primary string (that is, as the string defining the chainage for the section view) is automatically re-profiled.

Hence the regenerate option is equivalent to running the regenerate option for each section view with the edited alignment string as its primary string.

Validate

When constructing horizontal and vertical geometry, it is possible to end of with invalid constructs such as overlapping tangent points.

On selecting the validate option, the alignment string will be checked for

horizontal geometry checks

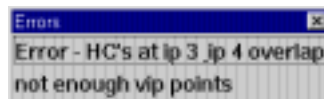
- ▲ at least two horizontal intersection points
- ▲ no co-incident horizontal intersection points
- ▲ no overlapping horizontal tangent points

vertical geometry checks

- ▲ at least two vertical intersection points
- ▲ no co-incident vertical intersection points
- ▲ no overlapping vertical tangent point
- ▲ vertical intersection points chainages are in ascending order

errors

If any errors occur, an errors menu is placed on the screen.

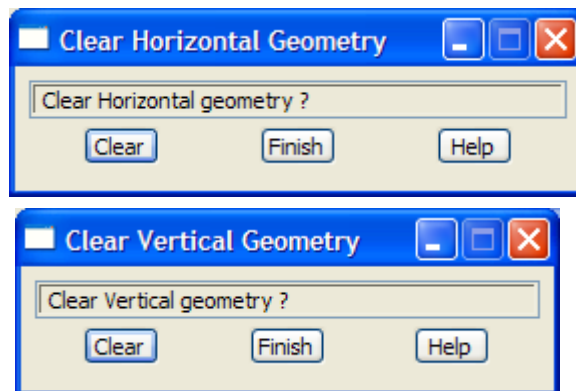


The errors menu remains on the screen and only disappears when either the [X] is picked or one of the error messages is picked with LB.

Note - the validate option is automatically run when the edit is finished.

Clear VG and Clear HG

`clear_horizontal_geometry`
`clear_vertical_geometry`



The Clear VG and Clear HG options are used to delete all the horizontal and/or vertical intersection points in the string.

The Clear VG option removes all the vertical geometry from the string.

The horizontal geometry still exists plus all the other string properties (model, name, colour and type).

The Clear HG option removes all the horizontal and vertical geometry from the string.

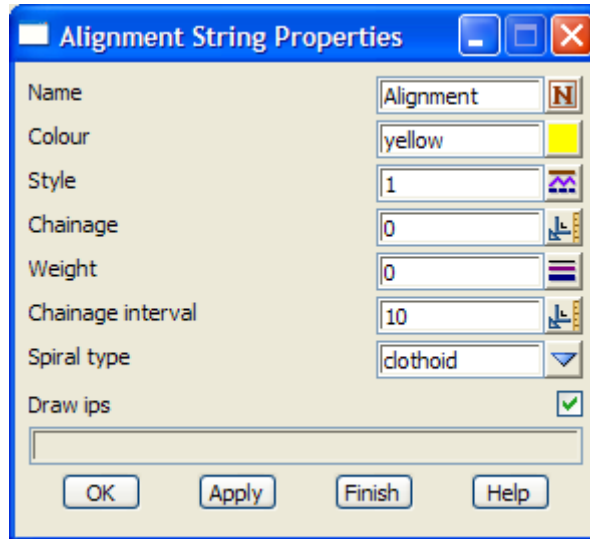
The string still exists and keeps its other properties such as model, name, colour and type.

After a Clear, the horizontal or vertical geometry can be re- entered using the edit options.

Properties

alignment_string_properties

Selecting **Properties** brings up the **Alignment String Properties** panel which is used to modify the string's header information.



The fields in this panel are similar to those in the **Create Alignment String** panel and the alignment string editor options. The only new field is

Field Description	Type	Defaults	Pop-Up
Draw ips	tick	tick	

*if tick, the horizontal and vertical intersection points are draw on plan and section views.
If no tick, the ips are not draw on the plan and section views.*

OK/Apply button

*for the string being edited, **OK** sets the string with the values in the panel fields and removes the panel.
Apply sets the string with the values in the panel fields and leaves the panel on the screen.*

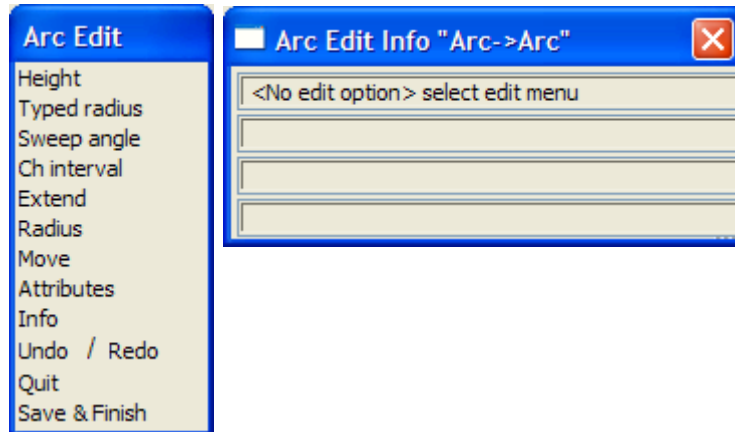
Finish

The finish option is used to terminate the alignment string edits. After selecting the finish option, the string is checked for overlapping horizontal or vertical tangent points and any errors reported.

Arc Edit

`arc_edit arc_edit_info`

On picking an arc string, the arc edit menu and **arc edit info** panel are placed on the screen.



Each option in the arc edit menu will now be described.

See the earlier section “Editor - Common Information” for general information about editing strings.

Height

The height option is used to define the z-value at the start or end point of the arc.

The z-value at any point on the arc is an interpolation on arc length of the values at the end points. Hence, the arc is an arc in plan only - in three dimensions, it is a **helix**.

Height is a two step process.

Step (a) - selecting the start or end point of the arc

After picking height, the end point of the arc whose height is to be modified is selected.

```
message area 1      <Height of arc>
Screen message area
    <Select point to change height> [picks][][menu]
    <Select point to change height> [picks][accepts][menu]
```

Step (b) - entering the new height

After the start or end point of the arc is selected, an **enter value** typed-input box is placed on the screen with the points current height displayed in it.

The enter value typed-input box looks like:



The new height for the point is entered into the typed-input box, terminated with <enter>. The typed-input box then disappears.

The height option repeats until cancelled by the user by either bringing up the pick ops menu and selecting cancel or by selecting a new option from the arc edit menu.

If, after bringing up the pick ops menu, it is decided to continue with the height option, simply select the restart option from the pick ops menu and the pick ops menu will disappear leaving the height option still current.

Typed Radius

The typed radius option is used to modify the radius of the selected arc.

After the typed radius option is chosen, an **enter value** typed-input box is placed on the screen with the arcs current radius displayed in it.

The **enter value** typed-input box looks like:



The arc radius is entered into the typed-input box, terminated with <enter>. The entered value is taken as the radius of the arc and the arc is redrawn with its new radius.

The typed-input box then disappears.

The typed radius option is automatically terminated and a new option needs to be selected from the arc edit menu.

Sweep Angle

The sweep angle option is used to modify the sweep angle of the selected arc.

After the sweep angle option is chosen, an **enter value** typed-input box is placed on the screen with the arcs current sweep angle displayed in it.

The **enter value** typed-input box looks like:



The arc sweep angle is entered into the typed-input box, terminated with <enter>. The entered value is taken as the sweep angle of the arc and the arc is redrawn with its new sweep angle.

The typed-input box then disappears.

The sweep angle option is automatically terminated and a new option needs to be selected from the arc edit menu.

Chainage interval

The **ch** interval option is used to modify the chainage interval of the selected arc.

After the **ch** interval option is chosen, an **enter value** typed-input box is placed on the screen with the arcs current chainage interval displayed in it.

The **enter value** typed-input box looks like:



The new chainage interval is entered into the typed-input box, terminated with <enter>. The entered value is taken as the chainage interval of the arc and the arc is redrawn with its new chainage interval.

The typed-input box then disappears.

The **ch** interval option is automatically terminated and a new option needs to be selected from the arc edit menu.

Move End

The move end option is used to re-position either the start or the end point of the arc.

Move end is a two step process.

Step (a) - selecting the start or end point of the arc

After selecting the move end option, the end point to be move is selected.

```
message area 1      <Move End>
Screen message area
    <Select point to move> [picks][][menu]
    <Select point to move> [picks][accepts][menu]
```

Step (b) - selecting the new position for the end point

After selecting the end point to move, the new position for the end point is selected.

```
message area 1      <Move End>
Screen message area
    <Select final position of point> [picks][][menu]
    <Select final position of point> [picks][accepts][menu]
```

The move end option repeats until cancelled by the user by either bringing up the pick ops menu and selecting cancel or by selecting a new option from the arc edit menu.

If, after bringing up the pick ops menu, it is decided to continue with the move end option, simply select the restart option from the pick ops menu and the pick ops menu will disappear leaving the move end option still current.

Radius

The radius option is used to change the radius of the arc by leaving the centre point alone and re-positioning a point on the arc. The new position for the point will define a new radius for the arc.

Radius is a two step process.

Step (a) - selecting the point on the arc to move

After selecting the radius option, the point on the arc to be moved is selected.

```
message area 1      <Radius>
Screen message area
    <Select point to move> [picks][][menu]
    <Select point to move> [picks][accepts][menu]
```

Step (b) - selecting the new position for the point

After selecting the point to move, the new position for the point is selected.

```
message area 1      <Radius>
Screen message area
    <Select final position of point> [picks][][menu]
    <Select final position of point> [picks][accepts][menu]
```

The radius option repeats until cancelled by the user by either bringing up the pick ops menu and selecting cancel or by selecting a new option from the arc edit menu.

If, after bringing up the pick ops menu, it is decided to continue with the radius option, simply select the restart option from the pick ops menu and the pick ops menu will disappear leaving the radius option still current.

Move

The move option is used to change the position of the entire arc by selecting and moving the arc centre or any point on the arc.

Move is a two step process.

Step (a) - selecting the point on the arc to move

After selecting the move option, the point on the arc to move is selected.

```
message area 1      <Move>
Screen message area
    <Select point to move> [picks][ ][menu]
    <Select point to move> [picks][accepts][menu]
```

Step (b) - selecting the new position for the point

After selecting the point to move, the new position for the point is selected.

```
message area 1      <Move>
Screen message area
    <Select final position of point> [picks][ ][menu]
    <Select final position of point> [picks][accepts][menu]
```

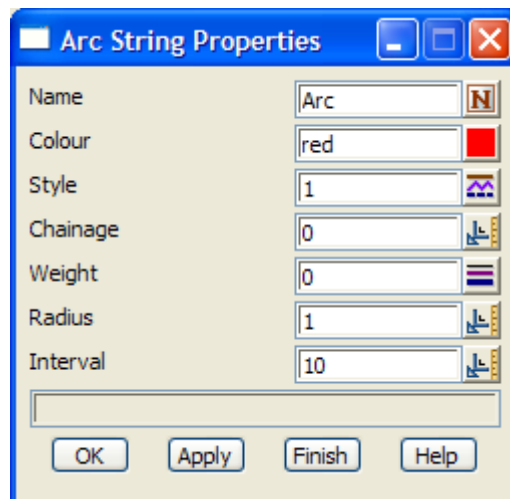
The move option repeats until cancelled by the user by either bringing up the pick ops menu and selecting cancel or by selecting a new option from the arc edit menu.

If, after bringing up the pick ops menu, it is decided to continue with the move option, simply select the restart option from the pick ops menu and the pick ops menu will disappear leaving the move option still current.

Properties

arc_string_properties

Selecting **Properties** brings up the **Arc String Properties** panel which is used to modify the string's header information.



The fields in this panel are similar to those in the **create arc string** panel and the arc editor options. The only new field is

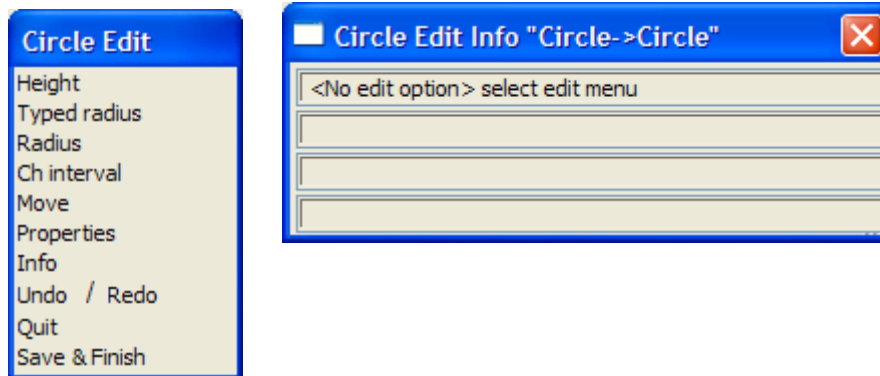
Field Description	Type	Defaults	Pop-Up
OK/Apply	button		

for the string being edited, OK sets the string with the values in the panel fields and removes the panel. Apply sets the string with the values in the panel fields and leaves the panel on the screen.

Circle Edit

[circle_edit](#) [circle_edit_info](#)

On picking a circle string, the **circle edit** menu and **circle edit info** panel are placed on the screen.



Each option in the circle edit menu will now be described.

See the earlier section “Editor - Common Information” for general information about editing strings.

Height

The **height** option is used to define the z-value for the entire circle.

After selecting the **height** option, an enter value typed-input box is placed on the screen with the circles current height displayed in it.

The enter value typed-input box looks like:



The new height for the circle is entered into the typed-input box, terminated with <enter>.

The typed-input box then disappears.

The **height** option is automatically terminated and a new option needs to be selected from the circle edit menu.

Typed Radius

The **typed radius** option is used to modify the radius of the selected circle.

After the **typed radius** option is chosen, an enter value typed-input box is placed on the screen with the circles current radius displayed in it.

The enter value typed-input box looks like:



The circle radius is entered into the typed-input box, terminated with <enter>. The entered value is taken as the radius of the circle and the circle redrawn with its new radius.

The typed-input box then disappears.

The **typed radius** option is automatically terminated and a new option needs to be selected from

the circle edit menu.

Radius

The radius option is used to change the radius of the circle by leaving the centre point alone and re-positioning a point on the circle. The new position for the point will define a new radius for the circle.

Radius is a two step process.

Step (a) - selecting the point on the circle to move

After selecting the radius option, the point on the circle to be moved is selected.

```
message area 1 <Radius>
Screen message area
    <Select point to move> [picks][][menu]
    <Select point to move> [picks][accepts][menu]
```

Step (b) - selecting the new position for the point

After selecting the point to move, the new position for the point is selected.

```
message area 1 <Radius>
Screen message area
    <Select final position of point> [picks][][menu]
    <Select final position of point> [picks][accepts][menu]
```

The radius option repeats until cancelled by the user by either bringing up the pick ops menu and selecting cancel or by selecting a new option from the circle edit menu.

If, after bringing up the pick ops menu, it is decided to continue with the radius option, simply select the restart option from the pick ops menu and the pick ops menu will disappear leaving the radius option still current.

Chainage Interval

The ch interval option is used to modify the chainage interval of the selected circle.

After the ch interval option is chosen, an **enter value** typed-input box is placed on the screen with the circles current chainage interval displayed in it.

The enter value typed-input box looks like:



The new chainage interval is entered into the typed-input box, terminated with <enter>. The entered value is taken as the chainage interval of the circle.

The typed-input box then disappears.

The ch interval option is automatically terminated and a new option needs to be selected from the circle edit menu.

Move

The move option is used to change the position of the entire circle by selecting and moving the circle centre or any point on the circle.

Move is a two step process.

Step (a) - selecting the point on the circle to move

After selecting the move option, the point on the circle to move is selected.

```
message area <Move>
Screen message area
    <Select point to move> [picks][ ][menu]
    <Select point to move> [picks][accepts][menu]
```

Step (b) - selecting the new position for the point

After selecting the point to move, the new position for the point is selected.

```
message area 1 <Move>
Screen message area
    <Select final position of point> [picks][ ][menu]
    <Select final position of point> [picks][accepts][menu]
```

The move option repeats until cancelled by the user by either bringing up the pick ops menu and selecting cancel or by selecting a new option from the circle edit menu.

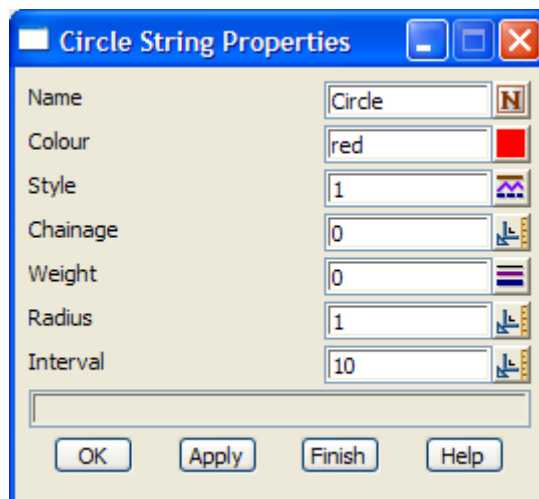
If, after bringing up the pick ops menu, it is decided to continue with the move option, simply select the restart option from the pick ops menu and the pick ops menu will disappear leaving the move option still current.

Note - the centre point of the circle can be selected and moved with the move option.

Properties

circle_string_properties

Selecting **Properties** brings up the **Circle String Properties** panel which is used to modify the string's header information.



The fields in this panel are similar to those in the **create circle string** panel and the circle editor options. The only new field is

Field Description	Type	Defaults	Pop-Up
Set	button		

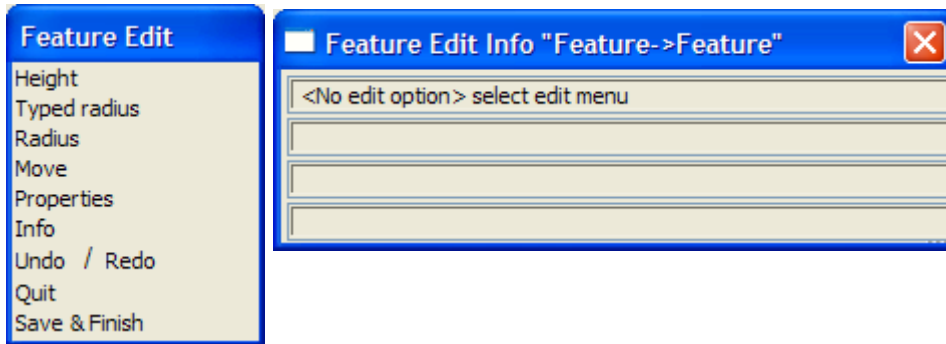
*for the circle being edited, set all the items in the **circle string Properties** panel to the values given in*

the panel.

Feature Edit

[feature_edit](#) [feature_edit_info](#)

On picking a feature string, the **feature edit** menu and panel are placed on the screen.



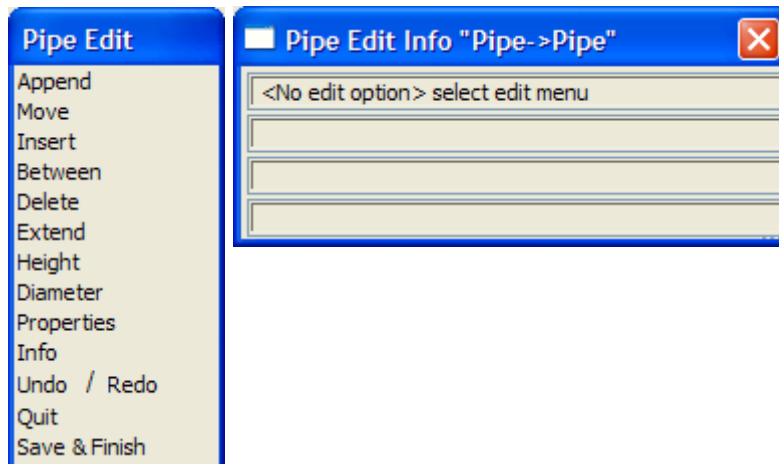
Each option in the feature edit menu is identical to those from the circle edit menu and will not be described again. See the section "Circle Edit"

See the earlier section "Editor - Common Information" for general information about editing strings.

Pipe Edit

[pipe_edit](#) [pipe_edit_info](#) [pipe_pipe_](#)

On picking a pipe string, the **pipe edit** menu and panel are placed on the screen.



The only difference between a 3d and a pipe string is that the pipe string has a diameter.

Hence most of the options in the pipe edit menu are similar to the 3d edit options of the same name, and only the diameter and Properties options need to be discussed. See the section "3d Edit" for information on the 3d string editor.

See the earlier section "Editor - Common Information" for general information about editing strings.

Diameter

The diameter option is used to modify the diameter of the pipe string.

After the diameter option is chosen, an enter value typed-input box is displayed on the screen with the string's current diameter.

The enter value typed-input box looks like:



The diameter is entered into the typed-input box, terminated with <enter>. The entered value is taken as the diameter of the pipe string. The typed-input box then disappears.

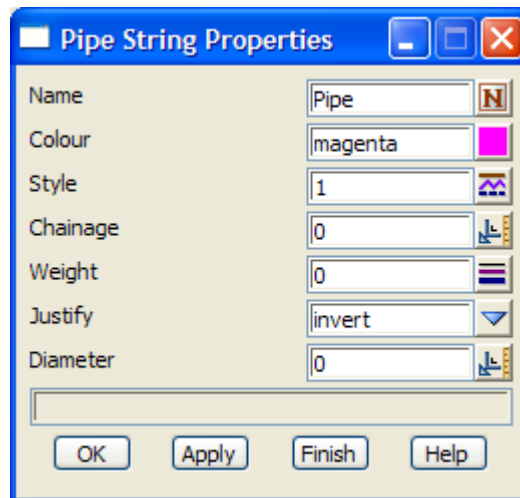
The diameter option automatically terminates and a new option is selected from the pipe edit menu.

Note - the pipe string has only one diameter for the entire string.

Properties

pipe_string_properties

Selecting **Properties** brings up the **Pipe String Properties** panel which is used to modify the string's header information.



The fields in this panel are similar to those in the **create pipe string** panel and the 3d string editor options. The only new field is

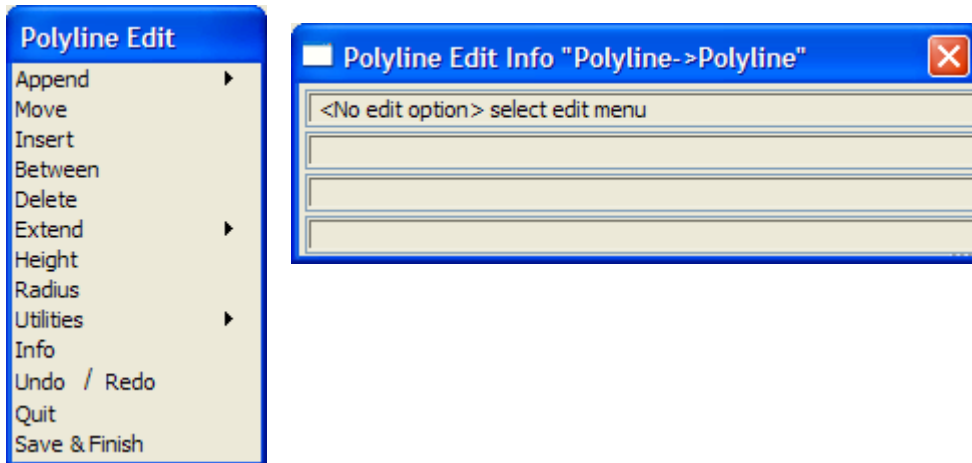
Field Description	Type	Defaults	Pop-Up
OK/Apply	button		

*for the string being edited, **OK** sets the string with the values in the panel fields and removes the panel. **Apply** sets the string with the values in the panel fields and leaves the panel on the screen.*

Polyline Edit

polyline_edit polyline_edit_info

On picking a polyline string, the **polyline edit** menu and **polyline edit info** panel are placed on the screen.



The major difference between a polyline and a 3d string is that a polyline string can have an arc instead of a line joining adjacent string points. Hence most of the options in the **polyline edit** menu are similar to the 3d edit options of the same name, and only the differences for each option will be discussed. See the section “3d Edit” for information on the 3d string editor.

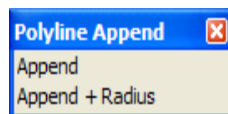
See the earlier section “Editor - Common Information” for general information about editing strings.

Append

polyline_append The **append** operation for a polyline string is similar to the 3d string case except that an arc radius can be given for each new line segment.

Since in many cases an arc radius is not required at every segment of a polyline string, there is an **append** option that asks for the radius at every point and another that does not ask.

The **append walk-right** is



If the **append + radius** option selected, then before each point is appended, an enter radius typed-input box is placed on the screen.

The enter radius typed-input box looks like



The radius is entered into the typed-input box, terminated with <enter>. The entered value is taken as the radius of the arc to the next polyline string point and the arc will be drawn correctly as the cursor is moved to the next point.

A **radius** value of **0** is taken to mean no arc.

The height question for each point is toggled on/off in the snaps menu just as it was for a 3d string.

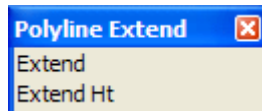
The **append** option is terminated on selecting **cancel** from the pick ops menu or by selecting a new option from the polyline edit menu

Extend

polyline_extend

There are two extend options for a polyline string - **extend=>extend** that is identical to the 3d string case where the z-value of the point being extended is kept constant, and a second option, **extend=>extend ht** where the z-value of the point being extended is linearly interpolated by the extension distance.

The **extend** walk-right is



Extend

extend=>extend that is identical to the 3d string case where the z-value of the point being extended is kept constant.

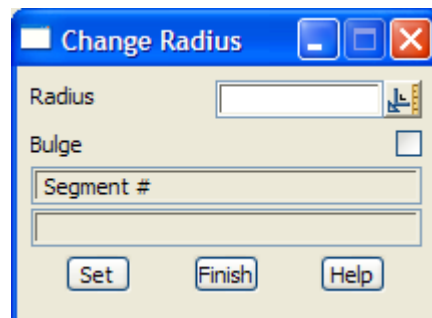
Extend by ht

extend=>extend ht not only moves the point but also linearly interpolates the z-value of the point being extended.

Radius

change_radius

Selecting **radius** brings up the **change radius** panel which is used to modify the radius of any arc/line joining adjacent polyline points.



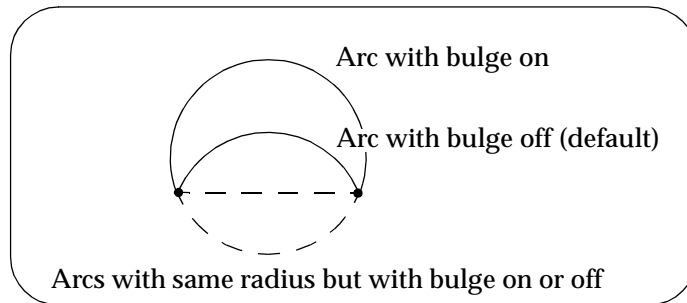
After selecting the radius option, the user selects the arc/straight to be modified and the current arc radius and bulge setting will be displayed in the **change radius** panel.

New values can then be entered and the arc modified by selecting the **set** button.

If the radius is positive, the arc is drawn from the start point to the next point on the polyline in a clockwise direction. If the radius is negative, the arc is drawn from the start point to the next point on the polyline in a counter-clockwise direction.

For a given radius (positive or negative), there are two possible cases for the arc- one where the arc is less than a semi-circle, the other when the arc is greater than a semi-circle.

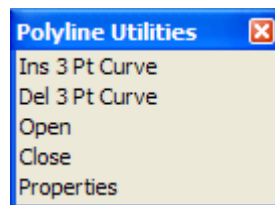
If bulge is turned on, the larger arc is used. The default is bulge turned off.



Utilities

polyline_utilities

The **utilities** walk-right menu contains a number of useful miscellaneous options for the polyline string. The menu is



Each of the new options will now be discussed.

Ins 3 Pt Curve

The **Ins 3 Pt Curve** option is used to insert a curve through three adjacent polyline points.

After selecting the option, the middle IP of the three adjacent polyline points is selected.

When the IP is accepted, the radius required to fit a curve through the IP and the two adjacent IP's is calculated, and this radius is then applied to the segments joining the adjacent IP's.

Del 3 Pt Curve

The **del 3 pt curve** option is used to delete the curves on either side of a polyline point.

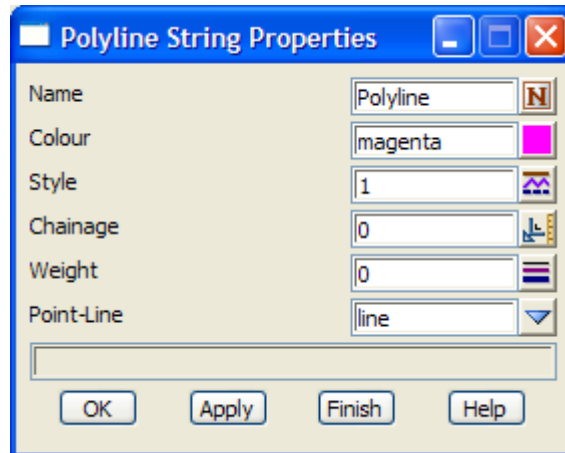
After selecting the option, an IP is selected and when the IP is accepted, the radii of the segments on either side are set to zero.

Hence the curves on either side of the IP are effectively removed.

Properties

polyline_string_properties

Selecting **Properties** brings up the **Polyline String Properties** panel which is used to modify the string's header information.



The fields in this panel are similar to those in the **create polyline string** panel and the polyline string editor options. The only new field is

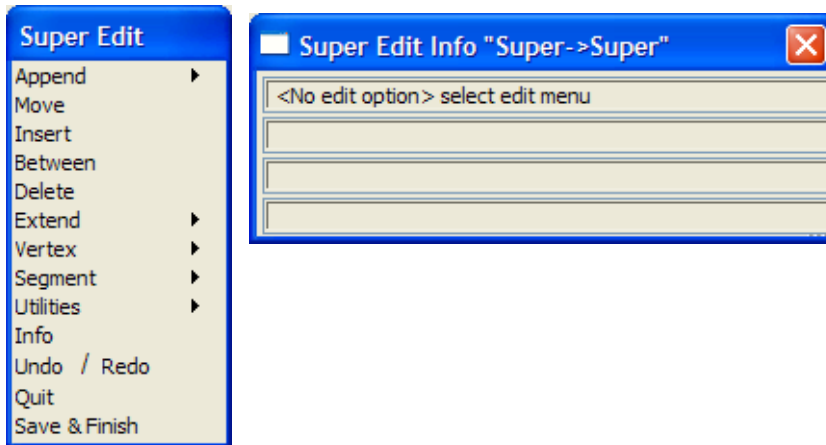
Field Description	Type	Defaults	Pop-Up
OK/Apply	button		

*for the string being edited, **OK** sets the string with the values in the panel fields and removes the panel. **Apply** sets the string with the values in the panel fields and leaves the panel on the screen.*

Super Edit

super_edit super_edit_info

On picking a super string, the **Super Edit** menu and **Super Edit Info** panel are placed on the screen.



The super string is similar to a polyline string in that it can have an arc instead of a line joining adjacent string points. Hence most of the options in the super edit menu are similar to the polyline edit options of the same name, and only the differences for each option will be discussed.

See the earlier section “Editor - Common Information” for general information about editing strings.

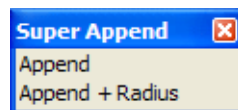
super_append

Append

The Append operation for a super is the same as the polyline case and an arc radius can be given for each new line segment.

Since in many cases an arc radius is not required at every segment of a super string, there is an append option that asks for the radius at every point and another that does not ask.

The append walk-right is



If the **Append + Radius** option selected, then before each vertex is appended, an enter radius typed-input box is placed on the screen.

The enter radius typed-input box looks like



The radius is entered into the typed-input box, terminated with <enter>. The entered value is taken as the radius of the arc to the next super string vertex and the arc will be drawn correctly as the cursor is moved to the next vertex.

A **radius** value of **0** is taken to mean **no arc**.

The height question for each vertex is toggled on/off in the snaps menu just as it was for a polyline string.

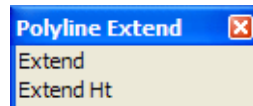
The Append option is terminated on selecting Cancel from the Pick Ops menu or by selecting a new option from the Super Edit menu

[polyline_extend](#)

Extend

There are two extend options for a polyline string - Extend=>Extend that is identical to the 3d string case where the z-value of the point being extended is kept constant, and a second option, Extend=>Extend Ht where the z-value of the point being extended is linearly interpolated by the extension distance.

The Extend walk-right is



Extend

Extend=>Extend that is identical to the 3d string case where the z-value of the point being extended is kept constant.

Extend by Ht

Extend=>Extend Ht not only moves the point but also linearly interpolates the z-value of the point being extended.

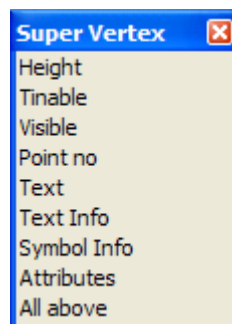
Please continue to the next section "Vertex" .

[super_vertex](#)

Vertex

The Vertex menu contains options to modify information at any vertex of the super string.

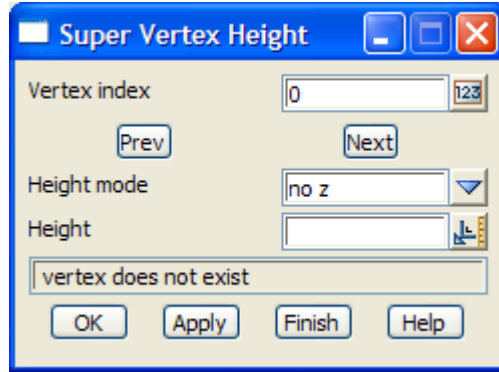
The Vertex walk-right is



Height

[super_vertex_height](#)

Selecting Vertex=>Height brings up the **Super Vertex Height** panel which is used to set the height value for vertices.



As soon as Height is chosen, a *<Select vertex> [Picks][Menu]* message is written to the **Status Bar** and vertices can be selected.

When the vertex to modify is selected, its *vertex number*, *height mode* and *height* are written to the appropriate panel fields. The values and modes can be changed and either **OK** or **Apply** selected to change the values of the vertex.

Another vertex can then be selected or the **Prev** and **Next** buttons used to move to adjacent vertices.

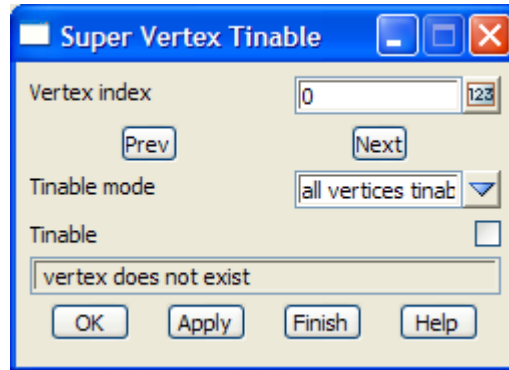
The fields and buttons used in the **Super Vertex Height** panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Vertex no.	input	selected vertex	
<i>if a vertex is selected, then its vertex number is displayed in this field. A number can also be typed in and any information in the panel will then be applied to that vertex if OK or Apply is selected.</i>			
Prev	button		
<i>move to the previous vertex (predecessor). The information for the previous vertex is displayed in the panel fields.</i>			
Next	button		
<i>move to the next vertex (successor). The information for the next vertex is displayed in the panel fields.</i>			
Height mode vertex	input		no z, entire string, each
<i>if no z, there is no z value for the vertex.</i>			
<i>if entire string, then the string has the same z value for each vertex.</i>			
<i>if each vertex, then each vertex has a separate z value.</i>			
Height	input	height of vertex/string	
<i>the height used for the vertex or for the entire string.</i>			
OK/Apply	button		
<i>for the vertex being edited, OK sets the vertex/string with the values in the panel fields and removes the panel. Apply sets the vertex/string with the values in the panel fields and leaves the panel on the screen.</i>			

Tinable

super_vertex_tinable

Selecting Vertex=>Tinable brings up the **Super Vertex Tinable** panel which is used to set the tinable flag for vertices.



As soon as Tenable is chosen, a `<Select vertex> [Picks][][Menu]` message is written to the **Status Bar** and vertices can be selected.

When the vertex to modify is selected, its *vertex number* and *tinable flag* are displayed in the panel. The tinable flag can be changed and either **OK** or **Apply** selected to change the tinable flag of the vertex.

Another vertex can then be selected or the **Prev** and **Next** buttons used to move to adjacent vertices.

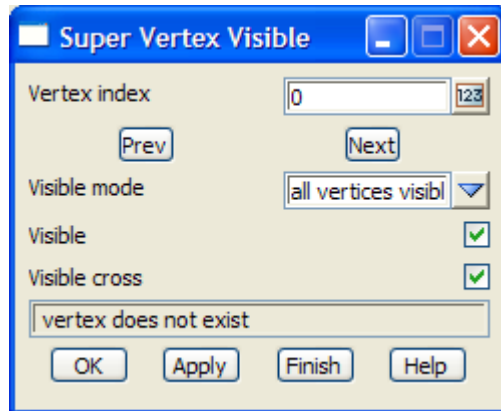
The fields and buttons used in the **Super Vertex Tenable** panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Vertex no.	input	selected vertex	
<i>if a vertex is selected, then its vertex number is displayed in this field. A number can also be typed in and any information in the panel will then be applied to that vertex if OK or Apply is selected.</i>			
Prev	button		
<i>move to the previous vertex (predecessor). The information for the previous vertex is displayed in the panel fields.</i>			
Next	button		
<i>move to the next vertex (successor). The information for the next vertex is displayed in the panel fields.</i>			
Tenable	tick		
<i>if tick, the vertex is included in tins. if not tick, then the vertex is ignored when triangulating.</i>			
OK/Apply	button		
<i>for the vertex being edited, OK sets the vertex/string with the values in the panel fields and removes the panel. Apply sets the vertex/string with the values in the panel fields and leaves the panel on the screen.</i>			

Visible

`super_vertex_visible`

Selecting Vertex=>Visible brings up the **Super Vertex Visible** panel which is used to set the visibility flag for vertices.



As soon as Visible is chosen, a `<Select vertex> [Picks][Menu]` message is written to the **Status Bar** and vertices can be selected.

When the vertex to modify is selected, its *vertex number* and *visibility flag* are displayed in the panel. The visibility flag can be changed and either **OK** or **Apply** selected to change the visibility flag of the vertex.

Another vertex can then be selected or the **Prev** and **Next** buttons used to move to adjacent vertices.

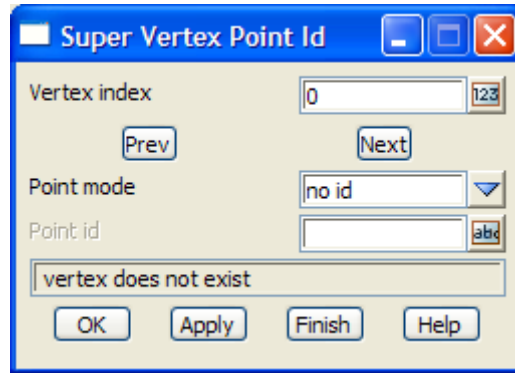
The fields and buttons used in the **Super Vertex Visible** panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Vertex no.	input	selected vertex	
<i>if a vertex is selected, then its vertex number is displayed in this field. A number can also be typed in and any information in the panel will then be applied to that vertex if OK or Apply is selected.</i>			
Prev	button		
<i>move to the previous vertex (predecessor). The information for the previous vertex is displayed in the panel fields.</i>			
Next	button		
<i>move to the next vertex (successor). The information for the next vertex is displayed in the panel fields.</i>			
Visible	tick		
<i>if tick, the vertex is visible.</i>			
<i>if not tick, then the vertex is invisible.</i>			
OK/Apply	button		
<i>for the vertex being edited, OK sets the vertex/string with the values in the panel fields and removes the panel. Apply sets the vertex/string with the values in the panel fields and leaves the panel on the screen.</i>			

Point no

`super_vertex_point_id`

Selecting Vertex=>Point no brings up the **Super Vertex Point Number** panel which is used to set the point numbers for vertices.



As soon as Point no is chosen, a `<Select vertex> [Picks][Menu]` message is written to the **Status Bar** and vertices can be selected.

When the vertex to modify is selected, its *vertex number* and *point number* are displayed in the panel. The point number can be changed and either **OK** or **Apply** selected to change the point number of the vertex.

Another vertex can then be selected or the **Prev** and **Next** buttons used to move to adjacent vertices.

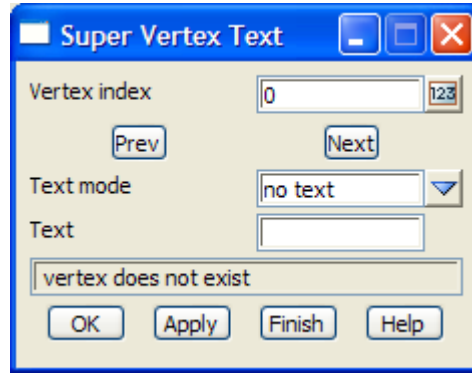
The fields and buttons used in the **Super Vertex Visible** panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Vertex no.	input	selected vertex	
<i>if a vertex is selected, then its vertex number is displayed in this field. A number can also be typed in and any information in the panel will then be applied to that vertex if OK or Apply is selected.</i>			
Prev	button		
<i>move to the previous vertex (predecessor). The information for the previous vertex is displayed in the panel fields.</i>			
Next	button		
<i>move to the next vertex (successor). The information for the next vertex is displayed in the panel fields.</i>			
Point no.	input	point no of vertex	
<i>the point number used for the vertex.</i>			
OK/Apply	button		
<i>for the vertex being edited, OK sets the vertex/string with the values in the panel fields and removes the panel. Apply sets the vertex/string with the values in the panel fields and leaves the panel on the screen.</i>			

Text

super_vertex_text

Selecting Vertex=>Text brings up the **Super Vertex Text** panel which is used to set the text for vertices.



As soon as Text is chosen, a `<Select vertex> [Picks][Menu]` message is written to the **Status Bar** and vertices can be selected.

When the vertex to modify is selected, its *vertex number*, *text mode* and *text* are written to the appropriate panel fields. The values and modes can be changed and either **OK** or **Apply** selected to change the values of the vertex.

Another vertex can then be selected or the **Prev** and **Next** buttons used to move to adjacent vertices.

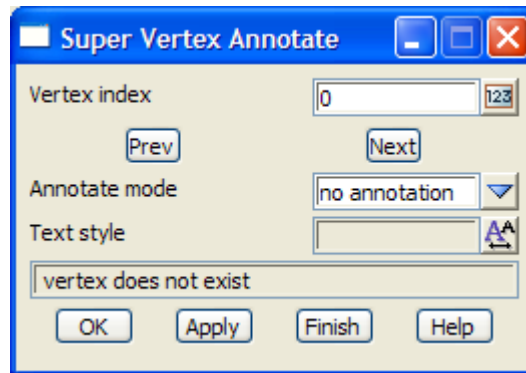
The fields and buttons used in the **Super Vertex Text** panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Vertex no.	input	selected vertex	
<i>if a vertex is selected, then its vertex number is displayed in this field. A number can also be typed in and any information in the panel will then be applied to that vertex if OK or Apply is selected.</i>			
Prev	button		
<i>move to the previous vertex (predecessor). The information for the previous vertex is displayed in the panel fields.</i>			
Next	button		
<i>move to the next vertex (successor). The information for the next vertex is displayed in the panel fields.</i>			
Text mode	input		no text, entire string, each vertex
<i>if no text, there is no text for the vertex.</i>			
<i>if entire string, then the string has the same text for each vertex.</i>			
<i>if each vertex, then each vertex has a separate text value.</i>			
Text	input	text of vertex/string	
<i>the text used for the vertex or for the entire string.</i>			
OK/Apply	button		
<i>for the vertex being edited, OK sets the vertex/string with the values in the panel fields and removes the panel. Apply sets the vertex/string with the values in the panel fields and leaves the panel on the screen.</i>			

Text Info

super_vertex_annotate

Selecting Vertex=>Text info brings up the **Super Vertex Annotate** panel which is used to set the annotation styles for the text at vertices.



As soon as Text info is chosen, a `<Select vertex> [Picks][Menu]` message is written to the **Status Bar** and vertices can be selected.

When the vertex to modify is selected, its *vertex number*, *annotate mode* and *annotation information* are written to the appropriate panel fields. The values and modes can be changed and either **OK** or **Apply** selected to change the values of the vertex.

Another vertex can then be selected or the **Prev** and **Next** buttons used to move to adjacent vertices.

The fields and buttons used in the **Super Vertex Annotate** panel have the following functions.

Field	Description	Type	Defaults	Pop-Up
Vertex no.		input	selected vertex	
	<i>if a vertex is selected, then its vertex number is displayed in this field. A number can also be typed in and any information in the panel will then be applied to that vertex if OK or Apply is selected.</i>			
Prev		button		
	<i>move to the previous vertex (predecessor). The information for the previous vertex is displayed in the panel fields.</i>			
Next		button		
	<i>move to the next vertex (successor). The information for the next vertex is displayed in the panel fields.</i>			
Annotate mode		input		no annotation, entire string, each vertex
	<i>if no annotation, then the text at the vertex is not displayed.</i>			
	<i>if entire string, then the same annotation settings are used for each vertex.</i>			
	<i>if each vertex, then each vertex has separate annotations settings.</i>			
Text style		input	1	available text styles
	<i>text style for the text at the vertex.</i>			
Text units		input	pixels	pixels, world
	<i>units for the height of the text.</i>			
Height (u)		input		
	<i>height of the text (in text units).</i>			
X factor		input	1	
	<i>x factor of the text.</i>			
Offset (u)		input	0	
	<i>distance (in text units) to offset the text from its (x,y) placement position.</i>			
Raise (u)		input	0	
	<i>distance (in text units) to raise the text above the line for its (x,y) placement position.</i>			

Justify input bottom-left bot-left/cent/right, mid-left/cent/right top-left/cent/right

text justification (about the offset position).

Angle input

angle of the text.

Slant input 0

slant, in degrees, of the text.

Colour input available colours

colour of the text.

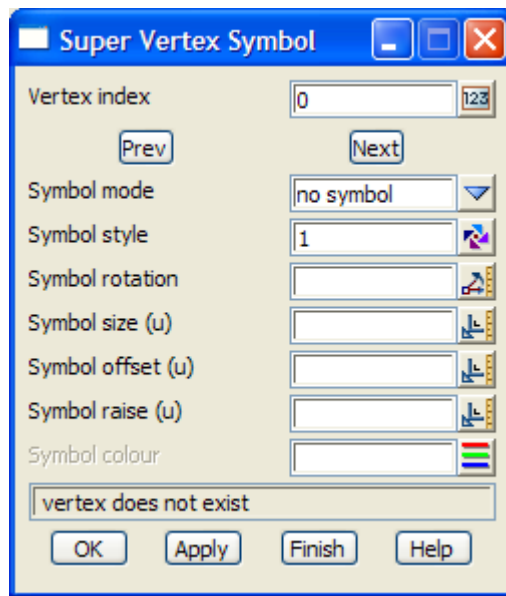
OK/Apply button

for the vertex being edited, OK sets the vertex/string with the values in the panel fields and removes the panel. Apply sets the vertex/string with the values in the panel fields and leaves the panel on the screen.

Symbol Info

super_vertex_symbol

Selecting Vertex=>Symbol info brings up the **Super Vertex Symbol** panel which is used to set symbols and their display parameters at vertices.



As soon as Symbol info is chosen, a <Select vertex> [Picks][][Menu] message is written to the **Status Bar** and vertices can be selected.

When the vertex to modify is selected, its *vertex number*, *symbol mode* and *symbol information* are written to the appropriate panel fields. The values and modes can be changed and either **OK** or **Apply** selected to change the values for the vertex.

Another vertex can then be selected or the **Prev** and **Next** buttons used to move to adjacent vertices.

The fields and buttons used in the **Super Vertex Symbol** panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Vertex no.	input	selected vertex	

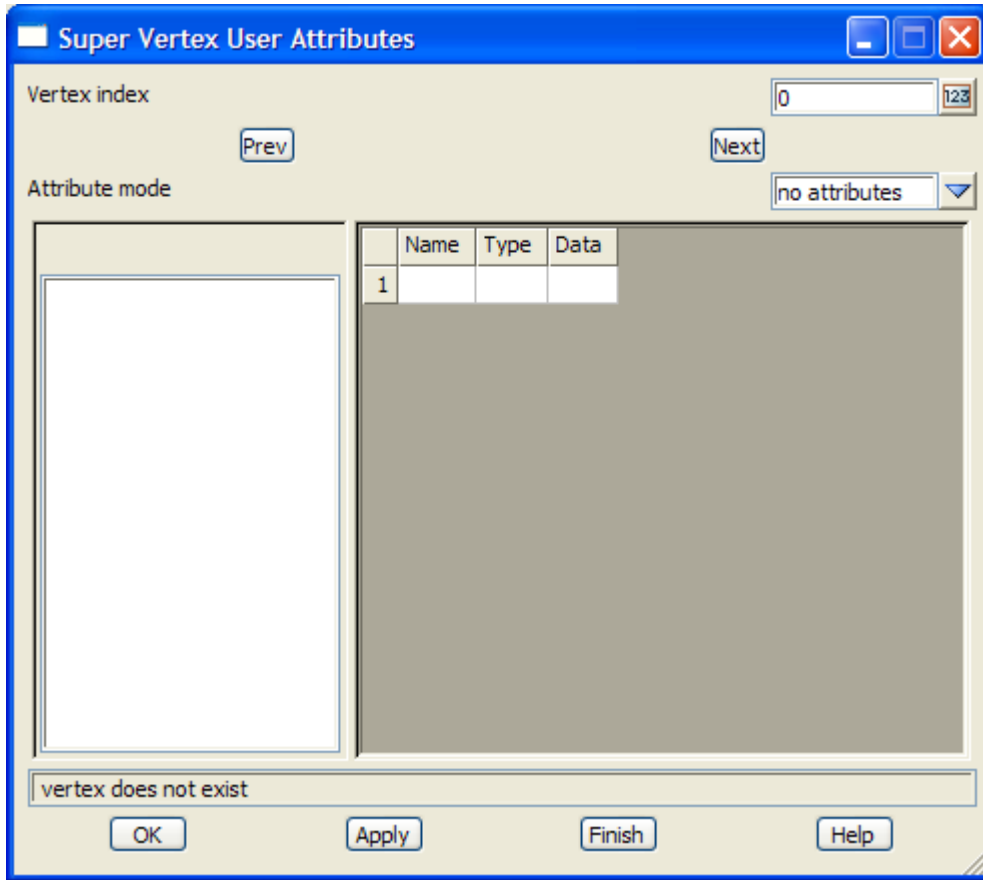
*if a vertex is selected, then its vertex number is displayed in this field. A number can also be typed in and any information in the panel will then be applied to that vertex if **OK** or **Apply** is selected.*

Prev	button		
	<i>move to the previous vertex (predecessor). The information for the previous vertex is displayed in the panel fields.</i>		
Next	button		
	<i>move to the next vertex (successor). The information for the next vertex is displayed in the panel fields.</i>		
Symbol mode	input		no symbol, entire string, each vertex
	<i>if no symbol, then there is no symbol at the vertex.</i>		
	<i>if entire string, then the same symbol and settings are used for each vertex.</i>		
	<i>if each vertex, then each vertex has separate symbols and settings.</i>		
Symbol style	input	1	available line styles
	<i>line style for the symbol at the vertex.</i>		
Symbol rotation	input		
	<i>rotation angle of the symbol.</i>		
Symbol size (u)	input		
	<i>size of the symbol (in xxx units).</i>		
Symbol offset (u)	input	0	
	<i>distance (in xxx units) to offset the symbol from its (x,y) placement position.</i>		
Symbol raise (u)	input	0	
	<i>distance (in xxx units) to raise the symbol above the line for its (x,y) placement position.</i>		
Symbol colour	input		available colours
	<i>colour of the symbol if none is defined in the symbol definition</i>		
OK/Apply	button		
	<i>for the vertex being edited, OK sets the vertex/string with the values in the panel fields and removes the panel. Apply sets the vertex/string with the values in the panel fields and leaves the panel on the screen.</i>		

Attributes

[super_vertex_user_attributes](#)

Selecting Vertex=>Attributes brings up the **Super Vertex User Attributes** panel which is used to display and edit user defined attributes at vertices of the super string.



The **Prev** and **Next** buttons are used to cycle through and display the attributes for each vertex in the super string in the *Name/Type/Data* grid.

The data in the *Name/Type/Data* grid can be deleted, modified or added to and then updated for the vertex using the **OK** or **Apply** button.

The fields and buttons used in the **Super Vertex User Attributes** panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Vertex no.	input	selected vertex	

*when the option starts, the user attributes for the first vertex is displayed. The **Next** and **Prev** buttons will move onto other vertices. Also a number can be typed into the field and any information in the panel will then be applied to that vertex if **OK** or **Apply** is selected. Typing <Enter> after entering a number will go to that vertex number and display the attributes.*

Prev button

move to the previous vertex (predecessor). The information for the previous vertex is displayed in the panel fields.

Next button

move to the next vertex (successor). The information for the next vertex is displayed in the panel fields.

Attribute mode choice box no attributes, each vertex

*if **no attributes**, then no vertices have user attributes.
if **each vertex**, then each vertex can have user attributes.*

Name/Type/Data Grid

Name	input	
	<i>name for the user attribute. This must be unique for all attributes at this vertex.</i>	
Type	choice box	integer, real, text
	<i>type of the attribute.</i>	
Data	input	
	<i>value for the attribute.</i>	

OK/Apply button

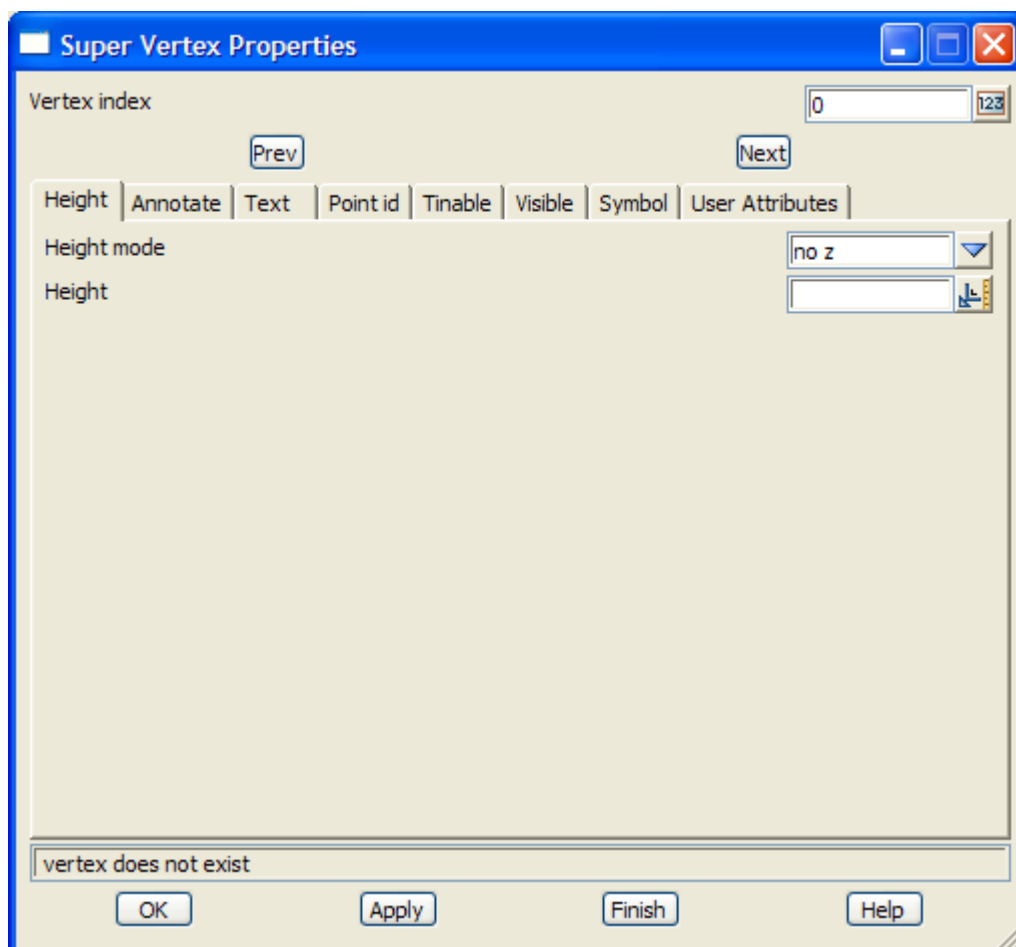
for the vertex being edited, **OK** sets the vertex with the values in the panel fields and removes the panel. **Apply** sets the vertex with the values in the panel fields and leaves the panel on the screen.

Vertex - All above**super_vertex_properties**

Selecting Vertex=>All above brings up the **Super Vertex Properties** panel which is used to display all the properties for a vertex.

This option is also available from the *Strings* menu

Position of option on menu: Strings =>Properties =>Vertex (all)



As soon as All above is chosen, a `<Select vertex> [Picks][Menu]` message is written to the **Status**

Bar and vertices can be selected.

When the vertex to modify is selected, its *vertex number* and all other *information* are written to the appropriate panel fields. The values and modes can be changed and either **OK** or **Apply** selected to change the values for the vertex.

The fields in the **Super Vertex Properties** panel have already been described in the other Vertex options and so will not be described again.

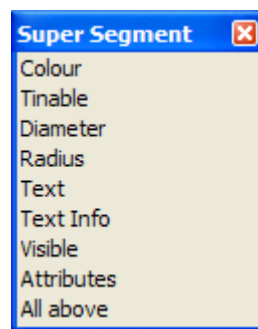
Please continue to the next section “Segment” .

Segment

super_segment

The **Segment** menu contains options to modify information at any segment of the super string.

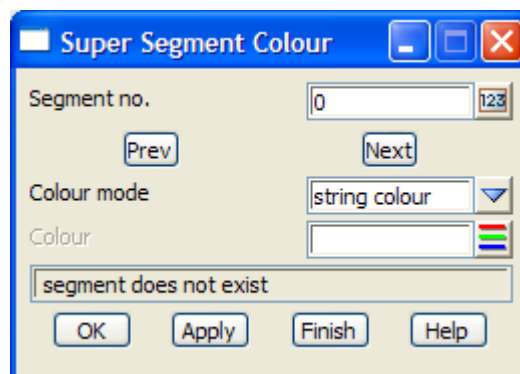
The **Segment** walk-right is



Colour

super_segment_colour

Selecting **Segment=>Colour** brings up the **Super Segment Colour** panel which is used to set the colour of the string segments.



As soon as **Colour** is chosen, a *<Select segment> [Picks][Menu]* message is written to the **Status Bar** and segments can be selected.

When the segment to modify is selected, its *segment number*, *colour mode* and *colour* are written to the appropriate panel fields. The values and modes can be changed and either **OK** or **Apply** selected to change the values of the segment.

Another segment can then be selected or the **Prev** and **Next** buttons used to move to adjacent segments. The appropriate segment highlights when the **Prev** and **Next** buttons are used.

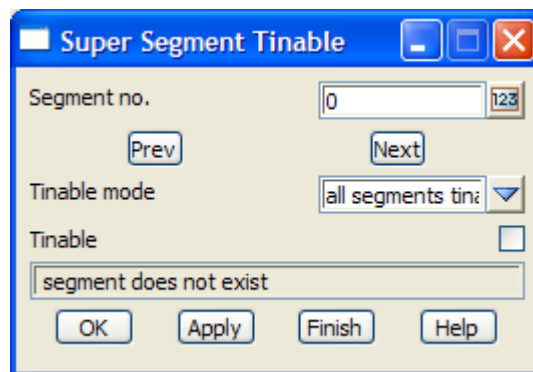
The fields and buttons used in the **Super Segment Colour** panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Segment no. <i>if a segment is selected, then its segment number is displayed in this field. A number can also be typed in and any information in the panel will then be applied to that segment if OK or Apply is selected.</i>	input	selected vertex	
Prev <i>move to the previous segment (predecessor). The information for the previous segment is displayed in the panel fields.</i>	button		
Next <i>move to the next segment (successor). The information for the next segment is displayed in the panel fields.</i>	button		
Colour mode <i>if no z, there is no z value for the vertex. if string colour, then all the segments in the string have the same colour. if each segment, then each segment has a separate colour.</i>	input		string colour, each segment
Colour <i>the colour used for the segment or for the entire string.</i>	input	colour of segment/string	available colours
OK/Apply <i>for the segment being edited, OK sets the segment/string with the values in the panel fields and removes the panel. Apply sets the segment/string with the values in the panel fields and leaves the panel on the screen.</i>	button		

Tinable

super_segment_tinable

Selecting Segment=>Tinable brings up the **Super Segment Tinable** panel which is used to set the tinable flag for segments.



As soon as Tinable is chosen, a `<Select segment> [Picks][Menu]` message is written to the **Status Bar** and vertices can be selected.

When the segment to modify is selected, its *segment number* and *tinable flag* are displayed in the panel. The tinable flag can be changed and either **OK** or **Apply** selected to change the tinable flag of the segment.

Another segment can then be selected or the **Prev** and **Next** buttons used to move to adjacent segments.

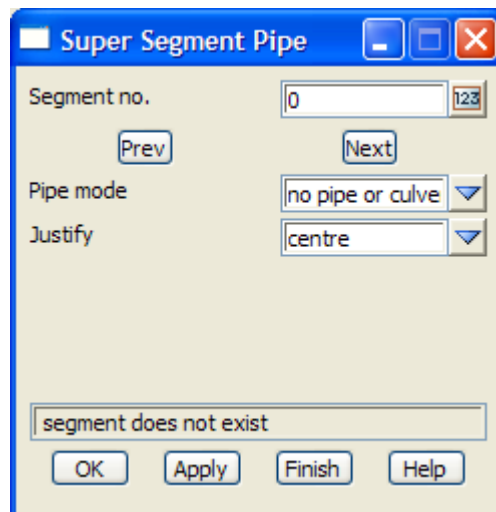
The fields and buttons used in the **Super Segment Tinable** panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Segment no. <i>if a segment is selected, then its segment number is displayed in this field. A number can also be typed in and any information in the panel will then be applied to that segment if OK or Apply is selected.</i>	input	selected segment	
Prev <i>move to the previous segment (predecessor). The information for the previous segment is displayed in the panel fields.</i>	button		
Next <i>move to the next segment (successor). The information for the next segment is displayed in the panel fields.</i>	button		
Tinable <i>if tick, the triangulation process tries to preserve the segment as a side of a triangle in the tin.</i>	tick		
OK/Apply <i>for the segment being edited, OK sets the segment/string with the values in the panel fields and removes the panel. Apply sets the segment/string with the values in the panel fields and leaves the panel on the screen.</i>	button		

Diameter

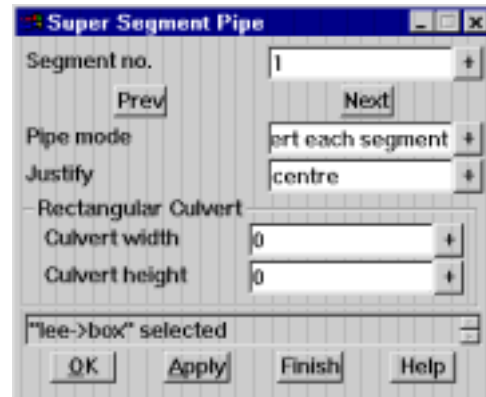
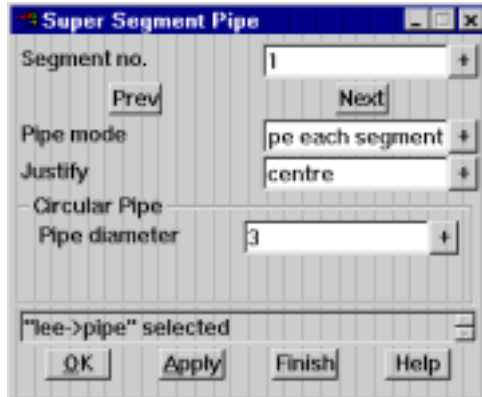
super_segment_pipe

The segments of a super string can have either a pipe or box cross section, or none. Selecting Segment=>Diameter brings up the **Super Segment Pipe** panel which is used to set the pipe mode and size for the string segments.



As soon as Diameter is chosen, a *<Select segment> [Picks][Menu]* message is written to the **Status Bar** and segments can be selected.

When the segment to modify is selected, its *segment number*, *pipe mode* and *information* are written to the appropriate panel fields and the **Super Segment Pipe** panel will change depending on whether it was a pip or box cross-section for the string.



After any panel fields are modified, selecting either **OK** or **Apply** will change the pipe information for the segment.

Another segment can then be selected or the **Prev** and **Next** buttons used to move to adjacent segments. The appropriate segment highlights when the **Prev** and **Next** buttons are used.

The fields and buttons used in the **Super Segment Pipe** panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Segment no.	input	selected vertex	
<i>if a segment is selected, then its segment number is displayed in this field. A number can also be typed in and any information in the panel will then be applied to that segment if OK or Apply is selected.</i>			
Prev	button		
<i>move to the previous segment (predecessor). The information for the previous segment is displayed in the panel fields.</i>			
Next	button		
<i>move to the next segment (successor). The information for the next segment is displayed in the panel fields.</i>			
Pipe mode	input		no pipe or box pipe entire string pipe each segment box entire string box each segment
<i>if no pipe or box, there is no z value for the vertex. if string colour, then all the segments in the string have the same colour. if each segment, then each segment has a separate colour.</i>			
Justify	input		invert, centre, overt
<i>justification of the pipe/box with respect to the co-ordinates given for the vertices of the super string. rotation angle of the symbol.</i>			
Pipe diameter	input		
<i>diameter of the pipe in world units.</i>			
Box width	input		
<i>width of the box section in world units.</i>			
Box height	input		
<i>height of the box section in world units.</i>			
OK/Apply	button		
<i>for the segment being edited, OK sets the segment/string with the values in the panel fields and</i>			

removes the panel. **Apply** sets the segment/string with the values in the panel fields and leaves the panel on the screen.

Radius

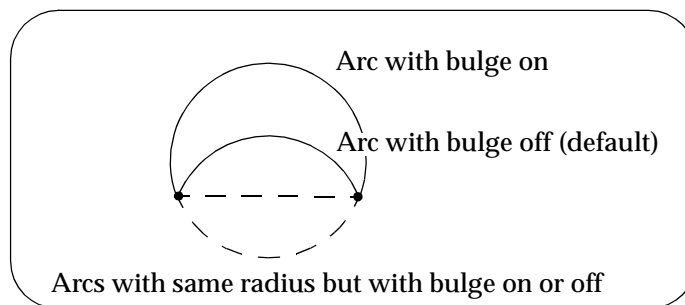
super_segment_radius

When viewed in plan, the segments of a super string can be joined by string lines or arcs. If the radius is positive, the arc is drawn from the start vertex to the end vertex of the segment in a clockwise direction. If the radius is negative, the arc is drawn from the start vertex to the end vertex on the segment in a counter-clockwise direction.

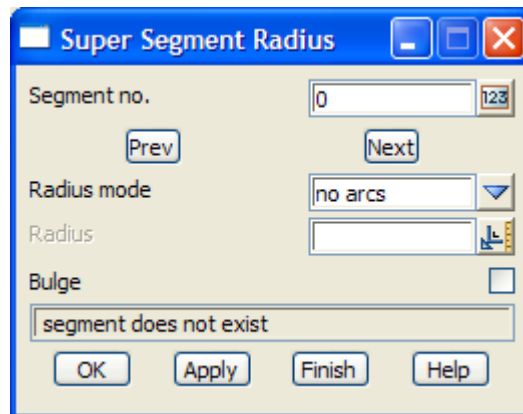
For a given radius (positive or negative), there are two possible cases for the arc- one where the arc is less than a semi-circle, the other when the arc is greater than a semi-circle.

If bulge is turned *on*, the larger arc is used. The default is bulge turned off.

A zero radius is interpreted to be a just a straight line segment with no arc.



Selecting Segment=>Radius brings up the **Super Segment Radius** panel which is used to set the plan radius of the segment.



As soon as Radius is chosen, a *<Select segment> [Picks][Menu]* message is written to the **Status Bar** and segments can be selected.

When the segment to modify is selected, its *segment number*, *radius* and *bulge* are written to the appropriate panel fields. The values and modes can be changed and either **OK** or **Apply** selected to change the values of the segment.

Another segment can then be selected or the **Prev** and **Next** buttons used to move to adjacent segments. The appropriate segment highlights when the **Prev** and **Next** buttons are used.

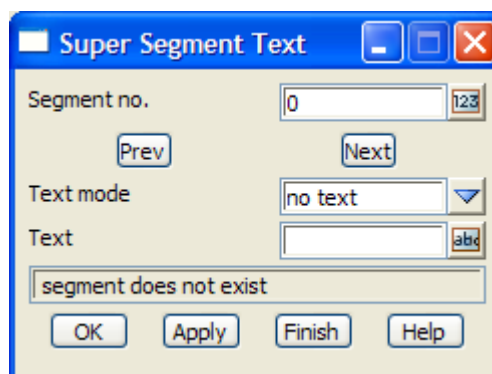
The fields and buttons used in the **Super Segment Radius** panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Segment no. <i>if a segment is selected, then its segment number is displayed in this field. A number can also be typed in and any information in the panel will then be applied to that segment if OK or Apply is selected.</i>	input	selected vertex	
Prev <i>move to the previous segment (predecessor). The information for the previous segment is displayed in the panel fields.</i>	button		
Next <i>move to the next segment (successor). The information for the next segment is displayed in the panel fields.</i>	button		
Colour mode <i>if no z, there is no z value for the vertex. if string colour, then all the segments in the string have the same colour. if each segment, then each segment has a separate colour.</i>	input		string colour, each segment
Radius <i>if tick, the larger arc is used. if not-tick, the smaller arc is used.</i>	tick		
Bulge <i>radius of the segment arc. A radius of 0 mean no arc.</i>	input	0	
OK/Apply <i>for the segment being edited, OK sets the segment/string with the values in the panel fields and removes the panel. Apply sets the segment/string with the values in the panel fields and leaves the panel on the screen.</i>	button		

Text

super_segment_text

Selecting Segment=>Text brings up the **Super Segment Text** panel which is used to set the text for segments.



As soon as Text is chosen, a `<Select segment> [Picks][Menu]` message is written to the **Status Bar** and vertices can be selected.

When the segment to modify is selected, its *segment number*, *text mode* and *text* are written to the appropriate panel fields. The values and modes can be changed and either **OK** or **Apply** selected to change the values of the segment.

Another segment can then be selected or the **Prev** and **Next** buttons used to move to adjacent segments.

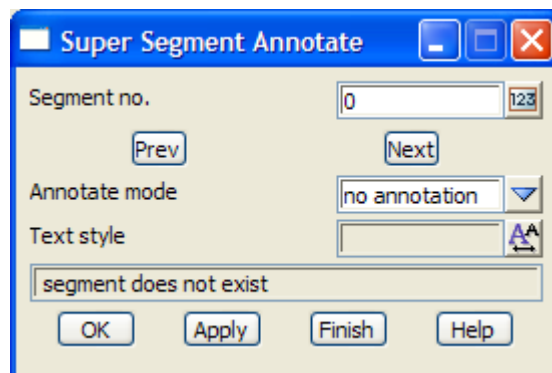
The fields and buttons used in the **Super Segment Text** panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Segment no. <i>if a segment is selected, then its segment number is displayed in this field. A number can also be typed in and any information in the panel will then be applied to that segment if OK or Apply is selected.</i>	input	selected vertex	
Prev <i>move to the previous segment (predecessor). The information for the previous segment is displayed in the panel fields.</i>	button		
Next <i>move to the next segment (successor). The information for the next segment is displayed in the panel fields.</i>	button		
Text mode <i>if no text, there is no text for the segment. if entire string, then the string has the same text for each segment. if each vertex, then each segment has a separate text value.</i>	input		no text, entire string, each segment
Text <i>the text used for the segment or for the entire string.</i>	input	text of segment/string	
OK/Apply <i>for the segment being edited, OK sets the segment/string with the values in the panel fields and removes the panel. Apply sets the segment/string with the values in the panel fields and leaves the panel on the screen.</i>	button		

Text Info

super_segment_annotate

Selecting Segment=>Text info brings up the **Super Segment Annotate** panel which is used to set the annotation styles for the text at segments.



As soon as Text info is chosen, a <Select segment> [Picks][Menu] message is written to the **Status Bar** and segments can be selected.

When the segment to modify is selected, its *segment number*, *annotate mode* and *annotation information* are written to the appropriate panel fields. The values and modes can be changed and either **OK** or **Apply** selected to change the values of the segment.

Another segment can then be selected or the **Prev** and **Next** buttons used to move to adjacent segments.

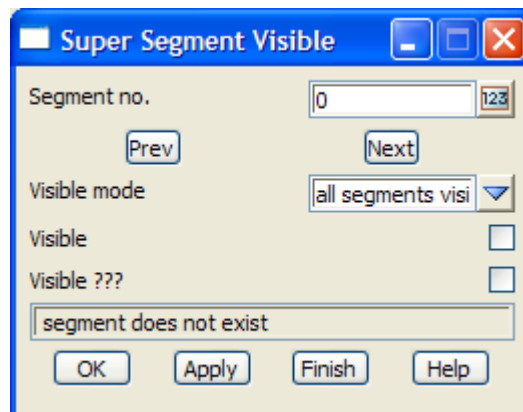
The fields and buttons used in the **Super Segment Annotate** panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Segment no. <i>if a segment is selected, then its segment number is displayed in this field. A number can also be typed in and any information in the panel will then be applied to that segment if OK or Apply is selected.</i>	input	selected vertex	
Prev <i>move to the previous segment (predecessor). The information for the previous segment is displayed in the panel fields.</i>	button		
Next <i>move to the next segment (successor). The information for the next segment is displayed in the panel fields.</i>	button		
Annotate mode <i>if no annotation, then the text at the segment is not displayed. if entire string, then the same annotation settings are used for each segment. if each vertex, then each segment has separate annotations settings.</i>	input		no annotation, entire string, each segment
Textstyle info <i>textstyle information.</i>	input		
OK/Apply <i>for the segment being edited, OK sets the segment/string with the values in the panel fields and removes the panel. Apply sets the segment/string with the values in the panel fields and leaves the panel on the screen.</i>	button		

Visible

super_segment_visible

Selecting Segment=>Visible brings up the **Super Segment Visible** panel which is used to set the visibility flag for segments.



As soon as Visible is chosen, a <Select segment> [Picks][Menu] message is written to the **Status Bar** and segments can be selected.

When the segment to modify is selected, its *segment number* and *visibility flag* are displayed in the panel. The visibility flag can be changed and either **OK** or **Apply** selected to change the visibility flag of the segment.

Another segment can then be selected or the **Prev** and **Next** buttons used to move to adjacent segments.

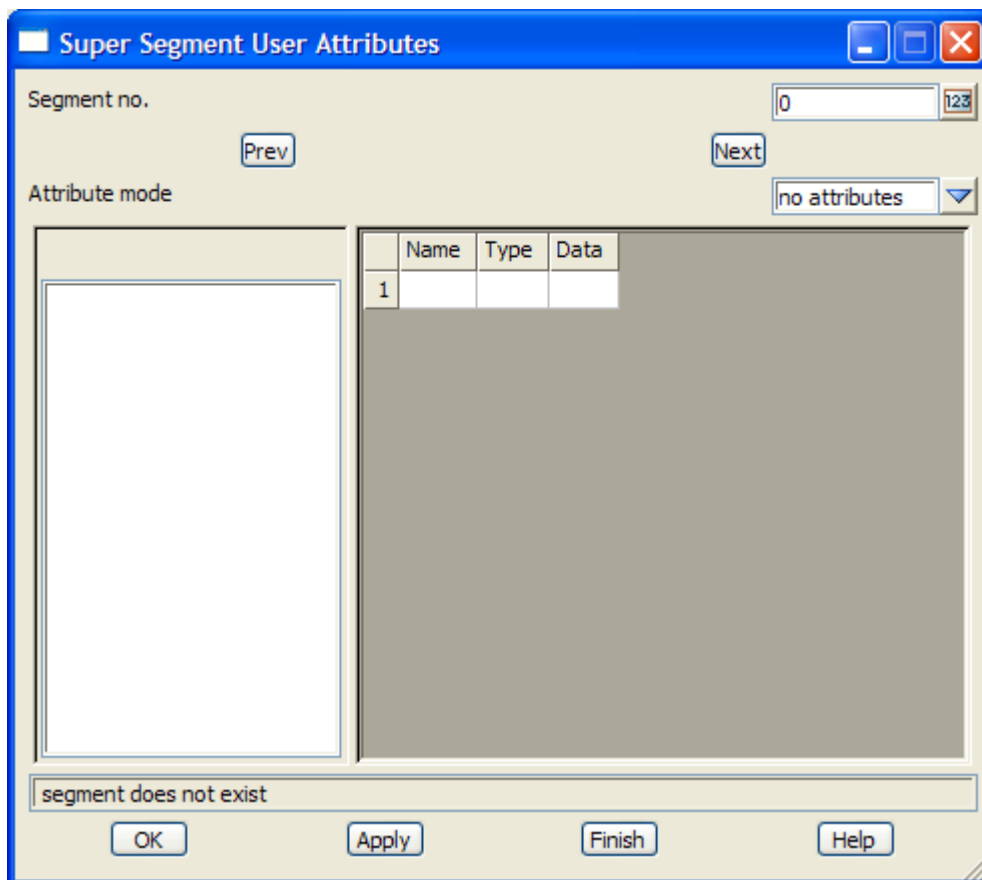
The fields and buttons used in the **Super Segment Visible** panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Segment no. <i>if a segment is selected, then its segment number is displayed in this field. A number can also be typed in and any information in the panel will then be applied to that segment if OK or Apply is selected.</i>	input	selected vertex	
Prev <i>move to the previous segment (predecessor). The information for the previous segment is displayed in the panel fields.</i>	button		
Next <i>move to the next segment (successor). The information for the next segment is displayed in the panel fields.</i>	button		
Visible <i>if tick, the segment is visible. if not tick, then the segment is invisible.</i>	tick		
OK/Apply <i>for the segment being edited, OK sets the segment/string with the values in the panel fields and removes the panel. Apply sets the segment/string with the values in the panel fields and leaves the panel on the screen.</i>	button		

Attributes

super_segment_user_attributes

Selecting Segment=>Attributes brings up the **Super Segment User Attributes** panel which is used to display and edit user defined attributes at segments of the super string.



The **Prev** and **Next** buttons are used to cycle through and display the attributes for each segment

in the super string in the *Name/Type/Data* grid.

The data in the *Name/Type/Data* grid can be deleted, modified or added to and then updated for the segment using the **OK** or **Apply** button.

The fields and buttons used in the **Super Segment User Attributes** panel have the following functions.

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Segment no.

*when the option starts, the user attributes for the first segment is displayed. The **Next** and **Prev** buttons will move onto other segments. Also a number can be typed into the field and any information in the panel will then be applied to that segment if **OK** or **Apply** is selected. Typing <Enter> after entering a number will go to that segment number and display the attributes.*

Prev button

move to the previous segment (predecessor). The information for the previous segment is displayed in the panel fields.

Next button

move to the next segment (successor). The information for the next segment is displayed in the panel fields.

Attribute mode choice box no attributes, each segment

*if **no attributes**, then no segments have user attributes.
if **each segment**, then each segment can have user attributes.*

Name/Type/Data Grid

Name input

name for the user attribute. This must be unique for all attributes at this segment.

Type choice box integer, real, text

type of the attribute.

Data input

value for the attribute.

OK/Apply button

*for the segment being edited, **OK** sets the segment with the values in the panel fields and removes the panel. **Apply** sets the segment with the values in the panel fields and leaves the panel on the screen.*

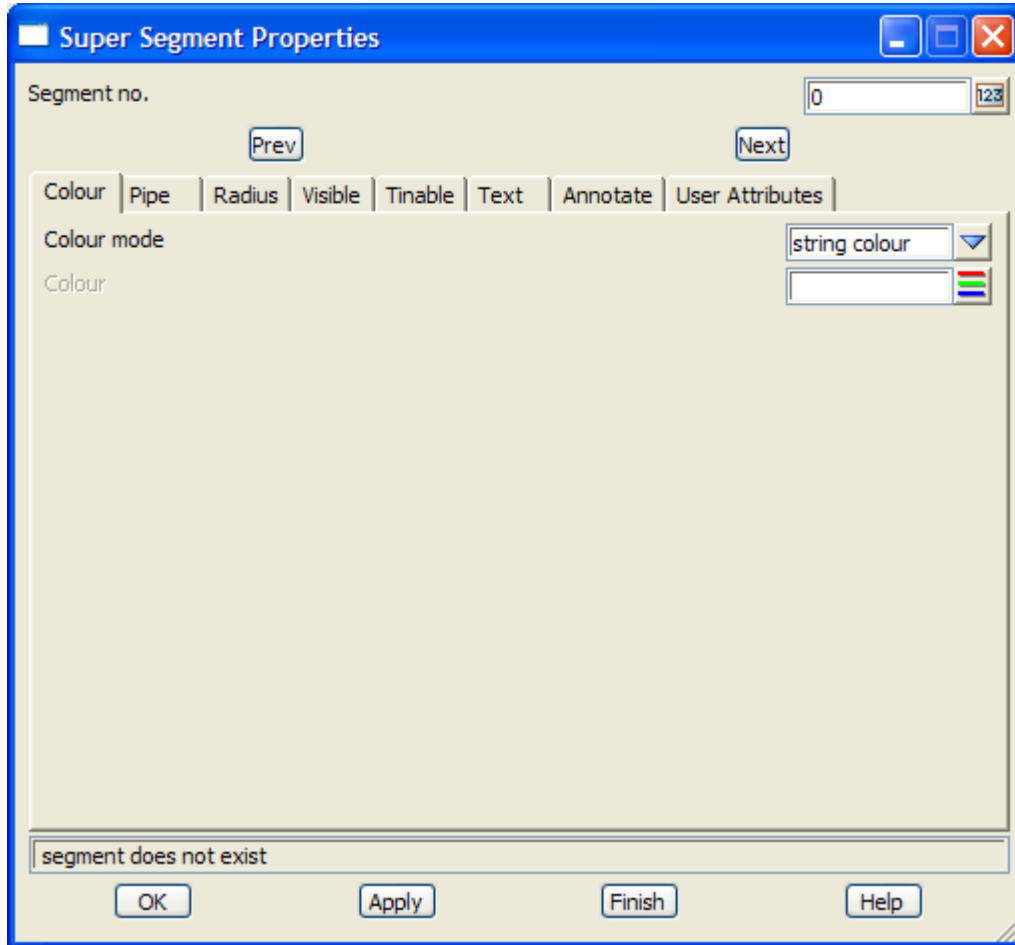
Segment - All above

[super_segment_properties](#)

Selecting Segment=>All above brings up the **Super Segment Properties** panel which is used to display all the properties of a segment.

This option is also available from the *Strings* menu

Position of option on menu: Strings =>Properties =>Segment (all)



As soon as **All above** is chosen, a `<Select segment> [Picks][Menu]` message is written to the **Status Bar** and segments can be selected.

When the segment to modify is selected, its *segment number* and all other *information* are written to the appropriate panel fields. The values and modes can be changed and either **OK** or **Apply** selected to change the values for the segment.

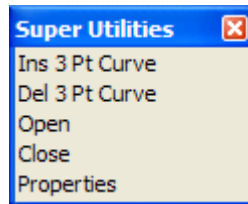
The fields in the **Super Segment Properties** panel have already been described in the other Segment options and so will not be described again.

Please continue to the next section “Utilities” for information on Utilities, Open, Close and Properties.

Utilities

super_utilities

The **Utilities** walk-right menu contains a number of useful miscellaneous option for the super string. The menu is



Each of the new options will now be discussed.

Ins 3 Pt Curve

The **Ins 3 Pt Curve** option is used to insert a curve through three adjacent super string vertices.

After selecting the option, the middle vertex of the three adjacent super string vertices is selected.

When the vertex is accepted, the radius required to fit a curve through the vertex and the two adjacent vertices is calculated, and this radius is then applied to the segments joining the adjacent vertices.

Del 3 Pt Curve

The **del 3 pt curve** option is used to delete the curves on either side of a super string vertex.

After selecting the option, a vertex is selected and when the vertex is accepted, the radii of the segments on either side are set to zero.

Hence the curves on either side of the vertex are effectively removed.

Open

If the string is closed, selecting the **open** option removes the segment between the 1st and last vertex of the super string.

If the string is not closed, the **open** option does nothing.

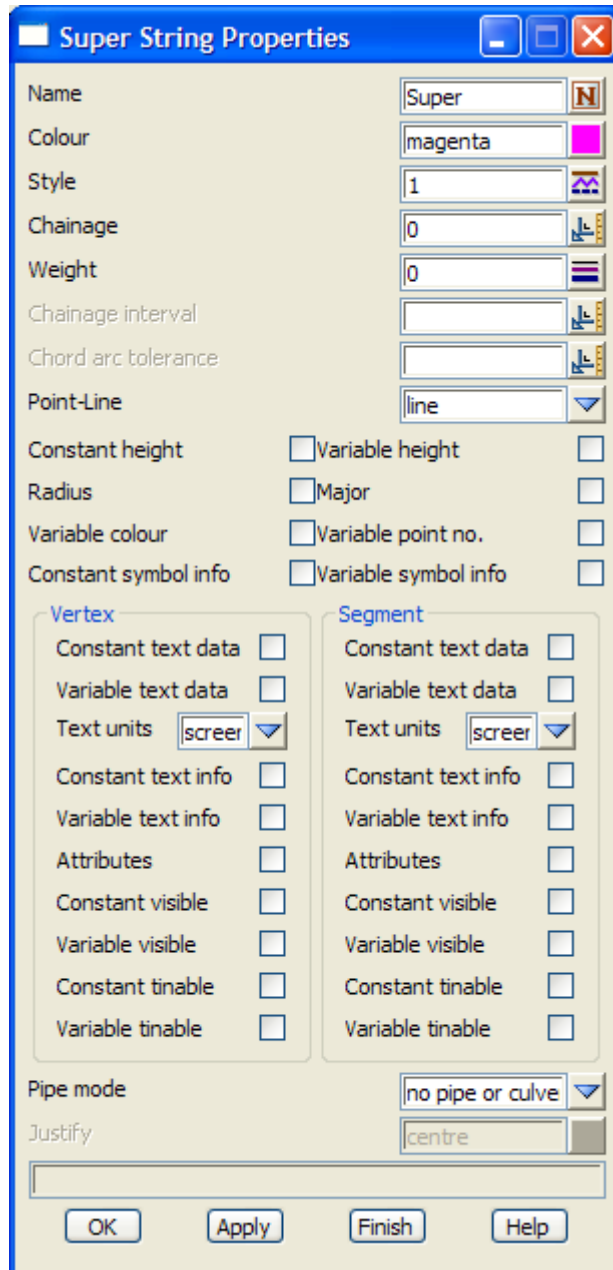
Close

Selecting the **close** option adds a segment between the 1st and the last vertices of the super string. Note that unlike other strings, no extra vertices are added.

Properties

super_string_properties

Selecting **Properties** brings up the **Super String Properties** panel which is used to modify the string's header information.



The fields in this panel are similar to those in the **Create Super String** panel and the Super String Editor options. The only new field is

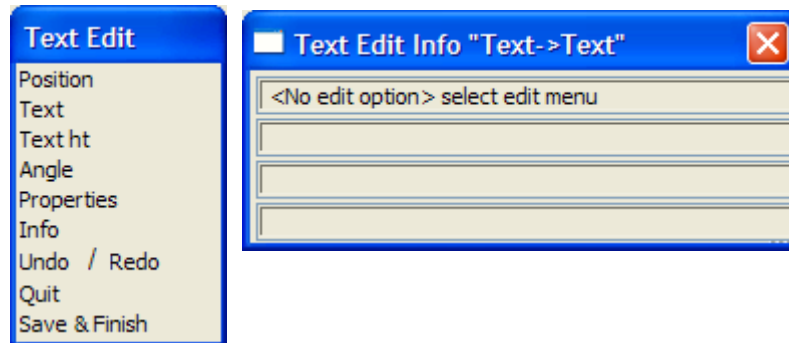
Field Description	Type	Defaults	Pop-Up
OK/Apply	button		

*for the string being edited, **OK** sets the string with the values in the panel fields and removes the panel. **Apply** sets the string with the values in the panel fields and leaves the panel on the screen.*

Text Edit

[text_edit](#) [text_edit_info](#)

On picking a text string, the **text edit** menu and the panel are placed on the screen.



Each option in the text edit menu will now be described.

See the earlier section “Editor - Common Information” for general information about editing strings.

Position

The **position** option is used to place the text string for the first time and to re-position (move) an existing text string.

Position is a one step process.

After selecting the **position** option, the new position for the text is selected. The text is then redrawn at the new position.

```
message area 1 <Position>
Screen message area
    <Select point position> [picks][ ][menu]
    <Select point position> [picks][accepts][menu]
```

The **position** option repeats until cancelled by the user by either bringing up the pick ops menu and selecting cancel or by selecting a new option from the text edit menu.

If, after bringing up the pick ops menu, it is decided to continue with the position option, simply select the restart option from the pick ops menu and the pick ops menu will disappear leaving the position option still current.

Typed input can be used at any stage

Text

The **text** option is used to modify the text of the text string.

After the **text** option is chosen, an enter text typed-input box is placed on the screen with the string's current text displayed in it.

The enter text typed-input box looks like:



The text is entered into the typed-input box, terminated with <enter>. The entered value is taken as the text of the text string and the string redrawn with the new text. The typed-input box then disappears.

The text option automatically terminates and a new option needs to be selected from the text edit menu.

Text ht

The text ht option is used to modify the height of the text in the text string.

After the text ht option is chosen, an **enter value** typed-input box is placed on the screen with the string's current text height displayed in it.

The enter value typed-input box looks like:



The text height is entered into the typed-input box, terminated with <enter>. The entered value is taken as the height of the text in the text string and the string redrawn with the new height.

The typed-input box then disappears.

The height option is automatically terminated and a new option needs to be selected from the text edit menu.

Angle

The angle option is used to modify the angle that the text in the text string is drawn at.

The text angle is measured in a counter-clockwise direction with respect to the horizontal axis.

After the angle option is chosen, an **enter angle** typed-input box is placed on the screen with the string's current text angle displayed in it.

The enter angle typed-input box looks like:



The text angle is entered into the typed-input box, terminated with <enter>. The entered value is taken as the angle of the text in the text string and the string redrawn with the new angle.

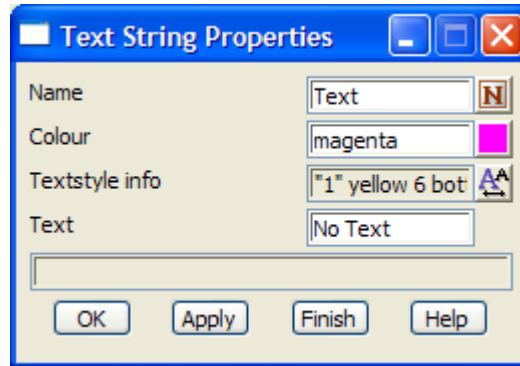
The typed-input box then disappears.

The angle option is automatically terminated and a new option needs to be selected from the text edit menu.

Properties

text_string_properties

Selecting **Properties** brings up the **Text String Properties** panel which is used to modify the string's header information.



The fields in this panel are similar to those in the **create text string** panel and the text string editor options. The only new field is

Field Description	Type	Defaults	Pop-Up
OK/Apply	button		

*for the string being edited, **OK** sets the string with the values in the panel fields and removes the panel. **Apply** sets the string with the values in the panel fields and leaves the panel on the screen.*

Points Edit

points_edit

Position of menu: Strings =>Points Edit

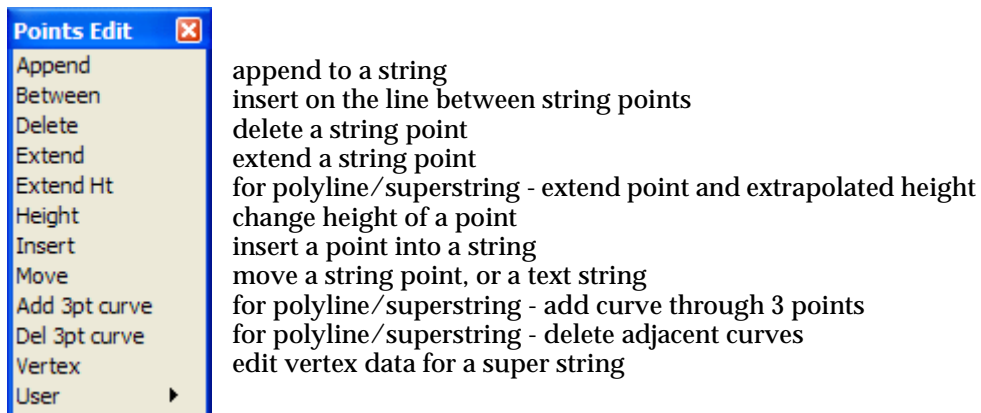
The points operations available in the points edit menu are similar to the create/edit options.

However, in the points edit options, the user does not begin by picking the particular string to be edited. Instead, the required option is selected followed by the point to be modified from any string.

The option can then be applied to another point on that or any other string, or another point operation chosen, and applied to any point.

If the user wants to make a large number of point edits to the one string, the editor option discussed in the last section is the easiest option to use. However, if a number of strings are going to be edited with the same operation or a selection of operations, then the points edit option is more suitable.

After selecting the points edit option, the points edit menu is displayed.



Each of the options performs the same work as the option of the same name in the Edit string option.

The individual options in the Points Edit menu will now be discussed in detail.

For the option *Append*, go to the section "Append Point"

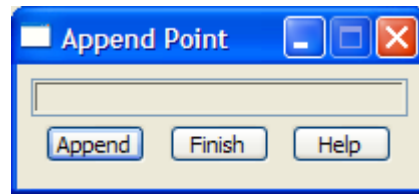
<i>Between</i>	"Between Point"
<i>Delete</i>	"Delete Point"
<i>Extend</i>	"Extend Point"
<i>Extend Ht</i>	"Extend Height"
<i>Height</i>	"Height"
<i>Insert</i>	"Insert Point"
<i>Move</i>	"Move Point"
<i>Add 3pt curve</i>	"Add 3 Point Curve"
<i>Del 3pt curve</i>	"Delete 3 Point Curve"
<i>Vertex</i>	"Edit Vertex"

Append Point

append_point

Position of option on menu: Strings =>Points Edit => Append

The append option adds additional points to the end of a string. On selecting the append option, an **append point** panel is displayed.



The message area of this panel informs the user of any error messages.

Once in the **append** option, the particular end of the string to append points to is selected using the standard LB and MB pick and accept sequence.

The points to be appended are then selected. The option keeps adding points to the selected string until the pick ops menu is brought up using RB and **cancel** is selected.

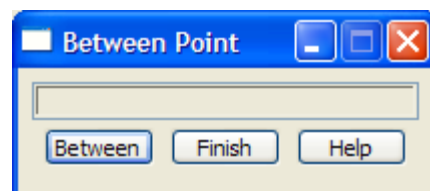
After the *append* has been completed, the option repeats. That is, the user is asked to select another string to append to. This continues until **finish** or **[X]** is selected from the **append point** panel.

Between Point

between_point

Position of option on menu: Strings =>Points Edit => Between

On selecting the between option, a **between point** panel is displayed.



The message area of this panel informs the user of any error messages.

Once in the **between** option, the particular segment to insert a point on is selected using the standard LB and MB pick and accept sequence. The position of the point to insert is then selected and accepted.

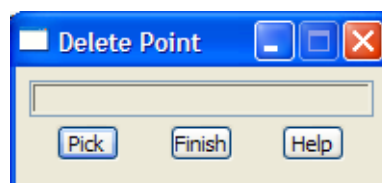
After the *between* has been completed, the option repeats. That is, the user is asked to select another segment to insert a point on. This continues until **finish** or **[X]** is selected from the **between point** panel.

Delete Point

delete_point

Position of option on menu: Strings =>Points Edit => Delete

On selecting the delete option, a **delete point** message panel is displayed.



The message area of this panel informs the user of any error messages.

Once in the delete option, the particular point to delete is selected using the standard LB and MB pick and accept sequence. When the point is accepted, it is deleted.

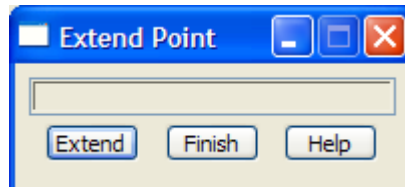
After the *delete* has been completed, the option repeats. That is, the user is asked to select another point to delete (the point can be on any string). This continues until **finish** or **[X]** is selected from the **delete point** panel.

Extend Point

extend_point

Position of option on menu: Strings =>Points Edit => Extend

On selecting the extend option, a **extend point** panel is displayed.



The message area of this panel informs the user of any error messages.

Once in the *extend* option, the particular point on a segment to extend is selected by picking the segment near to the point using the standard LB and MB pick and accept sequence. The position of the point is then moved along the segment until the final position is selected and accepted.

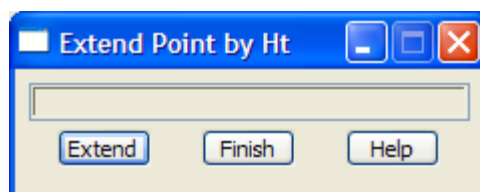
After the *extend* has been completed, the option repeats. That is, the user is asked to select another segment to extend a point on. This continues until **finish** or **[X]** is selected from the **extend point** panel.

Extend Height

extend_point_by_ht

Position of option on menu: Strings =>Points Edit => Extend Ht

The *extend point by height* option is similar to the *extend* option except that the z-value of the moved point is modified by linearly interpolating the z-value from the original points at the end of the selected segment. On selecting the *extend by ht* option, an **extend point by ht** panel is displayed.



The message area of this panel informs the user of any error messages.

Once in the *extend point by ht* option, the particular point on a segment to extend is selected by picking the segment near to the point using the standard LB and MB pick and accept sequence. The position of the point is then moved along the segment until the final position is selected and accepted. The z-value of the moved point is the linear interpolation of the selected segment.

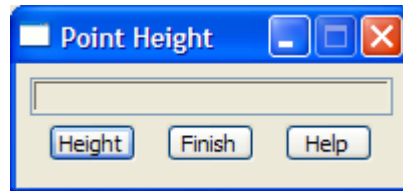
After the *extend point by ht* has been completed, the option repeats. That is, the user is asked to select another segment to extend a point on. This continues until **finish** or **[X]** is selected from the **extend point by ht** panel.

Height

point_height

Position of option on menu: Strings =>Points Edit => Height

On selecting the height option, a **point height** panel is displayed.



The message area of this panel informs the user of any error messages.

Once in the *height* option, the particular point to modify the height for is selected using the standard LB and MB pick and accept sequence. When the point is accepted, the height existing height is displayed in a **height** box which can be modified and accepted by typing <enter>.

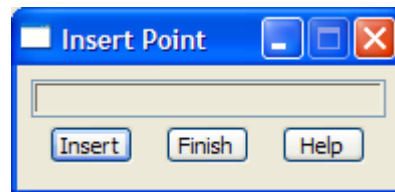
After the *height* has been completed, the option repeats. That is, the user is asked to select another point to modify the height for (the point can be on any string). This continues until **finish** or **[X]** is selected from the **point height** panel.

Insert Point

insert_point

Position of option on menu: Strings =>Points Edit => Insert

On selecting the insert option, an **insert point** message panel is displayed.



The message area of this panel informs the user of any error messages.

Once in the *insert* option, the particular segment to identify the two points to insert the point is selected using the standard LB and MB pick and accept sequence. The position of the point to insert is then selected and accepted.

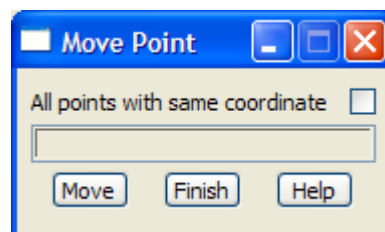
After the *insert* has been completed, the option repeats. That is, the user is asked to select another segment to insert a point on. This continues until **finish** or **[X]** is selected from the **insert point** panel.

Move Point

move_point

Position of option on menu: Strings =>Points Edit => Move

On selecting the move option, a **move point** panel is displayed.



The message area of this panel informs the user of any error messages. There are similar panels

for each of the other points edit options.

Once in the move option, the particular point to move is selected using the standard LB and MB pick and accept sequence. The position that the point is to be moved to is then selected and accepted.

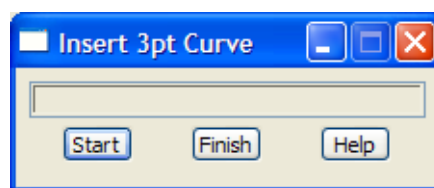
After the move has been completed, the option repeats. That is, the user is asked to select another point to move (the point can be on any string). This continues until **finish** or **[X]** is selected from the **move point** panel.

Add 3 Point Curve

insert_3pt_curve

Position of option on menu: Strings =>Points Edit => Add 3pt Curve

On selecting the add 3pt curve option, a **insert 3pt curve** panel is displayed.



The message area of this panel informs the user of any error messages.

Once in the add 3pt curve option, the middle point of the three points of the super string to fit a curve for, is selected using the standard LB and MB pick and accept sequence. When the point is accepted, the curve is fitted between it and the left and right adjacent points of the super string.

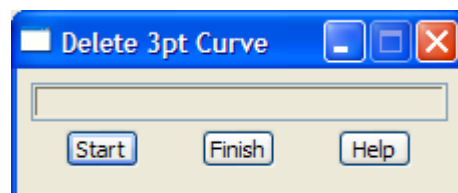
After the *add 3pt curve* has been completed, the option repeats. That is, the user is asked to select another point to add a curve to (the point can be on any super string). This continues until **finish** or **[X]** is selected from the **insert 3pt curve** panel.

Delete 3 Point Curve

delete_3pt_curve

Position of option on menu: Strings =>Points Edit => Del 3pt Curve

On selecting the del 3pt curve option, a **delete 3pt curve** panel is displayed.



The message area of this panel informs the user of any error messages.

Once in the delete 3pt curve option, a vertex from a super string is selected using the standard LB and MB pick and accept sequence and if there is curves on both sides of the vertex, the radii are removed and the vertices are joined by straight line segments.

After the *delete 3pt curve* has been completed, the option repeats. That is, the user is asked to select another point on a super string to remove the curves on either side (the point can be on any super string). This continues until **finish** or **[X]** is selected from the **delete 3pt curve** panel.

Edit Vertex

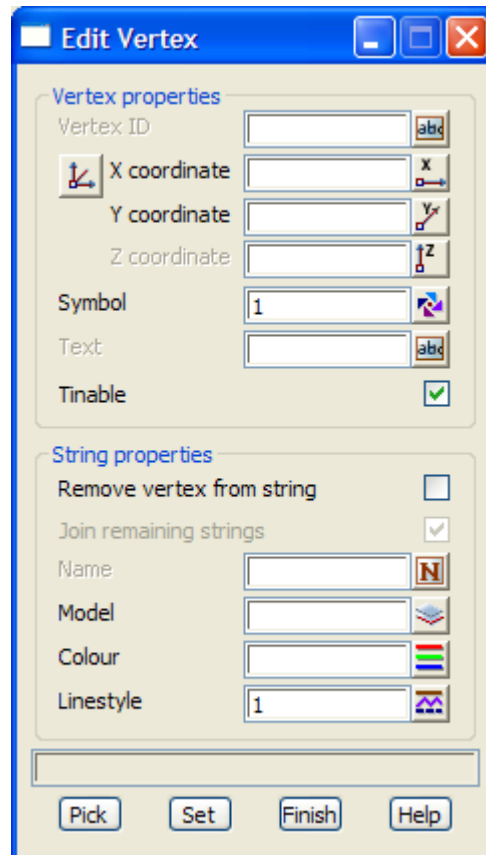
edit_vertex

Position of option on menu: Strings =>Points Edit => Vertex

The Edit Vertex option allows the quick editing of the co-ordinates, vertex id, symbol, vertex text and tinability of a selected string vertex.

The name, model, colour and linestyle, which are string properties, can also be modified however the user has the choice of modifying the string properties for the entire string, or have the option remove the selected vertex from the string and only give the string properties to the newly created one vertex string. If a vertex is removed from the string, the adjacent vertices of the removed vertex can be joined.

On selecting the Vertex option, a **Edit Vertex** panel is displayed.



The Edit Vertex option is already running and a super string vertex is selected.

The fields and buttons used in the panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Vertex properties			
Vertex id	input		
<i>the vertex id (point number) for the selected vertex. Change this to the required value.</i>			
X coordinate			Measure X panel
<i>the x coordinate (easting) of the selected vertex. Change this to the required value.</i>			
Y coordinate			Measure Y panel
<i>the y coordinate (northing) of the selected vertex. Change this to the required value.</i>			
Z coordinate			Measure Z panel
<i>the y coordinate (elevation) of the selected vertex. Change this to the required value.</i>			

Symbol symbol box available symbols
the symbol on the selected vertex. Change this to the required symbol.

Text input
the text on the selected vertex. Change this to the required text.

Tinable tick box
ticked if the selected vertex is tinable. Change if required.

String/New vertex properties

Remove vertex from string tick box
tick if the selected vertex is to be removed from its current string.

Join remaining points tick box
*only settable if **Remove vertex from string** is ticked.
If tick then the vertices on either side of the removed vertex are joined.
If not ticked then the original string will be broken into two strings when the vertex is removed.*

Name input
the name of the string containing the selected vertex. Change this to the required name.

Model model box available models
the model of the string containing the selected vertex. Change this to the required model.

Colour colour box available colours
the colour of the string containing the selected vertex. Change this to the required colour.

Linestyle linestyle box
the linestyle of the string containing the selected vertex. Change this to the required linestyle.

Pick button
chose Pick and then select the vertex to be edited.

Set button
apply the values in the panel to the selected vertex. Pick is still active so that another vertex can be selected.

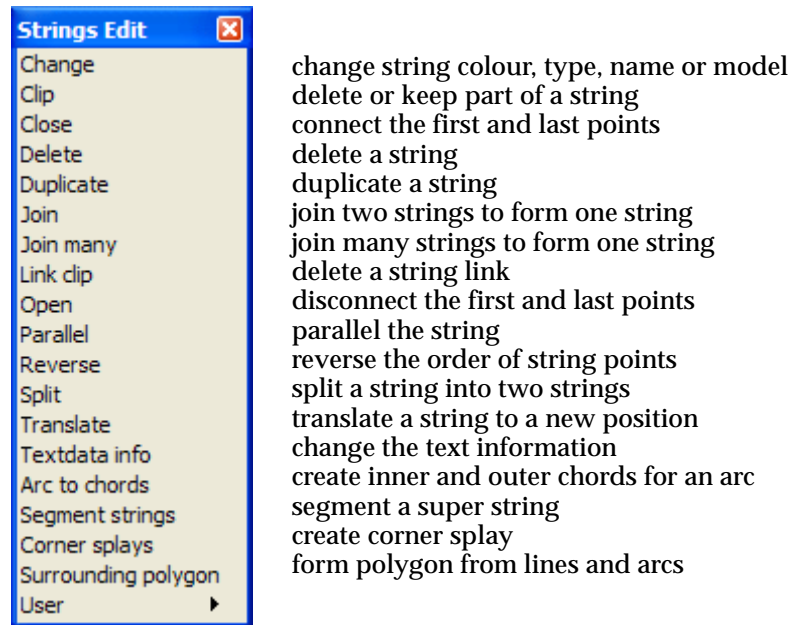
Strings Edit

strings_edit

Position of menu: Strings =>Strings Edit

The strings edit option contains operations to be applied, not to individual points of a string, but to entire strings.

After selecting the strings edit option, the strings edit menu is displayed.



The individual options in the strings edit menu will now be discussed in detail.

For the option *Change*, go to the section “Change”

<i>Clip</i>	“Clip”
<i>Close</i>	“Close”
<i>Delete</i>	“Delete”
<i>Duplicate</i>	“Duplicate”
<i>Join</i>	“Join”
<i>Join many</i>	“Join Many”
<i>Link clip</i>	“Link Clip”
<i>Open</i>	“Open”
<i>Parallel</i>	“Parallel”
<i>Reverse</i>	“Reverse”
<i>Split</i>	“Split”
<i>Translate</i>	“Translate”
<i>Textdata info</i>	“Textdata Info”
<i>Arc to chords</i>	“Arc to Chords”
<i>Segment strings</i>	“Segment Strings”
<i>Corner splays</i>	“Corner Splays”
<i>Surrounding polygon</i>	“Surrounding Polygon”

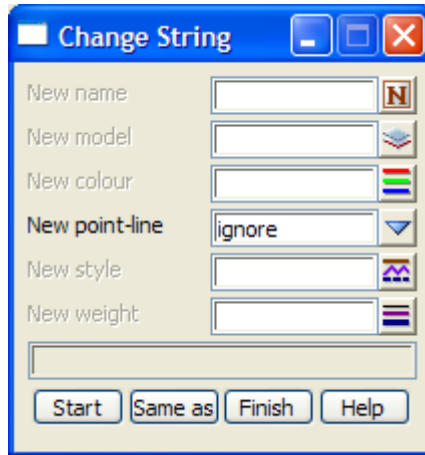
Change

change_string

Position of option on menu: Strings =>Strings Edit =>Change

The change option can be used to change the mode, colour, style, name and point-line type of a string.

On selecting the change option, the **change string** panel is displayed.



The change option is already in progress and if a string is selected, the model, colour, style, name and point-line type are changed according to the fields in the **change string** panel.

The fields and buttons used in the panel have the following functions.

Field Description	Type	Defaults	Pop-Up
New name <i>if non-blank, the name of the selected string will be changed to the name given in the new name field.</i>	input		
New model <i>if non-blank, the selected string will be moved to the model given in the new model field.</i>	input		available models
New colour <i>if non-blank, the colour of the selected string will be changed to the colour given in the new colour field.</i>	input		available colours
New point-line <i>if non-blank, the breakline type of the selected string will be changed to the type given in the new point-line field (point or line type).</i>	input		point, line
New style <i>if non-blank, the style of the selected string will be changed to the name given in the new style field.</i>	input		

Please continue to the next section "Clip" .

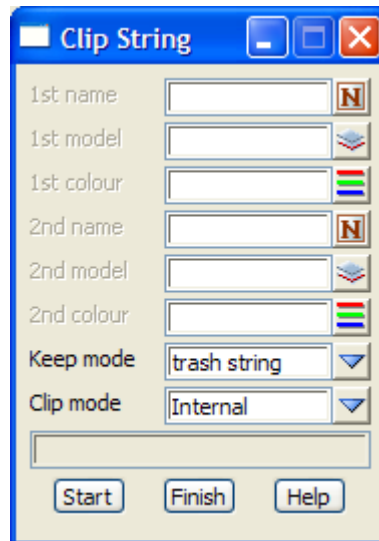
Clip

clip_string

Position of option on menu: Strings =>Strings Edit =>Clip

The clip option can be used to delete or keep part of a string.

On selecting the clip option, the **clip string** panel is displayed.



After selecting the clip option, the user is asked to select the string to be clipped. The user is then asked to select two points on the string to define the section to be clipped.

Depending on the clip mode, either

- a new string is created from the section of the string between the two points
- two new strings are created by deleting the section of the string between the two points
- one new string is created by deleting the section of the string between the two points and then joining the two selected points.

If the 1st name, 1st model and/or 1st colour panel fields are non-blank, the values are used for the 1st half of the clipped string. Otherwise the values of the original string are used for the 1st half of the string.

If the 2nd name, 2nd model and/or 2nd colour panel fields are non-blank, the values are used for the second half of the clipped string. Otherwise the values of the original string are used for the second half of the string.

If the keep mode is set to
 keep string, the original string is kept
 trash string, the original string is moved to the trash model
 delete string, the original string will be deleted.

Hence, the fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
1st name <i>if blank, the first half of the clipped string is given the name of the original string. If non-blank, the first half of the clipped string is given the name in the 1st name field.</i>	input		
1st model <i>if blank, the first half of the clipped string is placed in the same model as the original selected string. If non-blank, the first half of the clipped string is placed in the model given in the 1st model field.</i>	input		available models
1st colour <i>if blank, the first half of the clipped string is given the colour of the original string. If non-blank, the first half of the clipped string is given the colour specified in the 1st colour field.</i>	input		available colours
2nd name <i>if blank, the second half of the clipped string is given the name of the original string. If non-blank, the second half of the clipped string is given the name in the 2nd name field.</i>	input		

2nd model	input		available models
	<i>if blank, the second half of the clipped string is placed in the same model as the original selected string. If non-blank, the second half of the clipped string is placed in the model given in the 2nd model field.</i>		
2nd colour	input		available colours
	<i>if blank, the second half of the clipped string is given the colour of the original string. If non-blank, the second half of the clipped string is given the colour specified in the 2nd colour field.</i>		
Keep mode	input	keep string	delete, keep, trash string
	<i>if delete string, the string selected to be clipped is deleted. keep string, the selected string is not deleted. trash string, the string selected to be clipped is moved to the trash model.</i>		
Clip mode	input	internal	internal, external, join external
	<i>if internal, a new string is created from the section of string between the two selected points. external, two new strings are created by deleting the section of the string between the two points. join external, one new string is created by deleting the section of the string between the two points and then joining the two selected points.</i>		

How to Use the Panel and Panel Messages

- (a) Enter the new model, colour and name for the first and second parts of the clipped string.
- (b) The string to be clipped is selected.
- (c) The points to be used as the clipped point are then selected.
- (d) The section of the string is then clipped between the selected points and depending on the clip mode, the selected string is then clipped or the clipped section kept.

Please continue to the next section “Close” .

Close

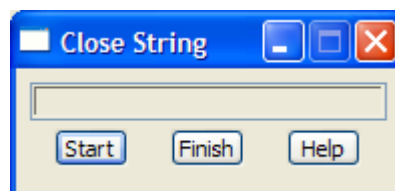
close_string

Position of option on menu: Strings =>Strings Edit =>Close

A closed string is simply a string whose 1st and last points are the same.

The close string option adds to the end of the string, a point that is identical to the 1st string point. This then forms a closed string.

On selecting the close option, the **close string** panel is displayed.



The close option is already in progress and if a string is selected, it is closed.

Please continue to the next section “Delete” .

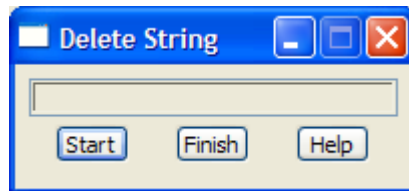
Delete

delete_string

Position of option on menu: Strings =>Strings Edit =>Delete

Entire strings can be deleted from the model using the delete option.

On selecting the delete string option, the **delete string** panel is displayed.



The delete option is already in progress and if a string is selected (LB) and accepted (MB), it is deleted

If the trash mode in the **trash defaults** panel is set to trash string, the original string is not deleted but moved to the trash model.

Please continue to the next section “Duplicate” .

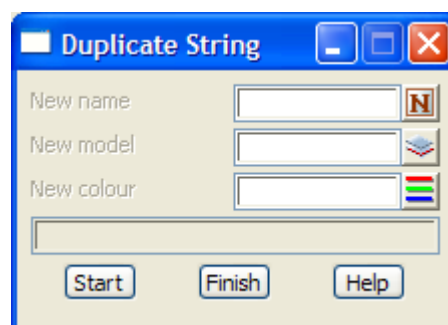
Duplicate

duplicate_string

Position of option on menu: Strings =>Strings Edit =>Duplicate

The duplicate option is used to make a copy of the string with the option of giving the duplicate string a new model, colour and/or name.

On selecting the duplicate option, the **duplicate string** panel is displayed.



The duplicate option is already in progress and if a string is selected, then a copy of the string will be created and possibly given a new model, colour or name depending on the fields in the **duplicate string** panel.

The fields and buttons used in the panel have the following functions.

Field Description	Type	Defaults	Pop-Up
New name	input		
New model	input		available models

if the new name field is blank, the duplicate string has the same name as the original string. If the new name field is non-blank, then the duplicate string is given the name in the new name field.

New model input available models

if new model is blank, the duplicate string is placed in the same model as the original string. If the new

model field is non-blank, then the duplicate string is placed in the model given in the new model field.

New colour input available colours

if the new colour field is blank, the duplicate string has the same colour as the original string. If the new colour field is non-blank, then the duplicate string is given the colour specified in the new colour field.

Please continue to the next section “Join” .

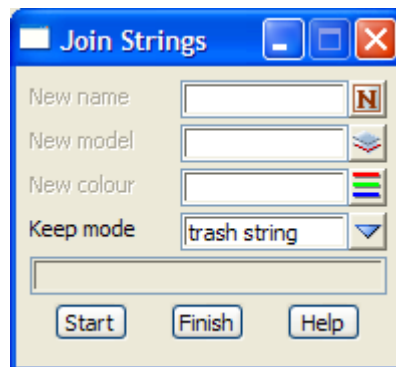
Join

join_strings

Position of option on menu: Strings =>Strings Edit =>Join

The join option is used to create a new string by joining two existing strings together.

On selecting the join option, the **join strings** panel is displayed.



After selecting the join option, the user is asked to select in turn the two strings that make up the joined string.

First, the string that will become the first half of the new joined string is selected with the direction that the string will have as the first half of the new string.

Next, the string that will become the second half of the new joined string is selected with the direction that the string will have as the second half of the new string.

The end of the first selected directed string and the beginning of the second selected directed string are joined to form the new joined string.

If the model, colour and/or name panel fields are non-blank, their values are used for the new joined string. Otherwise the values from the first selected string are used for the joined string.

If the keep mode is set to
 keep string, the original strings are kept
 trash string, the original strings are moved to the trash model
 delete string, the original strings are deleted.

Hence, the fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
New name <i>if the new name field is blank, the joined string is given the name of the first selected string. If the new name field is non-blank, the joined string is given the name in the new name field.</i>	input		
New model <i>if new model is blank, the joined string is placed in the same model as the first selected string. If the new model field is non-blank, the joined string is placed in the model given in the new model field.</i>	input		available models
New colour <i>if the new colour field is blank, the joined string is given the colour of the first selected string. If the new colour field is non-blank, then the joined string is given the colour specified in the new colour field.</i>	input		available colours
Keep mode <i>if delete string, the selected strings selected are deleted. keep string, the selected strings are not deleted. trash string, the strings selected to be joined are moved to the trash model.</i>	input	keep strings	delete string, keep strings

How to Use the Panel

- (a) Enter the new model, colour and name for the joined string.

- (b) The 1st string is selected by picking it with the required direction.
- (c) The string to be joined to the 1st selected string is selected by picking it with the required direction.
- (d) The last point of the 1st directed string and the 1st point of the second directed string are joined to create a new string with model, colour, name as specified in the **join strings** panel.

Please continue to the next section “Join Many” .

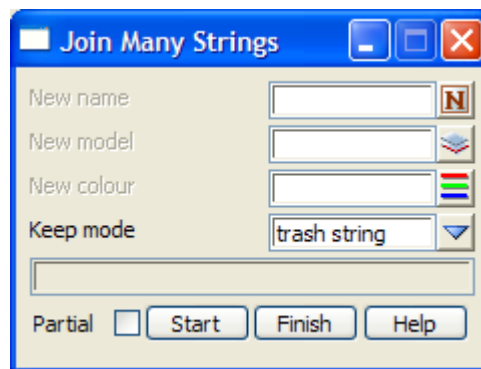
Join Many

join_many_strings

Position of option on menu: Strings =>Strings Edit =>Join many

The join many option is used to create a new string by joining two or more existing strings, or parts or strings, together.

On selecting the join many option, the **join many strings** panel is displayed.



After selecting the join many option, the user is asked to select in turn the strings that will make up the joined string. Using the partial mode, parts of strings can be joined.

First, the string that will become the first part of the new joined string is selected with the direction that the string will have as the first part of the new string.

If partial is **set (tick)**, two points are then picked on the string and only the part of the string between the picked points is used in the join.

Next, the strings that will become the subsequent parts of the new joined string are selected in order with the direction that the strings will have in the new joined string.

Again, whenever partial is **set (tick)**, two points are picked on the selected string and only the part of the string between the picked points is used in the join.

The end of each selected directed string (or partial string) is joined to the beginning of the subsequent selected directed string (or partial string) when forming the joined string.

If the name, model and/or colour panel fields are non-blank, their values are used for the new joined string. Otherwise the values from the first selected string are used for the joined string.

If the keep mode is set to
 keep string, the original strings are kept
 trash string, the original strings are moved to the trash model
 delete string, the original strings are deleted.

Hence, the fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
New name	input		

if blank, the joined string is given the name of the first selected string.

If non-blank, the joined string is given the name in the new name field.

New model input available models

if blank, the joined string is placed in the same model as the first selected string.

If non-blank, the joined string is placed in the model given in the new model field.

New colour input available colours

if blank, the joined string is given the colour of the first selected string.

If non-blank, the joined string is given the colour specified in the new colour field.

Keep mode input keep strings delete strings, keep strings

if **delete string**, the selected strings are deleted.

if **keep string**, the selected strings are not deleted.

if **trash string**, the strings selected to be joined are moved to the trash model.

Partial tick

if **tick**, two points are then picked on the string and only the part of the string between the picked points is used in the join.

if **no tick**, no extra points are required and the entire string is used.

How to Use the Panel and Panel Messages

- Enter the new model, colour and name for the joined string.
- The first string to be joined is then selected by picking the required string with the required direction, plus two points to restrict the string if partial is set on.
- The second and subsequent strings to be joined are then selected (or partial string if partial is set on) in order and with the required direction.
- The last point of each directed string is connected to the first point of the subsequent directed string to create a new joined string. The model, colour and name as specified in the **join many strings** panel are used for the new string.

Please continue to the next section "Link Clip" .

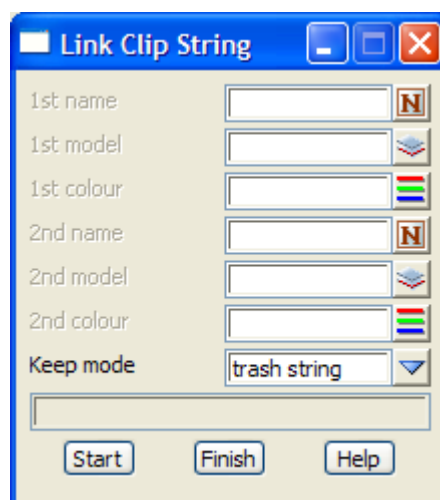
Link Clip

link_clip_string

Position of option on menu: Strings =>Strings Edit =>Link clip

The link clip option can be used to **delete** the link joining two adjacent vertices of a string.

On selecting the link clip option, the **link clip string** panel is displayed.



After selecting the link clip option, the user selects the link of the string to be clipped. On

acceptance, the selected link is deleted from the string, thus creating two new strings.

If the 1st name, 1st model and/or 1st colour panel fields are non-blank, the values are used for the first half of the link clipped string. Otherwise the values of the original string are used for the first half of the string.

If the 2nd name, 2nd model and/or 2nd colour panel fields are non-blank, the values are used for the second half of the link clipped string. Otherwise the values of the original string are used for the second half of the string.

If the keep mode is set to
 keep string, the original string is kept
 trash string, the original string is moved to the trash model
 delete string, the original string will be deleted.

Hence, the fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
1st name	input		
<i>if blank, the first half of the clipped string is given the name of the original string.</i>			
<i>If non-blank, the first half of the clipped string is given the name in the 1st name field.</i>			
1st model	input		available models
<i>if blank, the first half of the clipped string is placed in the same model as the original selected string.</i>			
<i>If non-blank, the first half of the clipped string is placed in the model given in the 1st model field.</i>			
1st colour	input		available colours
<i>if blank, the first half of the clipped string is given the colour of the original string.</i>			
<i>If non-blank, the first half of the clipped string is given the colour specified in the 1st colour field.</i>			
2nd name	input		
<i>if blank, the second half of the clipped string is given the name of the original string.</i>			
<i>If non-blank, the second half of the clipped string is given the name in the 2nd name field.</i>			
2nd model	input		available models
<i>if blank, the second half of the clipped string is placed in the same model as the original selected string.</i>			
<i>If non-blank, the second half of the clipped string is placed in the model given in the 2nd model field.</i>			
2nd colour		input	available colours
<i>if blank, the second half of the clipped string is given the colour of the original string.</i>			
<i>If non-blank, the second half of the clipped string is given the colour specified in the 2nd colour field.</i>			
Keep mode	input	keep string	delete, keep, trash string
<i>if delete string, the string selected to be clipped is deleted.</i>			
<i>keep string, the selected string is not deleted.</i>			
<i>trash string, the string selected to be clipped is moved to the trash model.</i>			

Please continue to the next section “Open” .

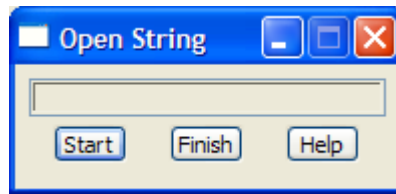
Open

open_string

Position of option on menu: Strings =>Strings Edit =>Open

A closed string is opened by removing the last point of the string.

On selecting the **open** option, the **open string** panel is displayed.



The open option is already in progress and if a closed string is selected, it is opened.
Please continue to the next section “Parallel” .

Parallel

parallel_string

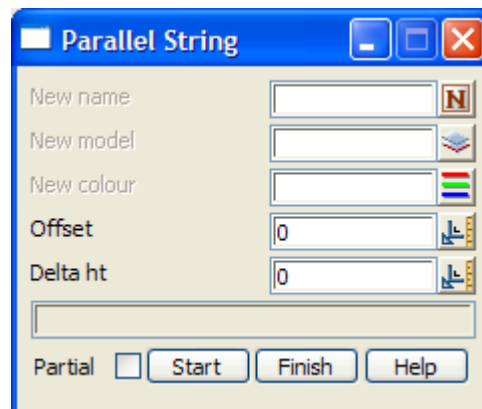
Position of option on menu: Strings =>Strings Edit =>Parallel

Strings, or parts of strings, can be translated perpendicularly to either the left or right using the parallel option. The z-values of the string can also be adjusted by a constant value.

The difference between a translate and a parallel is that for a straight translate, the translation vector is the same for the whole string. In a parallel, the translation is at right angles to each link of the string and hence the translation direction varies along the string.

For example, the edge of a road is a parallel of the centre-line, not a copy of the centre-line.

On selecting the parallel option, the **Parallel String** panel is displayed.



The user is then asked to select the string to parallel.

If partial is **not set**, the string is copied parallel through the distance given in the offset field.

If partial is **set (tick)**, two points are then picked on the string and only the part of the string between the picked points is copied parallel through the distance given in the offset field.

The value in the delta ht field is then added to the z-values of the string.

The direction imposed upon the string when selecting it is used to determine what is the left and right side of the string in the parallel operation.

A positive offset parallels the string to the right with respect to the direction of picking. A negative offset parallels to the left with respect to the direction of picking.

Hence, the fields and buttons used in the **parallel string** panel have the following functions.

Field Description	Type	Defaults	Pop-Up
New name	input		

if blank, the paralleled string is given the name of the original string.

If non-blank, the parallel string is given the name in the new name field.

New model	input	available models
<i>if blank, the paralleled string is placed in the same model as the original selected string. If non-blank, the paralleled string is placed in the model given in the new model field.</i>		
New colour	input	available colours
<i>if blank, the paralleled string is given the colour of the original string. If non-blank, the paralleled string is given the colour specified in the new colour field.</i>		
Offset	input	
<i>distance (in world units) that the string will be copied parallel through. A positive distance denotes that the string will be paralleled to the right of the original string.</i>		
Delta ht	input	
<i>value to add to the z-values of the string.</i>		
Partial	tick	
<i>if tick, two points are then picked on the string and only the part of the string between the picked points is used in the parallel. if no tick, no extra points are required and the entire string is used.</i>		

How to Use the Panel

- Enter the new model, colour and name for the paralleled string.
- Enter the offset distance for the parallel - left and right is determined by picking direction.
- Enter the height to add to the string's z-values in the delta ht field.
- The selected string (or partial string if partial is set on) is then copied parallel as required.

Please continue to the next section "Reverse" .

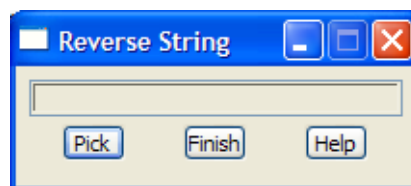
Reverse

reverse_string

Position of option on menu: Strings =>Strings Edit =>Reverse

The reverse string option simply reverses the order of the points in a string.

On selecting the reverse option, the **reverse string** panel is displayed.



After selecting the reverse option, the user simply picks (LB) the string that is to have its point order reversed and on acceptance (MB) of the string, the reversing takes place.

Please continue to the next section "Split" .

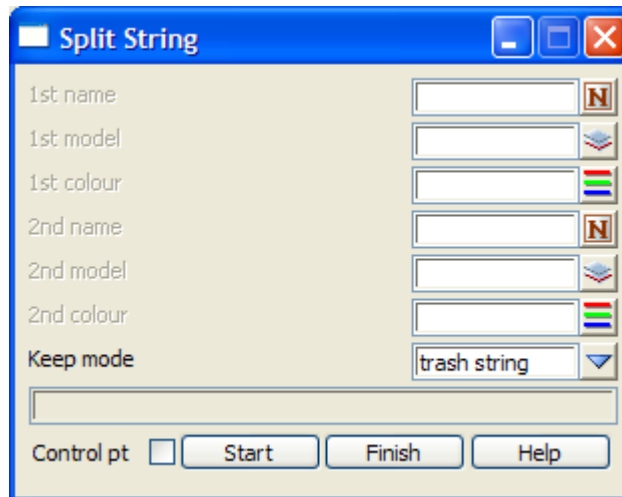
Split

split_string

Position of option on menu: Strings =>Strings Edit =>Split

The split option is used to create two new strings by splitting an existing string about a selected point on the string.

On selecting the split option, the **split string** panel is displayed.



If **control point** is set **off**, after selecting the split option, the user is asked to select the string and the selection point is **also** used as a split point. Hence the one point is used to select the string and as the split point.

If **control point** is set **on**, the user is asked to select the string to split and then pick the point that is dropped perpendicularly onto the selected string as the point on the string to be used as a split point. Hence the **string select** and the **split point** are selected separately.

Two strings are then created by splitting the chosen string about the split point.

If the 1st name, 1st model and/or 1st colour panel fields are non-blank, the values are used for the first half of the split string. Otherwise the values of the original string are used for the first half of the string.

If the 2nd name, 2nd model and/or 2nd colour panel fields are non-blank, the values are used for the second half of the split string. Otherwise the values of the original string are used for the second half of the string.

If the keep mode is set to
 keep string, the original string is kept
 trash string, the original string is moved to the trash model
 delete string, the original string will be deleted.

Hence, the fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
1st name	input		
<i>if blank, the first half of the split string is given the name of the original string.</i>			
<i>If non-blank, the first half of the split string is given the name in the 1st name field.</i>			
1st model	input		available models
<i>if blank, the first half of the split string is placed in the same model as the original selected string.</i>			
<i>If non-blank, the first half of the split string is placed in the model given in the 1st model field.</i>			
1st colour	input		available colours
<i>if blank, the first half of the split string is given the colour of the original string.</i>			

If non-blank, then the first half of the split string is given the colour specified in the 1st colour field.

2nd name input

if blank, the second half of the split string is given the name of the original string.

If non-blank, the second half of the split string is given the name in the 2nd name field.

2nd model input available models

if blank, the second half of the split string is placed in the same model as the original selected string.

If non-blank, the second half of the split string is placed in the model given in the 2nd model field.

2nd colour input available colours

if blank, the second half of the split string is given the colour of the original string.

If non-blank, then the second half of the split string is given the colour specified in the 2nd colour field.

Keep mode input keep string delete, keep, trash string

*if **delete string**, the string selected to be split is deleted.*

***keep string**, the selected string is not deleted.*

***trash string**, the string selected to be split is moved to the trash model.*

Control pt tick

*If **tick**, the user is asked to select the string to split and then pick the point that is dropped perpendicularly onto the selected string as the point on the string to be used as a split point.*

*If **not tick**, the user is asked to select the string and the selection point is **also** used as a split point.*

How to Use the Panel and Panel Messages

- (a) Enter the new model, colour and name for the first and second parts of the split string.
- (b) If control is on, the string is selected and then the split point is selected.
If control is off, the string is selected and the same point is to be used as the split point.
- (c) The chosen string is then split about the split point and the two halves given models, colours and names as defined by the split string panel.

Please continue to the next section "Translate" .

Translate

translate_string

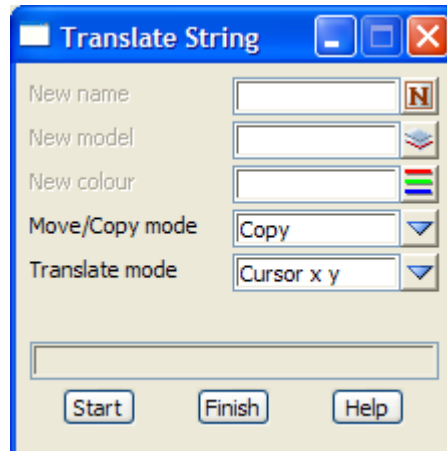
Position of option on menu: Strings =>Strings Edit =>Translate

Entire strings can be translated in the x,y and z directions using the translate option.

The translated string can either be moved or copied to its new translated position.

The difference between a copy or a move is simply that if a string is copied, a copy of the string is translated and the original string left untouched, whereas for a move, the actual string is moved from its original position to the new translated position.

On selecting the Translate option, the **Translate string** panel is displayed.



The selected string is translated by using the cursor to select a position on the string (the before point) and then selecting the position (not necessarily on a string) that the point will be translated to (after point).

Hence the translate operation requires two positions - a before and an after point - for the translation to be defined.

The first position (the before point) is selected using the normal select procedures. The second position (the after point) depends entirely on the translate mode.

If the translate mode is set to

cursor x y z or cursor x y

the cursor is used to not only select the string point but also to indicate where it is to be moved/copied to.

typed x y z

the second point has the absolute coordinates given in the x y z field.

typed dx dy dz

the second point is defined relative to the first point by the adding the dx dy dz given in the dx dy dz field.

Selected strings will be translated until the option is finished.

The fields and buttons used in the **translate** panel have the following functions.

Field Description	Type	Defaults	Pop-Up
New name <i>if blank, the string is given the name of the original string.</i> <i>If non-blank, the string is given the name in the new name field.</i>	input		
New model <i>if blank, the string is placed in the same model as the original selected string.</i> <i>If non-blank, the string is placed in the model given in the New model field.</i>	input		available models
New colour <i>if blank, the string is given the colour of the original string.</i> <i>If non-blank, then the string is given the colour specified in the new colour field.</i>	input		available colours
Translate mode	input	cursor xy	cursor xy, cursor xyz,

typed xyz, typed dxdydz

see comments about translate mode in the general description of move/copy

x y z input

*if Translate mode is **Typed x y z** then this field appears and the position on the string where the string was selected is translated to this co-ordinate.*

dx dy dz input

*if Translate **mode** is **Typed dx dy dz** then this field appears and the selected string is translated by the given dx dy dz.*

Move/copy mode input move copy, move

*if the mode is set to **move**, the string is translated as defined in the panel fields and the original string is deleted. If the mode is **copy**, the original string is left alone.*

How to Use the Panel and Panel Messages

- (a) Enter the new model, colour and name for the translated string.
- (b) The string to be translated and its “before” point is chosen.
- (c) The “after” point is chosen according to the translate mode.
- (d) The selected string is then translated (moved or copied) as required.

Please continue to the next section “Textdata Info” .

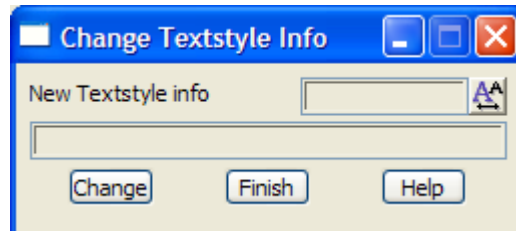
Textdata Info

change_textstyle_info

Position of option on menu: Strings =>Strings Edit =>Textdata info

The Textdata info option is used to change the information about the text for a text string, super strings and text for 4d strings.

Selecting the option, the **Change Textstyle Info** panel:



The parameters for the textstyle information are set and then any selected string is given the new textstyle parameters. If any of the parameters are left blank, then that parameter is not modified for the selected string.

To define the Textstyle info parameters, click on the text button and then the **edit** button.

The fields and buttons used in the panel have the following functions.

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

New textstyle info	textstyle data		
---------------------------	----------------	--	--

textstyle information to use for the selected strings.

Change	button		
---------------	--------	--	--

selected strings will have their text modified by the parameters in the new textstyle info field.

Arc to Chords

arc_to_chords

Position of option on menu: Strings =>Strings Edit =>Arc to chords

The *Arc to Chord* option works on a super string and creates inside or outside chords for any arc segments in the super string.

The number of chords created can be defined by giving the number of chords required, a chord length to use for each chord, or an arc to chord tolerance.

On selecting the **Arc to chords** option, the **Arc to Chords** panel is displayed.



The fields and buttons used in the panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Pick <i>select the super string to edit.</i>	button		
Previous <i>move to the previous segment of the super string.</i>	button		
Next <i>move to the next segment of the super string.</i>	button		
Convert mode <i>create the chords on the inside or the outside of the arc.</i>	choice box	inside	inside outside
Method <i>method for creating the chord.</i>	choice box	no. of chords	no. of chords chord length arc to chord tolerance
No. of Chords, Chord length, Arc to chord tolerance <i>value to use with the Method.</i>			
Process <i>create chords for the selected segment of the super string.</i>	button		

Segment Strings

segment_string

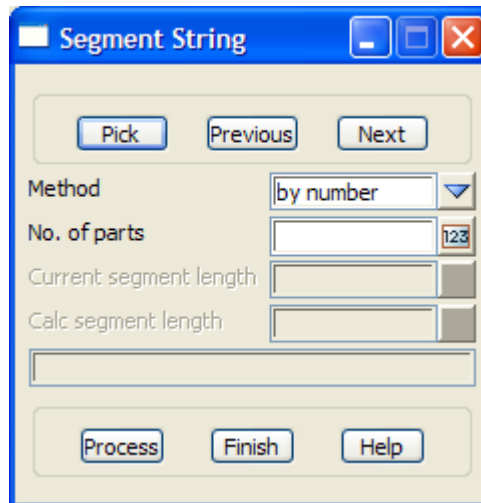
Position of option on menu: Strings =>Strings Edit =>Segment string

The *Segment string* option works on a super string and inserts extra points on an arc or line segment of the super string to break it into smaller arc or line segments.

The number of arcs/lines created can be controlled by specifying either

- the number of sub-segments required
- a single sub-segment length to break the start of the segment into that length
- a sub-segment length to break the segment into as many sub-segments of that length as possible.

On selecting the Segment strings option, the **Segment String** panel is displayed.



The fields and buttons used in the panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Pick	button		
<i>select the super string to edit.</i>			
Previous	button		
<i>move to the previous segment of the super string.</i>			
Next	button		
<i>move to the next segment of the super string.</i>			
Method	choice box	by number	by number one distance by distance
<i>method for creating the sub-segments.</i>			
<i>by number - the segment is broken into No of parts equal segments</i>			
<i>one distance - the segment is broken into two parts with the first part having the length Distance (which end will depend on the direction that the segment was selected).</i>			
<i>by distance - the segment is broken into as many sub-segments of length Distance as possible (which end the division starts at depends on the direction that the segment was selected).</i>			

No of parts, Distance

value to use with the Method.

Current segment length output only

length of the currently selected segment of the super string.

Calc segment length output only

calculated length of the segment that will be created.

Process button

create sub-segments for the selected segment of the super string.

Corner Splays

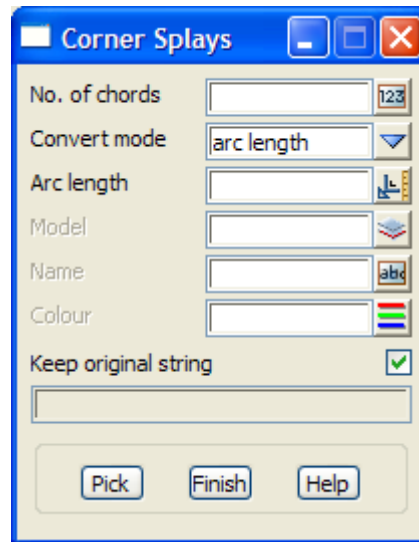
corner_splays

Position of option on menu: Strings =>Strings Edit =>Corner splays

The *Corner splays* option works on a super string and creates splays between two adjacent straight segments.

The number of chords created can be defined by giving the number of sub-segments required, one sub-segment length to beak of the segment or a sub-segment length to beak the segment into as many sub-segments as possible.

On selecting the Corner splays option, the **Corner splays** panel is displayed.



The fields and buttons used in the panel have the following functions.

Field Description	Type	Defaults	Pop-Up
No of chords <i>value to use with the Method.</i>			
Convert mode <i>method for creating the corner splays.</i>	choice box	arc length	arc length arc radius chord length total chords length tangent length
Arc length <i>Arc length, Arc radius, Chord length, Total chords length, tangent length value to use with the Convert mode.</i>			
Name <i>the name of the new string.</i>	input		
Model <i>name of the model that the new string is in.</i>	input		available models
Colour <i>the colour of the new string.</i>	input	default colour	available colours
Keep original string <i>if tick, the original string is not modified and a new string is created with the corner splays. If not tick, the original string is modified.</i>	tick box	tick	
Pick <i>select a super string and the splays will be created.</i>	button		

Surrounding Polygon

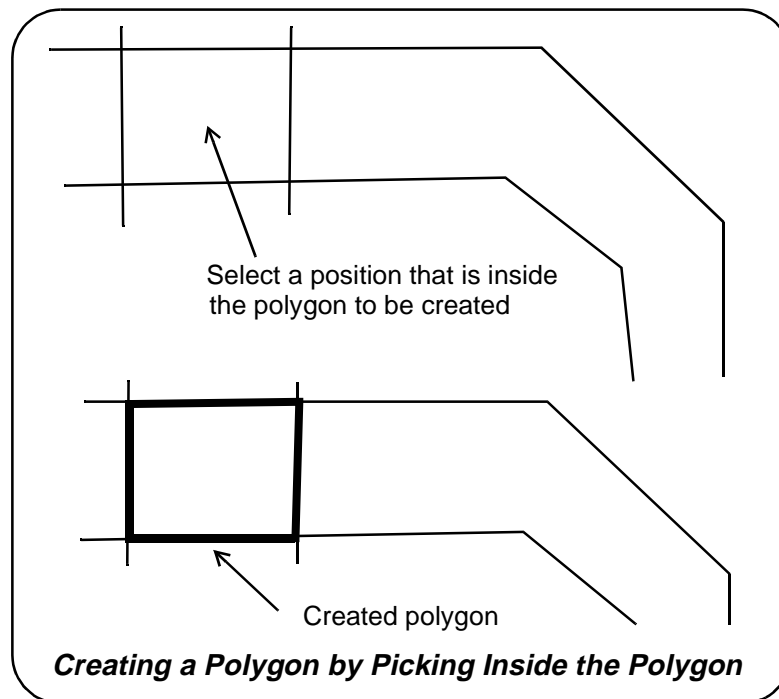
`create_polygon__pick_point_inside`

Position of option on menu: Strings =>Strings Edit =>Surrounding polygon

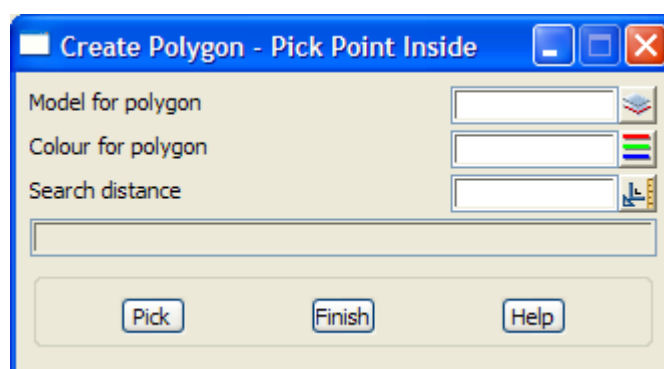
The *Surrounding polygon* option works on all the super strings on the view surrounding a selected position (point) and, if possible, creates a closed polygon from parts of the strings surrounding the selected point.

A straight line must be able to be drawn from the selected point to the lines/arcs that could be used in the surrounding strings.

This option creates a lot/polygon by a picking inside a collection of strings and the lot/polygon is created from the closest strings to the picked position. The picked position must be selected so that all sides of the lot/polygon can be "seen" from the picked position. That is, a straight line can be drawn from the picked position to the lot/polygon side without cutting any other segment.



On selecting the Surrounding polygon option, the Create Polygon - Pick Point Inside panel is displayed.



The fields and buttons used in the panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Name <i>the name of the new created polygon.</i>	input		

Model	input		available models
	<i>model for the created polygon.</i>		
Colour	input	default colour	available colours
	<i>colour for the created polygon.</i>		
Pick	button		
	<i>pick a position on a view and the surrounding polygon will be created from all the super strings on the view.</i>		

Cogo

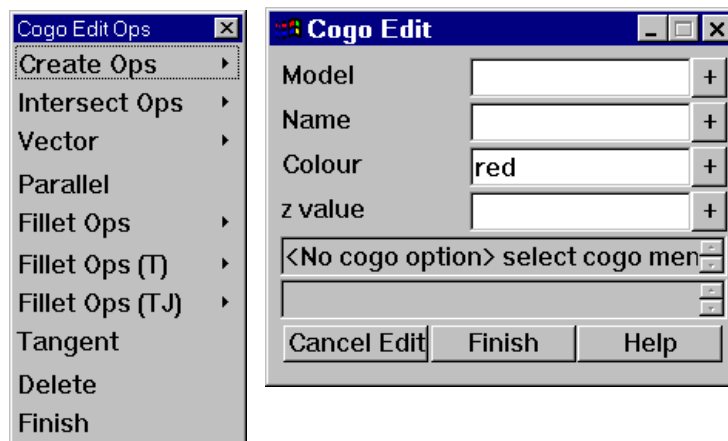
cogo_edit_ops

cogo_edit

Position of menu: Strings =>Cogo

The **cogo** (co-ordinate geometry) options provide methods of constructing points, lines and arcs from a variety of operations such as picking, filleting, intersecting and finding tangents.

Selecting the **cogo** option creates the **cogo edit ops** menu and the **cogo edit** panel.



The options in the **cogo edit ops** menu all create either a point, string or arc and the **cogo edit** panel remains on the screen for each of the menu options and provides the string properties for any created objects.

All of the options chosen from the **cogo edits ops** menu and its sub-menus repeat until cancelled by the user. That is, the option remains in force and can be applied repeatedly until terminated by the user.

The name of the current selected option is displayed in the first message area of the **cogo edit** panel.

To select a new **cogo edits ops** option, simply select the new option from the **cogo edit ops** menu or sub-menus. The current option is automatically terminated and the new option begun.

An option is also terminated when either the **cancel** or **finish** button is selected in the **cogo edit** panel, or **finish** is elected from the **cogo edit ops** menu.

Each of the options in the **cogo edit ops** menu will now be discussed.

For the option *Create ops*, please continue to the section “Create Ops” .

Intersect ops, please continue to the section “Intersect Ops” .

Vector, please continue to the section “Vector” .

Parallel, please continue to the section “Parallel” .

Fillet ops, please continue to the section “Fillet Ops” .

Fillet ops (T), please continue to the section “Fillet Ops (T)” .

Fillet ops (TJ), please continue to the section “Fillet Ops (TJ)” .

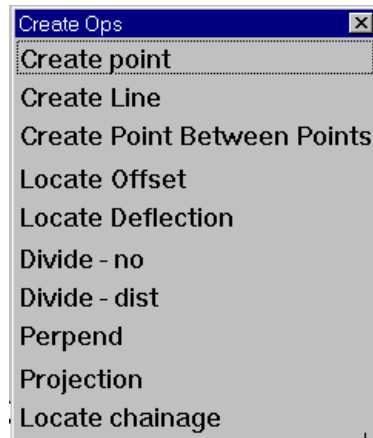
Tangent, please continue to the section “Tangent” .

Please continue to the next section “Create Ops” .

Create Ops

create_ops

The create ops walk-right menu is



Each of the options in the Create Ops menu will now be discussed.

For the option *Create point*, please go to the section “Create Point” .

<i>Create line</i>	“Create Line” .
<i>Create point between points</i>	“Create Point Between Points” .
<i>Locate offset</i>	“Locate Offset” .
<i>Locate deflection</i>	“Locate Deflection” .
<i>Divide - no</i>	“Divide - Number” .
<i>Divide - dist</i>	“Divide - Distance” .
<i>Perpedn</i>	“Perpendicular” .
<i>Projection</i>	“Projection” .
<i>Locate chainage</i>	“Locate Chainage” .

Create Point

After selecting the create point option, the user simply selects a point using the normal picking sequence.

The point will be created with name, colour and model from the **cogo edit** panel.

If no z-value is given in the **cogo edit** panel, then a null z-value is used.

If **height snap** is on and the point is created by snapping to an existing point or line, the z-value for the point is taken from the snapped point or if tin snap is on, from the underlying triangulation. The snapped z-value will be displayed in an enter height typed input box.

If required, this value can be modified by typing into the enter height box. If the box is empty, the z-value is taken from the **cogo edit** panel. If no value exists in the **cogo edit**, an error message **please specify z value** is displayed in the **cogo edit** message area.

The z-value in the enter height box is accepted by entering a <enter> in the box. The enter height box then disappears.

Screen message area

```
<<Create Point> Select position for point> [picks][][menu]
```

Create Line

After selecting the create line option, the user simply selects two points to be the end points of the line using the normal picking sequence.

The line will be created with name, colour and model from the **cogo edit** panel.

If either end point is created by snapping to an existing point or line, the z-value for the point is taken from the snapped point or if tin snap is on, from the underlying triangulation. If no z-value exists, the z-value is taken from the **cogo edit** panel.

If height snap is on, the snapped z-value will be displayed in an enter height typed input box.

If required, this value can be modified by typing into the enter height box. If the box is empty, the z-value is taken from the **cogo edit** panel. If no value exists in the **cogo edit**, an error message **please specify z value** is displayed in the **cogo edit** message area.

The z-value in the enter height box is accepted by entering a <enter> in the box. The enter height box then disappears.

Screen message area

```
<<Create Line> Select 1st point on line> [picks][][][menu]
<<Create Line> Select 2nd point on line> [picks][][][menu]
```

Create Point Between Points

The create point between points option allows the user to select two point to act as the end points of a line and then create a new point a user supplied given distance along that line.

After selecting the create point between points option, the user simply selects two points to act as the end points of the line using the normal picking sequence.

An enter distance from 1st point box is then displayed on the screen and the user simply enters the appropriate distance into the box, terminated with a <enter>. The box then disappears.

The point is then created with name, colour and model and **z-value** from the **cogo edit** panel.

If no z-value exists in the panel, no point is created.

Screen message area

```
<<Between> Select 1st point> [picks][][][menu]
<<Between> Select 2nd point> [picks][][][menu]
<Between> Enter distance from 1st point [caret][][][menu] select a button
```

Locate Offset

The locate offset option is used to create a point at a given perpendicular offset distance from a user defined point on a selected item.

The point on the item to offset from is determined by picking a control point on the item and projecting along the item by a given distance.

Hence the locate offset option needs

- (a) a selected item
- (b) a control point
- (c) a projection distance
- (d) an offset distance

After selecting the locate offset option, the user picks the item to project along using the normal picking sequence. The direction imparted when picking the item determines the sense for direction along the item and offset left and right.

Next a control point on the item is picked.

A distance along item box is then displayed on the screen and the user enters the appropriate distance into the box, terminated with a <enter>. The box then disappears. A positive distance is in the picking direction of the item.

Finally an offset distance box is displayed on the screen. The user enters the appropriate offset

distance into the box, terminated with a <enter>. The box then disappears. A positive offset is to the right of the item when moving in the picking direction of the item.

The appropriate point is then created with name, colour, model and z-value from the **cogo edit** panel.

If no z-value exists in the panel, no point is created.

Screen message area

```
<<Locate Offset> Select item to project along> [picks][ ][menu]
<<Locate Offset> Select control point> [picks][ ][menu]
<Locate Offset> distance along item [caret][ ][menu] select a button
<Locate Offset> offset distance [caret][ ][menu] select a button
```

Locate Deflection

The locate deflection option is used to create a point at a given deflection angle and distance from a user defined point on a selected item.

The locate deflection option is very similar to the locate offset option except instead of going out perpendicular to the item, the user provides a deflection angle. Hence the locate offset is a special case of the locate deflection option when the deflection angle is ninety degrees.

The point on the item to offset from is determined by picking a control point on the item and projecting along the item by a given distance.

Hence the locate deflection option needs

- (a) a selected item
- (b) a control point
- (c) a projection distance
- (d) a deflection angle
- (e) a deflection distance

After selecting the locate offset option, the user picks the item to project along using the normal picking sequence. The direction imparted when picking the item determines the sense for direction along the item and offset left and right.

Next a control point on the item is picked.

Boxes for the distance along item, deflection angle and deflection distance are then (sequentially) displayed on the screen and the user enters the appropriate values into each box, terminated with a <enter>. The box then disappears.

A positive distance is in the picking direction of the item and a positive angle is an angle to the right of the item when moving in the picking direction of the item.

The appropriate point is then created with name, colour, model and z-value from the **cogo edit** panel.

If no z-value exists in the panel, no point is created.

Screen message area

```
<<Locate Deflection> Select item to project along> [picks][ ][menu]
<<Locate Deflection> Select control point> [picks][ ][menu]
<Locate Deflection> distance along item [caret][ ][menu] select a button
<Locate Deflection> deflection distance [caret][ ][menu] select a button
<Locate Deflection> deflection angle [caret][ ][menu] select a button
```

Divide - Number

The `divide - nos` option is used to place points at positions which would divide an arc or a line into an equal number of pieces.

For example, if the option was used to show how and an arc could be divided into seven pieces, points would be placed at the six division marks. No point is placed at the start or end of the arc. Hence, the start and end points plus the division points divide the arc into the required number of divisions.

Since the option will only divide an arc or a line, when an item is selected only the picked line or arc sub-element of the item will be divided.

On selecting the `divide - nos` option, the user picks the item to divide using the normal picking sequence.

A no of divisions box is then displayed on the screen and the user enters the required number of divisions into the box, terminated with a `<enter>`. The box then disappears.

A point string is then created containing points at each of the required division positions. The string has the name, colour, model and z-value from the **cogo edit** panel.

Screen message area

```
<<Divide by #> Select item to divide> [picks][][menu]
<Divide by #> no division [caret][][menu] select a button
```

Divide - Distance

The `divide - dist` option is used to place points at positions which would divide an arc or a line into pieces of a given distance.

Note - unless the arc or line is exactly divisible by the distance, the last division will be smaller than the required distance.

Since the option will only divide an arc or a line, when an item is selected only the picked line or arc sub-element of the item will be divided.

On selecting the `divide - dist` option, the user picks the item to divide using the normal picking sequence.

A distance box is then displayed on the screen and the user enters the required distance for each division into the box, terminated with a `<enter>`. The box then disappears.

A point string is then created containing points at each of the required division positions. The string has the name, colour, model and z-value from the **cogo edit** panel.

Screen message area

```
<<Divide by distance> Select item to divide> [picks][][menu]
<Divide by #> distance [caret][][menu] select a button
```

Perpendicular

The `perpend` option is used to create the point which is the perpendicular projection of a selected point onto a selected line or arc.

Since the option can only drop a point onto an arc or a line, when the item is selected to project onto, only the picked line or arc sub-element of the item is used.

On selecting the `perpend` option, the user picks the point to drop perpendicularly.

The item to drop perpendicularly onto is then selected.

The point representing the perpendicular projection of the chosen point onto the selected item is then created. The created point has the name, colour, model and z-value from the **cogo edit** panel.

Screen message area

```
<<Perpend> Select point to drop> [picks][][menu]  
<<Perpend> Select item to drop onto> [picks][][menu]
```

Projection

The projection option is used to create a point which is given distance along a line or arc.

Since the option can only project a point along an arc or a line, when the item is selected to project along, only the picked line or arc sub-element of the item is used.

On selecting the projection option, the user picks the item to project along.

A distance box is then displayed on the screen and the user enters the appropriate projection distance into the box, terminated with a <enter>. The box then disappears. A positive distance is in the picking direction of the item.

The point representing the projected point along the selected item is then created using the name, colour, model and z-value from the **cogo edit** panel.

Screen message area

```
<<Projection> Select item to project along> [picks][][menu]  
<Projection> distance [caret][][menu] select a button
```

Locate Chainage

The locate chainage option is used to create a point at a given chainage on a selected string.

On selecting the locate chainage option, the user picks the item to locate the chainage on.

A locate chainage box is then displayed on the screen and the user enters the appropriate chainage into the box, terminated with a <enter>. The box then disappears.

A point at the given chainage on the selected item is then created using the name, colour, model and z-value from the **cogo edit** panel.

Screen message area

```
<<Locate chainage> Select item to locate on> [picks][][menu]  
<Locate chainage> chainage [caret][][menu] select a button
```

Please continue to the next section “Intersect Ops” .

Intersect Ops

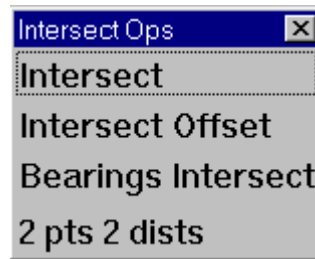
intersect_ops

The intersection options are for finding various intersections of lines and arcs.

Most of intersect cases can have more than one solution. For example, the intersection of a line with an arc.

To easily distinguish between the cases, 12d Model uses the sense of direction implied when picking items to determine which case was required by the user.

The intersect ops walk-right menu is



Each of the options in the Intersect Ops menu will now be discussed.

For the option *Intersect*, please continue to the section "Intersect" .

<i>Create line</i>	"Create Line" .
<i>intersect offset</i>	"Intersect Offset"
<i>Bearings intersect</i>	"Bearings Intersect" .
<i>2 pts 2 dists</i>	"Two Points, Two Distances" .

Intersect

The intersect option creates a point at the intersection of lines and arcs.

That is, it will find the intersection of

- (a) a line with a line
 - (b) a line with an arc
- or
- (c) an arc with an arc

After selecting the intersect option, the user simply selects the two items to intersect using the normal picking sequence.

If an intersect exists, a point is created at the intersection with name, colour, model and z-value from the **cogo edit** panel.

If no z-value exists in the panel, no point is created.

When there is more than one possible solution, the order of picking and the directions imparted when picking the items are used to determine which solution is required.

Since the option will only intersect arcs and lines, when an item is selected only the picked line or arc sub-element of the item is used in the intersect.

Screen message area

```
<<Intersect> Select 1st item to intersect> [picks][][][menu]
<<Intersect> Select 2st item to intersect> [picks][][][menu]
```

Intersect Offset

Like the intersect option, intersect offset is for creating points at the intersection of lines and arcs.

However, before the line or arc is used, it is offset by a user supplied distance.

Hence the intersection is between displaced lines and arcs.

A practical example of intersect offset is for finding the position of a manhole in a subdivision which is three metres from one property line and two metres from the culdesac arc.

After selecting the intersect option, the user selects the first item to intersect using the normal picking sequence.

A 1st offset box is then displayed on the screen and the user enters the appropriate offset for the first line into the box, terminated with a <enter>. The box then disappears. A positive offset is to the right of the item when moving in the picking direction of the item.

The second item to intersect is then selected and a 2nd offset box is displayed on the screen for the user to enter the offset for the second line.

If an intersect exists for the two offset items, a point is created at the intersection with name, colour, model and z-value from the **cogo edit** panel.

If no z-value exists in the panel, no point is created.

As in the intersect option, when more than one solutions is possible, the order of picking and the directions imparted when picking the items are used to determine which solution is required.

Since the option will only intersect arcs and lines, when an item is selected only the picked line or arc sub-element of the item is used in the intersect.

Screen message area

```
<<Intersect Offset> Select 1st item to intersect> [picks][ ][menu]
<Intersect Offset> 1st offset [caret][ ][menu] select a button
<<Intersect Offset> Select 2st item to intersect> [picks][ ][menu]
<Intersect Offset> 2nd offset [caret][ ][menu] select a button
```

Bearings Intersect

The bearings intersect option finds the intersect of the lines going through two user selected points at user supplied bearings.

Hence the option will calculate the point that is at given bearings from two selected points

After selecting the bearings intersect option, the user selects the first point using the normal picking sequence.

A bearing 1 box is then displayed on the screen and the user enters the bearing for the line through the point into the box, terminated with a <enter>. The box then disappears. The bearing is entered in degrees, minutes and seconds.

The second point is then selected and a bearing 2 box is displayed on the screen for the user to enter the bearing for the line through the second point.

The intersection of the two lines is then calculated and if it exists, a point is created at the intersection with name, colour, model and z-value from the **cogo edit** panel.

If no z-value exists in the panel, no point is created.

Note

The selected points do not have to be actual points in a point string. Any snap or cursor position is a valid **point** for the option

Screen message area

```
<<Bearings Intersect> Select 1st point> [picks][ ][menu]
<Bearings Intersect> bearing 1 [caret][ ][menu] select a button
<<Bearings Intersect> Select 2nd point> [picks][ ][menu]
<Bearings Intersect> bearing 2 [caret][ ][menu] select a button
```

Two Points, Two Distances

The 2 pts 2 dists option find the point that given distances from two user selected points.

This problem is equivalent to finding the intersection of two circles centred on the points and with radii the same as the distances.

When there is more than one solution, the solution to the right of the line joining the two points

is used. (the direction of the line is from the first point to the second point). To obtain the other solution, simply select the points in the opposite order.

After selecting the 2 pts 2 dists option, the user selects the first point using the normal picking sequence.

A 1st distance box is then displayed on the screen and the user enters the distance that the new point is from the selected point into the box, terminated with a <enter>. The box then disappears.

The second point is then selected and a 2nd distance box is displayed on the screen for the user to enter the distance to the second point.

The point that is the required distances from the two points is created with name, colour, model and z-value from the **cogo edit** panel. If no z-value exists in the panel, no point is created.

Note

The selected points do not have to be actual points in a point string. Any snap or cursor position is a valid **point** for the option

Screen message area

```
<<Locate 2 pts 2 dists> Select 1st point> [picks][][menu]
<Locate 2 pts 2 dists> 1st distance [caret][][menu] select a button
<<Locate 2 pts 2 dists> Select 2nd point> [picks][][menu]
<Locate 2 pts 2 dists> 2nd distance [caret][][menu] select a button
```

Please continue to the next section “Vector” .

Vector

vector_ops

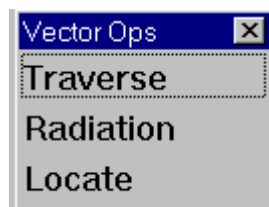
The vector options are for creating points which are a given as at a given vector from another point.

The default definition of the vector is as (bearing, distance) but other combinations such as (angle, distance), relative (x,y) and absolute (x,y) are possible using normal typed input.

The methods for creating the new points are

- (a) locate - create a new point using a vector
- (b) radiation - the points created are all a vector from the initial point selected
- (c) traverse - the last point created becomes the next point to work from

The vector walk-right menu is



Each of the options in the Vector Ops menu will now be discussed.

For the option *Traverse*, please go to the section “Traverse” .

Radiation

“Radiation” .

Intersect offset

“Intersect Offset”

Locate

“Locate” .

Locate

In the locate option, a point is selected and a vector supplied to produce a new point which is the vector away from the initial point.

The sequence is then repeated by selecting another point and giving another vector.

After selecting the locate option, the user simply selects the point to be used using the normal picking sequence.

A bearing distance box is then displayed on the screen and the user enters the required bearing and distance (separated by a space) into the box, terminated with a <enter>. The box then disappears.

A new point is then created which is the given bearing and distance from the selected point. The new point is given the name, colour, model and z-value from the **cogo edit** panel. If no z-value exists in the panel, the given z-value could be nonsense.

The sequence of picking a point and giving a vector is then repeated.

The option terminates when another cogo option is selected or the **cancel** button is selected on the **cogo edit** panel.

Screen message area

```
<<Locate> Select point> [picks][][menu]  
<Locate> bearing distance [caret][][menu] select a button
```

Radiation

In the radiation option, a point is selected and a vector supplied to produce a new point which is the vector away from the initial point.

After selecting the radiation option, the user simply selects the point to be used using the normal picking sequence.

A bearing distance box is then displayed on the screen and the user enters the required bearing and distance (separated by a space) into the box, terminated with a <enter>.

A new point is then created which is the given bearing and distance from the selected point. The new point is given the name, colour, model and z-value from the **cogo edit** panel. If no z-value exists in the panel, the given z-value could be nonsense.

The bearing distance box remains on the screen.

If another value is entered into the box (or the previous one left) terminated by a <enter>, a new point is created which is the new given bearing and distance from the original selected point.

The option terminates when another cogo option is selected or the **cancel** button is selected on the **cogo edit** panel.

Screen message area

```
<<Radiation> Select point> [picks][][menu]  
<Radiation> bearing distance [caret][][menu] select a button
```

Traverse

In the traverse option, an initial point is chosen and a vector supplied to produce a new point which is the vector away from the initial point.

The created point is then taken to be the start point for the next sequence of creating a new point by a vector.

After selecting the traverse option, the user simply selects the first point to be used using the normal picking sequence.

A bearing distance box is then displayed on the screen and the user enters the required bearing and distance (separated by a space) into the box, terminated with a <enter>.

A new point is then created which is the given bearing and distance from the selected point.

The new point is given the name, colour, model and z-value from the **cogo edit** panel. If no z-value exists in the panel, the given z-value could be nonsense.

The bearing distance box remains on the screen.

If another value is entered into the box (or the previous one left) terminated by a <enter>, a new point is created which is the given bearing and distance from the last created point.

Hence, the last created point takes the place of the original selected point.

The option terminates when another cogo option is selected or the **cancel** button is selected on the **cogo edit** panel.

Screen message area

```
<<Traverse> Select point> [picks][][menu]
<Traverse> bearing distance [caret][][menu] select a button
```

Please continue to the next section “Parallel” .

Parallel

Items can be translated perpendicularly to either the left or right using the parallel option (also known as a copy parallel operation).

After selecting the parallel option, the user simply selects the item to paralleled using the normal picking sequence.

A offset box is then displayed on the screen and the user enters the required offset distance into the box, terminated with a <enter>. The box then disappears. A positive offset is to the right of the item when moving in the picking direction of the item.

A new item is then created which is a copy parallel of the selected item by the given offset distance. The new item has the name, colour and model from the **cogo edit** panel.

The option terminates when another cogo option is selected or the **cancel** button is selected on the **cogo edit** panel.

Screen message area

```
<<Parallel> Select item to parallel> [picks][][menu]
<Parallel> offset> [caret][][menu] select a button
```

Please continue to the next section “Fillet Ops” .

Fillet Ops

fillet_ops

The fillet options are for creating an arc between lines and arcs.

That is, it will try and fit an arc between

- (a) two lines
 - (b) a line and an arc
- or
- (c) two arcs

The created arc is determined by tangents from the items it is a fillet for and another piece of information such as a radius or a start point.

Since the option can only fillet between arcs and lines, when an item is selected only the picked line or arc sub-element of the item is used in the fillet.

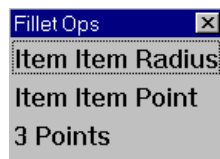
Most fillet cases can have more than one solution. For example, the fillet of a given radius between two lines can have up to four solutions.

To easily distinguish between the cases, 12d Model uses the order of picking and the sense of direction implied when picking the items to determine which case was required by the user.

The direction is used as follows -

the arc comes off the first item in the direction that the first item is picked and lands on the second in the direction that the second item is picked.

The fillet ops walk-right menu is



Each of the options in the Fillet Ops menu will now be discussed.

For the option *Item Item Radius*, please go to the section "Fillet Item Item Radius" .

<i>Item Item Point</i>	"Fillet Item Item Point" .
<i>Intersect offset</i>	"Intersect Offset"
<i>3 points</i>	"Fillet Three Points" .

Fillet Item Item Radius

This fillet option creates an arc of a user given radius between two user selected items.

After selecting the fillet item item radius option, the user selects the first item to be used in the fillet using the normal picking sequence.

Next the second item to be used in the fillet is selected.

An enter radius box is then displayed on the screen and the user types the appropriate radius for the fillet into the box, terminated with a <enter>. The box then disappears.

A positive radius implies that the arc travels in a clockwise direction and a negative radius for an arc travelling in an anti-clockwise direction.

If a fillet exists for the two items and the radius, an fillet arc is created with name, colour, model and z-value from the **cogo edit** panel.

If no z-value exists in the panel, no arc is created.

Screen message area

```
<<Fillet by radius> Select 1st item> [picks][][menu]
<<Fillet by radius> Select 2nd item> [picks][][menu]
<Fillet by radius> Enter radius [caret][][menu] select a button
```

Fillet Item Item Point

This fillet option creates an arc between two user selected items starting at a user defined control point.

After selecting the fillet item item pt option, the user selects the first item to be used in the fillet using the normal picking sequence.

Next the second item to be used in the fillet is selected.

Finally, a point is selected to act as the starting point for the fillet. This point, called the control point, must lie on the first item selected. If the selected point doesn't lie on the first item, the selected point is projected perpendicularly onto the item and the projected point used as the control point.

If a fillet exists for the two items and the control point, a fillet arc is created with name, colour, model and z-value from the **cogo edit** panel.

If no z-value exists in the panel, a null z-value is used.

Screen message area

```
<<Fillet by start point> Select 1st item> [picks][][menu]
<<Fillet by start point> Select 2nd item> [picks][][menu]
<<Fillet by start point> Select start point> [picks][][menu]
```

Fillet Three Points

This option creates an arc between three user selected points.

After selecting the fillet 3 pts option, the user selects the three points one after another using the normal picking sequence.

The three arc points must be selected in the order

- (a) the start point
- (b) a point between the start and end point
- (c) the end point

If an arc does exist containing the three points, it will be unique including its direction. The arc will be created with name, colour, model and z-value from the **cogo edit** panel.

If no z-value exists in the panel, a null z-value is used.

Screen message area

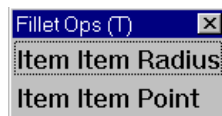
```
<<Fillet 3 points> Select 1st item> [picks][][menu]
<<Fillet 3 points> Select 2nd item> [picks][][menu]
<<Fillet 3 points> Select start point> [picks][][menu]
```

Please continue to the next section "Fillet Ops (T)" .

Fillet Ops (T)

fillet_ops_t_

The fillet (T) options are the almost identical to the fillet options.



The only difference is that after the fillet arc is created, the original items are trimmed back to the start and end of the arc.

The trimmed items are not joined to the fillet arc.

The original strings obey the trash defaults from the utilities=>defaults=>trash defaults option.

That is, if the trash mode is set to *keep string*, the original strings are untouched.

<i>delete string</i> ,	deleted.
<i>trash string</i> ,	moved to the trash model.

For information on the fillet options, see the section “Fillet Ops”

For the option *Item Item Radius*, please go to the section “Fillet Item Item Radius” .

Item Item Point

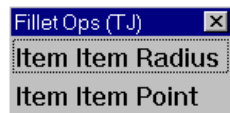
“Fillet Item Item Point” .

Please continue to the next section “Fillet Ops (TJ)” .

Fillet Ops (TJ)

fillet_ops_tj_

The fillet (TJ) options are the almost identical to the fillet and fillet (T) options.



The only difference is that after the fillet arc is created, the original items are trimmed back to the start and end of the arc and the three items joined to form a new item.

That is, the trimmed items are joined to the fillet arc.

The original strings obey the trash defaults from the Utilities=>Defaults=>Trash defaults option.

That is, if the trash mode is set to *keep string*, the original strings are untouched.

delete string,

deleted.

trash string,

moved to the trash model.

For information on the fillet options, see the section “Fillet Ops”

For the option *Item Item Radius*, please continue to the section “Fillet Item Item Radius” .

Item Item Point

“Fillet Item Item Point” .

Please continue to the next section “Tangent” .

Tangent

The tangent option creates tangent lines between point and arcs.

That is, tangents can be defined between

(a) a point and an arc

(b) two arcs

or

(c) two points - simply a line between the two points

Since the option can only fillet between points and arcs, when an item is selected, only the picked sub-arc of the item is used as an arc.

Most tangent cases can have more than one solution. For example, two tangents from a point to an arc.

To easily distinguish between the cases, 12d Model uses the order of picking the items and the sense of direction implied when picking an arc to determine which case was required by the user.

After selecting the tangent option, the user selects the first item to be used in the tangent calculations using the normal picking sequence.

Next the second item to be used is selected.

If a tangent line exists between the two items selected, a line string is created with name, colour, model and z-value from the **cogo edit** panel.

If no z-value exists in the panel, a null z-value is used for the line.

Screen message area

<<Tangent> Select 1st item> [picks][][menu]

<<Tangent> Select 2nd item> [picks][][menu]

Convert

convert_string

Position of option on menu: Strings =>Convert

The Convert option is used to create a new string of possibly a different string type from a chosen string.

Since not all string conversion are possible, or even make sense (for example, converting a 3d string to a text string), the list of defined conversion depends on the type of the string chosen for conversion.

After selecting the string to convert, a menu containing the possible conversions is raised and the required conversion selected from it.

After the type of conversion is selected, a string Properties panel containing the attribute information for the new string is displayed and can be used to modify any properties of the new string.

After selecting the **Convert option**, the **Convert String** panel is placed on the screen.



If a new name, model or colour is required for the converted string, the new data is entered into the **Convert String** panel. If a change isn't required, leave the appropriate panel field blank.

The Convert option is already in progress and if a string is selected and accepted, a menu containing all the available conversions for that particular string type is displayed.

convert_2d_string_to

convert_3d_string_to

convert_4d_string_to

convert_Alignment_string_to

convert_arc_string_to

convert_drainage_string_to

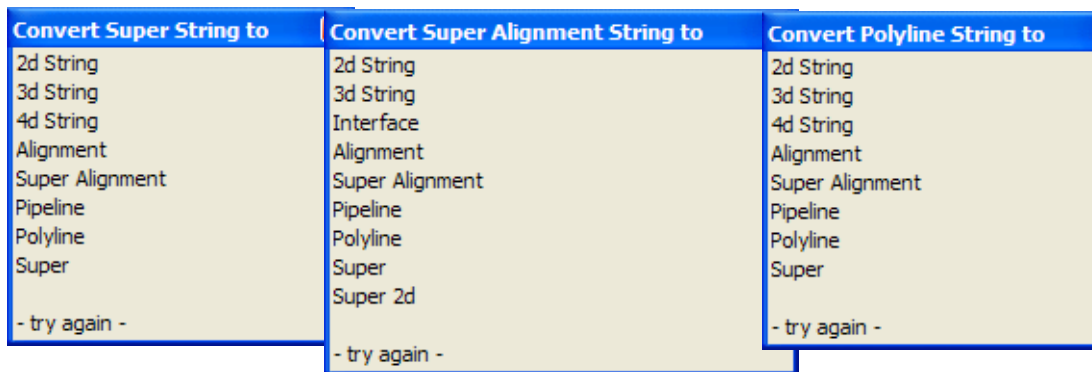
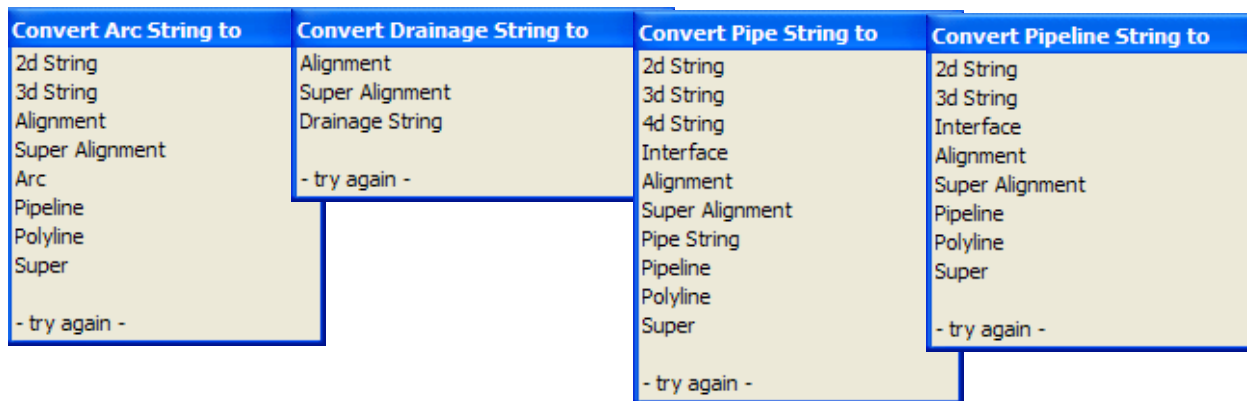
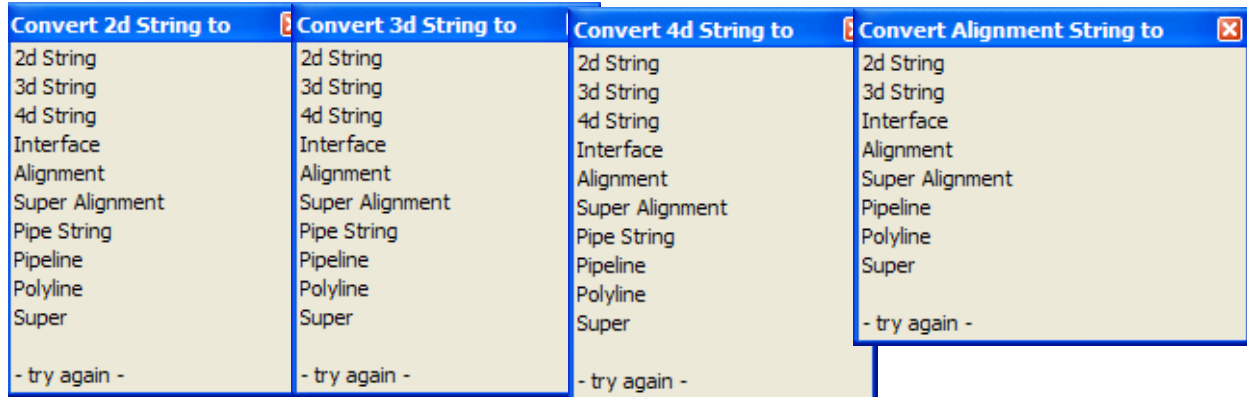
convert_pipe_string_to

convert_pipeline_string_to

convert_super_string_to

convert_super_alignment_string_to

For example, for each string type the choices are:



After selecting the conversion to be made, a new string of the selected type is created and given the model, colour and name according to the fields in the **Convert String** panel.

The **Properties** panel for the new string is also displayed and hence any of the strings properties can be modified for the new string.

The fields and buttons used in the **Convert String** panel have the following functions.

Field Description	Type	Defaults	Pop-Up
New name	input		
<i>If blank, the converted string is given the same name as the original string.</i>			
<i>If non-blank, then the converted string is given the name in the new name field.</i>			
New model	input		available models
<i>if blank, the converted string is placed in the same model as the original string.</i>			
<i>If non-blank, then the converted string will be placed in the model given in the new model field.</i>			

New colour input available colours
if blank, the converted string is given the same colour as the original string.
If non-blank, then the converted string is given the colour in the new colour field.

Mode input keep string keep, delete, trash string
if delete string, the string selected to be converted is deleted.
keep string, the selected string is not deleted.
trash string, the string selected to be converted is moved to the trash model.

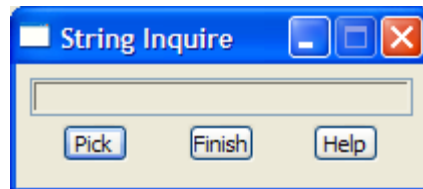
Inquire

string_inquire

Position of option on menu: Strings =>Inquire

The inquire option is used to obtain information about a string displayed on the screen. The amount and type of information varies between string types.

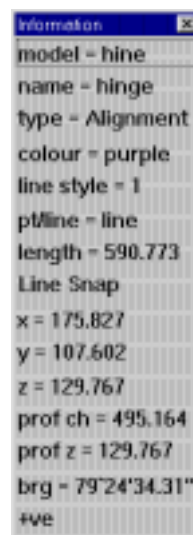
On selecting the Inquire option, the **String Inquire** panel is displayed.



The panel is used for any special messages and to end the option.

After selecting the inquire option, the strings are selected using the normal **12d** Model selecting mechanism (LB to pick a string, MB to accept a string, RB for the pick ops menu). Whenever a string is picked, the information about the picked string is displayed on the screen in the Information menu.

An example of the Information menu for an Alignment string is



For more details on the Information menu, go to the section “String Information”

Any number of string inquiries can be made with the option by repeated use of the mouse buttons LB and MB to pick and accept strings.

The inquire option is terminated by either selecting the Cancel option from the Pick Ops menu (raised by clicking RB) or selecting **Finish** or **[X]** from the **String Inquire** panel.

String Information

information

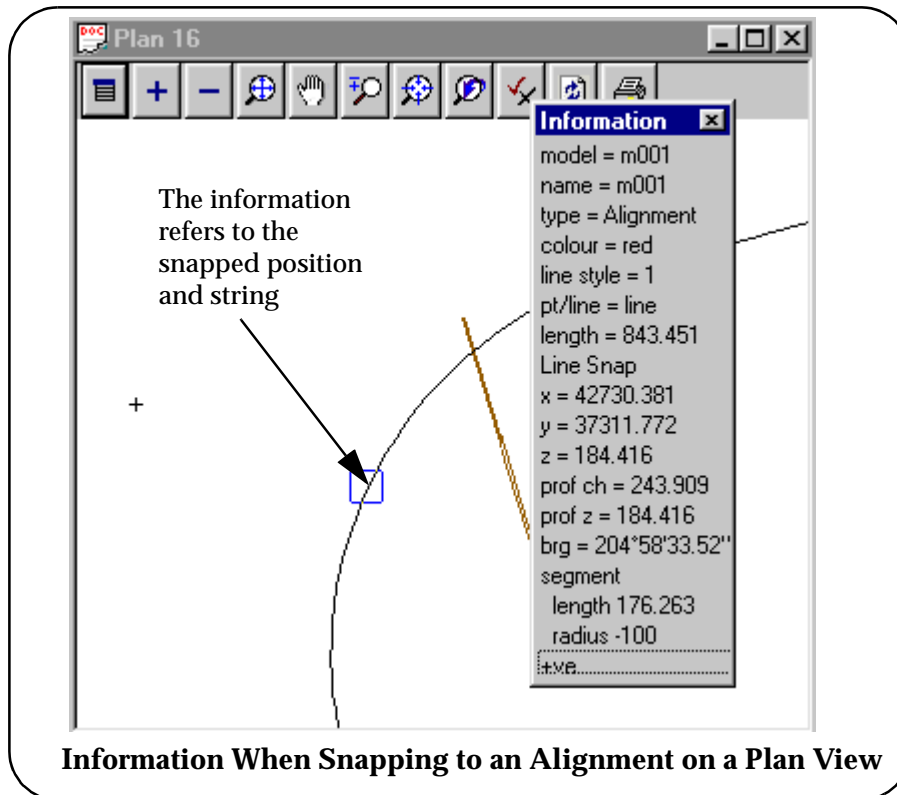
Whenever a string is picked, the information about the picked string is displayed on the screen in the Information menu

The Information menu displays different information depending on whether the string was picked in a Plan or Perspective view or in a Section view.

For a Plan or Perspective View

The details on the Information menu can include:

- model = - gives the model of the selected string
- name = - " name " " "
- type = - " type " " "
- colour = - " colour " " "
- line style = - " line style " " "
- pt/line = - " " breakline type " " "
- # pts = - " " number of points " " "
- area = - " " area if it is a closed string
- length = - " " length of the string
- Snap type - e.g. Line Snap, Point Snap
- x = - " " x co-ordinate of the selected position
- y = - " " y co-ordinate of the selected position
- prof ch = - " " chainage of the selected position on the string
- prof z = - " " z-value of the selected position on the string
- brg = - " instantaneous bearing of the selected position on the string
- segment length - " length of the string segment containing the selected position
- +ve or -ve - if the direction of the pick was the same as the direction of the string, then +ve is displayed otherwise the direction of the pick is opposite to the string direction and a -ve is displayed.



For a Section View

For a section view, the x-axis of the view is defined by the chainage along the string that is being profiled on the section view (the **profiled** string). The profiled string is displayed on the section view.

For any tins in models added to the section view, the sections through the tins along the

profiled string are also displayed in the section view.

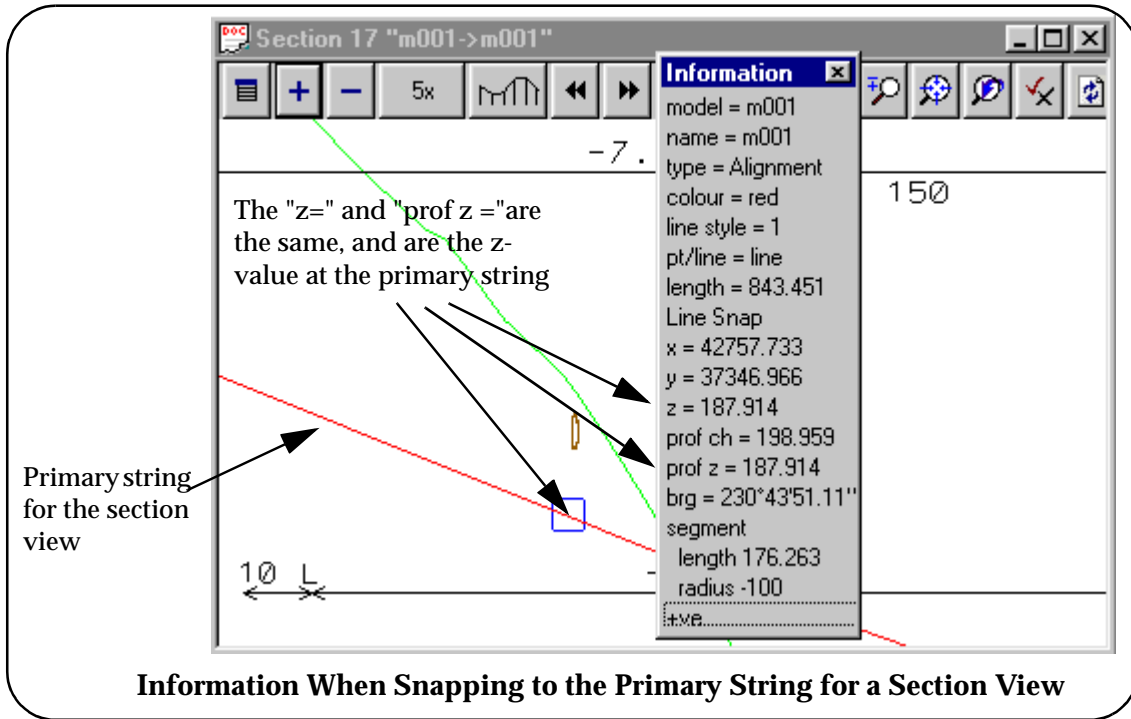
Finally, any parts of any strings in models added to the section view that are in the corridor defined for the section view are projected onto the section view and displayed.

The details on the Information menu can include:

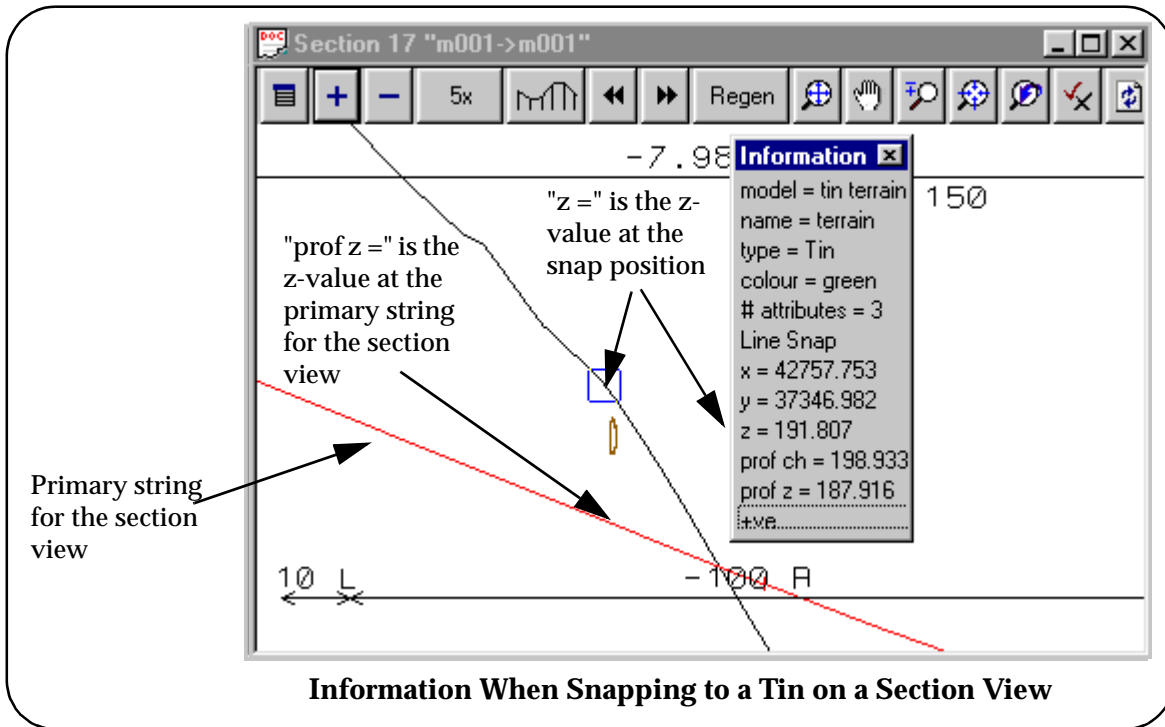
model =	- gives the model of the selected string
name =	- " name " " "
type =	- " type " " "
colour =	- " colour " " "
line style =	- " line style " " "
pt/line =	- " breakline type " " "
# pts =	- " number of points " " "
area =	- " area if it is a closed string
length =	- " length of the string
Snap type	- e.g. Line Snap, Point Snap
x =	- " x co-ordinate of the selected position
y =	- " y co-ordinate of the selected position
z =	- " z co-ordinate of the selected position
prof ch =	- " chainage of the <i>profiled</i> string at the selected position Note that this is not the chainage of the selected string unless the selected string is the profiled string
prof z =	- " " z-value of the <i>profiled</i> string at the profile chainage of the selected position Note that this is not the z of the selected position unless the selected string is the profiled string
brg =	- " instantaneous bearing of the selected position on the string
segment length	- " length of the string segment containing the selected position
+ve or -ve	- if the direction of the pick was the same as the direction of the string, then +ve is displayed otherwise the direction of the pick is opposite to the string direction and a -ve is displayed.

IMPORTANT NOTES

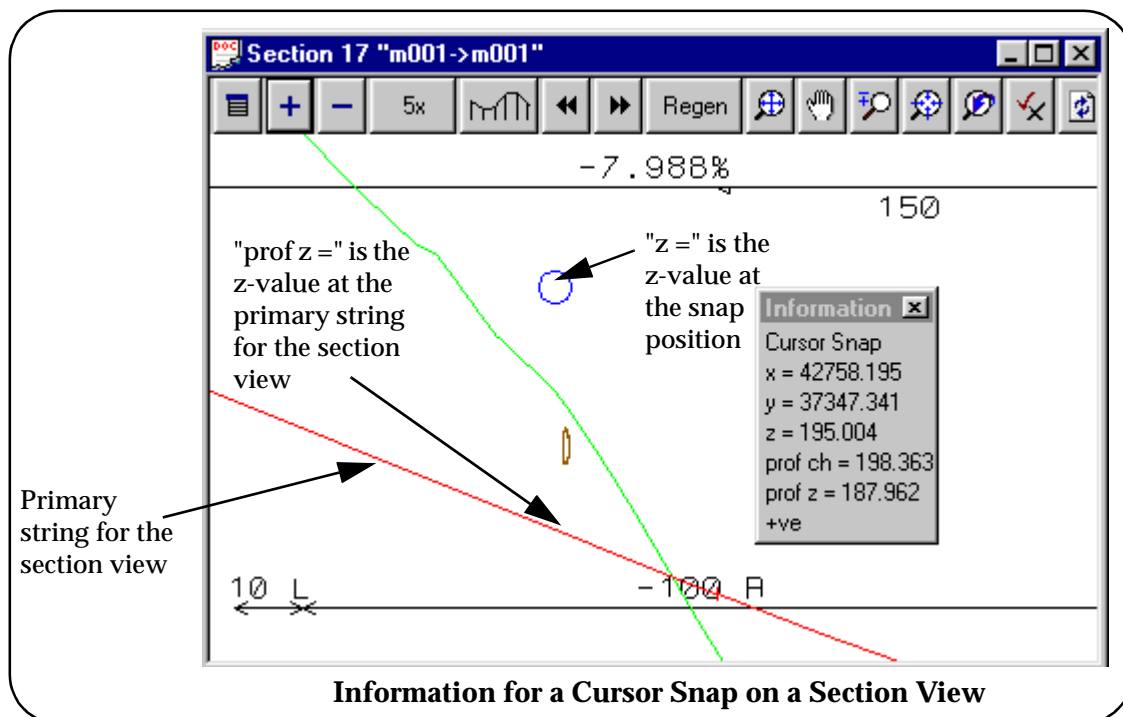
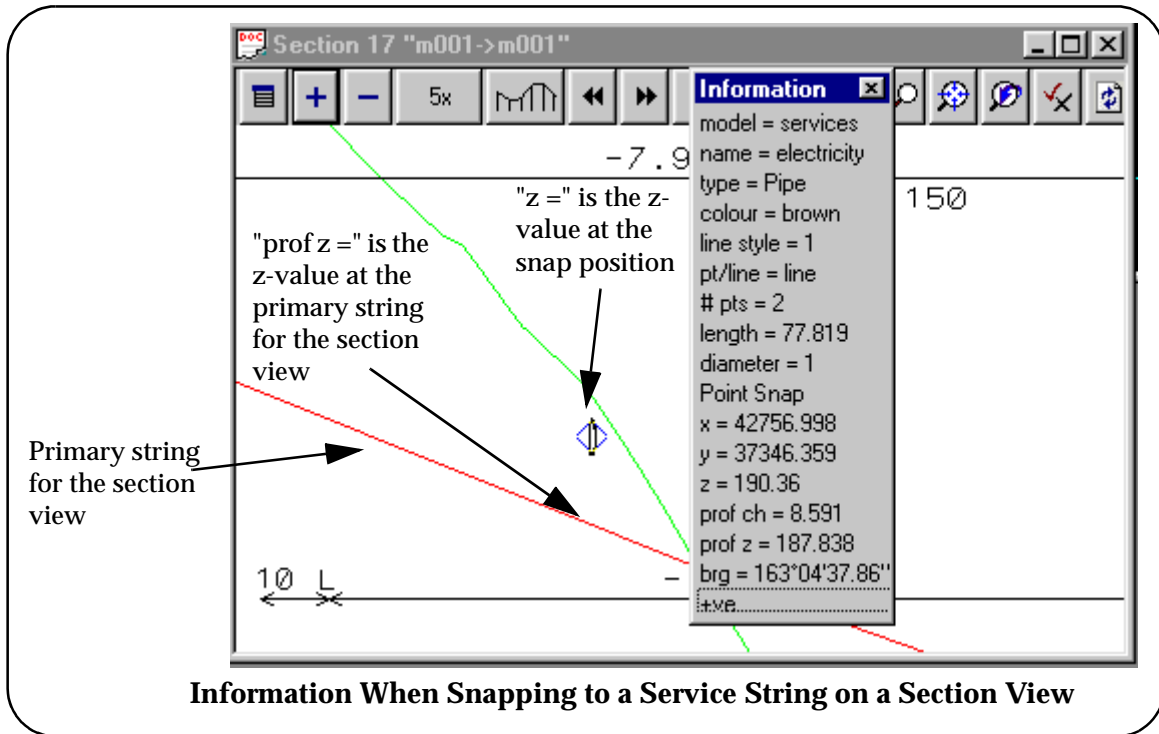
1. for a string selected on a section view, the " z = " value is the z co-ordinate of the selected position. The "**prof z** = " value is the z co-ordinate of the string profiled on the section view.
2. The "**prof ch** = " value is the chainage of the string profiled on the section view, not the chainage of the selected string.



Information When Snapping to the Primary String for a Section View



Information When Snapping to a Tin on a Section View



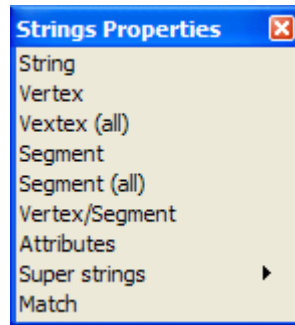
Properties

strings_properties

Position of menu: Strings =>Properties

The Properties walk-right menu contains options to obtain and/or modify the properties of any string displayed on the screen, or obtain and/or modify the vertices and segments of a super string.

The Properties walk-right menu is



For the option *String*, go to the section “String”

<i>Vertex</i>	“Vertex”
<i>Vertex (all)</i>	“Vertex - All above”
<i>Segment</i>	“Segment”
<i>Segment (all)</i>	“Segment - All above”
<i>Vertex/Segment</i>	“Vertex/Segment”
<i>Attributes</i>	“Attributes”
<i>Super strings</i>	“Super Strings”
<i>Match</i>	“Match”

String

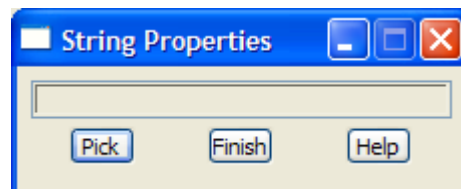
string_properties

Position of option on menu: Strings =>Properties =>String

The String option obtains and/or modify property information about any string displayed on the screen.

For example, the string’s name, colour and style are string properties. Each string type has its own particular set of properties.

On selecting the String option, the **String Properties** panel is displayed.

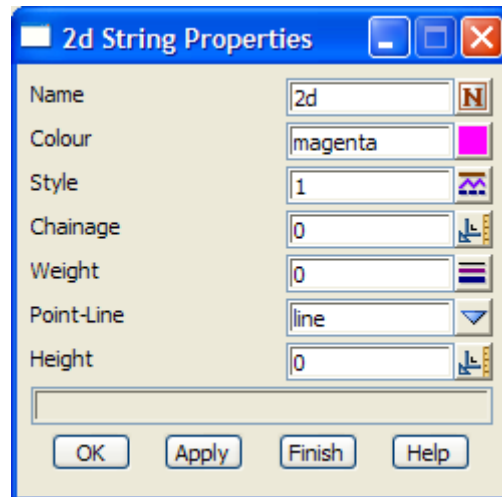


The panel is only used for any special messages and to end the option.

The String Properties option is automatically in a pick mode and the user selects strings using the normal 12d Model picking mechanism (LB to select a string, MB to accept a string, RB for the pick ops menu). Whenever a string is selected, the appropriate **Properties** panel for the string

type is displayed on the screen with all the picked string's properties shown.

For example, for a 2d string, the **Properties** panel is



To modify any of the properties for the selected string, simply change the information in the appropriate panel field and select the **OK** or **Apply** button.

The **Properties** panel is also brought up by the **Properties** option on each string editor and the **Properties** panel have been shown for each string in the Editor section of the manual.

Please continue to the next section "Vertex" .

Vertex

[string_vertex_properties](#)

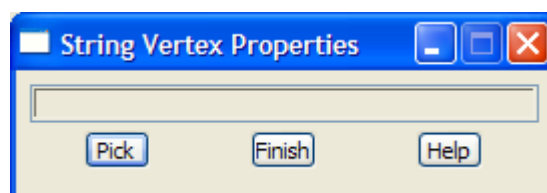
[vertex_properties](#)

Position of option on menu: Strings =>Properties =>Vertex

The Vertex option obtains and/or modify property information about the vertex of any super string displayed on the screen.

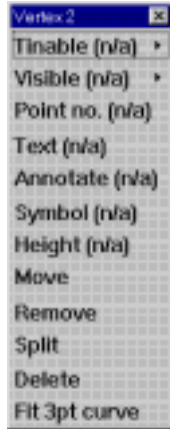
For example, the height, symbol, annotation, point no are all properties of a super string vertex.

On selecting the Vertex option, the **String Vertex Properties** panel is displayed.



The panel is only used for any special messages and to end the option.

The String Vertex Properties option is automatically in a pick mode and the user selects the *vertex* of a super string using the normal **12d** Model picking mechanism. Whenever a *vertex* is selected, a Vertex menu showing the properties of the vertex is displayed on the screen.



To modify any of the properties for the selected vertex, simply click on the appropriate item on the Vertex menu and the appropriate panel will come up to modify the vertex property.

Please continue to the next section “Segment” .

Segment

[string_segment_properties](#)

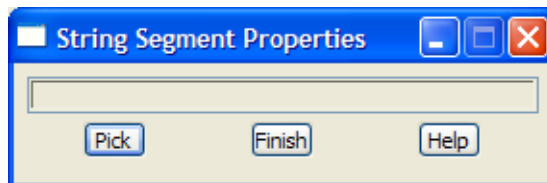
[segment_properties](#)

Position of option on menu: Strings =>Properties =>Segment

The Segment option obtains and/or modify property information about the segment of any super string displayed on the screen.

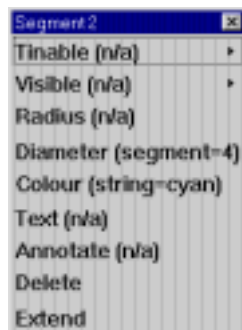
For example, the visibility, radius, colour, text are all properties of a super string segment.

On selecting the Segment option, the **String Segment Properties** panel is displayed.



The panel is only used for any special messages and to end the option.

The String Segment Properties option is automatically in a pick mode and the user selects the *segment* of a super string using the normal 12d Model picking mechanism. Whenever a *segment* is selected, a Segment menu showing the properties of the segment is displayed on the screen.



To modify any of the properties for the selected segment, simply click on the appropriate item on the Segment menu and the appropriate panel will come up to modify the segment property.

Please continue to the next section “Vertex/Segment” .

Vertex/Segment

[string_vertex_segment_properties](#)

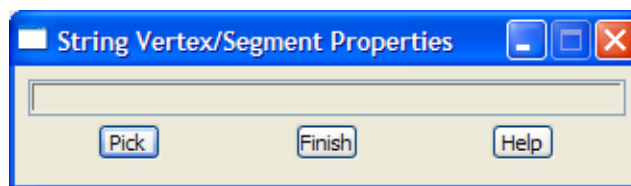
[vertex_properties](#) [segment_properties](#)

Position of option on menu: Strings =>Properties =>Vertex/Segment

This option is a combination of the Vertex and Segment options already documented.

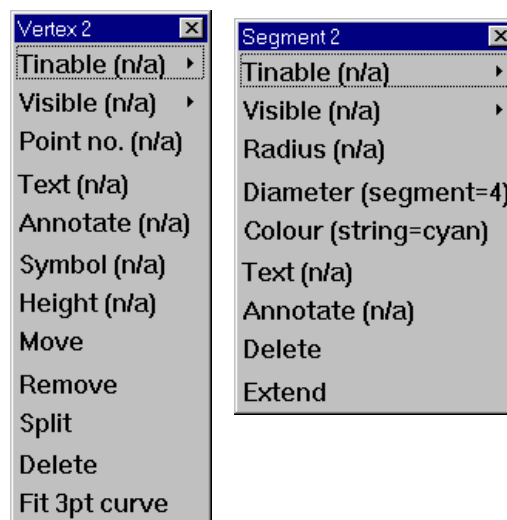
The Vertex/ Segment option obtains and/or modify property information about the vertex or segment of any super string displayed on the screen.

On selecting the Vertex/Segment option, the **String Vertex/Segment Properties** panel is displayed.



The panel is only used for any special messages and to end the option.

The String Vertex/Segment Properties option is automatically in a pick mode and the user selects either the *vertex* or the *segment* of a super string using the normal 12d Model picking mechanism. Whenever a *vertex* or *segment* is selected, the Vertex or Segment menu showing the properties of the selected vertex or segment is displayed on the screen.



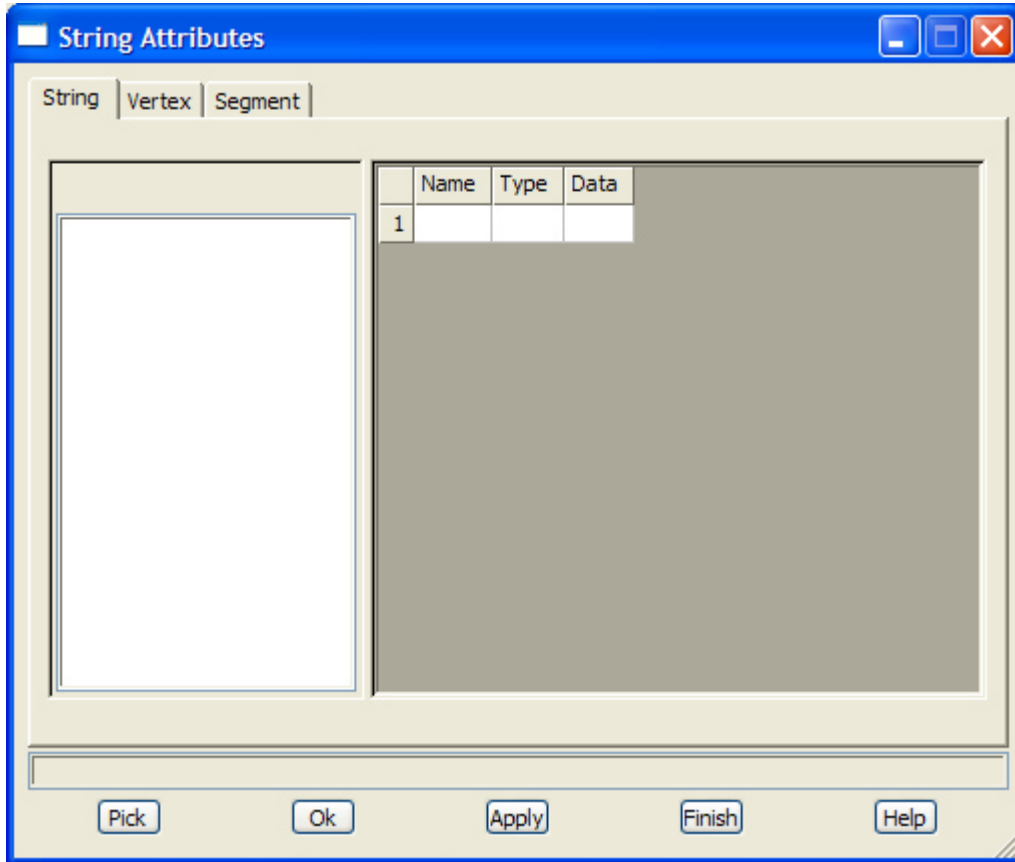
Attributes

[string_attributes](#)

Position of option on menu: String =>Properties =>Attributes

The Attributes options displays, creates and edits attributes for any strings in the project.

On selecting Attributes, the **String Attributes** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

String tab

this tab displays/edits the attributes that apply for the entire string. All string types have these.

Name

name of the string attribute

Type

integer, real, text

type of attribute - integer, real or text

Data

value for the string attribute

Segment tab

this tab displays/edits the attributes for each segment of a super string or pipe of a drainage or sewer string.

Segment no.

number of the segment of the string to display/edit attributes for

Prev

button

go to the previous segment of the string.

Next

button

go to the next segment of the string.

Name

name of the attribute for the segment

Type integer, real, text

type of attribute - integer, real or text

Data

value for the attribute for the segment

Vertex tab

this tab displays/edits the attributes for each vertex of a super string or pit of a drainage or sewer string.

Vertex no.

number of the vertex of the string to display/edit attributes for

Prev button

go to the previous vertex of the string.

Next button

go to the next vertex of the string.

Name

name of the attribute for the vertex

Type integer, real, text

type of attribute - integer, real or text

Data

value for the attribute for the vertex

Pick button

pick the string to display/edit the attributes for

OK button

set the attributes to the values in the panel and then exit the panel.

Apply button

set the attributes to the values in the panel but don't exit the panel.

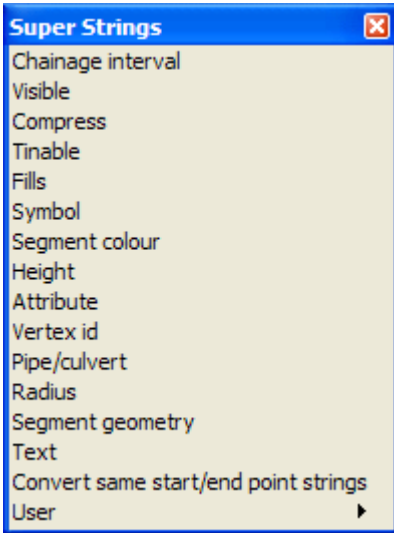
Super Strings

super_strings

Position of menu: Strings =>Properties =>Super strings

The super string has many

The Super string walk-right menu is:



set/reset the chainage interval and chord/arc tolerance
 set visibility flags to constant/variable or clear the flag
 compress a super sting
 set tinability to constant/variable or clear the flag
 set fill styles for the string
 define symbols constant/each vertex or have no symbols

For the option *Chainage interval*, go to the section “Chainage Interval” .

<i>Visible</i>	“Visible”
<i>Compress</i>	“Compress”
<i>Tenable</i>	“Tenable”
<i>Fills</i>	“Fills”
<i>Symbol</i>	“Symbol”
<i>Segment colour</i>	“Segment Colour”
<i>Height</i>	“Height”
<i>Attribute</i>	“Attribute”
<i>Vertex id</i>	“Vertex Id”
<i>Pipe/culvert/extrude</i>	“Pipe/Culvert”
<i>Radius</i>	“Radius”
<i>Segment geometry</i>	“Segment Geometry”
<i>Text</i>	“Text”

Chainage Interval

change_super_string_chainage_interval

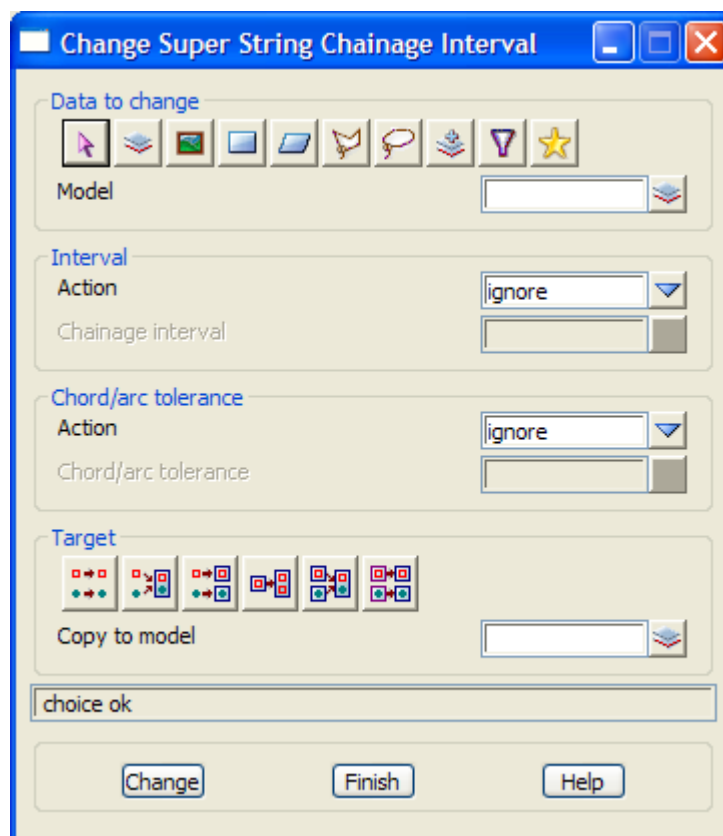
Position of option on menu: Strings =>Properties =>Super strings =>Chainage interval

A super string has one *chainage interval* value for the entire string. If the value is non-zero, then any line segments of the string are subdivided by the chainage interval when the super string is used in triangulations.

A super string also has one *arc-chord tolerance* value for the entire string. If the value is non-zero, then any curved segments are subdivided by the arc-chord tolerance when used in triangulations.

The Chainage interval option can set the *chainage interval* value and/or the *chord-to-arc tolerance* value for selected super strings.

On selecting the Chainage interval option, the **Change Super String Chainage Interval** panel is displayed.



The fields and buttons used in the panel have the following functions.

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Data source type		Model	
-------------------------	--	-------	--

data selection type - for a full description go to "Data Source" in the chapter "Tools and Concepts"

Data source	input		
--------------------	-------	--	--

source of data is to be processed.

Interval tab

Action	choice box	ignore	set, clear, ignore
---------------	------------	--------	--------------------

if set, set the chainage intervals of the selected super strings to the value in Chainage interval.

If clear, set all the selected super strings to not use a chainage interval.

If ignore, don't modify the chainage interval of the selected super strings.

Chainage interval input

the chainage interval to use for a super string.

Chord/arc tolerance tab

Action choice box ignore set, clear, ignore

*if **set**, set the chord/arc tolerance of the selected super strings to the value in Chord/arc tolerance.*

*If **clear**, set all the selected super strings to not use a chord/arc tolerance.*

*If **ignore**, don't modify the chord/arc tolerance of the selected super strings.*

Chord/arc tolerance input

the chord/arc tolerance to use for a super string.

Target type

data target type - for a full description go to "Data Target" in the chapter "Tools and Concepts"

Target info input

extra information required for the target.

Change button

process the selected strings

Visible

change_super_string_visibility

Position of option on menu: Strings =>Properties =>Super strings =>Visible

For selected super strings, the Visible option can set the flags that determine how visibility is defined for a super string.

Segment visibility can

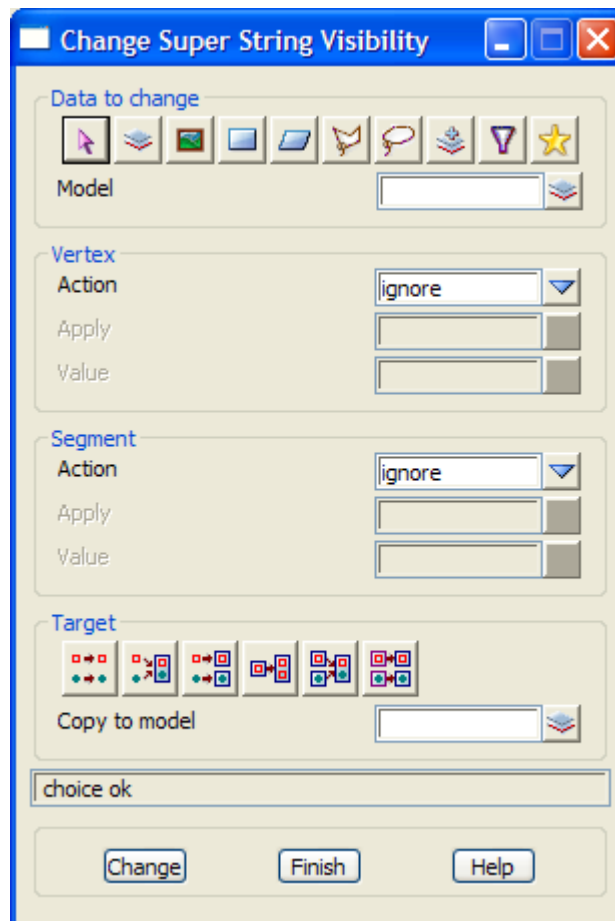
- (a) be not setable at all for the string - it is always visible
- (b) have one setting for the entire string - visible only
- (c) have separate settings for each segment (and all set to visible)

Similarly, vertex visibility can

- (a) be not setable at all for the string - it is always visible
- (b) have one setting for the entire string - visible only
- (c) have separate settings for each segment (and all set to visible).

The Visible option allows any of the above cases to be set up for the selected super strings.

On selecting the Visible option, the **Change Super String Visibility** panel is displayed.



The fields and buttons used in the panel have the following functions.

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Data source type		Model	
-------------------------	--	-------	--

data selection type - for a full description go to "Data Source" in the chapter "Tools and Concepts"

Data source	input		
--------------------	-------	--	--

source of data is to be processed.

Vertex tab

Action choice box ignore set, clear, ignore

*if **set**, the vertex visibility can be allowed to be a constant for all vertices in the string, or to be different for each vertex in the string.*

*If **clear**, the vertex visibility flags are removed for the string and the string vertices are always visible.*

*If **ignore**, don't modify the visibility flags for the vertices of the string.*

Apply choice box

*if **Action** is **set**, then the **Apply** field is used.*

*If **Apply** is **constant**, the string has only one visibility flag and it applies to all vertices in the string. It is set to visible.*

*If **Apply** is **variable**, each vertex in the string has its own visibility flag and each flag is set to visible.*

Segment tab

Action choice box ignore set, clear, ignore

*if **set**, the segment visibility can be allowed to be a constant for all segments in the string, or to be different for each segment in the string.*

*If **clear**, the segment visibility are removed for the string and the string segments are always visible.*

*If **ignore**, don't modify the visibility flags for segments of the string.*

Apply choice box

*if **Action** is **set**, then the **Apply** field is used.*

*If **Apply** is **constant**, the string has only one visibility flag and it applies to all segments in the string It is set to visible*

*If **Apply** is **variable**, each segment in the string has its own visibility flag and each flag is set to visible.*

Target type

data target type - for a full description go to "Data Target" in the chapter "Tools and Concepts"

Target info input

extra information required for the target.

Change button

process the selected strings.

Compress

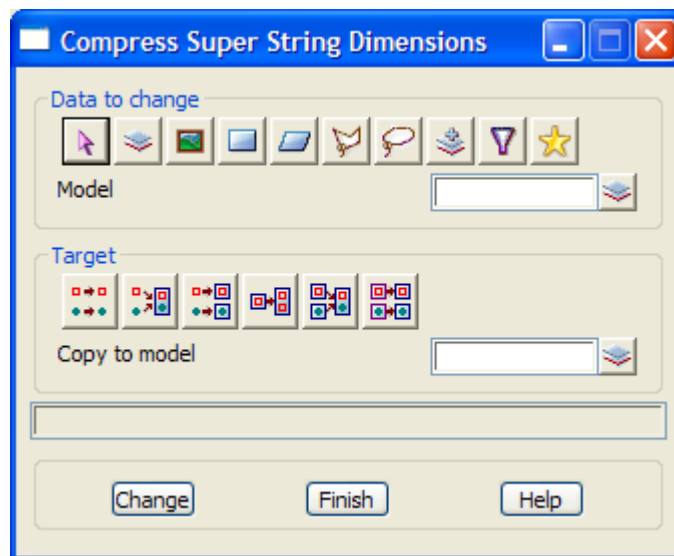
`compress_super_string_dimensions`

Position of option on menu: Strings =>Properties =>Super strings =>Compress

The compress option removes any super string dimensions that are not needed. For example, dimensions such radius, variable z etc. that are not being used in the string are removed.

This reduces the storage required for the super string.

On selecting the Compress option, the **Change Super String Visibility** panel is displayed.



The fields and buttons used in the panel have the following functions.

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Data source type		Model	
-------------------------	--	-------	--

data selection type - for a full description go to "Data Source" in the chapter "Tools and Concepts"

Data source	input		
--------------------	-------	--	--

source of data is to be processed.

Target type			
--------------------	--	--	--

data target type - for a full description go to "Data Target" in the chapter "Tools and Concepts"

Target info	input		
--------------------	-------	--	--

extra information required for the target.

Change	button		
---------------	--------	--	--

process the selected strings

Tinable

change_super_string_tinability

Position of option on menu: Strings =>Properties =>Super strings =>Tinable

For selected super strings, the Tinable option can set the flags that determine how tinability is defined for a super string and can also set whether segments or vertices are tinable or not.

Segment tinability can

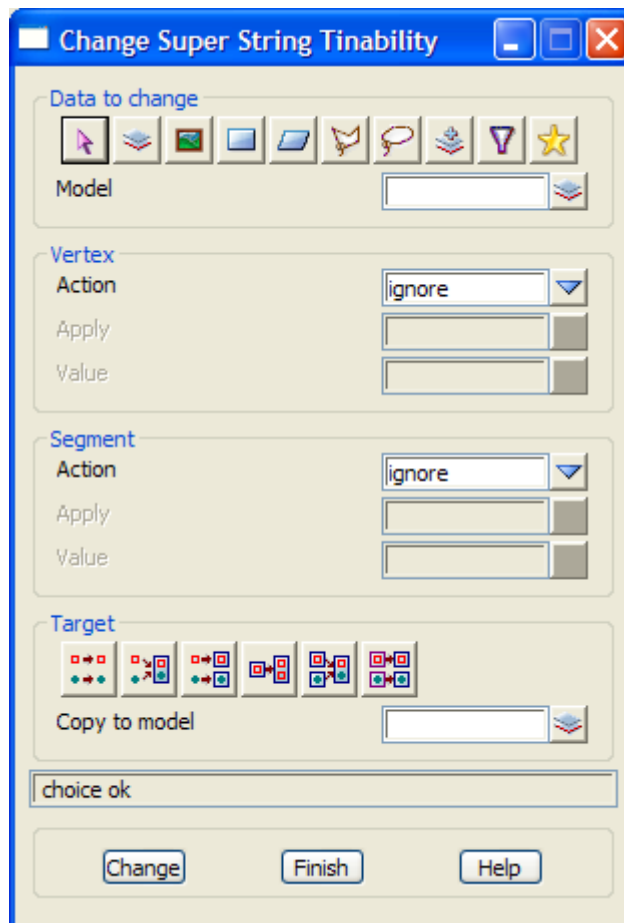
- (a) be not settable at all for the string - it is always tinable
- (b) have one setting for the entire string
- (c) have separate settings for each segment.

Similarly, vertex tinability can

- (a) be not settable at all for the string - it is always tinable
- (b) have one setting for the entire string
- (c) have separate settings for each segment.

The Tinable option allows any of the above cases to be set up for the selected super strings.

On selecting the Tinable option, the **Change Super String Tinability** panel is displayed.



The fields and buttons used in the panel have the following functions.

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Data source type		Model	
-------------------------	--	-------	--

data selection type - for a full description go to "Data Source" in the chapter "Tools and Concepts"

Data source input
source of data is to be processed.

Vertex tab

Action choice box ignore set, clear, ignore
if **set**, the vertex tinability can be allowed to be a constant for all vertices in the string, or to be different for each vertex in the string.
If **clear**, the vertex tinability can not be modified for the string and the string vertices are always tinable.
If **ignore**, don't modify the tinability flags for the vertices of the string.

Apply choice box

if **Action** is **set**, then the **Apply** field is used.
If **Apply** is **constant**, the string has only one tinability flag and it applies to all vertices in the string. The tinability flag it is set to the value in the **Value** field.
If **Apply** is **variable**, each vertex in the string has its own tinability flag. The tinability flag it is set to the value in the **Value** field.

Value choice box

if **Value** is **on**, then the tinable flag is set to **tinable**.
If **Value** is **off**, then the tinable flag is set to **not tinable**.

Segment tab

Action choice box ignore set, clear, ignore
if **set**, the segment tinability can be allowed to be a constant for all segments in the string, or to be different for each segment in the string.
If **clear**, the segment tinability can not be modified for the string and the string segments are always tinable.
If **ignore**, don't modify the tinability flags for segments of the string.

Apply choice box

if **Action** is **set**, then the **Apply** field is used.
If **Apply** is **constant**, the string has only one tinability flag and it applies to all segments in the string. The tinability flag it is set to the value in the **Value** field.
If **Apply** is **variable**, each segment in the string has its own tinability flag. The tinability flag it is set to the value in the **Value** field.

Value choice box

if **Value** is **on**, then the tinable flag is set to **tinable**.
If **Value** is **off**, then the tinable flag is set to **not tinable**.

Target type

data target type - for a full description go to "Data Target" in the chapter "Tools and Concepts"

Target info input

extra information required for the target.

Change button

process the selected strings

Fills

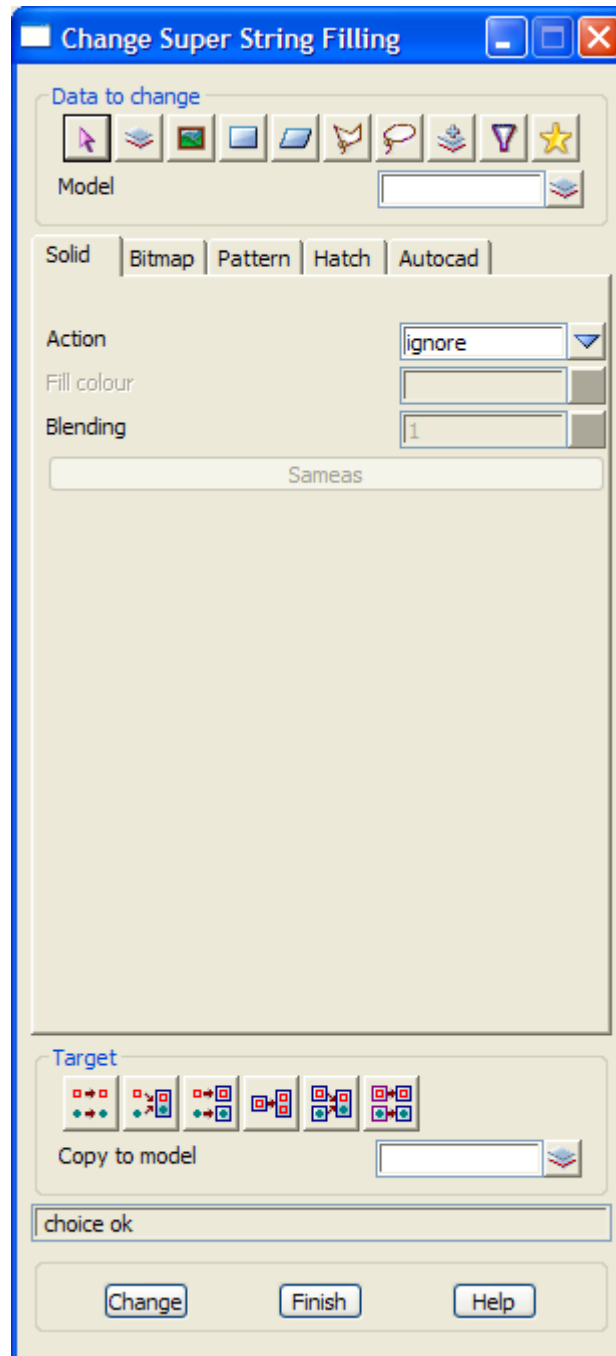
change_super_string_filling

Position of option on menu: Strings =>Properties =>Super strings =>Fills

For selected super strings, the Fills option can set the flags that determine how filling is defined for a super string. If the string is not closed, the first and last vertices are joined to define the region to fill.

A string can have zero, one or more types of fills from the types solid, bitmap, pattern, hatch and Autocad.

On selecting the Fill option, the **Change Super String Filling** panel is displayed.



The fields and buttons used in the panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Data source type		Model	
<i>data selection type - for a full description go to "Data Source" in the chapter "Tools and Concepts"</i>			

Data source	input		
<i>source of data is to be processed.</i>			

Solid, Bitmap, Pattern, Hatch and Autocad Tabs

each tab defines how that type of fill is applied to the string. Zero, one or more fill types can be applied to a string.

Action	choice box	ignore	set, clear, ignore
<i>if set, this type of fill is set for the string.</i>			
<i>If clear, this type of fill is turned off for the string.</i>			
<i>If ignore, don't modify this type of fill for the string.</i>			

Target type

data target type - for a full description go to "Data Target" in the chapter "Tools and Concepts"

Target info	input		
<i>extra information required for the target.</i>			

Change	button		
<i>process the selected strings</i>			

Symbol

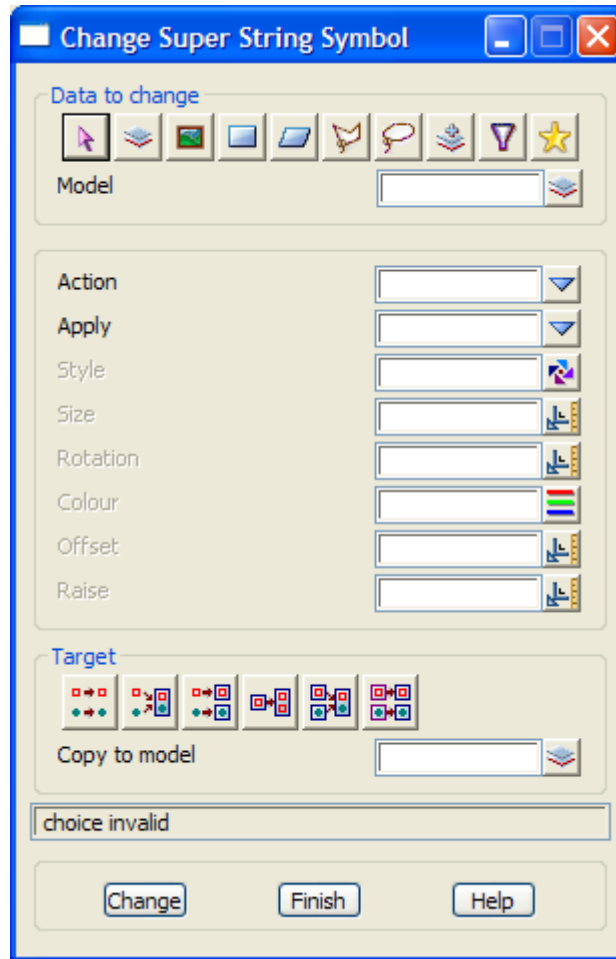
change_super_string_symbol

Position of option on menu: Strings =>Properties =>Super strings =>Symbol

For selected super strings, the symbols option can set the flags that determine how symbols are defined for a super string.

A super string can have no symbols, a constant symbol definition for the entire string or different symbol definitions at each vertex.

On selecting the symbol option, the **Change Super String Symbols** panel is displayed.



The fields and buttons used in the panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Data source type		Model	
<i>data selection type - for a full description go to "Data Source" in the chapter "Tools and Concepts"</i>			
Data source	input		
<i>source of data is to be processed.</i>			
Action	choice box	ignore	set, clear, ignore
<i>if set, a symbol can be constant for all vertices in the string, or can be different for each vertex in the string.</i>			
<i>If clear, there are no symbols for the string.</i>			
<i>If ignore, don't modify the symbol flags for the vertices of the string.</i>			
Apply	choice box		constant, variable
<i>if Action is set, then the Apply field is used.</i>			

If Apply is **constant**, the string has only one symbol and it used for each vertices in the string. It is set to visible.

If Apply is **variable**, each vertex in the string has its own symbol.

Symbol symbol box

symbol to be used.

Size

size of the symbol.

Rotation angle box

angle to rotation the symbol - positive is counter-clockwise.

Colour colour box

colour for the symbol (if the symbol has no imbedded colours).

Offset

distance the centre of the symbol is from the vertex.

Raise

distance the centre of the symbol is raised off the line through the vertex with the given angle.

Target type

data target type - for a full description go to "Data Target" in the chapter "Tools and Concepts"

Target info input

extra information required for the target.

Change button

process the selected strings

Segment Colour

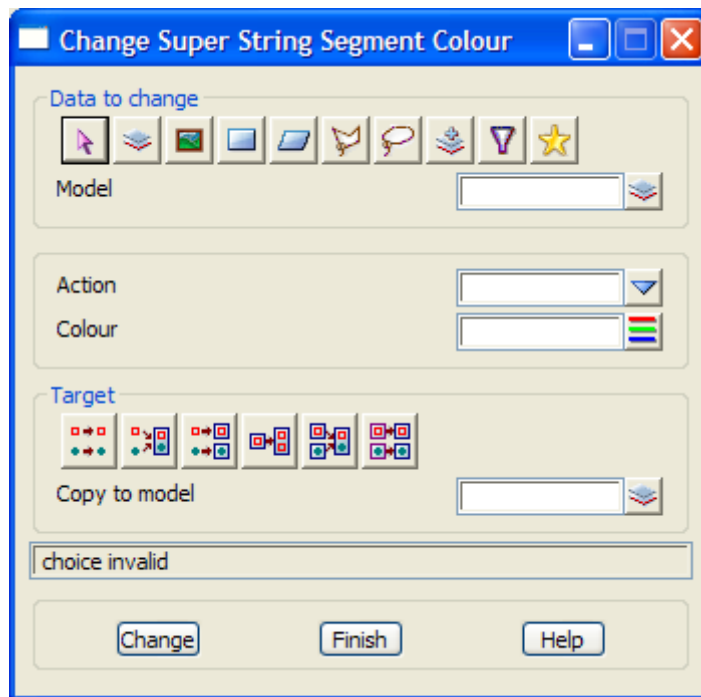
`change_super_string_segment_colour`

Position of option on menu: Strings =>Properties =>Super strings =>Segment colour

A super string has a default colour used for the entire string and segment colours setable for each segment which override the string colour for that segment.

The segment colour option can set a segment colour for every segment in the super string or clear all the set segment colours so that the default string colour is used.

On selecting the segment colour option, the **Change Super String Segment Colour** panel is displayed.



The fields and buttons used in the panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Data source type		Model	
<i>data selection type - for a full description go to "Data Source" in the chapter "Tools and Concepts"</i>			
Data source	input		
<i>source of data is to be processed.</i>			
Action	choice box		set, clear
<i>if set, each segment colour is set to the colour in the Colour box.</i>			
<i>If clear, any segment colours are removed and each segment set to having no segment colour.</i>			
Colour	colour box		
<i>if Action is set, then every segment is set to this colour.</i>			
Target type			
<i>data target type - for a full description go to "Data Target" in the chapter "Tools and Concepts"</i>			
Target info	input		
<i>extra information required for the target.</i>			
Change	button		
<i>process the selected strings</i>			

Height

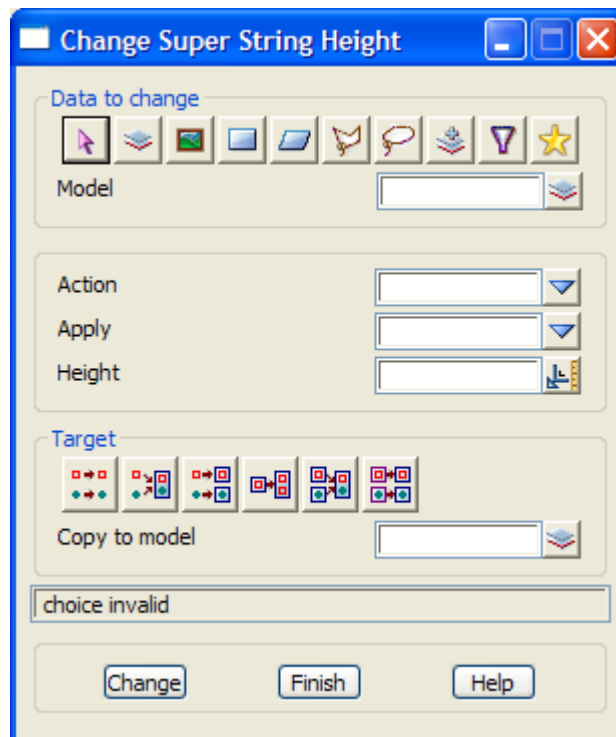
change_super_string_height

Position of option on menu: Strings =>Properties =>Super strings =>Height

A super string can have the one height that is used for every vertex in the super string (constant height) or it can have a different height at each vertex.

The Height option can set the super string to either having a constant height or to allow each vertex to have independent heights.

On selecting the Height option, the **Change Super String Height** panel is displayed.



The fields and buttons used in the panel have the following functions.

Field	Description	Type	Defaults	Pop-Up
Data source type			Model	
Data source		input		
Action		choice box	ignore	set, clear
Apply		choice box		constant, variable
Height				

Data source type

Model

data selection type - for a full description go to "Data Source" in the chapter "Tools and Concepts"

Data source

input

source of data is to be processed.

Action

choice box

ignore

set, clear

if set, the string height can be a constant for the entire string, or to be different for each vertex in the string.

If clear, the entire string and each vertex has no height.

Apply

choice box

constant, variable

if Action is set, then the Apply field is used.

If Apply is constant, the string has only one height and no vertex has its own height. The height for the string is set to the height in the Height field.

If Apply is variable, each vertex in the string is set to have its own height and it is set to the value in the Height field.

Height

if Action is set, then either the entire string or every vertex is set to this height.

Target type

data target type - for a full description go to "Data Target" in the chapter "Tools and Concepts"

Target info input

extra information required for the target.

Change button

process the selected strings

Attribute

change_super_string_attribute

Position of option on menu: Strings =>Properties =>Super strings =>Attribute

A super string can have independent attributes for the entire string, independent attributes for each segment and for each vertex.

The Attributes option can clear the super string attributes for the entire string, each vertex and/or each segment.

On selecting the Attributes option, the **Change Super String Attributes** panel is displayed.



The fields and buttons used in the panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Data source type		Model	
<i>data selection type - for a full description go to "Data Source" in the chapter "Tools and Concepts"</i>			
Data source	input		
<i>source of data is to be processed.</i>			
Vertex Action	choice box	ignore	ignore, clear
<i>if clear, the attributes are cleared at each vertex.</i>			
<i>If ignore, nothing is done for the vertex attributes.</i>			
Segment Action	choice box	ignore	ignore, clear
<i>if clear, the attributes are cleared on each segment.</i>			
<i>If ignore, nothing is done for the segment attributes.</i>			
String Action	choice box	ignore	ignore, clear
<i>if clear, the string attributes are cleared.</i>			
<i>If ignore, nothing is done for the string attributes.</i>			
Target type			

data target type - for a full description go to "Data Target" in the chapter "Tools and Concepts"

Target info input
extra information required for the target.

Change button
process the selected strings.

Vertex Id

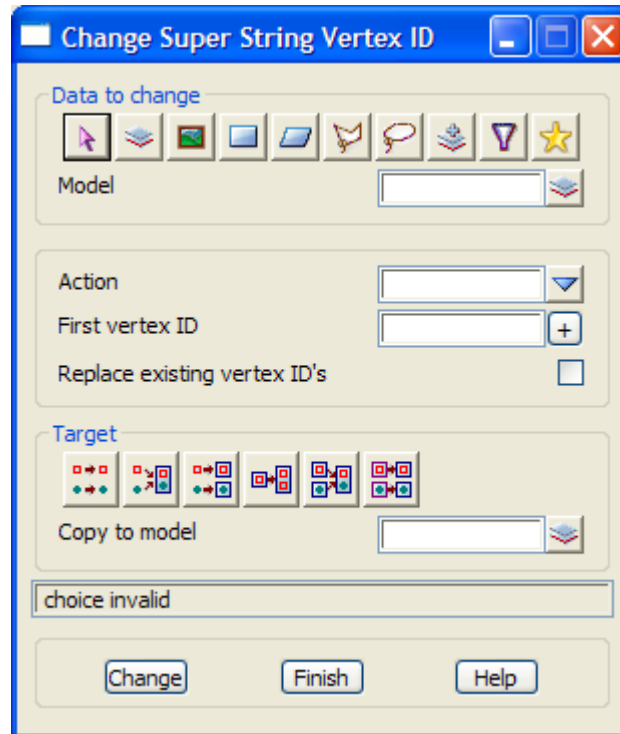
change_super_string_vertex_id

Position of option on menu: Strings =>Properties =>Super strings =>Vertex id

A super string has a *Vertex id* for each vertex.

The Vertex id option can set the Vertex ids to sequential numbers (optionally ignoring existing Vertex ids) or clear all the existing vertex ids for the super string.

On selecting the Vertex id option, the **Change Super String Vertex Id** panel is displayed.



The fields and buttons used in the panel have the following functions.

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Data source type

Model

data selection type - for a full description go to "Data Source" in the chapter "Tools and Concepts"

Data source

input

source of data is to be processed.

Action

choice box

set, clear

if clear, the vertex ids are cleared at each vertex.

If set, the vertex id's are given sequential numbers starting with the number given in First vertex id field.

First vertex id

if Action is set, the vertex id's start with this value.

Replace existing vertex id's

tick box

if tick, any vertex with an existing vertex is not given a new vertex id.

If not tick, all vertices are given new vertex ids.

Target type

data target type - for a full description go to "Data Target" in the chapter "Tools and Concepts"

Target info

input

extra information required for the target.

Change button
process the selected strings.

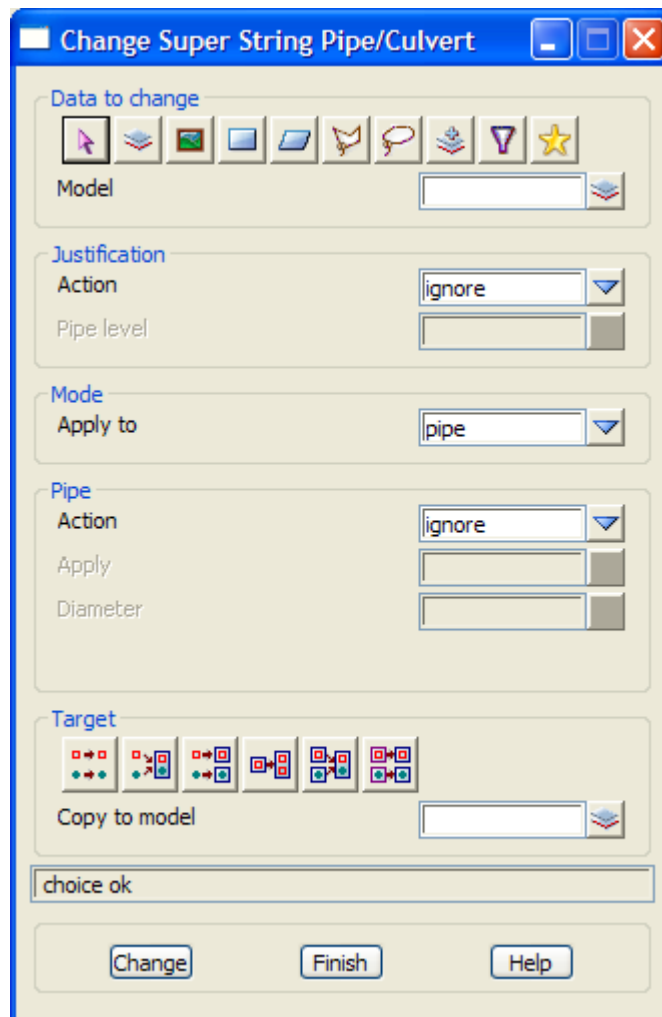
Pipe/Culvert

change_super_string_pipe_culvert

Position of option on menu: Strings =>Properties =>Super strings =>Pipe/culvert/extrude

Each segment of a super string can have a diameter or a rectangular cross-section (box culvert).

On selecting the Pipe/culvert option, the **Change Super String Pipe/Culvert** panel is displayed.



The fields and buttons used in the panel have the following functions.

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Data source type		Model	
-------------------------	--	-------	--

data selection type - for a full description go to "Data Source" in the chapter "Tools and Concepts"

Data source	input		
--------------------	-------	--	--

source of data is to be processed.

Justification

Action	choice box	set, clear, ignore
---------------	------------	--------------------

if set, the string justification is set to the type given in the Pipe level field.

If clear, the string justification information is cleared.

If ignore, nothing is done to the string justification.

Justification

if Action is set, the string justification is set to this value.

Mode

Apply to choice box pipe, culvert

*if **pipe**, the next section of the panel has fields for setting pipe information.*

*if **culvert**, the next section of the panel has fields for setting culvert information.*

Pipe

Action choice box set, clear, ignore

*if **set**, then the Pipe Apply field specifies how the pipe information is modified.*

*If **clear**, the pipe information is cleared at each segment.*

*If **ignore**, nothing is done to the pipe information.*

Apply choice box constant, variable

*if **Pipe Action** is set, then the Apply field is used.*

*If Apply is **constant**, the string has only one diameter and no segment has its own diameter. The diameter for the string is set to the value in the Diameter field.*

*If Apply is **variable**, each segment in the string is set to have has its own diameter and it is set to the value in the Diameter field.*

Diameter

diameter for each pipe segment.

Culvert

Action choice box set, clear, ignore

*if **set**, then the Culvert Apply field specifies how the culvert information is modified.*

*If **clear**, the culvert information is cleared at each segment.*

*If **ignore**, nothing is done to the culvert information.*

Apply choice box constant, variable

*if **Culvert Action** is set, then the Apply field is used.*

*If Apply is **constant**, the string has only one width and height and no segment has its own width and height. The width and height for the string is set to the values in the Width and Height fields.*

*If Apply is **variable**, each segment in the string is set to have has its own width and height and they are set to the values in the Width and Height fields.*

Width/Height

width/height for each culvert segment.

Target type

data target type - for a full description go to "Data Target" in the chapter "Tools and Concepts"

Target info input

extra information required for the target.

Change button

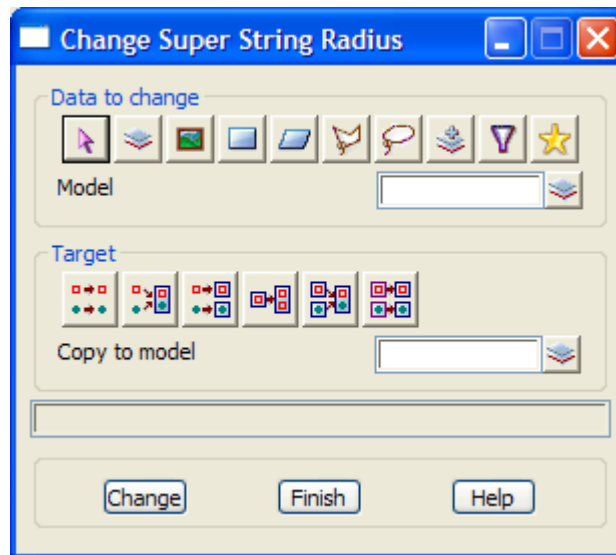
process the selected strings.

Radius

`change_super_string_radius`

Position of option on menu: Strings =>Properties =>Super strings =>Radius

The Radius option clears any segment radii.

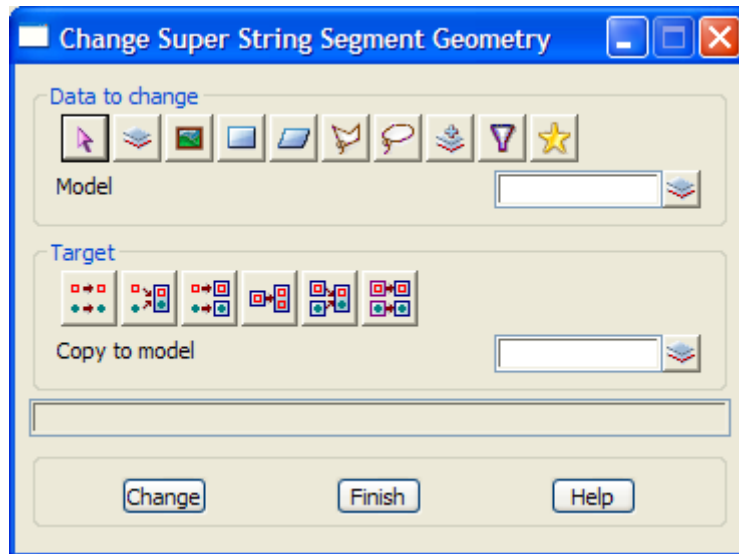


Segment Geometry

[change_super_string_segment_geometry](#)

Position of option on menu: Strings =>Properties =>Super strings =>Segment geometry

The Segment geometry option clears any segment geometry.



Text

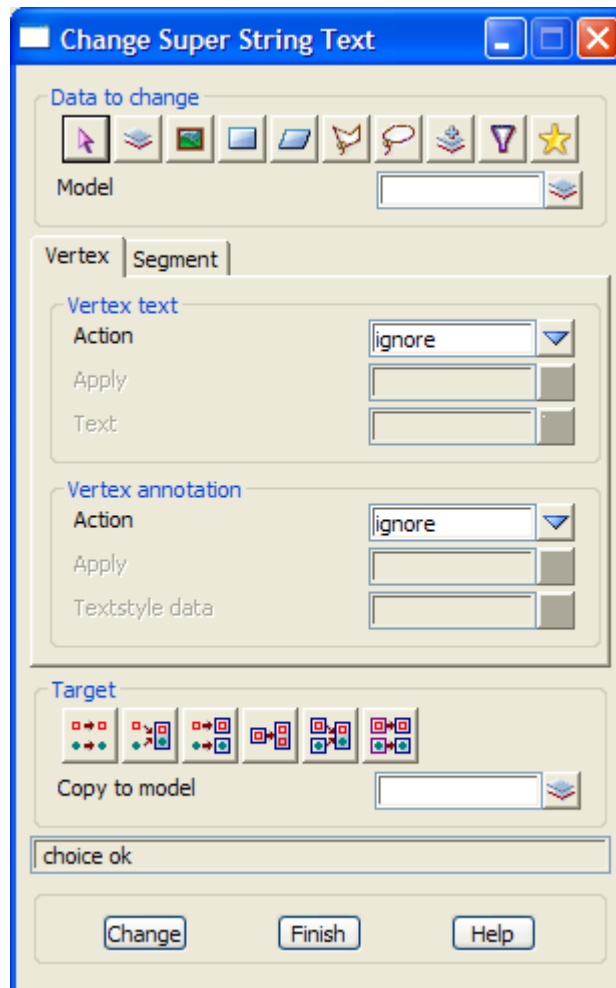
change_super_string_text

Position of option on menu: Strings =>Properties =>Super strings =Text

Each vertex and segment of a super string can have its own text.

The Text option can set, clear the vertex or segment text and/or textstyle data for the super string.

On selecting the Text option, the **Change Super String Text** panel is displayed.



The fields and buttons used in the panel have the following functions.

Field Description	Type	Defaults	Pop-Up
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Data source type

Model

data selection type - for a full description go to "Data Source" in the chapter "Tools and Concepts"

Data source	input		
--------------------	-------	--	--

source of data is to be processed.

Vertex tab**Vertex text**

Action	choice box	ignore	set, clear, ignore
---------------	------------	--------	--------------------

if set, the vertex text can be a constant for the entire string, or to be different for each vertex in the string.

If clear, the vertex text is cleared.

If ignore, nothing is done to the vertex text.

Apply choice box constant, variable

*if **Action** is set, then the Apply field is used.*

*If Apply is **constant**, the string has only one vertex text value and no vertex has its own vertex text. The vertex text for the string is set to the text in the Text field.*

*If Apply is **variable**, each vertex in the string is set to have has its own text and it is set to the value in the Text field.*

Text

if Action is set, then either the entire string or every vertex text is set to this value.

Vertex annotation

Action choice box ignore set, clear, ignore

if set, the vertex textstyle data can be a constant for the entire string, or to be different for each vertex in the string.

*If **clear**, the vertex textstyle data is cleared.*

*If **ignore**, nothing is done to the vertex textstyle data.*

Apply choice box constant, variable

*if **Action** is set, then the Apply field is used.*

*If Apply is **constant**, the string has only one vertex textstyle data and no vertex has its own vertex textstyle data. The vertex textstyle data for the string is set to the text in the Textstyle data field.*

*If Apply is **variable**, each vertex in the string is set to have has its own textstyle data and it is set to the value in the Textstyle data field.*

Textstyle data

if Action is set, then the vertex textstyle data is set to this value.

Target type

data target type - for a full description go to "Data Target" in the chapter "Tools and Concepts"

Target info input

extra information required for the target.

Change button

process the selected strings.

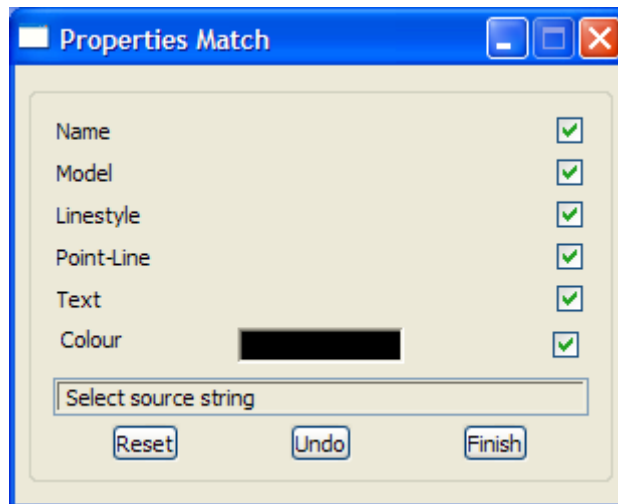
Match

prop_match_panel

Position of option on menu: Strings =>Properties =>Match

The Match option obtains information from a selected string and uses that to set information on another selected string.

On selecting the Match option, the **Properties Match** panel is displayed.



The properties match option is automatically in a pick mode for selecting the string whose properties you wish mimic (source string).

After the source string is selected, the values of the property from the source string are filled in on the panel and tick boxes turned on for each property. The tick boxes can be turned off if that property is not to be modified on the selected strings. The strings to change are then selected one after another.

If a new set of properties is required, selecting the **Reset** button is used to select a new source string.

The fields and buttons in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Name	tick box	tick	
<i>if tick, set the name of the selected string to the value displayed in the Name field.</i>			
Model	tick box	tick	
<i>if tick, set the model of the selected string to the value displayed in the Model field.</i>			
Linestyle	tick box	tick	
<i>if tick, set the model of the selected string to the value displayed in the Linestyle field.</i>			
Point-Line	tick box	tick	
<i>if tick, set the model of the selected string to the value displayed in the Point-Line field.</i>			
Text	tick box	tick	
<i>if tick, set the textstyle and height of a selected string to the values displayed in the Text field.</i>			
Colour	tick box	tick	
<i>if tick, set the colour of the selected string to the value displayed in the Colour field.</i>			
Reset	button		
<i>Select a new source string to set the values of the properties on the panel.</i>			

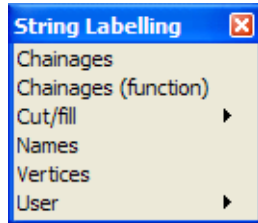
Label

string_labelling

Position of menu: Strings =>Properties =>Label

The label menu contains options to label string chainages, create tadpoles for cut and fill, label string vertices with their x, y, z or point numbers and names.

The Label walk-right menu is



For	<i>Chainages</i>	go to	"Label Chainages" .
	<i>Cut/fill</i>		"Label Cut/Fill" .
	<i>Names</i>		"Label Names" .
	<i>Vertices</i>		"Label Vertices" .

Label Chainages

label_chainages_on_string

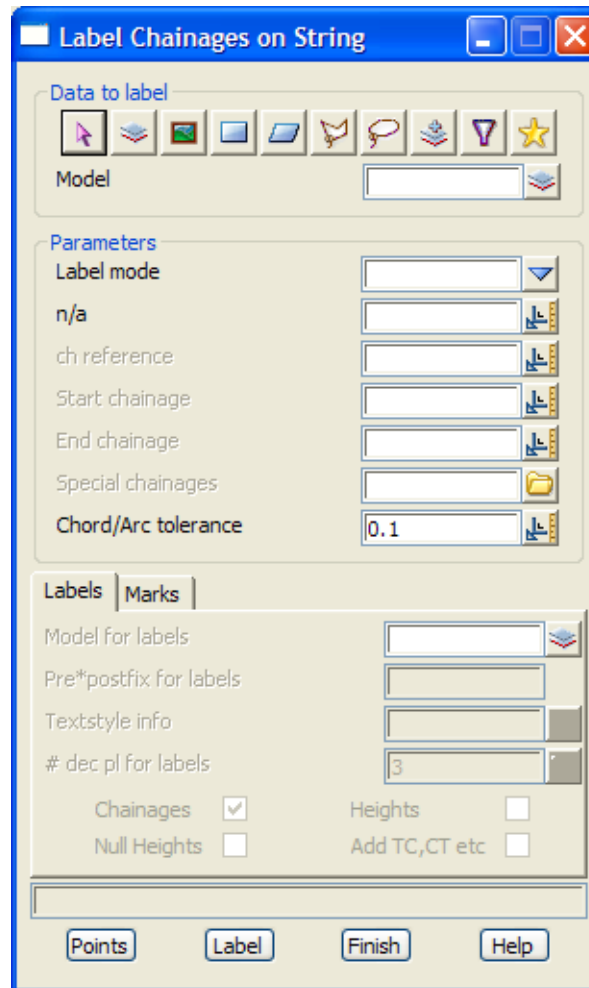
Position of option on menu: Strings =>Label => Chainages

The label chainages option is used to create text at regular chainages and special points on a string such as horizontal and vertical tangent points, crest and sag points and user selected points. It can also create tick marks at selected chainages.

The user has control over the label height, colour, angle, offset and the number of decimal places displayed, plus the size and colour of the tick marks.

As well as being used for labelling centre-lines, this option is used in conjunction with the sewer option to create special labels for sewer long section plots.

On selecting the Label chainages option, the **label chainages on string** panel is displayed.



Individual points can be labelled by selecting them after picking the **Points** button.

The **marks** button brings up the **label chainages on string (marks)** panel which is used to place marks at the chosen chainages.

The fields and buttons used in the **label chainages on string** panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Data source type <i>data source type.</i>			
Data source <i>data source for strings to label.</i>			
Label mode	input		regular interval, regular interval plus end pts end points only horizontal TPs, vertical TPs, horizontal discontinuities vertical discontinuities all discontinuities, crests/sags all horizontal points

type of labelling required.

Ch interval or n/a	input	
	<i>the regular interval to use for labelling points.</i>	
Ch reference	input	0
	<i>the chainages to be labelled are integer multiples of the chainage interval added to the reference chainage. For example, if the reference chainage is 23.2 and the chainage interval 10, the chainages 3.2, 13.2, 23.2, 33.2 etc. will be labelled.</i>	
Start chainage	input	
	<i>if non-blank, the string chainage to start labelling from. If blank, start at the beginning of the string.</i>	
End chainage	input	
	<i>if non-blank, the string chainage to end the labelling at. If blank, go to the end of the selected string.</i>	
Special chainage	input	
	<i>file of special chainages to create labels at.</i>	
Chord/arc tolerance	input	default chord/arc tolerance
	<i>the chord to arc tolerance to use on the strings being labelled for determining how many points are labelled around horizontal curves.</i>	

Labels tab

Model for labels	model box		available models
	<i>if non-blank, labels are generated and placed in this model. If blank, no labels are created (but tick marks may be).</i>		
Pre*postfix for labels	input		
	<i>the beginning and ending of the label to be given at each point. Spaces are significant. This uses the standard 12d method of pre-text*post-text. That is, 'Ch * m' would add 'Ch ' before the value and ' m' after the label.</i>		
Textstyle info	textstyle box	1	available textstyle data
	<i>textstyle data to use when creating the labels.</i>		
# dec pl for labels	input	0	
	<i>number of decimal places used in the labels.</i>		
Chainages	tick	tick	
	<i>if tick, the chainage of each point is appended to the label stem to create the label for the point. If no tick, only the label stem is used as the label.</i>		
Heights	tick		
	<i>if tick, the height of each point is used in the label for the point. If no tick, heights are not used in the label.</i>		
Null heights	tick		
	<i>if tick and the height of a point null, (null) is used in the label for the point. If no tick, null heights are not used in the label.</i>		
Add TC, CT etc.	tick		
	<i>if tick and labelling an alignment string, the critical point types are used in the label for the point. If no tick, critical point types are not used in the label.</i>		

Marks tab

Model for marks	input	available models
	<i>if non-blank, tick marks are generated according to the label mode and placed in this model.</i>	

If *blank*, no tick marks are created.

Mode for marks	input	ticks centred	ticks on lhs, ticks on rhs, ticks centred
-----------------------	-------	---------------	--

mode for the tick marks.

Name for marks	input	1
-----------------------	-------	---

name to give the tick marks (mainly used for mapping files)

Size for marks (w)	input	1
---------------------------	-------	---

size in world units for the tick marks

Colour for marks	input	orange	available colours
-------------------------	-------	--------	-------------------

colour of the tick marks.

Points	button
---------------	--------

pick individual positions to label with a label stem and chainage (if the chainages field is set to tick).

Label	button
--------------	--------

label the selected strings as specified by the label mode, mode for marks and other fields in the panel.

Please continue to the next section "Label Cut/Fill" .

Label Cut/Fill

cut_fill_marks

Position of menu: Strings =>Label => Cut/Fill

The cut/fill menu contains options to create cut and fill tick marks between selected strings.

The options can generate standard tadpoles, tick marks or use user specified model as the tick symbol.

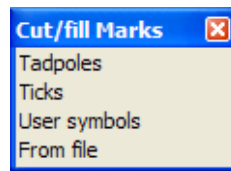
For each option, a **reference** string is selected which defines the chainages used for labelling cut/fill. The cut/fill symbols are drawn perpendicular to the reference string.

Two strings, **str1** and **str2** are selected for labelling.

The tick symbols are drawn at right angles to the reference string at a user specified chainage going between the two strings, **str1** and **str2**, from the higher string point to the lower string point (which string is higher or lower may vary along the strings). The tick symbol is repeated at the given chainage interval.

The tick symbol is drawn as a **percentage** of the **distance from the high point to the low point** between the two strings, **str1** and **str2** and this percentage is specified separately for the odd and even numbered ticks.

The cut/fill walk-right menu is



For the option *Tadpoles*, please go to the section "Tadpoles" .

<i>Ticks</i>	"Ticks"
<i>Ticks</i>	"Ticks"
<i>User symbols</i>	"User Symbols"
<i>From file</i>	"From File"

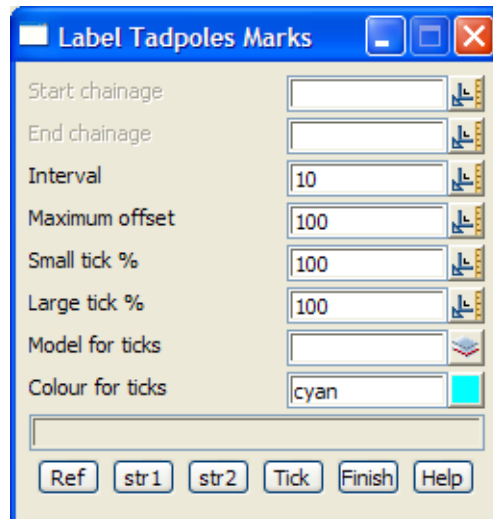
Tadpoles

label_tadpoles_marks

Position of option on menu: Strings =>Label => Cut/Fill => Tadpoles

The tadpoles option is used to generate tadpole symbols between two strings.

On selecting the tadpoles option, the **label tadpoles marks** panel is displayed.



The fields and buttons in this panel are used as follows

Field Description	Type	Defaults	Pop-Up
Start chainage <i>if non-blank, the reference string chainage to start creating tadpoles from. if blank, the reference string start chainage is used.</i>	input		
End chainage <i>if non-blank, the reference string chainage to end the tadpoles at. if blank, the reference string end chainage is used.</i>	input		
Interval <i>the chainage interval to use for creating tadpoles.</i>	input	10	
Maximum offset <i>the maximum distance to search from the reference string to find strings str1 and str2.</i>	input	100	
Small tick% <i>the percentage of the distance between the two strings, str1 and str2, that is taken up by the odd numbered tadpoles.</i>	input	100	
Large tick% <i>the percentage of the distance between the two strings, str1 and str2, that is taken up by the even numbered tadpole.</i>	input	100	
Model for ticks <i>the models for the tadpoles to placed into.</i>	input		available models
Colour for ticks <i>the colour for the tadpoles.</i>	input	cyan	available colours
Ref/Str1/Str <i>the selected string is used as the reference/str1/str2 string.</i>	button		

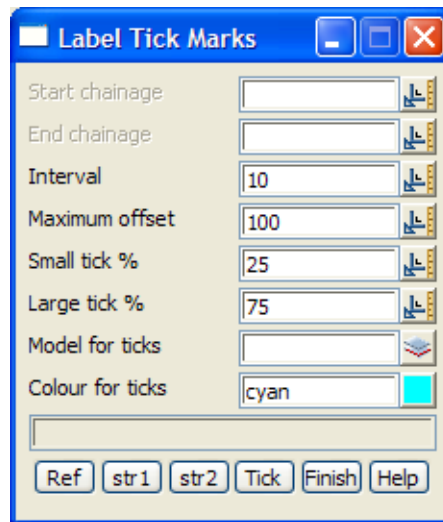
Ticks

label_tick_marks

Position of option on menu: Strings =>Label => Cut/Fill => Ticks

The ticks option is used to generate ticks (straight lines) between two strings.

On selecting the ticks option, the **label tick marks** panel is displayed.



The fields and buttons in this panel are used in exactly the same way as for the **label tadpoles marks** panels. The only difference is that the defaults for the small tick % and large tick % panel fields are 25 and 75 respectively.

User Symbols

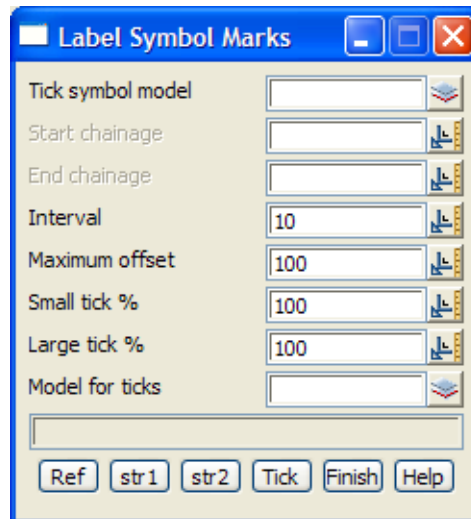
label_symbol_marks

Position of option on menu: Strings =>Label => Cut/Fill => User symbols

The user symbols option uses a given model, the **tick symbol model**, as the symbol to be drawn between the low and high points on the two strings.

The **tick symbol model** is aligned so that the model origin is at the high string point and the model's positive x-axis goes from the high string point to the low string point.

On selecting the ticks option, the **label tick marks** panel is displayed.



The fields and buttons in this panel are used in exactly the same way as for the **label tadpoles marks** panels except that a tick symbol model panel field is used to specify the symbol to be drawn for the cut/fill tick marks.

Field Description	Type	Defaults	Pop-Up
Tick symbol model	input		available models
<i>the model to be used as the tick mark symbols.</i>			

From File

Position of option on menu: Strings =>Label => Cut/Fill => From file

This is the same option as **Drafting =>Create cut/fill symbols**

Please go to the section “Label Cut/Fill” of the Chapter “Drafting” .

Label Names

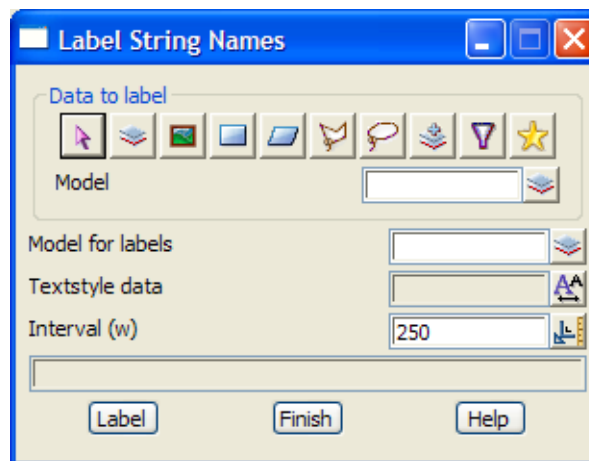
label_string_names

Position of option on menu: Strings => Label => Names

The label names option is used to label individual strings or all the strings in a model, with their string names.

The user has control over the label height, colour, and the distance between the labels.

On selecting the label names option, the **label string names** panel is displayed.



By using the **pick** button, individual strings can be labelled using the values in the panel fields. The model to label field is ignored.

If the **label** button is selected, then all the strings in the model given by the model to label field will be labelled according to the parameters in the panel fields.

The fields and buttons used in the **label names** panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Data source type <i>data source type.</i>			
Data source <i>data source for strings to label.</i>			
Textstyle data <i>textstyle information.</i>	input		
Interval (w) <i>chainage interval in world units between the labels.</i>	input	250	
Label <i>label all the strings in the model given in the model to label field.</i>	button		

Please continue to the next section “Label Vertices” .

Label Vertices

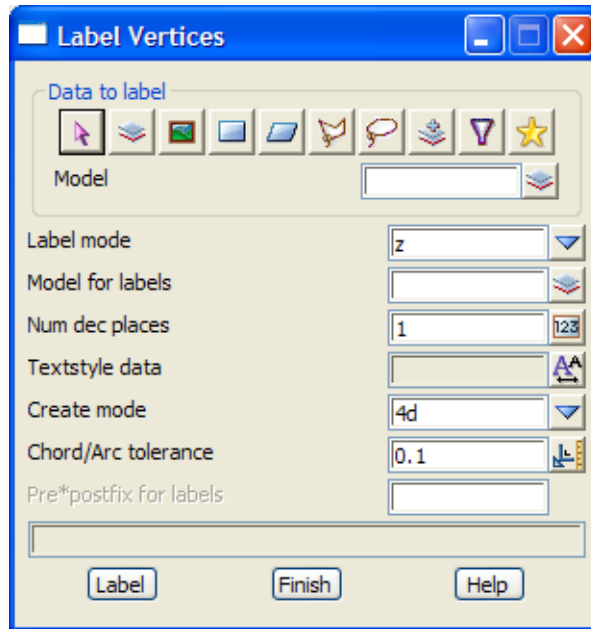
label_vertices

Position of option on menu: Strings =>Label => Vertices

The label vertices option can be used to label the x, y, z, z no nulls, point numbers, id-pt no, name and descriptions of strings selected by the data source.

The user has control over the label height, colour, the number of decimal places, the distance between the labels, the distance the label is from the point position, and the angle to draw the label at.

On selecting the label vertices option, the **label vertices** panel is displayed.



Individual strings can be labelled by using the **pick** button and then selecting the strings, to be labelled using the values in the panel fields. The string model field is ignored.

If the **label** button is selected, then all the strings in the model given by the string model field will be labelled according to the parameters in the panel fields.

The fields and buttons used in the label strings panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Data source type <i>data source type.</i>			
Data source <i>data source for strings to label.</i>			
Label mode	input	z	x,y,z, point number, Vertex no x and y id-vertex no z no nulls name <i>type of labelling required - x, y, z, point number, vertex no. for each point in the string.</i>
String model	input		available models <i>name of the model containing the strings to be labelled. Not used with the pick button.</i>

Model for labels	input		available models
<i>name of the model to place the labels in.</i>			
Num dec places	input	0	0,1,2,3,4,5
<i>number of decimal places used in the x,y,z labels.</i>			
Textstyle data	input		
<i>textstyle information.</i>			
Create mode	input	4d	4d, text
<i>if 4d, the vertex labels for the one string are placed in a 4d string.</i>			
<i>text, the vertex labels are created as individual text strings.</i>			
Chord/arc tolerance	input		default chord/arc tolerance
<i>the chord to arc tolerance to use on any alignment string being labelled for determining how many points are labelled around horizontal curves.</i>			
Label	button		
<i>label all the strings in the model given in the string model field.</i>			

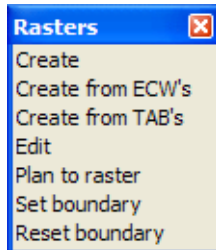
Rasters

rasters

Position of menu: Strings =>Rasters

The Rasters menu contains options for working with rasters.

The Rasters walk-right menu is



create a raster
 create a raster from an ECW file
 create a raster from an TAB file
 edit a raster
 convert plan view to a raster
 set a boundary for a raster
 remove the boundary from a raster

For	<i>Create</i>	go to	"Create a Raster"
	<i>Create from ECW's</i>		"Create Rasters from ECW Files"
	<i>Create from TABs'</i>		"Create Rasters from TAB Files"
	<i>Edit</i>		"Edit a Raster"
	<i>Plan to raster</i>		"Create Raster from Plan View" in the chapter "View Menus"
	<i>Set boundary</i>		"Set a Boundary for a Raster"
	<i>Reset boundary</i>		"Reset the Boundary for a Raster"

Create a Raster

create_raster_element

Position of option on menu: Strings =>Rasters =>Create

A raster element consists of a raster image and positioning information for the raster so that it can be mapped into world units.

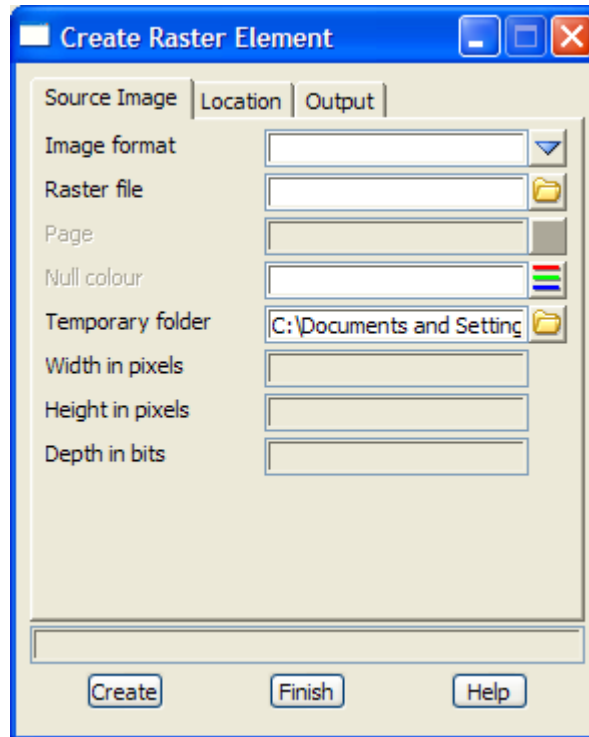
A raster element is added to a model just like any other string but for convenience it is suggested that no other strings are in the same model as a raster.

To help speed up drawing on a view, there is toggle for displaying/not displaying rasters on plan views.

Raster Restrictions

- The Raster file must have read/write permission
- Rasters are only supported on Win 2000 and above.

Selecting Create brings up the **Create Raster Element** panel.



The fields and buttons used in the panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Source Image tab			
Image format	choice box		BMP, DIB, GIF ECW, JPEG, JPEG 2000 PNG, TGA, TIFF
<i>format that the original image is in. Non ECW rasters must be 24 bit colour.</i>			
Raster file	file box		
<i>name of the original raster image. The file must have read/write access and be 24 bit colour.</i>			
Page			
<i>page number of the raster when the format can contain more than one image (e.g. in a TIFF)</i>			
Null colour	colour box		available colours
<i>colour when there is no pixel in the raster</i>			
Temporary folder	file box	c:\temp	select folder
<i>folder to use as a temporary storage area whilst converting the raster to the 12d raster format. The temporary folder needs to have enough free disk space to convert the largest of the rasters to bmp format.</i>			
Width/Height in pixels	output only		
<i>the width/height in pixels of the selected raster</i>			
Depth in bits	output only		
<i>display the colour depth of the source data</i>			
Projection	output only		
<i>display the projection of the source data if available</i>			

Location tab

The location tab supplies the information for positioning the raster in world units in 12d Model. Most

rasters formats, other than ECW or Geotiff, do not include this information so it must be supplied by other means, either in a file or by typing in a world origin, anticlockwise rotation angle and world width and height.

Data format choice box Raw details Raw Details, Autocad scr file
ESRI world, Geo Tiff,
Mapinfo tab

if **Raw details**, the location details are typed into the World Location Details section as rotation, world origin, world width and height.

If **Autocad scr file**, the location details are taken from the scr file given in Location file. An Autocad scr file gives the world co-ordinates of the corners of the raster starting in the bottom left hand corner, bottom right hand corner, top left hand corner and top right hand corner. An example of a scr file is:

```
line
22109.639,148090.695
23109.639,148090.695
22109.639,149090.695
23109.639,149090.695
```

If **ESRI world**, the location details are taken from the ESRI world file given in Location file. An ESRI world file gives the xscale, row rotation, column rotation, yscale, x origin and y origin. For use with 12d, the row and column rotations must be the same and yscale = - xscale.

If **Geo Tiff**, the Location details are taken from the geotiff file given in Location file panel field.

If **Mapinfo Tab**, the location details are taken from the Mapinfo tab file given in Location file.

Location file file box
file with the location details

Anticlockwise rotation angle box
the world rotation of the raster.

X/Y co-ordinate real box
the world x/y co-ordinate of the left hand bottom corner of the raster.

World width/height real box
the width/height in world units of the raster.

Output tab
the parameters for the created 12d raster.

Output size output
an estimate of the amount of disk space the raster will use in 12d Model

Fastest drawing speed input
only if raster is less than 24 bit depth - if selected, the raster is converted to a 24 bit image.

Minimum disk space input
only if raster is less than 24 bit depth - if selected, the raster is not converted to a 24 bit image and hence will take up less disk space. However it is converted at drawing time and so will be slower to display than a 24 bit image.

Name for raster input
the name for the raster

Model for raster input available models
name of the model for the raster element

Show border	tick	tick	
	<i>if tick then the border of the raster element is displayed</i>		
Colour for border	input	default colour	available colours
	<i>the colour of the border for the raster</i>		
Tin	tin box		available tins
	<i>if non blank, this tin is tagged with this raster so the raster is used for draping on the tin when the tin is used in visualisations</i>		
Create	button		
	<i>after the Create button is chosen, the raster element is created.</i>		

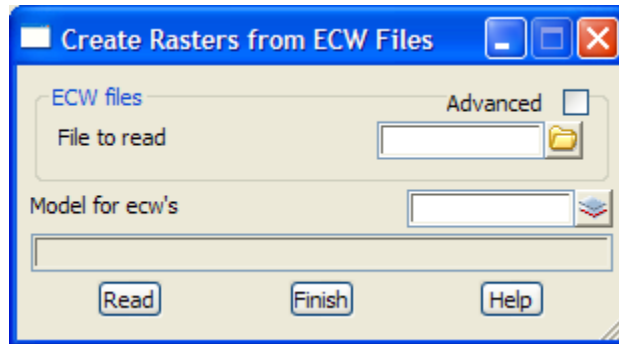
Create Rasters from ECW Files

create_rasters_from_ecw_files

Position of option on menu: Strings =>Rasters =>Create from ECW's

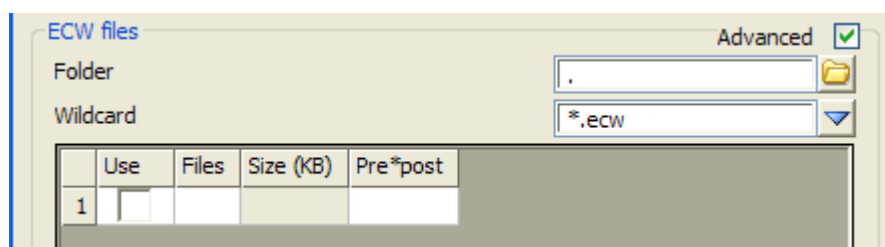
This option attaches one or more ECW files to a model.

Selecting Create from ECW's brings up the **Create Rasters from ECW Files** panel.



The fields and buttons used in the panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Model for ecw's <i>name of the model for the ECW files</i>	input		available models
Pre*post <i>if non blank, pre*post text to use for the name of the raster from the ECW file (see "Pre*Postfix Panel Fields" for information on using pre*postfix)</i>	text input		
File to read <i>name of the ECW file to attach to the model</i>	file box		*.ecw files
Advanced <i>if tick, a grid to allow multiple ECW files to be read in, is opened. A wild card is used to select all the files to be read in.</i>	tick box		



Folder <i>folder to search for files using the Wild card</i>	folder box
Wildcard <i>wild card to use in search for files in the given folder</i>	input
Use <i>if tick, read in the file</i>	tick box
Files <i>name of the file in the folder</i>	output

Size output
file size

Create button
*after the **Read** button is chosen, the raster elements are created.*

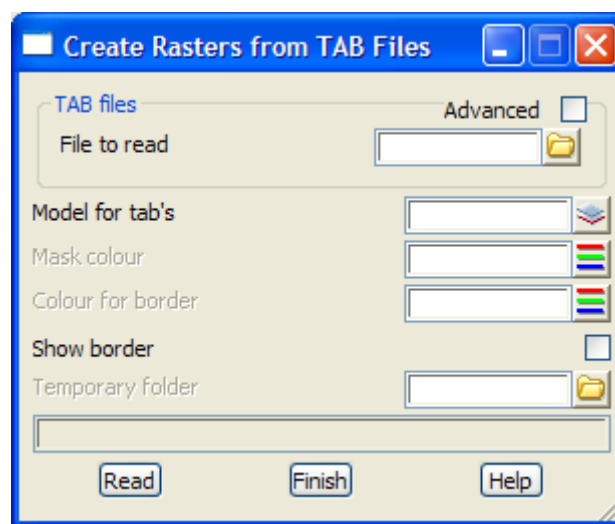
Create Rasters from TAB Files

[create_rasters_from_tab_files](#)

Position of option on menu: Strings =>Rasters =>Create from TAB's

This option reads one or more rasters as define by TAB files and places them in a model.

Selecting Create from TAB's brings up the **Create Rasters from TAB Files** panel.



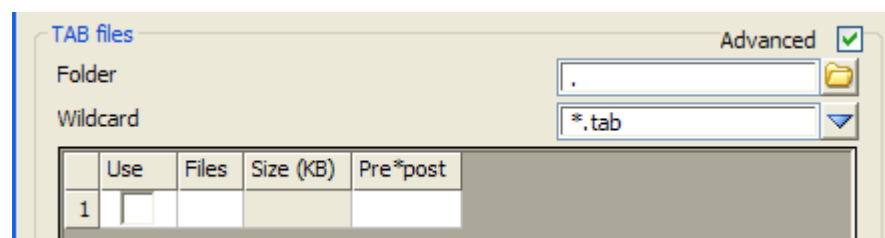
The fields and buttons used in the panel have the following functions.

Field Description	Type	Defaults	Pop-Up
File to read	file box		*.ecw files

name of the TAB files to read to define rasters to read into the model

Advanced	tick box
-----------------	----------

if tick, a grid to allow multiple TAB files to be read in, is opened. A wild card is used to select all the files to be read in.



Folder	folder box
---------------	------------

folder to search for files using the Wild card

Wildcard	input
-----------------	-------

wild card to use in search for files in the given folder

Use	tick box		
<i>if tick, read in the file</i>			
Files	output		
<i>name of the file in the folder</i>			
Size	output		
<i>file size</i>			
Model for tabs's	input		available models
<i>name of the model for the rasters defined by the TAB files</i>			
Pre*post	text input		
<i>if non blank, pre*post text to use for the raster for the TAB files (see "Pre*Postfix Panel Fields" for information on using pre*postfix)</i>			
Mask colour	colour box		available colours
<i>colour when there is no pixel in the raster</i>			
Colour for border	input	default colour	available colours
<i>the colour of the border for the raster</i>			
Show border	tick	tick	
<i>if tick then the border of the raster element is displayed</i>			
Temporary folder	file box	c:\temp	select folder
<i>folder to use as a temporary storage area whilst converting the raster to the 12d raster format. The temporary folder needs to have enough free disk space to convert the largest of the rasters to bmp format.</i>			
Create	button		
<i>after the Read button is chosen, the raster elements are created.</i>			

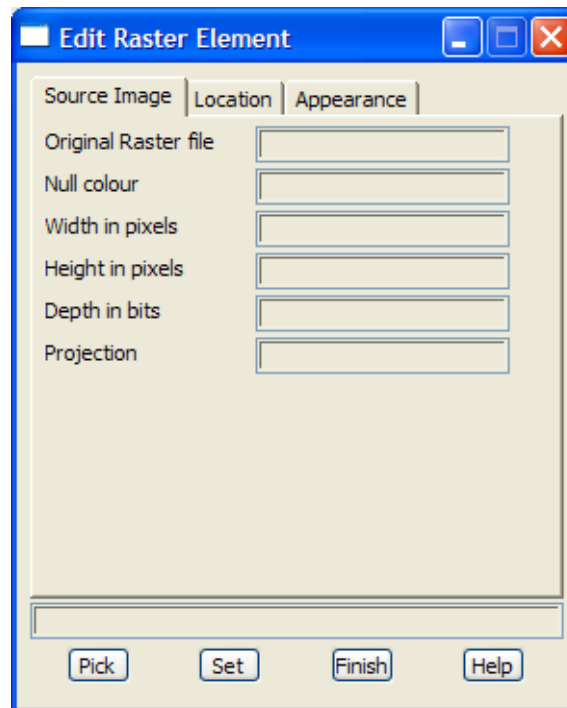
Edit a Raster

edit_raster_element

Position of option on menu: Strings =>Rasters =>Edit

The Edit option modifies the properties of any raster displayed in a *12d Model* view.

Selecting Edit brings up the **Edit Raster Element** panel.



The fields and buttons used in the panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Source Image tab			
Original raster file <i>file that the raster originally came from</i>	output		
Null colour <i>colour when there is no pixel in the raster</i>	colour box		available colours
Width/Height in pixels <i>the width/height in pixels of the selected raster</i>	output only		
Depth in bits <i>display the colour depth of the raster</i>	output only		
Projection <i>display the original projection of the raster (if available)</i>	output only		

Location tab

When the raster is selected, the raw details for the raster (or ECW details) are displayed. The location details can then be modified and hence how the raster is positioned in world units in *12d Model* is modified.

Data format	choice box	Raw details	Raw Details, Autocad scr file ESRI world, Geo Tiff, Mapinfo tab
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*if **Raw details**, the location details are typed into the World Location Details section as rotation, world origin, world width and height.*

*If **Autocad scr file**, the location details are taken from the scr file given in Location file. An Autocad scr file gives the world co-ordinates of the corners of the raster starting in the bottom left hand corner, bottom right hand corner, top left hand corner and top right hand corner. An example of a scr file is:*

```

line
22109.639,148090.695
23109.639,148090.695
22109.639,149090.695
23109.639,149090.695
    
```

*If **ESRI world**, the location details are taken from the ESRI world file given in Location file. An ESRI world file gives the xscale, row rotation, column rotation, yscale, x origin and y origin. For use with 12d, the row and column rotations must be the same and yscale = - xscale.*

*If **Geo Tiff**, the Location details are taken from the geotiff file given in Location file panel field.*

*If **Mapinfo Tab**, the location details are taken the Mapinfo tab file given in Location file.*

Location file	file box
----------------------	----------

file with the location details

Anticlockwise rotation	angle box
-------------------------------	-----------

the world rotation of the raster

X/Y co-ordinate	real box
------------------------	----------

the world x/y co-ordinate of the bottom left hand corner of the raster

World width/height	real box
---------------------------	----------

the width/height in world units of the raster

Appearance tab

Name for raster	input
------------------------	-------

the name of the raster element

Model for raster	input	available models
-------------------------	-------	------------------

model for the raster element.

Show border	tick	tick
--------------------	------	------

if tick then the border of the raster element is displayed

Colour for border	input	default colour	available colours
--------------------------	-------	----------------	-------------------

the colour of the border for the raster element

Buttons at Bottom

Pick	button
-------------	--------

select the raster element to edit by clicking on the border of the raster. The details for the selected raster are then displayed in the panel.

Set	button
------------	--------

give the raster element the new values from the panels fields

NOTE: A raster is **deleted** by using the string *Delete* option. The raster is selected for deleting by picking on the border of the raster.

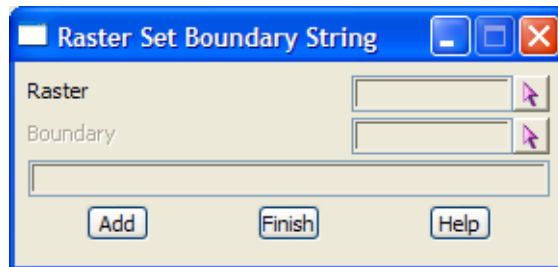
Set a Boundary for a Raster

raster_set_boundary_string

Position of option on menu: Strings =>Rasters =>Set boundary

The Set boundary option defines a boundary polygon for the raster. Only the parts of the raster inside the boundary polygon are displayed. The boundary polygon can have holes.

Selecting Set boundary brings up the **Raster Set Boundary String** panel.



The fields and buttons used in the panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Raster <i>select the raster to have a drawing polygon set for it</i>	raster select box		
Boundary <i>select a polygon</i>	string select box		
Add <i>add the selected polygon as a boundary polygon for the selected raster</i>	button		

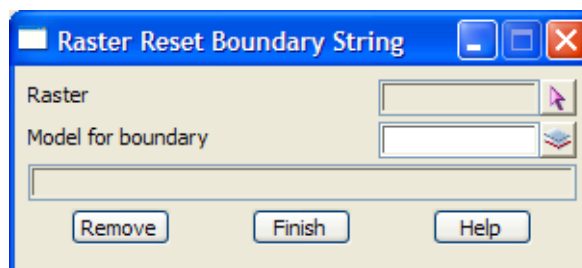
Reset the Boundary for a Raster

raster_reset_boundary_string

Position of option on menu: Strings =>Rasters =>Reset boundary

The Reset boundary option removes the boundary polygon from a raster.

Selecting Remove boundary brings up the **Raster Reset Boundary String** panel.



The fields and buttons used in the panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Raster <i>select the raster to have its drawing polygon removed</i>	raster select box		
Model for boundary <i>model to place the removed boundary polygon in</i>	model box		available models

Remove button
remove the boundary polygon from the selected raster

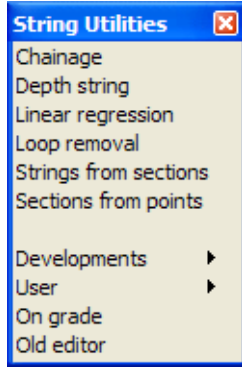
Utilities

string_utilities

Position of menu: Strings =>Utilities

The utilities menu contains miscellaneous options involving strings.

The Utilities walk-right menu is



set string chainage at a point
 calculate depth string, report offset & xfall
 fit lines and arcs
 remove loops from strings
 create strings from labelled sections
 create section from projecting points onto a line

For	<i>Chainage</i>	go to	"Chainage"
	<i>Depth string</i>		"Depth String"
	<i>Loop removal</i>		"Loop Removal"
	<i>Strings from sections</i>		"Strings from Sections"
	<i>Sections from points</i>		"Sections from Points" in the chapter "Design"
	<i>Developments</i>		"Developments"

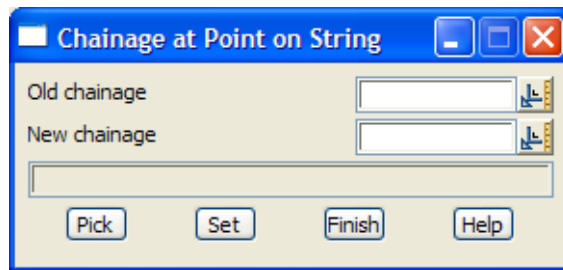
Chainage

chainage_at_point_on_string

Position of option on menu: Strings =>Utilities =>Chainage

The chainage menu option allows the user to specify the start chainage for a string by specifying what the chainage will be at a selected point on the string. The string's start chainage is then adjusted so that the point has the given chainage.

Selecting chainage fires up the **chainage at point on string** panel.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Old chainage <i>reports the initial chainage of the dropped point</i>	output		
New chainage <i>the new chainage for the dropped point.</i>	input		

Pick button

two objects to pick - pick the string to modify the chainage at a point and then pick a point which will be dropped onto the selected string to give the point that will have its chainage modified. The existing chainage on the string of the dropped point is then written to the old chainage panel field.

Set button

on selecting set, the start chainage is modified so that the chainage at the picked point is the value in the new chainage field. The old chainage field is then updated with the new chainage.

Please continue to the next section “Depth String” .

Depth String

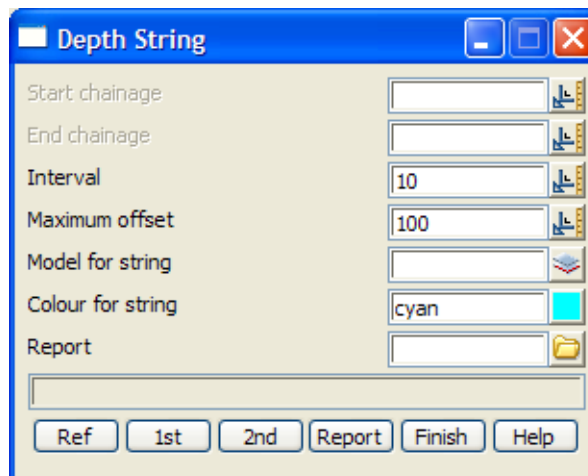
depth_string

Position of option on menu: Strings =>Utilities =>Depth string

The depth string option calculates the horizontal and vertical offsets and the cross-fall between two strings and then creates and/or reports on the string.

A reference string is selected which is used to define chainages. Lines perpendicular to the reference string are taken at regular chainages and intersected (in plan) with the first and second strings. The horizontal and vertical offsets and the cross-fall between the two strings are calculated at the intersection points.

On selecting the **depth string** option, the **depth string** panel is displayed.



The fields and buttons in this panel are used as follows

Field Description	Type	Defaults	Pop-Up
Start/End chainage	input		
<i>if blank, the start/end chainage of the reference string is used. if non-blank, the given chainage is used as the start/end chainage.</i>			
Interval	input		
<i>chainage interval to calculate values at.</i>			
Maximum offset	input		
<i>if non-blank, the maximum distance to search from the reference string to find the 1st and 2nd strings.</i>			
Model for string	input		available models
<i>if non-blank, a depth string is created and placed in this model.</i>			
Colour for string	input		available colours
<i>the colour for the depth string.</i>			

Report file	input	*.rpt
	<i>if non-blank, the file for the offset and cross-fall report</i>	
Ref/1st/2nd	button	
	<i>select the reference/first/second string.</i>	
Report	button	
	<i>calculate a depth string and produce an offset and cross-fall report on it.</i>	

Please continue to the next section “Loop Removal” .

Loop Removal

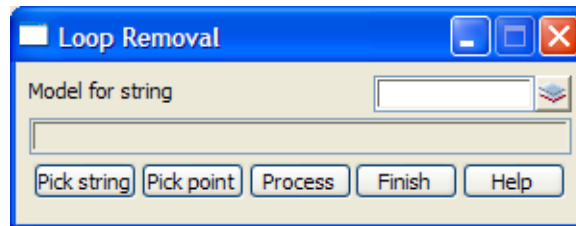
loop_removal

Position of option on menu: Strings =>Utilities =>Loop removal

The loop removal option tries to remove loops from strings by deleting points from the parts of the string where loops occur. No new points are introduced.

The user must indicate a good part on the string before any processing can begin.

Selecting loop removal fires up the **loop removal** panel.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Model for string <i>model for the processed string to go to.</i>	input		available models
Pick string <i>pick the string to try and remove loops from.</i>	button		
Pick point <i>pick a good point on the string.</i>	button		
Process <i>try and remove string points from the loops in the string.</i>	button		

Please continue to the next section “Strings from Sections” .

Strings from Sections

Position of option on menu: Strings =>Utilities =>Strings from sections

The strings from sections option creates strings by joining the common named points on successive 4d strings (usually generated as sections). This option is documented under

Design => X-Sections => Strings from Sections

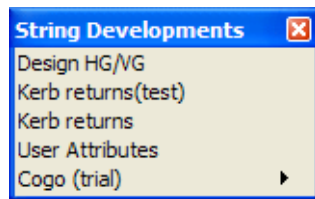
Please go to the section “Strings from Sections” of the Chapter “Design” .

Developments

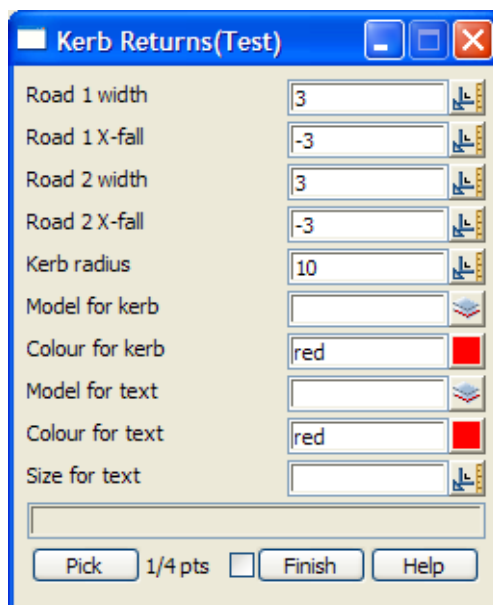
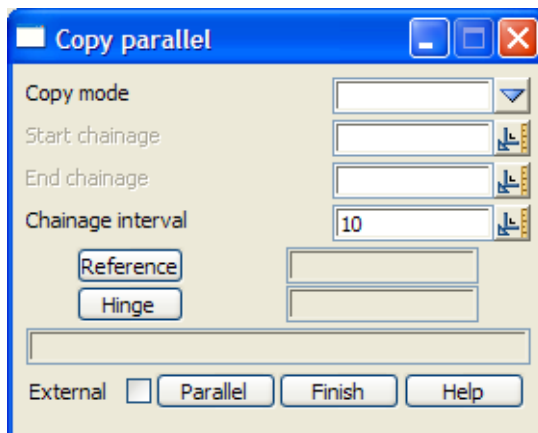
- string_developments
- copy_parallel
- kerb_returns_test_
- kerb_returns
- user_attributes_for_string

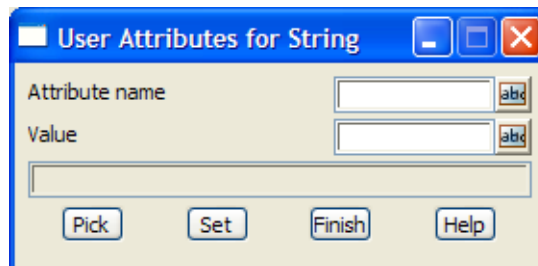
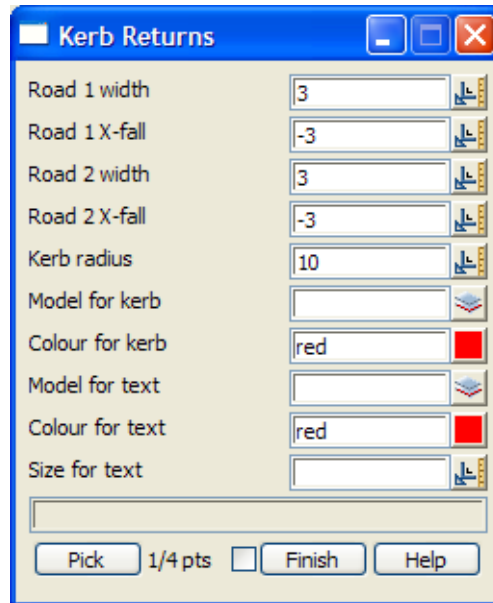
Position of menu: Strings =>Utilities =>Developments

Some of the options under string utilities are still under development, or are being phased out (Cogo(trial)) and won't be documented or released until future versions of 12d Model. The current options on the *Developments* menu are

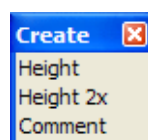
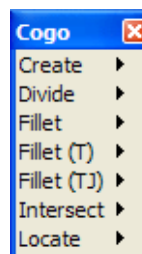


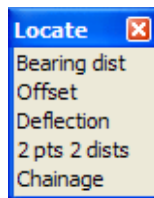
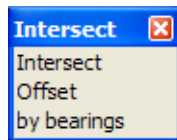
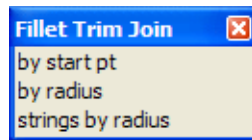
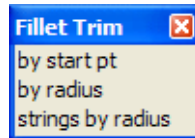
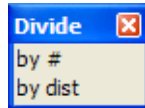
- VG detailed design option - test
- HG, VG detailed design option - test
- kerb return VG - test
- kerb return VG - test
- user attributes
- Cogo superseded by CAD





cogo
 create
 divide
 fillet
 fillet_trim
 fillet_trim_join
 intersect
 locate





Delete

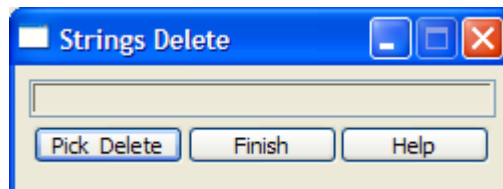
strings_delete

Position of option on menu: Strings =>Delete

Entire strings can be deleted from **12d** Model using the delete option.

Any number of strings can be deleted by successively selecting the strings.

On selecting the delete string option, the **strings delete** panel is displayed.



Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Pick & Delete	button		
--------------------------	--------	--	--

any selected strings are deleted.

The cycle is terminated by clicking RB to raise the pick ops menu and selecting cancel from it.

15 Triangles

triangles

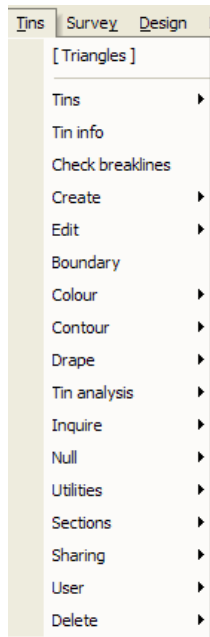
Position of menu: Tins

A **tin** (triangulated irregular network) is an accurate method of representing surfaces, especially those described by strings. **12d** Model uses tins in most operations involving surfaces. For example, contouring, interfacing and volume calculations.

Unlike strings, tins can be in more than one model, or even no model at all. However, to be **displayed** in a view or used for **profiling** on a section view, tins need to be in at least one model. It is suggested that each tin be in its own model called "tin **tin_name**". This makes it easy to know the model a tin is in, and also to see which models contain tins and obtain lists of all tins.

The triangles walk-right menu is

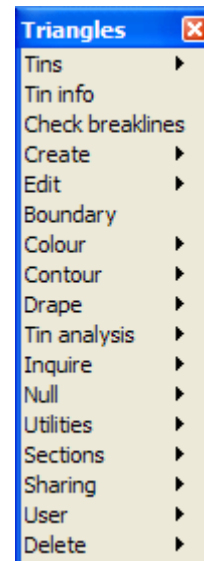
on Main menu



create floating Triangles menu

list of tins
information on project tins
check crossing breaklines
triangulate a model or view, supertin
modify model list etc. for tin
construct tin boundary
colour of tin, colour in polygon
contouring hts, depths, labelling
drape strings onto tin
slope, aspect, viewshed etc.
tin values at cursor position
remove unwanted triangles
various tin options
creating x-sections, mesh, long sec
tin sharing
User menus
delete tins from disk

on **12d** Model menu
and floating menu



Each of these options will now be discussed.

For the option *Tins*, please continue to "Tins"

<i>Tins info</i>	"Tin Info"
<i>Check breaklines</i>	"Check Breaklines"
<i>Create</i>	"Create"
<i>Edit</i>	"Edit"
<i>Boundary,</i>	"Boundary"
<i>Colour,</i>	"Colour"
<i>Contour</i>	"Contour"
<i>Drape</i>	"Drape"
<i>Tin analysis</i>	"Tin Analysis"
<i>Inquire</i>	"Inquire"
<i>Null</i>	"Null"
<i>Utilities</i>	"Utilities"

“Sections”
Delete

“Sections”
“Delete”

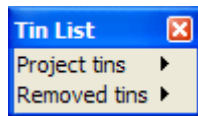
Tins

tin_list

Position of menu: Tins =>Tins

The tins walk-right menu provides options to list all the tins in the project (project tins) and all the tins in the project area but not in the project (removed tins).

The tins walk-right menu is



list of tins in project
list of removed tins in project area

Project Tins

Position of option on menu: Tins =>Tins => Project Tins

The project tins walk-right menu provides a list of all the tins in the project and there is a walk-right on each tin name showing what models the tin is in. If a tin name is selected from the list of tins, the **tin information** panel is fired up with the selected tin name already in the tin field.

Removed Tins

Position of option on menu: Tins =>Tins => Removed Tins

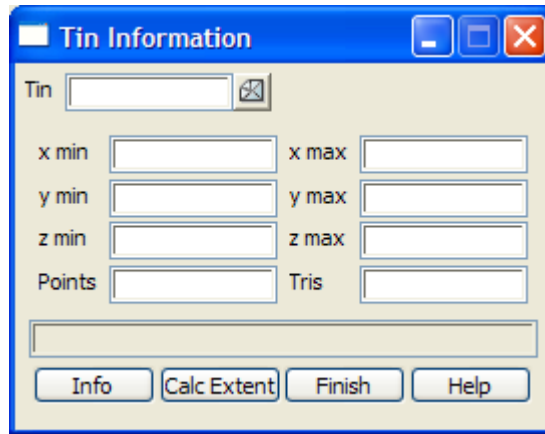
The removed tins walk-right menu provides a list of all the tins in the project area that have been removed from the project (using the removed from project option).

Tin Info

tin_information

Position of option on menu: Tins =>Tin info

Selecting tin info fires up the tin information panel.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Default	Pop-Up
Tin <i>input the name of the tin to get information on</i>	input		available tins
xmin, xmax	output		
ymin, ymax	output		
zmin, zmax <i>returns the tin x, y, z limits</i>	output		
Points <i>returns the number of points in the tin</i>	output		
Tris <i>returns the number of triangles in the tin</i>	output		
Info <i>get the information for the tin given in the tin field.</i>	button		
Calc Extent <i>recalculate the x, y, z bounding box for the tin given in the model field.</i>	button		

How to Use the Panel

The information for the tin given in the tin field is retrieved and placed in the appropriate panel fields when the tin name is piped into the tin field from the pop-ups, or an <enter> is entered after typing the tin name into the tin field, or on selecting the **info** button.

Check Breaklines

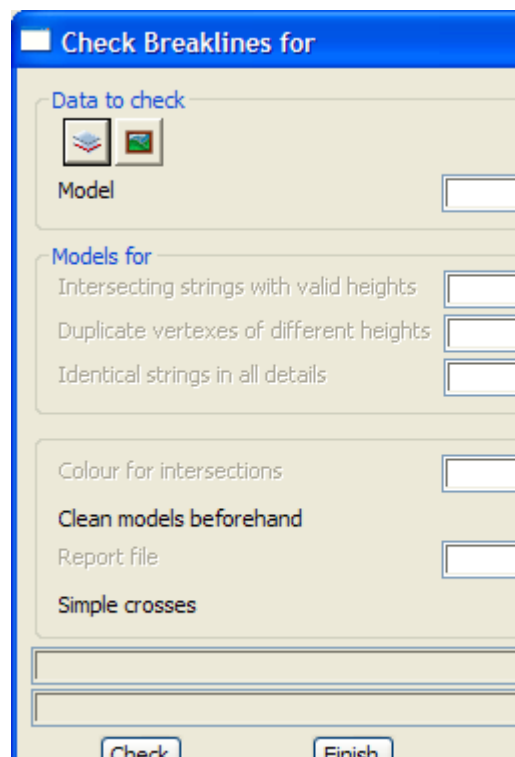
check_breaklines_for

Position of option on menu: Tins =>Check breaklines

The check breakline option is used to test whether any of the line segments from any line strings in a model or view intersect (cross) the line segments from any other string in the model/view. This includes self intersections of strings.

The option also checks for any points with the same x and y co-ordinates (same plan position) but different z-values, and for totally duplicated strings.

On selecting **Check breaklines** option and then the appropriate **Data Source** in the panel, the **Check Breaklines for** panel is displayed.



The fields and buttons in the panel have the following functions.

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Data source type		Model	
-------------------------	--	-------	--

data selection type - for a full description go to "Data Source" in the chapter "Tools and Concepts" .

Data source	input		
--------------------	-------	--	--

data to be processed.

Model for intersections	input		available models
--------------------------------	-------	--	------------------

if non-blank, check for any crossing line segments and place either a copy of the crossing segments into the model given in this field or a diamond depending on the state of "Simple crosses".

Model for duplicates	input		available models
-----------------------------	-------	--	------------------

*if non-blank, **copies** of any strings that are completely duplicated are placed in the model given in this field and circles are placed in this model at any duplicate points that aren't from an entire string.*

Model for identicals input available models
*if non-blank, the duplicates of any strings are **moved** to model given in this field. That is, if any strings are identical in all ways, then the second and subsequent identical strings are moved to the Model for identicals. This is for the case when a second copy of some data has been supplied.*

Colour for intersections input available colours
colour for the copies of the crossing segments.

Report file input
if non-blank, a report file of this name is created giving details of all the crossing breaklines and duplicate plan points with different z-values.

Duplicate points tick box tick
*if **tick**, check for points with the same (x,y) position.*

Duplicate strings tick box tick
*if **tick**, check for duplicate strings.*

Intersections tick box tick
*if **tick**, check for strings that intersect (in plan).*

Simple crosses tick box tick
*if **tick**, create diamonds at the position where strings cross, otherwise create a string in the shape of a cross with parts of the crossing strings.*

Check button
*after selecting the **check** button, all the strings in the model/view are tested for any crossing line segments or duplicate points. If requested, a report is generated.*

<esc> can be used to abort the checking option.

Create

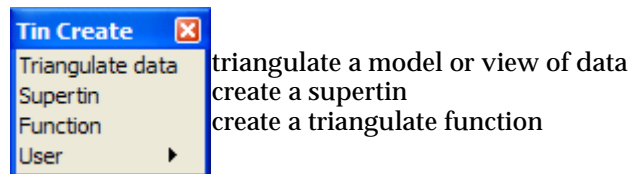
tin_create

Position of menu: Tins =>Create

The input data for a triangulation is either all the data in a selected model or all the data from all the models on a selected view or a list of models. The options for each method of selecting data are on the Create walk-right menu.

A SuperTin™ is a list of Tins and a Tin function creates a re-calc function name for an existing Tin. Each of these options are also on the Create walk-right menu.

The Create walk-right menu is



For the option *Triangulate data*, go to the section "Triangulate Data" .

Supertin

"Create SuperTin™" .

Function

"Function" .

Triangulate Data

triangulate_a_data_source

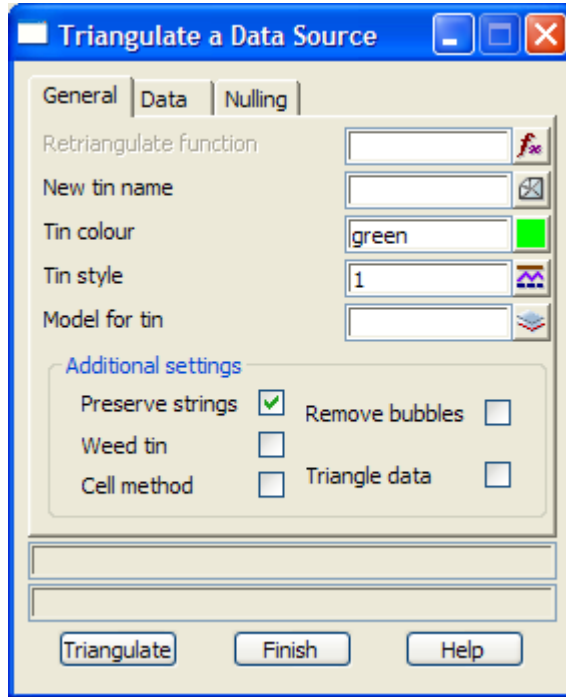
Position of option on menu: Tins =>Create =>Triangulate data

For simple jobs, the data to triangulate is all in the one model. However, it often occurs that the data one needs to triangulate is not in one model but is in the models displayed on a particular view.

The Triangulate data source option allows use to either select the data to triangulate from a single model, a list of models or to it uses the data points from all the models attached to a particular view, rather than the data from a particular model.

In each case, the models used in creating the triangulation are recorded so that the models can be easily retriangulated if any of the data changes.

On selecting the **Triangulate data** option, the **triangulate a Data Source** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Data source type		Model	
<i>data selection type - for a full description go to "Data Source" in the chapter "Tools and Concepts".</i>			
Data source	input		
<i>source of data is to be triangulated - only Model or View allowed for this option.</i>			
New tin name	input		
<i>name of the tin created from the triangulation of the model/view. If <enter> is type after the name, the model for tin field is filled out with the name tin new_tin_name.</i>			
Tin colour	input	default tin colour	available colours
<i>colour to draw the triangles whenever they are displayed in a view.</i>			
Tin style	input	1	available line styles
<i>line style used for drawing sections through the tin on the section view.</i>			
Model for tin	input		available models
<i>if non-blank, the created tin will be added to the model given in this field. if blank, the name tin new_tin_name will be placed in the field when the triangulate button is selected.</i>			
Preserve strings	tick box	tick	
<i>if tick, all strings with breakline type line or segment type tinable will be preserved as sides of triangles. Otherwise, all line strings or segments of type tinable will be treated as point strings for the triangulation.</i>			
Remove bubbles	tick box		
<i>if tick, post-processing occurs to try and stop all the points of a triangle coming from the same string. This helps prevent triangles with all three points coming from the one contour string and hence forming a flat triangle.</i>			

Weed tin tick box

if tick, all duplicate points are removed from the tin database. This helps to reduce the size of the tin files if there was a large amount of duplicate data. This flag is automatically set to tick for triangle data.

Triangle data tick box

if tick, then it is assumed the original data was triangles and 12d will ensure that the triangles produced by the triangulation exactly match (including null regions) the original triangle data. Weed tin is automatically set to tick if face data is set to tick.

Cell method tick box

if tick, try to create the triangles in cells - an alternate method of ordering the data which is often faster when the data comes in lines rather than randomly.

Data polygon string-select

if a string is selected as a data polygon, only string points that are inside the data polygon are used in the triangulation.

If no string is selected, then all the points in all the model/view are used in the triangulation.

Null polygon string-select

if a string is selected as a null polygon, any triangle whose centroid is outside the null polygon is automatically nulled.

Triangulate button

Triangulate the model/view given in the model/view to triangulate field. The created tin will be stored with the name given in the new tin name field. The tin will be the colour given in the tin colour field. If the model/view for tin field is non-blank, the created tin will be added to the model given in that field - if the model does not exist, it will be created.

Panel Messages

Progress messages - sent to the panel message area

no of points in model/view = no. of points

no. points pts no. break lines break lines

no. points pts no. of secs s no. pts/s no. dup

break lines finished. time taken = secs

Completion message - sent to the panel message area

average no of pts per sec = no.

<esc> can be used to abort the triangulation option.

Create SuperTin™

create_super_tin

Position of option on menu: Tins =>Create =>Supertin

The SuperTin™ option is designed to create a super triangulation from other triangulations.

With **SuperTins**, existing triangulations can be combined to form the equivalent of a merged triangulation without having to completely re-build a merged model and retriangulating it.

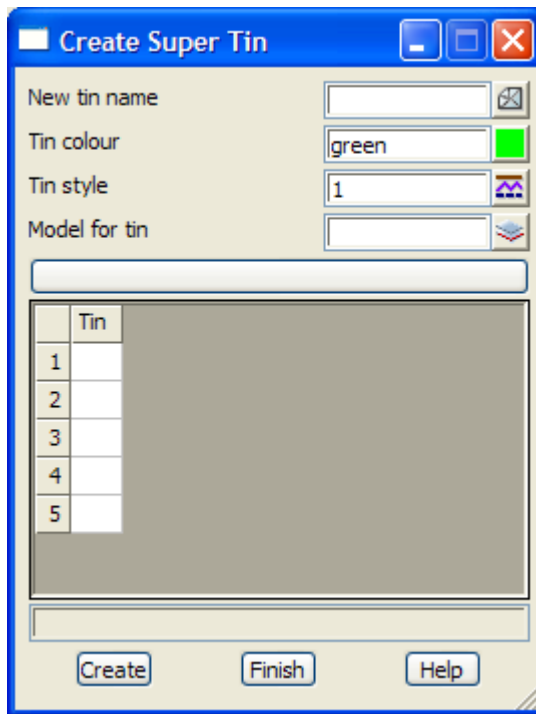
This means there are less steps in creating a SuperTin merged triangulation so a lot less time is required and there is less opportunity for errors. Also, if any of the component triangulations of the SuperTin are modified, then the SuperTin is also instantly modified.

The SuperTin is defined by a list of triangulations in increasing priority order. Wherever two triangulations overlap, the triangulation of higher priority takes precedence and is used to defined z-values and sections.

Hence, for any (x,y) point, the z-value on the SuperTin is defined to be the z-value from the triangulation of the highest priority which is under the (x,y) point.

A section through a SuperTin is made up of the sections through the triangulation of highest priority at each point along the section.

On selecting the Supertin option, the **Create Super Tin** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
New tin name	input		
<i>name of the tin created from the triangulation of the model/view. If <enter> is type after the name, the model for tin field is filled out with the name tin_new_tin_name.</i>			
Tin colour	input	default tin colour	available colours
<i>the tin colour is used as the section colour when sectioning through the supertin. When displayed on plan or section views, the each tin making up the supertin is drawn in its own colour.</i>			
Tin style	input	1	available line styles

line style used for drawing sections through the SuperTin on the section view.

Model for tin input available models

if non-blank, the created SuperTin will be added to the model given in this field.

*if blank, the name tin new_tin_name will be placed in the field when the **create** button is selected.*

Tins to include table available tins

name of the tin to be included in the SuperTin.

Create button

create a SuperTin from the tins in the tins to include table. The created SuperTin will be stored with the name given in the new tin name field.

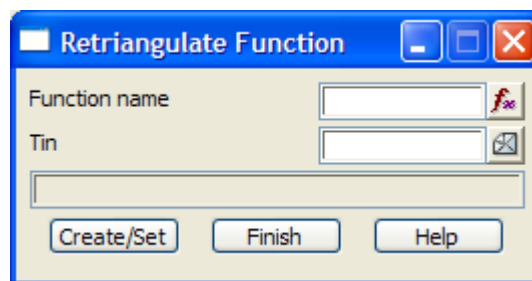
Function

retriangulate_function

Position of option on menu: Tins =>Create =>Function

The function option is used to construct a function which when recalced, will run a retriangulate on the tin.

On selecting the function option, the **retriangulate function** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Function name	input		available functions
----------------------	-------	--	---------------------

the name to give to the retriangulate function.

Tin	input		available tins
------------	-------	--	----------------

name of the tin to be retriangulated when the function is recalced.

Create/Set	button		
-------------------	--------	--	--

create or modify the retriangulate function.

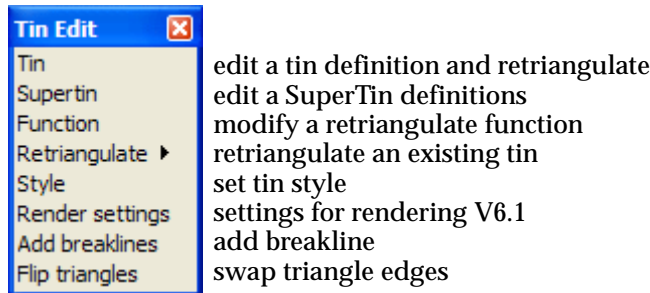
Edit

tin_edit

Position of menu: Tins =>Edit

The input data for a triangulation is either all the data in a selected model or all the data from all the models on a selected view

The options for both methods of selecting data are on the **create** walk-right menu. The **create** walk-right menu is



For the option *Tin*, please go to the section “Edit a Tin” .

<i>Supertin</i>	“Edit SuperTin” .
<i>Function</i>	“Edit Tin Function” .
<i>Retriangulate</i>	“Retriangulate” .
<i>Style</i>	“Style” .
<i>Render settings</i>	“Render Settings” .
<i>Add breaklines</i>	“Add Breaklines” .
<i>Flip triangles</i>	“Flip Triangles” .

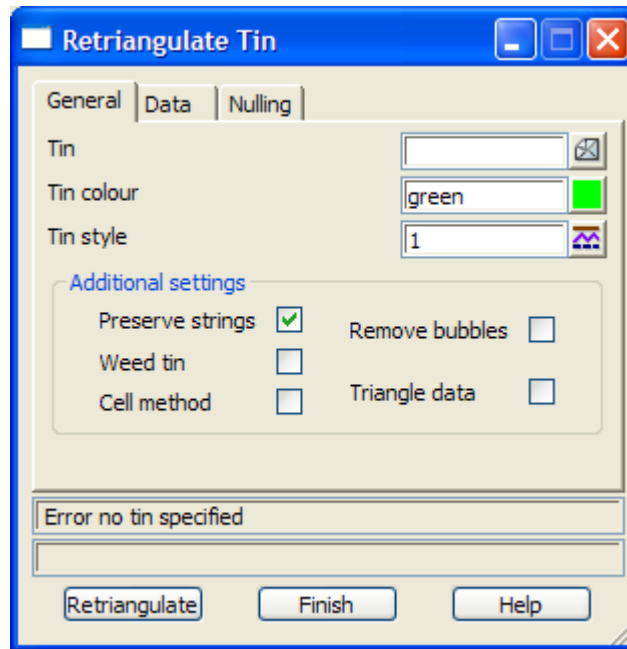
Edit a Tin

retriangulate_tin

Position of option on menu: Tins =>Edit =>Tin

When a tin is created, the settings and models used in the triangulation are recorded with the tin data. The **edit=>tin** option can be used to modify the models and setting used to define the tin and then **recreate** the tin from the new models and settings.

On selecting the **edit=>tin** option, the **retriangulate tin** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Tin	input		
<i>name of the tin to be retriangulated. When the tin name is given, the list of models used for the tin and other settings, are displayed.</i>			
Tin colour	input	original colour	available colours
<i>original colour of the tin - this can be modified.</i>			
Tin style	input	original line style	available line styles
<i>original line style of the tin - this can be modified.</i>			
Preserve strings	tick box	original setting	
<i>if tick, all strings with breakline type line will be preserved as sides of triangles. Otherwise, all line strings will be treated as point strings for the triangulation.</i>			
Remove bubbles	tick box	original setting	
<i>if tick, post-processing occurs to try and stop all the points of a triangle coming from the same string.</i>			
Weed tin	tick box	original setting	
<i>if tick, all duplicate points all removed from the tin database.</i>			
Triangle data	tick box	original setting	
<i>if tick, only triangles in the tin that are under the centroid of a string representing a triangle in the model/view are considered valid, all others are set to null. That is, any triangles not under the centroid of a string from the model/view will be set to null. This is extremely useful when the original string data represents triangles and it will ensure that the triangles produced by the triangulation will exactly match, including null regions, the original triangle data. Weed tin is automatically set to tick if face data is set to tick.</i>			
Cell method	tick box	original setting	
<i>if tick, try to create the triangles in cells - an alternate method of ordering the data for use when the triangulation takes too long by the non-cell method.</i>			

Data polygon string-select original data polygon

if a string is selected as a data polygon, only string points that are inside the data polygon are used in the triangulation.

If no string is selected, then all the points in all the models are used in the triangulation.

Null polygon string-select original null polygon

if a string is selected as a null polygon, any triangle whose centroid is outside the null polygon is automatically nulled.

Retriangulate button

The original tin is deleted and the data in the models to include table used to create a new triangulation which is given the original tin name. The settings in this panel are used for the retriangulation.

Edit SuperTin

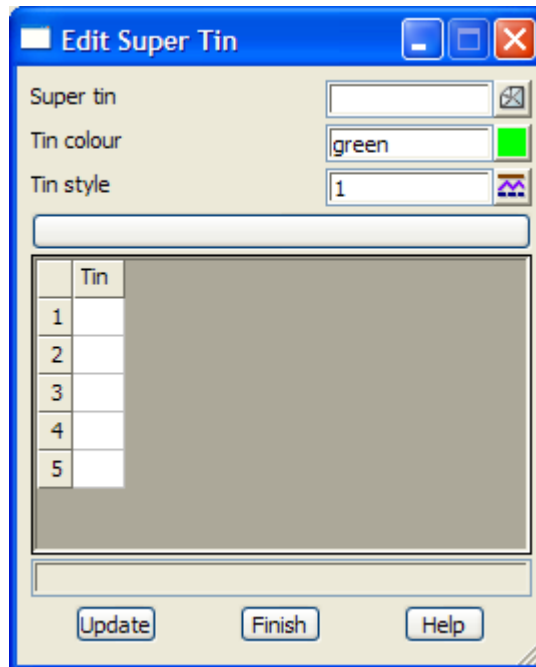
edit_super_tin

Position of option on menu: Tins =>Edit =>Supertin

When a Supertin is created, the tins and settings used to create the SuperTin are recorded.

The edit=>supertin option can be used to modify the tins and setting used to define the SuperTin.

On selecting the edit=>supertin option, the **edit super tin** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Super tin name <i>name of the SuperTin to be modified.</i>	input		existing SuperTins
Tin colour <i>original colour for drawing sections through the SuperTin - this can be modified.</i>	input	existing super tin colour	available colours
Tin style <i>original linestyle for drawing sections through the SuperTin - this can be modified.</i>	input	existing supertin style	available line styles
Tins to include <i>original tin in the SuperTin - these can be modified.</i>	table	existing tins	available tins
Update <i>update the SuperTin definition with the information in the above panel fields.</i>	button		

Edit Tin Function

Position of option on menu: Tins =>Edit =>Function

The edit=>function option is used to edit a tin function.

On selecting the **function** option, the **retriangulate function** panel is displayed which is the same as for the option tins=>create=>function.

Retriangulate

Position of option on menu: Tins =>Edit =>Retriangulate

When a tin is created, the settings and models used in the triangulation are recorded with the tin data. The **retriangulate** option is used to **recreate** the tin from the **same** models and settings.

The **retriangulate** menu item operates two ways.

- The **retriangulate walk-right** brings up the tins menu which is a list of all the existing tins. By choosing one of the tins from the tins menu, the tin is retriangulated.
- If **retriangulate** itself is activated (by clicking LB when **retriangulate** is highlighted), the **retriangulate tin** panel appears. The **retriangulate tin** panel can be used to modify the tin definition and retriangulate the tin.

Style

tin_linestyle

Position of option on menu: Tins =>Edit =>Style

When a tin is created, it is given a linestyle (the tin linestyle) which is used for drawing the tin whenever it is profiled on a section view or plotted in long and cross section plots.

The **style** option is used to modify the tin linestyle.

On selecting the **style** option, the **tin linestyle** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Tin <i>name of the tin to modify the linestyle of.</i>	input		available tins
Style <i>linestyle for the tin.</i>	input	1	available linestyles
Set <i>set the tin linestyle to that given in the style panel field.</i>	button		

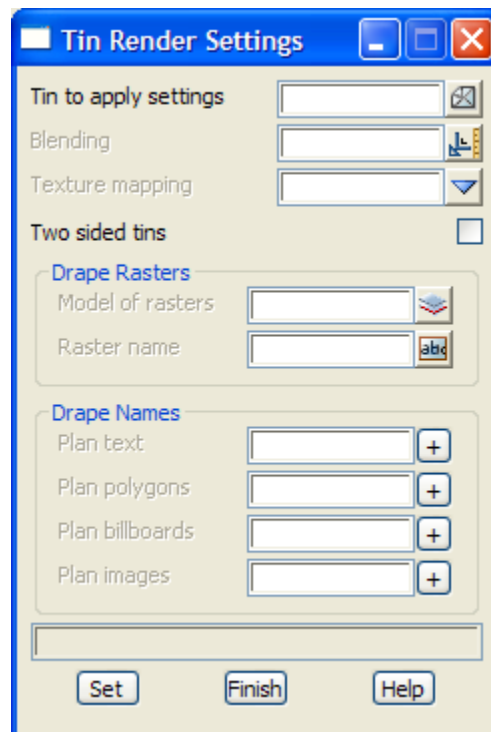
Render Settings

tin_render_settings

Position of option on menu: Tins =>Edit =>Render settings

This Option is currently under development.

On selecting the Render settings option, the **Tin Render Settings** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Tin to apply settings <i>name of the tin to apply the render settings to.</i>	input		available tins
Model <i>if non blank, the model of ortho-rectified rasters to be associated with the tin (and hence draped onto the tin in an Perspective OpenGL view).</i>	input		available models
Raster name <i>if non blank, the name of an ortho-rectified raster to be associated with the tin (and hence draped onto the tin in an Perspective OpenGL view).</i>	input		
Texture mapping <i>if non blank, the name of the set of colour-to-texture mappings that is defined in the file textures.4d and are to be used for applying textures to the coloured triangles of the tin.</i>	input		
Blending <i>The value of blending is between 0 and 1. 0 means the tin is totally transparent (and hence invisible) and 1 means that the tin is opaque (non-translucent) and can't be seen through at all. If blank, then the value is taken as 1 and the tin is opaque (non-translucent).</i>	input		

Two sided tins

tick box

if tick, the tin is visible when viewed from both above and below. For example, the tin used for the bottom of a bridge needs to be two-sided.

If non-tick, then the tin is one sided and only shows when viewed from above.

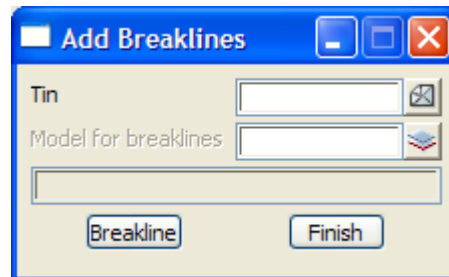
Add Breaklines

add_breaklines_panel

Position of option on menu: Tins =>Edit =>Add breaklines

This option allows extra breaklines joining existing vertices in the tin to be created. The new breaklines can be added to a model so that the results can be reproduced on a retriangulation.

On selecting the **Add breakline** option, the **Add Breaklines** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Tin <i>name of the tin to add a breakline to.</i>	input		available tins
Model for breaklines <i>if non-blank, then as breaklines as created with this option, then the breakline is automatically added to this model so that the breakline modifications will try to be preserved on a retriangulation (this may not be possible with crossing breaklines).</i>	input	1	available models
Breakline <i>add a breakline by clicking near the two vertices of the tin that are to be connected by a breakline (cursor snap will do). As each breakline is added, the triangles are rearranged. If fast contours are turned on, the effect will be immediate. Note that you can have fast contours and tin edges toggled on at the same time.</i>	button		

Flip Triangles

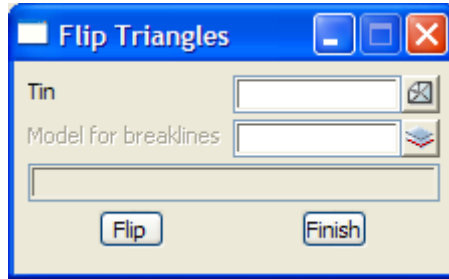
flip_triangles_panel

Position of option on menu: Tins =>Edit =>Flip triangles

This option works on a triangle side and if it is possible, it finds the two triangles with this common side, removes the common side and replaces it with a new common side which joins the non common triangle points in the original triangle. Note that this can't be done when the new side goes outside the two triangles.

A new breaklines can also be automatically added to a model so that the results can be reproduced on a retriangulation.

On selecting the **Flip triangles** option, the **Flip Triangles** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Tin <i>name of the tin to add a breakline to.</i>	input		available tins
Model for breaklines <i>if non-blank, then as triangles are selected and flipped, then breaklines are is automatically added to this model so that the flip modifications will try to be preserved on a retriangulation (this may not be possible with crossing breaklines).</i>	input	1	available models
Flip <i>flip a triangle by clicking near the common edge (cursor snap will do). As each flip is done, the triangles are rearranged. If fast contours are turned on, the effect will be immediate. Note that you can have fast contours and tin edges toggled on at the same time.</i>	button		

Boundary

create_boundaries_for_tin

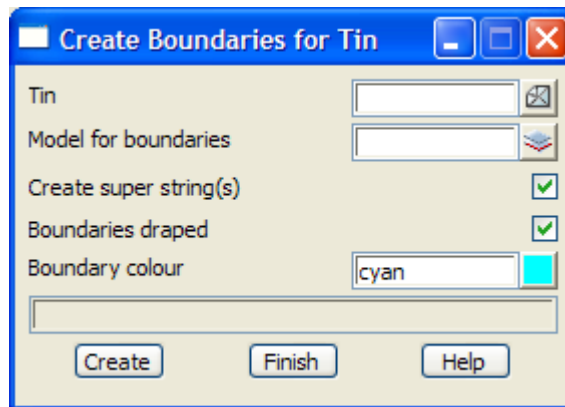
Position of option on menu: Tins =>Boundary

The boundary option is used to construct the boundary strings for a tin, i.e. the strings going around the edges between the null and non-null triangles in the tin.

If the tin has holes (internal null regions), then there will be more than one boundary string created.

Often the boundary strings is used as a first step in creating a polygon to be used to null out further triangles not required in the tin.

On selecting the **Boundary** option, the **Create Boundaries for Tin** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Tin <i>name of the tin to calculate the boundary strings for.</i>	input		available tins
Model for boundaries <i>the model to place the boundary strings in.</i>	input		available models
Create super string(s) <i>if tick, the boundary string is a super string. If not tick, the boundary string is a 3d string.</i>	tick box		
Boundaries draped <i>if tick, the points of the boundary have the z-values from the tin. If not tick, the z-value is set to 1.</i>	tick box		
Boundary colour <i>the colour for the boundary strings</i>	input	cyan	available colours
Create <i>create the boundary polygons for the tin.</i>	button		

Colour

tin_colouring

Position of menu: Tins =>Colour

When a tin is created, all the triangles have the same colour (called the tin's base colour). This is the colour given by the user when creating the tin with the **triangulate model** or **triangulate view** panel. The base colour can be changed at any time using the colour of tin option.

However, it often necessary to colour specific triangles in some other colour than the base colour. The option colour within polygon is designed to do just that.

The colour menu item operates in two ways.

First, if colour itself is activated (by clicking LB when colour is highlighted), the **colour of tin** panel appears (see the next section).

Secondly, the colour walk-right brings up the tin colouring menu.

The tin colouring walk-right menu is



change base colour of tin
 colour triangles within a polygon
 reset all triangles to base colour
 colour height ranges
 colour depth ranges between two tins
 colour aspect ranges
 colour slope ranges

For the option *Colour of tin*, please go to the section "Colour of Tin" .

<i>Colour within polygon</i>	"Colour Within Polygon"
<i>Reset</i>	"Reset"
<i>Retriangulate</i>	"Retriangulate"
<i>Tin height colour</i>	"Tin Height Colour"
<i>Tins depths colour</i>	"Tins Depths Colour" .
<i>Aspect colouring</i>	"Aspect Colouring" .
<i>Slope colouring,</i>	"Slope Colouring" .

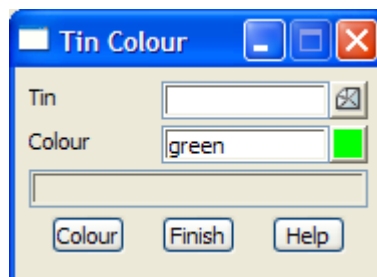
Colour of Tin

tin_colour

Position of option on menu: Tins =>Colour =>Colour of tin

A tin is given a base colour when it is originally constructed. The colour of tin option allows the user to change the base colour of the tin.

On selecting the **colour of tin** option, the **tin colour** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Tin	input		available tins
<i>name of the tin to have its base colour modified. The tin must exist in 12d Model. When the tin name is entered, the existing colour of the tin is displayed in the tin colour panel field.</i>			
Colour	input	default tin colour	available colours
<i>the new base colour for the tin given.</i>			
Colour	button		
<i>colour all the base triangles with the colour given in the colour field.</i>			

Colour Within Polygon

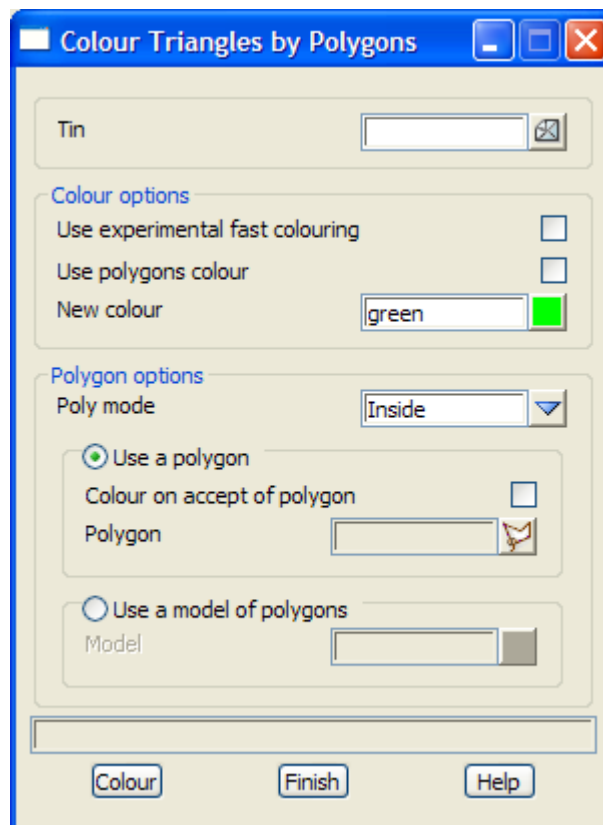
colour_triangles_by_polygons

Position of option on menu: Tins =>Colour =>colour within polygon

Although a tin is given a base colour when constructed, it is useful to be able to change the colour of selected triangles. For example, in a design tin with a road and terrain, the road and the terrain could be displayed in different colours. This is particularly effective in shades.

The colour within polygon option allows the user to colour all the triangles whose centroids lie inside (or outside) a selected polygon, or for all the polygons in a given model, with either a user specified colour or the colour of each polygon. If a model of polygons is used, the polygons are processed in the order that they occur in the model. The option can be applied any number of times to a tin.

On selecting the colour within polygon option, the **colour triangles by polygons** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Tin <i>name of the tin to have some of its triangles coloured. The tin must exist in 12d Model.</i>	input		available tins
Use experimental fast colouring <i>if tick, an experimental fast colouring algorithm is used.</i>	tick box		
Use polygons colour <i>if tick, the colour of the polygons is used as the colour for the triangles.</i>	tick box		
New colour <i>if use polygons colour is not set to tick, this is the colour to set all the triangles within/out a polygon to.</i>	input	default tin colour	available colours

Poly mode choice inside inside, outside
*mode to select whether the triangles with centroids **inside** or **outside** the selected polygons are to be coloured.*

Use a polygon tick box
*if **tick**, then individual polygons are selected and the tin coloured within them.*

Colour on accept of polygon tick box
*if **tick**, then the colouring is done as soon as a polygon is accepted.*

Polygon polygon selected button string pop-up

this is used to
 (a) select an individual string to use as a polygon for colouring
 (b) dynamically define a rectangle to use as a polygon for colouring
 (c) dynamically define a trapezoid to use as a polygon for colouring
 (d) dynamically define a lasso to use as a polygon for colouring



Use a model of polygons tick box
*if **tick**, then all the polygons in the given model are used for colouring.*

Model input available models
*model of polygons which are used for selecting triangles to be coloured. Colour happens when the **Colour** button is selected.*

Colour button
each string in the model of polygons is used to colour the triangles in the tin given in the tin field.

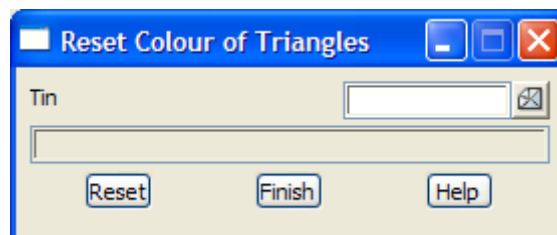
Reset

reset_colour_of_triangles

Position of option on menu: Tins =>Colour =>Reset

The reset option is used to change all the non base-coloured triangles in a tin back to the base colour.

On selecting the reset option, the **reset colour of triangles** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Tin	input		available tins
<i>name of the tin to have any non base-coloured triangles reset to the base colour. The tin must exist in 12d Model.</i>			

Reset button
change any selectively coloured triangles back to the base colour.

Tin Height Colour

colour_height_range_for_tin

Position of option on menu: Tins =>Colour =>Tin height colour

The tin height colour option is used to calculate height bands for the tin and colour a view and/or create faces. The calculations can be restricted to within a user selected polygon, or if no polygon is selected, the entire tin is used.

The calculated heights and colours are given in a user supplied range file. A plan view can be temporarily coloured on the height basis using the **range** file. The temporary colours will disappear next time the view is refreshed.

For permanency, the option can also create coloured faces with the appropriate range colour. The faces can be displayed on any plan view using a solid fill colour or a hatch pattern.

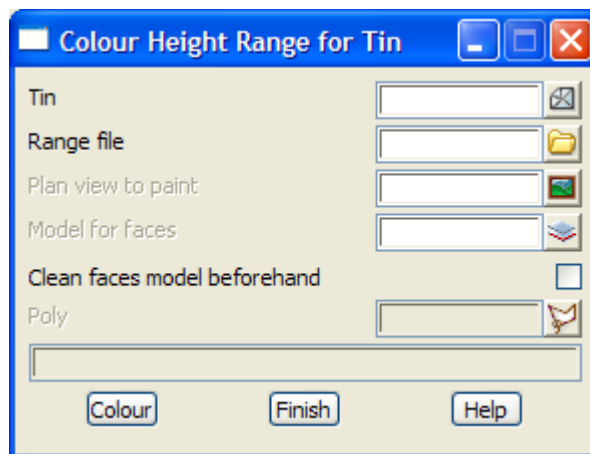
For tin height colour, the range file consists of a list of ranges and colours, one set per line, in the format

```
lower_height upper_height range_colour
```

where this line represents all heights satisfying

```
lower_height < height <= upper_height.
```

On selecting the tin height colour option, the colour height range for tin panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Tin <i>name of the tin for which the height ranges of the triangles will be calculated and a view coloured.</i>	input		available tins
Range file <i>the user supplied range file is used to give the colour ranges for heights of the tin.</i>	input		*.hrf
Plan view to paint <i>if non-blank, the given plan view will be painted according to the range colours given in the range file.</i>	input		available views
Model for faces <i>if non-blank, faces will be created with colours according to the range colours given in the range file.</i>	input		available models
Clean faces model beforehand	tick box		

if tick, the model of faces is cleaned out before the option runs.

Select polygon string-select

if selected, this string is used as the bounding polygon for the height calculations.

Colour button

On selecting this button, the heights of the triangles of the tin within the selected bounding polygon are calculated.

<esc> can be used to terminate the option during height calculations.

Tins Depths Colour

colour_depth_range_for_tins

Position of option on menu: Tins =>Colour =>Tin depths colour

The tins depths colour option is used to calculate colour bands for the depths between two tins and colour a view and/or create faces. The calculations can be restricted to within a user selected polygon, or if no polygon is selected, the common portions of the tins are used.

The calculated depths and colours are given in a user supplied range file. A plan view can be temporarily coloured on the depth basis using the **range** file. The temporary colours will disappear next time the view is refreshed.

For permanency, the option can also create coloured faces with the appropriate range colour. The faces can be displayed on any plan view using a solid fill colour or a hatch pattern.

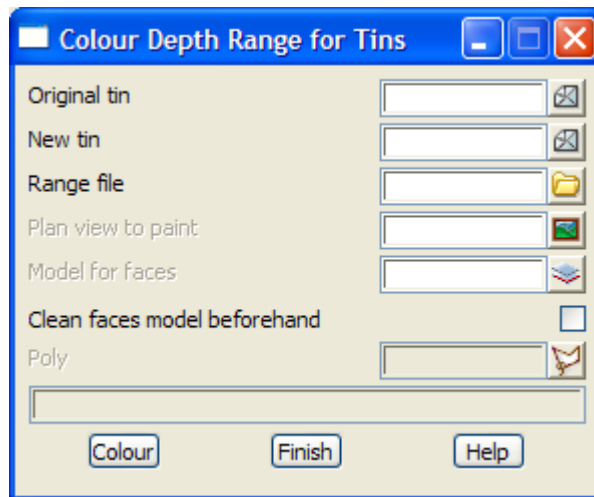
For tins depths colour, the range file consists of a list of ranges and colours, one set per line, in the format

lower_depth upper_depth range_colour

where this line represents all depths satisfying

lower_depth < depth <= upper_depth.

On selecting the tins depths colour option, the colour depth range for tins panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Original/New tin <i>name of the original/new tin to colour depths between. Cut is when the new tin is below the original tin.</i>	input		available tins
Range file <i>the user supplied range file is used to give the colour ranges for depths.</i>	input		*.hrf
Plan view to paint <i>if non-blank, the given plan view will be painted according to the range colours given in the range file.</i>	input		available views
Model for faces <i>if non-blank, faces will be created with colours according to the range colours given in the range file.</i>	input		available models
Clean faces model beforehand	tick box		

if tick, the model of faces is cleaned out before the option runs.

Select polygon string-select

if selected, this string is used as the bounding polygon for the height calculations.

Colour button

colour the depths between the tins within the selected bounding polygon.

<esc> can be used to terminate the option during depth calculations.

Aspect Colouring

aspect_analysis_colour

Position of option on menu: Tins =>Colour =>Aspect colouring

The aspect colouring option is used to colour the triangles according to the aspect (direction) of the triangles in the tin. An aspect range file is used to define the colour ranges.

Note that the actual colours of the triangles are changed - not a face model produced.

For aspect colouring, the range file consists of a list of aspect ranges and colours, one set per line, in the format as for aspect analysis:

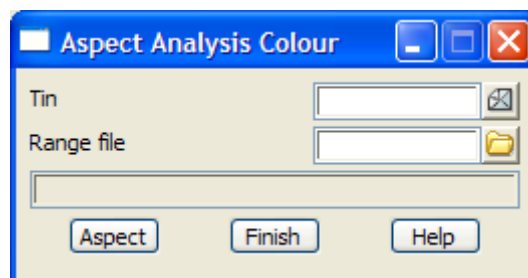
```
lower_bearing upper_bearing range_colour
```

where this line represents all bearings satisfying

```
lower_bearing < bearing <= upper_bearing.
```

For each range in the file, the boundary strings for areas of common range can be created and also coloured faces that can be displayed on any plan view.

On selecting the aspect colouring option, the **Aspect Analysis Colour** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Tin <i>name of the tin for which the aspects of the triangles will be calculated and then the tin coloured.</i>	input		available tins
Range file <i>the user supplied range file is used to give the colour ranges for aspects to use to colour the triangles.</i>	input		*.arf
Aspect <i>On selecting this button, the aspects of the triangles of the tin are calculated and the triangle coloured according to the range file.</i>	button		

<esc> can be used to terminate the option during aspect calculations.

Slope Colouring

slope_analysis_colour

Position of option on menu: Tins =>Colour =>Slope colouring

The slope colouring option is used to colour the triangles in the tin according to the slope of the triangles. A slope range file is used to define the colour ranges.

Note that the actual colours of the triangles are changed - not a face model produced.

For slope colouring, the range file consists of a list of ranges and colours, one set per line, in the format

lower_value upper_value range_colour

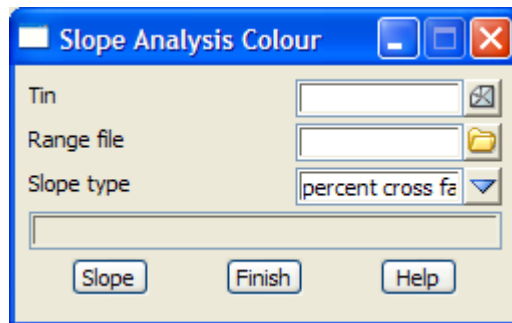
where this line represents all angle satisfying

lower_value < value <= upper_value.

The values can be percent cross fall, "1v in" slope or degrees (in 12d Model dms format).

The range_colour is used to colour all triangles in the tin satisfying the range.

On selecting the slope colouring option, the **Slope Analysis Colour** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Tin <i>name of the tin for which the slope of the triangles will be calculated and then the tin coloured.</i>	input		available tins
Range file <i>the user supplied range file is used to give the colour ranges for slopes to use to colour the triangles.</i>	input		*.arf
Slope type <i>the units used for slope in the range file.</i>	input	percent cross fall	percent cross fall, degrees, 1v in
Slope <i>On selecting this button, the slopes of the triangles of the tin are calculated and coloured according to the slope range file.</i>	button		

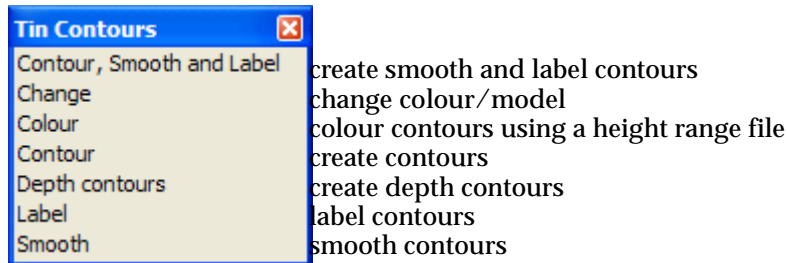
<esc> can be used to terminate the option during aspect calculations.

Contour

tin_contours

Position of menu: Tins =>Contour

The tin contours walk-right menu is



For the option *Contour, smooth and label*, go to the section “Contour, Smooth and Label”

<i>Change</i>	“Change Contours”
<i>Colour</i>	“Colour”
<i>Contour</i>	“Contour”
<i>Depth contours</i>	“Depth Contours”
<i>Label</i>	“Label Contours”
<i>Smooth</i>	“Smooth”

For information on creating contours, go to the section “Creating, Smoothing and Labelling Contours” .

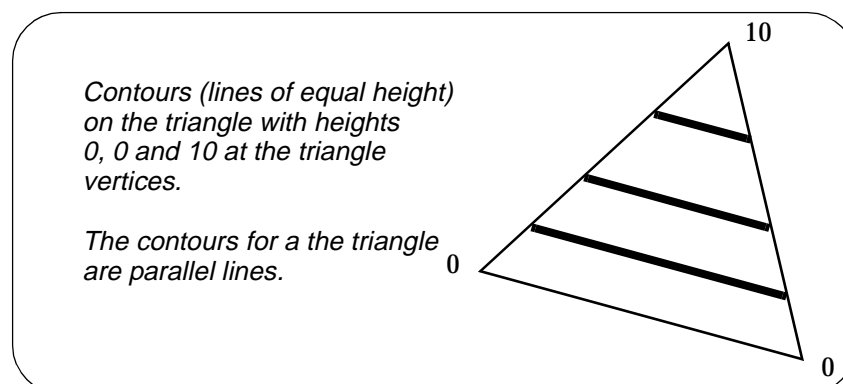
Creating, Smoothing and Labelling Contours

Creating Contours

Contours (or level lines) for a surface are the strings of constant height. Contours are often produced on maps and labelled with the height of the contours.

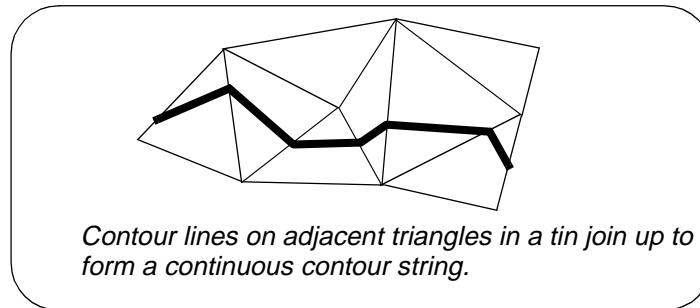
A 12d Model tin represents a surface in three dimensions and there is an option in 12d Model for producing the contours for the tin.

For a triangle in three dimensions, a string of constant height is actually a straight line across the triangle and the contour lines of different heights for a triangle are parallel lines.



Because triangles in a tin have common sides, a contour of a given height for one triangle will connect to the contour of the same height in an adjacent triangle.

So the contour lines on adjacent triangles join up to form continuous contour strings, each segment of which is straight across a triangle.



The contours for a tin lie on the surface of the tin.

The options to create contours in 12d Model has five parameters to define which contours are calculated. They are the

- minimum contour value
- maximum contour value
- contour increment
- contour reference
- bold increment

The elevation range over which the contours are to be produced is defined by the minimum and maximum contour values. If the minimum (maximum) value is not specified, the tin minimum (maximum) z-value is used.

The increment between successive contours is given by the contour increment.

For example, if contours are required every two metres from 100.0 metres to 200.0 metres, the parameters needed are

- contour minimum = 100.0
- contour maximum = 200.0
- contour increment = 2.0

This would be sufficient information to produce the contours

100.0, 102.0, 104.0... 198.0, 200.0.

However, 12d Model also provides a parameter to allow the following contours to be produced

101.0, 103.0, 105.0 197.0, 199.0

For this and similar cases, the contour reference value is used.

When a contour reference value is specified, all the contour increments are taken from the contour reference value.

In the first example, the contour reference value is the default value of 0.0. In the second example, the contour reference value is 1.0.

If **major** (or **bold** or **index**) contours are required, the major contour increment is given a non-zero value. Major contours will be drawn at the integer multiples of the major increment instead of the standard contours.

For information on labelling contours, go to the section "Labelling Contours".

For information on smoothing contours, go to the section "Smoothing Contours".

Smoothing Contours

If the triangles in a tin, or sections of a tin, are large then the contours for that section of the tin may appear angular. Consequently some people like to "smooth" the contours to take out the angularity.

Be careful of smoothing because "smoothing" of contours produces strings that no longer sit on the triangulation.

12d Model smooths contours by apply a smoothing algorithm to each of the contour strings that were produced from the triangulation.

Two smoothing algorithms are available

- (a) Preserve string points - this method ensures that the smoothed contour goes through all the vertices from the original contour string.
- (b) Don't preserve string points - this method does not have to include the vertices from the original contours in the smoothed contour.

For information on creating contours, go to the section "Creating Contours" .

For information on labelling contours, go to the section "Labelling Contours" .

Labelling Contours

12d Model labels contours by placing text labels at user controlled distances along the contour string.

The position and frequency of the contour labels along a contour string is controlled by two parameters, the *start distance* and the *separation distance*.

The first contour label is placed at a chainage distance of **start distance** from the beginning on the contour and the labels are repeated at a chainage distance of **separation distance** from the previous contour label.

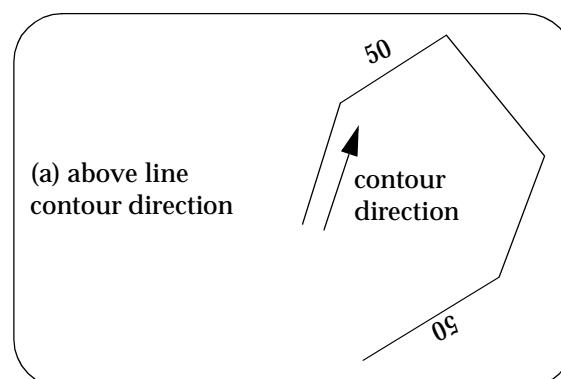
There is also a parameter to specify that contours are to be labelled at the start and the end regardless of the *start distance* and *separation distance*.

The number of decimal places used for the contour label is also user specified.

12d Model has seven methods for positioning the contour labels. They are the

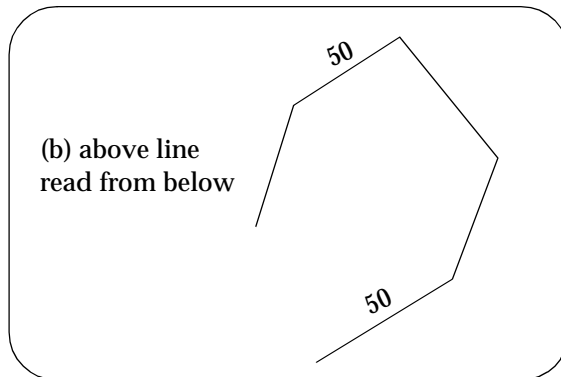
- (a) above line contour direction

contour labels are created with the text parallel to the contours line and in the same direction as the contour string. The text is raised slightly above the contour string.



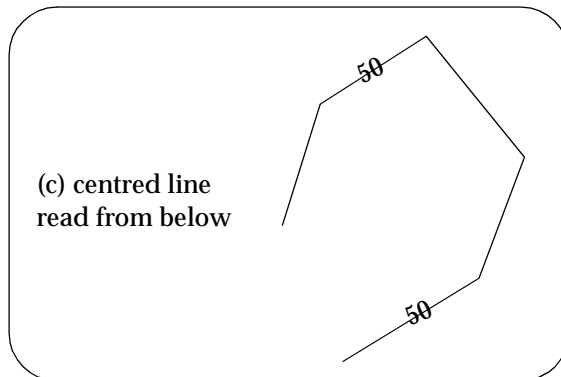
- (b) above line read from below

contour labels are created with the text parallel to the contour line and in the same direction as the contour string but at an angle between -90 and +90 degrees. The text is raised slightly above the contour string.



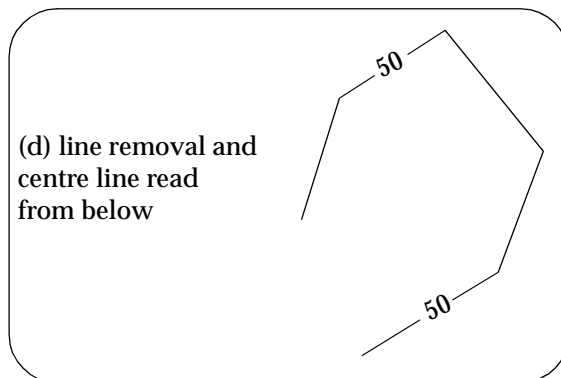
(c) centre line read from below

contour labels are created with the text parallel to the contour line and in the same direction as the contour string but at an angle between -90 and +90 degrees. The text is centred on the contour string so the contour string goes through the text.



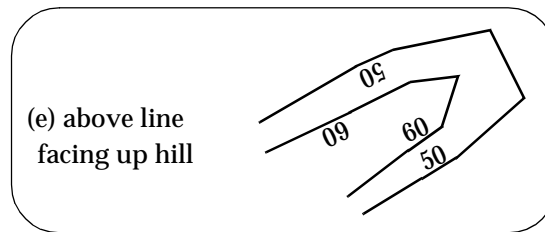
(d) line removal & centred line read from below

contour labels are created with the text parallel to the contour line and in the same direction as the contour string but at an angle between -90 and +90 degrees. The text is centred on the contour string so the contour string goes through the text. Also the contours are cut so that gaps are left for the labels.



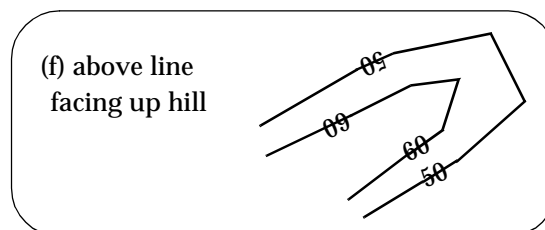
(e) above line facing up hill

contour labels are created with the text parallel to the contours line in the same direction as the contour string. The text is orientated so that it faces uphill. The text is raised slightly above the contour string.



(f) centre line facing up hill

contour labels are created with the text parallel to the contours line in the same direction as the contour string. The text is orientated so that it faces uphill. The text is centred on the contour string so the contour string goes through the text.



(g) line removal & centred line facing up hill

contour labels are created with the text parallel to the contour line. The text is orientated so that it faces uphill. The text is centred on the contour string so the contour string goes through the text. Also the contours are cut so that gaps are left for the labels.



For information on creating contours, go to the section “Creating Contours” .

For information on smoothing contours, go to the section “Smoothing Contours” .

Contour

contour_a_tin

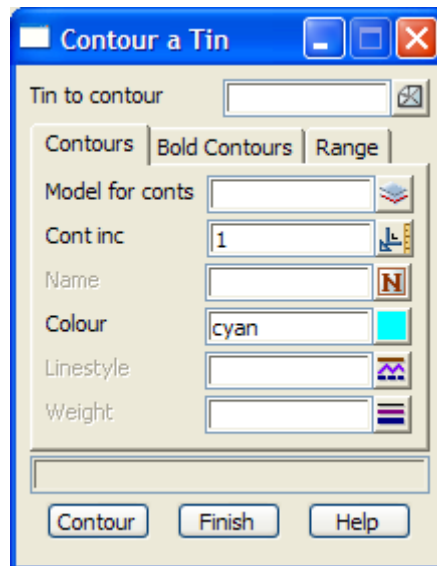
Position of option on menu: Tins =>Contour =>Contours

One method of visualizing tin data is with contours. In 12d Model, contour strings can be produced over any user defined elevation range and at any interval.

For more information on contouring in 12d Model, go to the section “Creating Contours”

The contour option can be applied to a tin any number of times. This may be necessary if the contour parameters vary over the total range to be contoured.

On selecting the contour option, the **contour a tin** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Tin to contour <i>name of the tin to be contoured.</i>	input		available tins

Contours tab

Model for conts <i>name of the model to place the contours in.</i>	input		available models
Cont inc <i>increment between contoured values.</i>	input	1.0	
Name <i>if non-blank, name to give the contour strings.</i>	input		
Colour <i>colour of the contours</i>	input	cyan	available colours
Linestyle <i>linestyles for the contour strings.</i>	input	1	available linestyles
Weight <i>if non-blank, weight to give the contour strings.</i>	input		

Bold Contours tab

Model for bolds	input		available models
<i>name of the model to place the bold contours in. If blank, the same model is used as for the ordinary contours.</i>			
Bold inc	input	5.0	
<i>increment for the bold contours. If blank or zero, then no bold contours are drawn. If non-zero, it must be an integer multiple of the contour increment</i>			
Bold colour	input	magenta	available colours
<i>colour of the bold contours</i>			
Name	input		
<i>if non-blank, name to give the bold contour strings.</i>			
Colour	input	cyan	available colours
<i>colour of the bold contours</i>			
Linestyle	input	1	available linestyles
<i>linestyles for the bold contour strings.</i>			
Weight	input		
<i>if non-blank, weight to give the bold contour strings.</i>			

Range tab

Cont min	input		
<i>minimum value of the z range to be contoured. If blank, the tin's minimum z-value is used.</i>			
Cont max	input		
<i>maximum value of the z range to be contoured. If blank, the tin's maximum z-value is used.</i>			
Cont ref	input	0.0	
<i>reference value for the contour increments.</i>			

Contour button

contour the tin given in the tin field and place the contours in the model given in the model field. The contour range, contour increment and bold contour increment are used specify which contours are calculated.

Panel Messages

Progress messages - sent to the panel message area

start contouring
contouring level z-value

Completion message - sent to the panel message area

finished contouring - no. contours

<esc> can be used to abort the calculation of contours.

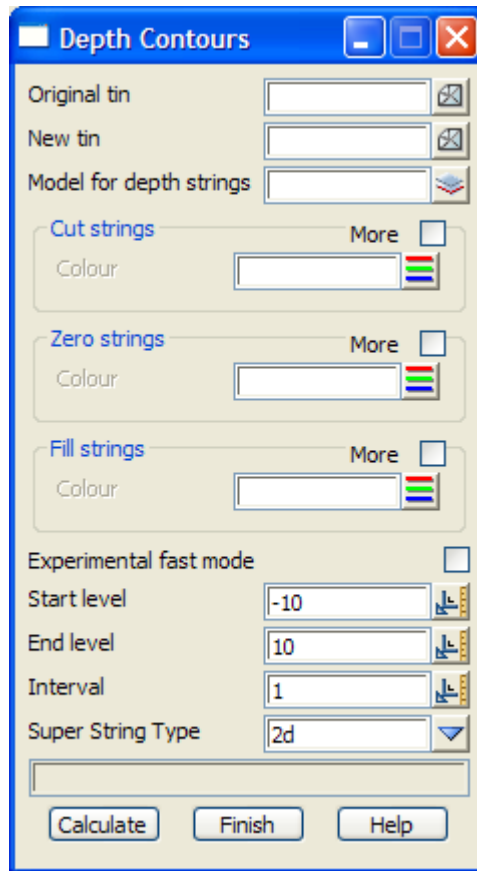
Depth Contours

depth_contours

Position of option on menu: Tins =>Contour =>Depth contours

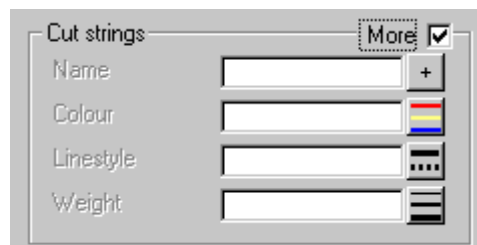
The depth contours option finds the contours lines for the difference between two tins. That is, it calculates the isopachs between the two tins.

On selecting the depth contours option, the **Depth Contours** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Original/New tin <i>name of the original/new tin to contour between. Cut is when the new tin is below the original tin.</i>	input		available tins
Model for depth strings <i>name of the model to contain the depth strings.</i>	input		available models
Cut/Zero/Fill strings section <i>if no tick then only the Colour panel field is displayed</i>	More tick box		
Colour <i>if non-blank, colour for the strings</i> <i>if tick then Name, Colour, Linestyle and Weight fields are displayed</i>	input	cyan	available colours



Name	input		
	<i>if non-blank, name to give the strings.</i>		
Colour	input	cyan	available colours
	<i>if non-blank, colour for the strings</i>		
Linestyle	input	1	available linestyles
	<i>linestyles for the strings.</i>		
Weight	input		
	<i>if non-blank, weight to give the strings.</i>		
Start level	input	-10	
	<i>the minimum depth to start the depth contours at.</i>		
End level	input	10	
	<i>the maximum depth to calculate the depth contours to.</i>		
Interval	input	1	
	<i>the interval between the depth contours.</i>		
2d/3d strings	input	2d	2d, 3d original, 3d new
	<i>If 2d, the created strings are 2d strings with a z-value equal to the depth.</i>		
	<i>If 3d original/new, the depth strings are draped over the original/new tin to form 3d strings.</i>		
Calculate	button		
	<i>calculate the depth contours between two tins given in the panel fields. The resulting strings are added to the model given in the model for depth strings field.</i>		

Label Contours

label_contours

Position of option on menu: Tins =>Contour =>Label

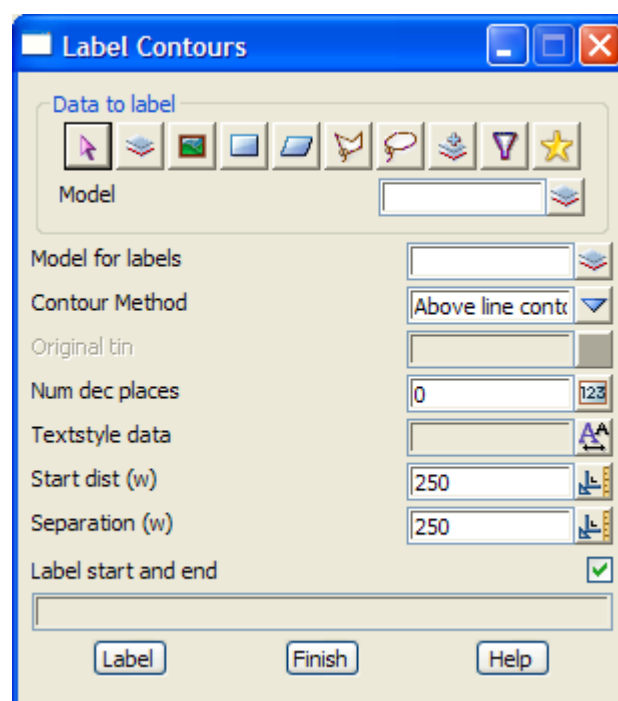
The label contours option can be used to label individual contour (2d) strings, or all the contour strings in a model.

The user has control over the label size, colour, number of decimal places, the distance between the labels and the distance to the first label on a string (start distance).

Note - this option cannot label fast contours. Contours strings must already exist or be generated using *Tins => Contour=> Contour*.

For more information on labelling contours, go to the section “Labelling Contours” .

On selecting the label contours option, the **label contours** panel is displayed.



When the **label** button is selected, then all the contour strings given by the data source field will be labelled according to the parameters in the panel fields.

The fields and buttons used in the **label contours** panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Data source type		Model	
<i>data selection type - for a full description go to “Data Source” in the chapter “Tools and Concepts” .</i>			
Data source	input		
<i>source of data is to be triangulated - only Model or View allowed for this option.</i>			
Model for labels	input		available models
<i>name of the model to place the contour labels in.</i>			
Label method	input		above line contour direction above line read from below centred line read from below

line removal and centred line read from below
 above line facing uphill
 centred line facing uphill
 line removal & centred facing uphill

in all cases, contour labels are created and added to the model 'Model for contours'.

For information on each of the methods of labelling contours, go to the section "Labelling Contours".

Original tin input available tins
only needed for the "facing uphill" methods - name of the tin used to generate the contours. This is needed to calculate which direction is uphill.

Num dec places input 1 0,1,2,3,4,5
number of decimal places used in the contour label.

Textstyle data input 1 textstyle favourites
textstyle information to use for the contour labels.

Start dist (w) input 0
chainage distance to the first label on the string - world units

Separation (w) input 250
chainage interval between the labels - world units

Pick button

*if a number of individual contour strings need to be labelled, the pick button is used. After **pick** is chosen, any strings selected are then labelled using the information in the panel fields. After labelling one string, another pick and label cycle automatically begins.*

*The cycle is terminated by clicking RB to raise the **pick ops** menu and selecting cancel from it.*

Label button

label all the contour strings selected by the "Data to label" data source.

Smooth

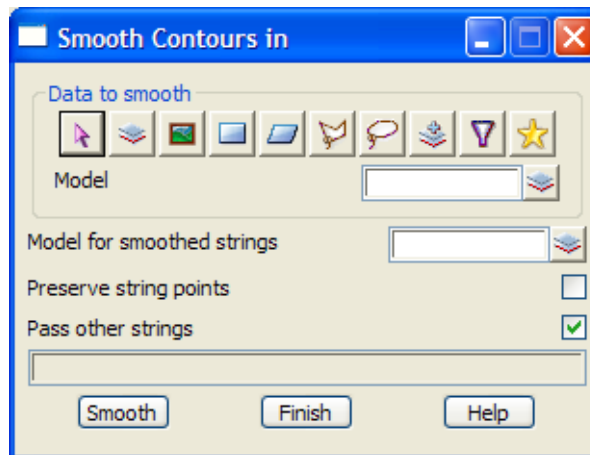
smooth_contours_in

Position of option on menu: Tins =>Contour =>Smooth

The smooth options are used to add extra points into a contour string (2d strings) to make a smoother string.

For more information on labelling contours, go to the section “Smoothing Contours” .

On selecting Smooth, the Smooth Contours in panel is displayed.



The fields and buttons in this panel are used as follows

Field Description	Type	Defaults	Pop-Up
Data source type <i>data selection type - for a full description go to “Data Source” in the chapter “Tools and Concepts” .</i>		Model	
Data source type <i>data selection type</i>		Model	
Data source <i>data source to be smoothed.</i>	input		
Model for smoothed strings <i>model for the smoothed strings to go to</i>	input		available models
Preserve string points <i>if tick, the smoothed contour will still contain all the original points. if not tick, the smoothed contour may deviate from the original string points</i>	tick box		
Pass other strings <i>if tick, any non-contour string is copied and added to the smoothed strings model.</i>	tick box	tick	
Smooth <i>smooth the selected contour (2d) strings.</i>	button		

Change Contours

change_Contours

Position of option on menu: Tins =>Contour =>Change

The Change option is for changing the model and/or colour of contours with a given height interval.

The main purpose of the option is to separate contours to be used as index contours from other contours. For example, when contours are supplied by a third party and all the contours are in the same model with the same colour, change contour colour can move contours to be used as index contours to a different model and give them a different colour.

For this option the selection process for a Data source is extended.

After the data is selected as defined by the Data source, the two extra parameters, interval and reference, are used to further specify which contours are to be moved and/or coloured.

Only contour strings whose heights satisfy

$$\text{height} = \text{reference} + \text{integer} * \text{interval}$$

are selected.

For example, if the contours 5, 10, 15 etc. are required, the reference and interval would be

$$\text{reference} = 0$$

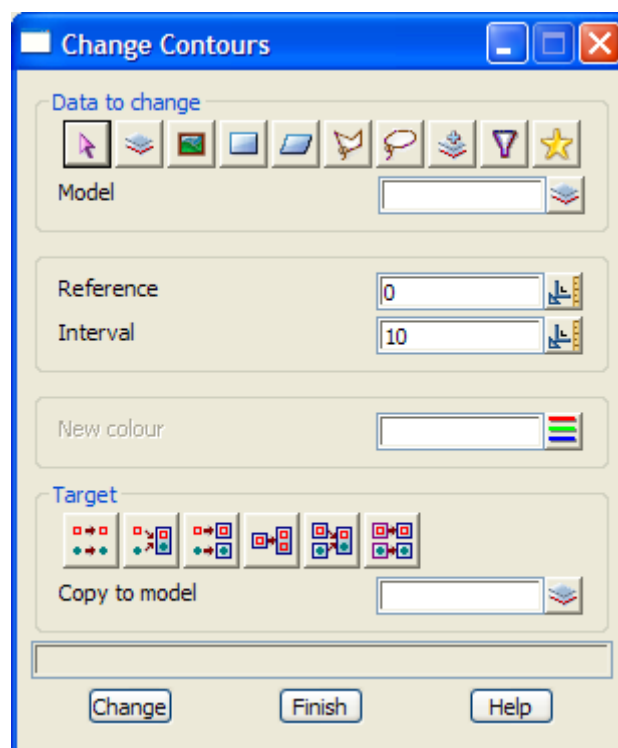
$$\text{interval} = 5$$

However, to modify the contours 6, 11, 16 etc., the required parameters are

$$\text{reference} = 1$$

$$\text{interval} = 5$$

On selecting the Change option, the **Change Contours** panel is displayed.



The fields and buttons used in the panel have the following functions.

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Data source type		Model	
-------------------------	--	-------	--

data selection type - for a full description go to "Data Source" in the chapter "Tools and Concepts"

Data source	input	
<i>source of data is to be processed.</i>		
Reference	input	0
<i>the reference value to use to select contours.</i>		
Interval	input	10
<i>the interval to use to select contours.</i>		
New colour	input	available colours
<i>if non-blank, then the colour of the selected strings will be changed to the colour given in the new colour field.</i>		
Target type		
<i>data target type - for a full description go to "Data Target" in the chapter "Tools and Concepts"</i>		
Target info	input	
<i>extra information required for the target.</i>		
Colour	button	
<i>process the selected strings</i>		

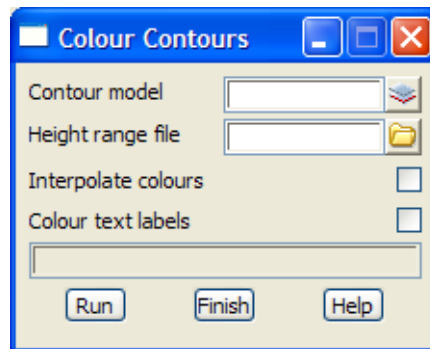
Colour

colour_contours

Position of option on menu: Tins =>Contour =>Colour

The colour option is used to colour contours in a model according to a selected height range file.

On selecting Colour, the Colour Contours panel is displayed.



The fields and buttons in this panel are used as follows

Field Description	Type	Defaults	Pop-Up
Contour model <i>model of contours to colour</i>	input		available models
Height range file <i>height range file to specify the colour of the contour.</i>	input		.hrf files
Interpolate colours <i>if tick, the colour of the contour will be interpolated between the colour for the range and the colour for the next range in the height range file. If not tick, all contours in the same range in the height range file will have the same colour</i>	tick box		
Colour text labels <i>if tick, any text labels in the model will also be coloured.</i>	tick box	tick	
Run <i>colour the contours according to the height range file.</i>	button		

Contour, Smooth and Label

tin_contour_smooth_and_label

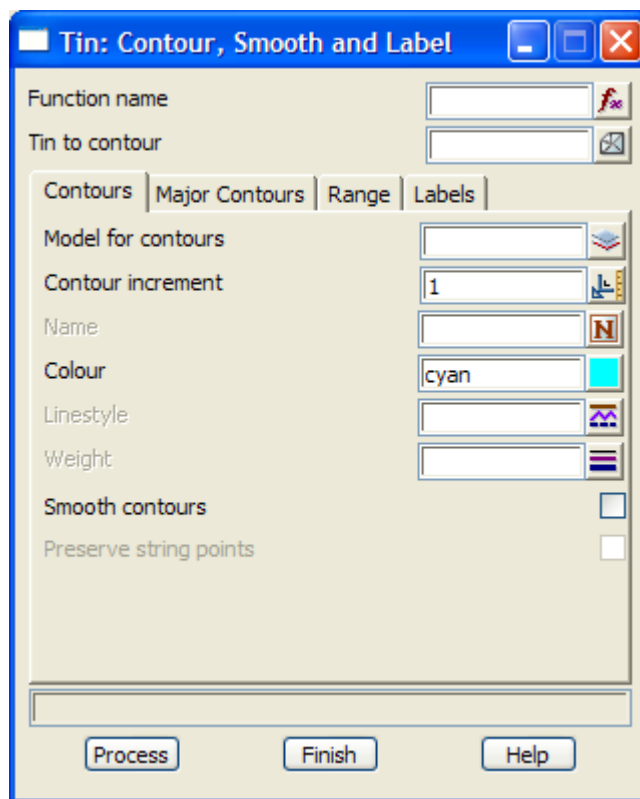
Position of option on menu: Tins =>Contour =>Contour, smooth and label

One method of visualizing tin data is with contours. In 12d Model, contour strings can be produced over any user defined elevation range and at any interval.

This option creates contours and can also smooth and label them. It is a function and so if a function is re-run it will remove any data from its last run.

For more information on contouring, smoothing and labelling in 12d Model, go to the section "Creating Contours"

On selecting the Contour, smooth and label option, the **Contour, Smooth and Label** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Function name <i>name of the contour, smooth and label function.</i>	function box		available contour fns
Tin to contour <i>name of the tin to be contoured.</i>	input		available tins

Contours tab

Model for contours <i>name of the model to place the contours in.</i>	model box		available models
Contour increment <i>increment between contoured values.</i>	input	1.0	

Name	input		
	<i>if non-blank, name to give the contour strings.</i>		
Colour	input	cyan	available colours
	<i>colour of the contours</i>		
Linestyle	input	1	available linestyles
	<i>linestyles for the contour strings.</i>		
Weight	input		
	<i>if non-blank, weight to give the contour strings.</i>		
Smooth contours	tick box		
	<i>if tick, the contours are smoothed.</i>		
Preserve string points	tick box		
	<i>if tick, then the smoothed string goes through the original vertices of the non smoothed contour strings. If not tick, then the smoothed strings do not have to include the vertices from the non-smoothed contours.</i>		

Major Contours tab

Create major contours	tick box		
	<i>if tick, then major contours can be given a different name, colour, style, weight and model.</i>		
Model for major contours	model box		available models
	<i>if non blank, the name of the model to place the major contours in. If blank, the same model is used as for the ordinary contours.</i>		
Major contour increment	input	5.0	
	<i>increment for the major contours. If blank or zero, then no bold contours are drawn. If non-zero, it must be an integer multiple of the contour increment.</i>		
Name	input		
	<i>if non-blank, name to give the major contour strings. If blank, the same name is used as for the ordinary contours.</i>		
Colour	input	off yellow	available colours
	<i>colour of the major contours. If blank, the same colour is used as for the ordinary contours.</i>		
Linestyle	input	1	available linestyles
	<i>if non blank, linestyles for the major contour strings. If blank, the same linestyle is used as for the ordinary contours.</i>		
Weight	input		
	<i>if non-blank, weight to give the major contour strings. If blank, the same weight is used as for the ordinary contours.</i>		

Range tab

Cont min	input		
	<i>minimum value of the z range to be contoured. If blank, the tin's minimum z-value is used.</i>		
Cont max	input		
	<i>maximum value of the z range to be contoured. If blank, the tin's maximum z-value is used.</i>		
Cont ref	input	0.0	

reference value for the contour increments.

Labels tab

Label contours tick box

if tick, then the contours are labelled.

Label major contours only tick box

if tick, then only the major contours are labelled.

Model for labels model box available models

if non blank, the name of the model to place the contour labels in. If blank, the same model is used as for the contours.

Contour method input

- above line contour direction
- above line read from below
- centred line read from below
- line removal and centred line read from below
- above line facing uphill
- centred line facing uphill
- line removal & centred facing uphill

For information on each of the methods of labelling contours, go to the section "Labelling Contours".

Decimal places

number of decimal places used in the contour label.

Textstyle data input 1 textstyle favourites

textstyle information to use for the contour labels.

Start dist (w) input 0

chainage distance to the first label on the string - world units

Separation (w) input 250

chainage interval between the labels - world units

Model of label lines model box available models

if non blank then instead of using the start distance and separation parameters to define where the contour labels are placed, the Model of label lines is used. In this case, a label is created where ever a string in the Model of label lines cuts a contour.

Label start and end tick box tick

if tick, the start and end of the contours are labelled regardless of the values of start distance and separation.

Process button

contour, smooth and label the tin given in the tin field and place the contours in the model given in the model field.

Drape

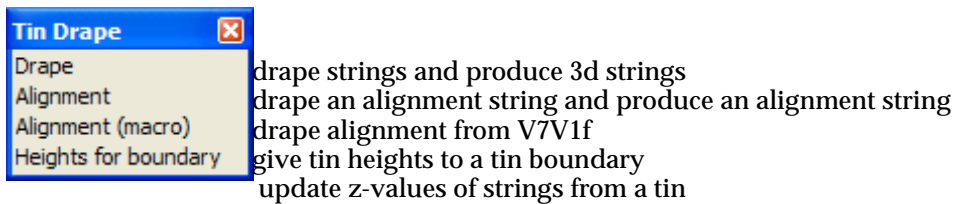
tin_drape

Position of menu: Tins =>Drape

The drape option sections along a string and creates a new 3d-string which sits over the original string in plan view (with line approximations for arcs and spirals) but with z-values taken from a triangulated surface (a tin).

The drape alignment option takes an alignment string and creates a new alignment string with the identical horizontal geometry and vertical intersection points with z-values taken from a tin.

The tin drape walk-right menu is



The options in the tin contours menu will now be discussed.

For the option *Drape*, please go to the section "Drape"

<i>Alignment</i>	"Drape Alignment (Macro)"
<i>Heights</i>	"Heights for Tin Boundary"
<i>String heights for tin,</i>	"Update Z-values from Tin"

Drape

drape

Position of option on menu: Tins =>Drape =>Drape

The drape operation is simply sectioning along a string.

Draping is a very useful method for attaching a z-value for strings defined in plan only. For example, cadastral information often has only (x,y) co-ordinates. The drape operation could be used to apply z-values to the cadastral information, for example, z-values from the natural surface tin. The draped cadastral information would then sit on the natural surface and could be used effectively in perspective views as well as plan views to delineate properties etc.

Instead of simply producing a section along a string, *drape* can also be used to produce a face for every segment of the string by draping the segment onto the tin and forming a face by perpendicularly connecting the end points of the segment and the draped segment. For example, if the strings represented the tops of buildings, the created faces would be the sides of the buildings down to the terrain.

The data to be draped can be selected in three ways - an individual string can be selected and draped, all the strings in a model can be draped, or all the strings in a view can be draped.

On selecting *drape*, the **drape** panel is displayed.

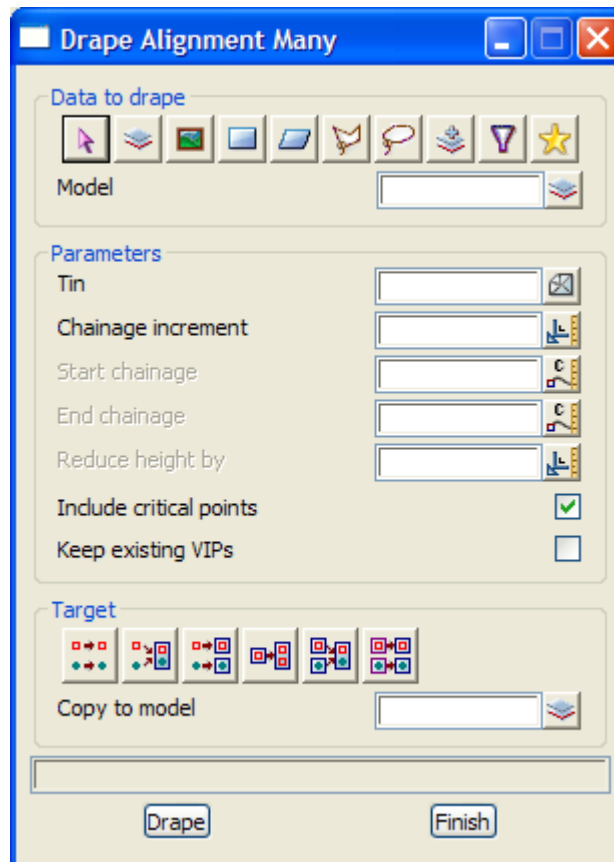
Drape Alignment

drape_alignment_many

Position of option on menu: Tins =>Drape =>Alignment

The Drape alignment operation takes an alignment/super alignment string and creates a new alignment/super alignment string with identical horizontal geometry and the z-value for vertical intersection points taken from a tin. The z-values are taken over a user specified chainage interval and chainage increment. Vertical intersection points outside the chainage range can be kept.

On selecting **Alignment**, the **Drape Alignment Many** panel is displayed.



The fields and buttons used in this panel have the following functions:

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Data source type		Model	
-------------------------	--	-------	--

data selection type - for a full description go to "Data Source" in the chapter "Tools and Concepts" .

Data source	input		
--------------------	-------	--	--

source of data of alignment/super alignment strings to drape.

Tin	input box		
------------	-----------	--	--

triangulation to take z-values from.

Chainage increment	input box		
---------------------------	-----------	--	--

the chainage interval to create VIP points for. Each created VIP point is given the z-value from the tin

and the (x,y) position of the VIP.

Start/End chainage input box

*if non blank, the chainage range to create VIP's over.
If blank, use the start/end chainage of the selected string.*

Reduce height by input box

*if non blank, the value is **subtracted** from the z-value on the tin.*

Include critical points tick box tick

if tick, VIP's are created at the horizontal tangent points.

Keep existing VIPs tick box

*if tick, any existing VIP's outside the given chainage range are kept.
If not tick, don't create any VIP points outside the chainage range.*

Target type

data target type - for a full description go to "Data Target" in the chapter "Tools and Concepts"

Target info input

extra information required for the target.

Drape button

create new alignment/super alignment strings with the same horizontal geometry as the selected strings and the z-value for VIP points taken from the given tin.

Drape Alignment (Macro)

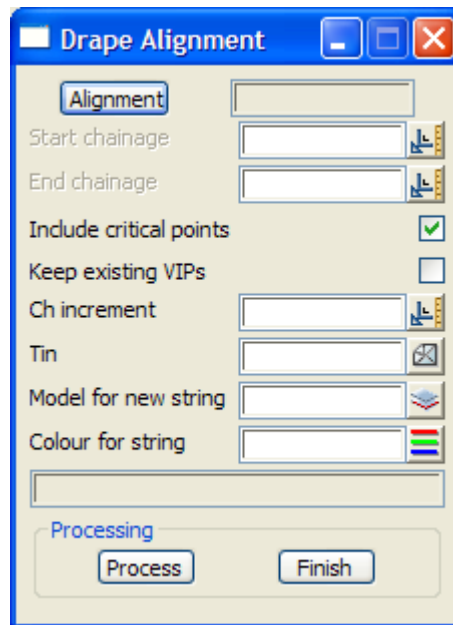
drape_alignment_panel

Position of option on menu: Tins =>Drape =>Alignment (macro)

This is the *Drape =>Alignment* option from V7C1f. It has now been superseded.

The Drape alignment (macro) operation takes an alignment string and creates a new alignment string with identical horizontal geometry and the z-value for vertical intersection points taken from a tin. The z-values are taken over a user specified chainage interval and chainage increment. Vertical intersection points outside the chainage range can be kept.

On selecting Alignment (macro), the **drape alignment** panel is displayed.



The fields and buttons used in this panel have the following functions:

Field Description	Type	Defaults	Pop-Up
Alignment <i>alignment string to drape.</i>	string select		
Start/End chainage <i>the chainage range to create VIP's over. if blank, use the start/end chainage of the selected string.</i>	input box		
Include critical points <i>if tick, VIP's are created at the horizontal tangent points.</i>	tick box	tick	
Keep existing VIPs <i>if tick, any existing VIP's outside the given chainage range are kept. If not tick, don't create any VIP points outside the chainage range.</i>	tick box		
Ch increment <i>the chainage interval to create VIP points for. Each created VIP point is given the z-value from the tin and the (x,y) position of the VIP.</i>	input box		

Tin input box

triangulation to take z-values from.

Model for new string input box

model for the draped string.

Colour for string input box

Colour for the draped string.

Process button

create a new alignment string with the same horizontal geometry as the selected string and the z-value for VIP points taken from the given tin.

Heights for Tin Boundary or Drape Using Closest Tin Node

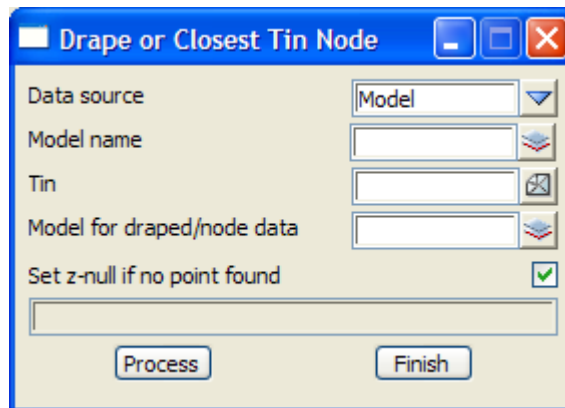
drape_or_closest_tin_node_panel

Position of option on menu: Tins =>Drape =>Heights for boundary

This option takes strings and for each vertex of each string, replaces the z-value by the z-value at the same (x,y) position from a given tin, or if there is no tin at the (x,y) position, takes the z-value from the closest non-null tin node to the (x,y) position.

The option is useful for taking a tin boundary with no z-values and creating z-values for each vertex from the tin.

On selecting Heights from boundary, the Update Z-values from Tin panel is displayed.



The fields and buttons used in this panel have the following functions:

Field Description	Type	Defaults	Pop-Up
Data source <i>type of the data source</i>	choice box	model	model, view, string

Model/View/String name
source of the data to drape vertices for.

Tin
tin to drape the vertices onto.

Model for draped/node data
model for the draped strings.

Set z-null if no point found	tick box	tick	
<i>if tick, the vertex z-value is set to null if no tin exists at the vertex. If not tick and the tin does not exist at the vertex, the z-value for the vertex is taken from the closest non-null tin node.</i>			

Process	button	
<i>run the option.</i>		

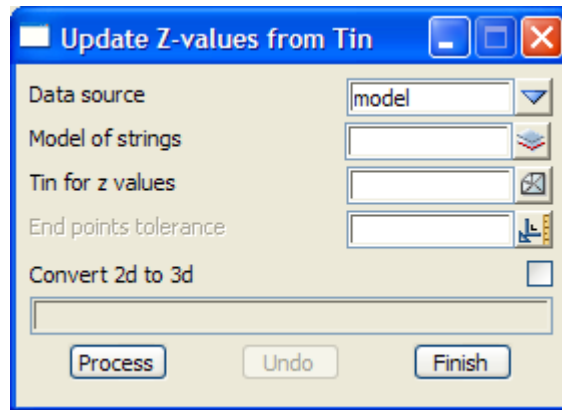
Update Z-values from Tin

string_zvalues_from_tin_panel

Position of option on menu: Tins =>Drape =>String heights from tin

The Update z-values from tin option takes a string (not an alignment string) and replaces the z-value at a vertex by the z-value from the tin at that (x,y) position.

On selecting Update z-values from tin, the Update Z-values from Tin panel is displayed.



The fields and buttons used in this panel have the following functions:

Field Description	Type	Defaults	Pop-Up
Data source type <i>data selection type.</i>		model	string, model, view
Data source <i>source of data to process.</i>		model	string, model, view
Tin for z values <i>triangulation to take z-values from.</i>	tin box		
Convert 2d to 3d <i>if tick, any 2d strings are converted to 3d string so that each point can have a different z-value.</i>	tick box	tick	
Process <i>takes all strings (not an alignment string) in the data source and replaces the z-value at a vertex by the z-value from the tin at that (x,y) position.</i>	button		

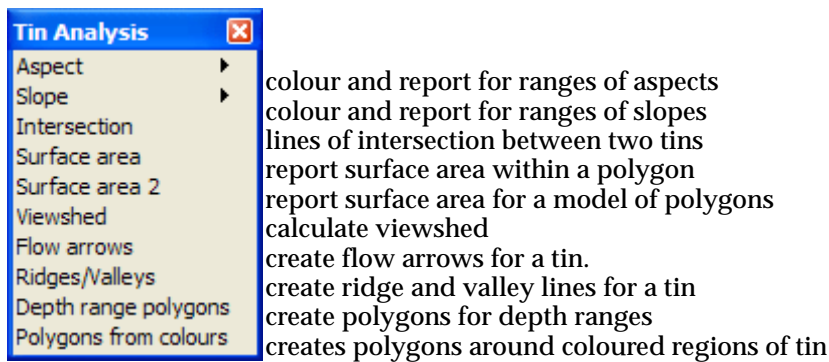
Tin Analysis

tin_analysis

Position of menu: Tins =>Tin analysis

The tin analysis options are used to calculate the direction and slope of triangles, the intersection between tins, surface areas, flow arrows, ridge and valley lines and viewsheds.

The tin analysis walk-right menu is



For the options *Aspect*, please go to the section “Aspect” .

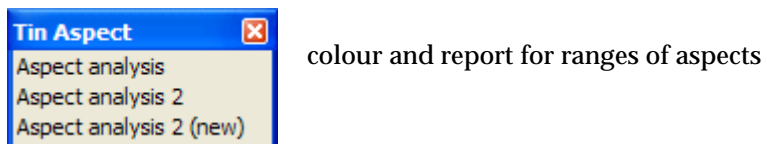
<i>Slope</i>	“Slope”
<i>Intersection</i>	“Intersection”
<i>Surface area</i>	“Surface Area” .
<i>Surface area 2</i>	“Surface Area 2”
<i>Viewshed</i>	“Viewshed”
<i>Flow arrows</i>	“Flow Arrows”
<i>Ridge/Valleys</i>	“Ridge/Valleys”
<i>Depth range polygons</i>	“Depth Range Polygons”
<i>Polygons from colours</i>	“Polygons from Tin Colours”

Aspect

tin_aspect

Position of menu: Tins =>Tin analysis =>Aspect

The tin aspect options calculate and report on the directions of the triangles. The tin aspect walk-right menu is



The options in this menu will now be discussed.

Aspect Analysis

aspect_analysis

Position of option on menu: Tins =>Tin analysis =>Aspect => Aspect Analysis

This panel is used to calculate the aspect or direction that the triangles of a tin face. The

calculations can be restricted to within a user selected polygon, or if no polygon is selected, the entire tin is used.

The calculated aspects can be produced and reported over user supplied bearing ranges. Similarly, a plan view can be temporarily coloured on an aspect basis using the same **range** file. The temporary colours will disappear next time the view is refreshed.

For permanency, the option can also create coloured faces with the appropriate range colour. The faces can be displayed on any plan view using a solid fill colour or a hatch pattern.

For aspect analysis, the range file consists of a list of aspect ranges and colours, one set per line, in the format

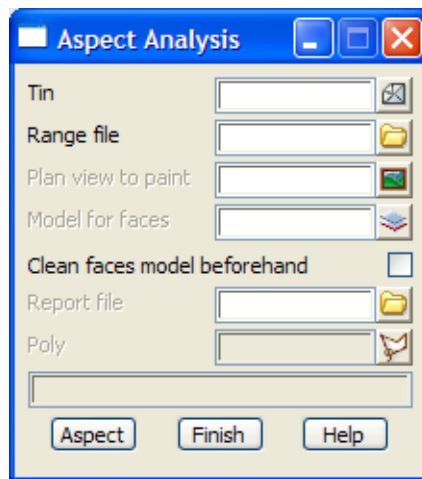
lower_bearing upper_bearing range_colour

where this line represents all bearings satisfying

lower_bearing < bearing <= upper_bearing.

For each range in the file, the plan and slope areas of the triangles in the bearing range will be reported on, and the range_colour can be used to colour all areas on a plan view satisfying the range.

On selecting the aspect analysis option, the **Aspect Analysis** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Tin <i>name of the tin for which the aspects of the triangles will be calculated.</i>	input		available tins
Range file <i>the user supplied range file is used to split up the aspect report and define the range colours used for painting a plan view.</i>	input		*.arf
Plan view to paint <i>if non-blank, the given plan view will be painted according to the range colours given in the range file.</i>	input		available views
Model for faces <i>if non-blank, faces will be created with colours according to the range colours given in the range file.</i>	input		available models
Clean faces model beforehand <i>if tick, the model of faces is cleaned out before the option runs.</i>	tick box		

Report file input *.rpt
name of the file to contain the aspect report. If the file already exists, the report will be appended to the file. If no name is given, no report is produced.

Poly string-select
if selected, this string is used as the bounding polygon for the aspect calculations.

Aspect button
the aspects of the triangles of the tin within the selected bounding polygon are calculated.

<esc> can be used to terminate the option during aspect calculations.

Example of an Aspect Range File

```
// aspect range file
// format: lower_bearing upper_bearing colour_for_range
0 45 red // colour red the triangles with bearing greater than 0 and less than or equal to 45
45 90 green // colour green the triangles with bearing > 45, and <= 90
90 123.30 "dark green" // colour dark green triangles with bearing > 90 and <=1 to 123 deg 30'
```

Aspect Analysis 2 and 2 (new)

aspect_analysis_2

Position of option on menu: Tins =>Tin analysis =>Aspect => Aspect Analysis 2

Position of option on menu: Tins =>Tin analysis =>Aspect => Aspect Analysis 2 (new)

As with the aspect analysis option, the aspect analysis 2 option is used to calculate the aspect or direction that the triangles in the tin face. [aspect_analysis_2_new](#)

However, this option can also create the strings that bound the triangles in the same aspect range. The aspect analysis 2 (new) option is the same as aspect analysis 2 except the boundary polygons have slightly different names.

One restriction for this option is that the calculations **can not** be restricted to be within a polygon and the entire tin is used.

For aspect analysis 2, the range file consists of a list of aspect ranges and colours, one set per line, in the format as for aspect analysis:

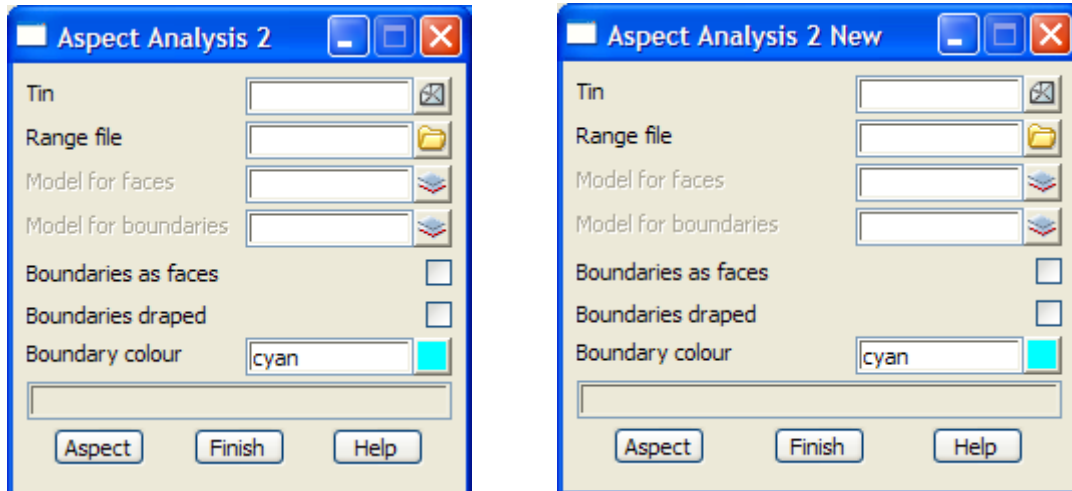
```
lower_bearing upper_bearing range_colour
```

where this line represents all bearings satisfying

```
lower_bearing < bearing <= upper_bearing.
```

For each range in the file, the boundary strings for areas of common range can be created and also coloured faces that can be displayed on any plan view.

On selecting the aspect analysis 2 option, the **Aspect Analysis 2** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Tin <i>name of the tin for which the aspects of the triangles will be calculated.</i>	input		available tins
Range file <i>the user supplied range file is used to split the triangles into groups of common aspects so that boundary strings can be created and the range colours used for faces and the boundary strings.</i>	input		*.arf
Model for faces <i>if non-blank, a faces will be created (with the colour given in the range file) for each triangle.</i>	input		available models
Model for boundaries <i>if non-blank, for each range of aspects in the range file, boundary strings will be created for regions of common aspect. The boundary strings are given the name "aspect boundaries" plus the number of the entry in the range file. Many of the boundaries will exist twice since they are the upper boundary for one range and the lower boundary for the next range but will have a different colour and name. For aspect analysis 2 (new), the boundary name also has the addition of "face" and a number to more clearly differentiate the boundaries of the same range.</i>	input		available models
Boundaries as faces <i>if tick, output the regions of common aspect as faces.</i>	tick box		
Boundary colour <i>not used - was the colour for the aspect boundaries.</i>	input	cyan	available colours
Aspect <i>On selecting this button, the aspects of the triangles of the tin are calculated and the appropriate boundaries and faces created.</i>	button		

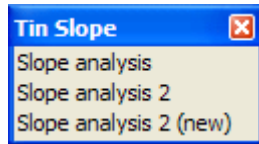
<esc> can be used to terminate the option during aspect calculations.

Slope

tin_slope

Position of menu: Tins =>Tin analysis =>Slope

The tin slope options calculate and report on the slopes of the triangles. The tin slope walk-right menu is



colour and report for ranges of slopes

The options in this menu will now be discussed.

Slope Analysis**slope_analysis**

Position of option on menu: Tins =>Tin analysis =>Slope =>Slope analysis

This panel is used to calculate the slopes of triangles in the tin. The calculations can be restricted to within a user selected polygon, or if no polygon is selected, the entire tin is used.

The calculated slopes can be produced and reported over user supplied slope ranges. Similarly, a plan view can be temporarily coloured on a slope basis using the same **range** file. The temporary colours will disappear next time the view is refreshed.

For permanency, the option can also create coloured faces with the appropriate range colour. The faces can be displayed on any plan view using a solid fill colour or a hatch pattern.

For slope analysis, the range file consists of a list of ranges and colours, one set per line, in the format

```
lower_slope upper_slope range_colour
```

where this line represents all slopes satisfying

```
lower_slope < slope <= upper_slope.
```

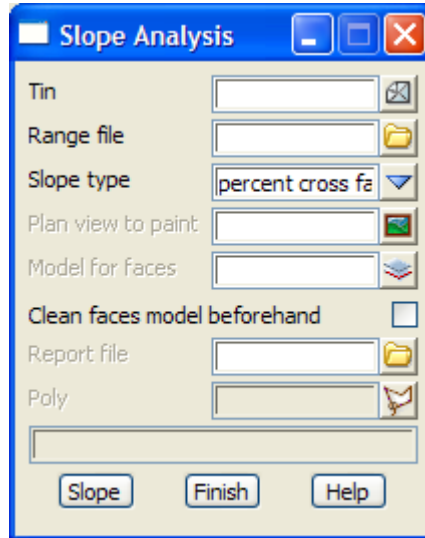
The slopes in the file can be percent cross fall, "1v in" slope or degrees (in **12d** Model dms format) but they must **all be of the same type** in the file.

Note - if "1v in" is used, the range is converted to:

```
smaller_slope_as_percent_cross_fall < slope <= larger_slope_as_percent_crossfall
```

For each range in the file, the plan and slope areas of the triangles in the range will be reported on, and the range_colour used to colour all areas on a plan view satisfying the range.

On selecting the Slope analysis option, the **Slope Analysis** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Tin <i>name of the tin for which the slopes of the triangles will be calculated.</i>	input		available tins
Range file <i>the user supplied range file is used to split up the slope report and define the range colours used for painting a view.</i>	input		*.srf
Slope type <i>the units used for slope in the range file.</i>	input		percent cross fall, degrees, 1v in
Plan view to paint <i>if non-blank, the given plan view will be painted according to the range colours given in the range file.</i>	input		available views
Clean faces model beforehand <i>if tick, the model of faces is cleaned out before the option runs.</i>	tick box		
Model for faces <i>if non-blank, faces will be created with colours according to the range colours given in the range file.</i>	input		available models
Report file <i>name of the file to contain the slope report. If the file already exists, the report will be appended to the file. If no name is given, no report is produced.</i>	input		*.rpt
Poly <i>if selected, this string is used as the bounding polygon for the slope calculations.</i>	string-select		
Slope <i>On selecting this button, the slopes of the triangles of the tin within the selected bounding polygon are calculated.</i>	button		

<esc> can be used to terminate the option during slope calculations.

Example of a Slope Range File

```
// slope range file in percent cross fall
// format: lower_slope upper_slope colour_for_range
0 5 red // colour red the triangles with slope greater than 0% and less than
// or equal to 5% x-fall
5 10 green // colour green the triangles with slope > 5%, and <= 10% x-fall
10 300 "dark green" // colour dark green triangles with slope greater than 10%
// and less than or equal to 300% x-fall

// slope range file in "1v in" slopes
// format: lower_slope upper_slope colour_for_range
0 20 red // colour red the triangles with slope greater than flat and
// less than or equal to 1:20
20 10 green // colour green the triangles with slope between 1:20 and equal to 1:10
10 1 blue // colour blue triangles with slope between 1:10 and equal to 1:1
```

Slope Analysis 2 and 2 (new)

[slope_analysis_2](#)

[slope_analysis_2_new](#)

Position of option on menu: Tins =>Tin analysis =>Slope =>Slope analysis 2

Position of option on menu: Tins =>Tin analysis =>Slope =>Slope analysis 2 (new)

As with the slope analysis option, the slope analysis 2 option is used to calculate the slope of triangles in the tin. However, this option can also create the strings that bound the triangles in the same slope range.

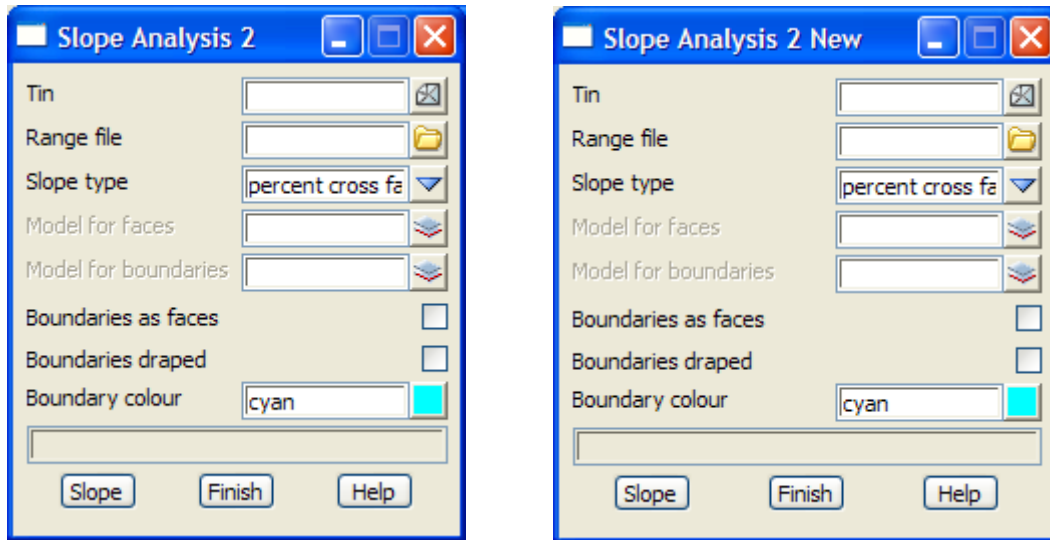
The slope analysis 2 (new) option is the same as *slope analysis 2* except the boundary polygons have slightly different names.

One restriction for this option is that the calculations **can not** be restricted to be within a polygon and the entire tin is used.

The range file for slope analysis 2 has the same format as for slope analysis.

For each range in the file, the boundary strings for areas of common range can be created and also coloured faces that can be displayed on any plan view.

On selecting the Slope analysis 2 option, the **Slope Analysis 2 new** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Tin <i>name of the tin for which the slopes of the triangles will be calculated.</i>	input		available tins
Range file <i>the user supplied range file is used to split the triangles into groups of common slopes so that boundary strings can be created and the range colours used for faces.</i>	input		*.srf
Slope type <i>the units used for slope in the range file.</i>	input		percent cross fall, degrees, 1v in
Model for faces <i>if non-blank, a faces will be created (with the colour given in the range file) for each triangle.</i>	input		available models
Model for boundaries <i>if non-blank, for each range of slopes in the range file, boundary strings will be created for regions of common slope. The boundary strings are given the name "slope boundaries" plus the number of the entry in the range file. Many of the boundaries will exist twice since they are the upper boundary for one range and the lower boundary for the next range but they will have a different colour and name. For slope analysis 2 (new), the boundary name also has the addition of "face" and a number to more clearly differentiate the boundaries of the same range.</i>	input		available models
Boundaries as faces <i>if tick, output the regions of common aspect as faces.</i>	tick box		
Boundary colour <i>colour for the slope boundaries.</i>	input	cyan	available colours
Slope	button		

On selecting this button, the slopes of the triangles of the tin are calculated and the appropriate boundaries and faces created.

<esc> can be used to terminate the option during slope calculations.

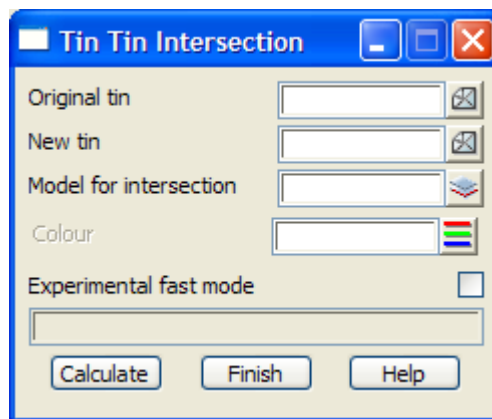
Intersection

tin_tin_intersection

Position of option on menu: Tins =>Tin analysis =>Intersection

The intersection option finds the lines of intersection between two tins.

On selecting the intersection option, the **Tin Tin Intersection** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Original tin <i>name of one of the tins to be intersected.</i>	input		available tins
New tin <i>name of the other tin to be intersected.</i>	input		available tins
Model for intersection <i>name of the model to contain the intersection strings.</i>	input		available models
Colour for intersection <i>colour to make the intersection strings</i>	input	default colour	available colours
Calculate <i>calculate the intersection between two tins given in the panel fields. The resulting intersection strings are added to the model given in the model for intersection field.</i>	button		

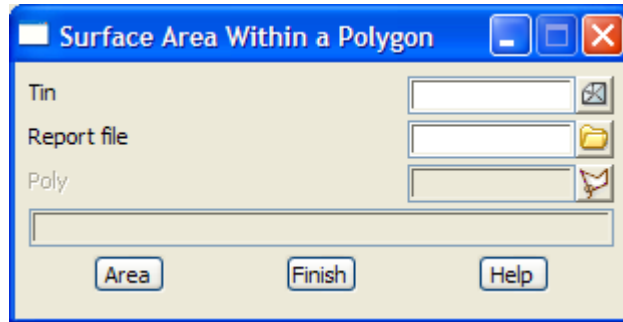
Surface Area

surface_area_within_a_polygon

Position of option on menu: Tins =>Tin analysis =>Surface area

The surface area option is used to calculate the surface area of a tin within a user selected string.

On selecting the surface area option, the **surface area within a polygon** panel is placed on the screen.



The fields and buttons have the following functions.

Field Description	Type	Defaults	Pop-Up
Tin <i>the tin to calculate the surface area on.</i>	input		available tins
Report file <i>if non-blank, the name of the file to write the surface area within the selected polygon to.</i>	input		*.rpt files
Poly <i>select the string to find the slope area within.</i>	button		
Area <i>calculate the surface area of the tin within the selected polygon.</i>	button		

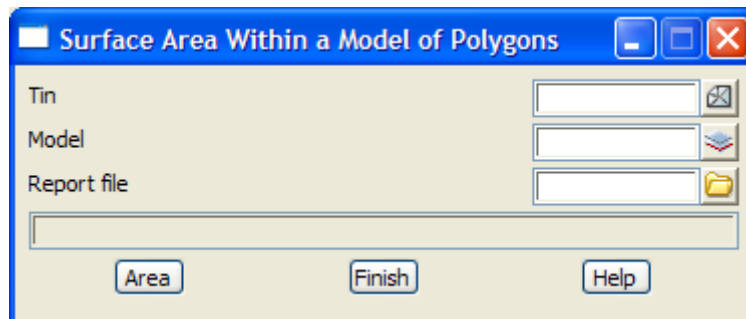
Surface Area 2

surface_area_within_a_model_of_polygons

Position of option on menu: Tins =>Tin analysis =>Surface area 2

The **surface area 2** option is used to calculate the surface area of a tin within each polygon in a model.

On selecting the **surface area 2** option, the **Surface Area Within a Model of Polygons** panel is placed on the screen.



The fields and buttons have the following functions.

Field Description	Type	Defaults	Pop-Up
Tin <i>the tin to calculate the surface area on.</i>	input		available tins
Model <i>the model of polygons for calculating surface area within.</i>	input		available models
Report file <i>if non-blank, the name of the file to write the surface area within each polygons in the model, plus the total of the surface area.</i>	input		*.rpt files
Area <i>calculate the surface area of the tin within each polygons in the model, and sum the areas.</i>	button		

Viewshed

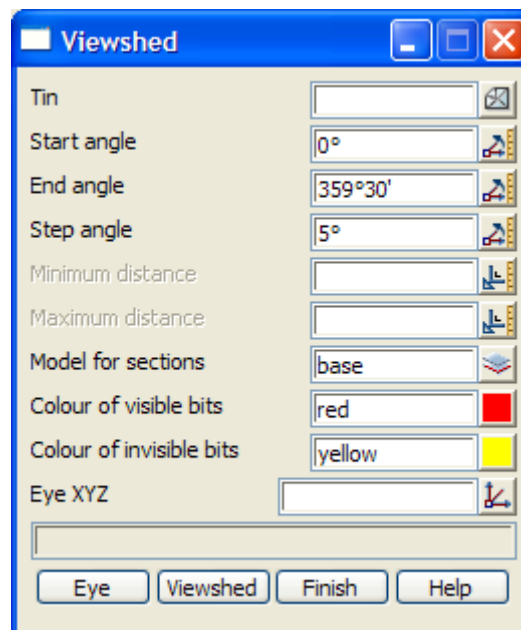
viewshed

Position of option on menu: Tins =>Tin analysis =>Viewshed

This panel is used to calculate the points that are visible and invisible from a user selected eye position. This is equivalent to calculating the points that can or can not see a selected point.

The calculations are made along rays emanating from the eye point from a minimum to a maximum distance from the eye point. The rays are created at regular angular steps from a start angle to an end angle.

On selecting the viewshed option, the **Viewshed** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Tin <i>name of the tin to be used for the viewshed analysis.</i>	input		available tins

Start angle	input	0	
			<i>the angle to begin taking sight rays emanating from the eye point.</i>
End angle	input	359.30	
			<i>the angle to stop taking sight rays emanating from the eye point.</i>
Step angle	input	5	
			<i>the angle between successive sight rays emanating from the eye point.</i>
Minimum distance	input		
			<i>if non-blank, the minimum distance from the eye point along the sight ray to begin recording visible/invisible points.</i>
			<i>If blank, the minimum distance is zero.</i>
Maximum distance	input		
			<i>the maximum distance from the eye point along the sight ray to record visible/invisible points.</i>
			<i>If blank, the entire tin is considered.</i>
Model for sections	input		available models
			<i>the model for the visible/invisible sight strings.</i>
Colour of visible bits	input		default line colour
			<i>if non-blank, the colour for the visible parts of the rays.</i>
			<i>If blank, the visible parts are not created.</i>
Colour of invisible bits	input		default point colour
			<i>if non-blank, the colour for the invisible parts of the rays.</i>
			<i>If blank, the invisible parts are not created.</i>
Eye XYZ	input/output		xyz ops menu
			<i>the XYZ co-ordinates of the eye point.</i>
Eye	button		
			<i>if picked, an eye point is selected and then the height displayed in an enter height input box. If required, a new height can be typed into the enter height box. After typing an <enter> into the input box, the box is removed from the screen and the x, y and height is piped into the eye XYZ panel field.</i>
Viewshed	button		
			<i>On selecting this button, the lines of sight emanating from the eye XYZ point are calculated.</i>
			<esc> can be used to terminate the option during viewshed calculations.

Flow Arrows

flow_arrows

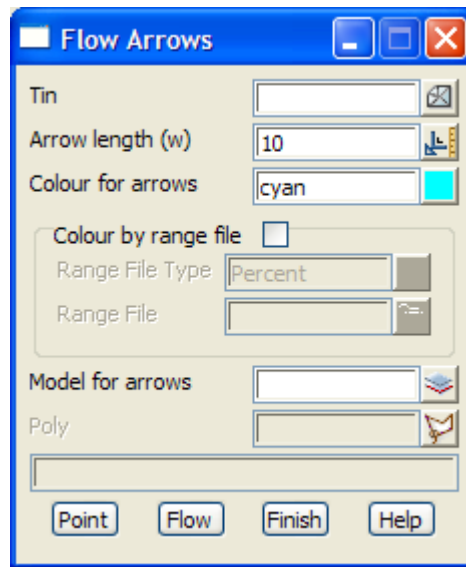
Position of option on menu: Tins =>Tin analysis =>Flow arrows

The **flow arrows** option draws arrows indicating the flow direction across triangles in a tin.

The flow arrows can be drawn for selected points, for all the triangles within a polygon, or if no polygon is selected, for all triangles in the tin.

The arrows are drawn at the centroid of the triangle and have a fixed user given length.

On selecting the **flow arrows** option, the **flow arrows** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Tin <i>name of the tin to calculate flow arrows for.</i>	input		available tins
Arrow length (w) <i>length in world units to draw the flow arrows.</i>	input		
Colour for arrows <i>colour for the arrows.</i>	input	cyan	available colours
Model for arrows <i>model to put flow arrows in. Must be non-blank.</i>	input		available models
Pick <i>after selecting pick, a flow arrow is drawn at each selected point. This continues until cancel is selected from the pick ups menu.</i>	button		
Poly <i>if a polygon is selected, then the spot heights will be restricted to within the polygon. If no polygon is selected, the spot heights will be calculated over the entire tin.</i>	button		
Flow <i>calculate the flow arrows for all the triangles in the tin, or if a polygon has been selected, for the triangles whose centroid is inside the polygon.</i>	button		

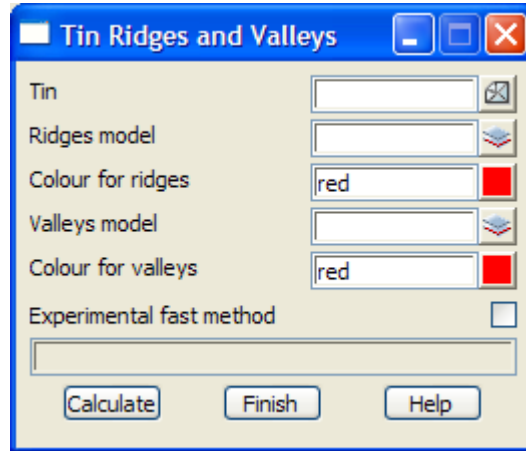
Ridge/Valleys

tin_ridges_and_valleys

Position of option on menu: Tins =>Tin analysis =>Ridges/Valleys

In the ridge/valleys option, ridge and valley lines are calculated for the given tin.

On selecting the ridge/valley option, the **tin ridges and valleys** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Tin <i>name of the tin to calculate ridge and valley lines for.</i>	input		available tins
Ridge model <i>if non-blank, the name of the model to contain the ridge lines. If blank, the ridge lines are not created.</i>	input		available models
Colour for ridges <i>colour for the ridge lines</i>	input	default colour	available colours
Valleys model <i>if non-blank, the name of the model to contain the valley lines. If blank, the valley lines are not created.</i>	input		available models
Colour for valleys <i>colour for the valley lines</i>	input	default colour	available colours
Calculate <i>ridge and valley lines will be calculated for the given tin and placed in the ridge and valley models.</i>	button		

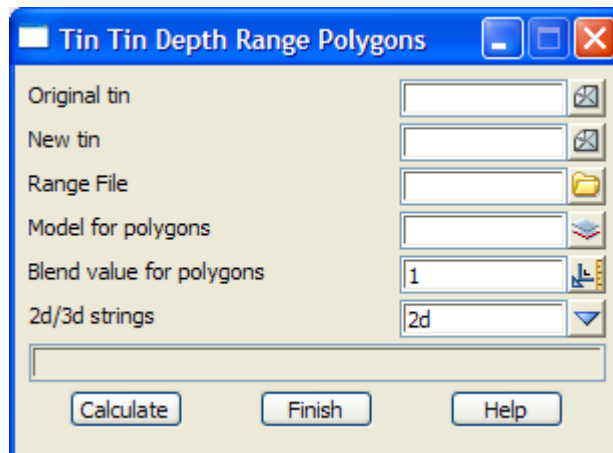
Depth Range Polygons

tin_tin_depth_range_polygons

Position of option on menu: Tins =>Tin analysis =>Depth range polygons

In the Depth range polygons option, polygons are created around the regions given by a depth range file.

On selecting the Depth range polygons option, the **Tin Tin Depth Range Polygons** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Original/New Tin <i>name of the original/new tin for determining depths between.</i>	tin box		available tins
Range file <i>the user supplied range file for splitting up the depths.</i>	input		*.drf
Model for polygons <i>model to contain the polygons.</i>	model box		available models
Calculate <i>create the polygons surrounding regions of different heights between the tins.</i>	button		

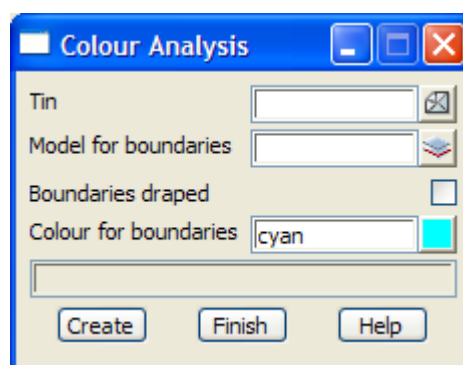
Polygons from Tin Colours

colour_analysis

Position of option on menu: Tins =>Tin analysis =>Polygons from colours

In the Polygons from colours option, polygons are created around the different coloured regions of the tin.

On selecting the Polygons from colours option, the **Colour Analysis** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Tin	input		available tins

name of the tin to calculate polygons around the coloured regions.

Model for boundaries input available models

model to contain the polygons.

Colour for boundaries input default colour available colours

colour for the polygons

Boundaries draped tick box

if tick, the z-values for the vertices for the boundary strings come from the vertices of the coloured triangles.

If not tick, the boundaries have constant z-values.

Colour for boundaries input default colour available colours

colour for the polygons

Create button

create the polygons surrounding regions of different colours on the tin.

Inquire

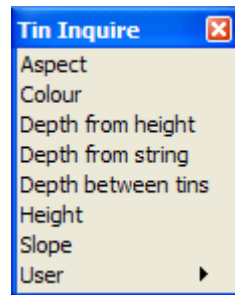
tin_inquire

Position of menu: Tins =>Inquire

The inquire options are used to display at the current cursor position the height (z-value) on a tin, the colour of the triangle, the depth from a fixed height to a tin, and the depth between two tins.

Once the user specifies which tin or tins are to be analysed, then as the cursor moves around in any plan view, the triangles below the cursor are examined and the appropriate information displayed.

The tin inquire walk-right menu is



report aspect of triangles
report colour of tin
calculate depth from height to tin
calculate depth from string to a tin
calculate depth between tins
report height on tin
report slope of triangles

The options in the tin inquire menu will now be discussed.

For the options *Aspect*, please go to the section “Aspect Inquire” .

<i>Colour</i>	“Colour Inquire”
<i>Depth from height</i>	“Depth from Height”
<i>Depth from string</i>	“Depth from String”
<i>Depth between tins</i>	“Depth Between Tins”
<i>Height</i>	“Height Inquire”
<i>Slope</i>	“Slope Inquire”

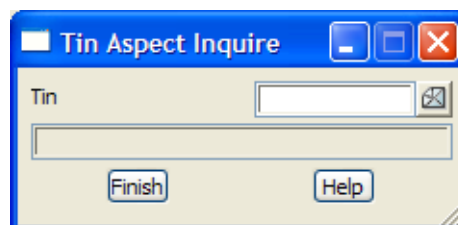
Aspect Inquire

tin_aspect_inquire

Position of option on menu: Tins =>Inquire =>Aspect

The aspect inquire option calculates and displays the aspect (direction) of the triangles under the current plan view cursor position. The aspect is displayed in bearings in degrees, minutes and seconds.

On selecting the tin aspect inquire option, the **tin aspect inquire** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Tin	input		avail tins

name of the tin for which the aspect of the triangle that the cursor is above will be displayed in the

panel's message area.

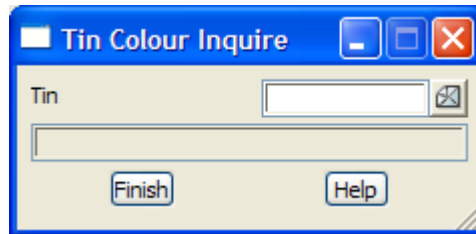
Colour Inquire

tin_colour_inquire

Position of option on menu: Tins =>Inquire =>Colour

colour inquire displays the colour of the triangles under the current plan view cursor position.

On selecting the tin colour inquire option, the **tin colour inquire** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Tin	input		available tins

name of the tin for which the colour of the triangle at the current cursor position is displayed in the panel's message area.

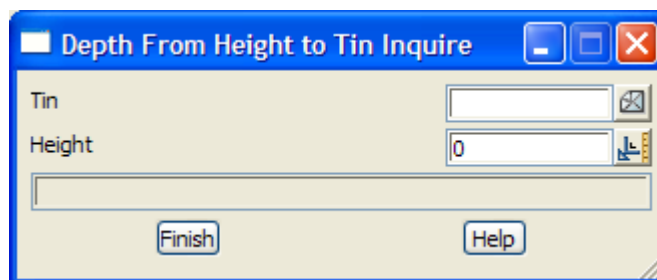
Depth from Height

depth_from_height_to_tin_inquire

Position of option on menu: Tins =>Inquire =>Depth from height

The depth from height option calculates and displays the difference between the z-value of a tin and a given height for the current plan view cursor position.

On selecting the depth from height option, the **depth from height to tin inquire** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Tin	input		available tins

name of the tin used for calculating the distance from the tin to the given height at the cursor position.

Height	input	0	
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the difference between the tin value and the value given in this field is displayed in the panel's message area.

Depth from String

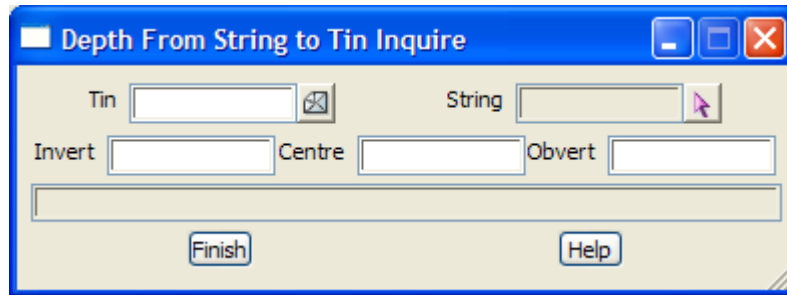
depth_from_string_to_tin_inquire

Position of option on menu: Tins =>Inquire =>Depth from string

The depth from string option calculates and displays the difference between the z-value of a tin and the height of a selected string at the current plan or section view cursor position projected back onto the selected string.

The obvert (top of the string) value is also known as the **cover** above a string to a tin.

On selecting the Depth from string option, the **Depth From String to Tin Inquire** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Tin	input		available tins

name of the tin used for calculating the z-value at the cursor position.

String	string-select
---------------	---------------

if a string is selected, the difference between the tin value and the height of the selected string (to the invert, centre and obvert of the string) at the current plan or section view cursor position, projected back onto the selected string, is displayed in the panel's message areas.

Invert/Centre/Obvert	output
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displays the distance between the tin and the invert (bottom), centre and obvert (top) of the selected string

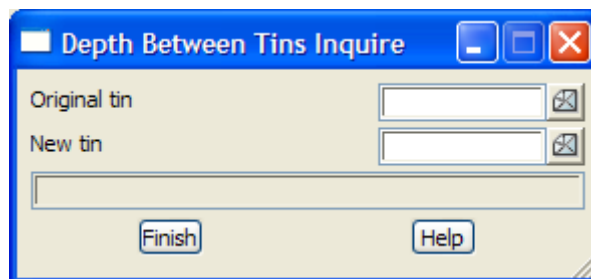
Depth Between Tins

depth_between_tins_inquire

Position of option on menu: Tins =>Inquire =>Depth between tins

The depth between tins option calculates and displays the difference between the z-values of two given tins at the current plan view cursor position.

On selecting the **depth between tins** option, the **depth between tins inquire** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Original/new tin	input		available tins
<i>name of the two tins or which the z-value is to be calculated at the current plan view cursor position and the difference between the z-values ($z_{\text{new}} - z_{\text{original}}$) is displayed in the panel's message area.</i>			

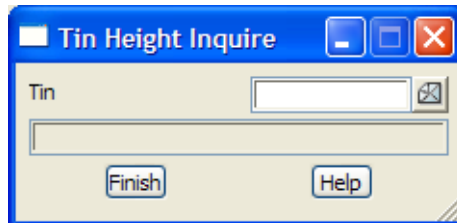
Height Inquire

tin_height_inquire

Position of option on menu: Tins =>Inquire =>Height

The height inquire option calculates and displays the height (z-value) of triangles from a tin at the current plan view cursor position.

On selecting the tin height inquire option, the **tin height inquire** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Tin	input		available tins

name of the tin for which the z-value at the current plan view cursor position is displayed in the panel's message area.

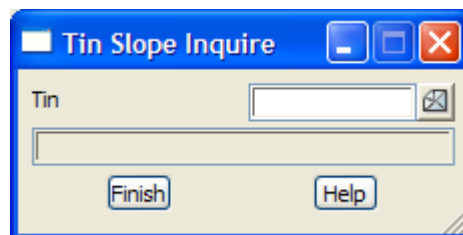
Slope Inquire

tin_slope_inquire

Position of option on menu: Tins =>Inquire =>Slope

The slope inquire option calculates and displays the slope of triangles from a tin at the current plan view cursor position. The slope is displayed as a percent cross fall, a "1v in "slope and as an angle in degrees, minutes and seconds.

On selecting the tin slope inquire option, the **tin slope inquire** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Tin	input		avail tins

name of the tin for which the slope of the triangle that the cursor is above is displayed in the panel's message area.

Null

tin_null

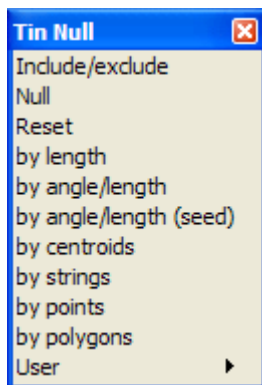
Position of menu: Tins =>Null

The triangulation process forms triangles throughout the convex polygon enclosing the data set. This means that triangles may cross regions where there is very little data and may produce strange results in the ill-defined regions.

In **12d** Model, it is possible to make triangles invisible (called **nulling** triangles) so that they are not used in any options.

Note - nulled triangles are **not** deleted and can be made visible again at any time.

The **null** walk-right menu is



set a polygon to include/exclude all triangles inside the polygon
 null triangles outside a polygon
 reset all null triangles
 null triangles by length of sides
 null triangles by length of sides and angle
 null/reset triangle under the centroid of strings
 null triangles that are crossed by strings
 pick triangles to null/reset
 null/reset triangles inside/outside polygons

The three options in the tin colouring menu will now be discussed.

For the options *Include/exclude*, please go to the section "Include/Exclude Boundaries" .

<i>Null</i>	"Null"
<i>Reset</i>	"Reset"
<i>by length</i>	"Null by Length"
<i>by angle/length</i>	"Null by Angle and Length"
<i>by centroids</i>	"Null by Centroids"
<i>by string</i>	"Null by Strings"
<i>by points</i>	"Null by Points"
<i>by polygons</i>	"Null by polygons"

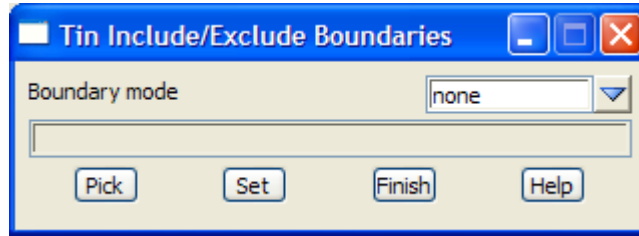
Include/Exclude Boundaries

tin_include_exclude_boundaries

Position of option on menu: Tins =>Null =>Include/excludes

The **Include/exclude** option is used to tag a polygon that is part of the data set for a Tin so that all the triangles inside the polygon are either set to null or non-null.

On selecting the **Include/exclude** option, the **Tin Include/Exclude Boundaries** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Boundary mode	choice box	none	none, include, exclude

mode to set the polygon to.

*If the mode is **exclude**, then any triangles inside the polygon are set to null.*

*If the mode is **include**, then any triangles inside the polygon are reset so that they aren't null.*

*If the mode is **none**, then the polygon is not used for automatically nulling/resetting triangles.*

Pick button

select the polygon to define a boundary mode for.

Set button

set the boundary mode for the selected polygon.

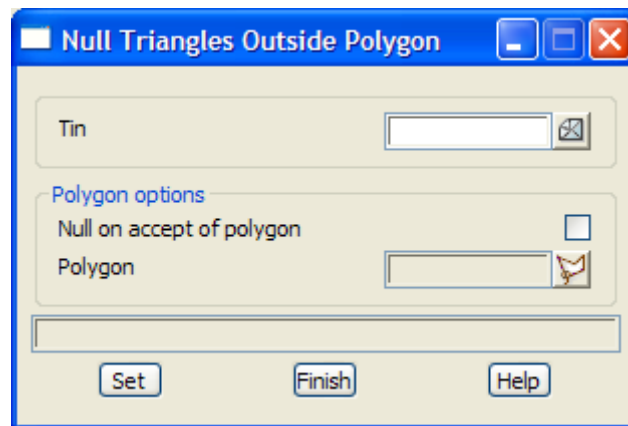
Null

null_triangles_outside_polygon

Position of option on menu: Tins =>Null =>Null

The null option is used to **null** any triangle whose *centroid* is outside a user selected polygon.

On selecting the Null option, the **Null Triangles Outside Polygon** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Tin	input		available tins

name of the tin to null triangles in.

Null on accept of polygon tick box

if tick, the triangles will be nulled as soon as the string is accepted.

*If not tick, the triangles will not be nulled until the **Set** button is selected.*

Polygon button

the string to be used as the polygon is selected after choosing this button. If Null on accept of polygon is set, then the polygon is processed immediately.

Set button

process the selected string/. Any triangle whose centroid is outside the selected boundary polygon is set to null.

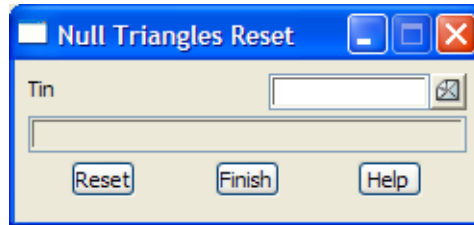
Reset

null_triangles_reset

Position of option on menu: Tins =>Null =>Reset

The reset option is used to change all the nulled triangles in a tin back to the visible triangles.

On selecting the reset option, the **Null Triangles Reset** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Tin <i>name of the tin to have any nulled triangles reset to being visible triangles.</i>	input		available tins
Reset <i>the reset button resets all null triangles in the tin to the base colour.</i>	button		

Null by Length

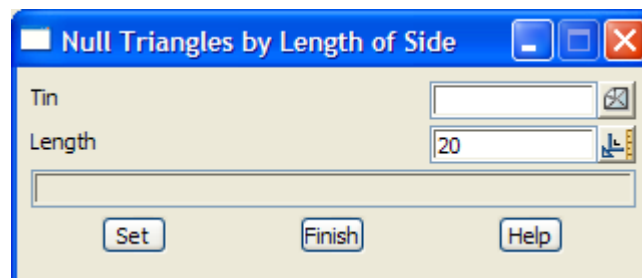
null_triangles_by_length_of_side

Position of option on menu: Tins =>Null =>by length

The null by length option is used to **null** any triangle with a side of length greater than a user specified length.

Warning - this option will null out *internal* triangles. The next option, Null by angle/length will only null triangles on the outer shell.

On selecting the by length option, the **null triangles by length of side** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Tin <i>name of the tin to null triangles in.</i>	input		available tins
Length	input		

length to check triangle sides against.

Set button

*after selecting the **set** button, the tin will be processed and any triangle with a side of length greater than the value given in the length panel field, will be nulled.*

Null by Angle and Length

null_triangles_by_angle_and_length

Position of option on menu: Tins =>Null =>by angle/length

The null by angle/length option is a more powerful nulling option which tries to remove most of the external triangles that one expects should be removed. For example, for a T-intersection, all the long, thin outer triangles should be removed. The option has two sets of tests - one to remove long thin triangles and the other which uses a combined test to remove squat triangles.

Unlike the *null by length* option, *null by angle/length* only works on triangles which have an outer null triangle on one or two sides (it does not work on internal holes). These triangles are called *external triangles* and sides with an outer null triangle on them are called *external sides*.

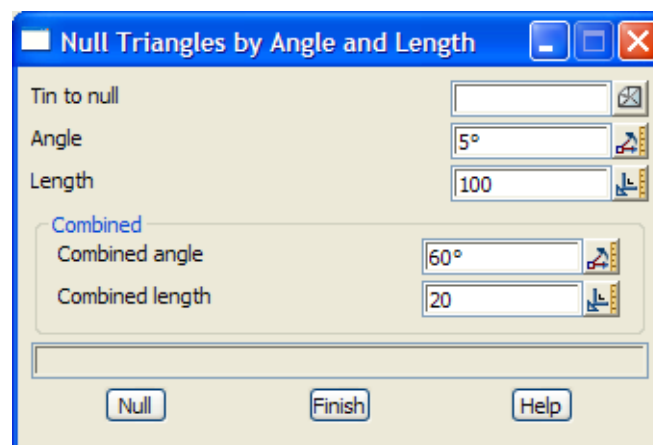
The *null by angle and length* option **does not** remove triangles whose external side is a breakline. Hence, as expected, breaklines will stop the nulling process.

Note that *null by angle and length* keeps processing the remaining non-nulled triangles until no more can be nulled or are stopped by breaklines. Hence the nulling works inwards as outer triangles are nulled revealing new external triangles to be tested. The nulling process is like peeling off layers of an onion.

Important note - the setting for this option are **stored** by the triangulation and the option is automatically re-run if the triangulation is re-run. To turn off the tests, just set the panel fields to blank.

Warning - this option should be the first nulling option used because all null triangles are first reset to valid triangles before this option is applied.

On selecting the null by angle/length option, the **Null Triangles by Angle and Length** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
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Tin to null	input		available tins
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name of the tin to have triangles nulled. If this option has been previously run on the tin, the previous panel values are written into the panel fields.

Angle	input	5	
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if a triangle has an external side (that is not a breakline) with an angle on it less than Angle, then the triangle is nulled. The default value works most of the time.

If blank then no triangles are nulled by this test.

Length input 100

if a triangle has an external side (that is not a breakline) greater than Length, the triangle is nulled.
If blank then no triangles are nulled by this test.

Combined angle input 60

Combined length input 20

For the Combined case, a triangle is nulled if it:

has an external side (that is not a breakline) and the **sum** of the two angles on it is **less** than Combined angle (the default value works most of the time)
and

has an external side (that is not a breakline) whose length is **greater** than Combined length. A suggested value is one third to one half of Length.

If either Combined angle or Combined length is blank, then no triangles are nulled by this test.

Null button

after selecting the **Null** button, all nulled triangles are reset to be valid triangles and the tin then processed and triangles nulled.

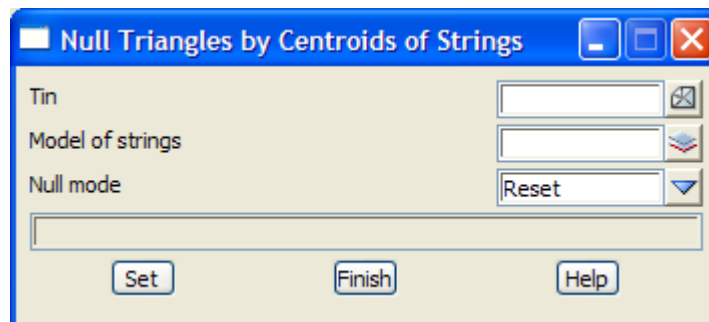
Null by Centroids

[null_triangles_by_centroids_of_strings](#)

Position of option on menu: Tins =>Null =>by centroids

null by centroids is used to **null/reset** any triangle that lies **under** the centroid of a string.

On selecting the by centroids option, the **null triangles by centroids of strings** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
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Tin	input		available tins
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name of the tin to null/reset triangles in.

Model of strings	input		available models
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model of strings to be used to select triangles that are under a centroid of one of the model's strings.

Null mode	input	Reset	Reset, Null
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*if **null**, any triangle under the centroid of a string from the model of strings, will be nulled.*

***reset**, any triangle under the centroid of a string from the model of strings, will be made visible again.*

Set	button		
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*after selecting the **set** button, the tin will be processed and any triangle under the centroid of a string will be set according to the null mode panel field.*

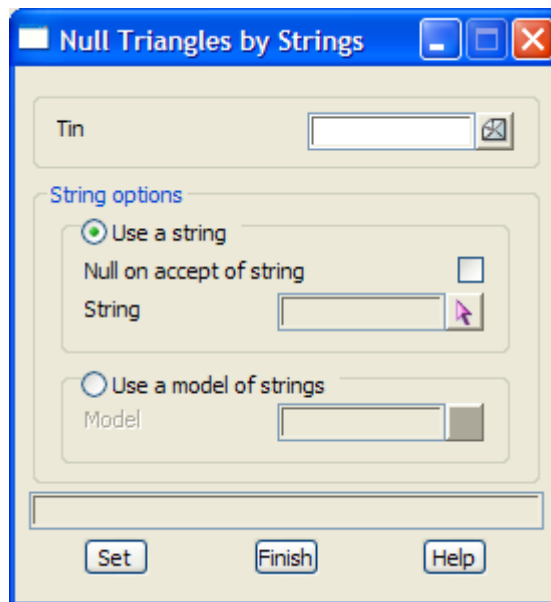
Null by Strings

null_triangles_by_strings

Position of option on menu: Tins =>Null =>by strings

The null by strings option is used to **null** any triangle that is cut by a string.

On selecting the by strings option, the **null triangles by strings** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Tin	input		available tins

name of the tin to null triangles in.

Use a string	radio button
---------------------	--------------

if set, strings will be selected and used to null any triangle that the string passes through.

Null on accept of string	tick box
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if tick, the triangles will be nulled as soon as the string is accepted.

*If not tick, the triangles will not be nulled until the **Set** button is selected.*

String	string select	existing string	string pop-up
---------------	---------------	-----------------	---------------

if string, a strings will be selected and used to null any triangle that the string passes through.

If line, a temporary two point line is drawn and used to null any triangle that the line passes through

If polyline, a temporary polyline is drawn and used to null any triangle that the string passes through

If closed polyline, a temporary closed polyline is drawn and used to null any triangle that the string passes through



Use a model of strings	radio button
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if set, a model of strings is used and a triangle is nulled if it is cut by any one of the strings.

Model	input	available models
--------------	-------	------------------

model of strings to cut the triangles.

Set	button
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*after selecting the **set** button, the tin will be processed and any triangle that is cut by a string from the*

Model, or a selected string for the User a string case, will be nulled.

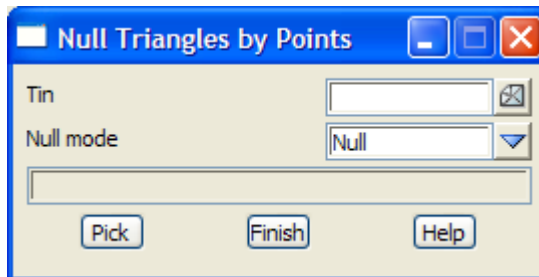
Null by Points

null_triangles_by_points

Position of option on menu: Tins =>Null =>by points

The null by points option is used to **null/reset** any triangle that the user selected with the mouse.

On selecting the **by points** option, the **null triangles by points** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Tin <i>name of the tin to null/reset triangles in.</i>	input		available tins
Null mode <i>if null, any triangles under a cursor pick will be nulled. reset, any nulled triangles under a cursor pick will be turned back on.</i>	input	Null	Reset, Null
Pick <i>any triangle under the cursor select will be processing according to the null mode panel field.</i>	button		

Null by polygons

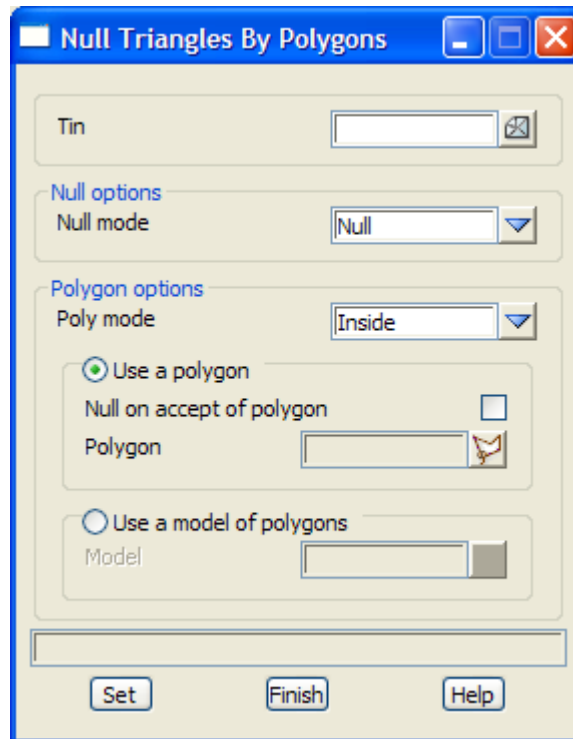
null_triangles_by_polygons

Position of option on menu: Tins =>Null =>by polygons

The null by polygons option is used to **null/reset** any triangles that are inside or outside a user selected polygon, or model of polygons.

If a string is selected to use and it is not closed, then a polygon is formed by joining the first and the last points of the string.

On selecting the **by polygons** option, the **null triangles by polygons** panel is displayed



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Tin <i>name of the tin to null/reset triangles in.</i>	input		available tins
Null mode <i>if null, any triangles selected will be nulled. reset, any nulled triangles selected will be turned back on.</i>	input	Null	Reset, Null
Poly mode <i>mode to select whether the triangles with centroids inside or outside the selected polygons are to be nulled.</i>	input	inside	inside, outside
Use a polygon <i>if set, strings will be selected and used as the polygon to null/reset all triangles with centroids inside/outside the polygon.</i>	radio button		
Null on accept of polygon <i>if tick, the triangles will be nulled/reset as soon as the polygon (string) is accepted. If not tick, the triangles will not be nulled/reset until the Set button is selected.</i>	tick box		
Use a model of polygons <i>if set, a model of strings will be used as the polygons to null/reset triangles whose centroids are inside/outside one of the polygons.</i>	radio button		
Model <i>model of strings to provide the polygons for nulling/resetting triangles.</i>	input		available models
Set <i>each string in the model of polygons is used to null/reset the triangles in the tin given in the tin field</i>	button		

according to the null mode and poly mode panel field.

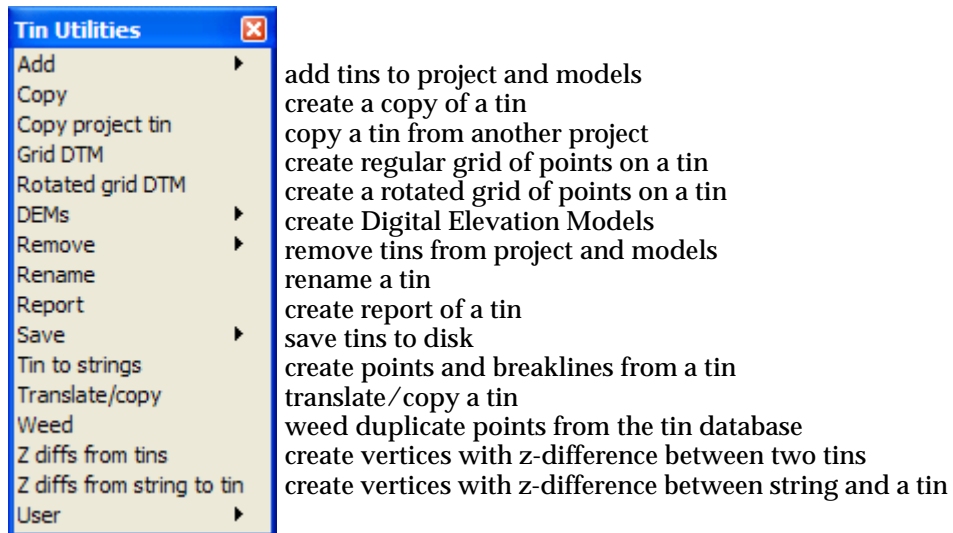
Utilities

tin_utilities

Position of option on menu: Tins =>Utilities =>Tin Utilities

The triangles=>utilities menu contains miscellaneous options involving tins.

The utilities walk-right menu is



Each option will now be described.

For the options <i>Add</i> , go to the section	"Add"
<i>Copy</i>	"Copy"
<i>Copy project tin</i>	"Copy Project Tin"
<i>Grid DTM</i>	"Grid DTM"
<i>Rotated grid DTM</i>	"Rotated Grid"
<i>DEMs</i>	"DEMs"
<i>Remove</i>	"Remove"
<i>Rename</i>	"Rename"
<i>Report</i>	"Report"
<i>Save</i>	"Save"
<i>Tin to strings</i>	"Tin to Strings"
<i>Translate/copy</i>	"Translate/Copy"
<i>Weed</i>	"Weed"
<i>Z diffs from tins</i>	"Z Differences from Tins"
<i>Z diffs from string to tin</i>	"Z Differences from String to Tin"

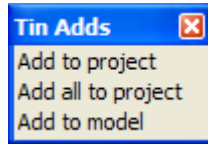
Add

tin_adds

Position of menu: Tins =>Utilities =>Add

Tins can be added to the project and to models.

The tin adds walk-right menu is



The options in this menu will now be described.

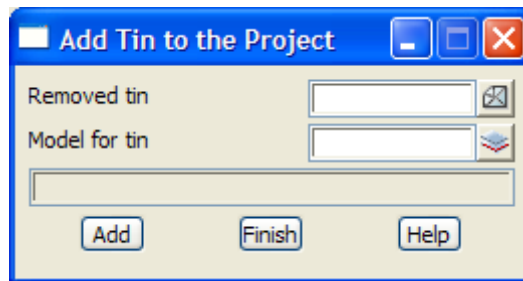
Add to Project

add_tin_to_the_project

Position of option on menu: Tins =>Utilities =>Add =>Add to project

The add to project option is used to add a removed tin back into the project.

On selecting the add tin to project option, the **add tin to the project** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Removed tin <i>name of the tin to be added to the working project. The tin must exist on the disk in the project area and not already be in the project.</i>	input		available tins
Model for tin <i>if non-blank, the loaded tin will be added to the model given in this field.</i>	input		available models
Add <i>Add the tin given in the Tin field to the working project. If the model for tin field is non-blank, the tin will be added to the model given in that field - if the model does not exist, it will be created.</i>	button		

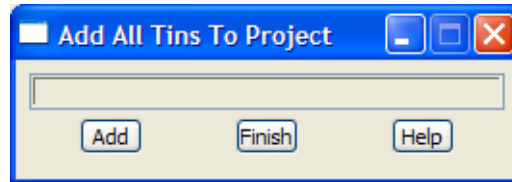
Add All To Project

add_all_tins_to_project

Position of option on menu: Tins =>Utilities =>Add =>Add all to project

The add all tins option is used to add all the removed tins back into the project.

On selecting the add all to project option, the **add all tins to project** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Add	button		

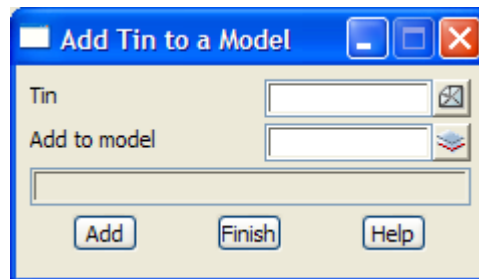
after selecting this button, all removed tins in the working project will be added to the project.

Add to Model

[add_tin_to_a_model](#)

Position of option on menu: Tins =>Utilities =>Add =>Add to model

On selecting the **add to model** output option, the **add tin to a model** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Tin	input		available tins
Add to model	input		available models

name of the tin to be added to a model.

name of the model to which the tin given in the tin field will be added.

Add	button		
------------	--------	--	--

add the tin given in the tin field to the model given by the add to model field.

Copy

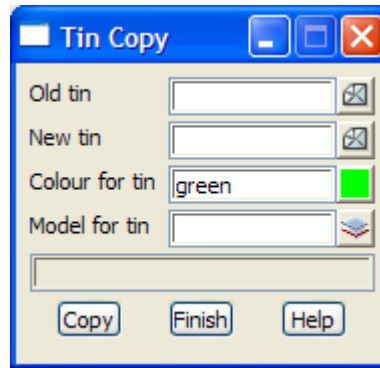
tin_copy

Position of option on menu: Tins =>Utilities =>Copy

A copy of an existing tin can be made using the copy option.

A SuperTin can also be copied and what is created is a new super tin with a new name but exactly the same tins making it up.

On selecting copy, the **tin copy** panel is displayed.



The fields and buttons used in this panel have the following functions.

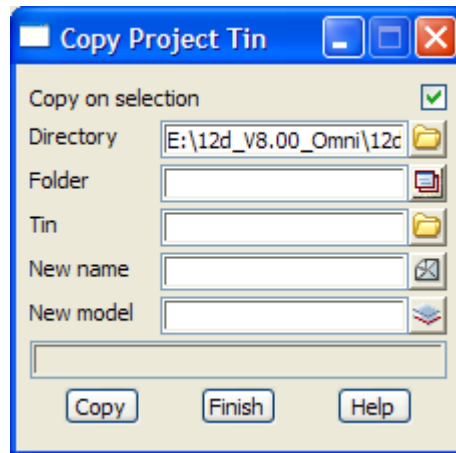
Field Description	Type	Defaults	Pop-Up
Old tin <i>name of the tin to be copied.</i>	input		available tins
New tin <i>name of the copy of the tin - this can't be the same as any existing tin in the project.</i>	input		available tins
Colour of tin <i>if non-blank, the colour of the new tin. If blank, use the old tin colour</i>	input		available colours
Model for tin <i>if non-blank, the name of the model for the new tin. If blank, the tin is not put in any model.</i>	input		available models
Copy <i>after selecting this button, the tin given in the old tin field will be copied and the copy given the name in the new tin field and placed in the model given in the model for tin field.</i>	button		

Copy Project Tin

copy_project_tin

Position of option on menu: Tins =>Utilities =>Add =>Copy project tin

On selecting the copy project tin option, the **copy project tin** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Folder <i>name of the folder that the project to get the tin from, is in.</i>	input		current directories
Project <i>name of the project in the folder given in the folder field, that the tin is to be copied from.</i>	input		current projects
Tin <i>name of the tin to be copied.</i>	input		available tins
New name <i>if non-blank, the new name to be given to the copied tin which must be different to all the exiting tins names in the working project. If blank, keep the name of the original tin (as long as it is different to the existing tins).</i>	input		
New model <i>if non-blank, the tin will be placed in this model.</i>	input		available models
Copy <i>copy to this project, the tin given in the tin field from the project given in the project field.</i>	button		

Grid DTM

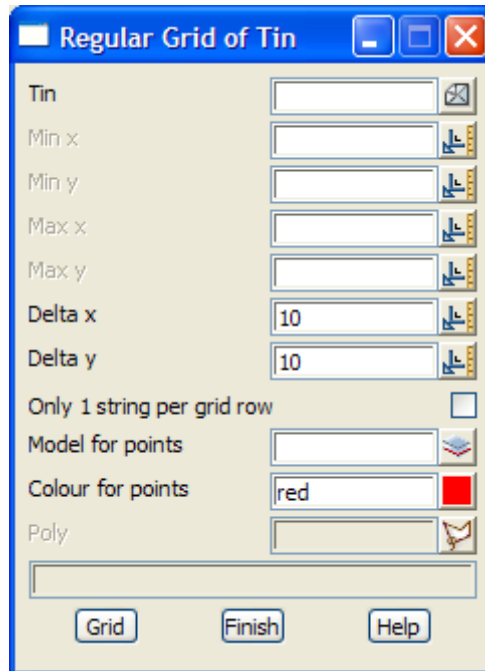
regular_grid_of_tin

Position of option on menu: Tins =>Utilities =>Grid

The **grid** option calculates heights at points at regular x and y increments between given minimum and maximum x and y values. If a polygon is given, a z-value is only calculated for points inside the polygon.

Also see the “DEMs” options for creating a file of a regular grid to different formats (Arc View, Quantm, Sokkia).

On selecting the Grid option, the **Regular Grid of Tin** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Tin <i>name of the tin on which the spot heights will be calculated.</i>	tin box		available tins
Min x/y <i>minimum x/y values to calculate spot heights for.</i>	input		
Max x/y <i>maximum x/y values to calculate spot heights for.</i>	input		
Delta x/y <i>difference between the x/y-values for the grid.</i>	input		
Model for points <i>if blank, no point strings will be created. If non-blank, points strings of the spots heights will be created and stored in this model.</i>	input		available models
Colour for points <i>colour to make the point strings.</i>	input	default colour	available colours
Poly	poly-select		

*if a polygon is selected, then the spot heights will be restricted to within the polygon.
If no polygon is selected, the spot heights will be calculated over the entire tin.*

Grid button

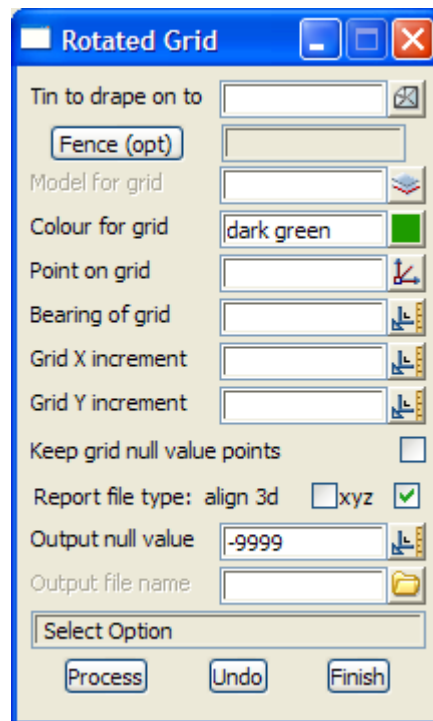
calculate the spot heights at regular points over the area given by the min and maximum x and y values and restricted to be inside the polygon.

Rotated Grid

rotated_grid_panel

Position of option on menu: Tins =>Utilities =>Rotated Grid

This panel is used to create a grid of points with z-values from a given tin. The grid can be rotated and a polygon can be used to restrict the created points. A report of grid points can also be calculated in either simple x y z (one point per line) form or if no polygon is used, in a format accepted by Quantm (formerly Align 3D).



The fields and buttons used in this panel have the following functions:

Field Description	Type	Defaults	Pop-Up
Tin to drape on to <i>Tin to get the z-values from.</i>	tin box		available tins
Fence (opt) <i>Optional – if selected, the grid is restricted to being inside the polygon.</i>	string select		
Model for grid <i>Model for the created grid.</i>	model box		available models
Colour for grid <i>Colour for the created grid</i>	colour box	dark green	available colours
Point on grid <i>The selected point is on the grid. The other grid points are integer multiples of the “Grid X increment” and “Grid Y increment” (with the bearing “Bearing of grid”) from this point.</i>	input box		

Bearing on grid input box

Bearing of the side of the grid.

Grid X increment input box

The grid is made up of points of integer multiple of “Delta X” in the X direction.

Grid Y increment input box

The grid is made up of points of integer multiple of “Delta Y” in the Y direction.

Keep grid null value pointstick box

If tick, the “Output null value” is written out for any null z-values.

Report file type radio button align 3d/xyz xyz

If xyz – the grid is written out as x y z with one point per line. The” Output null value” is used for any null z-values in the grid.

If align 3d – the grid is written out in a format suitable for align 3d. The” Output null value” is used for any null z-values in the grid.

Output null value input box -9999

The z-value to write out if any grid z-value is null.

Output file name file box *.rpt files

Name of the output file for the grid data.

Process button

Run the option

Undo button

Undo the last grid created whilst the panel is up.

DEMs

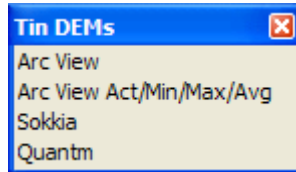
tin_dems

Position of menu: Tins =>Utilities =>Dems

DEMs (Digital Elevation Models) can be created from a tin. DEMs are only regular arrays of z-values, rather than the random values and break lines supported by Tins.

Unfortunately there is not just one formats for DEMs.

The DEMS walk-right menu is



For the option *Arc View*, go to the section “Write Arc View DEM”

- | | |
|---------------------------------|---|
| <i>Arc View Act/Min/Max/Avg</i> | “Write Arc View DEM (Actual, Min, Max, Av)” |
| <i>Quantm</i> | “Quantm” |
| <i>Sokkia</i> | “Sokkia” |

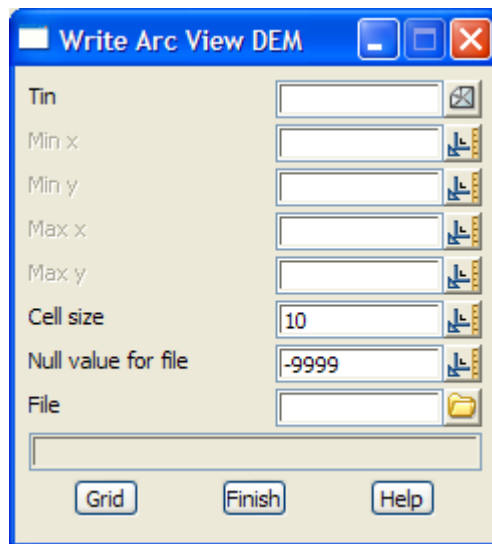
Write Arc View DEM

write_Arc_View_DEM

Position of option on menu: Tins =>Utilities =>DEM =>Arc View

The Arc View option calculates heights at points at regular x and y increments (cell size) between given minimum and maximum x and y values and writes out the data in the Arc View DEM format.

On selecting the Arc View option, the **Write Arc View DEM** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Tin	input		available tins
<i>name of the tin on which the DEM heights will be calculated.</i>			

Min x/y input

minimum x/y values to calculate spot heights for.

Max x/y input

maximum x/y values to calculate spot heights for.

Cell size input

size of the delta x and delta y - cell is a square.

Null value for file input -9999

value to use when writing null z-values out to the file.

File input *.grd

the file name for the spot height values in Arc View DEM format.

Grid button

calculate the spot heights at regular points over the area given by the min and maximum x and y values and write out the file.

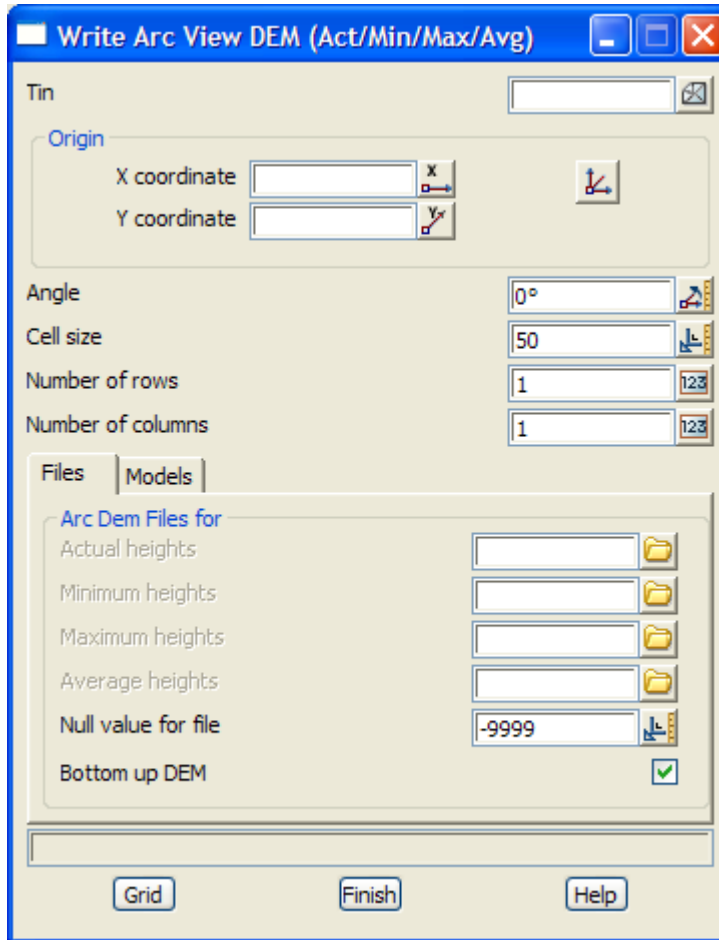
Write Arc View DEM (Actual, Min, Max, Av)

Write_Arc_View_DEM_Act_Min_Max_Avg_

Position of option on menu: Tins =>Utilities =>DEM =>Arc View Act/Min/Max/Avg

The Arc View Act/Min/Max/Agg option calculates heights at points at regular x and y increments (cell size) between given minimum and maximum x and y values, and also the minimum, maximum and average values for the cell. The data is written out in the Arc View DEM format.

On selecting the Arc View Act/Min/Max/Avg option, the **Write Arc View DEM (Act/Min/Max/Avg)** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Tin	input		available tins

name of the tin on which the DEM heights will be calculated.

Cell size	input		
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size of the delta x and delta y - cell is a square.

Null value for file	input	-9999	
----------------------------	-------	-------	--

value to use when writing null z-values out to the file.

Grid	button		
-------------	--------	--	--

calculate the spot heights at regular points over the area given by the min and maximum x and y values and write out the file.

Quantm

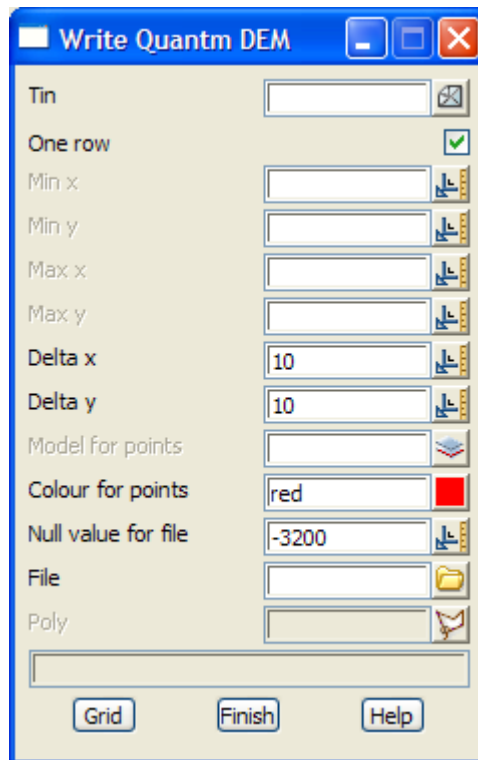
write_quantm_DEM

Position of option on menu: Tins =>Utilities =>DEM =>Quantm

The Quantm option calculates heights at points at regular x and y increments between given minimum and maximum x and y values. If a polygon is given, a z-value is only calculated for points inside the polygon.

Actual point strings and/or a file of heights at the points in Quantm (formerly Align 3D) format can be generated. For Quantm no polygon should be used and if there is no z-value (no tin) at a point, then a null z-value is written to the output file.

On selecting the Quantm option, the **Write Quantm DEM** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Tin <i>name of the tin on which the spot heights will be calculated.</i>	tin box		available tins
One row <i>If tick, null points are added in for any missing (x,y) so that there is only one row of data (one string) for each x-value.</i>	tick box		
Min x/y <i>minimum x/y values to calculate spot heights for.</i>	input		
Max x/y <i>maximum x/y values to calculate spot heights for.</i>	input		
Delta x/y <i>difference between the x/y-values.</i>	input		
Model for points <i>if blank, no point strings will be created. If non-blank, points strings of the spots heights will be created and stored in this model.</i>	input		available models
Colour for points <i>colour to make the point strings.</i>	input	default colour	available colours
Null value for file	input	-3200	

value to use when writing null z-values out to the file.

File input *.grd

If non-blank, a file of the spot height values in Quantm format is created.

Poly poly-select

if a polygon is selected, then the spot heights will be restricted to within the polygon.
If no polygon is selected, the spot heights will be calculated over the entire tin.

Grid button

calculate the spot heights at regular points over the area given by the min and maximum x and y values and restricted to be inside the polygon.

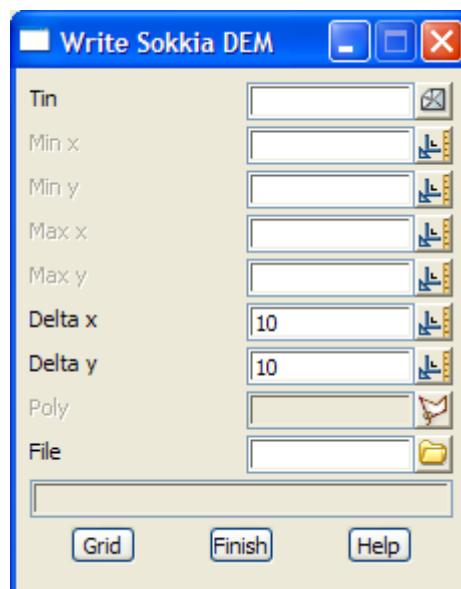
Sokkia

write_Sokkia_DEM

Position of option on menu: Tins =>Utilities =>DEM =>Sokkia

The Sokkia option calculates heights at points at regular x and y increments between given minimum and maximum x and y values. If a polygon is given, a z-value is only calculated for points inside the polygon. A file of heights at the points in Sokkia format is generated.

On selecting the Sokkia option, the **Write Sokkia DEM** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Tin <i>name of the tin on which the spot heights will be calculated.</i>	tin box		available tins
Min x/y <i>minimum x/y values to calculate spot heights for.</i>	input		
Max x/y <i>maximum x/y values to calculate spot heights for.</i>	input		
Delta x/y	input		

difference between the x/y-values.

Poly poly-select

*if a polygon is selected, then the spot heights will be restricted to within the polygon.
If no polygon is selected, the spot heights will be calculated over the entire tin.*

File input *.grd

If non-blank, a file of the spot height values in Sokkia format is created.

Grid button

calculate and write a file of the spot heights at regular points over the area given by the min and maximum x and y values and restricted to be inside the polygon.

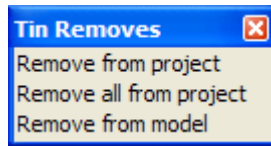
Remove

tin_removes

Position of menu: Tins =>Utilities =>Remove

Tins can be removed from models and from the project. Remove tins are not deleted but simply taken off the tin list in the project. Removed tins are left in the project area and can be added in again using the add option.

The tin removes walk-right menu is



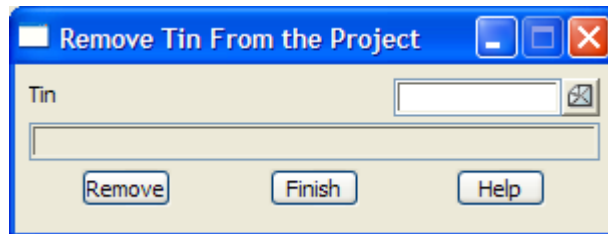
The options in the menu will now be described.

Remove From Project

remove_tin_from_the_project

Position of option on menu: Tins =>Utilities =>Remove =>Remove from project

On selecting the remove from project option, the **remove tin from the project** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Tin	input		available tins

name of the tin to be removed from the working project.

Remove button

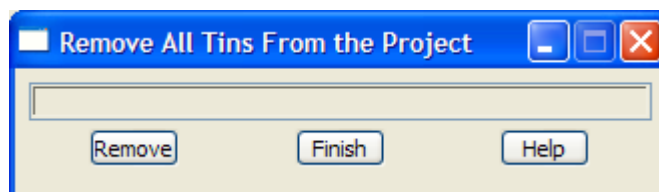
remove the tin given in the tin field from the project.

Remove All From Project

remove_all_tins_from_the_project

Position of option on menu: Tins =>Utilities =>Remove =>Remove all from project

On selecting the remove all from project option, the **remove all tins from project** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Remove	button		

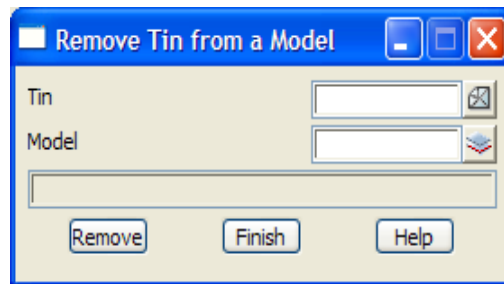
remove all the tins from the working project. If no errors occur, the panel will be removed after the tins have been removed.

Remove From Model

remove_tin_from_a_model

Position of option on menu: Tins =>Utilities =>Remove =>Remove from model

On selecting the remove from model option, the **remove tin from a model** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Tin	input		available tins
<i>name of the tin to be removed from a model.</i>			
Model	input		available models
<i>name of the model from which the tin given in the tin field will be removed.</i>			
Remove	button		
<i>remove the tin given in the tin field from the model given in the model field.</i>			

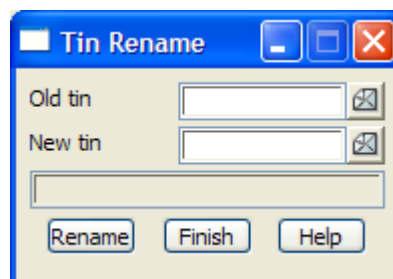
Rename

tin_rename

Position of option on menu: Tins =>Utilities =>Rename

On selecting the rename option, the **tin rename** panel is displayed.

This panel can be used to change the names of existing tins



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Old tin	input		available tins

name of the tin to be renamed.

New tin input

new name for the tin

Rename button

change the name of the tin in the old tin field to the name given in the new tin field.

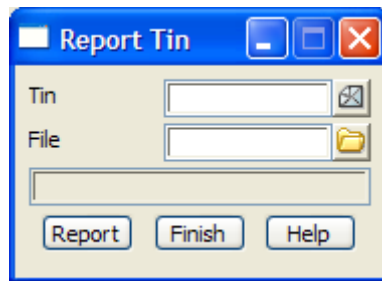
Report

report_tin

Position of option on menu: Tins =>Utilities =>Report

This panel produces a report on the tin including the models making up the tin and all the settings used when creating the tin.

On selecting the Tin report option, the **Report Tin** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Tin <i>name of the tin to create report for.</i>	input		available tins or super tins
File <i>name of the report file</i>	file box		*.rpt files
Report <i>create the tin report.</i>	button		

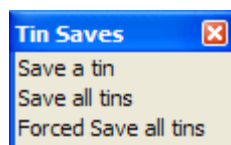
Save

tin_saves

Position of menu: Tins =>Utilities =>Save

Tins are automatically saved on disk when they are first created but various operations can then be applied to tins which may not be immediately updated on disk.

The tin saves walk-right menu is

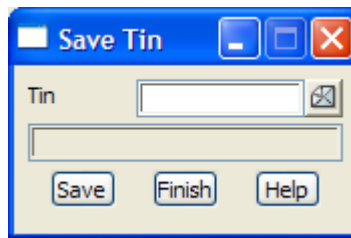


The options in the menu will now be described.

Save a Tin

save_tin

On selecting the save a tin option, the **save tin** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Tin <i>name of the tin to be saved to disk.</i>	input		available tins
Save <i>after selecting this button, the tin given in the tin field will be saved to disk.</i>	button		

Save/Forced Save All Tins

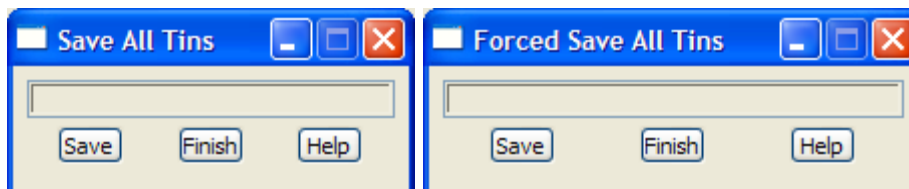
save_all_tins

forced_save_all_tins

Position of option on menu: Tins =>Utilities =>Save =>Save all tins

Position of option on menu: Tins =>Utilities =>Save =>Forced Save all tins

On selecting the save/force save all tins option, the **save/forced save all tins** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Save	button		

for save all tins: after selecting this button, all tins in the working project that have been modified since their last save, will be saved to disk. Unless an error occurs, the panel will be removed after the saving is completed.

for force save all tins: after selecting this button, all tins in the working project will be saved to disk. Unless an error occurs, the panel will be removed after the saving is completed.

Tin to Strings

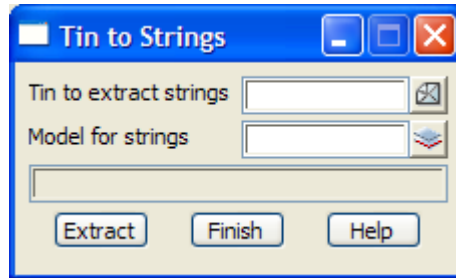
tin_to_strings

Position of option on menu: Tins =>Utilities =>Tin to strings

The points and breaklines of an existing tin can be extracted using the Tin to strings option.

Note that only the final points and breaklines used in creating the tin are extracted. Original string name, colours etc. are not obtainable.

, Selecting Tin to strings displays the **Tin to Strings** panel:



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Tin to extract strings <i>name of the tin to extract points and breaklines from.</i>	tin box		available tins
Model for strings <i>model to hold the extracted point and breakline strings.</i>	input		available models
Colour for point strings <i>colour of the extracted point strings.</i>	colour box		available colours
Colour for breakline strings <i>colour of the extracted breakline strings.</i>	colour box		available colours
Extract <i>extract the points and breaklines that make up a tin.</i>	button		

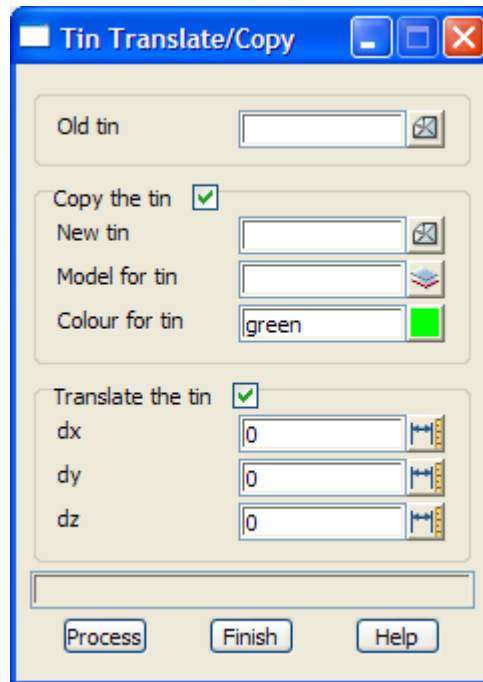
Translate/Copy

tin_translate_copy

Position of option on menu: Tins =>Utilities =>Translate/copy

An existing tin can be translated and/or copied using the Translate/copy option.

Selecting Translate/copy, displays the **Tin Translate/Copy** panel:



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Old tin <i>name of the tin to be copied/translated.</i>	input		available tins
Copy the tin <i>if tick, the New tin, Model for Tin and Colour for tin fields are activated and supply the information for the new tin.</i>	tick box	tick	
New tin <i>name of the copy of the tin - this can't be the same as any existing tin in the project.</i>	input		available tins
Model for tin <i>if non-blank, the name of the model for the new tin. If blank, the tin is not put in any model.</i>	input		available models
Colour of tin <i>if non-blank, the colour of the new tin. If blank, use the old tin colour</i>	input		available colours
Translate the tin <i>if tick, the dx, dy and dz fields are activated and supply the information for translating the tin</i>	tick box	tick	
dx, dy, dz <i>the delta amounts to translate the tine by.</i>	real box	0	
Process <i>translate/copy the tin.</i>	button		

Weed

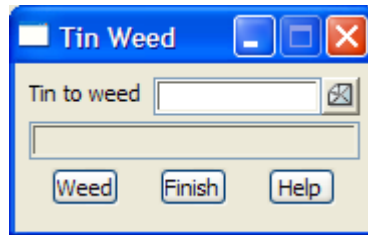
tin_weed

Position of option on menu: Tins =>Utilities =>Weed

When a tin is created, a copy of all the points and lines used in creating the tin is saved with the tin, including any duplicate points and lines.

The weed option will remove all the duplicate points and lines from the tin database.

On selecting the **Weed** option, the **tin weed** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Tin <i>name of the tin to weed.</i>	input		available tins
Weed <i>remove all duplicate points and lines from the tin database.</i>	button		

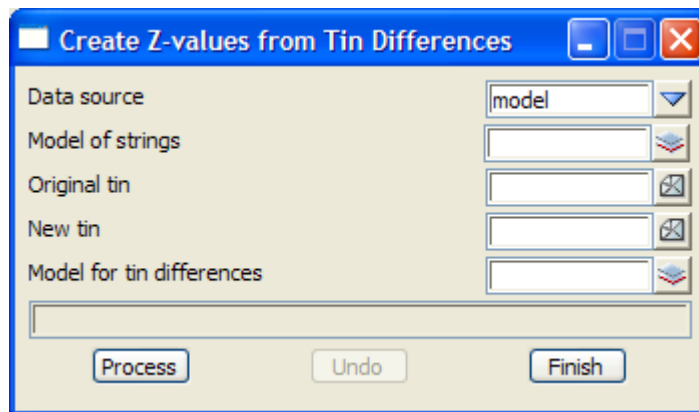
Z Differences from Tins

tin_diffs_to_z_panel

Position of option on menu: Tins =>Utilities =>Z diffs from tins

This option takes a data source and for each point in the data source, creates a new point whose z-value is the difference in z-values from two given tins at the plan position of the data source point.

On selecting the Z diffs from Tins option, the **Create Z-Values from Tin Differences** panel is displayed.



The fields and buttons used in this panel have the following functions:

Field Description	Type	Defaults	Pop-Up
Data source type <i>data selection type</i>		Model	
Data source <i>data to be processed.</i>	input		
Original tin <i>name of the tin to get the z-value from.</i>	tin box		available tins
New tin <i>name of the tin to get the z-value from.</i>	tin box		available tins
Model for tin differences <i>model to place the strings containing the z values with the difference between the tins.</i>	input		available models
Process <i>for all strings in the data source, calculate the difference in the z-values from the two tins at the string vertices.</i>	button		

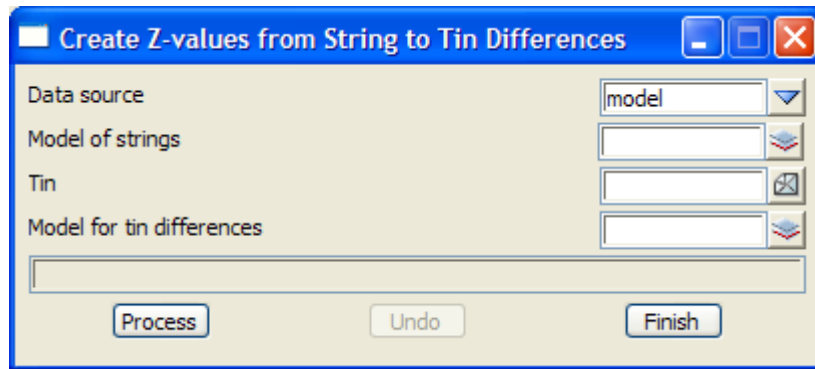
Z Differences from String to Tin

Tin_diffs_to_string_z_panel

Position of option on menu: Tins =>Utilities =>Z diffs from string to tin

This option takes a data source and for each string in the data source, creates a plan copy of the string and for each vertex in the new string, the z-value at a vertex is the difference in z-values from the original string vertex and the z-value of the tin at the (x,y) position of the vertex.

On selecting the Z diffs from string to tin option, the **Create Z-Values from String to Tin Differences** panel is displayed.



The fields and buttons used in this panel have the following functions:

Field Description	Type	Defaults	Pop-Up
Data source type <i>data selection type</i>		Model	
Data source <i>data to be processed.</i>	input		
Tin <i>name of the tin to get the z-value from.</i>	tin box		available tins
Model for tin differences <i>model to place the strings containing the z values with the difference between the original string and the tin.</i>	input		available models
Process <i>for all strings in the data source, calculate the difference in the z-values from the string to the tin.</i>	button		

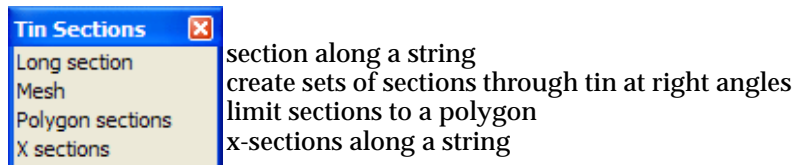
Sections

tin_sections

Position of menu: Tins =>Sections

The triangles=>sections menu contains options involving sections through the tin.

The sections walk-right menu is



For the option *Long section*, please go to the section “Long Sections” .

Mesh,

“Mesh”

Polygon sections

“Polygon Sections”

X-sections

“X-Sections”

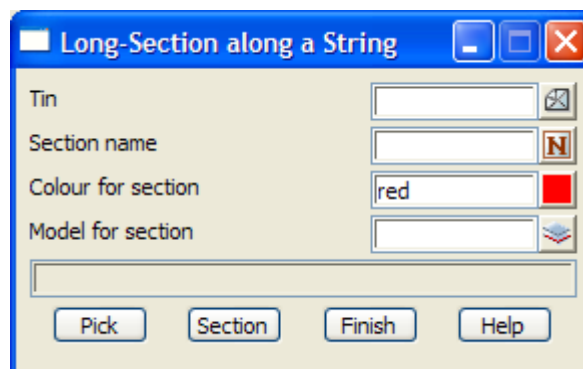
Long Sections

long_section_along_a_string

Position of option on menu: Tins =>Sections =>Long Section

The **long section** option calculates the section through a tin along a particular string. This option is rarely used because tins are automatically profiled through on the section view and in long section and x-section plots.

On selecting the long section option, the **long section along a string** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Tin <i>name of the tin that the string will be sectioned against.</i>	input		available tins
Section name <i>name to give the long section string</i>	input		
Colour for section <i>colour to make the long section string</i>	input	default colour	available colours
Model for section	input		available models

name of the model to contain the long section string.

Pick string-select

select the string to be sectioned along.

Section button

*calculate the long section along the string selected by the **pick** button, against the tin given in the tin field. The resulting section string is added to the model given in the Model for Section field.*

Mesh

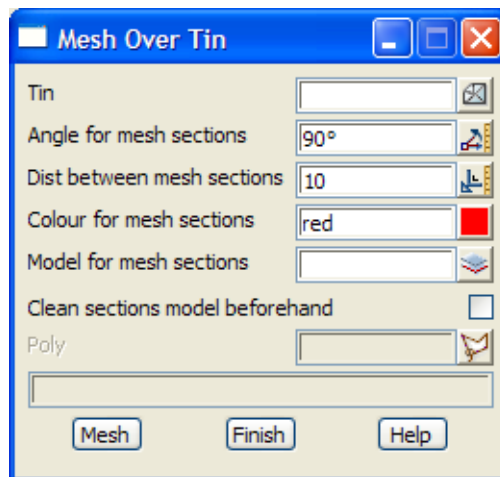
mesh_over_tin

Position of option on menu: Tins =>Sections =>Mesh

A **12d** Model mesh is simply a series of lines cutting through the tin (sections) at a given angle and spacing, and at right angles to the given angle with the same spacing.

A mesh is an effective method of visualizing a triangulation when displayed in a perspective view and for hidden views.

On selecting the mesh option, the **mesh over tin** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Tin <i>name of the tin that the mesh sections will be calculated through.</i>	input		available tins
Angle for mesh sections <i>angle (in degrees) of the lines to section along. The sections are also created at rights angles to this angle as well.</i>	input	90.0	0,45,90
Dist between mesh sections <i>distance between the lines to section along</i>	input	10.0	1,10,100
Colour for mesh sections <i>colour to make the calculated sections</i>	input	default colour	available colours
Model for mesh sections <i>name of the model to contain the calculated sections.</i>	input		available models
Clean sections model beforehand <i>if tick, the model of sections is cleaned out before the option runs.</i>	tick box		
Poly <i>if a polygon is selected, then the sections are restricted to remaining within the polygon.</i>	button		
Mesh <i>two sets of sections through the tin given in the tin field are created within the selected polygon, or if no polygon is selected, the bounding polygon for the tin. One set of sections are calculated along straight lines at the angle given by the angle field and at a separation given by the dist field and the second set at right angles to the first set.</i>	button		

<esc> can be used to abort the mesh option.

Polygon Sections

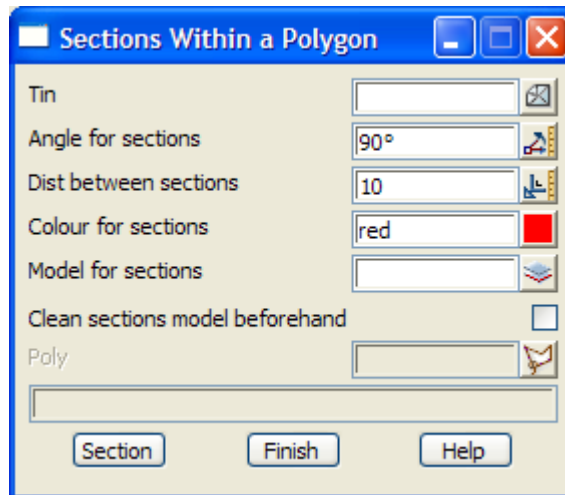
sections_within_a_polygon

Position of option on menu: Tins =>Sections =>Polygon sections

In the polygon sections option, sections are calculated for a series of parallel lines covering the polygon, or if no polygon is given, the tin. The angle of the parallel lines and the distance between them are set by the user.

This option provides a quick method for producing a one directional set of sections covering a polygonal region on a tin.

On selecting the **poly** sections option, the **sections within a polygon** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Tin <i>name of the tin that the sections will be calculated through</i>	input		available tins
Angle for sections <i>angle (in degrees) of the lines to section along</i>	input	90.0	0,45,90
Dist between sections <i>distance between the lines to section along</i>	input	10.0	1,10,100
Colour for sections <i>colour to make the calculated sections</i>	input	default colour	available colours
Model for section <i>name of the model to contain the calculated sections.</i>	input		available models
Clean sections model beforehand <i>if tick, the model of sections is cleaned out before the option runs.</i>	tick box		
Poly <i>A string is selected from a view. The string will be used as the polygon for this option. If no polygon is selected, sections are created over the entire tin.</i>	string-select		
Section <i>Sections within the polygon selected by poly will be calculated along parallel straight lines at the angle given by the angle field and at a separation given by the dist field. The sections are made against the tin</i>	button		

given by the Tin field. The sections colour is that given in the colour field and the section strings are placed in the model given in the model field.

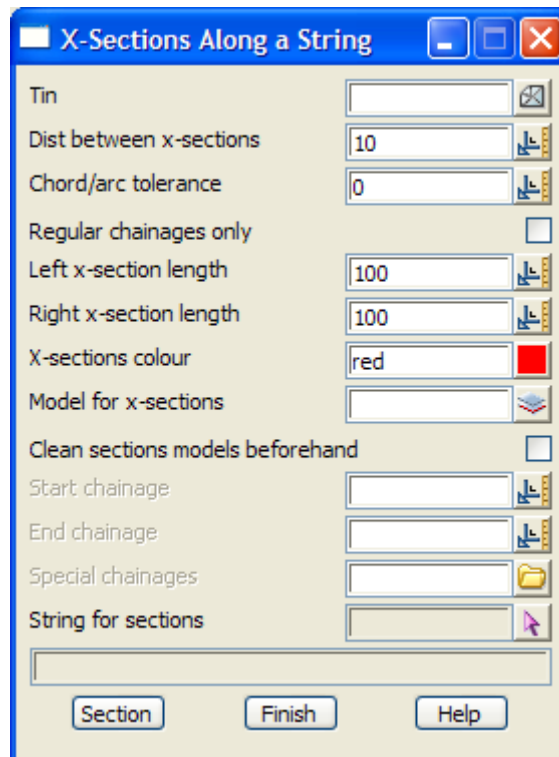
X-Sections

x_sections_along_a_string

Position of option on menu: Tins =>Sections =>X Sections

The X-sections (cross sections) option calculates cross sections at a given interval along a string.

On selecting the x-section option, the **x-sections along a string** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Tin	input		available tins

name of the tin that the x-sections will be calculated through.

Dist between x-sections	input	10	
--------------------------------	-------	----	--

the distance between points on the selected string where the x-sections are calculated.

Regular interval only	yes-no	no	yes, no
------------------------------	--------	----	---------

*if yes, sections are only calculated at points at the given distance apart.
If no, extra sections are created at horizontal tangent points and horizontal IPs.*

Left x-section length	input	100	
------------------------------	-------	-----	--

the plan distance for the left side of the x-section - that is, the distance that the x-section extends to the left of the selected string.

Right x-section length	input	100	
-------------------------------	-------	-----	--

the plan distance for the right side of the x-section - that is, the distance that the x-section extends to the right of the selected string.

X-sections colour	input	default colour	available colours
--------------------------	-------	----------------	-------------------

colour to make the x- sections

Model for x-sections	input		available models
-----------------------------	-------	--	------------------

name of the model to contain the x-sections.

Start/End chainage input

the string chainage to start/end the x-sections. If blank, the start/end chainage is taken to be the chainage at the beginning/finish of the string.

Pick string-select

select the string to calculate the x-sections along.

Section button

*calculate the x-sections along the string selected by the **pick** button, against the tin given in the tin field. The resulting x-section strings are added to the model given in the model for x-sections field.*

Sharing

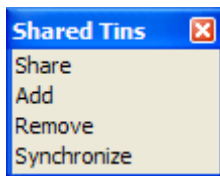
shared_tins

Position of menu: Tins =>Sharing

Sharing allows tins from a project (the server project) to be added to other projects (client projects).

Before any tins can be added to a client project, they must first be tagged in the server project as allowed to be shared.

The Sharing walk-right menu is



allow tins in this project to used by other projects
 add a tin from another project
 remove a shared tin
 updated shared tins

For the option *Share*, go to

Add

Remove

Synchronize

“Share Tins”

“Add Shared Tins”

“Remove Shared Tins”

“Synchronize Shared Tins”

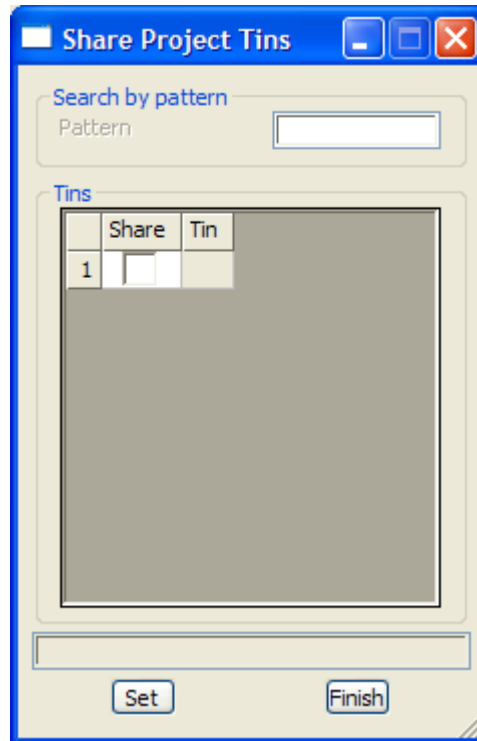
Share Tins

share_project_tins

Position of option on menu: Tins =>Sharing =>Share

Before tins in a server project can be added to client projects, the tins must be made available for sharing in the server project by using the Share option.

Selecting Share displays the **Share Project Tins** panel.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Default	Pop-Up
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*All the models in the project are listed in the **Share Project Tins** panel and if a tin has been tagged for Sharing, a tick will be displayed in the **Share** column of the grid.*

Pattern

*if a pattern is typed then all the tins matching the pattern will have a tick placed in the **Share** column. If * is typed then all tin are ticked for sharing.*

Share grid column

*tick if the tin is to be made available for sharing when the **Set** button is pressed.*

*Clicking RB on **Share** at the top of the column brings up a menu to **Toggle** the ticks, **Set** all the ticks on, **Clear** to turn all the ticks off.*

Tin grid column

this column lists all the tins in the project

Set button

*clicking **Set** tags all the tins with a tick in the **Tick** column as being available for sharing. Those tins without a tick will not be available for sharing.*

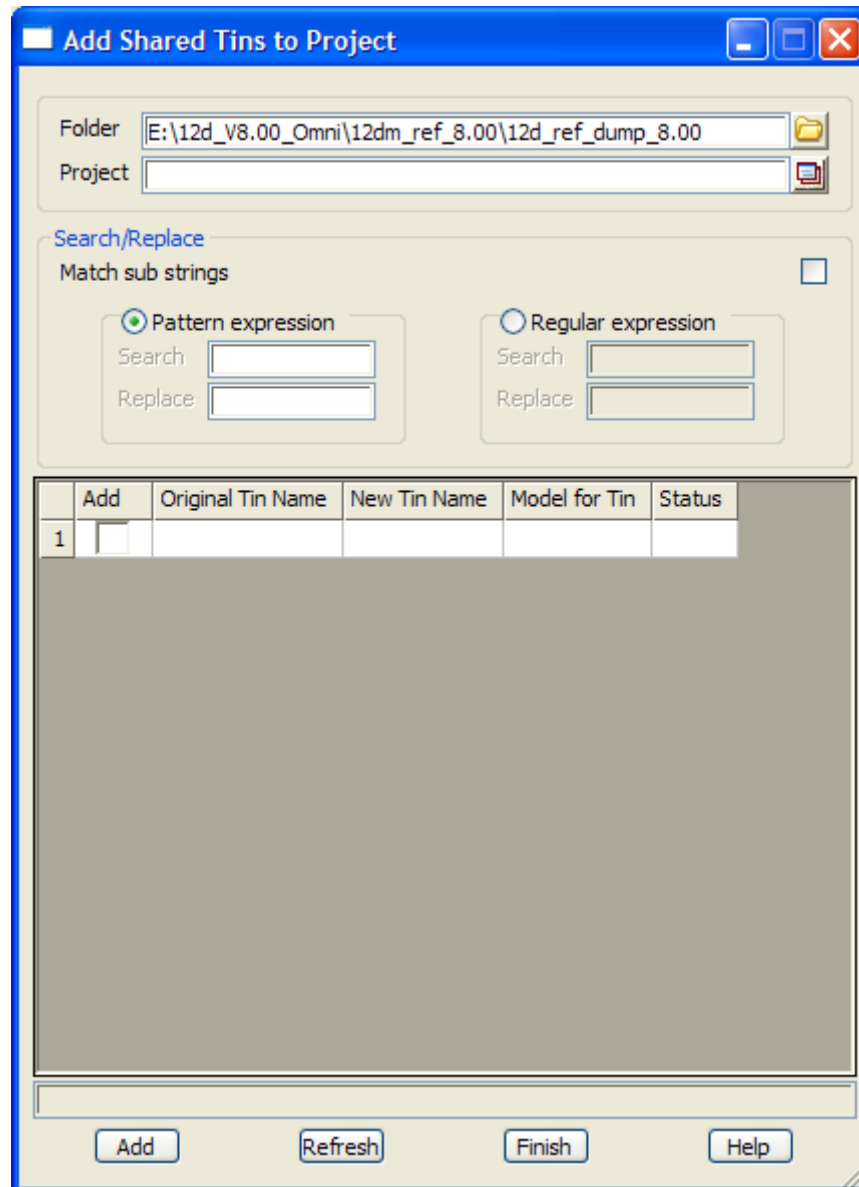
Add Shared Tins

add_shared_tins_to_project

Position of option on menu: Tins =>Sharing =>Add

The Add option is used to add shared tins (from a server project) to this project (a client project).

Selecting Add displays the **Add Shared Tins to Project** panel.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Folder	folder box		select folder

*folder to look for 12d Model projects. When a folder is selected, all the 12d Model projects in the folder will be displayed in a **Projects** pop-up list.*

Project	folder box		select folder
----------------	------------	--	---------------

12d Model project to search for tins that can be shared.

Search and Replace section:

Match sub strings	tick box
--------------------------	----------

*if **tick**, the Search expression is used to match against part of each tin name.
If **not tick**, the Search expression is used to match against the entire tin name.*

***Pattern expressions** or **Regular expressions** can be used to create New Tin Names when a shared tin is added to the project*

***Search** - type in the expression*

Replace - type in the expression to replace the **Search** expression.

Copy tick boxes in grid column

if tick, the tin will be added to the project when the **Add** button is pressed.

Clicking RB on **Copy** at the top of the column brings up a menu to **Toggle** the ticks, **Set** all the ticks on, **Clear** to turn all the ticks off.

Note - a shared tin that has been previously added can only be removed by using the Tins =>Sharing =>Remove option.

Original Tin Name grid column

this column lists all the tins in the server project that are available for adding to this client project.

New Tin Name grid column

if **non blank**, the name to use instead of the **Original Tin Name** when the tin is added to the project.

If **blank**, the **Original Tin Name** is used for the tin when it is added to the project.

Model for Tin grid column

if **non blank**, the model name to use in the client project for this tin added to the project
If **blank**, the model name is the same as that in the server project.

Status output grid column

displays if there is a **match** or **no match** when a pattern or regular expression is used

Add button

clicking **Add** adds all the tins with a tick to this project (a client project).

Refresh button

clicking **Refresh** refreshes the list of all tins available for sharing in the selected 12d Model project (server project).

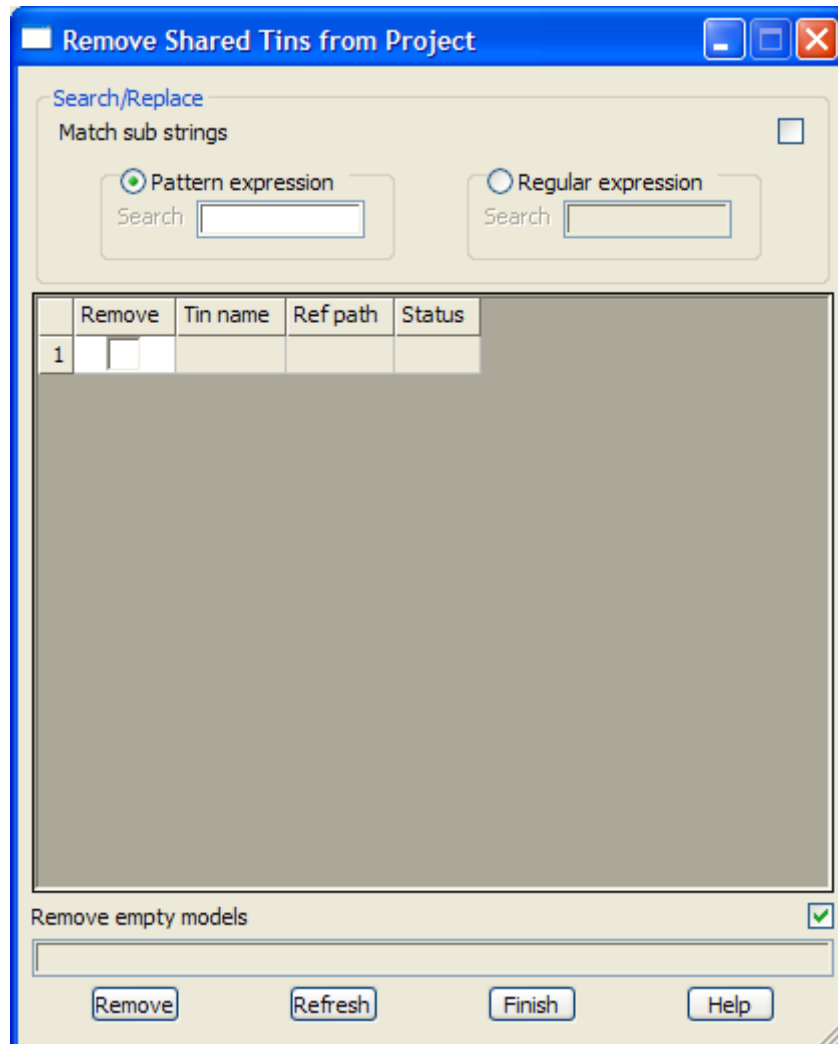
Remove Shared Tins

remove_shared_tins_from_project

Position of option on menu: Tins =>Sharing =>Remove

The Remove option is used to remove shared tins from the project. The shared tins would have been previously added to the project with the Tins =>Sharing =>Add option.

Selecting Remove displays the **Remove Shared Tins from Project** panel.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Search and Replace section:

Match sub strings tick box

if tick, the Search expression is used to match against part of each tin name.

If not tick, the Search expression is used to match against the entire tin name.

Pattern expressions or **Regular expressions** can be used to select and tick shared tin.

Remove tick boxes in grid column

*if tick, the tin will be removed from the project when the **Remove** button is pressed.*

Clicking RB on **Copy** at the top of the column brings up a menu to **Toggle** the ticks, **Set** all the ticks on, **Clear** to turn all the ticks off.

Tin Name grid column

this column lists all the tins in this project that have been added from other (server) projects

Ref path

this column lists the full path name to the server project and the original tin name in the server project

Remove button

*clicking **Remove** removes all the tins with a tick from this project (a client project).*

Refresh button

*clicking **Refresh** refreshes the list of all shared tins previously added to the project*

Synchronize Shared Tins

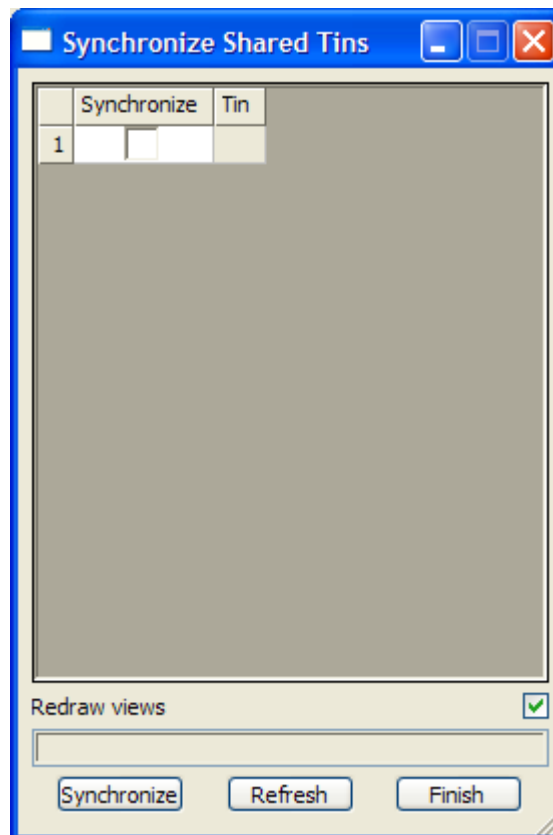
`synchronize_shared_tins`

Position of option on menu: Tins =>Sharing =>Synchronize

The **Synchronize** option is used to updated any added shared tins. The shared tins would have been previously added to the project with the Tins =>Sharing =>Add option.

Three environment variables control the synchronization of updates of added shared models and tins. For more information on synchronizing, go to the section “Share Settings” .

Selecting Synchronize displays the **Synchronize Shared Tins** panel.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Synchronize	tick boxes in grid column		
--------------------	---------------------------	--	--

*if tick and the tin has changed in the server project, then it will be re-copied from the server project when the **Synchronize** button is pressed.*

*Clicking RB on **Copy** at the top of the column brings up a menu to **Toggle** the ticks, **Set** all the ticks on, **Clear** to turn all the ticks off.*

Tin	grid column		
------------	-------------	--	--

this column lists all the tins in this project that have been added from other (server) projects

Synchronize	button		
--------------------	--------	--	--

*clicking **Synchronize** re-copies any tins with a tick from the server projects*

Refresh	button		
----------------	--------	--	--

*clicking **Refresh** refreshes the list of all shared tins previously added to the project*

Delete

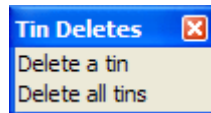
tin_deletes

Position of menu: Tins =>Delete

The delete option is used to delete tins from the project and from the computer disk so that they no longer can be accessed or take up disk space.

To help protect against disasters, a **yes-no** pop-up menu is used to confirm that the user did intend deleting the tin. If deletion is confirmed, the selected tin is removed from the project (if its in the project) and deleted from the disk.

The tin Deletes walk-right menu is



For the option *Delete a tin*, please go to the section “Delete a Tin” .

Delete all tins

“Delete All” .

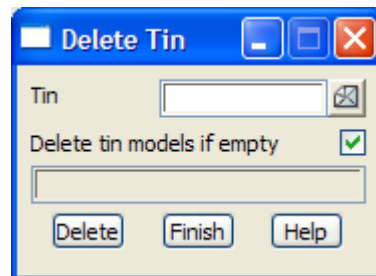
Delete a Tin

delete_tin

Position of option on menu: Tins =>Delete =>Delete a tin

The delete a tin option can be used to delete a tin in the project.

On selecting the delete a tin option, the **delete tin** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Tin	input		project tins

name of the tin to be deleted from the computer disk.

Delete tin models if empty tick box

if tick then the models containing the tin are also deleted if they are empty after the tin is deleted.

Delete button

*after selecting this button, the tin given in the tin field will be deleted from the computer disk. A **yes-no** pop-up is used to confirm that deletion is required.*

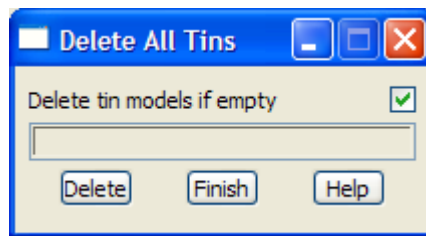
Delete All

delete_all_tins

Position of option on menu: Tins =>Delete =>Delete all tins

The delete all option will delete all tins in the working project. It does not delete tins that are in the working project area but not yet added to the project.

On selecting the delete all option, the **delete all tins** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Delete tin models if empty	tick box		

if tick then the models containing the tins are also deleted if they are empty after the tins are deleted.

Delete	button
---------------	--------

*after selecting this button, a **yes-no** pop-up is used to confirm that deletion is required. If it is, all tins in the working project will be deleted from disk. Unless an error occurs, the panel will be removed.*

16 Survey

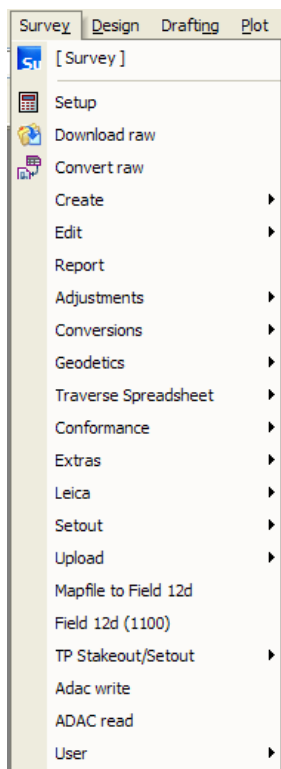
survey

Position of menu: Survey

The Survey walk-right menu is laid out to reflect the normal sequence of operations when handling field survey data.

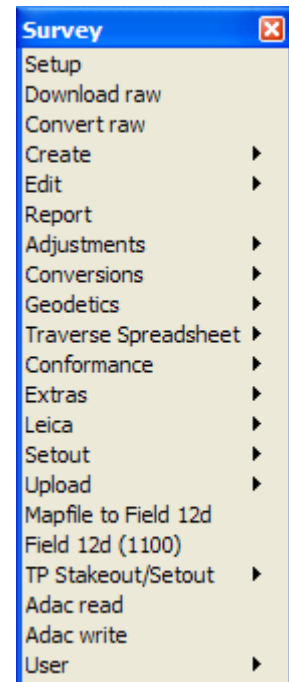
The description of the options on the Survey menu assumes that the reader is familiar with surveying, the 12d Model method of field coding for their particular data collector, data collector definitions and the 12d Model field file. A description of the 12d Model field coding and data collector definitions is given in the Appendix "12D Survey Guide"

on Main menu



create floating Survey menu
 select data collector (DC)
 transfer data from DC to 12d field file
 convert raw data collector data to 12d field file
 create 12d Survey function
 edit 12d Survey function - text and graphically
 report on 12d Survey function
 bowditch, least squares etc.
 conversion functions
 Geodetic measure functions
 traverse spreadsheet functions
 conformance reporting options
 extra survey functions - bd entry etc.
 outputs for various Leica instruments
 setout macros
 create upload file & upload to data collectors
 create field 12d file from map file
 compile Field 12d code
 Mick Gunter's TP Stakeout/Setout macros
 test for ADAC read
 test for ADAC write

on 12d Model menu and floating menu



For the option *Setup*, go to the section

Download raw

Convert raw

Create

Edit

Report

Adjustments

Conversions

Geodetics

Traverse Spreadsheet

Conformance

Extras

Leica

"Setup"

"Download Raw"

"Convert Raw"

"Create Survey Function"

"Edit Survey Function"

"Report"

"Adjustments"

"Conversions"

"Geodetic Measures and Entry"

"Traverse Spreadsheet"

"Conformance"

"Extras"

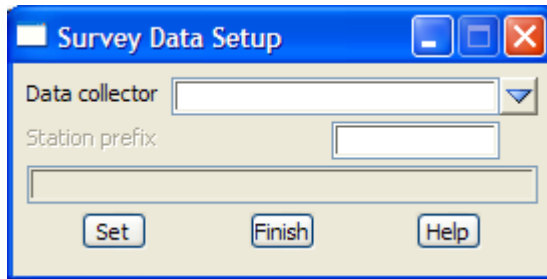
Setout	"Setout"
Upload	"Upload"
Mapfile to Field 12d	"Mapfile to Field 12d"
Field 12d	"Field 12d"
Adac read	"Read Adac XML File"
Adac write	"Create Adac XML File"
TP Stakeout/Setout	"TP Stakeout/Setout"

Setup

survey_data_setup

Position of option on menu: Survey =>Setup

Selecting setup brings up the **survey data setup** panel



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Data collector <i>name of the data collector definition used to define how to read and interpret the raw survey data file. The list of available data collectors definitions is given in the file pointed to by the environment variable DATA_COLLECTORS_4D.</i>	input		available data collectors

A data collector definition can be created/edited edited by

*(a) clicking on the choice button at the end of the **Data collector** panel field and selecting [Edit] at the bottom of the pop-up list of defined data collectors to bring up the Survey.4d Edit/Create panel.*

*(b) using **Project=>Browse=>Survey data collectors** the create/edit the Survey.4d file.*

Please see the "Data Collector Definitions" of Appendix "12D Survey Guide" for more information on setting up a data collector definition.

Station prefix <i>if non-blank, the prefix to be used for any text given for new instrument stations.</i>	input
--	-------

Set <i>store the selected data collector as being the currently selected one.</i>	button
---	--------

Note: Selecting [Edit] at the bottom of the pop-up list of data collectors will bring up the **Survey.4d Create/Edit** panel.

Download Raw

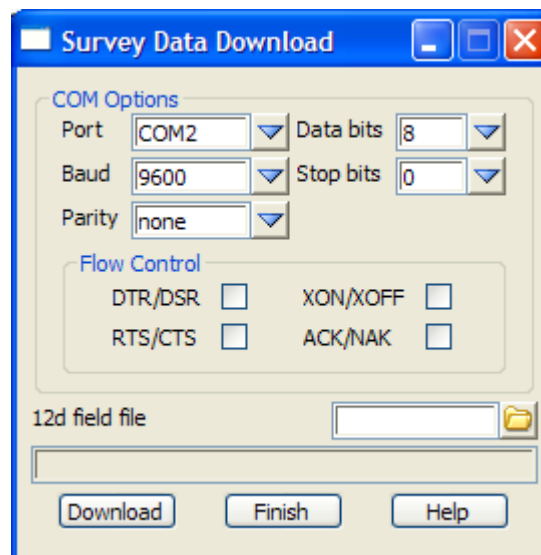
survey_data_download

Position of option on menu: Survey =>Download raw

The **download raw** option will read data from the data collector connected to the computer's serial port, save it in a file (the raw data file) and once the download is completed, automatically convert the raw data file into a 12d field file using the currently defined data collector.

Hence the **download** option downloads data from the data recorder and creates a data collector raw file and an equivalent 12d field file.

Selecting **download raw** brings up the **Survey Data Download** panel



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Port <i>name of the computer serial port that the data collector is connected to. The default port is specified in the data collector configuration file.</i>	input	from configuration file	
Data bits <i>number of bits</i>	input	from configuration file	5,6,7,8
Baud rate <i>speed of the serial port</i>	input	from configuration file	
Stop bits <i>number of stop bits</i>	input	from configuration file	
Parity <i>parity</i>	input	from configuration file	
DTR/DSR <i>if tick, use DTR/DSR flow control</i>	tick	from configuration file	
RTS/CTS <i>if tick, use RTS/CTS flow control</i>	tick	from configuration file	

XON/XOFF tick from configuration file
if tick, use Xon/Xoff

ACK/NAK tick from configuration file
if tick, use ACK/NAK

12d Field file input *.fld files
name of the 12d field file that the raw file is to be converted to. The raw file is given the same name but with the extension specified in the configuration file, e.g., “.gre”.

Download button

On clicking the download button, the software will read a data stream from the serial port and store the raw data into a file. The extension of this file, will be specified in the configuration file. The name will be the same as the field file, with any “.fld” removed.

On completion of the download, the raw data file is automatically converted to a 12d field file of name given in the field file field.

Convert Raw

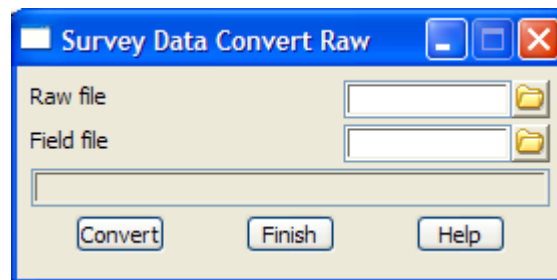
survey_data_convert_raw

Position of option on menu: Survey =>Convert raw

The **convert raw** option is used to convert an existing raw data file of the type given by the data collector setup, into a 12d field file.

The raw data file may have been previously down loaded by **12d** Model or obtained via another mechanism.

Selecting **convert raw** brings up the **survey data convert raw** panel



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Raw file	input		available raw files
<i>name of the raw data file to be converted to a 12d field file. The popup will contain all files with the extension specified in the configuration file for raw data files, e.g. ".gre".</i>			
Field file	input		*.fld files
<i>name of the 12d field file that the raw file is to be converted to. When the raw file name is given, the file of the same name but with the extension .fld is automatically piped into the field file field.</i>			
Convert	button		
<i>convert the raw data given in the raw file field into the 12d field file format and save it in the file given in the field file field.</i>			

Create Survey Function

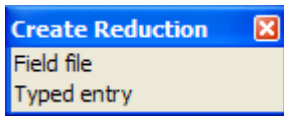
create_reduction

Position of menu: Survey =>Create

The create walk-right menu contains options to create a 12d Model *Survey* function from either a 12d field file or from scratch using *Survey Reduction edit commands*.

Basically, a Survey function keeps track of the field data, the information involved in the survey reduction and all the strings and models created by the Survey function. The field data for the Survey function can be edited and the reduction re-run and all the old reduced strings automatically deleted and replaced by the updated reduced strings.

The create walk-right menu is:



create survey reduction function from a 12d field file - reduces data
create survey reduction function by typed entry into 12d field file.

For the option *Field file*, go to the section "Field File"
Typed entry "Typed Entry"

Field File

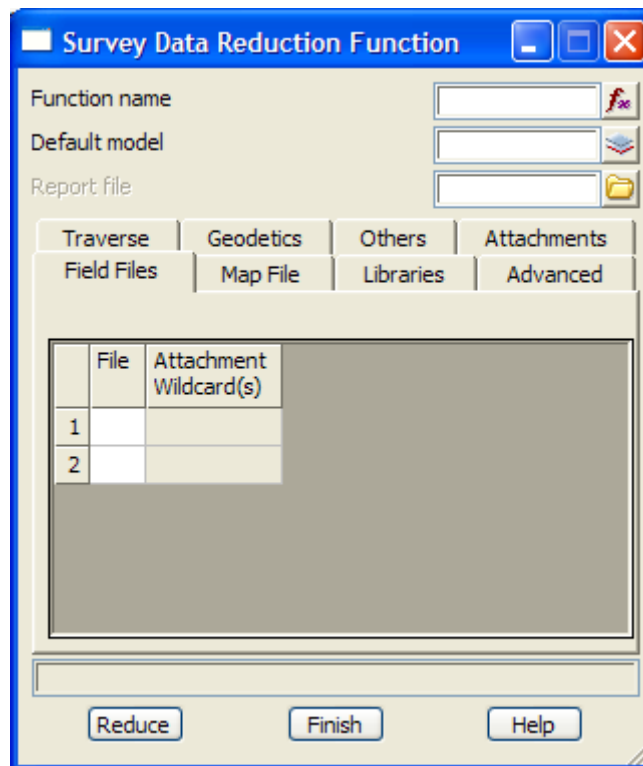
[survey_data_reduction_function](#)

[survey_data_edit](#)

Position of option on menu: Survey =>Create =>Field file

The field file option creates a Survey *function* from a 12d field file

Selecting field file brings up the **survey data reduction function** panel



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Function name	input		available Survey functions
<i>name of the 12d Survey function. If the Survey function exists, then it is loaded into the panel. If the Survey function does not exist, then a new Survey function is created.</i>			
Default model	input		available models
<i>if a feature code is not found in the map file, or no map file is selected, the strings and points of that feature code will be placed in the default model. The colour used will be the default line or point colour for 12d Model. The default model field is compulsory. Check measurements will be always placed in the default model if a check model is not given (on the Advanced tab).</i>			
Report file	input		*.rpt
<i>if non-blank, a log of the reduction steps, including new instrument stations, new target heights, scale factors, backsights and check measurements is created. Any errors are also logged.</i>			

Field Files tab

list of field files to read in

Field file	input	*.fld files
<i>name of the 12d field file to be read into the function as its initial field data, and then reduced. The field data in the Survey function can be edited either by command or graphically.</i>		

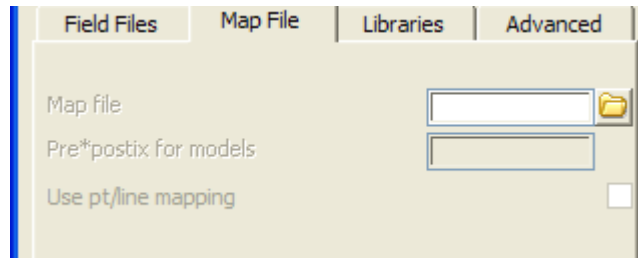
Attachment wildcards input
not yet used

Button at Bottom

Reduce button

On clicking the reduce button, the software converts the field measurements in the selected 12d field file, using coordinates from the control model if necessary, and produces super strings. The super strings will be assigned names and models using the name library and map file.

Map File tab



Map file input *.mf files

*if **non-blank**, the **map file** is used to map feature codes to string names, models, colours, line styles, etc. In general, strings will be created as line strings by assigning a non-zero string number in the field, and strings will be created as point strings by assigning a zero string number in the field. This behaviour may be overridden with field codes 92, 93 and 94.*

Pre*postfix for models input available models

*the **pre*postfix for models** text is applied to all model names in the map file.*

Use pt/line mapping tick

*if **tick** and a **map file** is used, the **column** in the map file that specifies the point/line type of the string is be used to set the point/line type of the string.*

*If **not tick** and a **map file** is used, the **column** is ignored (not used for setting point/line type of the string).*

Libraries tab



Name library input *.nl files

*if **non-blank**, the name library can be used to automatically create vertex text for the string if no vertex text is given in the field. A name library file contains two columns separated by one or more spaces. The text in the first column is matched against the feature code (wild cards * and ? can be used). The second column contains the vertex text to use if a match occurs.*

Note that if vertex text is given in the field then it is used instead of the text in the name library.

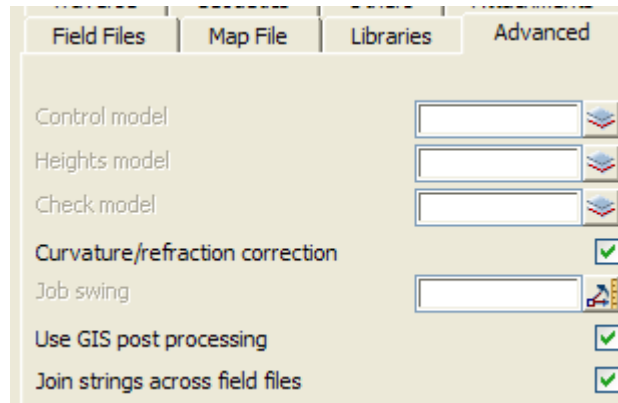
*Pre-super strings: if **non-blank**, the name library will be used to automatically create 4d strings and to assign text to 4d strings. Name library files will contain two columns. The first column in the name*

library will be matched against the feature code. Note that if a match is found, a 4d string is always created, as opposed to another string type. The second column will contain the text for the 4d string.

Attribute library input *.al files

if **non-blank**, the attribute library is used to give names to any unnamed attributes. The first word of each line in the file is the code to define the attribute for (can include wild cards) and the next n words are the names for each unnamed attributes in order. If the attribute library is mission, then the unnamed attributes will be given the names "unnamed attribute i" for 1=1,

Advanced tab



Control model input available models

if non blank, name of the model containing instrument and backsight stations that can be referenced during the reduction. The name of the string is taken as the station name and if the string contains more than one point, the first point in the string is used for the co-ordinates of the station.

Heights model input available models

if non blank, name of the model containing points that are used for the heights of points during reduction. The points in the heights model have the point id of required point and a height which is used whenever that point id is found in the reduction. The (x,y) co-ordinates of the point are ignored.

Check model input available models

if non-blank, then all check shots will go to this model.
If blank then check shots go to the default model.

Curvature/refraction correction tick box tick

if **tick**, during the reduction, each EDM tacheometry measurement (field code 7) has a correction for earth curvature and refraction applied to the measurement.

Job swing

if non-blank, then the job is swung through this value. The rotation is in a clockwise direction and the value is in hp dms format.

Use GIS post processing tick box tick

if tick, run the given 12d macro to process attribute blocks

Join strings across field files tick box tick

if **tick**, points with the same code and string number will be included in the same string in any of the field files. The order that the points are placed in the string is the order of the field files in the **Field File** tab.

If **not tick**, any strings will terminate at the end of a field file. Even if the string has the same name and string number is any following field file, a new string is started in the following field files.

Traverse tab

Do traverse calcs tick box not tick

if tick, the traverse coded points are placed into a network model, and an adjustment done at the time of reduction.

Traverse code input

if valid, this code will be used to identify traverse data. This will effectively be the same as stringing features in the field except the user has the option of isolating the model, adjusting the strings etc.

E.g. TL. The reduction function will look at the field file and extract any observations involving field codes with the TL code. Only backsights and measurements with the point name field populated will be processed.

Each traverse will have a separate string number: i.e. The main traverse with a feature code/string number of e.g. TL7 and a side traverse having a feature code/string number of e.g. TL3. Note the string numbers do not have to be in any particular order. The reduction will determine the order on which the separate traverses will be processed (by dependencies).

Adjustment method choice bowditch, compass,
transit, least square, none

*method of adjustment. The adjustment will be made to the extracted traverse strings from known point to known point. **If a traverse string goes through a number of known points (known coordinates), the adjustment will made from known point to known point rather than the first known to the last known point.***

Network model model box

if non blank, any valid traverse strings are placed in this model

Geodetics tab

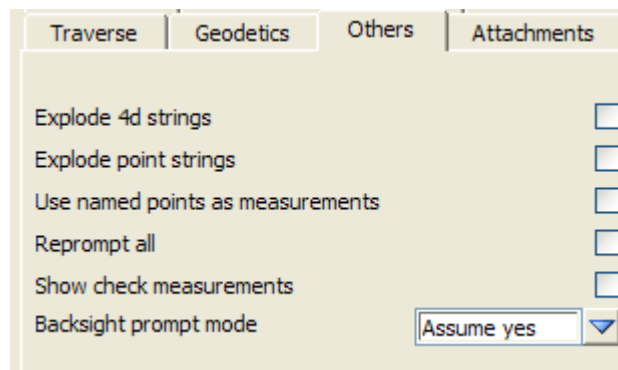
Projection projection box current projection available projections

*the projection of the data to be reduced. If a valid projection is specified, the reduction will be done taking into account the projection scale factors. **If this method is used it is paramount that the known coordinates(e.g station setups) are in terms of the projection coordinates and are not truncated (i.e. full coordinate values).** These coordinates will allow the calculation of the relative longitude and latitude values which are used to compute coordinates from observations from the setup points. For more information about how to setup different projections see the section "Projections" .*

N values choice box currently set method Available n value methods
the N value method allows the conversion of non-ellipsoid heights to ellipsoid. The methods are defined in the project n value settings. For more information on the n value settings see the section "N values"
The N value will be used to convert a geoid height (e.g. AHD) into an ellipsoid height. Ellipsoid height = geoid height + N value. The conversion is used for the calculations only. The original z value for the point will remain unchanged

For more information about geodetic terminology including projections and N values, see the Appendix "Geodetics Summary".

Others tab



Explode 4d strings tick box
if tick, any 4d strings created during the reduction process will have only one vertex (point), i.e., no stringing of 4d strings will occur.

Explode point strings tick box
if tick, point strings are created as one vertex (point) strings i.e., no stringing of any point strings will occur.

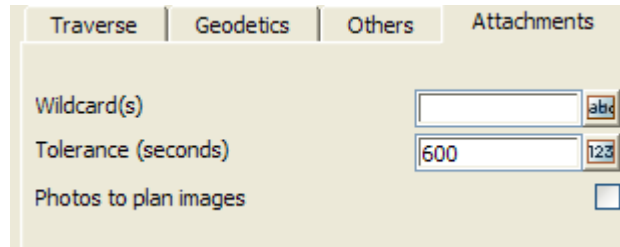
Use named points as measurements tick box
if tick, named points are also created as measurements.

Reprompt all
if tick, all check measurements are redisplayed on recalcs. Also if Backsight prompt mode is set to prompt, then backsights are redisplayed on recalcs.
if not tick, check measurements are not redisplayed on a recalc and backsights depend on the backsight prompt mode.

Show check measurements tick box
if tick, when a check measurement is processed a panel is displayed showing the calculated (x,y,z) for the check measurement.

Backsight prompt mode choice box prompt, assume yes
 assume no
if prompt, then the backsight panel is brought up in a command has not been answered adequately previously or if something has changed that warrants a redisplay of the panel.
If assume yes, then yes is assumed for all the backsights and the panel is not brought up.
If assume no, then no is assumed for all the backsights and the panel is not brought up.

Attachments tab



Wildcards(s)

space delimited list of wildcards for attaching files to shots. For example, photo images taken in the field.

Tolerance (seconds) input 600

the shot must be taken first and then any files with time less than this number of seconds after the shot, but before any subsequent shots, are attached to the shot

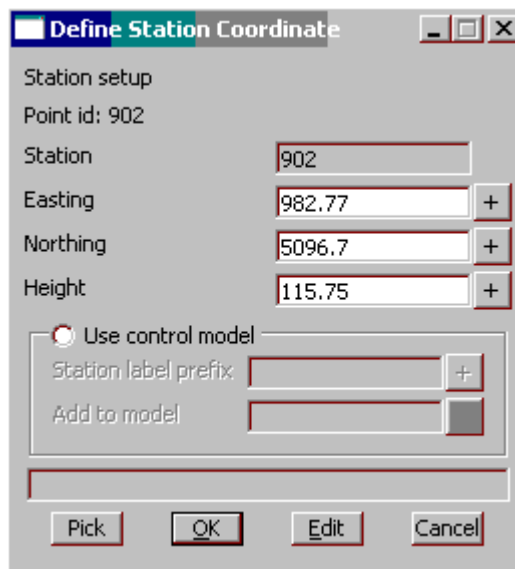
Photos to plan images tick box

if tick, 12d plan images are created for any attached image in jpeg, tiff, bmp or png format

During the reduction, the coordinates of a point may need to be supplied. This occurs when:

- ▲ an undefined point is named as the new instrument point (field code 3)
- ▲ backsight measurements are made to an undefined point (field code 4)
- ▲ check measurements are made to an undefined point (field code 6)

In this situation, a **define station coordinate** panel will pop up:



The coordinates may be typed in, or selected from existing strings. The station may also be added to a model to allow it to be used as a station later.

The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Station name	output		
<i>the station name</i>			

Use control model radio button

if ticked, the point is added to the control model.

if not ticked, the point is created but is not placed in the control model.

Easting/Northing/Height input xyz ops menu

the easting (x)/northing (y)/height (z) co-ordinates for the station.

Station prefix input

if non-blank, the created station name will be prefixed by this value.

Add to model input control model available models

if non-blank, a 4d string is created using the Easting/Northing/Height values as co-ordinates, and the station name (with a possible prefix) as the text and name of the 4d string. The station can then be referred to later in the reduction.

Pick button

pick a point whose co-ordinates are piped into the Easting/Northing/Height fields.

OK button

on selecting ok, the coordinates entered in the station xyz field are used as the station co-ordinates and if the add to model field is non-blank, a 4d string created.

Edit button

on selecting Edit, the next new instrument station entry is shown which allows the station number and associated fields to be edited.

Cancel button

the cancel button will remove the panel and terminate the reduction.

If the Backsight prompt mode is set on, then at each backsight measurement, the **bearing datum difference** panel is displayed

:

	Observed	Calculated	Observed - Calculated	Corrected	Corrected - Calculated
Easting	982.767	982.770	-0.003	982.770	0.000
Northing	5096.699	5096.700	-0.001	5096.700	-0.000
Height	115.976	115.750	0.226	115.976	0.226
Bearing	349° 53' 42"	349° 53' 49"	- 0° 0' 7"	349° 53' 49"	0° 0' 0"
Distance		98.223			

No distance was measured on this check measurement.
We assume the correct distance so that we get a measure of the accuracy of the check.

Horizontal collimation +

Vertical collimation +

Apply Swing

If **yes** button is selected, the bearing datum difference is applied to this horizontal circle reading.

If **yes to all** button is selected, the bearing datum difference is applied to all subsequent horizontal circle readings.

The **cancel** button terminates the reduction.

If **no** is selected, this horizontal circle reading is treated as actual bearing.

If **no to all** is selected, all the horizontal circle reading are treated as actual bearings.

This facility allows the horizontal circle to have any orientation during data capture.

At each check measurement, the **check measurement** panel is displayed giving information about the measurement, the point it was a check measurement for and the differences between the two.

:

	Observed	Calculated	Difference
Easting	982.770	982.770	-0.000
Northing	5096.687	5096.700	-0.013
Height	115.749	115.750	-0.001
Bearing	349° 53' 44"	349° 53' 49"	- 0° 0' 5"
Distance	98.211	98.223	-0.013

If the **Continue** button is selected, the reduction continues.

The **Cancel** button terminates the reduction

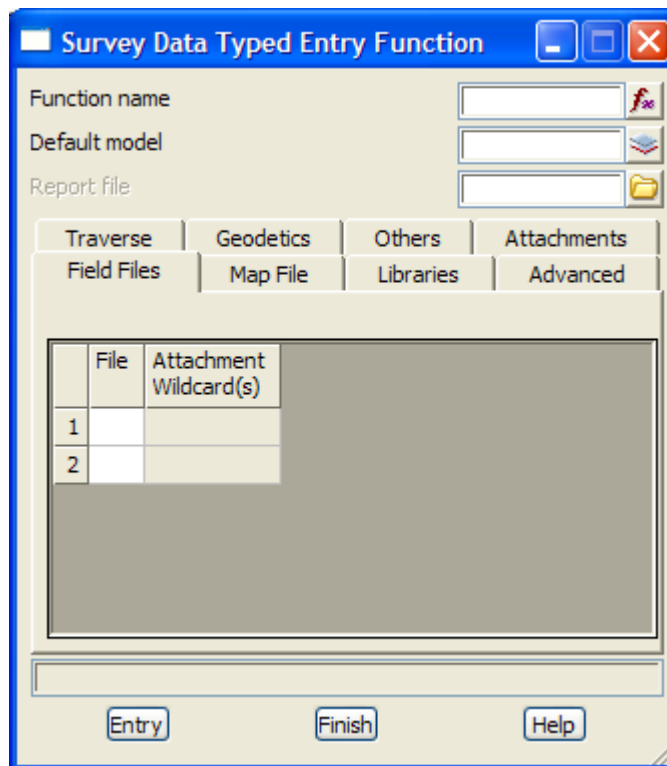
Typed Entry

`survey_data_typed_entry_function`

Position of option on menu: Survey =>Create =>Typed entry

The **Typed** entry option creates a *Survey function* from scratch using the edit commands.

Selecting **Typed** entry brings up the **survey Data Typed Entry Function** panel



The fields and buttons are identical to those in the **Survey Data Reduction Function** panel in the previous section "Field File" .

Edit Survey Function

edit_reduction

Position of menu: Survey =>Edit =>Edit Reduction

The edit reduction walk-right menu contains options to create a *12d Model Survey function* from either a *12d field file* or from scratch using *Survey Reduction edit commands*.

Basically, a *Survey* function keeps track of all the information involved in the survey data reduction and all the strings and models created by the *Survey* function. The *Survey* function can be re-run and all the old information automatically deleted and replaced by the updated information.

Once the *Survey* function is created, it then reduces the data according to the information supplied and stored with the *Survey* function. As with other *12d Model* functions, the *Survey* function information can be modified and the function recalculated.

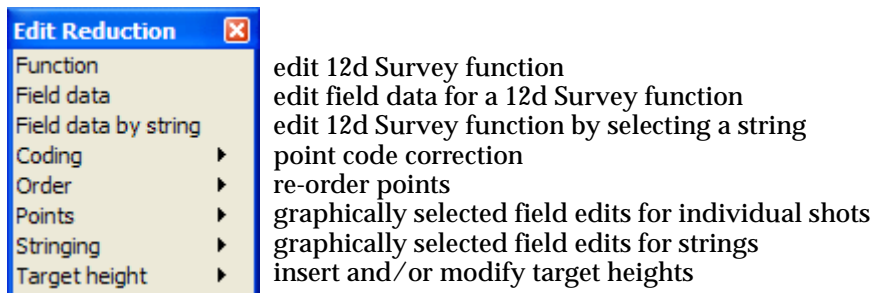
Many errors in a raw data file are only detected after the reduction has taken place. These are then corrected and the function recalculated to re-reduce the data.

Some of the types of problems that regularly occur during electronic field surveys are:

- ▲ Instrument height incorrectly entered
- ▲ Target height incorrectly entered
- ▲ Change of target height not entered
- ▲ Backsight station incorrectly named
- ▲ Instrument station incorrectly named
- ▲ Feature code and string number errors

The *12d Survey* edits allow for all commands in the field data to be modified and new commands added. Selection for some edits can be done graphically (for example incorrect target height) and others through interactive editing of the Survey field data. In all cases, once the edit is completed, the effect is immediately calculated and displayed.

The edit walk-right menu is



Each option will now be described in detail.

For the option *Function*, please go to the section

Field data

Field data by string

Coding

Order

Points

Stringing

Target height

“Function”

“Field Data”

“Field Data by String”

“Coding”

“Order”

“SDR Point Edits”

“SDR Strings Edit”

“Target Height”

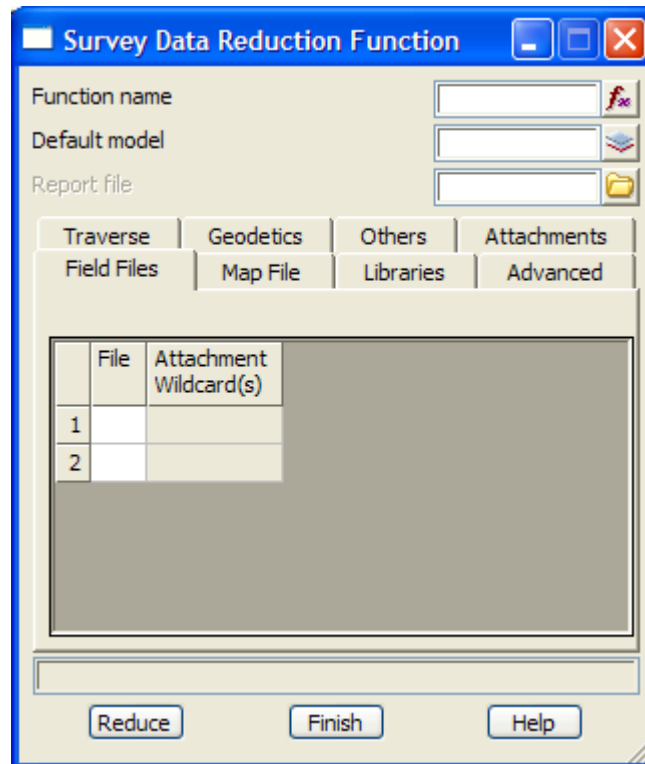
Function

Position of option on menu: Survey =>Edit =>Function

The **function** option is used to edit the set-up panel values for a *Survey* function.

Note - to edit the *field data* rather than the set-up panel, the **Field data** option is used.

Selecting **function** brings up the **Survey Data Reduction Function** panel (which is the same panel used to create the function in the Survey =>Create =>Field file option).



A *Survey* function is selected for editing by choosing the survey function from the Function name pop-up list which loads up the panel information for that function.

The panel information is then modified and the new values stored and used by selecting the **Reduce** button. This recalcs the function and hence re-reduces the data using the new panel fields.

For more information on the fields in the panel, go to the section “Edit Survey Function” .

For information on the *Survey Field Data Editor*, go to the section “Survey Field Data Editor” .

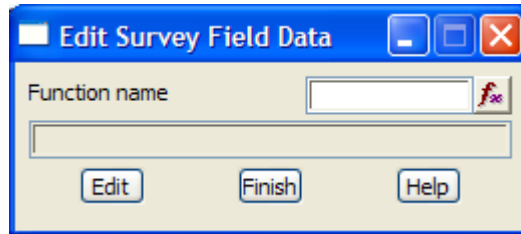
Field Data

edit_survey_field_data

Position of option on menu: Survey =>Edit =>Field data

The **field data** option is used to edit the *field data* from a Survey function. As the changes are made, the field data is automatically reduced to reflect the changes.

Selecting **Field data** brings up the **Edit Survey Field Data** panel:



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Function name <i>name of the Survey function to have the field data modified.</i>	function box		all survey functions

Edit button
clicking edit will start the Survey Field Data Editor for the given Survey function. This will be documented in the section Survey Field Data Editor.

For information on the *Survey Field Data Editor*, go to the section “Survey Field Data Editor” .

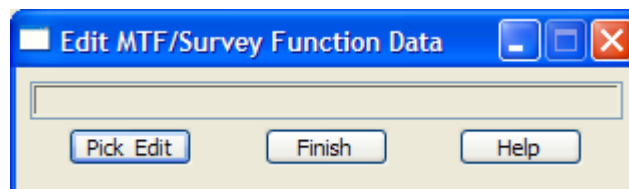
Field Data by String

[edit_mtf_survey_function_data](#)

Position of option on menu: Survey =>Edit =>Field data by string

The Field data by string option is used to edit the *field data* by selecting a string created from a Survey function.

Selecting Field data by string brings up the **Edit MTF/Survey Function Data** panel:



After selecting the **Pick Edit** button, a string created by Survey function is selected and the Survey Field Data Editor is started for the given Survey function.

For information on the *Survey Field Data Editor*, go to the section “Survey Field Data Editor” .

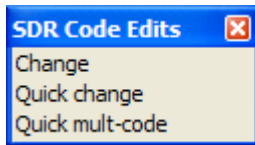
Coding

sdr_code_edits

Position of menu: Survey =>Edit =>Coding

The **coding** options are used to modify the feature code and/or string number of selected points. The 12d field file is automatically updated.

The coding walk-right menu is



change for feature code, string number
 same of change feature code, string number for many point

Each option will now be described in detail.

For the option *Change*, go to the section

Quick change

Quick multi-code

“Change”

“Quick Change”

“Quick Multi Coding”

Change

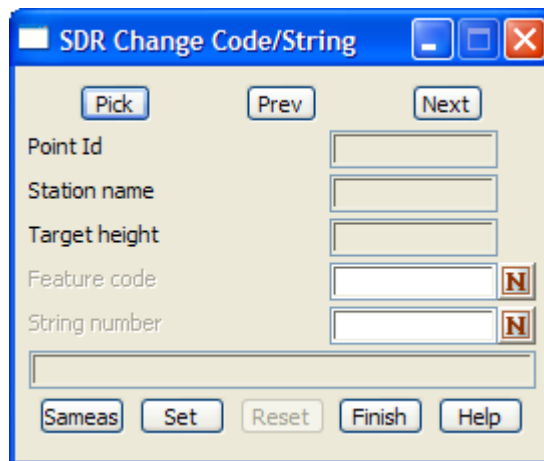
sdr_change_code_string

Position of option on menu: Survey =>Edit =>Coding =>Change

Change is used to modify a points feature code and/or string number. When a point is selected, its point id, station name and target height are displayed as well as feature code and string number.

If either the feature code or string number is then modified in the panel, selecting the set button will give the selected point the new values for feature code and/or string number.

Selecting **Change** brings up the **SDR Change Code/String** panel:



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Pick	button		
-------------	--------	--	--

select a point whose information will be displayed in the panel fields. A highlighted line joining the point to the station that it was surveyed from is also displayed.

Prev	button		
-------------	--------	--	--

move to the previous point in the string.

Next button
move to the next point in the string.

Point id display only
point id of the selected point.

Station name display only
name of the station that the point was surveyed from.

Target height display only
height of the target when the point was surveyed.

Feature code input/output
*when a point is selected, its feature code is displayed in this field. The value can then be changed by the user and if **set** is selected, the point is given the new feature code.*

String number input/output
*when a point is selected, its string number is displayed in this field. The value can then be changed by the user and if **set** is selected, the point is given the new string.*

Same as button
*after selecting **same as**, a point is selected and its feature code and string number are piped into the panel fields.*

Set button
*selecting **set** gives the selected point the values in the panel fields.*

Reset button
reset undoes the changes.

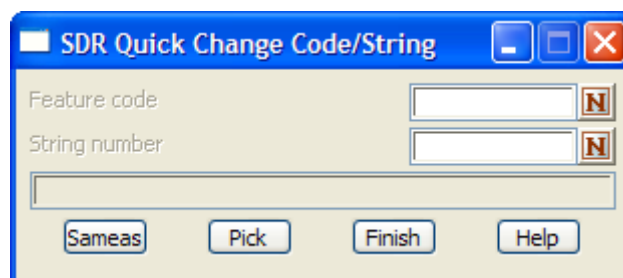
Quick Change

[sdr_quick_change_code_string](#)

Position of option on menu: Survey =>Edit =>Coding =>Quick change

The **quick change** option is for more advanced users wishing to modify the same feature code and/or string number for many points.

The new feature code and/or string number is entered into the panel and whenever a point is selected and accepted, it is given the new feature code and/string number. The picking of points continues until the picking is cancelled from the pick ops menu.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Feature code	input/output		

if not blank, when a point is accepted its feature code is changed to the value in this field.

String number input

if not blank, when a point is accepted its string number is changed to the value in this field.

Same as button

after selecting same as, a point is selected and its feature code and string number are piped into the panel fields.

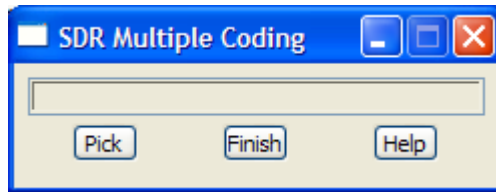
Pick button

selecting pick starts the picking sequence and any accepted point will have its feature code and/or string number modified if the corresponding panel field is not blank. The pick is terminated by selecting cancel from the pick ops menu.

Quick Multi Coding

sdr_multiple_coding

Position of option on menu: Survey =>Edit =>Coding =>Quick multi-code



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Pick button

after selecting Pick, pick the vertex that you want to multi-code, and then pick a string and the code and string number from the string will be added to the selected vertex as a multi-code.

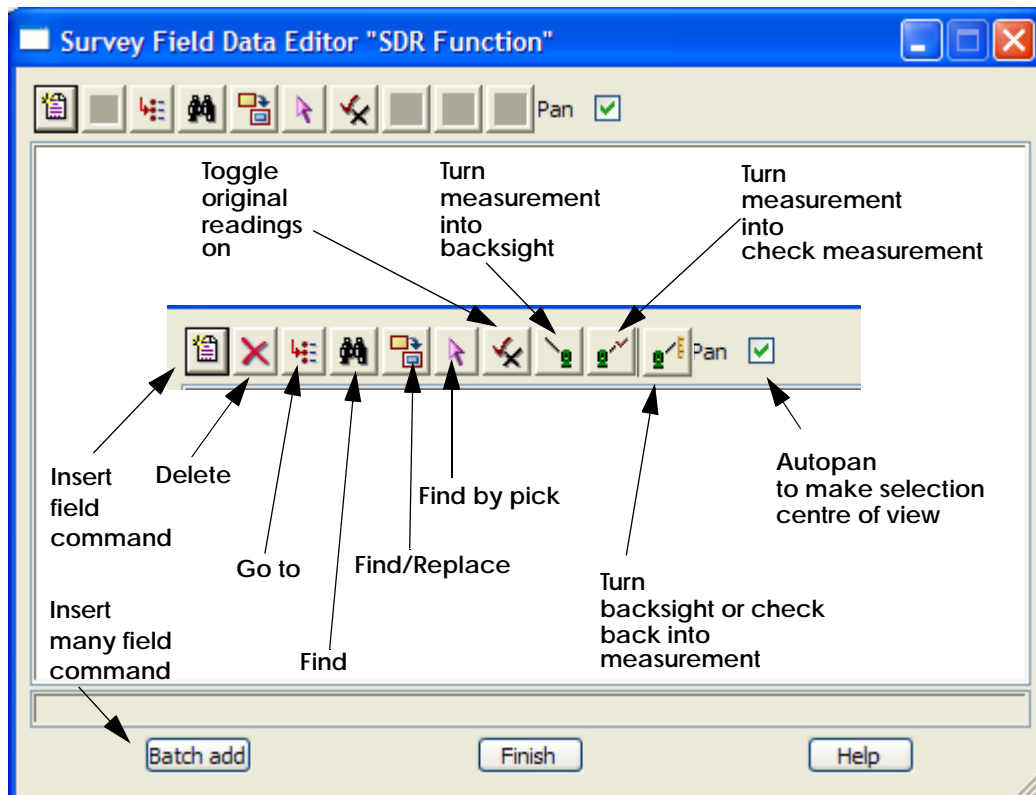
The sequence start again and continues until the pick is terminated by selecting Cancel from the Pick ops menu.

Survey Field Data Editor

survey_field_data_editor

The Survey Field Data Editor is used to interactively edit the field data of a **Survey** function. All the commands in the field data can be modified or deleted, or new commands added. When changes are made, the field data is automatically re-reduced so the effects can be immediately checked.












If the Editor is opened using the Survey=>Create=>Typed Entry option the editor will appear blank.



For information on using things inside the panel, go to "Using the Survey Field Data Panel"

For information on the field commands, go to "List of Field Data Commands and Panels"

For information on the icons and buttons on the panel:

 - Insert	go to	"Insert and Batch Add button"
 - Delete		"Delete"
 - Go to		"Goto"
 - Find		"Find"
 - Find/Replace		"Find/Replace"
 - Find by Pick		"Find by Pick"
 - Toggle		"Toggle"
 - Make backsight		"Make Measurement into a Backsight"
 - Make check measurement		"Make Measurement into a Check Measurement"
 - Change to measurement		"Make into a Measurement"
 Pan <input checked="" type="checkbox"/>	- Autopan	"Autopan"

- Batch add

"Insert and Batch Add button"

Using the Survey Field Data Panel

Colour Coding of the Field Data

Normally data has been loaded into the Survey function by a raw data file being downloaded from a data collector, converted to a 12d field file and then loaded into a Survey function.

When 12d Model converts the raw file to a 12d field file, all the raw data can be included in the 12d field file as comments.

All **comments** lines are displayed in **green**.

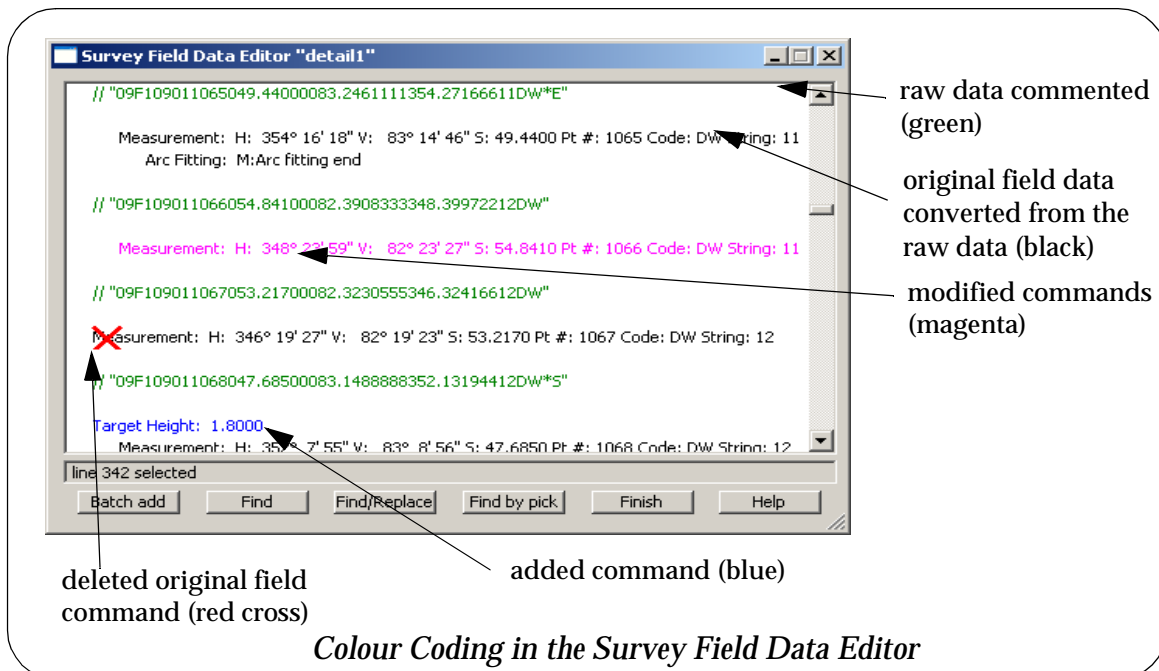
Each line (or lines if necessary) of raw data is converted into one or more equivalent 12d field file commands. These field file commands are placed straight after the commented line containing the raw data lines so it is easy to see what the raw data was converted to.

The **original 12d field commands** converted from the raw data are displayed in **black**.

If a field command has been **inserted**, it is coloured in **blue**. If a comment has been inserted, it will still be displayed in green but the word ": added" will be appended to the end of the comment.

If a field command has been **modified**, it is displayed in **magenta**.

If an **original** command has been **deleted**, the original command is left in the file but it has a **large red cross** placed on the left hand side of the line to indicate that it has been deleted. Any original command that has been deleted can be undeleted by simply deleting the command again.

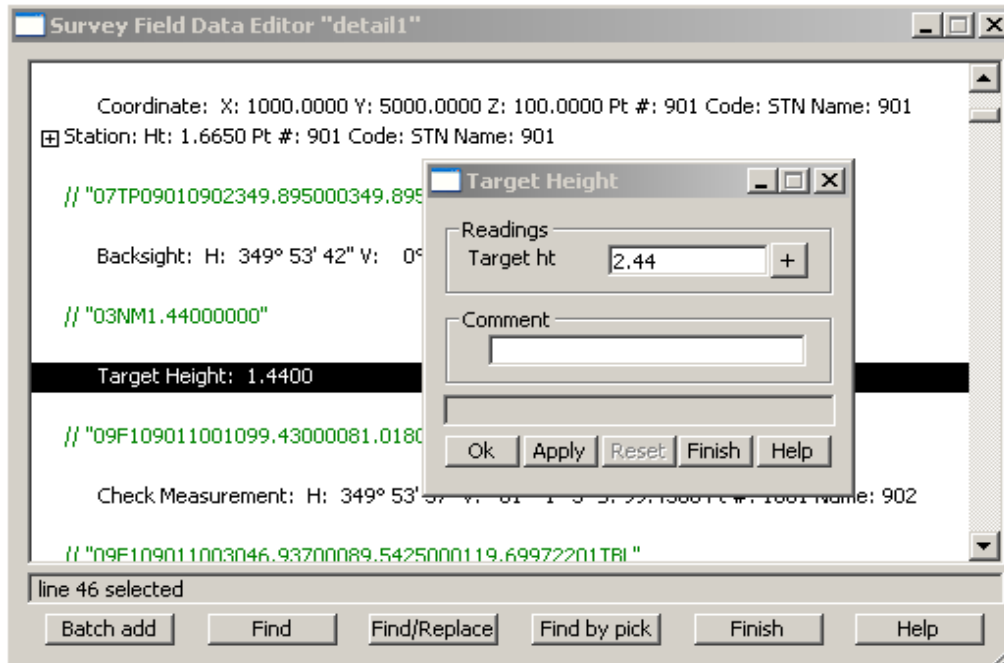


Modifying the Field Data

To modify an existing command in the field data, double click on the line to be modified and the appropriate panel for the line of field data is displayed. The data in the panel can then be

modified and stored by selecting either the **OK** or **Apply** buttons. The colour of the line of modified field data is then magenta.

For example, double clicking on **target height** command in the field file brings up the **Target Height** panel with the values loaded into the appropriate panel field. The data in the panel can be modified and saved by clicking **OK**.



Deleting Field Data

To delete a line from the field data, simply highlight the data by clicking in the line and then delete key on the keyboard or select the delete icon from the top of the panel. If the line was an original command, a red cross is placed

If an **original** command has been **deleted**, the original command is left in the file but it has a **large red cross** placed on the left hand side of the line to indicate that it has been deleted. Any original command that has been deleted can be undeleted by simply highlighting the deleting command and pressing the delete icon or delete key again.

If an **inserted** command has been **deleted**, the command is removed from the field data.

More than one line can be selected for deletion by using the standing Windows selection commands to highlight the commands and then press the delete key on the keyboard or select the delete icon from the top of the panel. Similarly to undelete multiple commands.

For information on the field commands, go to “List of Field Data Commands and Panels”

For information on the icons and buttons on the Survey Field Data panel, go to “Icons and Buttons on the Survey Field Data Editing Panel”

Icons and Buttons on the Survey Field Data Editing Panel

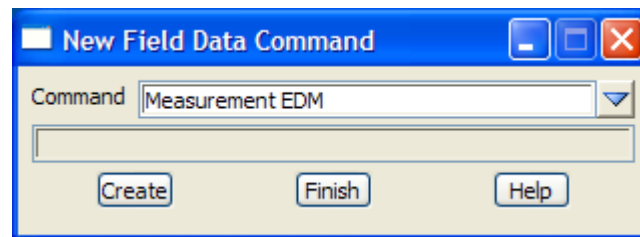
The use of the buttons at the bottom of the survey field data editing panel will now be described.
[new_field_data_command](#)

Insert and **Batch Add** button

To insert a new command into the field data, simply click on the line where the data is to be inserted and press the **Batch Add** button or select the **Insert** icon from the top of the panel.

The difference between the button and the icon, is that the button allows multiple entries whilst the icon allows one entry at a time.

Selecting either the icon or the **Batch Add** button, displays the **New Field Data Command** panel.



By clicking on the Command choice box selector, a full list of field commands is displayed and the required command is selected from the list.

Clicking **Create** then brings up the panel for the selected command type. The description of the field data commands panels is given in the section “List of Field Data Commands and Panels”

Alternatively, if the **12d Field Data Op Code** is known, this can be entered into the choice box instead of selecting from the list. For example, to enter a **Measurement EDM** field data command, the number 7 can be inserted in the choice box field.

When using **Batch Add**, once a command is selected, it will remain as a default for subsequent entries until another type is chosen. This allows a number of the same command to be quickly entered such as in the case of **Measurement EDM** by entering data into the appropriate fields and continuing to press <enter> through the default choices

For a more detailed explanation on each of the fields within the panels and the appropriate field **12d Field File Op Codes** see the section “Full Description of 12d Field File Op Codes” .

For a summary of just the field file op codes, see the section “Summary of 12d Field File Op Codes”

Delete

To delete a line from the field data, highlight the data by clicking in the line and then either use the **Delete** key on the keyboard or select the **Delete** icon from the top of the panel.

If an **original** command has been **deleted**, the original command is left in the file but has a **large red cross** placed on the left hand side of the line to indicate that it has been deleted. Any original command that has been deleted can be undeleted by simply highlighting the deleted command and pressing the **Delete** icon or **Delete** key again.

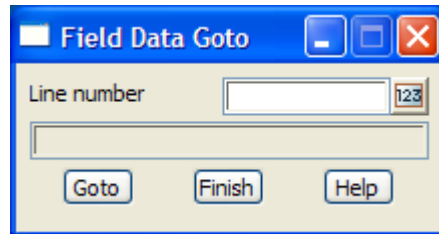
If an **inserted** command has been **deleted**, the command is removed from the field data.

More than one line can be selected for deletion by using the standing Windows selection commands to highlight the commands and then press the **Delete** key on the keyboard or the **Delete** icon from the top of the panel. Similarly to undelete multiple commands.

[Field_Data_Goto](#)

Goto

Selecting the **Goto** icon brings up the **Field Data Goto** panel.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Line number

line number to go to

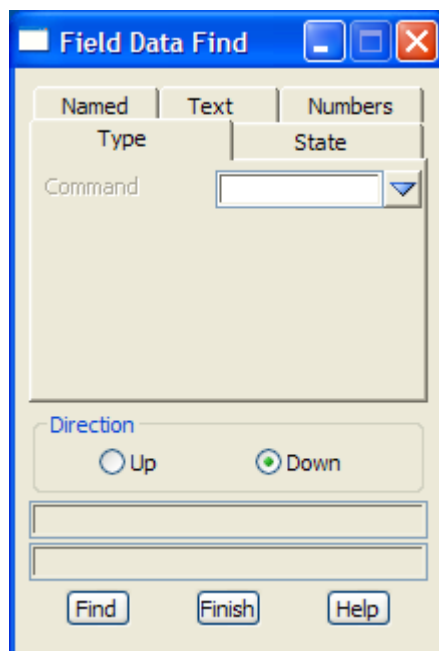
Goto	button		
-------------	--------	--	--

go to the given line number

field_data_find

Find

Selecting **Find** brings up the **Field Data Find** panel.



Each of the tabs sets the panel for the required data.

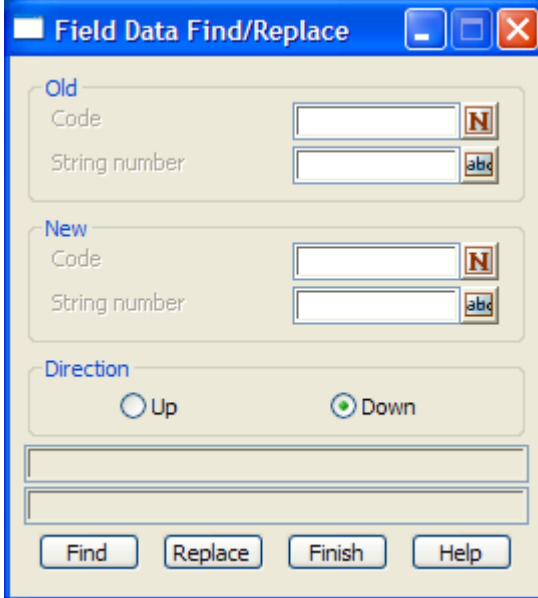
Named	find given code, string number, point id etc.
Numbers	find numbers between given minimum and maximum.
State	find a field command in a given modification state (added, changed, deleted, field)
Text	find text containing given text.
Type	find a field command of a given type. For example "New String".

The up/down radio button define which direction to search in the field data.

Field_Data_Find_Replace

Find/Replace 

Selecting the **Find/replace** icon brings up the **Field Data Find/Replace** panel.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

The user specifies the old and new **Code** and old and new **String number** fields, and the search and replace is done using those parameters.

The **Up/Down** radio button define which direction to search in the field data.

Find by Pick 

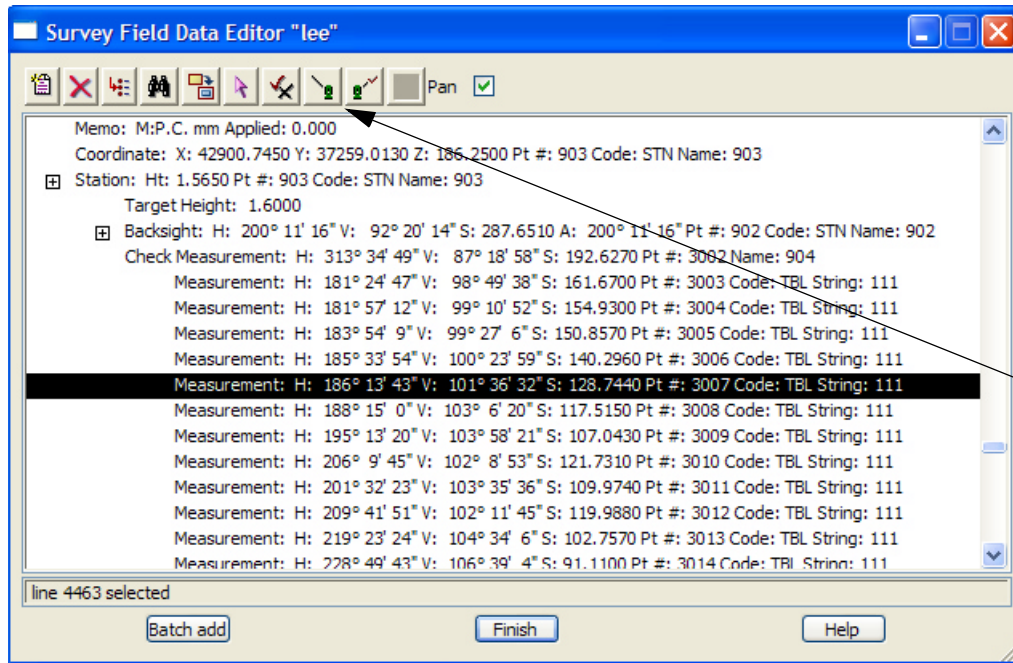
After selecting **Find by pick**, the user selects a point created by the Survey function and the field data editor will scroll to the line of the field data that created the point.

Toggle 

The toggle button allows commented information to be shown/ not shown. Simply press the **Toggle** icon to move from one state to another.

Make Measurement into a Backsight 

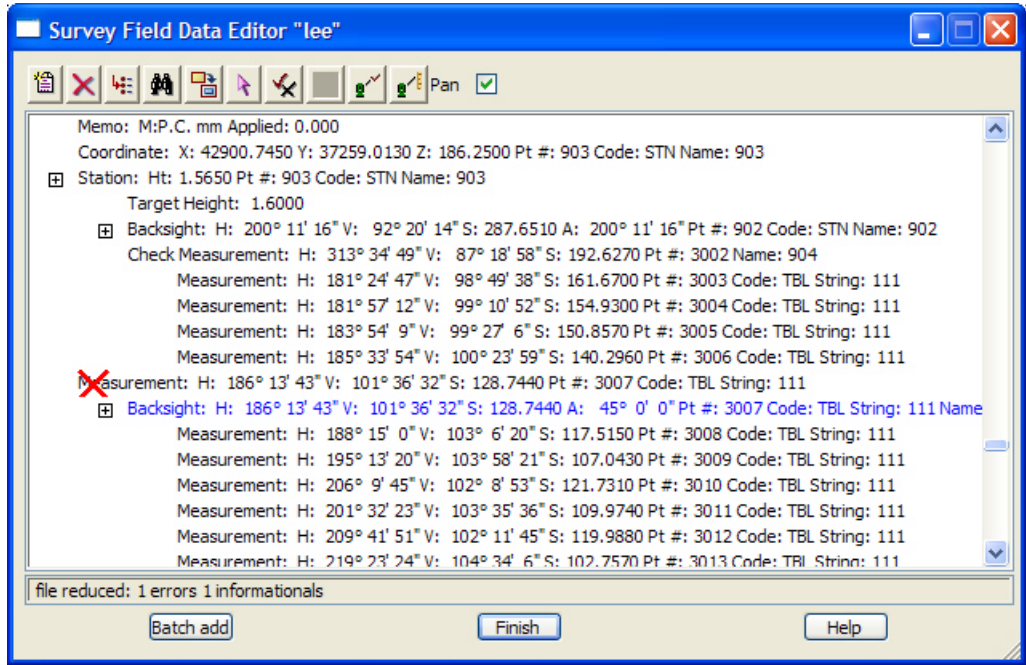
The **Make Backsight** icon is visible when a **measurement** line has been selected (highlighted) in the field data.



Highlighting a **Measurement** then displays the **Make Backsight** and **Make Check Measurement** icons

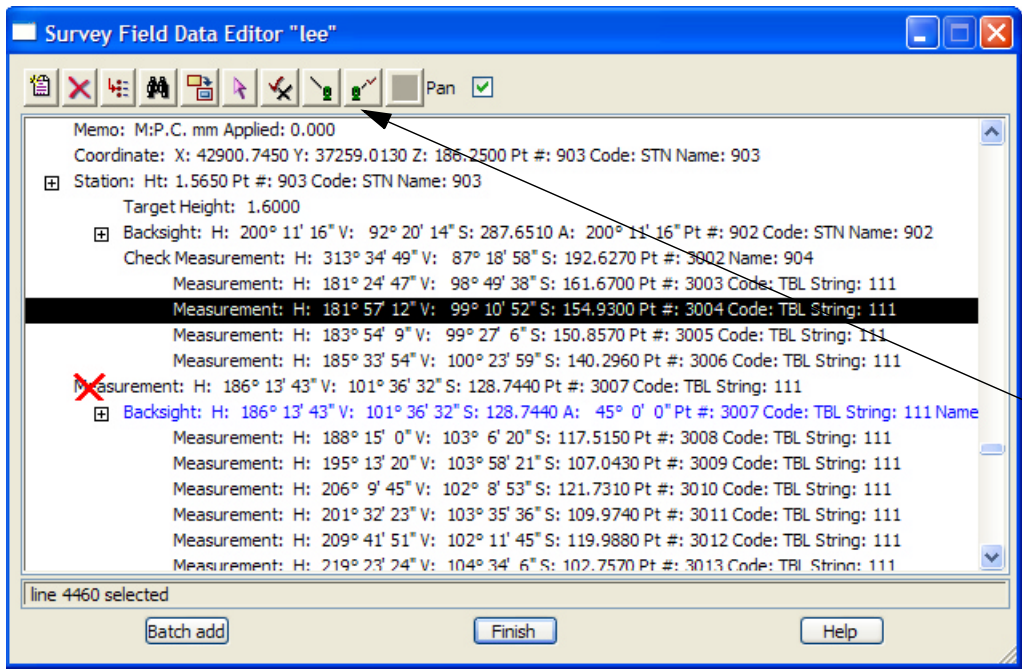
When the measurement line is highlighted, clicking on the **Make Backsight** icon brings up the **Backsight** panel with the highlighted measurement details filled in.

The **Azimuth** and **Backsight point** fields are filled in and the **OK** or **Apply** button selected. The original measurement will then be shown as deleted and a new Backsight record created.



Make Measurement into a Check Measurement

The **Make Check Measurement** icon is only visible when a *measurement* or *backsight* line has been selected (highlighted) in the field data.



When the measurement line is highlighted, clicking on the **Make Check Measurement** icon brings up the **Check Measurement** panel with the details from the highlighted measurement filled in.

Check Measurement

Readings

Horizontal angle: 181°57'11.88"

Vertical angle: 99°10'51.96"

Slope distance: 154.93

Description

Code: TBL

String number: 111

Check point:

Point Id: 3004

Attribute:

Time Surveyed: 01/Jan/1970 00:00:00

Comment:

Ok Apply Reset Finish Help

The **Check point** is then filled in and the **OK** or **Apply** button selected.

The original measurement will then be shown as deleted and a new **Check measurement** record created.

Survey Field Data Editor "lee"

Memo: M:P.C. mm Applied: 0.000

Coordinate: X: 42900.7450 Y: 37259.0130 Z: 186.2500 Pt #: 903 Code: STN Name: 903

Station: Ht: 1.5650 Pt #: 903 Code: STN Name: 903

Target Height: 1.6000

Backsight: H: 200° 11' 16" V: 92° 20' 14" S: 287.6510 A: 200° 11' 16" Pt #: 902 Code: STN Name: 902

Check Measurement: H: 313° 34' 49" V: 87° 18' 58" S: 192.6270 Pt #: 3002 Name: 904

Measurement: H: 181° 24' 47" V: 98° 49' 38" S: 161.6700 Pt #: 3003 Code: TBL String: 111

~~Measurement: H: 181° 57' 12" V: 99° 10' 52" S: 154.9300 Pt #: 3004 Code: TBL String: 111~~

Check Measurement: H: 181° 57' 12" V: 99° 10' 52" S: 154.9300 Pt #: 3004 Code: TBL String: 111 Name: lee

Measurement: H: 183° 54' 9" V: 99° 27' 6" S: 150.8570 Pt #: 3005 Code: TBL String: 111

Measurement: H: 185° 33' 54" V: 100° 23' 59" S: 140.2960 Pt #: 3006 Code: TBL String: 111

~~Measurement: H: 186° 13' 43" V: 101° 36' 32" S: 128.7440 Pt #: 3007 Code: TBL String: 111~~

Backsight: H: 186° 13' 43" V: 101° 36' 32" S: 128.7440 A: 45° 0' 0" Pt #: 3007 Code: TBL String: 111 Name: lee

Measurement: H: 188° 15' 0" V: 103° 6' 20" S: 117.5150 Pt #: 3008 Code: TBL String: 111

Measurement: H: 195° 13' 20" V: 103° 58' 21" S: 107.0430 Pt #: 3009 Code: TBL String: 111

Measurement: H: 206° 9' 45" V: 102° 8' 53" S: 121.7310 Pt #: 3010 Code: TBL String: 111

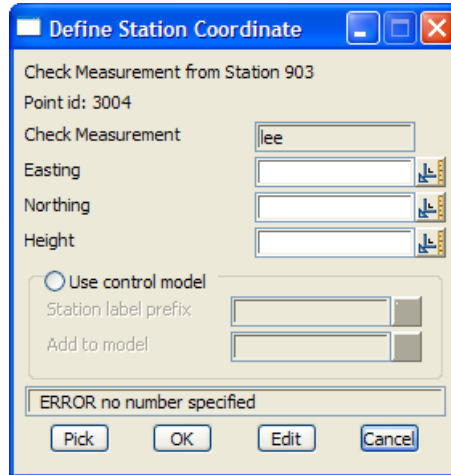
Measurement: H: 201° 32' 23" V: 103° 35' 36" S: 109.9740 Pt #: 3011 Code: TBL String: 111

Measurement: H: 209° 41' 51" V: 102° 11' 45" S: 119.9880 Pt #: 3012 Code: TBL String: 111

Station coordinate required

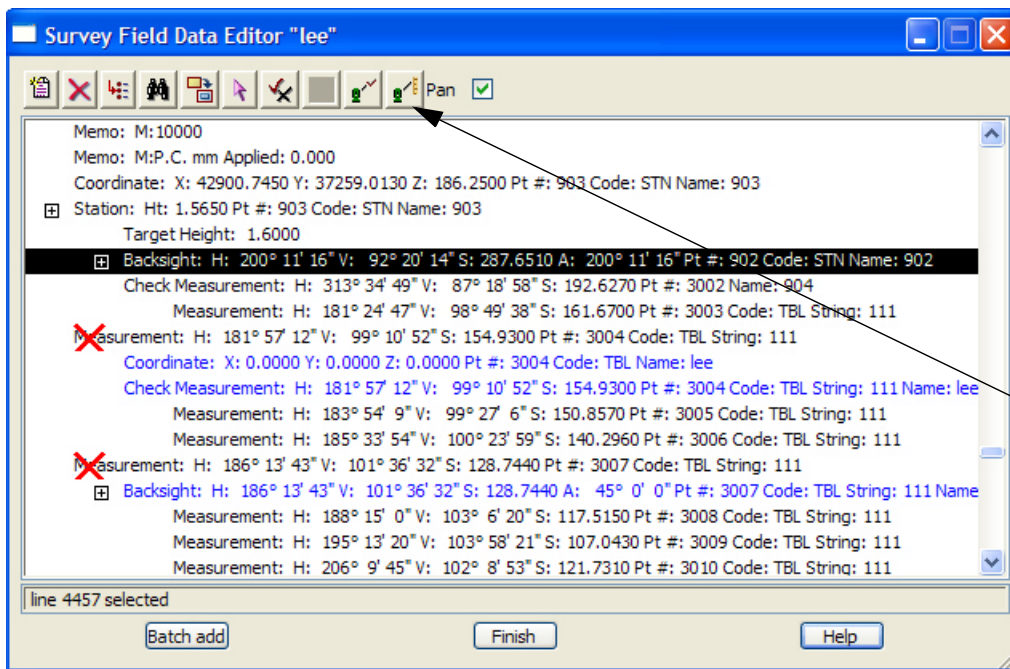
Batch add Finish Help

Note - if the **Check point** does not exist, a **Define Station Coordinate** panel is displayed for the user to enter the coordinates for the **Check point**.



Make into a Measurement

The **Make into a Measurement** icon is visible when a *backsight* or *check measurement* line has been selected (highlighted) in the field data.



Highlighting a **Backsight** or **Check Measurement** then displays the **Make Measurement** icon

When the measurement line is highlighted, clicking on the **Make Measurement** icon brings up the **EDM Measurement** panel with the highlighted *backsight* or *check measurement* details filled in.

EDM Measurement

Readings
 Horizontal angle: 200°11'16.08"
 Vertical angle: 92°20'13.56"
 Slope distance: 287.651

Description
 Code: STN
 String number:
 Named point: 902
 Point Id: 902
 Attribute:

Time Surveyed

Comment

Ok Apply Reset Finish Help

The **String number** field may need to be filled in and the **OK** or **Apply** button selected. The original **backsight** or **check measurement** will then be shown as deleted and a new **Measurement** record created.

Survey Field Data Editor "lee"

Memo: M:10000
 Memo: M:P.C. mm Applied: 0.000
 Coordinate: X: 42900.7450 Y: 37259.0130 Z: 186.2500 Pt #: 903 Code: STN Name: 903
 Station: Ht: 1.5650 Pt #: 903 Code: STN Name: 903
 Target Height: 1.6000
 Backsight: H: 200° 11' 16" V: 92° 20' 14" S: 287.6510 A: 200° 11' 16" Pt #: 902 Code: STN Name: 902
Measurement: H: 200° 11' 16" V: 92° 20' 14" S: 287.6510 Pt #: 902 Code: STN Name: 902
 Check Measurement: H: 313° 34' 49" V: 87° 18' 58" S: 192.6270 Pt #: 3002 Name: 904
 Measurement: H: 181° 24' 47" V: 98° 49' 38" S: 161.6700 Pt #: 3003 Code: TBL String: 111
 Measurement: H: 181° 57' 12" V: 99° 10' 52" S: 154.9300 Pt #: 3004 Code: TBL String: 111
 Coordinate: X: 0.0000 Y: 0.0000 Z: 0.0000 Pt #: 3004 Code: TBL Name: lee
 Check Measurement: H: 181° 57' 12" V: 99° 10' 52" S: 154.9300 Pt #: 3004 Code: TBL String: 111 Name: lee
 Measurement: H: 183° 54' 9" V: 99° 27' 6" S: 150.8570 Pt #: 3005 Code: TBL String: 111
 Measurement: H: 185° 33' 54" V: 100° 23' 59" S: 140.2960 Pt #: 3006 Code: TBL String: 111
 Measurement: H: 186° 13' 43" V: 101° 36' 32" S: 128.7440 Pt #: 3007 Code: TBL String: 111
 Backsight: H: 186° 13' 43" V: 101° 36' 32" S: 128.7440 A: 45° 0' 0" Pt #: 3007 Code: TBL String: 111 Name
 Measurement: H: 188° 15' 0" V: 103° 6' 20" S: 117.5150 Pt #: 3008 Code: TBL String: 111
 Measurement: H: 195° 13' 20" V: 103° 58' 21" S: 107.0430 Pt #: 3009 Code: TBL String: 111

line 4458 selected

Batch add Finish Help

Autopan Pan

Ticked on - when a line is selected (highlighted) in the survey data editor panel, if the point is not visible in a plan view that the model for the data is on, the view is modified so that the selected point is at the centre of the view (keeping the same scale for the view).

List of Field Data Commands and Panels

Panel buttons

The buttons that appear on the bottom of the panels used in this section have the following functions.

OK - Changes field data and closes the panel

Apply - Changes the field data but keeps the panel in view

Reset - If the record was an original field record (i.e. the command was not inserted manually) pressing the reset button will revert the record back to the original values.

Help and **Finish** are standard 12d buttons.

Existing point search

Some commands such as ***Backsight***, ***New instrument***, ***Check*** etc. allow the user to enter existing *point names* (i.e. backsight point, Setup point and Check point) or in the case of measurements from a data collector, both *point name* and *point ids*. The difference between *point names* and *point ids* is that *point names* are usually specified by the user and should be a unique identifier for a point, whilst for that same physical point a number of measurements (and hence point ids) may be assigned (usually by the data collector). This may be particularly true of control station measurements where measurements are made to a given point name but each measurement is given a different point id by the data collector.

In most instances, a measurement to a point has a point id (from the data collector) and 12d automatically gives it the same point name as it is rare to measure a non-control point more than once (the point name can be over ridden by the user).

The names allow the reduction routine to search for the details of that point (eg coordinates) to allow for the reduction of further measurements. The order in which this searching takes place is as follows:

First search the Control model (if it exists):

1. A search is made of the control model for a string whose name is the same as the specified *point name*. If a string is found, the first point of the string is used for the (x,y,z) co-ordinates.
2. A search is made of the control model for a vertex of a string whose point id is the same as the specified *point name*. If a vertex is found its (x,y,z) co-ordinates are used.
3. If only a *point id* was specified, a search is made of the control model for a vertex of a string whose point id is the same as the specified *point id*. If a vertex is found its (x,y,z) co-ordinates are used.

Next search the already entered directly entered co-ordinates (DEC) in the field file:

4. A search is made of previously entered directly entered co-ordinates in the field file for a directly entered co-ordinate whose *point name* is the same as the specified *point name*. If a DEC is found, its (x,y,z) co-ordinates are used.
5. A search is made of previously entered directly entered co-ordinates in the field file for a directly entered co-ordinate whose *point id* is the same as the specified *point name*. If a DEC is found, its (x,y,z) co-ordinates are used.
6. A search is made of previously entered directly entered co-ordinates in the field file for a directly entered co-ordinate whose *point id* is the same as the specified *point id*. If a DEC is found, its (x,y,z) co-ordinates are used.

Next search the previous measurements in the field file:

7. A search is made of previous measurements in the field file for a measurement whose *point name* is the same as the specified *point name*. If a measurement is found, its (x,y,z) co-ordinates are used.
8. A search is made of previous measurements in the field file for a measurement whose *point id*

is the same as the specified *point name*. If a measurement is found, its (x,y,z) co-ordinates are used.

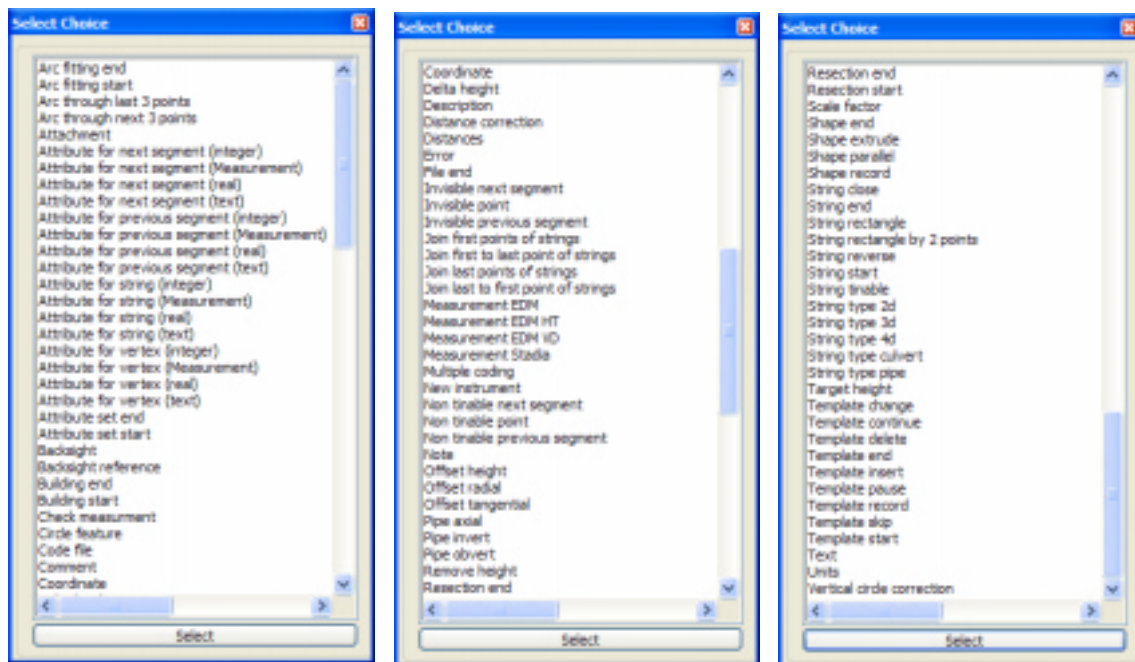
9. A search is made of previous measurements in the field file for a measurement whose *point id* is the same as the specified *point id*. If a measurement is found, its (x,y,z) co-ordinates are used.

Finally

10. If no match is found, the user will be prompted for the details of the previously undefined point. The user is asked to type in the (x,y,z) co-ordinates in the **Define Station coordinate** panel. If a model is specified in the Add to model field of the panel, then a new one point super string is created with the name *point name*, and as the vertex text for the point, the Station label prefix field value followed by *point name*

Field Data commands

The list of field commands in the pop-up from **Insert** or **Batch Add** are:



For a summary of the field file op codes see the section “Summary of 12d Field File Op Codes”

For details on each option in the pop-up:

<i>Arc fitting end</i>	go to	“Arc Fitting”
<i>Arc fitting start</i>		“Arc Fitting”
<i>Arc through last 3 points</i>		“Arc Fitting”
<i>Arc through next 3 points</i>		“Arc Fitting”
<i>Attachment</i>		“Attachment”
<i>Attribute for next segment (integer)</i>		“Attributes”
<i>Attribute for next segment (measurement)</i>		“Attributes”
<i>Attribute for next segment (real)</i>		“Attributes”
<i>Attribute for next segment (text)</i>		“Attributes”
<i>Attribute for previous segment (integer)</i>		“Attributes”
<i>Attribute for previous segment (measurement)</i>		“Attributes”
<i>Attribute for previous segment (real)</i>		“Attributes”
<i>Attribute for previous segment (text)</i>		“Attributes”
<i>Attribute for string segment (integer)</i>		“Attributes”
<i>Attribute for string segment (measurement)</i>		“Attributes”

<i>Attribute for string segment (real)</i>	"Attributes"
<i>Attribute for string segment (text)</i>	"Attributes"
<i>Attribute for vertex segment (integer)</i>	"Attributes"
<i>Attribute for vertex segment (measurement)</i>	"Attributes"
<i>Attribute for vertex segment (real)</i>	"Attributes"
<i>Attribute for vertex segment (text)</i>	"Attributes"
<i>Attribute set start)</i>	"Attributes"
<i>Attribute set end)</i>	"Attributes"
<i>Backsight</i>	"Backsight"
<i>Backsight reference</i>	"Backsight Reference"
<i>Building start</i>	"Buildings"
<i>Building end</i>	"Buildings"
<i>Check measurement</i>	"Check Measurement"
<i>Circle feature</i>	"Feature"
<i>Comment</i>	"Comment"
<i>Coordinate</i>	"Coordinate"
<i>Delta height</i>	"Height Or Depth"
<i>Description</i>	"Job Data"
<i>Distances</i>	"Coordinate"
<i>Error</i>	"Error"
<i>File end</i>	"End File"
<i>Invisible next segment</i>	"Invisible"
<i>Invisible point</i>	"Invisible"
<i>Invisible previous segment</i>	"Invisible"
<i>Join first points of strings</i>	"Strings Join"
<i>Join first to last point of strings</i>	"Strings Join"
<i>Join last points of strings</i>	"Strings Join"
<i>Join last to first point of strings</i>	"Strings Join"
<i>Measure EDM</i>	"EDM Measurement"
<i>Measure EDM HT</i>	"EDM Measurement (HA,HD,HT)"
<i>Measure EDM VD</i>	"Edm measurement (HA,HD,Diff HT)"
<i>Measure Stadia</i>	"Stadia Measurement"
<i>Multiple coding</i>	"Multiple Coding"
<i>New instrument</i>	"New Instrument"
<i>Non tinalbe next segment</i>	"Tinalbe"
<i>Non tinalbe point</i>	"Tinalbe"
<i>Non tinalbe previous segment</i>	"Tinalbe"
<i>Note</i>	"Note"
<i>Offset height</i>	"Offset Measurement"
<i>Offset radial</i>	"Offset Measurement"
<i>Offset tangential</i>	"Offset Measurement"
<i>Pipe axial</i>	"Pipe Justification"
<i>Pipe invert</i>	"Pipe Justification"
<i>Pipe obvert</i>	"Pipe Justification"
<i>Remove height</i>	"Remove Height"
<i>Resection start</i>	"Resection Start"
<i>Resection end</i>	"Resection End"

<i>Scale factor</i>	"Scale Factor"
<i>Shape end</i>	"Shaping"
<i>Shape extrude</i>	"Shaping"
<i>Shape parallel</i>	"Shaping"
<i>Shape record</i>	"Shaping"
<i>String close</i>	"String Close"
<i>String end</i>	"String End"
<i>String rectangle</i>	"Rectangle"
<i>String rectangle by 2 points</i>	"Rectangle By 2 Points"
<i>String reverse</i>	"String Reverse"
<i>String start</i>	"String Start"
<i>String tinable</i>	"Breakline String"
<i>String type 2d</i>	"String Type"
<i>String type 3d</i>	"String Type"
<i>String type 4d</i>	"String Type"
<i>String type culvert</i>	"Culvert"
<i>String type pipe</i>	"Pipe Diameter"
<i>Target height</i>	"Target Height"
<i>Template change</i>	"Templating"
<i>Template continue</i>	"Templating"
<i>Template delete</i>	"Templating"
<i>Template end</i>	"Templating"
<i>Template insert</i>	"Templating"
<i>Template pause</i>	"Templating"
<i>Template record</i>	"Templating"
<i>Template skip</i>	"Templating"
<i>Template start</i>	"Templating"
<i>Text</i>	"Additional Text For Point"
<i>Units</i>	"Units"
<i>Vertical circle correction</i>	"Vertical Circle Correction"

arc_fitting

Arc Fitting

The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Arc mode	choice box	Arc through last 3 pts	Arc thro last 3 pts Arc thro next 3 pts Start arc fitting End arc fitting

Arc through last 3 pts

Named point is not used.

If no *feature code*, *string number*, *named point* or *point id* is given, then the current measurement point and the two previous points with the same feature code and string number as the current measurement point, are joined by an arc. If there is less than three such points, no arc is fitted.

If the *feature code* and *string number* exist, the last three previous measurement points of the same *feature code* and *string number* are joined by an arc. If the current measurement point has that feature code and string number, then it is the third of the three points used. If there is less than three points, no arc is fitted.

If a *point id* exists, then the *feature code* and *string number* are taken from the previous measurement point **with** that point id. That point and two measurement points previous to the predefined point of the same *feature code* and *string number*, are joined by an arc. If there is less than three points, no arc is fitted.

Arc through next 3 pts

Named point is not used.

If no *feature code*, *string number*, *named point* or *point id* is given, an arc is inserted through the current measurement point and the next two measured points with the same feature code and string number as the current measurement point. If there is less than three points, no arc is fitted.

If a *feature code*, *string number* or *point id* exists, then either the *feature code* and/or *string number* and/or the *point id* section of the *point description* can be used.

If the *feature code* or *string number* exist, a search is made for a previously defined measurement with the same feature code or string number. An arc is inserted through this previous measurement and the

next two measured points following this previous measurement with the same feature code and string number. If the current point has that feature code and string number, then it is the first of the three points. If there is less than three points, no arc fitted.

If the *point id* exists, then the *feature code* and *string number* are taken from the previous measurement point **with** that point id, and an arc is inserted through that point and the next two measurement points with the same *feature code* and *string number*. If there is less than three points, no arc is fitted

Start arc fitting

Named point is not used.

If no *feature code*, *string number*, *named point* or *point id* is given, arcs are inserted through the following sets of measurement points with the same feature code and string number as the current measurement point. The current measurement point is the first of the points.

The arcs are fitted as follows - the first arc is fitted through points one, two and three, the next arc through points three, four and five etc. If the current point has that feature code and string number, then it is the first of the points. If there is less than three points, then no arc is fitted.

If the *feature code* and *string number* exist, a search is made for a previously defined measurement with the same feature code or string number. An arc is inserted through the following measured points with the same feature code and string number as given. If the current point has that feature code and string number, then it is the first of the points.

If the *point id* exists, then the *feature code* and *string number* are taken from the previous measurement point **with** that point id, and arcs are inserted through that point and the following measured points with the same *feature code* and *string number*.

End arc fitting

Named point is not used.

If no *feature code*, *string number*, *named point* or *point id* is given, the fitting of arcs through the current string is stopped. The current measurement point is the last of the points used in the arc fitting.

If the *feature code* and *string number* exist, then the fitting of arcs through the points of the previous string with the same *feature code* and *string number* is stopped. If the current measurement point has that feature code and string number, then it is the last point used in the arc fitting.

If the *point id* from the *point description* exists, then the point with that point id is the last point used in the arc fitting.

If 12d Model encounters an *End Arcs* (62) but no *Start Arcs through sets of three points* (61) command for the string, then a *Start Arcs through sets of three points* (61) is assumed to apply at the beginning of the string and hence arc fitting will be applied to the entire string.

Code

feature code. See the description of the panel field *Arc mode for usage*

String number

string number. See the description of the panel field *Arc mode for usage*

Named point

not used

Point id

point id. See the description of the panel field *Arc mode for usage*

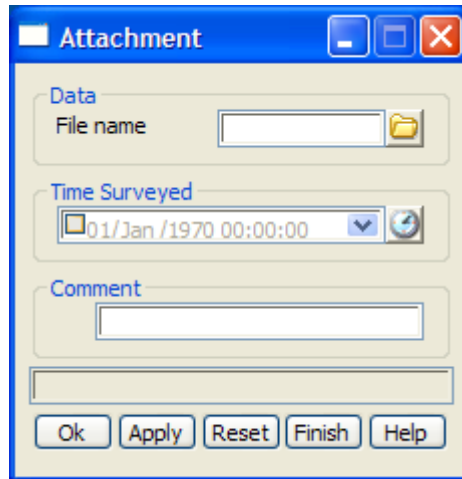
Comment

comment for the command within the field file.

OK, Apply, Reset, Finish, Help See the description for the panel buttons in the section“Panel buttons”

attachment

Attachment



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

File name

file to attach to the measurement

Time surveyed

time when the command (op code) was created

Comment

comment for the command within the field file.

OK, Apply, Reset, Finish, Help See the description for the panel buttons in the section“Panel buttons”

attributes

Attributes

The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Mode	choice box	String (integer)	String (integer) String (real) String (text) Vertex (integer) Vertex (real) Vertex (text) Next segment (integer) Next segment (real) Next segment (text) Previous segment (integer) Previous segment (real) Previous segment (text)

String (integer)

Add an user defined integer attribute to the current string.

String (real)

Add a real (floating point) user defined attribute to the current string.

String (text)

Add a text user defined attribute to the current string.

Vertex (integer)

Add an integer user defined attribute to the current measurement point.

Vertex (real)

Add a real (floating point) user defined attribute to the current measurement point.

Vertex (text)

Add a text user defined attribute to the current measurement point.

Next segment (integer)

Add an integer user defined attribute to the next segment from the current measurement point.

Next segment (real)

Add a real (floating point) user defined attribute to the next segment from the current measurement point.

Next segment (text)

Add a text user defined attribute to the next segment from the current measurement point.

Previous segment (integer)

Add an integer user defined attribute to the previous segment for the current measurement point.

Previous segment (real)

Add a real (floating point) user defined attribute to the previous segment for the current measurement point.

Previous segment (text)

Add a text user defined attribute to the previous segment for the current measurement point.

Name

The name of the attribute.

Value

The attribute data in the form specified by the mode.

Time surveyed

time when the command (op code) was created

Comment

comment for the command within the field file.

OK, Apply, Reset, Finish, Help See the description for the panel buttons in the section "Panel buttons"

backsight

Backsight

Individual backsight measurements can be entered or they can exist of pairs of Face1/Face2 measurements. To enter a Face1/face2 measurement the backsight command should be entered twice, with the appropriate values entered into the panel each time.

The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Horizontal angle

the horizontal angle to the backsight in dd.mmss format.

Vertical angle

the vertical angle to the backsight in dd.mmss format. If the value is in the range 0 -180 degrees the measurement is considered a Face 1 measurement, and for measurements in the range 180-360 degrees they are considered Face2.

Slope distance

the slope distance to the measurement to the backsight. If a pair of face1/face2 measurements exist, the mean value of the slope distance is used for reduction purposes.

Value

the azimuth to the backsight in dd.mmss format. This allows backsights to be specified by azimuth only. In the case of a differing azimuth and horizontal angle, a swing will be computed by the subtraction of the azimuth value and the horizontal angle.

Code

the feature code of the measurement.

String number

the string number of the measurement.

Backsight point

point name.of the backsight point. This can be an integer, real, text or alphanumeric. For a more detailed description of how the reduction finds/uses the appropriate point see the section “Existing point search”

Point id

point id.of the backsight point. This can be an integer, real, text or alphanumeric. For a more detailed description of how the reduction finds/uses the appropriate point see the section “Existing point search” . If a new backsight entry is inserted into the file, this field will be non-editable since only the backsight point is required.

Attribute

Time surveyed

time when the command (op code) was created

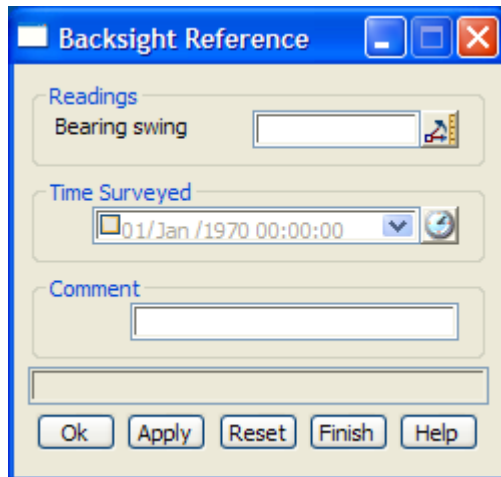
Comment

comment for the command within the field file.

OK, Apply, Reset, Finish, Help See the description for the panel buttons in the section “Panel buttons”

backsight_reference

Backsight Reference



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Bearing swing

the angle (measured positive, clockwise from north) to swing following measurements. It is equivalent to the bearing datum difference. Note, this swing is only current for measurements following the command and for that particular station setup. It also negates any previous swings calculated from

backsight measurements (bearing datum difference) for that station setup. Therefore, measurements after the command will use the new swing value. The direction of the swing is positive in the clockwise direction

Time surveyed

time when the command (op code) was created

Comment

comment for the command within the field file.

OK, Apply, Reset, Finish, Help See the description for the panel buttons in the section “Panel buttons”

buildings

Buildings

The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Mode			Buildings end Buildings start

Building end

If no *name* exists, the current building face observation set is finished (including the current measurement point).

Buildings start

Start recording a field template with the given name. If *name* is non-blank, then the default building face is defined by the *feature code* and *string number* of the following measurements until a *Finish* code (111) are stored as the building face. There is no limit to the number of points in a building face.

Name

Name has the meaning as outlined above in Building end/start definition.

Time surveyed

time when the command (op code) was created

Comment

insert a comment within the field file.

OK, Apply, Reset, Finish, Help See the description for the panel buttons in the section “Panel buttons”

check_measurement

Check Measurement

Individual check measurements can be entered or they can exist of pairs of Face1/Face2 measurements. To enter a Face1/face2 measurement the check command should be entered twice, with the appropriate values entered into the panel each time.

The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Horizontal angle

the horizontal angle to the check point in dd.mmss format.

Vertical angle

the vertical angle to the check point in dd.mmss format. If the value is in the range 0 -180 degrees the measurement is considered a Face 1 measurement, and for measurements in the range 180-360 degrees they are considered Face2.

Slope distance

the slope distance to the measurement to the check point. If a pair of face1/face2 measurements exist, the mean value of the slope distance is used for reduction purposes.

Code

the feature code of the measurement.

String number

the string number of the measurement.

Check point

point name.of the check point. This can be an integer, real, text or alphanumeric. For a more detailed description of how the reduction finds/uses the appropriate point see the section “Existing point search”

Point id

point id.of the check point. This can be an integer, real, text or alphanumeric. For a more detailed description of how the reduction finds/uses the appropriate point see the section “Existing point search” . If a new check point entry is inserted into the file, this field will be non-editable since only the check point is required.

Attribute

Time surveyed

time when the command (op code) was created

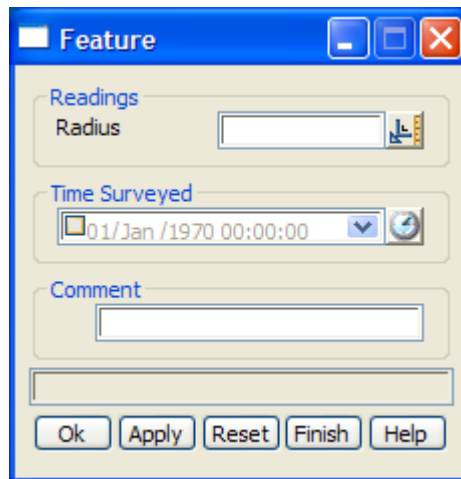
Comment

comment for the command within the field file.

OK, Apply, Reset, Finish, Help See the description for the panel buttons in the section “Panel buttons”

feature

Feature



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Radius

the radius of the circle to be drawn around the current measurement point.

Time surveyed

time when the command (op code) was created

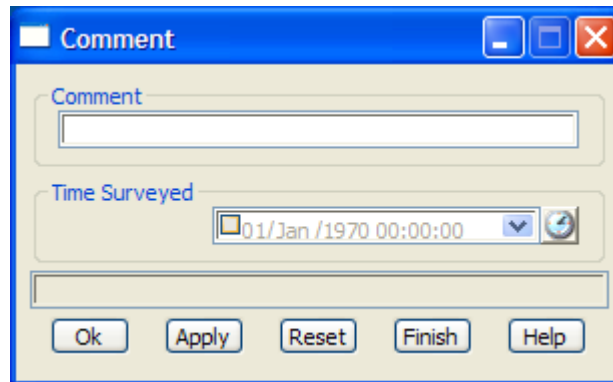
Comment

comment for the command within the field file.

OK, Apply, Reset, Finish, Help See the description for the panel buttons in the section “Panel buttons”

comment

Comment



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Comment

insert a comment within the field file.

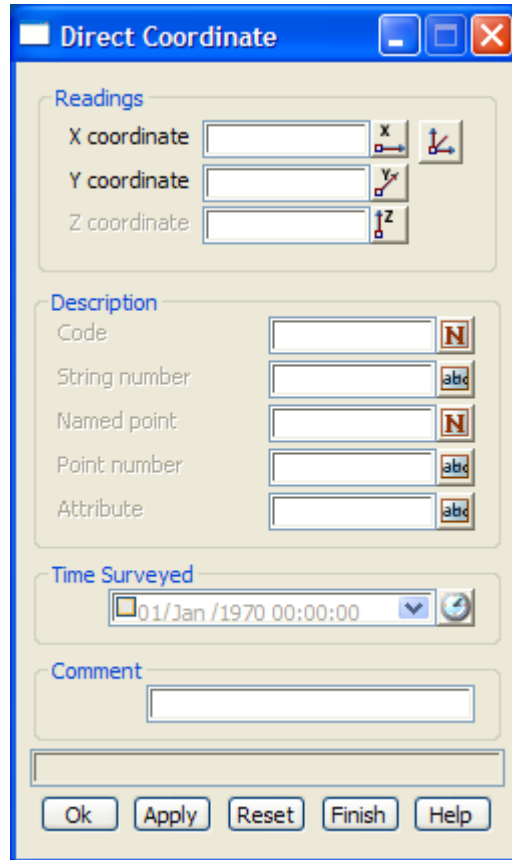
Time surveyed

time when the command (op code) was created

OK, Apply, Reset, Finish, Help See the description for the panel buttons in the section "Panel buttons"

direct_coordinate

Coordinate



The fields and buttons used in this panel have the following functions.

Field	Description	Type	Defaults	Pop-Up
-------	-------------	------	----------	--------

X coordinate		double box		
	<i>the x coordinate value of the nominated point.</i>			

Y coordinate		double box		
	<i>the y coordinate value of the nominated point.</i>			

Z coordinate		double box		
	<i>the z coordinate value of the nominated point.</i>			

Code				
	<i>the feature code of the nominated point.</i>			

String number				
	<i>the string number of the nominated point.</i>			

Named point				
	<i>point name.of the point. This can be an integer, real, text or alphanumeric. For a more detailed description of how the reduction finds/uses the appropriate point see the section “Existing point search”</i>			

Point id				
	<i>point id.of the point. This can be an integer, real, text or alphanumeric. For a more detailed description of how the reduction finds/uses the appropriate point see the section “Existing point search” . If a new</i>			

check point entry is inserted into the file, this field will be non-editable since only the check point is required.

Attribute

Time surveyed

time when the command (op code) was created

Comment

insert a comment within the field file.

OK, Apply, Reset, Finish, Help See the description for the panel buttons in the section “Panel buttons”

height_or_depth

Height Or Depth

Note - this option **does not alter heights**. It just adds a text comment of the given height value.

The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Value

value is converted to text and added to the string name as specified in the description fields.

Code, String number, Named point

Named point is not used.

If no feature *code*, *string number*, *named point* or *point id* is given, the value is added to all string names with the same code and string number as the current measurement. This applies to the entire field file.

If the *feature code* and *string number* exist, then the value is added to all string names with the same code and string number. This applies to the entire field file.

If the *point id* exists, then the value is added to all string names with the same code and string number

as the point defined by the point id. This applies to the entire field file.

Time surveyed

time when the command (op code) was created

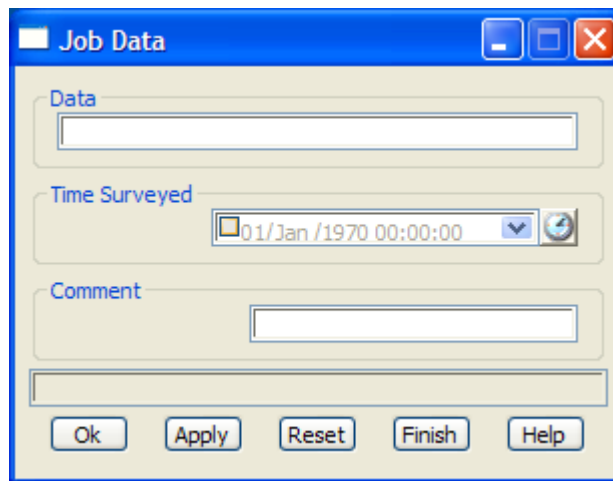
Comment

insert a comment within the field file.

OK, Apply, Reset, Finish, Help See the description for the panel buttons in the section “Panel buttons”

job_data

Job Data



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Data

extra text to be added as header information

Time surveyed

time when the command (op code) was created

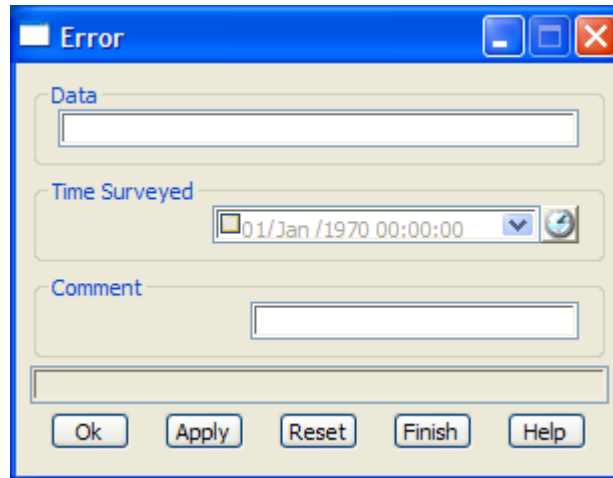
Comment

insert a comment within the field file.

OK, Apply, Reset, Finish, Help See the description for the panel buttons in the section “Panel buttons”

error

Error



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Data

extra text to be added as error information. If the field file was reduced from a raw data collector file, any records that can't be parsed correctly will have an error comment.

Time surveyed

time when the command (op code) was created

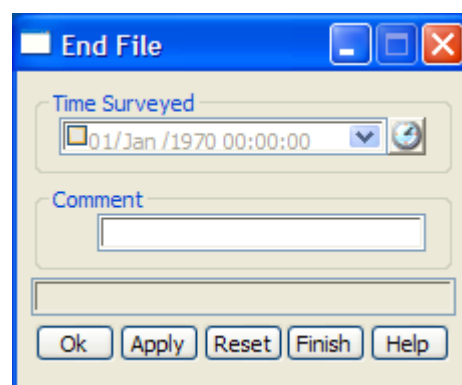
Comment

insert a comment within the field file.

OK, Apply, Reset, Finish, Help See the description for the panel buttons in the section "Panel buttons"

end_file

End File



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Time surveyed

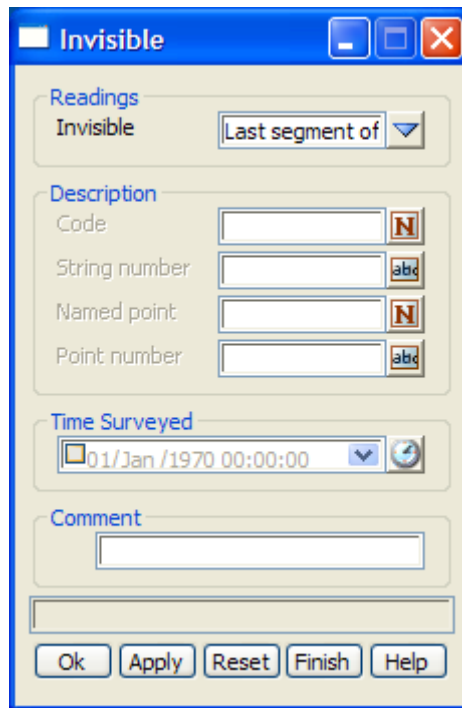
time when the command (op code) was created

Comment

Stop processing the 12d field file at this line. Useful for debugging errors.

OK, Apply, Reset, Finish, Help See the description for the panel buttons in the section “Panel buttons”
invisible

Invisible



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Tinable mode			Last segment of point invisible Next segment of point invisible Point invisible

Make the previous segment invisible

If no *description* is given, the previous segment containing the current measurement point is set to invisible.

If a *description* exists, then either the *feature code* and *string number* or the *point id* section of the *description* can be used.

If the *feature code* and *string number* exist, then the last segment of the previous string with that *feature code* and *string number* is set to invisible.

If the *point id* exists, then the segment containing the point with that point id as an end point, is set to invisible.

Make the next segment invisible

If no *description* is given, the next segment containing the current measurement point as a starting point is set to invisible. That is, it will not be treated as a breakline in triangulations.

If a *description* exists, then either the *feature code* and *string number* or the *point id* section of the *description* can be used.

If the *feature code* and *string number* exist, then the segment that is created in the future from the last point of the previous string with that *feature code* and *string number* is set to invisible.

If the *point id* exists, then the segment containing the point with that point id as a start point, is set to invisible.

Make a point invisible

If no *description* is given, the current measurement point is set to invisible. That is, it will not be included in triangulations.

If a *description* exists, then either the *feature code* and *string number* or the *point id* section of the *description* can be used.

If the *feature code* and *string number* exist, then the last point of the previous string with that *feature code* and *string number* is set to invisible.

If the *point id* exists, then the point with that point id is set to invisible.

Code

the feature code of the nominated point.

String number

the string number of the nominated point.

Named point

point name of the point. This can be an integer, real, text or alphanumeric. For a more detailed description of how the reduction finds/uses the appropriate point see the section "Existing point search"

Point id

point id of the point. This can be an integer, real, text or alphanumeric. For a more detailed description of how the reduction finds/uses the appropriate point see the section "Existing point search". If a new check point entry is inserted into the file, this field will be non-editable since only the check point is required.

Time surveyed

time when the command (op code) was created

Comment

comment for the command within the field file.

OK, Apply, Reset, Finish, Help See the description for the panel buttons in the section "Panel buttons" .

strings_join

Strings Join

The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Join mode			Last points of strings First to last points of strings Join first points of strings Last to first points of strings

Join last points of strings

In the final reduction, the last point of the string with the given *feature code* and *string_number_1* is joined to the last point of the string with given *feature code* and *string_number_2*. The created string has the given *feature code* (no string number is needed since it is the final phase of reduction when the string numbers are dropped).

Join first to last point of strings

In the final reduction, the first point of the string with the given *feature code* and *string_number_1* is joined to the last point of the string with given *feature code* and *string_number_2*. The created string has the given *feature code* (no string number is needed since it is the final phase of reduction when the string numbers are dropped).

Join first points of strings

In the final reduction, the first point of the string with the given *feature code* and *string number 1* is joined to the first point of the string with given *feature code* and *string number 2*. The created string has the given *feature code* (no string number is needed since it is the final reduction when the string numbers are then dropped).

Join last to first point of strings

In the final reduction, the last point of the string with the given *feature code* and *string_number_1* is joined to the first point of the string with given *feature code* and *string_number_2*. The created string has the given *feature code* (no string number is needed since it is the final phase of reduction when the string numbers are dropped).

Code

the feature code of the strings to be joined

String number 1

the string number of the first string

String number 2

the string number of the second string

Time surveyed

time when the command (op code) was created

Comment

insert a comment within the field file.

OK, Apply, Reset, Finish, Help See the description for the panel buttons in the section "Panel buttons"

edm_measurement

EDM Measurement

Individual measurements can be entered or they can exist of pairs of Face1/Face2 measurements. To enter a Face1/face2 measurement the command should be entered twice, with the appropriate values entered into the panel each time.

The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Horizontal angle

the horizontal angle to the point in dd.mmss format.

Vertical angle

the vertical angle to the point in dd.mmss format. If the value is in the range 0 -180 degrees the measurement is considered a Face 1 measurement, and for measurements in the range 180-360 degrees

they are considered Face2.

Slope distance

the slope distance to the measurement to the point. If a pair of face1/face2 measurements exist, the mean value of the slope distance is used for reduction purposes.

Code

the feature code of the measurement.

String number

the string number of the measurement.

Named point

point name.of the point. This can be an integer, real, text or alphanumeric. For a more detailed description of how the reduction finds/uses the appropriate point see the section “Existing point search”

Point id

point id.of the point. This can be an integer, real, text or alphanumeric. For a more detailed description of how the reduction finds/uses the appropriate point see the section “Existing point search” . If a new check point entry is inserted into the file, this field will be non-editable since only the check point is required.

Attribute

Time surveyed

time when the command (op code) was created

Comment

comment for the command within the field file.

OK, Apply, Reset, Finish, Help See the description for the panel buttons in the section “Panel buttons”

edm_measurement_HT

EDM Measurement (HA,HD,HT)

The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Horizontal angle

the horizontal angle to the point in dd.mmss format.

Horizontal distance

the reduced horizontal distance.

Height

the height of the observation point.

Code

the feature code of the measurement.

String number

the string number of the measurement.

Named point

point name.of the point. This can be an integer, real, text or alphanumeric. For a more detailed description of how the reduction finds/uses the appropriate point see the section "Existing point search"

Point id

point id.of the point. This can be an integer, real, text or alphanumeric. For a more detailed description of how the reduction finds/uses the appropriate point see the section "Existing point search" . If a new check point entry is inserted into the file, this field will be non-editable since only the check point is required.

Attribute

Time surveyed

time when the command (op code) was created

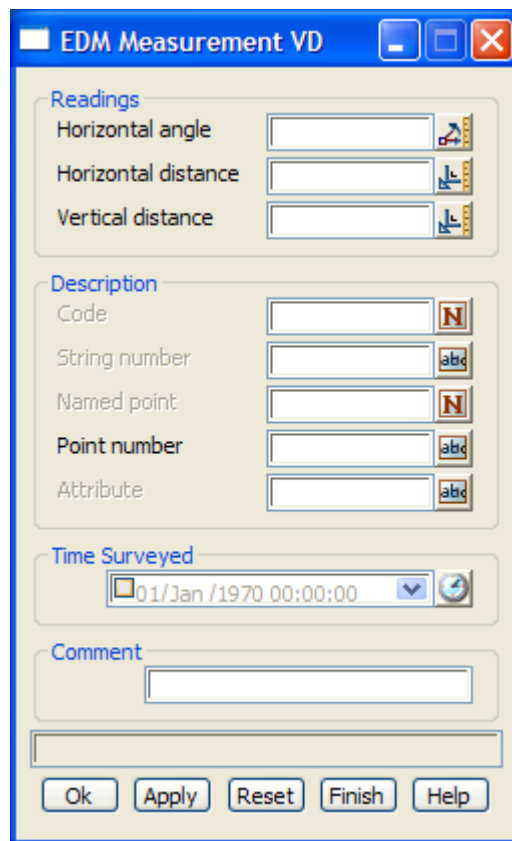
Comment

comment for the command within the field file.

OK, Apply, Reset, Finish, Help See the description for the panel buttons in the section “Panel buttons”

edm_measurement_VD

Edm measurement (HA,HD,Diff HT)



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Horizontal angle

the horizontal angle to the point in dd.mmss format.

Horizontal distance

the reduced horizontal distance.

Vertical distance

the change in height as measured from the collimation height of the instrument to the target point (usually centre of target).

Code

the feature code of the measurement.

String number

the string number of the measurement.

Named point

point name.of the point. This can be an integer, real, text or alphanumeric. For a more detailed description of how the reduction finds/uses the appropriate point see the section “Existing point search”

Point id

point id.of the point. This can be an integer, real, text or alphanumeric. For a more detailed description of how the reduction finds/uses the appropriate point see the section “Existing point search” . If a new check point entry is inserted into the file, this field will be non-editable since only the check point is required.

Attribute**Time surveyed**

time when the command (op code) was created

Comment

comment for the command within the field file.

OK, Apply, Reset, Finish, HelpSee the description for the panel buttons in the section“Panel buttons”

stadia_measurement

Stadia Measurement

The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Horizontal angle

the horizontal angle to the point in dd.mmss format.

Vertical angle

the vertical angle to the point in dd.mmss format.

Top

the top hair reading.

Middle

the middle hair reading.

Bottom

the bottom hair reading.

Code

the feature code of the measurement.

String number

the string number of the measurement.

Named point

point name of the point. This can be an integer, real, text or alphanumeric. For a more detailed description of how the reduction finds/uses the appropriate point see the section "Existing point search"

Point id

point id. of the point. This can be an integer, real, text or alphanumeric. For a more detailed description of how the reduction finds/uses the appropriate point see the section "Existing point search" . If a new check point entry is inserted into the file, this field will be non-editable since only the check point is required.

Attribute**Time surveyed**

time when the command (op code) was created

Comment

comment for the command within the field file.

OK, Apply, Reset, Finish, Help See the description for the panel buttons in the section "Panel buttons"

multiple_coding

Multiple Coding

A new measurement point is created at the same position as the current measurement point but with the *feature code* and *string number* if specified.

The *point id* and *text* are recorded as the point id and text for that vertex of the super string.

If a *point name* exists, then it is a **named measurement** and a 4d point string of name *point name* is created and mapped using the mapping file. The 4d text is the station prefix followed by *point name*.

The *point name* is added to the internal list of named points for searching for co-ordinates.

The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Code

the feature code of the measurement.

String number

the string number of the measurement.

Named point

point name.of the point. This can be an integer, real, text or alphanumeric. For a more detailed description of how the reduction finds/uses the appropriate point see the section "Existing point search"

Point id

point id.of the point. This can be an integer, real, text or alphanumeric. For a more detailed description of how the reduction finds/uses the appropriate point see the section "Existing point search" . If a new check point entry is inserted into the file, this field will be non-editable since only the check point is required.

Attribute**Time surveyed**

time when the command (op code) was created

Comment

comment for the command within the field file.

OK, Apply, Reset, Finish, Help See the description for the panel buttons in the section “Panel buttons”

new_instrument

New Instrument

The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Instrument ht

the height of the instrument setup.

Code

the feature code of the measurement.

String number

the string number of the measurement.

Named point

point name.of the point. This can be an integer, real, text or alphanumeric. For a more detailed description of how the reduction finds/uses the appropriate point see the section "Existing point search"

Point id

point id.of the point. This can be an integer, real, text or alphanumeric. For a more detailed description of how the reduction finds/uses the appropriate point see the section "Existing point search" . If a new check point entry is inserted into the file, this field will be non-editable since only the check point is

required.

Easting

this field is non-editable and is populated if a valid coordinate exists for the nominated setup point.

Northing

this field is non-editable and is populated if a valid coordinate exists for the nominated setup point.

Height

this field is non-editable and is populated if a valid coordinate exists for the nominated setup point.

Attribute

Time surveyed

time when the command (op code) was created

Comment

comment for the command within the field file.

OK, Apply, Reset, Finish, Help See the description for the panel buttons in the section "Panel buttons"

tunable

Tunable

The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Tunable mode			Last segment of point non-
tunable			Next segment of point non-
tunable			Point non-tunable

Make the previous segment non-tinable

If no *description* is given, the previous segment containing the current measurement point is set to non-tinable. That is, it will not be treated as a breakline in triangulations.

If a *description* exists, then either the *feature code* and *string number* or the *point id* section of the *description* can be used.

If the *feature code* and *string number* exist, then the last segment of the previous string with that *feature code* and *string number* is set to non-tinable.

If the *point id* exists, then the segment containing the point with that point id as an end point, is set to non-tinable.

Make the next segment non-tinable

If no *description* is given, the next segment containing the current measurement point as a starting point is set to non-tinable. That is, it will not be treated as a breakline in triangulations.

If a *description* exists, then either the *feature code* and *string number* or the *point id* section of the *description* can be used.

If the *feature code* and *string number* exist, then the segment that is created in the future from the last point of the previous string with that *feature code* and *string number* is set to non-tinable.

If the *point id* exists, then the segment containing the point with that point id as a start point, is set to non-tinable.

Make a point non-tinable

If no *description* is given, the current measurement point is set to non-tinable. That is, it will not be included in triangulations.

If a *description* exists, then either the *feature code* and *string number* or the *point id* section of the *description* can be used.

If the *feature code* and *string number* exist, then the last point of the previous string with that *feature code* and *string number* is set to non-tinable.

If the *point id* exists, then the point with that point id is set to non-tinable.

Attribute

Time surveyed

time when the command (op code) was created

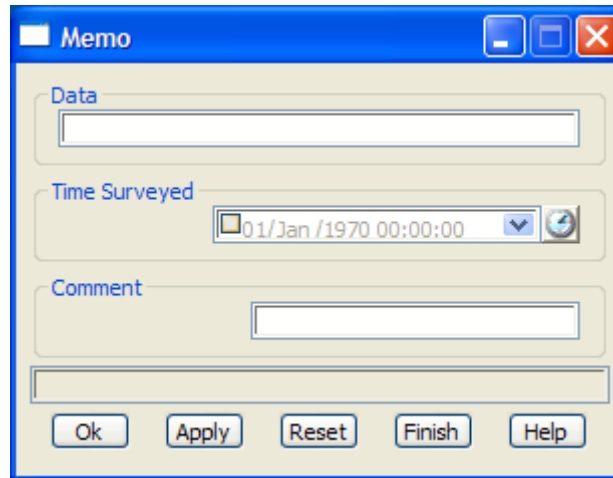
Comment

comment for the command within the field file.

OK, Apply, Reset, Finish, Help See the description for the panel buttons in the section "Panel buttons"

memo

Note



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Data

extra text to be added as information in the field file.

Time surveyed

time when the command (op code) was created

Comment

insert a comment within the field file.

OK, Apply, Reset, Finish, Help See the description for the panel buttons in the section "Panel buttons"

offset_measurement

Offset Measurement

The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Offset mode			radial tangential height

radial

The *radial offset* is used to adjust the position of the specified point by a plan distance from the specified points original position, along the plan line joining the current station to the specified point. A positive offset is away from the station, negative is toward the station.

If no *point description* is given, the offset is used to adjust the position of the current measured point.

If a *point description* exists, then either the *feature code* and *string number* or the *point id* section of the *point description* can be used.

If the *feature code* and *string number* exist, then the last point of the previous string with that *feature code* and *string number* is adjusted.

If the *point id* exists, then the point with that point id is adjusted.

tangential

The *tangential offset* is used to adjust the position of the specified point by a plan distance from the specified points original position, at rights angles to the plan line joining the current station to the specified point. A negative offset is to the left (looking from the station), and positive is to the right (looking from the station).

If no *point description* is given, the offset is used to adjust the position of the current measured point.

If a *point description* exists, then either the *feature code* and *string number* or the *point id* section of the *point description* can be used.

If the *feature code* and *string number* exist, then the last point of the previous string with that *feature code* and *string number* is adjusted.

If the *point id* exists, then the point with that point id is adjusted.

height

If the height of the specified point is not null, then the *height offset* adjusts the height of the point. A positive offset adds to the height, a negative offset reduces the height.

If no *point description* is given, the offset is used to adjust the position of the current measured point.

If a *point description* exists, then either the *feature code* and *string number* or the *point id* section of the *point description* can be used.

If the *feature code* and *string number* exist, then the last point of the previous string with that *feature code* and *string number* is adjusted.

If the *point id* exists, then the point with that point id is adjusted.

Time surveyed

time when the command (op code) was created

Comment

comment for the command within the field file.

OK, Apply, Reset, Finish, Help See the description for the panel buttons in the section “Panel buttons”

pipe_justification

Pipe Justification

The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Pipe mode			Invert Axial Obvert

Invert

If no *point description* is given, the current measurement point is on the invert (bottom) of a pipe. This is the default for measurements to points on pipe strings. If the point is not part of a pipe string, it is ignored.

If the *feature code* and *string number* exist, the last point of the previous string with the same *feature code* and *string number* as given in *point description* is on the invert (bottom) of a pipe. If the point is not part of a pipe string, it is ignored.

If the *point id* exists, then the point with that point id is on the invert (bottom) of a pipe. If the point is not part of a pipe string, it is ignored.

Axial

If no *point description* is given, the current measurement point is on the axis (centre) of a pipe. If the point is not part of a pipe string, it is ignored.

If the *feature code* and *string number* exist, the last point of the previous string with the same *feature code* and *string number* as given in *point description* is on the axis (centre) of a pipe. If the point is not part of a pipe string, it is ignored.

If the *point id* exists, then the point with that point id is on the axis (centre) of a pipe. If the point is not part of a pipe string, it is ignored.

Obvert

If no *point description* is given, the current measurement point is on the obvert (top) of a pipe. If the point is not part of a pipe string, it is ignored.

If the *feature code* and *string number* exist, the last point of the previous string with the same *feature code* and *string number* as given in *point description* is on the obvert (top) of a pipe. If the point is not part of a pipe string, it is ignored.

If the *point id* exists, then the point with that point id is on the obvert (top) of a pipe. If the point is not part of a pipe string, it is ignored.

Code

the feature code of the measurement.

String number

the string number of the measurement.

Named point

point name of the point. This can be an integer, real, text or alphanumeric. For a more detailed description of how the reduction finds/uses the appropriate point see the section "Existing point search"

Point id

point id of the point. This can be an integer, real, text or alphanumeric. For a more detailed description of how the reduction finds/uses the appropriate point see the section "Existing point search". If a new check point entry is inserted into the file, this field will be non-editable since only the check point is required.

Time surveyed

time when the command (op code) was created

Comment

comment for the command within the field file.

OK, Apply, Reset, Finish, Help See the description for the panel buttons in the section "Panel buttons"

remove_height

Remove Height

If no *point description* is given, the height of the current measurement point is set to null.

If the *feature code* and *string number* exist, then the height of the last point of the previous string with that *feature code* and *string number* is set to null.

If the *point id* exists, then the height of the point with that point id is set to null.

The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
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Code

the feature code of the measurement.

String number

the string number of the measurement.

Named point

point name.of the point. This can be an integer, real, text or alphanumeric. For a more detailed description of how the reduction finds/uses the appropriate point see the section "Existing point search"

Point id

point id.of the point. This can be an integer, real, text or alphanumeric. For a more detailed description of how the reduction finds/uses the appropriate point see the section "Existing point search" . If a new check point entry is inserted into the file, this field will be non-editable since only the check point is required.

Time surveyed

time when the command (op code) was created

Comment

comment for the command within the field file.

OK, Apply, Reset, Finish, Help See the description for the panel buttons in the section “Panel buttons”

resection_start

Resection Start

This option is under development.

Resection Start

Readings
Instrument ht

Description
Code N
String number abg
Setup point N
Point number abg
Attribute abg

Position
Easting
Northing
Height
Accuracy

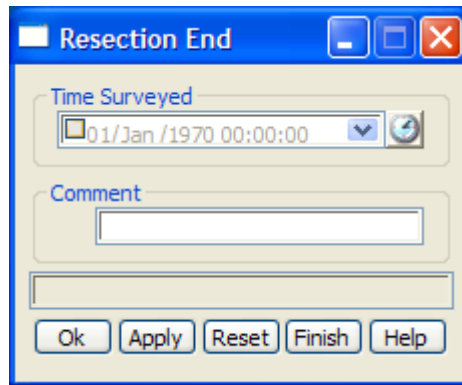
Time Surveyed

Comment

resection_end

Resection End

This option is under development.



scale_factor

Scale Factor

The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
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Scale factor

the scale factor to be applied to subsequent distance measurements. It is applied by multiplying raw distances by the scale factor to give the corrected distance.

Time surveyed

time when the command (op code) was created

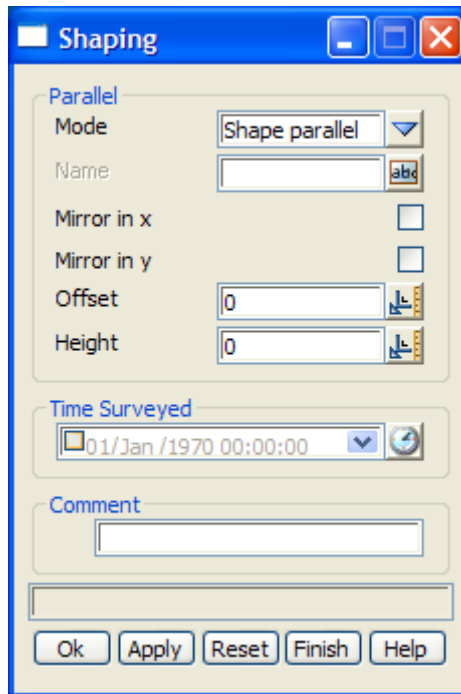
Comment

comment for the command within the field file.

OK, Apply, Reset, Finish, Help See the description for the panel buttons in the section “Panel buttons”

shaping

Shaping



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Mode			Shape end Shape record Shape extrude Shape parallel

Shape end

Stops using the current shape or stops recording a shape.

Shape record

Start recording a shape with the shape name. If *Shape_name* is non-blank, then the default field Shape is defined by the *feature_code* and *string_number* of the following measurements until a *shape end* co. There is no limit to the number of points in a shape.

Shape extrude

extrude the current shape along the specified super string.

Shape parallel

parallel the current shape along the specified super string. This creates a number of strings to represent each feature code of the shape record. In the case of shapes which contain curves, a number of strings will be created according to an arc/chord tolerance.

Name

the name of the shape.

Time surveyed

time when the command (op code) was created

Comment

comment for the command within the field file.

OK, Apply, Reset, Finish, Help See the description for the panel buttons in the section “Panel buttons”

string_close

String Close

If no *point description* is given, the current string is closed.

If the *feature code* and *string number* from the *point description* exist, the last previous string with that *feature code* and *string number* is closed.

If the *point id* from the *point description* exists, then the string containing that point id will be closed.

The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Code

the feature code of the measurement.

String number

the string number of the measurement.

Named point

point name.of the point. This can be an integer, real, text or alphanumeric. For a more detailed description of how the reduction finds/uses the appropriate point see the section "Existing point search"

Point id

point id.of the point. This can be an integer, real, text or alphanumeric. For a more detailed description of how the reduction finds/uses the appropriate point see the section "Existing point search" . If a new check point entry is inserted into the file, this field will be non-editable since only the check point is required.

Time surveyed

time when the command (op code) was created

Comment

comment for the command within the field file.

OK, Apply, Reset, Finish, Help See the description for the panel buttons in the section “Panel buttons”

string_end

String End

If no *Description* exists, the current string is terminated (including the current measurement point).

If *Code* (feature code) and *String number* exist, then the last point of the previous string with that feature code and string number becomes the last point of that string.

If *Point id* exists, then the previous string containing the point with that point id is terminated *after* the point id point

The fields and buttons used in this panel have the following functions.

Field	Description	Type	Defaults	Pop-Up
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Code

the feature code of the measurement.

String number

the string number of the measurement.

Named point

point name.of the point. This can be an integer, real, text or alphanumeric. For a more detailed description of how the reduction finds/uses the appropriate point see the section "Existing point search"

Point id

point id.of the point. This can be an integer, real, text or alphanumeric. For a more detailed description of how the reduction finds/uses the appropriate point see the section "Existing point search" . If a new check point entry is inserted into the file, this field will be non-editable since only the check point is required.

Time surveyed

time when the command (op code) was created

Comment

comment for the command within the field file.

OK, Apply, Reset, Finish, Help See the description for the panel buttons in the section “Panel buttons”

rectangle

Rectangle

If no *Description* is given, the current measurement point and the two previous points from the current string are used and a fourth point is created to form a parallelogram (squashed rectangle) and the height of the fourth point is set to null. The string is then closed.

If the *feature code* and *string number* exist, the last three points with that *feature code* and *string number* are used and a fourth point is created to form a parallelogram (squashed rectangle) and the height of the fourth point is set to null. The string is then closed.

If the *point id* exists, then the *feature code* and *string number* of the point with that point id are used and processed as above. Note that the point with the point id is not necessarily used.

The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Code

the feature code of the measurement.

String number

the string number of the measurement.

Named point

point name.of the point. This can be an integer, real, text or alphanumeric. For a more detailed description of how the reduction finds/uses the appropriate point see the section "Existing point search"

Point id

point id.of the point. This can be an integer, real, text or alphanumeric. For a more detailed description of how the reduction finds/uses the appropriate point see the section "Existing point search". If a new check point entry is inserted into the file, this field will be non-editable since only the check point is required.

Time surveyed

time when the command (op code) was created

Comment

comment for the command within the field file.

OK, Apply, Reset, Finish, Help See the description for the panel buttons in the section “Panel buttons”

rectangle_by_2_points

Rectangle By 2 Points

The rectangle is defined by two points (reference side) and a offset.

If a positive offset value is given, two points will be created to the right of the reference side.

If a negative offset value is given, two points will be created to the left of the reference side.

If no *Description* is given, the two new points will be joined to the given points in a closed rectangular string, and will have the same feature code as the points given.

If the *feature code* and *string number* exist, then a search is made for the last occurrence of two points with the same *feature code* and *string number*. If found, then these points are used to define the reference side of the rectangle.

If the *point id* exists, then a search is made for the last occurrence of two points with the same *feature code* and *string number* as the point given by the point id. If found, then these points are used to define the reference side of the rectangle.

Two consecutive rectangles are unable to be defined side by side. In other words if the two points given are part of string of greater than two vertices, the command will only work for sets of two points that are exclusively defined. i.e. For a 5 point string, a rectangle can be defined by points 1 and 2, and 4 and 5.

The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Code

the feature code of the measurement.

String number

the string number of the measurement.

Named point

point name.of the point. This can be an integer, real, text or alphanumeric. For a more detailed description of how the reduction finds/uses the appropriate point see the section “Existing point search”

Point id

point id.of the point. This can be an integer, real, text or alphanumeric. For a more detailed description of how the reduction finds/uses the appropriate point see the section “Existing point search” . If a new check point entry is inserted into the file, this field will be non-editable since only the check point is required.

Time surveyed

time when the command (op code) was created

Comment

comment for the command within the field file.

OK, Apply, Reset, Finish, Help See the description for the panel buttons in the section “Panel buttons”

string_reverse

String Reverse

If no *point description* is given, the current string is reversed.

If the *feature code* and *string number* from the *point description* exist, the last previous string with that *feature code* and *string number* is reversed.

If the *point id* from the *point description* exists, then the string containing that point id will be reversed.

The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Code

the feature code of the measurement.

String number

the string number of the measurement.

Named point

point name.of the point. This can be an integer, real, text or alphanumeric. For a more detailed description of how the reduction finds/uses the appropriate point see the section "Existing point search"

Point id

point id.of the point. This can be an integer, real, text or alphanumeric. For a more detailed description of how the reduction finds/uses the appropriate point see the section "Existing point search" . If a new check point entry is inserted into the file, this field will be non-editable since only the check point is required.

Time surveyed

time when the command (op code) was created

Comment

comment for the command within the field file.

OK, Apply, Reset, Finish, Help See the description for the panel buttons in the section “Panel buttons”

string_start

String Start

If no *Description* is given, the current string is terminated (without including the current measurement point) and the current measurement point becomes the first point of a new string with the same feature code and string number.

If the *feature code* and *string number* exist, then the last point of the previous string with that feature code and string number becomes the first point of a new string with the same *feature code* and *string number*.

If the *point id* exists, then the previous string containing the point with that point id is terminated *before* the point id point, and the point becomes the first point of a new string with the *same feature code* and *string number*.

The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
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Code

the feature code of the measurement.

String number

the string number of the measurement.

Named point

point name of the point. This can be an integer, real, text or alphanumeric. For a more detailed description of how the reduction finds/uses the appropriate point see the section “Existing point search”

Point id

point id of the point. This can be an integer, real, text or alphanumeric. For a more detailed description of how the reduction finds/uses the appropriate point see the section “Existing point search” . If a new

check point entry is inserted into the file, this field will be non-editable since only the check point is required.

Time surveyed

time when the command (op code) was created

Comment

comment for the command within the field file.

OK, Apply, Reset, Finish, Help See the description for the panel buttons in the section “Panel buttons”

breakline_string

Breakline String

The *point description* is used to select a string and the *mode* is used specify if the string is a breakline or not.

If no *point description* is given, the current string is selected.

If the *feature code* and *string number* exist, the last string with that *feature code* and *string number* is selected.

If the *point id* exists, then the string containing the point with that point id is selected.

If no *mode* is given, the selected string is set as a point string (that is, not a breakline).

The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Breakline mode			not a breakline breakline

Not a breakline

the selected string is set to a point string and hence is not a breakline.

Breakline

the selected string is set to a *line* string and is therefore a breakline

Code

the feature code of the measurement.

String number

the string number of the measurement.

Named point

point name.of the point. This can be an integer, real, text or alphanumeric. For a more detailed description of how the reduction finds/uses the appropriate point see the section “Existing point search”

Point id

point id.of the point. This can be an integer, real, text or alphanumeric. For a more detailed description of how the reduction finds/uses the appropriate point see the section “Existing point search” . If a new check point entry is inserted into the file, this field will be non-editable since only the check point is required.

Time surveyed

time when the command (op code) was created

Comment

comment for the command within the field file.

OK, Apply, Reset, Finish, HelpSee the description for the panel buttons in the section “Panel buttons”

string_type

String Type

The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
String type		2d	2d 3d 4d

2d - the string has one height for the entire string

3d - the string can have different heights at each vertex

4d - the string can have different heights and text at each vertex

Code

the feature code of the measurement.

String number

the string number of the measurement.

Named point

point name of the point. This can be an integer, real, text or alphanumeric. For a more detailed description of how the reduction finds/uses the appropriate point see the section "Existing point search"

Point id

point id of the point. This can be an integer, real, text or alphanumeric. For a more detailed description of how the reduction finds/uses the appropriate point see the section "Existing point search". If a new check point entry is inserted into the file, this field will be non-editable since only the check point is required.

Time surveyed

time when the command (op code) was created

Comment

comment for the command within the field file.

OK, Apply, Reset, Finish, Help See the description for the panel buttons in the section "Panel

buttons”

culvert

Culvert

Culvert strings are always line strings and are stored with the justification of the majority of the string points. Individual culvert points are picked up either top (obvert), centre (axial) or bottom (invert) of the culvert using op codes 80, 81 and 82.

If no *point_description* is given, the current string is created as a culvert string with the given width and height.

If a *point_description* exists, then either the *feature code* and *string number* or the *point id* section of the *point_description* can be used.

If the *feature code* and *string number* exist, the last string with the same *feature code* and *string number* is created as a culvert with the given width and height.

If the *point id* exists, then the string containing that point id is created as a culvert string with the given width and height.

The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
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Width

the width of the culvert

Height

the height of the culvert

Code

the feature code of the measurement

String number

the string number of the measurement

Named point

point name of the point. This can be an integer, real, text or alphanumeric. For a more detailed description of how the reduction finds/uses the appropriate point see the section “Existing point search”

Point id

point id of the point. This can be an integer, real, text or alphanumeric. For a more detailed description of how the reduction finds/uses the appropriate point see the section “Existing point search”. If a new check point entry is inserted into the file, this field will be non-editable since only the check point is required.

Time surveyed

time when the command (op code) was created

Comment

comment for the command within the field file

OK, Apply, Reset, Finish, Help See the description for the panel buttons in the section “Panel buttons”

pipe_diameter

Pipe Diameter

Pipe strings are always line strings and are stored with the justification of the majority of the string points. Individual pipe points are picked up either top (obvert), centre (axial) or bottom (invert) of the pipe using op codes 80, 81 and 82.

If no *point_description* is given, the current string is created as a pipe string with the given diameter.

If a *point_description* exists, then either the *feature code* and *string number* or the *point id* section of

the *point_description* can be used.

If the *feature code* and *string number* exist, the last string with the same *feature code* and *string number* is created as a pipe with the given diameter.

If the *point id* exists, then the string containing that point id is created as a pipe string with the given diameter.

The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
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Diameter

the diameter of the pipe.

Code

the feature code of the measurement.

String number

the string number of the measurement.

Named point

point name.of the point. This can be an integer, real, text or alphanumeric. For a more detailed description of how the reduction finds/uses the appropriate point see the section “Existing point search”

Point id

point id.of the point. This can be an integer, real, text or alphanumeric. For a more detailed description of how the reduction finds/uses the appropriate point see the section “Existing point search” . If a new check point entry is inserted into the file, this field will be non-editable since only the check point is required.

Time surveyed

time when the command (op code) was created

Comment

comment for the command within the field file.

OK, Apply, Reset, Finish, Help See the description for the panel buttons in the section “Panel buttons”

target_height

Target Height

The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
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Target height

target height of following measurements.

Time surveyed

time when the command (op code) was created

Comment

comment for the command within the field file.

OK, Apply, Reset, Finish, Help See the description for the panel buttons in the section “Panel buttons”

templating

Templating

The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Mode			Template start Template end Template pause Template continue Template record Template skip Template insert Template delete

Template start

Start using the field template *Template_name*. If *Template_name* is blank, the default field template is used.

If *mode* is **for**, then the field template is used as a *forward* template.

rev, then the field template is used as a *reverse* template.

zig, then the field template is used as a *zig_zag* template and is used in the *forward* definition direction first (that is starts on a zig).

zag, then the template is used as a *zig_zag* template and is used in the *reverse* direction first (that is, starts on a zag).

If *mode* is **blank**, or anything other than **for**, **rev**, or **zag** then the field template is used as a zig-zag template starting on a *zig*.

Template end

Stops using the current field template or stops recording a field template.

Template pause

Pause using the current field template or defining a field template, until a continue field template (54) or a finish field template (52) code is given.

Template continue

Continue using or defining the current field template, which has been stopped by a *Pause* field template command (53). The *Continue* command only needs to be given once and applies to all following measurements until another *Pause* or *Finish* command is given.

Template record

Start recording a field template with the name *Template_name*. If *Template_name* is blank, then it is the default field template that is defined. The *feature_code* and *string_number* of the following measurements until a *Finish* code (52) are stored as the field template. There is no limit to the number of points in a field template.

Template skip

Allows the user to skip picking up one or more points from the field template currently being used. The next measurement takes the *feature_code* and *string_number* from the next point of the field template definition. If *num_skipped_points* is missing, then only one point is skipped otherwise *num_skipped_points* are skipped.

Template insert

Allows the user to insert new string definitions into the template. These may be new strings or multiple coded strings.

Template delete

Allows the user to delete 1 or more points on the template. Picking up will use the updated template definition.

Time surveyed

time when the command (op code) was created

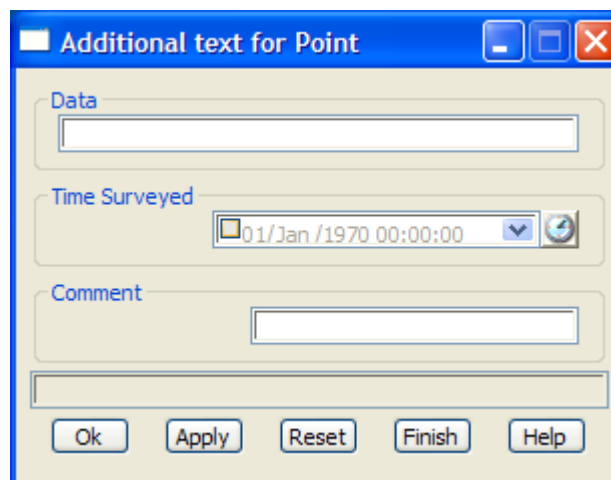
Comment

comment for the command within the field file.

OK, Apply, Reset, Finish, Help See the description for the panel buttons in the section “Panel buttons”

Additional_text_for_point

Additional Text For Point



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Data

The given *text* is added to the end of any existing text for the current measurement point.

Time surveyed

time when the command (op code) was created

Comment

comment for the command within the field file.

OK, Apply, Reset, Finish, Help See the description for the panel buttons in the section “Panel buttons”

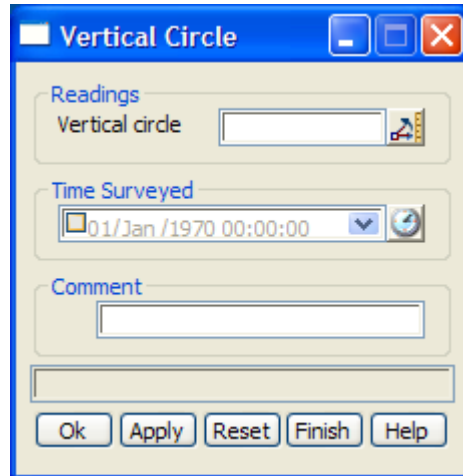
Units

Units

This option is still under development.

vertical_circle

Vertical Circle Correction



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Vertical circle

*the vertical circle (in decimal degrees) is **subtracted** from the vertical circle value in any measurements*

Time surveyed

time when the command (op code) was created

Comment

comment for the command within the field file.

OK, Apply, Reset, Finish, Help See the description for the panel buttons in the section "Panel buttons"

Order

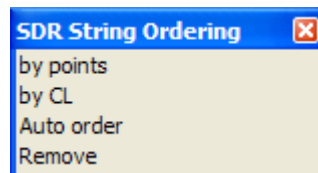
SDR_string_ordering

Position of menu: Survey =>Edit =>Order

This option is still under development.

The order option re-orders points in a string.

The Order walk-right menu is

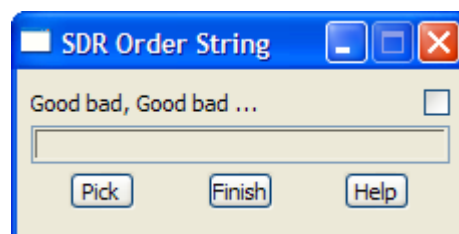


By Points

sdr_order_string

Position of option on menu: Survey =>Edit =>Order =>by points

This option is still under development.

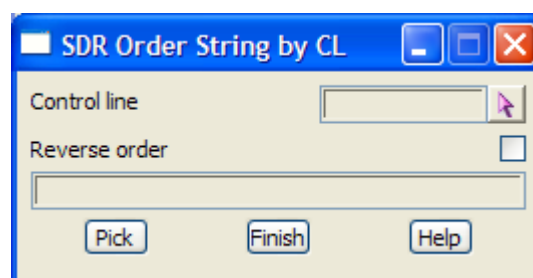


By CL

sdr_order_string_by_CL

Position of option on menu: Survey =>Edit =>Order =>by CL

This option is still under development.

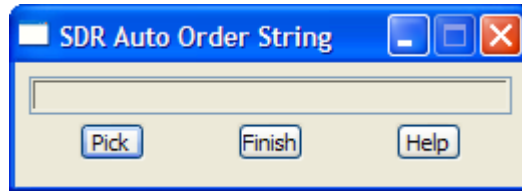


Auto Order

sdr_auto_order_string

Position of option on menu: Survey =>Edit =>Order =>Auto order

This option is still under development.

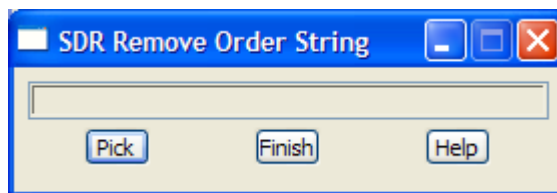


Remove Order

`sdr_remove_order_string`

Position of option on menu: Survey =>Edit =>Order =>Remove

This option is still under development.



SDR Point Edits

SDR_points_edit

Position of menu: Survey =>Edit =>Points

The Points walk-right menu contains options that work on individual points (vertices).

Note - a point may be individual point (one vertex strings) or a vertex of a string.

The Points walk-right menu is:

SDR Point Edits	
Additional text	add text to the vertex
Attachment	attach an image to the vertex
Arc next 3 points	put an arc through the next 3 points
Arc last 3 points	put an arc through the preceding 3 points
Arc fitting start	start arc fitting
Arc fitting end	end arc fitting
Circle feature	make the vertex a feature
Invisible	make the vertex invisible
Invisible last seg	make the last segment invisible
Invisible next seg	make the next segment invisible
Non tinable	make the vertex non tinable
Non tinable last seg	make the last segment non tinable
Non tinable next seg	make the next segment non tinable
Pipe invert	the z-value is the invert of a pipe
Pipe cl	the z-value is the centre of a pipe
Pipe obvert	the z-value is the overt of a pipe
Rectangle last 3 points	make a rectangle of the last 3 points
Rectangle last 2 points	make a rectangle of the last two points
Remove point	delete a point
Remove height	make the height null

For the option *Additional text*, go to the section "Additional Text"

<i>Attachment</i>	"Attach a File"
<i>Arc next 3 points</i>	"Arc Through Next Three Points"
<i>Arc last 3 points</i>	"Arc Through Last Three Points"
<i>Arc fitting start</i>	"Start Arc Fitting"
<i>Arc fitting end</i>	"End Arc Fitting"
<i>Circle feature</i>	"Create a Feature String"
<i>Invisible</i>	"Make a Vertex Invisible"
<i>Invisible last seg</i>	"Make the Previous Segment Invisible"
<i>Invisible next seg</i>	"Make the Next Segment Invisible"
<i>Non tinable</i>	"Make a Vertex Non Tinable"
<i>Non tinable last seg</i>	"Make the Previous Segment Non Tinable"
<i>Non tinable next seg</i>	"Make the Next Segment Non Tinable"
<i>Pipe invert</i>	"Make a Vertex an Invert Level of a Pipe"
<i>Pipe axial</i>	"Make a Vertex an Axial Level of a Pipe"
<i>Pipe obvert</i>	"Make a Vertex an Obvert Level of a Pipe"
<i>Rectangle last 3 points</i>	"Make a Parallelogram from the Last Three Points"
<i>Rectangle last 2 points</i>	"Make a Rectangle from the Last Two Points"
<i>Remove point</i>	"Delete a Vertex"
<i>Remove height</i>	"Set a Vertex Height to Null"

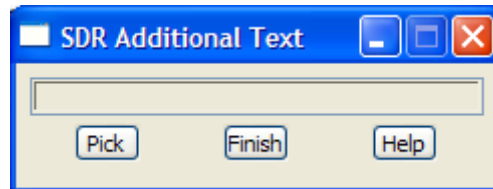
Additional Text

sdr_additional_text

Position of option on menu: Survey =>Edit =>Points =>Additional text

Additional text adds text to selected vertices. The user selects the vertex to add text to, and then types in the text.

Selecting **Additional text** brings up the **SDR Additional Text** panel:



Pick button

*As soon as the option is selected, the **Pick** is active and vertices can be selected.*

*Each time a vertex is picked and accepted, an **Additional text** typed input panel is displayed to type the text into. A **Text** code is then inserted into the 12d field file.*

*The option continues until the **Finish** button is selected.*

*If the **pick** is cancelled by hitting the <Esc> key or selecting **Cancel** from the Pick Ops menu, the **Pick** button can be used to restart the option.*

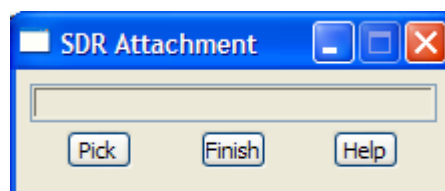
Attach a File

sdr_attachment

Position of option on menu: Survey =>Edit =>Points =>Attachment

Attachment adds files to selected vertices. The user selects the vertex to add an attachment to, and then enters the name of the file to attach.

Selecting **Attachment** brings up the **SDR Attachment** panel:



Pick button

*As soon as the option is selected, the **Pick** is active and vertices can be selected.*

*Each time a vertex is picked and accepted, an **Attachment file name** typed input panel is displayed to enter the file name into. An **Attachment** field code is then inserted into the 12d field file.*

*The option continues until the **Finish** button is selected.*

*If the **pick** is cancelled by hitting the <Esc> key or selecting **Cancel** from the Pick Ops menu, the **Pick** button can be used to restart the option.*

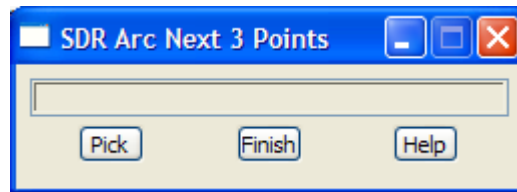
Arc Through Next Three Points

sdr_arc_next_3_points

Position of option on menu: Survey =>Edit =>Points =>Arc next 3 points

Arc next 3 points adds an arc through the selected vertex and the next two vertices of the same string.

Selecting Arc next 3 points brings up the **SDR Arc Next 3 Points** panel:



Pick button

*As soon as the option is selected, the **Pick** is active and vertices can be selected.*

*Each time a vertex is picked and accepted, an arc is placed through the selected vertex and the next two vertices of the same string by inserting an **Arc through next 3 points** field code.*

*The option then repeats and continues until the **Finish** button is selected.*

*If the **Pick** is cancelled by hitting the <Esc> key or selecting **Cancel** from the Pick Ops menu, the **Pick** button can be used to restart the option.*

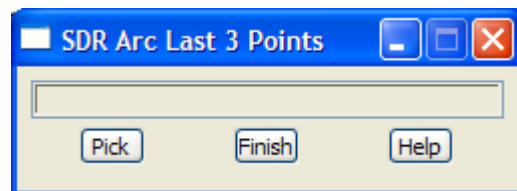
Arc Through Last Three Points

sdr_arc_last_3_points

Position of option on menu: Survey =>Edit =>Points =>Arc last 3 points

Arc last 3 points adds an arc through the selected vertex and the previous two vertices of the same string.

Selecting Arc last 3 points brings up the **SDR Arc Last 3 Points** panel:



Pick button

*As soon as the option is selected, the **Pick** is active and vertices can be selected.*

*Each time a vertex is picked and accepted, an arc is placed through the selected vertex and the previous two vertices of the same string by inserting an **Arc through last 3 points** field code.*

*The option then repeats and continues until the **Finish** button is selected.*

*If the **Pick** is cancelled by hitting the <Esc> key or selecting **Cancel** from the Pick Ops menu, the **Pick** button can be used to restart the option.*

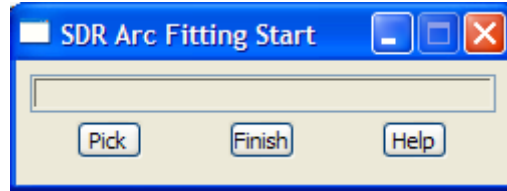
Start Arc Fitting

sdr_arc_fitting_start

Position of option on menu: Survey =>Edit =>Points =>Arc fitting start

Arc fitting start starts arc fitting through from the selected vertex until the end of the string or an stop arc fitting field code is encountered for that string.

Selecting Arc fitting start brings up the **SDR Arc Fitting Start** panel:



Pick button

*As soon as the option is selected, the **Pick** is active and vertices can be selected.*

*Each time a vertex is picked and accepted, arc fitting is started at the selected vertex by inserting an **Arc fitting start** field code.*

*The option then repeats and continues until the **Finish** button is selected.*

*If the **Pick** is cancelled by hitting the <Esc> key or selecting **Cancel** from the Pick Ops menu, the **Pick** button can be used to restart the option.*

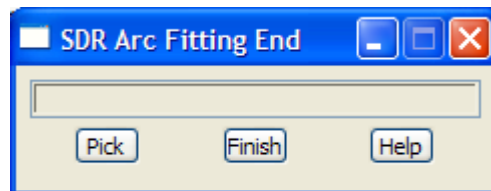
End Arc Fitting

sdr_arc_fitting_end

Position of option on menu: Survey =>Edit =>Points =>Arc fitting end

Arc fitting end ends any arc fitting for that string at the selected vertex.

Selecting Arc fitting end brings up the **SDR Arc Fitting End** panel:



Pick button

*As soon as the option is selected, the **Pick** is active and vertices can be selected.*

*Each time a vertex is picked and accepted, any arc fitting for the string is stopped at the selected vertex by inserting an **Arc fitting end** field code.*

*The option then repeats and continues until the **Finish** button is selected.*

*If the **Pick** is cancelled by hitting the <Esc> key or selecting **Cancel** from the Pick Ops menu, the **Pick** button can be used to restart the option.*

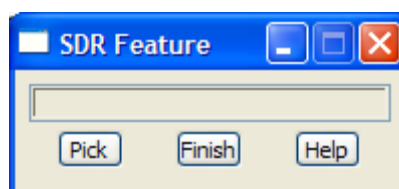
Create a Feature String

sdr_feature

Position of option on menu: Survey =>Edit =>Points =>Circle feature

Circle feature creates a feature string of a given radius at the selected vertex.

Selecting Circle feature brings up the **SDR Feature** panel:



Pick button

*As soon as the option is selected, the **Pick** is active and vertices can be selected.*

*Each time a vertex is picked and accepted, an **Feature radius** typed input panel is displayed to type the radius into. A **Feature** code is then inserted into the 12d field file.*

*The option then repeats and continues until the **Finish** button is selected.*

*If the **Pick** is cancelled by hitting the <Esc> key or selecting **Cancel** from the Pick Ops menu, the **Pick** button can be used to restart the option.*

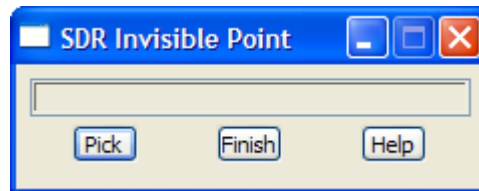
Make a Vertex Invisible**sdr_invisible_point**

Position of option on menu: Survey =>Edit =>Points =>Invisible

Invisible turns the selected vertex invisible.

Even if the segments on either side of the invisible vertex **are** tagged as visible, the segments can not be drawn because the start/end point of the segment is invisible.

Selecting Invisible brings up the **SDR Invisible Point** panel:

**Pick** button

*As soon as the option is selected, the **Pick** is active and vertices can be selected.*

*Each time a vertex is picked and accepted, the vertex is turned invisible by inserting an **Invisible Point** code into the 12d field file.*

*The option then repeats and continues until the **Finish** button is selected.*

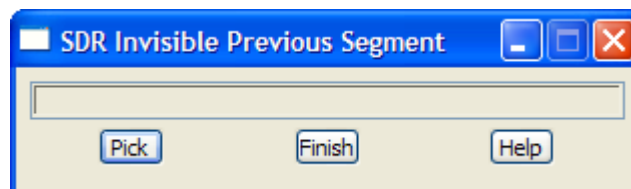
*If the **Pick** is cancelled by hitting the <Esc> key or selecting **Cancel** from the Pick Ops menu, the **Pick** button can be used to restart the option.*

Make the Previous Segment Invisible**sdr_invisible_previous_segment**

Position of option on menu: Survey =>Edit =>Points =>Invisible previous segment

Invisible previous segment turns the segment ending on the selected vertex invisible. The vertex itself is not invisible.

Selecting Invisible previous segment brings up the **SDR Invisible Previous Segment** panel:

**Pick** button

*As soon as the option is selected, the **Pick** is active and vertices can be selected.*

Each time a vertex is picked and accepted, the segment ending on the vertex is turned invisible by

inserting an **Invisible Previous Segment** code into the 12d field file.

The option then repeats and continues until the **Finish** button is selected.

If the **Pick** is cancelled by hitting the <Esc> key or selecting **Cancel** from the Pick Ops menu, the **Pick** button can be used to restart the option.

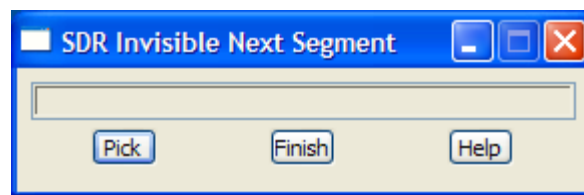
Make the Next Segment Invisible

sdr_invisible_next_segment

Position of option on menu: Survey =>Edit =>Points =>Invisible next segment

Invisible next segment turns the segment starting on the selected vertex invisible. The vertex itself is not invisible.

Selecting **Invisible next segment** brings up the **SDR Invisible Next Segment** panel:



Pick button

As soon as the option is selected, the **Pick** is active and vertices can be selected.

Each time a vertex is picked and accepted, the segment starting on the vertex is turned invisible by inserting an **Invisible Next Segment** code into the 12d field file.

The option then repeats and continues until the **Finish** button is selected.

If the **Pick** is cancelled by hitting the <Esc> key or selecting **Cancel** from the Pick Ops menu, the **Pick** button can be used to restart the option.

Make a Vertex Non Tenable

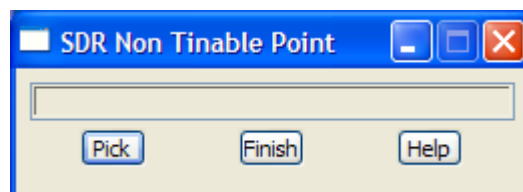
sdr_non_tenable_point

Position of option on menu: Survey =>Edit =>Points =>Non tenable

Non tenable sets the selected vertex to be non tenable (that is, the vertex is not included in any triangulation).

Even if the segments on either side of the non tenable vertex **are** tenable, the segments can not be included in any triangulation because the start/end point of the segment is non tenable.

Selecting **Non tenable** brings up the **SDR Non Tenable Point** panel:



Pick button

As soon as the option is selected, the **Pick** is active and vertices can be selected.

Each time a vertex is picked and accepted, the vertex is set to non tenable (that is, the vertex is not included in any triangulations) by inserting a **Non tenable point** code into the 12d field file.

The option then repeats and continues until the **Finish** button is selected.

If the **Pick** is cancelled by hitting the <Esc> key or selecting **Cancel** from the Pick Ops menu, the **Pick** button can be used to restart the option.

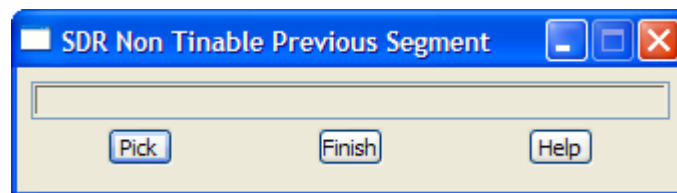
Make the Previous Segment Non Tinable

sdr_non_tinable_previous_segment

Position of option on menu: Survey =>Edit =>Points =>Non tinable previous segment

Non tinable previous segment sets the segment ending on the selected vertex non tinable. That is, the segment is not included as a breakline in any tins (triangulations) The vertex itself can be tinable.

Selecting **Non tinable previous segment** brings up the **SDR Non Tinable Previous Segment** panel:



Pick button

*As soon as the option is selected, the **Pick** is active and vertices can be selected.*

*Each time a vertex is picked and accepted, the segment ending on the vertex is set to non tinable by inserting a **Non tinable previous segment** code into the 12d field file.*

*The option then repeats and continues until the **Finish** button is selected.*

*If the **Pick** is cancelled by hitting the <Esc> key or selecting **Cancel** from the Pick Ops menu, the **Pick** button can be used to restart the option.*

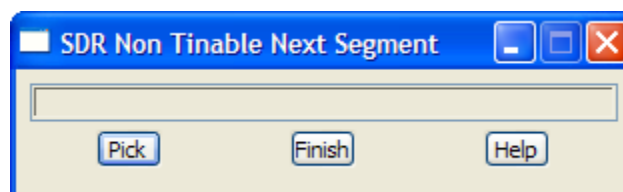
Make the Next Segment Non Tinable

sdr_non_tinable_next_segment

Position of option on menu: Survey =>Edit =>Points =>Non tinable next segment

Non tinable next segment sets the segment starting on the selected vertex non tinable. That is, the segment is not included as a breakline in any tins (triangulations) The vertex itself can be tinable.

Selecting **Non tinable next segment** brings up the **SDR Non Tinable Next Segment** panel:



Pick button

*As soon as the option is selected, the **Pick** is active and vertices can be selected.*

*Each time a vertex is picked and accepted, the segment starting on the vertex is set to non tinable by inserting an **Non tinable next segment** code into the 12d field file.*

*The option then repeats and continues until the **Finish** button is selected.*

*If the **Pick** is cancelled by hitting the <Esc> key or selecting **Cancel** from the Pick Ops menu, the **Pick** button can be used to restart the option.*

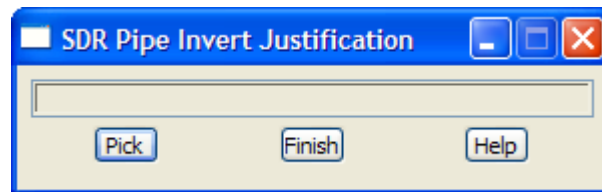
Make a Vertex an Invert Level of a Pipe

sdr_pipe_invert_justification

Position of option on menu: Survey =>Edit =>Points =>Pipe invert

Pipe invert sets the z-value of the selected vertex to be used as an invert level (pipe top) when the vertex is in a pipe string.

Selecting Pipe invert brings up the **SDR Pipe Invert Justification** panel:



Pick button

*As soon as the option is selected, the **Pick** is active and vertices can be selected.*

*Each time a vertex is picked and accepted, the vertex is set to be an invert level (top of the pipe) for any pipe string it is in by inserting a **Pipe invert** code into the 12d field file.*

*The option then repeats and continues until the **Finish** button is selected.*

*If the **Pick** is cancelled by hitting the <Esc> key or selecting **Cancel** from the Pick Ops menu, the **Pick** button can be used to restart the option.*

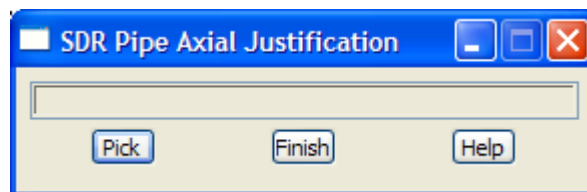
Make a Vertex an Axial Level of a Pipe

sdr_pipe_axial_justification

Position of option on menu: Survey =>Edit =>Points =>Pipe axial

Pipe axial sets the z-value of the selected vertex to be used as an axial level (pipe centre) when the vertex is in a pipe string.

Selecting Pipe axial brings up the **SDR Pipe Axial Justification** panel:



Pick button

*As soon as the option is selected, the **Pick** is active and vertices can be selected.*

*Each time a vertex is picked and accepted, the vertex is set to be an axial level (centre of the pipe) for any pipe string it is in by inserting a **Pipe axial** code into the 12d field file.*

*The option then repeats and continues until the **Finish** button is selected.*

*If the **Pick** is cancelled by hitting the <Esc> key or selecting **Cancel** from the Pick Ops menu, the **Pick** button can be used to restart the option.*

Make a Vertex an Obvert Level of a Pipe

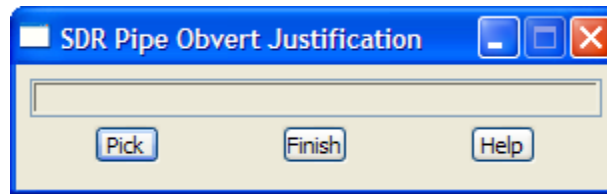
sdr_pipe_obvert_justification

Position of option on menu: Survey =>Edit =>Points =>Pipe obvert

Pipe obvert sets the z-value of the selected vertex to be used as an obvert level (bottom of pipe)

when the vertex is in a pipe string.

Selecting **Pipe obvert** brings up the **SDR Pipe Obvert Justification** panel:



Pick button

*As soon as the option is selected, the **Pick** is active and vertices can be selected.*

*Each time a vertex is picked and accepted, the vertex is set to be an obvert level (bottom of the pipe) for any pipe string it is in by inserting a **Pipe obvert** code into the 12d field file.*

*The option then repeats and continues until the **Finish** button is selected.*

*If the **Pick** is cancelled by hitting the <Esc> key or selecting **Cancel** from the Pick Ops menu, the **Pick** button can be used to restart the option.*

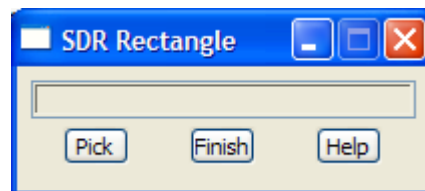
Make a Parallelogram from the Last Three Points

sdr_rectangle

Position of option on menu: Survey =>Edit =>Points =>Rectangle last 3 points

Rectangle last 3 points creates a parallelogram (squashed rectangle) from the selected vertex and the previous two vertices in the same string.

Selecting **Rectangle last 3 points** brings up the **SDR Rectangle** panel:



Pick button

*As soon as the option is selected, the **Pick** is active and vertices can be selected.*

Each time a vertex is picked and accepted, a parallelogram (squashed rectangle) is created using the selected vertex and the previous two vertices of the same string (three vertices in total) and creating a four vertex to form the parallelogram of four vertices. The three vertices are removed from the original string and any following vertices are used in a new string.

*A **String rectangle** code is inserted into the 12d field file.*

*The option then repeats and continues until the **Finish** button is selected.*

*If the **Pick** is cancelled by hitting the <Esc> key or selecting **Cancel** from the Pick Ops menu, the **Pick** button can be used to restart the option.*

Make a Rectangle from the Last Two Points

sdr_rectangle_by_2_points

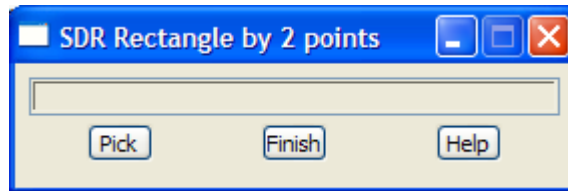
Position of option on menu: Survey =>Edit =>Points =>Rectangle last 2 points

Rectangle last 2 points creates a rectangle from the selected vertex and the previous vertex in the same string, and a width supplied by the user.

The rectangle is formed by using the two vertices as the base of the rectangle and using the given

width as the length of the other side of the rectangle. Two new vertices are created to from the rectangle.

Selecting Rectangle last 2 points brings up the **SDR Rectangle by 2 Points** panel:



Pick button

*As soon as the option is selected, the **Pick** is active and vertices can be selected.*

*Each time a vertex is picked and accepted, a **Rectangle width** type input box is displayed and filled in.*

The rectangle is formed by using the two vertices as the base of the rectangle and using the given width as the length of the other side of the rectangle. Two new vertices are created to from the rectangle.

The two vertices are removed from the original string and any following vertices are used in a new string.

*A **String rectangle by 2 points** code is inserted into the 12d field file.*

*The option then repeats and continues until the **Finish** button is selected.*

*If the **Pick** is cancelled by hitting the <Esc> key or selecting **Cancel** from the Pick Ops menu, the **Pick** button can be used to restart the option.*

Delete a Vertex

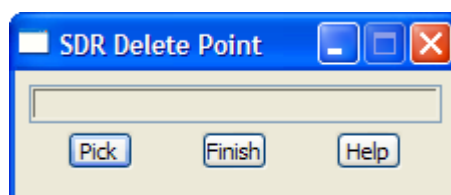
sdr_delete_point

Position of option on menu: Survey =>Edit =>Points =>Remove point

Remove point deleted the selected vertex.

The adjacent vertices in the string containing the deleted vertex will then be joined together.

Selecting Remove point brings up the **SDR Delete Point** panel:



Pick button

*As soon as the option is selected, the **Pick** is active and vertices can be selected.*

Each time a vertex is picked and accepted, the vertex deleted from the field file.

*The option then repeats and continues until the **Finish** button is selected.*

*If the **Pick** is cancelled by hitting the <Esc> key or selecting **Cancel** from the Pick Ops menu, the **Pick** button can be used to restart the option.*

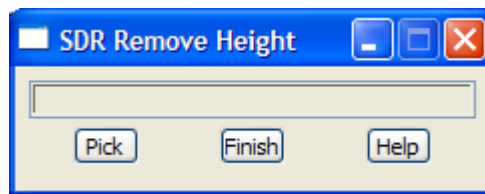
Set a Vertex Height to Null

sdr_remove_height

Position of option on menu: Survey =>Edit =>Points =>Remove height

Remove height sets the height of the selected vertex to null.

Selecting Remove height brings up the **SDR Remove Height** panel:



Pick button

*As soon as the option is selected, the **Pick** is active and vertices can be selected.*

*Each time a vertex is picked and accepted, the height of the selected vertex is set to null by inserting a **Remove height** code into the 12d field file.*

*The option then repeats and continues until the **Finish** button is selected.*

*If the **Pick** is cancelled by hitting the <Esc> key or selecting **Cancel** from the Pick Ops menu, the **Pick** button can be used to restart the option.*

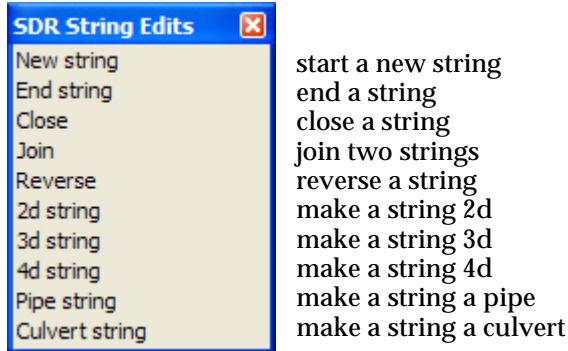
SDR Strings Edit

SDR_points_edit

Position of menu: Survey =>Edit =>Stringing

The Stringing walk-right menu contains options that work on strings rather than individual points.

The Stringing walk-right menu is:



For the option *New string*, go to the section

End string

Close

Join

Reverse

2d string

3d string

4d string

Pipe string

Culvert string

“New String”

“End String”

“Close String”

“Join Two Strings of Same Feature Code”

“Reverse String Direction”

“Make a 2d String”

“Make a 3d String”

“Make a 4d String”

“Make a Pipe String”

“Make a Culvert String”

New String

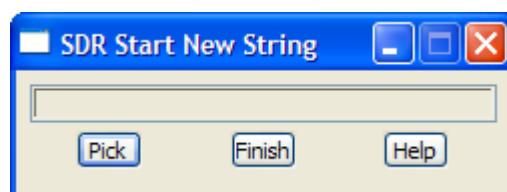
sdr_start_new_string

Position of option on menu: Survey =>Edit =>Stringing =>New string

New string corrects the problem of not changing string numbers which creates the error of the last point of one string being joined to the first point of what should have been the next string. Hence there is a link between the two points that should not exist.

With **new string**, the user selects the incorrect link and a **new string** command is inserted into the 12d field file which removes the link by starting a new string at the end point of the link.

Selecting **New string** brings up the **SDR Start New String** panel:



Pick button

As soon as the option is selected, the **Pick** is active and string links can be selected. If the pick is

cancelled for some reason, the **Pick** button can be used to restart the option.

Each time a string segment is picked and accepted, a **string start** command is inserted into the 12d field file which removes the link by starting a new string at the end point of the link.

The option then repeats and continues until the **Finish** button is selected.

If the **Pick** is cancelled by hitting the <Esc> key or selecting **Cancel** from the Pick Ops menu, the **Pick** button can be used to restart the option.

End String

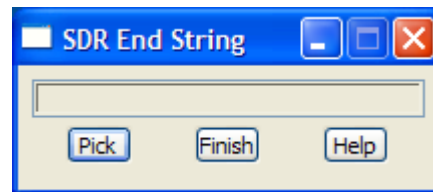
sdr_end_string

Position of option on menu: Survey =>Edit =>Stringing =>End string

End string corrects the problem of not changing string numbers which creates the error of the last point of one string being joined to the first point of what should have been the next string. Hence there is a link between the two points that should not exist.

With **end string**, the user selects the incorrect link and a **end string** command is inserted into the 12d field file which removes the link by starting a new string at the end point of the link.

Selecting **End string** brings up the **SDR End String** panel:



Pick button

As soon as the option is selected, the **Pick** is active and string links can be selected. If the pick is cancelled for some reason, the **Pick** button can be used to restart the option.

Each time a string segment is picked and accepted, an **string end** command is inserted into the 12d field file which removes the link by starting a new string at the end point of the link.

The option then repeats and continues until the **Finish** button is selected.

If the **Pick** is cancelled by hitting the <Esc> key or selecting **Cancel** from the Pick Ops menu, the **Pick** button can be used to restart the option.

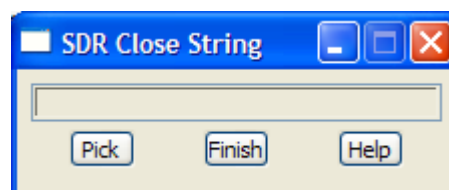
Close String

sdr_close_string

Position of option on menu: Survey =>Edit =>Stringing =>Close

With **Close**, the user selects any part of the string to be closed and a **close string** command is inserted into the 12d field file.

Selecting **Close** brings up the **SDR Close String** panel:



Pick button

As soon as the option is selected, the **Pick** is active and string can be selected. If the pick is cancelled for some reason, the **Pick** button can be used to restart the option.

Each time a string is picked and accepted, a **string close** command is inserted in the 12d field file which closes the selected string.

The option then repeats and continues until the **Finish** button is selected.

If the **Pick** is cancelled by hitting the <Esc> key or selecting Cancel from the Pick Ops menu, the **Pick** button can be used to restart the option.

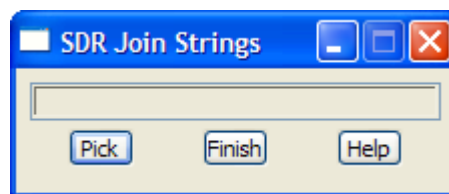
Join Two Strings of Same Feature Code

sdr_join_strings

Position of option on menu: Survey =>Edit =>Stringing =>Join

With Join, the two strings of the same name (code) are selected with direction and the strings are joined by inserting the appropriate **join string** command in the 12d field file.

Selecting Join brings up the **SDR Join Strings** panel:



Pick button

As soon as the option is selected, the **Pick** is active and string can be selected. If the pick is cancelled for some reason, the **Pick** button can be used to restart the option.

Each time two strings of the same name (code) are picked with direction, the appropriate join string field code (**Join first points of strings**, **Join first to last point of strings**, **Join last points of strings**, **Join last to first point of strings**) is inserted into the 12d field file.

The option then repeats and continues until the **Finish** button is selected.

If the **Pick** is cancelled by hitting the <Esc> key or selecting Cancel from the Pick Ops menu, the **Pick** button can be used to restart the option.

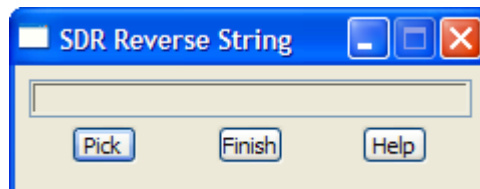
Reverse String Direction

sdr_reverse_string

Position of option on menu: Survey =>Edit =>Stringing =>Reverse

With Reverse, the selected strings is reversed by inserting the **String reverse** command into the 12d field file.

Selecting Reverse brings up the **SDR Reverse String** panel:



Pick button

As soon as the option is selected, the **Pick** is active and string can be selected. If the pick is cancelled for some reason, the **Pick** button can be used to restart the option.

Each time a string is selected, a **String reverse** field code is inserted into the 12d field file.

The option then repeats and continues until the **Finish** button is selected.

If the **Pick** is cancelled by hitting the <Esc> key or selecting **Cancel** from the Pick Ops menu, the **Pick** button can be used to restart the option.

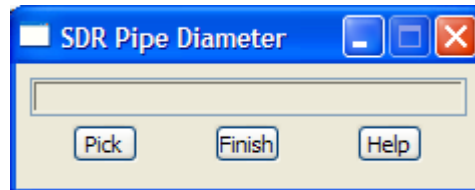
Make a 2d String

sdr_string_type_2d

Position of option on menu: Survey =>Edit =>Stringing =>2d string

With 2d string the user selects any vertex of a string and a **string type 2d** command is then inserted into the *12d field file*.

Selecting 2d string brings up the **SDR String Type 2d** panel:



Pick button

As soon as the option is selected, the **Pick** is active and string can be selected. If the pick is cancelled for some reason, the **Pick** button can be used to restart the option.

Each time a string is picked and accepted, a **String type 2d** command is inserted in the *12d field file*.

The option then repeats and continues until the **Finish** button is selected.

If the **Pick** is cancelled by hitting the <Esc> key or selecting **Cancel** from the Pick Ops menu, the **Pick** button can be used to restart the option.

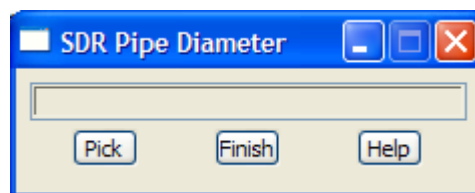
Make a 3d String

sdr_string_type_3d

Position of option on menu: Survey =>Edit =>Stringing =>3d string

With 3d string the user selects any vertex of a string and a **string type 3d** command is then inserted into the *12d field file*.

Selecting 3d string brings up the **SDR String Type 3d** panel:



Pick button

As soon as the option is selected, the **Pick** is active and string can be selected. If the pick is cancelled for some reason, the **Pick** button can be used to restart the option.

Each time a string is picked and accepted, a **String type 3d** command is inserted in the *12d field file*.

The option then repeats and continues until the **Finish** button is selected.

If the **Pick** is cancelled by hitting the <Esc> key or selecting **Cancel** from the Pick Ops menu, the **Pick** button can be used to restart the option.

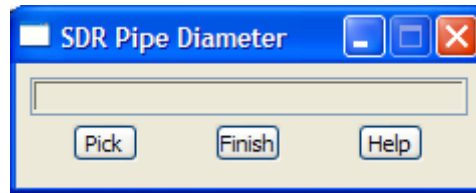
Make a 4d String

sdr_string_type_4d

Position of option on menu: Survey =>Edit =>Stringing =>4d string

With 4d string the user selects any vertex of a string and a **string type 4d** command is then inserted into the 12d field file.

Selecting 4d string brings up the **SDR String Type 4d** panel:



Pick button

*As soon as the option is selected, the **Pick** is active and string can be selected. If the pick is cancelled for some reason, the **Pick** button can be used to restart the option.*

*Each time a string is picked and accepted, a **String type 4d** command is inserted in the 12d field file.*

*The option then repeats and continues until the **Finish** button is selected.*

*If the **Pick** is cancelled by hitting the <Esc> key or selecting Cancel from the Pick Ops menu, the **Pick** button can be used to restart the option.*

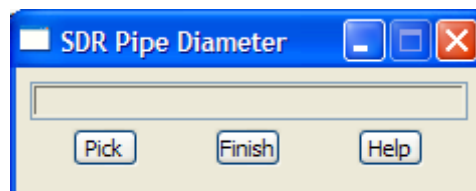
Make a Pipe String

sdr_pipe_diameter

Position of option on menu: Survey =>Edit =>Stringing =>Pipe string

With Pipe string, the user selects any vertex of a string, gives a pipe diameter and then a **string type pipe** command is inserted into the 12d field file.

Selecting Pipe string brings up the **SDR Pipe Diameter** panel:



Pick button

*As soon as the option is selected, the **Pick** is active and string can be selected. If the pick is cancelled for some reason, the **Pick** button can be used to restart the option.*

*Each time a string is picked and accepted, a **Pipe diameter** text input is displayed and after a value is typed in, a **String type pipe** command is inserted in the 12d field file.*

*The option then repeats and continues until the **Finish** button is selected.*

*If the **Pick** is cancelled by hitting the <Esc> key or selecting Cancel from the Pick Ops menu, the **Pick** button can be used to restart the option.*

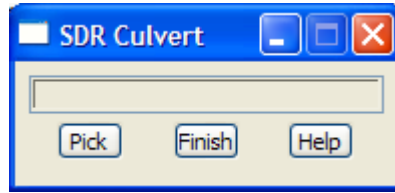
Make a Culvert String

sdr_culvert

Position of option on menu: Survey =>Edit =>Stringing =>Culvert string

With Culvert string, the user selects any vertex of a string, gives a culvert width and height and then a **string type culvert** command is inserted into the 12d field file.

Selecting Culvert string brings up the **SDR Culvert** panel:



Pick button

*As soon as the option is selected, the **Pick** is active and string can be selected. If the pick is cancelled for some reason, the **Pick** button can be used to restart the option.*

*Each time a string is picked and accepted, **Culvert width** and **Culvert height** text inputs are displayed and after values are typed in, a **String type culvert** command is inserted in the 12d field file.*

*The option then repeats and continues until the **Finish** button is selected.*

*If the **Pick** is cancelled by hitting the <Esc> key or selecting **Cancel** from the Pick Ops menu, the **Pick** button can be used to restart the option.*

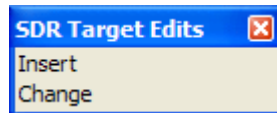
Target Height

SDR_target_edits

Position of menu: Survey =>Edit =>Target height

The Target height option is used to correct target height errors. This includes giving an incorrect value for a target height or forgetting to change the target height.

The Target height walk-right menu is



insert an new target height
change existing target height

Each option will now be described in detail.

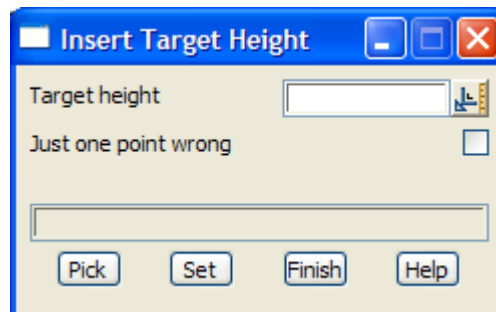
Insert Target Height

insert_target_height

Position of option on menu: Survey =>Edit =>Target height =>Insert

The insert option inserts a new target height command into the 12d field file at a user selected point. The user can choose whether the new target height only applied for that one point or for all following points until a new target height is set.

Selecting insert brings up the **insert target height** panel:



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Target height	input/output		
----------------------	--------------	--	--

when a point is selected, the target height for that point is displayed. The value can then be changed by the user and if set is selected, the target height is modified and all affected points updated.

Just one point	tick		
-----------------------	------	--	--

if tick, the new target height only applied for that one point and then reverts pack to the previous target height.

if not tick, the new target height applies for all following points until a new target height is set.

Pick	button		
-------------	--------	--	--

pick the point to insert a new target height.

Set	button		
------------	--------	--	--

selecting set inserts the new target height command into the 12d field file.

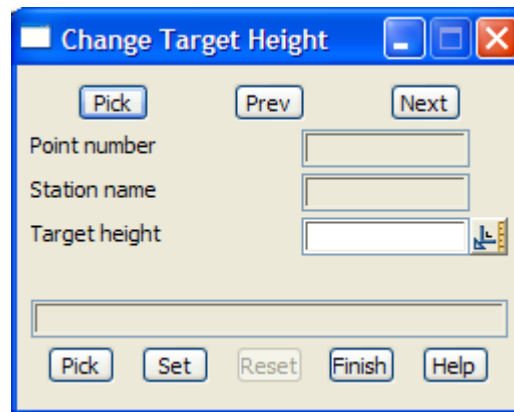
Change Target Height

change_target_height

Position of option on menu: Survey =>Edit =>Target height =>Change

The change option changes an existing target height to a new value.

Selecting change brings up the **change target height** panel:



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Pick	button		
-------------	--------	--	--

select a point whose information will be displayed in the panel fields. A highlighted line joining the point to the station that it was surveyed from is also displayed.

Prev	button		
-------------	--------	--	--

move to the previous point in the string.

Next	button		
-------------	--------	--	--

move to the next point in the string.

Point id	display only		
-----------------	--------------	--	--

point id of the selected point.

Station name	display only		
---------------------	--------------	--	--

name of the station that the point was surveyed from.

Target height	input/output		
----------------------	--------------	--	--

when a point is selected, the target height for that point is displayed. The value can then be changed by the user and if set is selected, the target height is modified and all affected points updated.

Pick	button		
-------------	--------	--	--

pick the point to change the target height.

Set	button		
------------	--------	--	--

selecting set changes the target height command in the 12d field file and updates affected points.

Reset	button		
--------------	--------	--	--

reset undoes the changes.

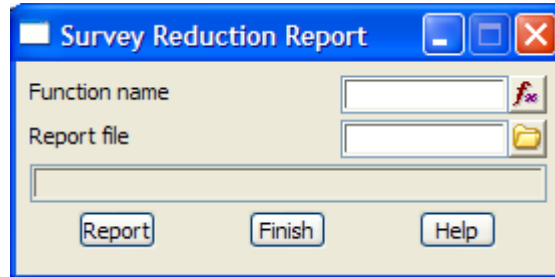
Report

survey_reduction_report

Position of option on menu: Survey =>Report

Report produces a report on the field data from a *Survey* function.

Selecting report brings up the **survey reduction report** panel



The fields and buttons used in this panel have the following functions.

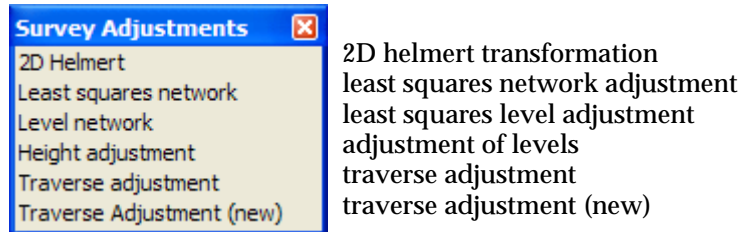
Field Description	Type	Defaults	Pop-Up
Function name <i>name of the 12d Survey function to report on.</i>	input		available Survey functions
Report file <i>name of the file for the Survey function report.</i>	input		*.rpt
Report <i>create the Survey report.</i>	button		

Adjustments

survey_adjustments

Position of menu: Survey =>Adjustments

The Adjustments walk-right menu is



For the option *2D Helmert*, go to the section

Least squares network

Level network

Height adjustment

Traverse Adjustment

Traverse Adjustment (new)

“2D Helmert” in the chapter “Utilities”

“Least Squares Network”

“Level Network”

“Height Adjustment”

“Traverse Adjustment”

“Traverse Adjustment”

2D Helmert

Position of option on menu: Survey =>Adjustments =>2D Helmert

The *2D Helmert* option performs a 2D helmert transformation on selected data. This transformation includes a rotation, scale and two translation parameters.

The *Helmert* Transformation has already been documented in the section “2D Helmert” in the chapter “Utilities”

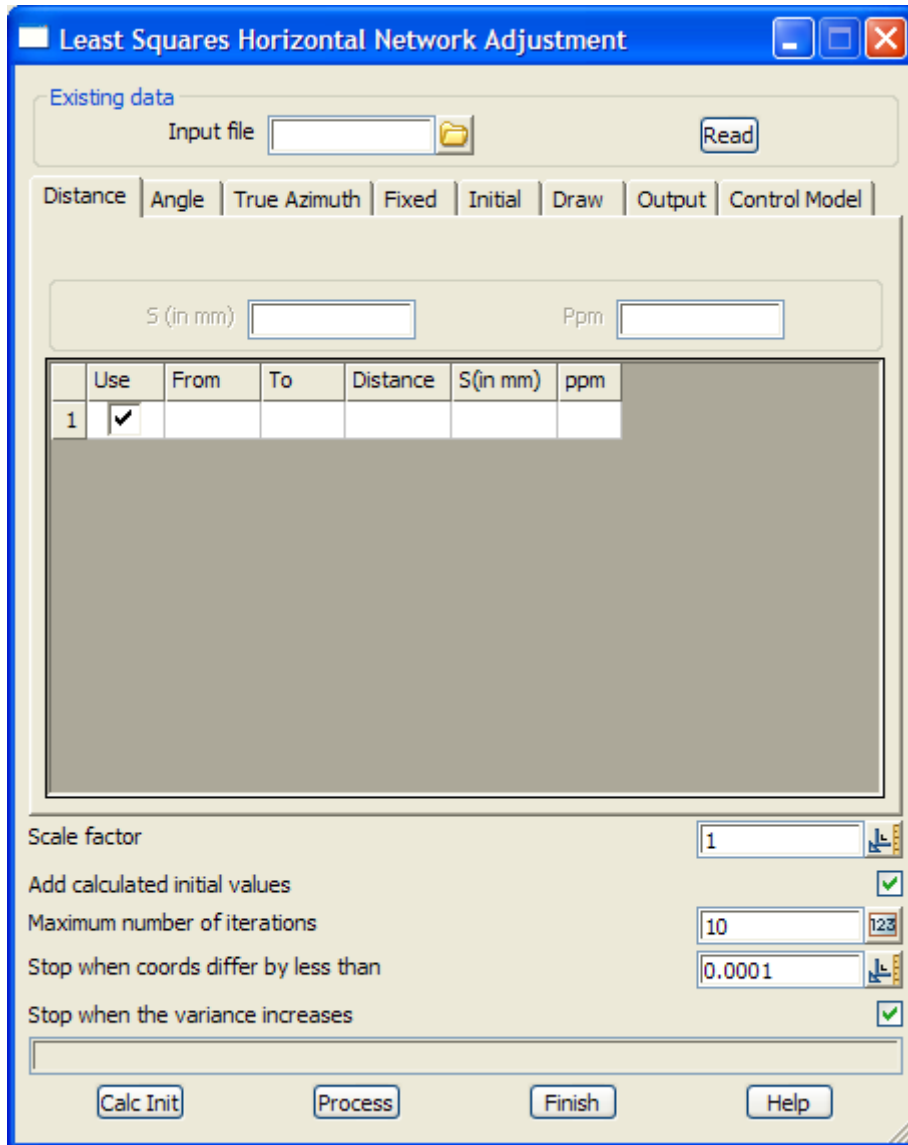
Least Squares Network

least_squares_horizontal_network_adjustment

Position of option on menu: Survey =>Adjustments =>Least squares network

The Least square network option performs a least square adjustment on a set of observations that can be manually entered into predefined grid box columns or by reading an existing input file. These observations can be of the form of distances, angles, azimuths or a combination of these.

Selecting Least squares network brings up the **Least squares horizontal network adjustment** panel



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Input file	input box		*.in
<i>a pre existing .in input file can be specified. For the format of the .in file, go to "Format of the LSA .in File"</i>			
Read	button		
<i>on selection of the read button, if a valid .in input file has been specified, the relevant parameters will be</i>			

read into the grid controls.

Distance tab

	Use	From	To	Distance	S(in mm)	ppm
1	<input checked="" type="checkbox"/>					

The fields and buttons used in this tab have the following functions.

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

S(in mm)	input box		
-----------------	-----------	--	--

standard deviation of a single distance measurement in mm. If entered the value will be used for all lines in the grid. This eliminates the need to put the standard deviation on each line.

ppm	button		
------------	--------	--	--

parts per million error. If entered the value will be used for all lines in the grid. This eliminates the need to put the ppm on each line.

the grid control values can be entered using valid inputs into the various fields:

Use - if tick, the row is used in the adjustment. If **not ticked** then the row is ignored

From point id which represents the point from which the distance was read

To point id which represents the point to which the distance was read

Distance (horizontal) with all corrections having been made except for that of scale.

S(in mm) - if non blank, the standard deviation to use for this single distance measurement in millimetres. If blank, the default value in the panel field **S(in mm)** is used.

ppm - if non blank, the parts per million (ppm) error to use for this single distance measurement. If blank, the default value in the panel field **Pmm** is used.

Angle tab

	Use	Backsight	Instrument	Foresight	Cw angle(dms)	S(in second)
1	<input checked="" type="checkbox"/>					

The fields and buttons used in this tab have the following functions.

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

S(in sec)	input box		
------------------	-----------	--	--

standard deviation for a single angle measurement in seconds of arc. If entered the value will be used for all lines in the grid. This eliminates the need to put the standard deviation on each line.

the grid control values can be entered using valid inputs into the various fields. Angle input must be in

the form of degrees minutes and seconds in hp notation (e.g. 12.1055)

Use - if tick, the row is used in the adjustment. If **not ticked** then the row is ignored

Backsight - the backsight point id is entered.

Instrument - the point id of the instrument or observation station is entered.

Foresight - the point id of the foresight station is entered into the **Foresight** column.

Angle(dms) - the angle defined by the clockwise measurement from the backsight to foresight station as observed from the instrument station. Valid ranges of 0 -360 degrees.

S(in second) - if non blank, the standard deviation of the angular measurement in seconds of arc to use for this single angle measurement. If blank, the default value in the panel field **S (in sec)** is used.

Azimuth tab

The fields and buttons used in this tab have the following functions.

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

S(in sec)	input box		
------------------	-----------	--	--

standard deviation for a single azimuth measurement in seconds of arc. If entered the value will be used for all lines in the grid. This eliminates the need to put the standard deviation on each line.

the grid control values can be entered using valid inputs into the various fields.

Use - if tick, the row is used in the adjustment. If **not ticked** then the row is ignored

From - the instrument station point id should be entered.

To - the point id of the observed station is entered.

Azimuth - the true azimuth to the observed point is entered. Azimuth input should be in the form of degrees minutes and seconds (e.g. 12.1055) Valid ranges of 0 -360 degrees.

S(in second) - if non blank, the standard deviation of the azimuth in seconds of arc to use for this single angle measurement. If blank, the default value in the panel field **S (in sec)** is used.

Fixed tab

the grid control values can be entered using valid inputs into the various fields.

Use - if tick, the row is used in the adjustment. If **not ticked** then the row is ignored

Point name - the point id of the fixed stations

X coord - the fixed x coordinate value is entered

Y coord - the fixed y coordinate value is entered

Z coord - the fixed z coordinate value is entered

Initial tab

12d Model will try and calculate initial position for each point from the entered measurement but for some points this is not possible and then the user must enter an initial position.

Distance	Angle	Azimuth	Fixed	Initial	Draw	Output	Control Model
	Use	Point name	X coord	Y coord	Z coord		
1	<input checked="" type="checkbox"/>						

the grid control values can be entered using valid inputs into the various fields.

Use - if tick, the row is used in the adjustment. If **not ticked** then the row is ignored

Point name - the point id of a free or floating station should be entered.








X coord - the initial x coordinate estimate is entered.

Y coord - the initial y coordinate estimate is entered.

Z coord - the initial z coordinate estimate is entered.

NB. It is very important that the initial values are approximately equal to the true values. A solution will still be generated for rubbish values.

Draw tab

Distance	Angle	Azimuth	Fixed	Initial	Draw	Output	Control Model
Name							<input type="text" value=""/>
Model							<input type="text" value=""/>
Colour							<input type="text" value="red"/> 
Fixed station style							<input type="text" value="STATION"/> 
Fixed station size							<input type="text" value="1"/> 
Fixed station colour							<input type="text" value="green"/> 
Scale for error ellipses							<input type="text" value="1000"/> 
Symbol for given init pts							<input type="text" value="1"/> 
Symbol for calc init pts							<input type="text" value="1"/> 
Clear draw model							<input type="checkbox"/>

the following values can be entered to enable the production of a user defined plot of the adjustment.

Field Description	Type	Defaults	Pop-Up
Name	name box		defined names from names.4d file

if non-blank, the name of the new string

Model	model box		available models
--------------	-----------	--	------------------

if non-blank, the model of the new string (including error ellipse and station symbol if specified).

Colour	colour box	red	available colours
---------------	------------	-----	-------------------

if non-blank, the colour of the new string. If blank, the original string colour is used.

Fixed station style	input	Station	available line styles
----------------------------	-------	---------	-----------------------

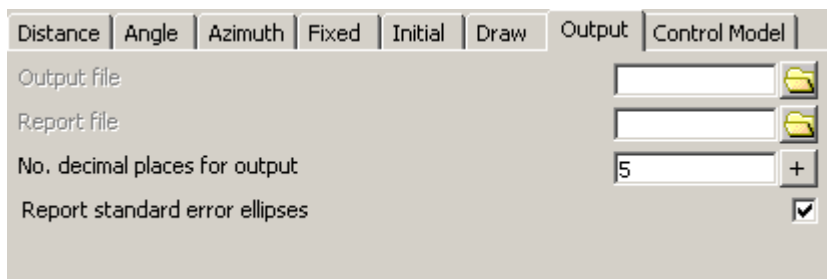
line style of the station symbol. These will be placed at all of the fixed stations if specified.

Fixed station size	input	1	
---------------------------	-------	---	--

size of symbol in world units.

- Fixed station colour** colour box green available colours
if non-blank, the colour of the station symbols
- Scale for error ellipses** input 1000
this value will be applied to any error ellipses to enable an exaggerated view of the ellipse geometry
- Symbol for given init points** input 1 available line styles
line style of the given initial point symbols
- Symbol for calc init points** input 1 available line styles
line style of the calculated initial point symbols
- Clear draw model beforehand** tick box
if ticked, the draw model will be cleaned before the new strings are created

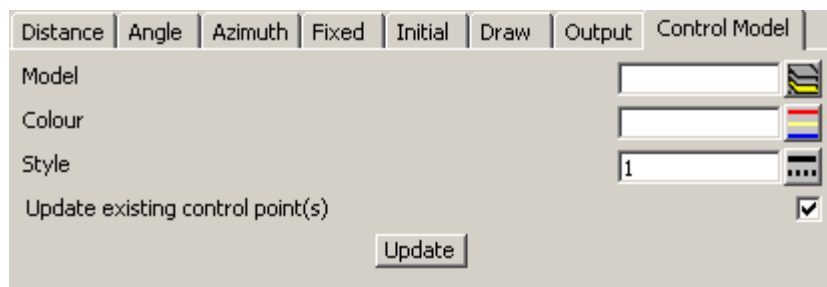
Output tab



The fields in this panel define the output parameters.

- | Field Description | Type | Defaults | Pop-Up |
|--|-----------|----------|--------|
| Output file
<i>if non blank, an output file is produced that can be read in the future.</i> | input box | | *.in |
| Report file
<i>if non blank, a report file of this name is creating giving the calculation specific parameters and result.</i> | input box | | *.rpt |
| No. decimal places for output
<i>the number of decimal place to use in the report</i> | input box | 5 | |
| Report standard error ellipse
<i>if tick, error ellipses for each new point are created</i> | tick box | ticked | |

Control Model tab



- Model** model box
a new model or an existing model containing some control points an be entered.

If a new model, the calculated points will placed into that control model.

*If an existing model, if there is a point in the model with the same point id as a point being calculated, then that rather than a new point being created, the coordinates of the existing point can be updated after the reduction is complete (depends on the **Update existing controls points** tick box).*

Colour model box
colour used for control station symbol

Style linestyle box
style for control stations.

Update existing control points tick box ticked
if ticked, any existing coordinate positions from the adjustment will be updated in the given control model.

Update button
if pressed, the updating of changed level values in the given control model will be carried out.

The remaining fields refer to those located below the grid control

Scale factor input box project central meridian scale factor
a scale factor can be defined which will be applied to any entered distances. Final distances used in calculations are derived by multiplying the entered distance by the scale factor.

Add calculated initial values tick box tick
if this box is checked, then the initial values will be included in the report

Maximum number of iterations input box 10
the calculation of the adjustment can be aborted if a solution is not found after the specified number of iterations

Stop when coords differ... input box 0.0001
the calculation of the adjustment is stopped when the difference between successive calculations meet the defined tolerance

Stop when the variance increases tick box tick
if tick, the calculation of the adjustment is stopped when the variance between successive calculations increases

Process button
run the adjustment

Format of the LSA .in File

The data in each line of the *.in* file is space delimited. That is, each piece of data on the line is separated by one or more spaces.

Line 1:

The layout of the data on the first line is as follows:

Position	Description	Variable	Type
1	Number of distance observations	N-Dist	Integer
2	Number of angle observations	N-Ang	Integer
3	Number of true azimuth observations	N-Azi	Integer
4	Number of control (fixed) stations	N-Fix	Integer
5	Number of stations (including control stations)	N-Stn	Integer
6	Distance standard deviation (positive if used)	D-Std	Double
7	Distance part per million (non-negative if used)	D-Ppm	Double
8	Angle standard deviation (positive if used)	A-Std	Double
9	Azimuth standard deviation (positive if used)	Z-Std	Double
10	Scale factor		Double

Note: *D-Std*, is in millimetres, *A-Std* and *Z-Std* are in seconds.

Example:

```
63 71 0 16 35 5.00000 5.00000 15.00000 5.00000 1.00000
```

Next N-Stn lines:

The next *N-Fix* lines are *control station* records, followed by (*N-Stn - N-Fix*) *station* records.

The layout of the line of a *station record* is as follows:

Position	Description	Type
1	Flag (1 if the station is used, otherwise 0)	Integer
2	Point number	Text
3	X-coord	Double
4	Y-coord	Double

Example:

```
1 9338 3889.23700 5341.54800
```

```
....
```

```
....
```

```
0 9712a 4007.45700 5168.68700
```

```
....
```

Next N-Dist lines

The next *N-Dist* lines are *distance observation* records.

The layout of the line of a *distance observation record* is as follows:

Position	Description	Type
1	Flag (1 if the observation is used, otherwise 0)	Integer
2	Start point number	Text
3	End point number	Text
4	Distance	Double
5	Standard deviation (in meter, negative if not used)	Double
6	Part per million*	Double

Note: * Part per million is different to D-Ppm by a factor of 1000. That is, if you want a ppm value of 5, the number in the file should be 0.005

Example:

```
1 9542 9702 100.20200 0.00300 0.00200
1 9542 9703 142.98200 -1.00000 -1.00000
0 9700 9506 72.10700 -1.00000 -1.00000
....
```

Next N-Ang lines

The next *N-Ang* lines are *angle observation* records.

The layout of the line of a *angle observation record* is as follows:

Position	Description	Type
1	Flag (1 if the observation is used, otherwise 0)	Integer
2	Backsight point number	Text
3	Instrument point number	Text
4	Foresight point number	Text
5	Degree	Integer
6	Minute	Integer
7	Second	Double
8	Standard deviation (in mm, negative if not used)	Double

Example:

```
1 19206 9506 9701 174 29 20.00000 -1000.00000
....
```

Next N-Azi lines

The next *N-Azi* lines are *true azimuth observation* records.

The layout of the line of a *true azimuth observation record* is as follows:

Position	Description	Type
1	Flag (1 if the observation is used, otherwise 0)	Integer
2	Backsight point number	Text
3	Instrument point number	Text
4	Foresight point number	Text
5	Degree	Integer
6	Minute	Integer
7	Second	Double
8	Standard deviation (in mm, negative if not used)	Double

Example:

1 19206 9506 174 29 20.00000 3.00000

....

That is the end of data in the file.

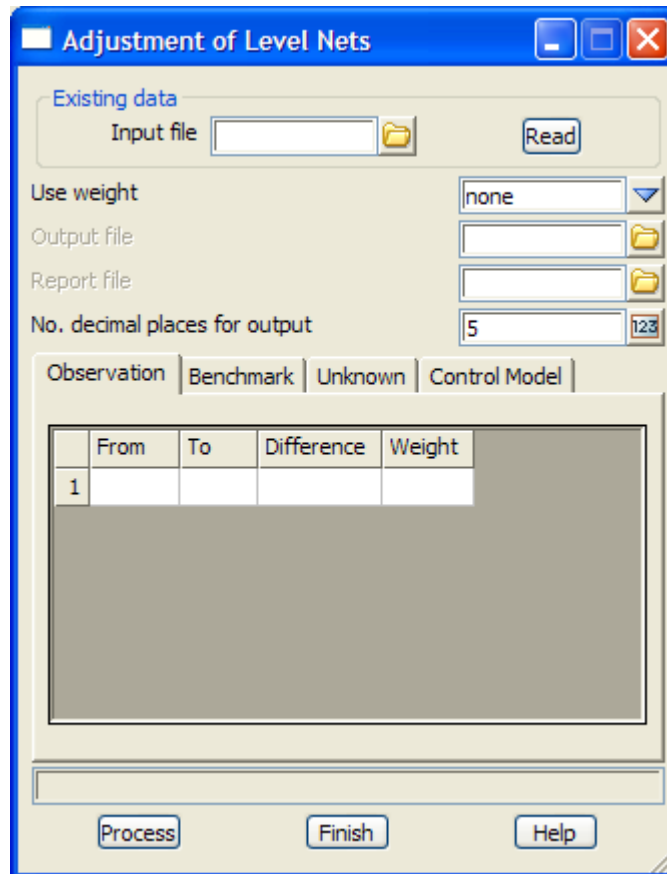
Level Network

adjustment_of_level_nets

Position of option on menu: Survey =>Adjustments =>Level network

The level network option performs a least square adjustment on a set of level observations that can be manually entered into predefined grid box columns or by reading an existing input file.

Selecting Level network brings up the **Adjustment of Level Nets** panel



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Input file	input box		*.in
-------------------	-----------	--	------

a pre existing input file can be specified.

Read	button		
-------------	--------	--	--

on selection of the read button, if a valid input file has been specified, the relevant parameters will be read into the grid controls.

Use weight	choice box	none	none, distance, standard deviation
-------------------	------------	------	------------------------------------

*a weighting per observation can be made according to the **none**, **distance**, and **standard deviation** choices*

***None** - no weighting will be applied.*

***Distance** - if the distance of the level network legs are to be used. The horizontal distance is entered into the weight field. eg 101.23*

***Standard deviation** - to define a standard deviation. e.g. 0.005*

Note: The method of defining the weight should be kept consistent. i.e. one of the 3 options.

Output file input box *.in
an output file can be defined which will allow for the reading of the file in the future.

Report file *.rpt files
a report using the nominated file name is created.

No. decimal places for out,,,input box 5
the number of decimal places for the new levels can be defined.

Observation tab

Observation				
Benchmark Unknown Control Model				
	From	To	Difference	Weight
1				

the grid control values can be entered using valid inputs into the various fields:
From point id which represents the first point of the level difference
To point id which represents the second point to which the level difference refers
Difference the difference between the levels defined by the **From** point and the **To** point. i.e. the difference = (to point) level - (from point) level

Benchmark tab

Observation		
Benchmark Unknown Control Model		
	Station	Level
1		

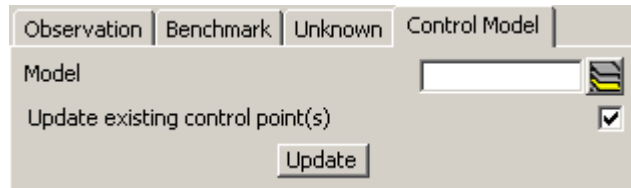
the grid control values can be entered using valid inputs into the various fields.
Station. The point id of a fixed level station should be entered.
Level. The corresponding level value of the fixed station.

Unknown tab

Observation		
Benchmark Unknown Control Model		
	Station	Level
1		

the grid control values can be entered using valid inputs into the various fields.
Station. The point id of any free or floating level stations should be entered.
Level. The corresponding approximate level value of free or floating level station.

a report using the nominated file name is created.

Control Model tab

Observation | Benchmark | Unknown | **Control Model**

Model

Update existing control point(s)

Update

Model model box

an existing control model can be entered so that changes to level values can be updated.

Update existing control points tick box ticked

if ticked, any new level values from the adjustment will be updated in the given control model.

Update button

if pressed, the updating of changed level values in the given control model will be carried out.

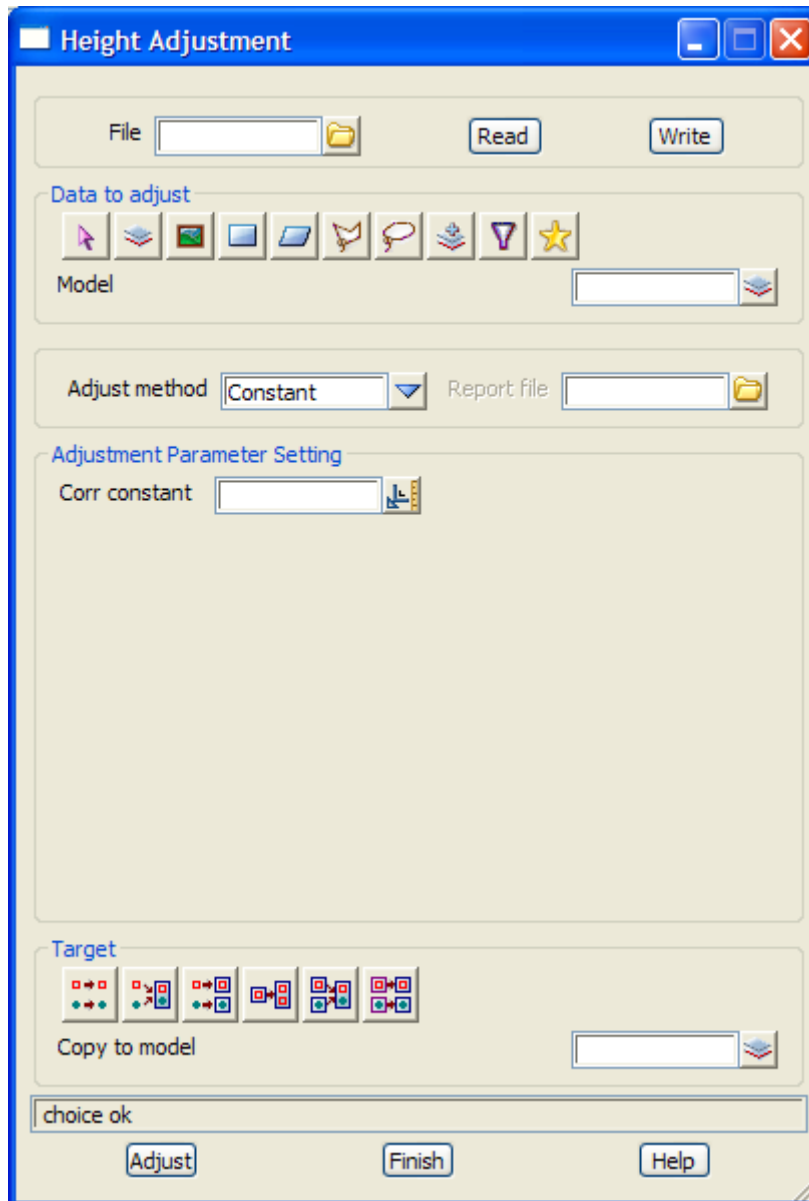
Height Adjustment

height_adjustment

Position of option on menu: Survey =>Adjustments =>Height adjustment

The Height adjustment option adjusts the selected data using either a constant z value, a plane defined by parameters, a plane defined by points (least square fit) or a tin of height differences.

Selecting Height adjustment brings up the Height Adjustment panel



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
File	file box		*.haf files
<i>a filename can be specified for reading or writing a file.</i>			
Read	button		
<i>if a valid file exists, the file contents can be loaded into the panel.</i>			
Write	button		

if a valid name is specified, the user can write the input data to a file.

Data to adjust input

the source of the data to be adjusted is selected using the data source box. For more information on the data source box see "Data Source"

Adjustment method choice box Constant Constant
Plane parameters
Plane by points
Difference tin

the adjustment method should be selected from the list. A description of each method is given below.

Report file *.rpt files

a report using the nominated file name is created.

Target target

the target for the adjusted data should be specified. For more information on how to use a data target box see the section "Data Target"

Transform button

perform the transformation.

Constant adjustment method

Adjust method: Constant Report file:

Adjustment Parameter Setting

Corr constant:

Corr constant input box

the value to be added to the selected data. This method is the same as a translation in the z values only.

Plane parameters adjustment method

Adjust method: Plane parameter Report file:

Adjustment Parameter Setting

Corr constant: Origin point: SL

Corr per unit N: North coord: 36971.386

Corr per unit E: East coord: 42663.658

Corr constant input box

the value to be added to the selected data.

- Corr per unit N** input box
the z value correction per unit northing.
- Corr per unit E** input box
the z value correction per unit easting.
- Origin point** string select [same as]
the name of the string of the origin pt.
- North coord** input box
the northing value of the origin point.
- East coord** input box
the easting value of the origin point.

Plane by points adjustment method

Adjust method: Report file:

Adjustment Parameter Setting

Corr constant: Origin point:

Corr per unit N: North coord:

Corr per unit E: East coord:

	Use pt	Point	Northing	Easting	Current_Ht	Correct_Ht	Adju
1	<input checked="" type="checkbox"/>						

the grid control values can be entered to build up the bench mark points from which the plane will be fitted to.

Use pt. *the point (bench mark point) can be included in the derivation of the parameters by selecting the Use pt option. If the point is not to be included, then uncheck the box.*

Point. *The point id of the bench mark*

Northing. *The northing value of the bench mark*

Easting. *The Easting value of the bench mark*

Current_Ht. *The current level value of the bench mark*

Correct_Ht. *The correct height in the adjusted level plane.*

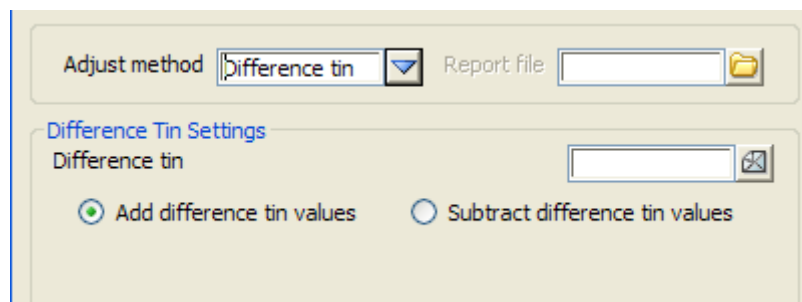
Adjusted_Ht. *This field shows the adjusted height after the adjustment is performed.*

Residual. This field shows the difference between the correct height and the adjusted height. This value is shown after the adjustment is performed.

The **Add pt** button used in this panel can be used to add points into the grid control from selecting points from a current view. After the button is selected, consequent selection and acceptance of points from the view will add the value into the grid. The **Correct_Ht** parameter will then have to be filled out by the user.

The **Calculate** button can be used to calculate the adjustment parameters and residuals so that they can be inspected before the adjustment is made.

Difference tin adjustment method



This option allows a difference tin to be specified as the adjustment reference. The selected points to be adjusted will be projected onto the difference tin to establish an interpolated adjustment value. This value is then applied to the data according to the add or subtract options. The fields used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Difference tin	tin box		available tins

the difference tin to be used to interpolate adjustment values.

Add difference tin values radio button

*if the button **Add difference tin values** is checked the interpolated value from the difference tin will be added to the existing levels of the adjusted points.*

Subtract difference tin values radio button

*if the button **Subtract difference tin values** is checked the interpolated value from the difference tin will be subtracted from the existing levels of the adjusted points.*

if **Constant**, a given value is subtracted from each z-value

Corr constant

the value to be subtracted from all z-values

Origin points

the value to be added to all z-values

if **Plan parameters**, a 3d-plane is defined and the z-value of the plane subtracted from any points

Corr constant

z-correction at the original point

Corr per unit N

z-correction per unit is the North (y) direction about the origin point

Corr per unit E

z-correction per unit is the East (x) direction

Origin point 2d select box

pick box for selected a pint to use for North and East coordinates about the origin point

North coordinate

East coordinate

if **Constant**, a given value is subtracted from each z-value

Corr constant

the value to be subtracted from all z-values

Origin points

the value to be added to all z-values

if **Plan by points** a 3d-plane is fitted using least squares adjustment to selecting points. The z-value of the plane is then subtracted from any points.

Corr constant

z-correction at the original point

Corr per unit N

z-correction per unit is the North (y) direction about the origin point

Corr per unit E

z-correction per unit is the East (x) direction

Origin point 2d select box

pick box for selected a pint to use for North and East coordinates about the origin point

North coordinate

East coordinate

if **Difference tin**, the z-value from a triangulation is added/subtracted from any points

Difference tin tin box available tins

tin of values to be added/subtracted from the z-values of points

Add difference tin values radio button

*if on, the values of the tin are **added** to the selected points*

Subtract difference tin values radio button

*if on, the values of the tin are **subtracted** to the selected points*

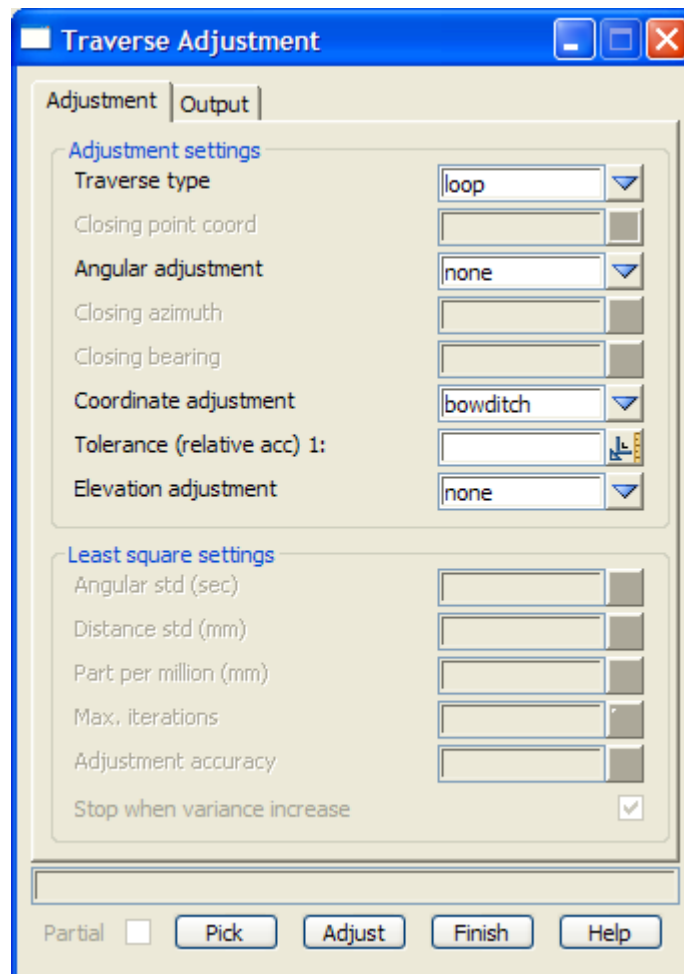
Traverse Adjustment

traverse_adjustment

Position of option on menu: Survey =>Adjustments =>Traverse adjustment

The traverse adjustment option performs a Bowditch, transit, compass or least square adjustment on a selected string. The adjustment can be for a closed string (loop) or an open string (non-loop).

Selecting traverse adjustment brings up the **traverse adjustment** panel



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Adjust Settings tab			
Traverse type <i>the traverse can be a closed loop or a non loop.</i>	choice box	loop	loop, non-loop
Last point coord <i>co-ordinates of the last point of the traverse. Only applicable for a non-loop traverse.</i>	xyz		
Adjustment method <i>method of adjustment.</i>	choice box	transit	transit, bowditch, compass, least square
Distribute angular misclose	tick box	unticked	

if ticked, the closing azimuth and bearing fields are enabled, allowing the entry of the values so that a calculation of an angular misclose can be made. i.e. $\text{angular misclose} = \text{closing azimuth} - \text{closing bearing}$.

This requires a closing observation to be recorded separately to the adjustment string chosen.

This angular misclose can be distributed around the traverse before adjustment. The distribution follows standard survey practice, calculating a misclose value per setup station and then adding this constant to every traverse leg in an accumulative manner.

i.e. $\text{The 1st leg angle adjusted bearing} = \text{orig bearing 1st leg} + 1 * \text{misclose} / \text{setup stn.}$

$\text{The 2nd leg angle adjusted bearing} = \text{orig bearing 1st leg} + 2 * \text{misclose} / \text{setup stn.}$ and so forth.

The closing observation is not taken from the traverse string to be adjusted, but by direct entry into the closing azimuth and bearing fields.

Closing azimuth angle box

The closing azimuth is the bearing as calculated from the last point (known coordinate; equal to the start point if a loop traverse) to the closing station (known coordinate or bearing).

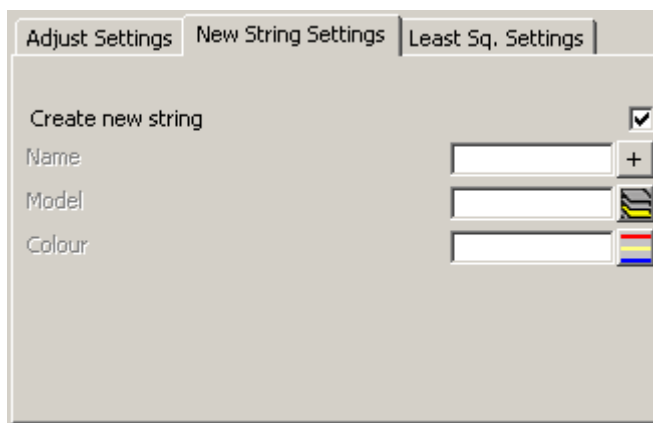
Closing bearing angle box

The closing bearing is the observation from the last traverse point to the closing station (known coordinate or bearing)

Tolerance (relative acc) 1:

The accuracy can be set which will be used to assess the misclose value before the adjustment is made. If the misclose is out of tolerance, a message box will appear notifying the user that the linear tolerance has not been met and prompting for further action. This may force the adjustment to continue or the exit of the process.

New String Settings tab



Create new string tick box tick

if tick, a new adjusted string is created. If not tick, the selected string is adjusted.

Name name box

if non-blank, the name of the new string. If blank, the original string name is used.

Model model box available models

if non-blank, the model of the new string. If blank, the original string model is used.

Colour colour box available colours
if non-blank, the colour of the new string. If blank, the original string colour is used.

*if the least square method is chosen the following parameters can be set in the **Least Sq. Settings** tab. If a different method is chosen the least square parameters are shown **greyed out** indicating that they are not used in the adjustment.*

Least Sq. Settings tab

Direction obs std (sec)

standard deviation of a single angular measurement in seconds of arc.

Distance obs std (mm)

standard deviation of a single distance measurement.

Distance ppm

distance error in parts per million.

This value is defined by the edm scale error which is dependant on the length of line measured (e.g. 5ppm = 5mm error over a 1km distance)

Iterations	input box	10
-------------------	-----------	----

the calculation of the adjustment can be aborted if a solution is not found after the specified number of iterations.

Coords differ	input box	0.0001
----------------------	-----------	--------

the calculation of the adjustment can stopped when the difference between successive calculations meet the defined tolerance.

Variance increase	tick box	ticked
--------------------------	----------	--------

the calculation of the adjustment can stopped when the variance between successive calculations increases

The remaining values are as follows:

Report file	.rpt files
--------------------	------------

if non-blank, a report for the adjustment is created with this name. If non-blank, no report is created.

Partial	tick box
----------------	----------

if tick, only part of the selected string is adjusted.

Pick	button
-------------	--------

select the string to adjust.

Adjust	button
---------------	--------

perform the adjustment.

Conversions

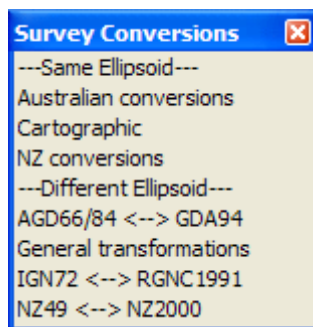
survey_conversions

Position of menu: Survey =>Conversions

The Conversions walk-right menu contains survey transformations for converting between most projections (or longitude, latitude) including Transverse Mercator, UTM etc.conversion options.

Conversions can involve the same ellipsoid or different ellipsoid. When using different ellipsoids, either a 7-parameter transformation or NTVT2 grids can be used to convert between the ellipsoids.

The Conversion walk-right menu is



Australian conversions (eg zone to zone) fro the same datum
 Cartographic conversion from one projection to another (same datum)
 NZ conversions (eg circuit to circuit) for the same datum

AGD 66/84 <--> GDA94 conversions (AMG <--> MGA
 General conversions with ellipsoid change
 IGN72 <-->RGN1991 conversions
 NZ49 <--> NZ2000 conversions

For converting between projections using the same ellipsoid:

For the option *Australian conversions*, go to the section "Australian Conversions" .

<i>Cartographic,</i>	"Cartographic"
<i>NZ conversions,</i>	"NZ Conversions"

For converting between projections with different ellipsoids:

For the option *AGD66/84<-->GDA94*, go to the section "AGD66/84 <---> GDA94" .

<i>General transformations</i>	"General Transformations"
<i>IGN72<-->RGNC1991,</i>	"IGN72 <---> RGNC1991"
<i>NZ49<-->NZ2000,</i>	"NZ49 <---> NZ2000"

For more information about terminology used in these sections, see the Appendix "Geodetics Summary" .

Australian Conversions

Australian_conversions

Position of option on menu: Survey =>Conversions =>Australian conversions

The **Australian conversions** option converts data from one form (AMG/MGA, Long Lat, Global XYZ) to another for the same common datum (AGD66/84 or GDA94). The option also allows for the conversion from one zone to another for a common datum. (e.g. from zone 54 to 55 in MGA).

For converting ISG co-ordinates in the same datum, use the option

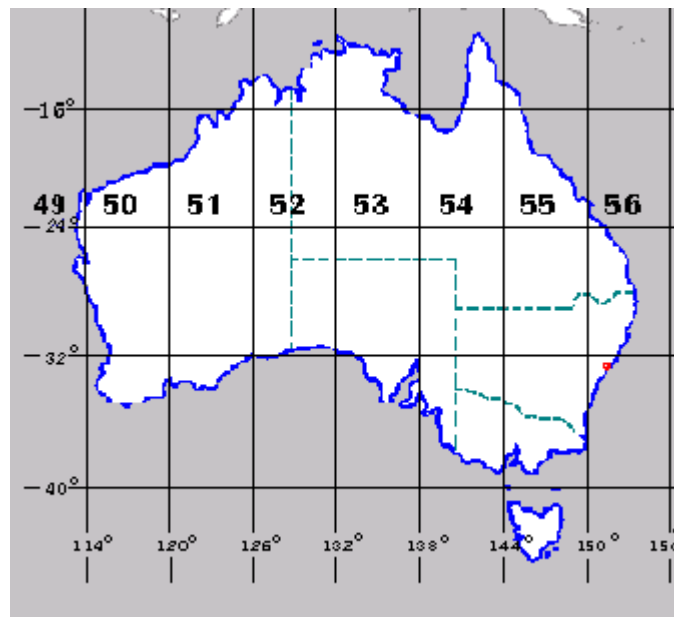
Survey =>Conversions =>Cartographic (see "Cartographic").

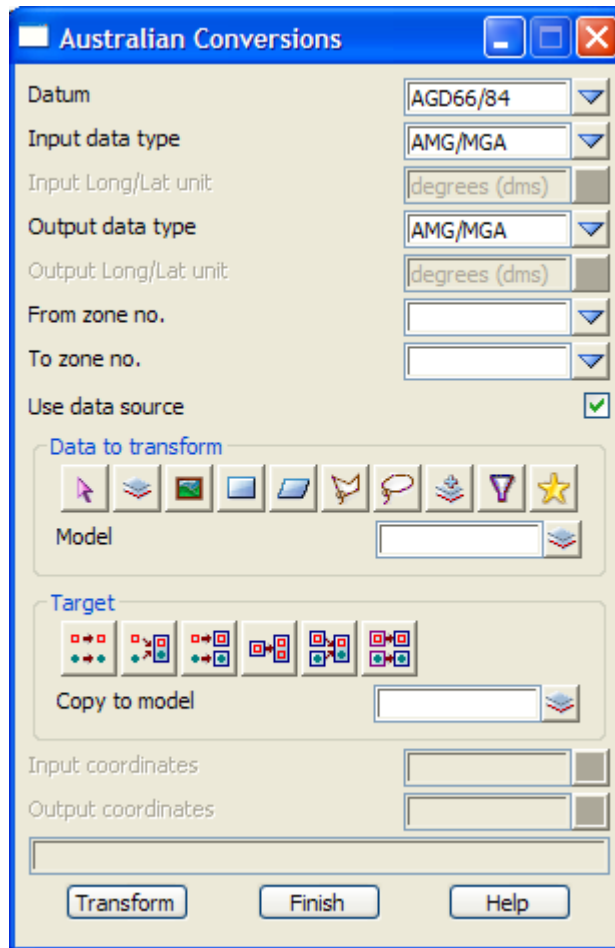
For converting between the **different** datums AGD66/84 and GDA94, use the option

Survey =>Conversions =>AGD66/84 <-> GDA94 (see "AGD66/84 <--> GDA94").

For more information, go to the section "Converting Between AMG, ISG and MGA" in the Appendix "Geodetics Summary" .

Selecting **Australian conversions** brings up the **Australian conversions** panel





The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Datum <i>either AGD66/84 or MGA94 is selected.</i>	choice box	AGD66/84	AGD66/84, GDA94
Input data type <i>type of the input data type.</i>	choice box	AMG/MGA	AMG/MGA, Long Lat Global XYZ
Input Lat/Long unit <i>if Lat/Long was selected, the Lat-Long coords have the selected units.</i>	choice box	degrees	radians, degrees, decimal degrees
Output data type <i>type of the input data type.</i>	choice box	AMG/MGA	AMG/MGA, Long Lat Global XYZ
Output Lat/Long unit <i>if Lat/Long was selected, the Lat-Long coords have the selected units.</i>	choice box	degrees	radians, degrees, decimal degrees
From zone no. <i>if AMG/MGA was selected for the input data type, the AMG/MGA zone is given is this field.</i>			49 -> 59
To zone no.			49 -> 59

if AMG/MGA was selected for the output data type, the AMG/MGA zone is given in this field.

Use data source tick box tick

if tick, a data source is used to select the data to be transformed. If not tick, a given co-ordinate is transformed.

Data source input

*if **use data source** is ticked, the source of data to transform. The source of the data to be adjusted is selected using the data source box. For more information on the data source box see "Data Source"*

Target target

*if **use data source** in the data source is ticked, the target of the transformed data should be specified. The target for the data is selected using the data target box. For more information on the data target box see "Data Target"*

Input coordinates XYZ box

*if **use data source** is not ticked, the co-ordinates in this field is transformed.*

Output coordinates XYZ box

*if **use data source** is not ticked, the transformed co-ordinates are displayed in this field.*

Transform button

perform the transformation.

Cartographic

cartographic

Position of option on menu: Survey =>Conversions =>Cartographic

Position of option on menu: Utilities =>A-G =>Cartographic

The Cartographic option is used to transform data based on the same datum between

- (a) two different cartographic projections (based on the same datum)
- (b) longitude and latitude and a cartographic projection (based on the same datum)
- (c) a cartographic projection and longitude and latitude (based on the same datum).

The datum, relates to the ellipsoid model used. This should be the same for both the to and from fields. i.e. a transform between data based on the ANS ellipsoid, to data based on the WGS84 ellipsoid would be incorrect.

(a) Transforming Between Two Cartographic Projections

For the first case, the data starts in one cartographic projection and is to be transformed into another cartographic projection.

This is achieved by converting the data in (x,y) co-ordinates in the original projection, to (longitude, latitude) and then converting from (longitude, latitude) to (x,y) in the new projection.

original projection \longrightarrow (longitude, latitude) \longrightarrow new projection

For example, to transform from MGA zone 50 to MGA zone 51, the original data starts in MGA zone 50, is transformed to (longitude, latitude) and then transformed from (longitude, latitude) to MGA zone 51.

Note that to make the transformation, the two cartographic projection must already be defined. That is in the example above, the two projections MGA zone 50 and MGA zone 51 must already be defined.

In **12d** Model, a *Cartographic projection* is defined by the option

Project => Projections =>Create/edit

and is documented in the section "Create/Edit Projection" of the chapter "Projects" .

The two cartographic projection definitions for the conversion are given in the **Cartographic** panel.

(b) Transform Between Longitude-Latitude and a Cartographic Projection

For the second case, the data starts in (longitude, latitude) is to be transformed into (x,y) co-ordinates in a cartographic projection.

(longitude, latitude) \longrightarrow cartographic projection

For example, to transform (longitude, latitude) to MGA zone 51.

To make the transformation, the required cartographic projection must already be defined by the option

Project => Projections =>Create/edit

which is documented in the section "Create/Edit Projection" of the chapter "Projects" .

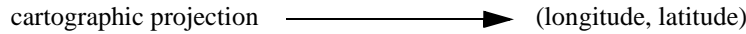
Notes

1. In the southern hemisphere, the latitude values are **negative**. If the latitude is given as posi-

- tive rather than negative, then the option Factor can be used to multiply the latitude by -1.
- 2. If the information is given in (latitude, longitude) rather than the required (longitude, latitude), then the option Swap XY can be used to swap the order of the co-ordinates.

(c) Transform Between a Cartographic Projection and Longitude-Latitude

For the third case, the data starts in (x,y) co-ordinates in a cartographic projection and need to be transformed to (longitude, latitude).



For example, to transform from MGA zone 51 to (longitude, latitude).

To make the transformation, the required cartographic projection must already be defined by the option

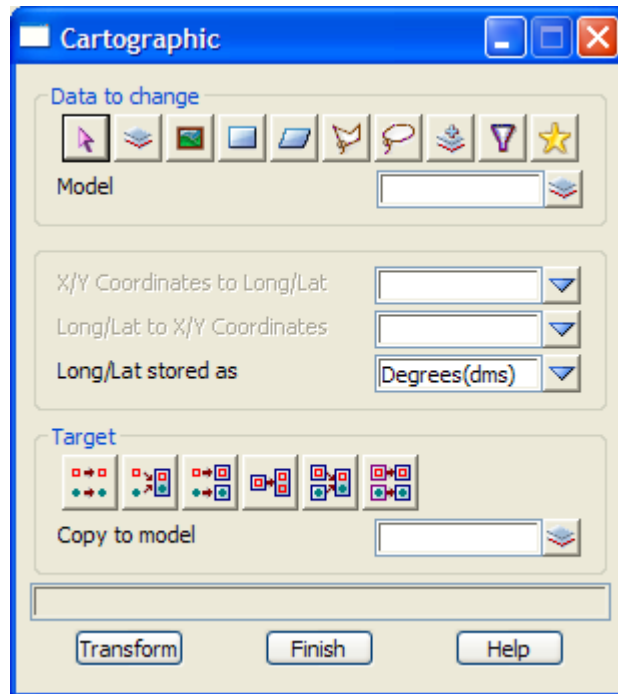
Project => Projections =>Create/edit

which is documented in the section “Create/Edit Projection” of the chapter “Projects” .

Notes

- 1. In the southern hemisphere, the latitude values are **negative**. If a positive value for latitude is required, then the option Factor can be used to multiply the latitude by -1.
- 2. If the information is required to be given in (latitude, longitude) rather than the (longitude, latitude) produced by the transformation, then the option Swap XY can be used to swap the order of the co-ordinates.

On selecting the **Cartographic** option, the **Cartographic** panel is displayed.



The fields and buttons used in the panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Data source type	Model		

NZ Conversions

New_Zealand_conversions

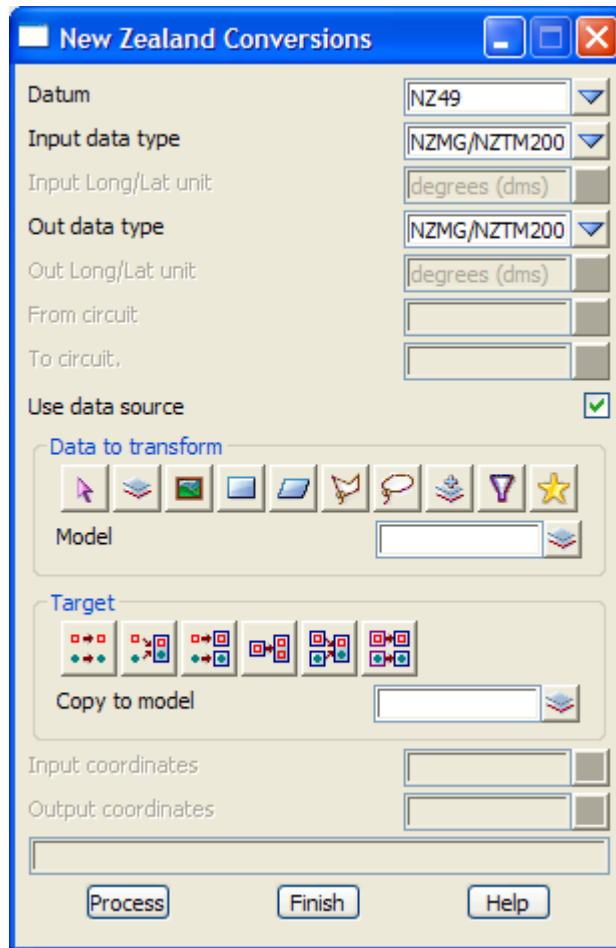
Position of option on menu: Survey =>Conversions =>NZ conversions

The NZ conversions option converts data from one form (NZMG/NZTM2000, Long Lat) to another for the same ellipsoid (i.e. datum NZ49 or NZ2000).

For converting between the **different** datums NZ 49 and NZ 2000, use the option

Survey =>Conversions =>NZ49 <-> NZ2000 (see "NZ49 <----> NZ2000").

Selecting **NZ conversions** brings up the **New Zealand Conversions** panel



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Datum <i>either NZ49 or NZ2000 is selected.</i>	choice box	NZ49	NZ49, NZ2000
Input data type <i>type of the input data type.</i>	choice box	NZMG/NZTM2000	NZMG. Circuit, Long Lat
Input Lat/Long unit <i>if Lat/Long was selected, the Lat-Long coords have the selected units.</i>	choice box	degrees	radians, degrees, decimal degrees
Output data type	choice box	NZMG/NZTM2000	NZMG. Circuit, Long Lat

type of the input data type.

Output Lat/Long unit choice box degrees radians, degrees,
decimal degrees

if Lat/Long was selected, the Lat-Long coords have the selected units.

From Circuit

if Circuit was selected for the input data type, the NZ Circuit is given is this field.

To Circuit

if Circuit was selected for the output data type, the NZ Circuit is given is this field.

Use data source tick box tick

if tick, a data source is used to select the data to be transformed. If not tick, a given co-ordinate is transformed.

Data source type Model

if use data source is ticked, the data selection type

Data source input

if use data source is ticked, the source of data to transform. The source of the data to be adjusted is selected using the data source box. For more information on the data source box see "Data Source"

Target target

if use data source in the data source is ticked, the target of the transformed data should be specified. The target for the data is selected using the data target box. For more information on the data target box see "Data Target"

Input coordinates XYZ box

if use data source is not ticked, the co-ordinates in this field is transformed.

Output coordinates XYZ box

if use data source is not ticked, the transformed co-ordinates are displayed in this field.

Transform button

perform the transformation.

AGD66/84 <---> GDA94

agd66_84 _____ **gda94**

Position of option on menu: Survey =>Conversions =>AGD66/84 <-> GDA94

This option converts data between the two Australian Datums, AGD 66/84 and GDA 94. The transformation between the two datums can be by either a seven parameter similarity transformation for a State, or a NTV2 grid for either a State or Australia.

12d Model is GDA compliant for both the similarity transformations and NTV2 grids.

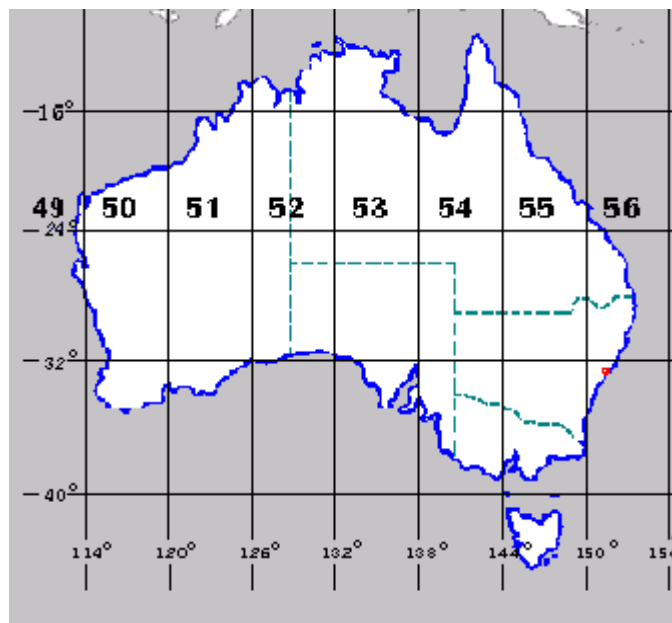


The AGD 66/84 data can be either longitude and latitude, co-ordinates in an AMG Zone or co-ordinates in an ISG Zone.

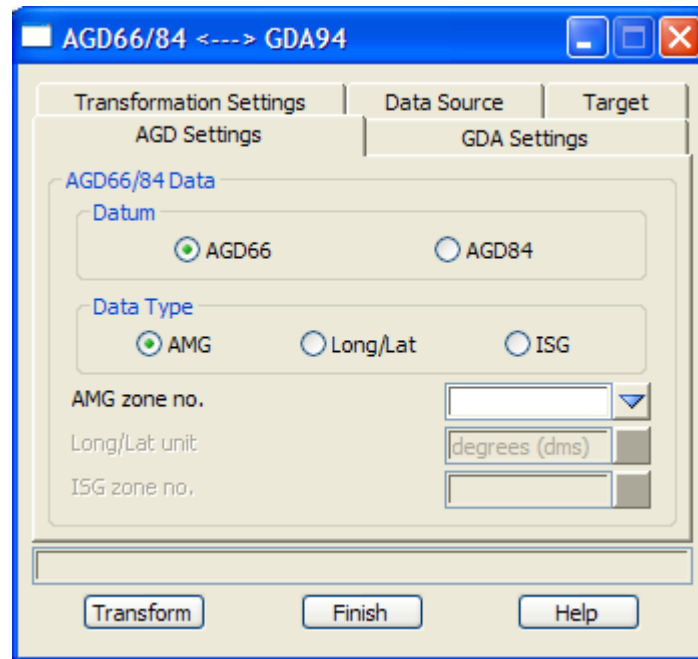
The GDA 94 data can be either longitude and latitude, Global XYZ or co-ordinates in a MGA Zone.

Hence the option will convert data from AMG 66/84 or ISG 66/84 to MGA 94 and vice-versa.

For more information, go to the section "Converting Between AMG, ISG and MGA" in the Appendix "Geodetics Summary"



Selecting **agd66/84 <---> gda94** brings up the **agd66/84 <---> gda94** panel



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
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AGD Settings

AGD66 AGD84	radio button		
<i>either AGD66 or AGD84 is selected. (AGD = Australian Geodetic datum)</i>			

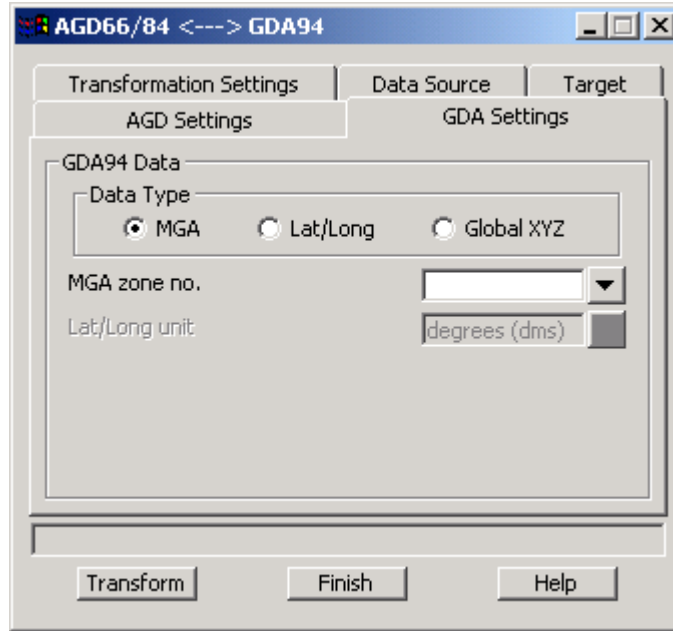
AMG Lat/Long ISG	radio button		
<i>either AMG, Lat/Long or ISG is selected. (AMG = Australian Map Grid, ISG = Integrated Survey Grid). The ISG relates to the state of New South Wales</i>			

AMG Zone no.	choice box		49 -> 59
<i>if AMG was selected, the AMG zone is given in this field.</i>			

Lat/Long unit	choice box	degrees	radians, degrees, decimal degrees
<i>if Lat/Long was selected, the Lat-Long coords have the selected units.</i>			

ISG Zone no.	choice box		ISG54/2 -> ISG56/3
<i>if ISG was selected, the ISG zone is given in this field.</i>			

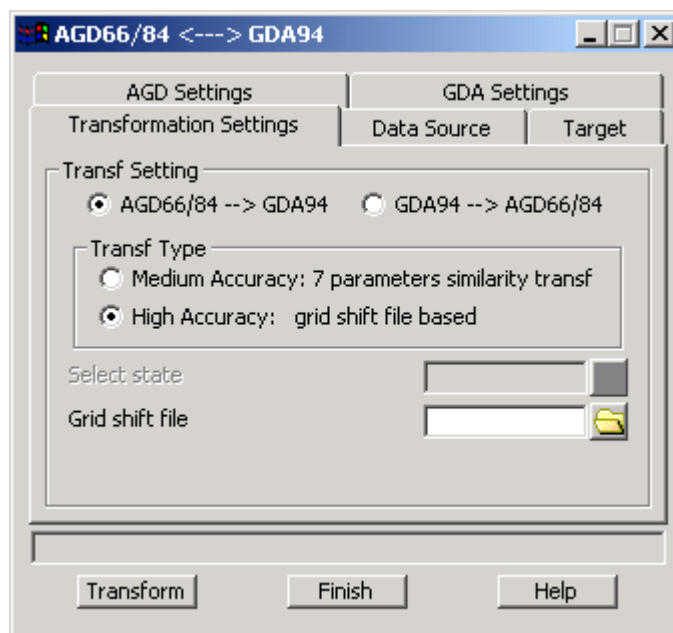
GDA Settings



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
MGA Lat/Long Global XYZ	radio button		
<i>one of the three choices is selected.</i>			
MGA Zone no.	choice box		49 -> 59
<i>if MGA was selected, the MGA zone is given is this field.</i>			
Lat/Long unit	choice box	degrees	radians, degrees, decimal degrees
<i>if Lat/Long was selected, the Lat-Long coordinates have the selected units.</i>			

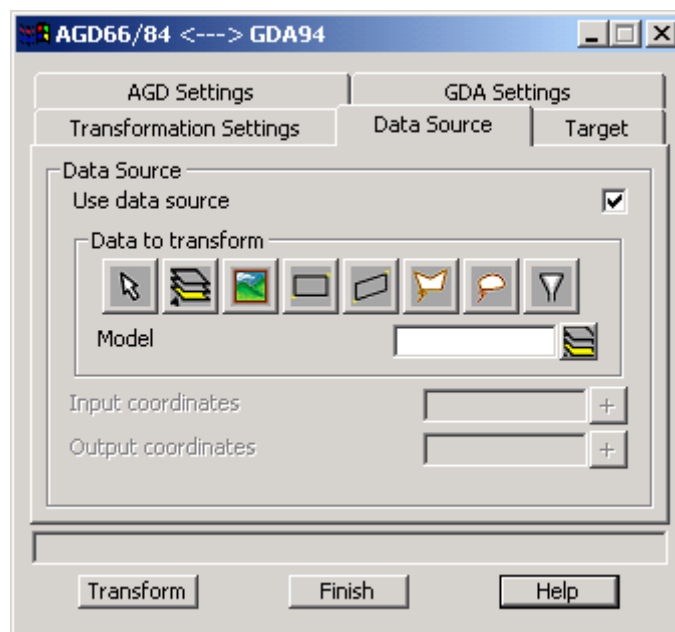
Transformation Settings



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
AGD66/84 --> GDA94 GDA94 --> AGD66/84	radio button		
<i>one of the two choices is selected.</i>			
Medium accuracy	radio box	tick	
<i>if tick, a seven parameter similarity transformation for the selected Australian State is used.</i>			
High accuracy	radio button		
<i>if tick, the NT V2 grid shift file is used.</i>			
Select State	choice box		ACT, NSW, TAS, VIC
<i>if the AGD66 datum has been selected, and the 7 parameter transformation is to be used, the seven parameter transformation parameters are different for each state. (i.e the states which adopted the AGD66 datum) By selecting the appropriate state, the corresponding values will be used.</i>			
<i>If the AGD84 datum has been selected, the parameters used are the Australian wide values and therefore the state selection is not appropriate.</i>			
Grid shift file	file box		*gsb
<i>for high accuracy, the NTv2 grid shift files can be used.</i>			

Data Source



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Use data source	tick box	tick	
<i>if tick, a data source is used to select the data to be transformed. If not tick, a given co-ordinate is transformed.</i>			
Data source	input		

if use data source is ticked, the source of data to transform. The source of the data to be adjusted is selected using the data source box. For more information on the data source box see “Data Source”

Input coordinates XYZ box

if use data source is not ticked, the co-ordinates in this field is transformed.

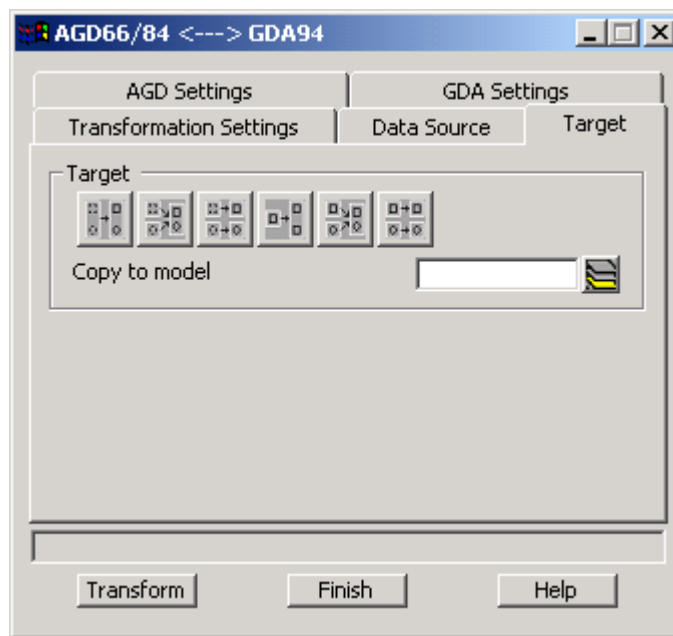
Output coordinates XYZ box

if use data source is not ticked, the transformed co-ordinates are displayed in this field.

Transform button

perform the transformation.

Target



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
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Target target

*if use data source in the data source is ticked, the target of the transformed data should be specified
The target for the data is selected using the data target box. For more information on the data target box see “Data Target”*

NZ49 <----> NZ2000

nz49 _____ **nz2000**

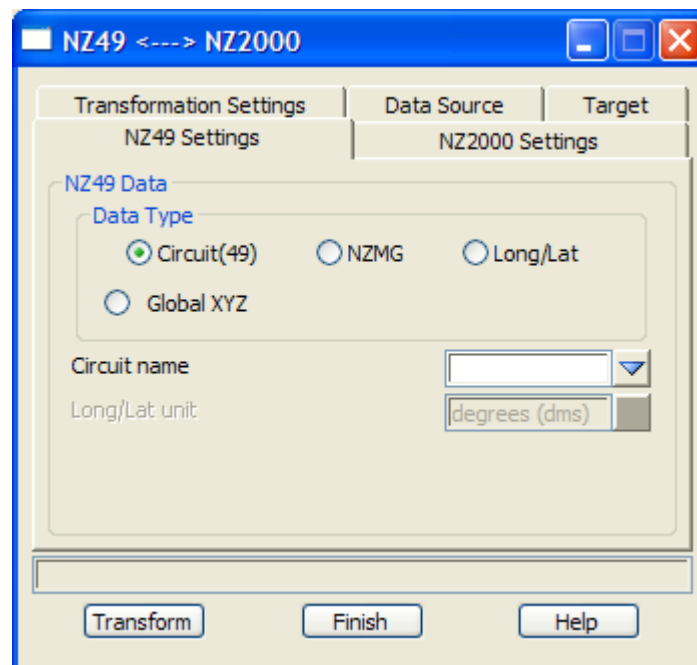
Position of option on menu: Survey =>Conversions =>NZ49 <-> NZ2000

This option converts data from the NZ 49 datum to the NZ 2000 datum and vice-versa.

The transformation between the two datums can be by either the NZ seven parameter similarity transformation or a NTv2 grid.

The data to be converted can be longitude and latitude, NZMG, circuits or Global XYZ.

Selecting **NZ49<----> NZ2000** brings up the **NZ49 <----> NZ2000** panel



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
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NZ 49 Settings

Circuit (49) radio button

*if the data in the NZ49 datum is of **circuit** type the circuit radio button is selected.*

NZMG radio button

*if the data in the NZ49 datum is of **NZMG** type the radio button is selected.*

Lat/Long radio button

*if the data in the NZ49 datum is of **Lat/Long** type the radio button is selected.*

Global XYZ radio button

*if the data in the NZ49 datum is of **Global XYZ** type the radio button is selected.*

Circuit name choice box

All NZ 1949 circuits

*if **Circuit (49)** was selected, the specific NZ Circuit should be selected.*

Lat/Long unit

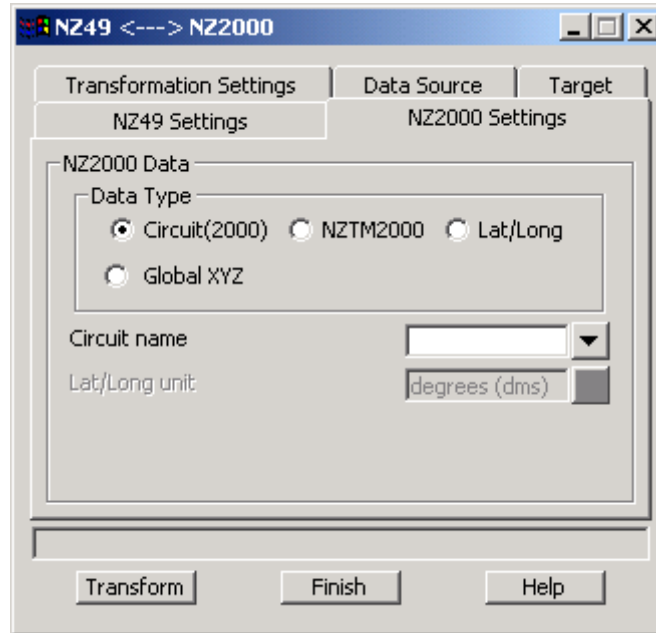
choice box

degrees

radians, degrees,
decimal degrees

if **Lat/Long** was selected, the Lat-Long coords have the selected units.

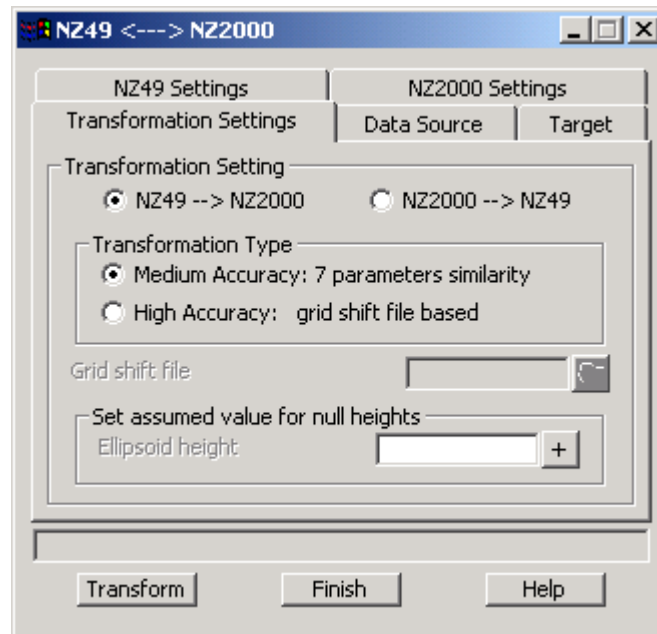
NZ 2000 Settings



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Circuit (2000)	radio button		
<i>if the data in the NZ2000 datum is of circuit type the circuit radio button is selected.</i>			
NZTM2000	radio button		
<i>if the data in the NZ2000 datum is of NZTM2000 type the radio button is selected.</i>			
Lat/Long	radio button		
<i>if the data in the NZ2000 datum is of Lat/Long type the radio button is selected.</i>			
Global XYZ	radio button		
<i>if the data in the NZ2000 datum is of Global XYZ type the radio button is selected.</i>			
Circuit name	choice box		All NZ 1949 circuits
<i>if Circuit (2000) was selected, the specific NZ Circuit should be selected.</i>			
Lat/Long unit	choice box	degrees	radians, degrees, decimal degrees
<i>if Lat/Long was selected, the Lat-Long coords have the selected units.</i>			

Transformation Settings



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
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NZ49 --> NZ2000 **NZ2000 --> NZ49** radio button

the direction of the transformation is specified by the selection of one of the two choices.

Medium accuracy tick box tick

if tick, a seven parameter similarity transformation for NZ is used.

High accuracy tick box

if tick, the NT V2 grid shift file is used.

Grid shift file *file box*

if High accuracy is ticked, a NTv2 grid shift should be selected. A single file for New Zealand can be used.

Ellipsoid Height *input box*

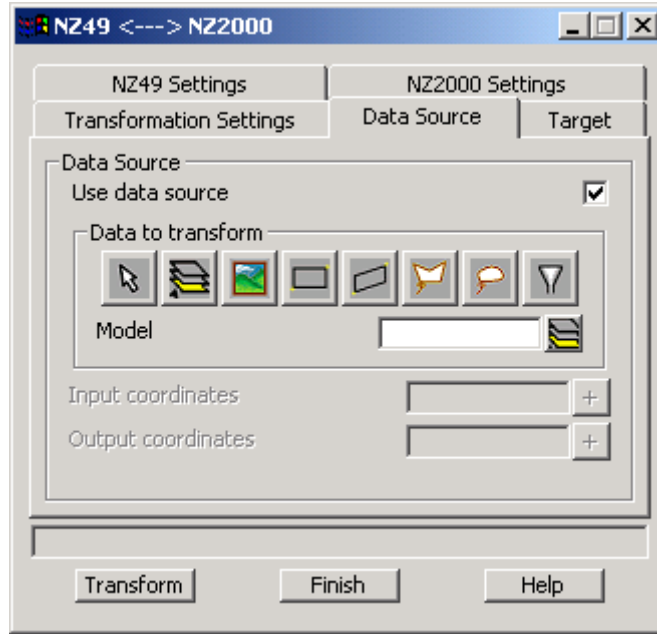
*this is only required if the data to be transformed contains null values **and** when*

*1) The 7 parameter **similarity transformation** is used and/or*

*2) When either the input or output types are of **Global XYZ** type*

An approximate ellipsoid level needs only to be +/- 100 m from the true value for most accuracy requirements. (An error in estimation of the ellipsoid height of a few hundred metres will introduce an error in the transformed horizontal position in the order of millimetres only).

Data Source



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
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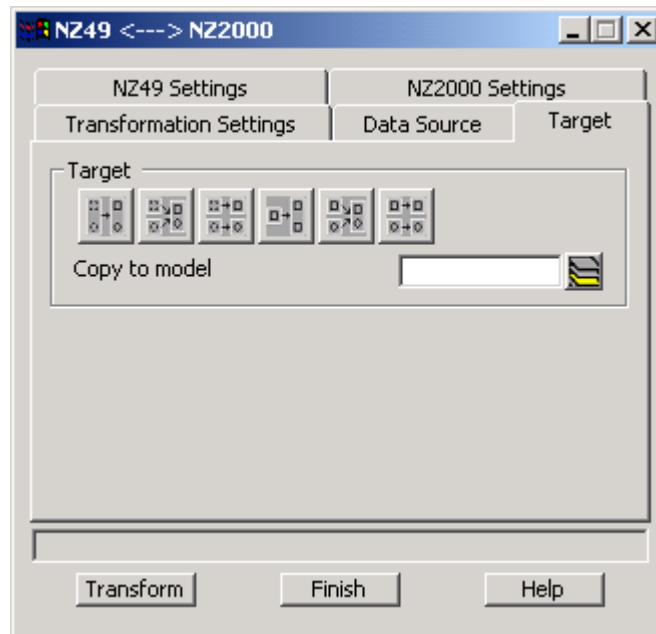
Use data source	tick box	tick	
<i>if tick, a data source is used to select the data to be transformed. If not tick, a given co-ordinate is transformed.</i>			

Data source	input		
<i>if use data source is ticked, the source of data to transform. The source of the data to be adjusted is selected using the data source box. For more information on the data source box see "Data Source"</i>			

Input coordinates	XYZ box		
<i>if use data source is not ticked, the co-ordinates in this field is transformed.</i>			

Output coordinates	XYZ box		
<i>if use data source is not ticked, the transformed co-ordinates are displayed in this field.</i>			

Target



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
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Target	target		
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if use data source in the data source is ticked, the target of the transformed data should be specified. The target for the data is selected using the data target box. For more information on the data target box see "Data Target"

Transform	button		
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perform the transformation.

General Transformations

general_transformations

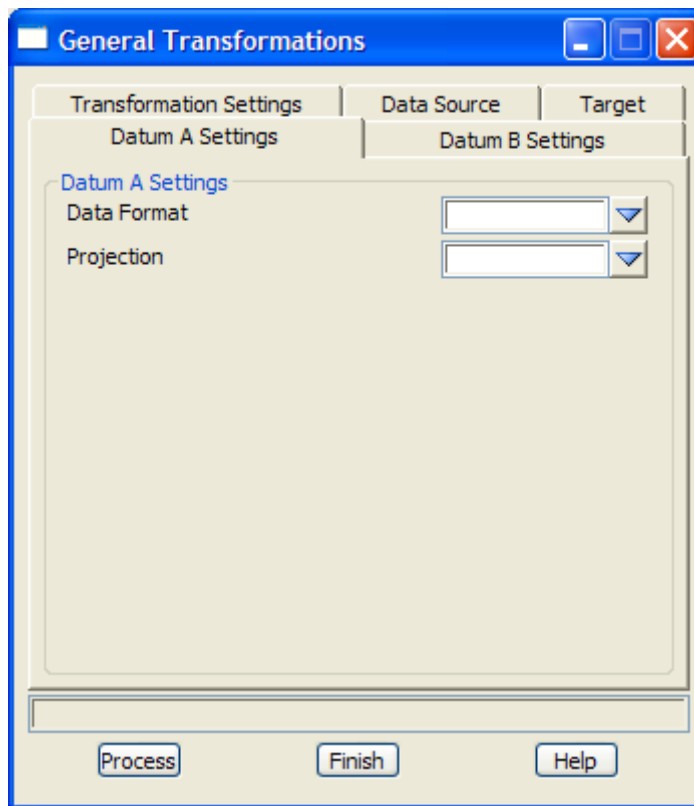
Position of option on menu: Survey =>Conversions =>General transformations

This option converts data between two datums (i.e. different ellipsoids).

The transformation between the two datums can be by either a seven parameter similarity transformation or a NTV2 grid.

The data to be converted can be longitude and latitude, a 12d supported projection (eg TM, UTM) or Global XYZ.

Selecting General transformations brings up the **General Transformations** panel



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
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Datum A Settings, Datum B Settings

Data format	choice box		Global XYZ Easting Northing Long Lat - radians Long Lat - degrees (dms) Long Lat - decimal degrees
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the type of data to be transformed/ transformed to.

*if **Easting, Northing**, the data is co-ordinates in the projection defined by the Projection field.*

*if **Long Lat - radians**, the data is (longitude, latitude) with the angles given in radians.*

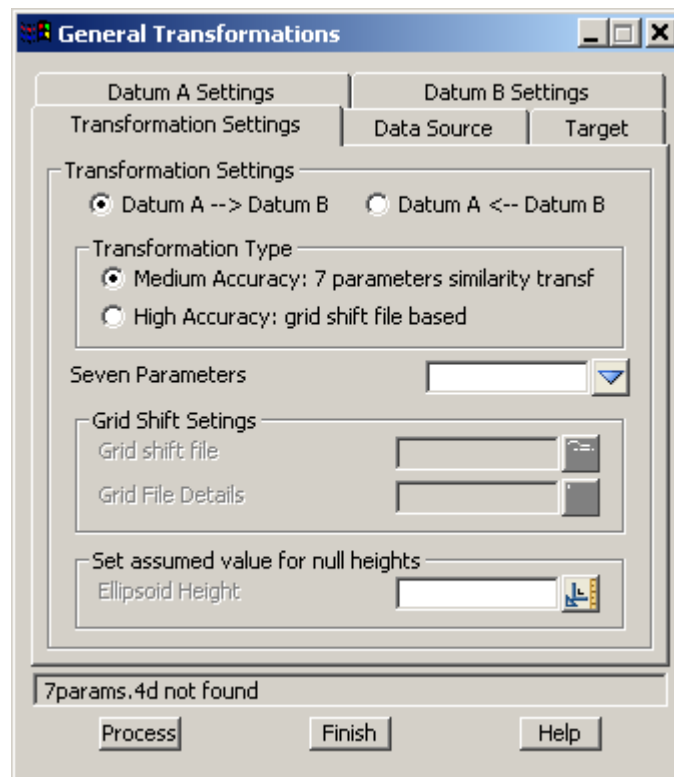
*if **Long Lat - degrees (dms)**, the data is (long,lat) with the angles given in hp format (i.e. ddd.mmssss).*

*if **Long Lat - decimal degrees**, the data is (long,lat) with the angles given decimal degrees.*

*if **Global XYZ**, the data is in the Global XYZ system.*

Projection projection box defined projections
the name of the cartographic projection that the data is in.

Transformation Settings



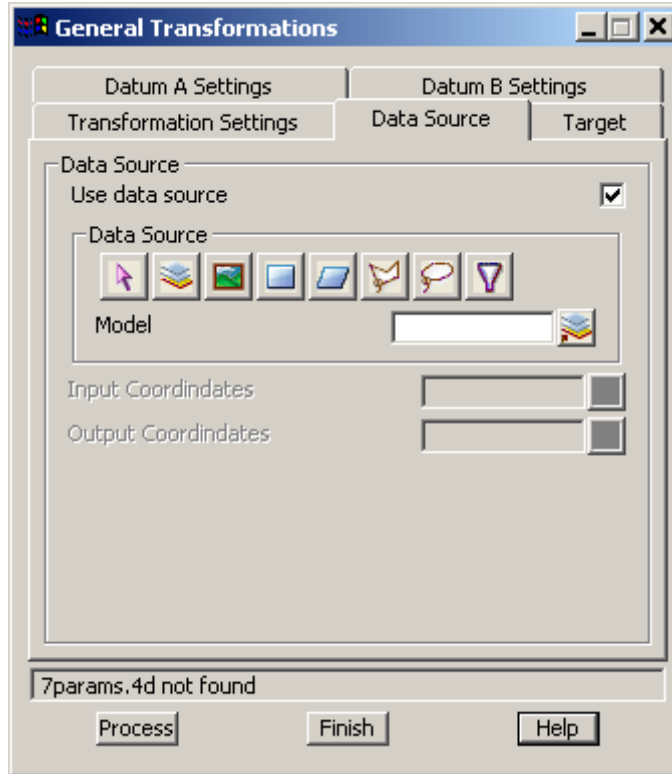
The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Datum A --> Datum B	Datum B --> Datum A		radio button
<i>the direction of the transformation is specified by the selection of one of the two choices.</i>			
Medium accuracy	tick box	tick	
<i>if tick, a seven parameter similarity transformation is used.</i>			
High accuracy	tick box		
<i>if tick, a NT V2 grid shift file is used.</i>			
Seven parameters	file box		available 7 param definitions
<i>if Medium accuracy is ticked, a seven parameter similarity transformation is selected.</i>			
Grid shift file	file box		available gsb files
<i>if High accuracy is ticked, a NTv2 grid shift is selected.</i>			
Ellipsoid Height	input box		
<i>this is only required if the data to be transformed contains null values and when</i>			
<i>1) The 7 parameter similarity transformation is used and/or</i>			

2) When either the input or output types are of **Global XYZ** type

An approximate ellipsoid level needs only to be +/- 100 m from the true value for most accuracy requirements. (An error in estimation of the ellipsoid height of a few hundred metres will introduce an error in the transformed horizontal position in the order of millimetres only).

Data Source



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
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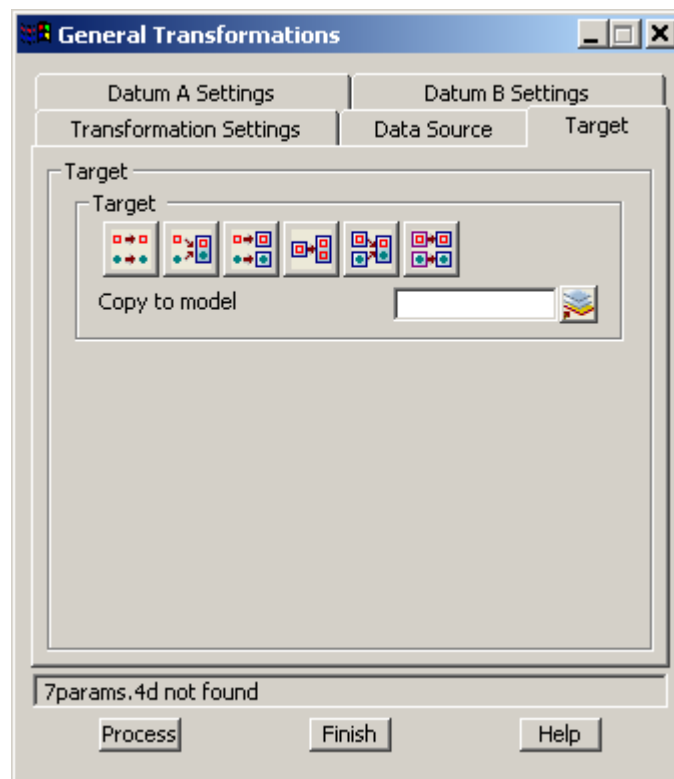
Use data source	tick box	tick	
<i>if tick, a data source is used to select the data to be transformed. If not tick, a given co-ordinate is transformed.</i>			

Data source	input		
<i>if use data source is ticked, the source of data to transform. The source of the data to be adjusted is selected using the data source box. For more information on the data source box see "Data Source"</i>			

Input coordinates	XYZ box		
<i>if use data source is not ticked, the co-ordinates in this field is transformed.</i>			

Output coordinates	XYZ box		
<i>if use data source is not ticked, the transformed co-ordinates are displayed in this field.</i>			

Target



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
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Target	target		
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if use data source in the data source is ticked, the target of the transformed data should be specified. The target for the data is selected using the data target box. For more information on the data target box see "Data Target"

Process	button		
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perform the transformation.

IGN72 <---> RGNC1991

ign72_____rgnc1991

Position of option on menu: Survey =>Conversions =>IGN72 <->RGNC1991

This option converts data between the old and new datums for Noumea.

The transformation between the two datums can be by either a seven parameter similarity transformation or a NTV2 grid.

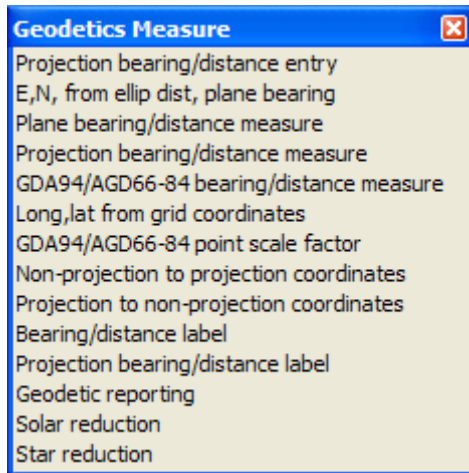
The data to be converted to/from can be (longitude, latitude) or (Easting, Northing).

Geodetic Measures and Entry

geodetics_measure

Position of menu: Survey =>Geodetics

The Geodetics walk-right menu is



Bearing distance entry for a projection
Use ellipsoid dist, plane brg to create point
Measure bearing, distance, with user input for scale
Measure plane brg, ellip dist, given projection
Bearing dist between 2 pts for GDA/AGD
Long and lat from projection (grid) co-ords
Point scale factor at a grid point for GDA/AGD
Non- projection to projection coordinate conversion
Projection to non-projection coordinate conversion
Bearing distance label for selected string/segment
Projection brg-dist label for selected string/segment
Create a report based on projection coordinates
Reduce solar observations
Reduce star observations

For the option Projection bearing /distance entry please continue to the section “Projection Bearing/Distance Entry”

E,N calc from ellip dist, plane brg, “E,N from Ellipsoid Distance and Plane Bearing” .

Plane bearing /distance measure, “Bearing and Distance” in the chapter “Utilities”

Projection bearing/distance measure, “Projection Bearing and Distance Measure”

GDA94/AGD66-84 bearing/distance measure, “GDA94/AGD66-84 Bearing and Distance Measure”

Long, lat from grid coordinates, “Longitude, Latitude from Grid Coordinates”

GDA94/AGD66-84 Point scale factor, “GDA94/AGD66-84 Point Scale Factor”

Non-projection to projection coordinates, “Non-Projection to Projection Coordinates”

Projection to non-projection coordinates, “Projection to Non-Projection Coordinates”

Bearing/distance label, “Bearing/Distance Label”

Projection bearing/distance label, “Bearing/Distance Label”

Geodetic reporting, “Geodetic reporting”

Solar reduction, “Solar Reduction”

Star reduction, “Star Reduction”

For more information about terminology used in these sections, see the Appendix “Geodetics Summary” .

Projection Bearing/Distance Entry

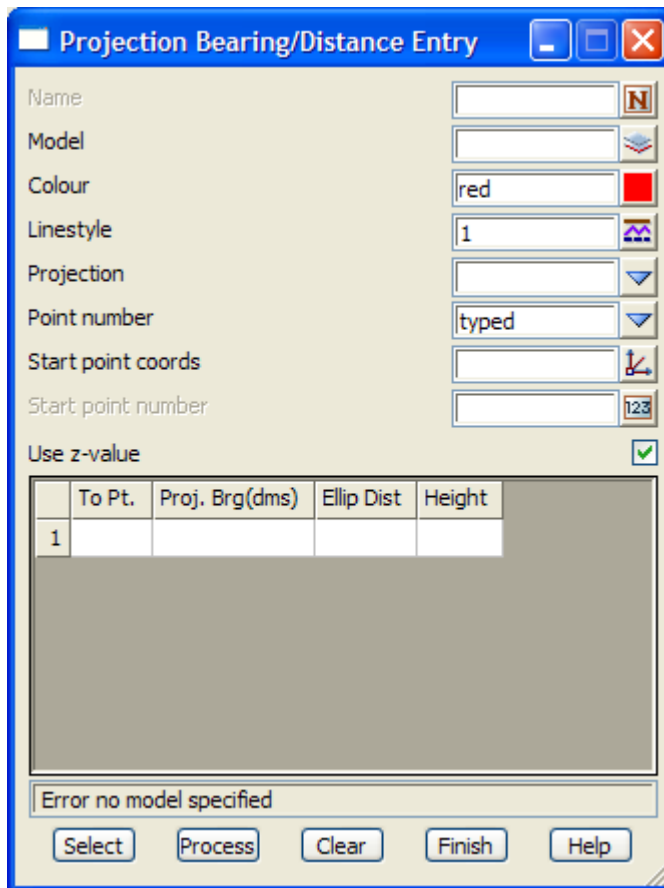
projection_bearing_distance_entry

Position of option on menu: Survey =>Geodetics =>Projection bearing/distance entry

The projection bearing/distance entry option allows the input of a traverse by manual input of projection bearings (the plane bearing) and ellipsoid distances or by selecting an existing string.

For each point, the projection co-ordinates are used with the projection bearing and ellipsoid distance from that point to calculate the projection co-ordinates for the new point taking the map projection into account.

Selecting Projection bearing/distance entry brings up the **Projection Bearing/Distance Entry** panel



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Name <i>this field is optional. If non-blank, the name of the new string.</i>	name box		defined names from names.4d file
Model <i>if non-blank, the model of the new string. If blank, the original string model is used.</i>	model box		available models
Colour <i>if non-blank, the colour of the new string. If blank, the original string colour is used.</i>	colour box	red	available colours

Linestyle input 1 available line styles
line style of the string.

Projection input project projection available projections
This is the projection that is used for calculating the (Easting, Northing) values.

Use z- value tick box transit
*if tick, the z-values for each point are entered.
 If no tick then z-values are not entered and are not displayed in the grid.*

Point id input typed none, auto increment, typed
if none, no point ids are entered and the grid control will not show a column for point ids.

If auto increment then the values of point ids will be incremented by a value of 1 starting from the specified Start point id. If no Start point id is specified then no point ids will be allocated. No column for point ids is shown in the grid control.

if typed then the values of point ids will be incremented by a value of 1, starting from the specified Start point id. If no Start point id is specified then no point ids will be allocated unless a value is entered in the grid control on which time the next value in the grid will have a incremented value. The column for point ids is shown in the grid control.

VALUES IN GRID grid box
The columns shown in the grid will depend on the selection of the Use z- value and Point id fields.

	To Pt.	Proj. Brg(dms)	Ellip Dist	Height
1				

To Pt. input
if none is selected for the Point id field, this column will not be displayed.

if auto increment is selected for the Point id field, this column will not be displayed.

if typed is selected for the Point id field, this column will be displayed. In this case, the point id will increment automatically by entering over the field. If a new value is typed into the To Pt. field, the next line will increment from that number.

Proj.Brg angle box

The user should enter the projection bearing for the segment into this field. The projection bearing can be defined as the bearing resulting from plane geometry calculations between the two projection coordinates. This is sometimes called the grid bearing in some countries (e.g. New Zealand) and the plane bearing in others such as Australia as defined in the GDA technical manual (ICSM)).

Ellip Dist input box

the user should enter the ellipsoid distance. This distance is the measured horizontal distance that has been reduced onto the ellipsoid taking into account the heights above the ellipsoid at each end of the measured line. This reduction may be by the use of a height scale factor for example. Distances that are measured near mean sea level approximate the ellipsoid distance (since the MSL approximates the ellipsoid in many reference ellipsoids (eg AGD)). The amount of correction will be dependant on the length of line, the heights above the ellipsoid and the reference ellipsoid being used.

Height input box

This column will only be visible in the grid if the Use z- value tickbox has been ticked. The user should enter the height of the point. This value will not be used for calculation of the segment. It will simply be assigned to the newly created vertex.

Select button

on pressing the select button, a user is able to pick an existing string from the current view. If a non-traverse type string is selected an option to convert it to a traverse string will be given. The grid control will be filled with the relevant information for the traverse string.

If a traverse string has been modified by some other process (e.g. move) an option will be given to adopt the new characteristics of the string as displayed or revert back to the information that originally defined the traverse string. Depending on which option is selected, the grid will be filled with the relevant information.

Process button

changes to the traverse can be made in the grid control for lines already defined. For example, a distance entry may be incorrectly typed in and edited some time later. By using the process button the traverse string is re-calculated using the current values in the grid control.

E,N from Ellipsoid Distance and Plane Bearing

projection_coords_from_plane_brg_and_ellipsoid_dist

Position of option on menu: Survey =>Geodetics =>E,N from ellip dist, plane bearing

The E,N calc from ellip dist, plane brg option allows users to calculate projection coordinates given the projection, start coordinate, plane bearing and ellipsoid distance. The results are given inside the panel.

On selecting the E,N calc from ellip dist, plane brg option, the Projection Coords from plane brg and ellipsoid dist panel is displayed.

The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Projection <i>the projection of the data to be used.</i>	choice	current projection	available projections
Easting <i>the easting value of the start coordinate.</i>	input		
Northing <i>the northing value of the start coordinate.</i>	input		
Select Pt <i>if the point exists in a view, the coordinate can be entered by selecting the button and then on the required point. The selected points coordinates will be returned to the relevant coordinate boxes.</i>	button		
Plane bearing <i>the plane bearing (or Projection brg) of the line from the nominated start coordinate. The projection bearing can be defined as the bearing resulting from plane geometry calculations between the two projection coordinates. This is sometimes called the grid bearing in some countries (e.g. New Zealand) and the plane bearing in others (eg Australia as defined in the GDA technical manual (ICSM)).</i>	input		

Ellipsoid distance	input
<i>the ellipsoid distance of the line from the nominated start coordinate</i>	
Easting	input
<i>the calculated easting value of the 2nd point.</i>	
Northing	input
<i>the calculated northing value of the 2nd point.</i>	
Process	button
<i>perform the calculation.</i>	
Clear	button
<i>clear the input fields</i>	

Plane Bearing and Distance Measure

Position of option on menu: Survey =>Geodetics =>Plane bearing/distance measure

Measures the plane angle and plane distance between two selected points.

This option has already been documented in section "Bearing and Distance" of chapter "Utilities" .

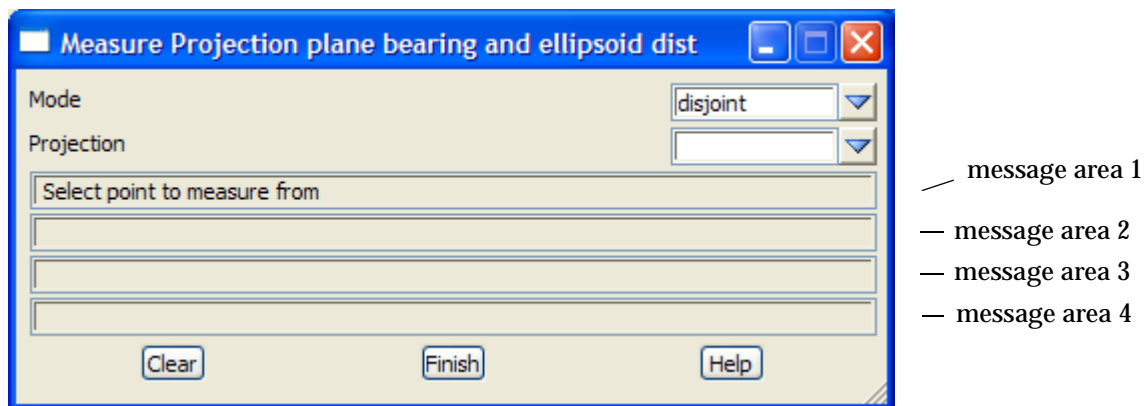
Projection Bearing and Distance Measure

measure_projection_plane_bearing_and_ellipsoid_dist

Position of option on menu: Survey =>Geodetics =>Projection bearing/distance measure

The Projection bearing and dist option allows users to measure projection plane bearing, plane distance, ellipsoid distance, arc-to chord values and a line scale factor.

On selecting the Projection bearing and dist option, the **Measure Projection Plane bearing and ellipsoid dist** panel is displayed.



This panel is principally used to display the distances between, and bearing of the line joining, pairs of user selected points.

message area 1: point selection comment

message area 2: $dx = dy =$

message area 3: plane brg = plane dist = ellipsoid dist =

message area 4: t-T fwd = t-T rev = l.s.f =

where dx is the x coordinate difference between the points, dy is the y coordinate difference between the points

plane brg is the angle measured clockwise from north and is calculated using the coordinate values (Inverse value)

plane dist is the distance calculated using the coordinate values (Inverse value)

ellipsoid dist is the ellipsoid distance calculated using the specified projection and coordinate values.

t-T fwd is the forward arc-to chord correction.

t-T rev is the reverse arc-to chord correction.

l.s.f is the line scale factor. It is calculated by plane distance/ellipsoid distance.

The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Mode	input	disjoint	disjoint, continuous

In disjoint mode, only the distance between the two points and the bearing (in degrees, minutes and seconds) of the (imaginary) line connecting the two points are displayed.

In continuous mode, after the initial reporting of the bearing/distance, the user is prompted to select the next point(2nd point). In this case the previously selected second point becomes the first point.

Projection	choice	current projection	available projections
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the projection of the data to be used.

Clear button

when this button is selected, the selection sequence is re-initialised.

GDA94/AGD66-84 Bearing and Distance Measure

[measure_bearing_and_distance_gda94_agd66_84_](#)

Position of option on menu: Survey =>Geodetics =>GDA94/AGD66-84 bearing/distance measure

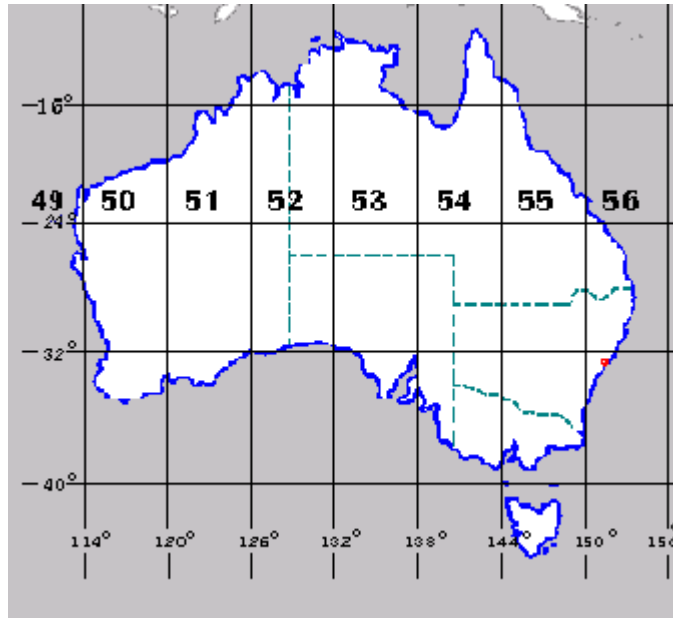
The Bearing and distance (GDA94/AGD66-84) is specifically for Australian use. It allows users to select two AMG/MGA coordinates and return the calculated geodetic parameters.

On selecting the Bearing and distance (GDA94/AGD66-84) option, the Bearing and distance (GDA94/AGD66-84) panel is displayed.

The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Mode	input	disjoint	disjoint, continuous
<p><i>In disjoint mode, the geodetic parameters between the two points are displayed. After the first calculation, further selections must include both the first and second points.</i></p> <p><i>In continuous mode, after the initial reporting of the values, the user is prompted to select the next point(2nd point). In this case the previously selected second point becomes the first point.</i></p>			
Datum	choice	current projection	AGD66/84 GDA94
<p><i>the datum of the data to be used.</i></p>			

1



Zone	choice	current zone	49 50 51 52 53 54 55 56 57 58 59
-------------	--------	--------------	--

the zone of the data to be used.

Select N value setting

radio button selected

if the data has non-ellipsoid heights then a conversion to ellipsoid heights is available using a method defined in the N value interpolation method choice box.

Note: The ellipsoid height is required to calculate the values. However most level datums, such as AHD approximate geoid heights. Therefore, one of the selected points should at least have a non-null value and a means for computing a ellipsoid height. If one point has a valid height and the other does not, an option will be given to assume the other point has the same value.

Various options of converting non-ellipsoid geoid heights to ellipsoid are given by the N value interpolation method choice box or the user can enter N values for the first and second points.

N value interpolation method choice box currently set method Available n value methods

the N value method allows the conversion of non-ellipsoid heights to ellipsoid. The methods are define d in the project n value settings. For more information on the n value settings see the section “N values”

The N value will be used to convert a geoid height (e.g. AHD) into an ellipsoid height. Ellipsoid height

= geoid height + N value. The conversion is used for the calculation only. The original z value for the point will remain unchanged

Input N values radio button unselected

if an N value is known for the area or for the selected points, it will be used to convert a geoid height (e.g. AHD) into an ellipsoid height. Ellipsoid height = geoid height + N value. The conversion is used for the calculation only. The original z value for the point will remain unchanged

1st pt N value input box

if the Input N value option is chosen, an N value is entered for the first point.

2nd pt N value input box

if the Input N value option is chosen, an N value is entered for the second point.

How to Use the Panel and Panel Messages

The results are returned to the panel in the following format:

message area 1	Messages
message area 2	plane brg =, plane dist, dx =, dy =
measure area 3	grid brg =, ellipsoid dist =, line scale factor =
message area 4	Mean height factor =, (Plane dist/level terrain dist) scale factor =
measure area 5	Mean level terrain distance =

Note: Mean height factor is the factor to apply to a measured horizontal distance (usually measured at a height above or below the ellipsoid) to reduce it down to an ellipsoid distance. The other geodetic values and terminology are clearly defined in the GDA technical manual. See <http://www.anzlic.org.au/icsm/gdatm/>

The cycle can then be repeated for another point by simply selecting another point without leaving the option. The **clear** button resets the message areas.

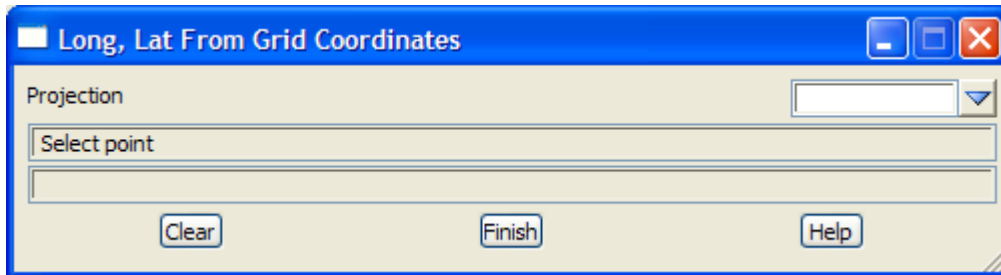
Longitude, Latitude from Grid Coordinates

[long_lat_from_grid_coordinates](#)

Position of option on menu: Survey =>Geodetics =>Long, lat from grid coordinates

The Longitude, latitude from grid coordinates option allows a user to calculate Longitude, latitude and convergence of a point, given a projection and selection of a grid coordinate.

On selecting the Longitude, latitude from grid coordinates option, the Longitude, latitude from grid coordinates panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Projection	choice	current projection	available projections
<i>the projection of the data to be used.</i>			

The cycle can then be repeated for another point by simply selecting another point without leaving the option. The **clear** button resets the message areas.

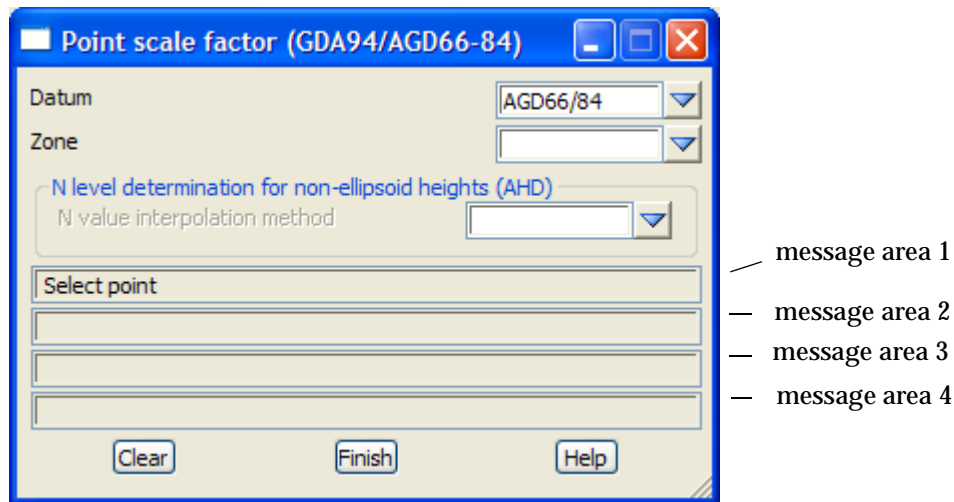
GDA94/AGD66-84 Point Scale Factor

point_scale_factor__gda94_agd66_84_

Position of option on menu: Survey =>Geodetics =>GDA94/AGD66-84 point scale factor

The Point scale factor (GDA94/AGD66-84) is specifically for Australian use. It allows users to select AMG/MGA coordinates and return the point scale factor and latitude and longitude of the point.

On selecting the Point scale factor (GDA94/AGD66-84) option, the Point scale factor (GDA94/AGD66-84) panel is displayed.

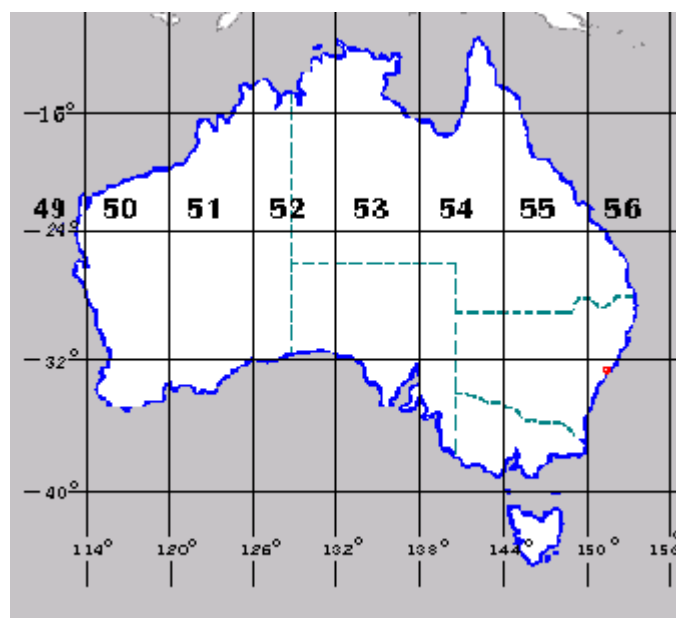


The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Datum	choice	current projection	AGD66/84 GDA94

the datum of the data to be used.

1



Zone	choice	current zone	49
			50
			51
			52
			53
			54
			55
			56
			57
			58
			59

the zone of the data to be used.

Note: *The ellipsoid height is required to calculate the point scale factor. However most level datums, such as the AHD approximate geoid heights. Therefore, selected points should at least have a non-null value and a means for computing a ellipsoid height. Various options of converting non-ellipsoid geoid heights to ellipsoid are given.*

Select N value setting

radio button selected

*if the data has non-ellipsoid heights then a conversion to ellipsoid heights is available using a method defined in the **N value interpolation method choice box**.*

N value interpolation method choice box currently set method Available n value methods

the N value method allows the conversion of non-ellipsoid heights to ellipsoid. The methods are define d in the project n value settings. For more information on the n value settings see the section “N values”

The N value will be used to convert a geoid height (e.g. AHD) into an ellipsoid height. Ellipsoid height = geoid height + N value. The conversion is used for the calculation only. The original z value for the point will remain unchanged

Input N value radio button unselected

if an N value is known for the area or for the selected point, it will be used to convert a geoid height (e.g. AHD) into an ellipsoid height. Ellipsoid height = geoid height + N value. The conversion is used for the calculation only. The original z value for the point will remain unchanged

Enter N value input box

if the Input N value option is chosen, an N value is entered.

How to Use the Panel and Panel Messages

The results are returned to the panel in the following format:

message area 1	Messages
message area 2	Point scale = , Interpolated or entered N value = (if applicable)
message area 3	Combined point scale/height factor =
message area 4	Longitude = Latitude =

The cycle can then be repeated for another point by simply selecting another point without leaving the option. The **clear** button resets the message areas.

Non-Projection to Projection Coordinates

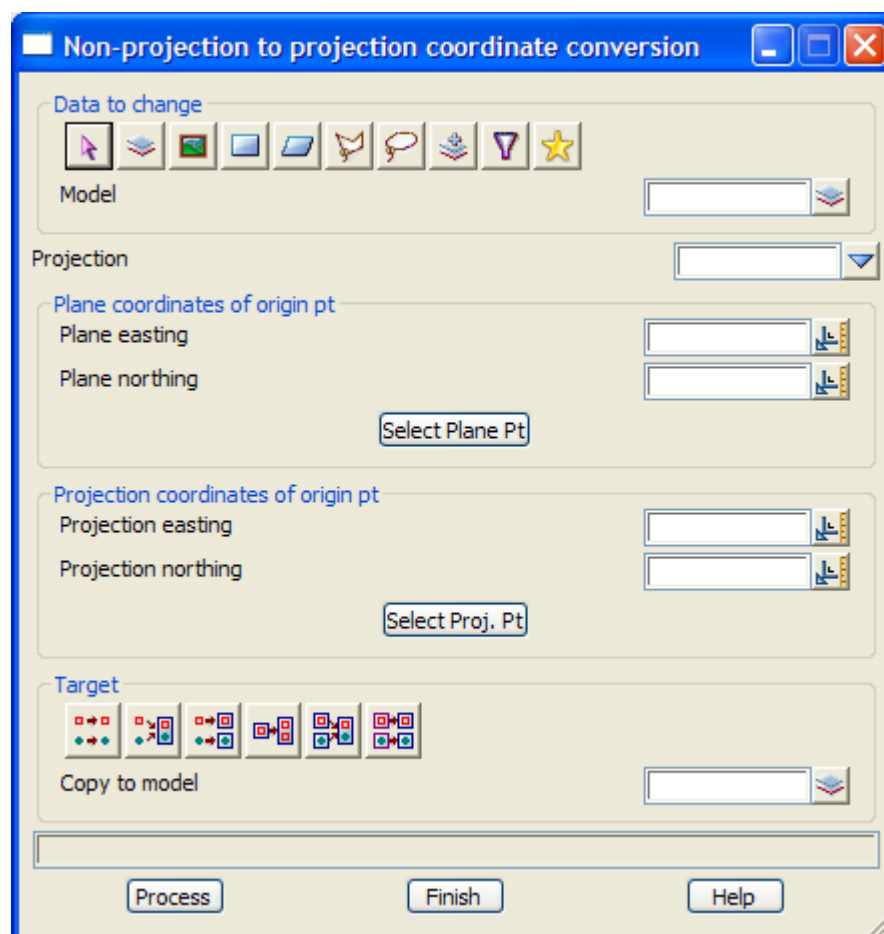
Non_projection_to_projection_coordinate_conversion

Position of option on menu: Survey =>Geodetics =>Non-projection to projection coordinate conversion

The Non-projection to projection coordinate conversion is for the conversion of non-projection coordinates (plane) to a specified projection system. This is done by calculating a series of vectors from an origin point. The origin coordinates in both the plane and projection are known. The plane vector is calculated between the origin and other selected points. Then using the projection coordinates of the origin and the plane vector a projection vector is calculated which allows the projection coordinates of the selected points to be calculated. **The azimuth orientation should be the same in both systems, i.e. no swing should be required.**

The process will convert the vertex of straight segments very effectively. However, care should be taken when trying to convert non-linear segments such as curves. These may have construction entities such as TP's that no longer have the same relationship with a centre point after conversion for example. This is due to differing scale factors of points due to the projection.

On selecting the Non-projection to projection coordinates option, the Non-projection to projection coordinate conversion panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Data to change	source box	model	

the source of objects to be converted are selected using the data source box. For more information on the

data source box see "Data Source"

Projection projection box current projection available projections
the projection to which the data is to be converted to is specified in the projection box.

Plane easting input box
the plane easting value of the origin point.

Plane northing input box
the plane northing value of the origin point.

Select Plane Pt button
selection of the button allows the point to be picked from a view. The user selects and accepts the point and then the values are placed into the relevant input boxes.

Projection easting input box
the projection easting value of the origin point.

Projection northing input box
the projection northing value of the origin point.

Select Projection Pt button
selection of the button allows the point to be picked from a view. The user selects and accepts the point and then the values are placed into the relevant input boxes.

Target target
the target of the transformed data should be specified. The target for the data is selected using the data target box. For more information on the data target box see "Data Target"

Projection to Non-Projection Coordinates

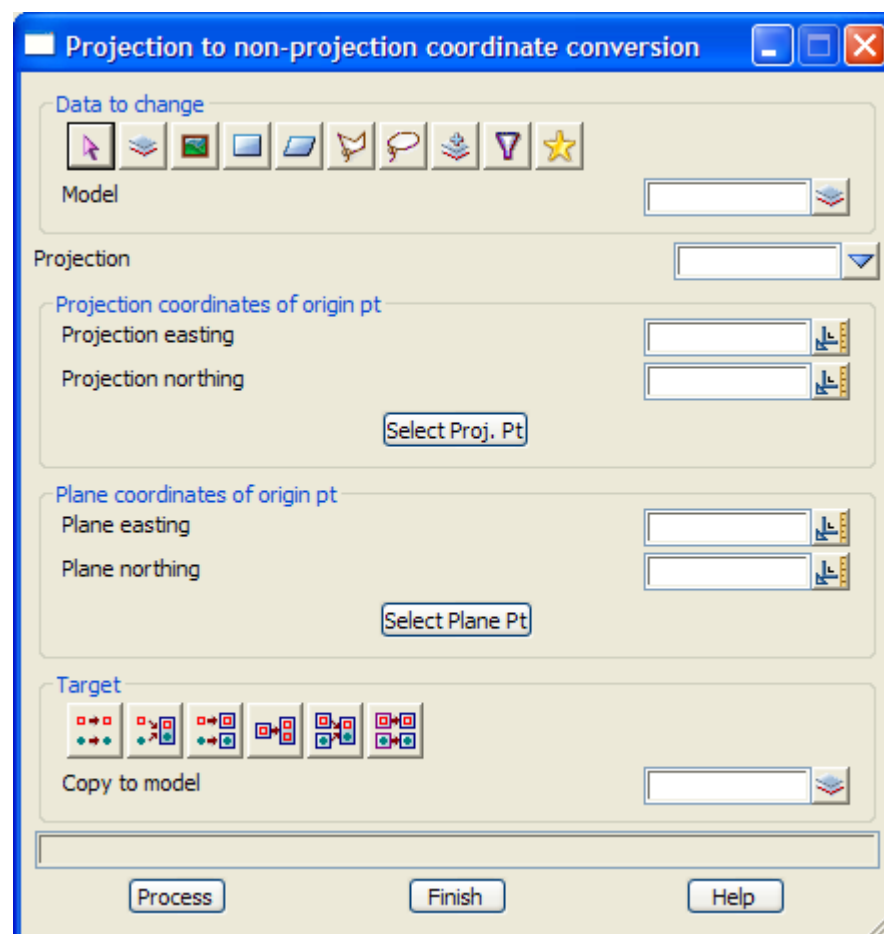
Projection_to_non_projection_coordinate_conversion

Position of option on menu: Survey =>Geodetics => Projection to non-projection coordinate conversion

The Projection to non-projection coordinate conversion is for the conversion of projection coordinates to plane coordinates. This is done by calculating a series of vectors from an origin point. The origin coordinates in both the plane and projection are known. The projection vector is calculated between the origin and other selected points. Then using the plane coordinates of the origin and the projection vector a plane vector is calculated which allows the projection coordinates of the selected points to be calculated. **The azimuth orientation should be the same in both systems, i.e. no swing should be required.**

The process will convert the vertex of straight segments very effectively. However, care should be taken when trying to convert non-linear segments such as curves. These may have construction entities such as TP's that no longer have the same relationship with a centre point after conversion for example. This is due to differing scale factors of points due to the projection.

On selecting the Projection to non-projection coordinates option, the Projection to non-projection coordinate conversion panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Data to change	source box	model	

the source of objects to be converted are selected using the data source box. For more information on the

data source box see "Data Source"

Projection projection box current projection available projections
the projection to which the data is to be converted from is specified in the projection box.

Plane easting input box
the plane easting value of the origin point.

Plane northing input box
the plane northing value of the origin point.

Select Plane Pt button
selection of the button allows the point to be picked from a view. The user selects and accepts the point and then the values are placed into the relevant input boxes.

Projection easting input box
the projection easting value of the origin point.

Projection northing input box
the projection northing value of the origin point.

Select Projection Pt button
selection of the button allows the point to be picked from a view. The user selects and accepts the point and then the values are placed into the relevant input boxes.

Target target
the target of the transformed data should be specified. The target for the data is selected using the data target box. For more information on the data target box see "Data Target"

Bearing/Distance Label

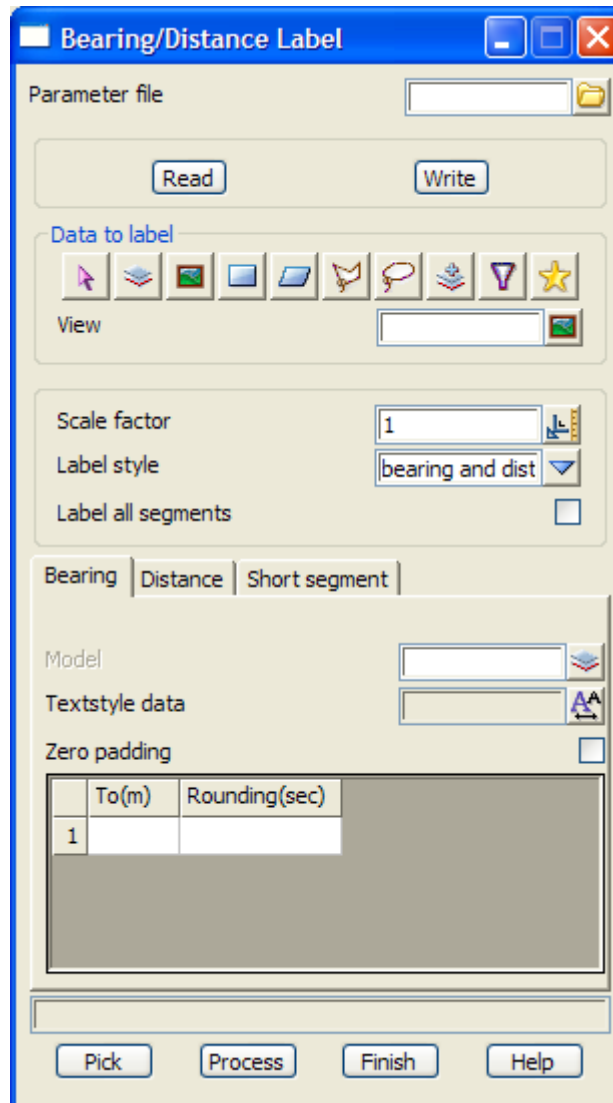
Bearing_Distance_Label

Position of option on menu: Survey =>Geodetics => Bearing/distance label

The Bearing/distance label is for the labelling of a selected string with bearing and distance information. It allows a parameter file to be setup (*.lbf) which can be written and read into the option. This file allows the setting of panel parameters such as rounding, textstyle data etc.

The pick should be with direction. This will effect the bearing that is labelled (+/-180 degrees).

On selecting the Bearing/distance label option, the **Bearing/distance label** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Parameter file	file box		*.lbf files

the parameter file can be read in which will fill in the remaining values within the panel. The user can make changes and save the choices as a different file, thus enabling a library of labelling options to be created.

Read	button
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if a valid parameter file is entered into the parameter file field, the user can press the read button to load

the information in the file into the panel.

Write button

if a valid parameter file name is entered into the parameter file field, the user can press the write button to save the edited panel information into a file so that it can be read in at a later date.

Scale factor input box Current Scale factor at Central meridian if set
 if a scale factor is specified, the distance values labelled will use the scale factor to compute the label distance. This scale factor will be applied to the calculated plane distance from coordinates in the following manner:

$$\text{label distance} = \text{plane distance} / \text{scale factor.}$$

Label style choice box bearing and distance bearing and distance
 bearing distance
 distance bearing

the label style.

Bearing and distance equates to having the bearing and distance justification point at the same point on the midpoint of the segment (the text justification can make the bearing bottom-middle and the distance top-middle for example to show the bearing above the line and the distance below)

Bearing distance equates to having the bearing and distance justification point along side. For example, a label may be a bearing on the left and a distance on the right

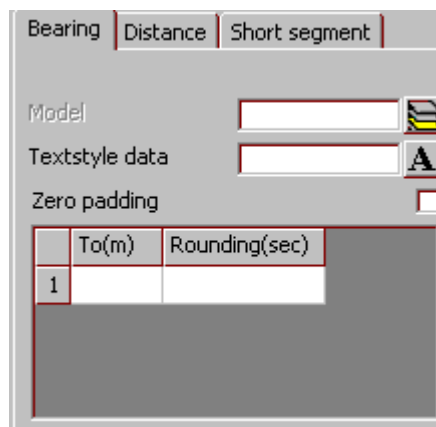
Distance bearing equates to having the distance and bearing justification point along side. For example, a label may be a distance on the left and a bearing on the right

Label all segments tick box unticked

if ticked all the segments of the selected string will be labelled.

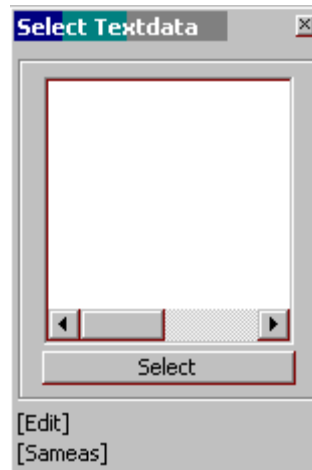
Bearing tab

the following fields are located on the bearing tab.

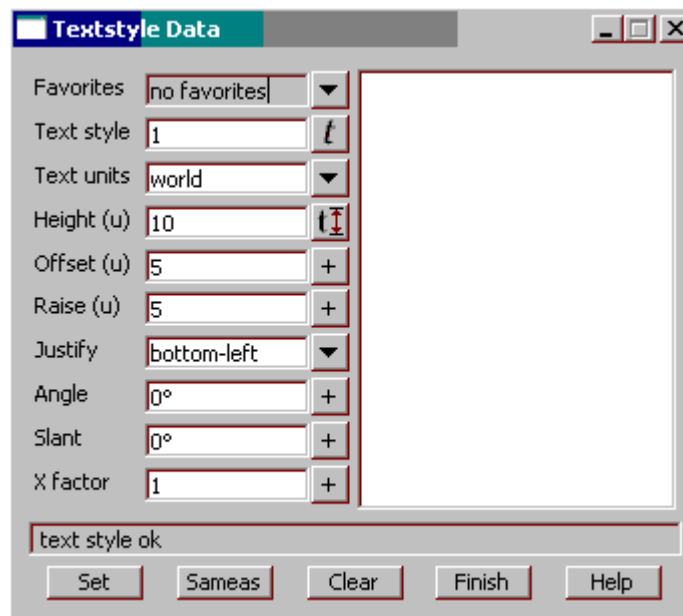


Field Description	Type	Defaults	Pop-Up
Model	model box		current models
if a valid model name is specified, the bearing text will be created in that model.			

Textstyle data textstyle box current textstyle names
on pressing the textstyle data button a list of available textdata predefined names read from the textstyles_name.4d file are displayed.



If no names exist, the user can edit the current settings by selecting the edit button and bring up the textstyle data panel. This allows for definition of textstyle, units, height offset raise etc.



The textstyle data panel enables the user to define multiple text parameters.

Zero padding tick box unticked
if ticked, the labels will have zero's inserted so that at least 2 characters exist for the minutes and second part of the label. For example, A bearing of $10^{\circ} 6' 5''$ would become $10^{\circ} 06' 05''$ with padding.

The values in the grid relate to the rounding of bearings for labelling. Many different ranges can be specified in the grid with each line representing a valid rounding range.

To(m) input box
the rounding upper range limit in meters. This value together with the rounding specified, allow the bearings between certain distance ranges to be rounded to a certain value. The first line in the grid is

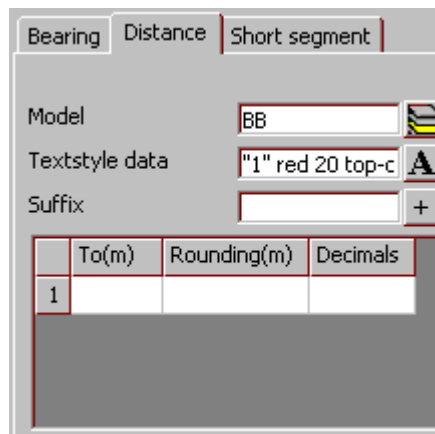
from 0 to the specified distance range. Any following lines in the grid use the **To(m)** value in the previous line for the lower limit to the **To(m)** value in that line.

Rounding(sec) input box

the rounding value given relates to the distance range. Any bearing within the distance range specified will be rounded to the value in seconds. e.g for a rounding value of 60 seconds the bearing will be rounded to the nearest minute.

Distance tab

the following fields are located on the distance tab.



Field Description

Type

Defaults

Pop-Up

Model

model box

current models

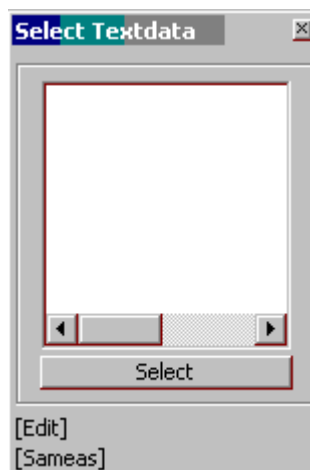
if a valid model name is specified, the distance text will be created in that model.

Textstyle data

textstyle box

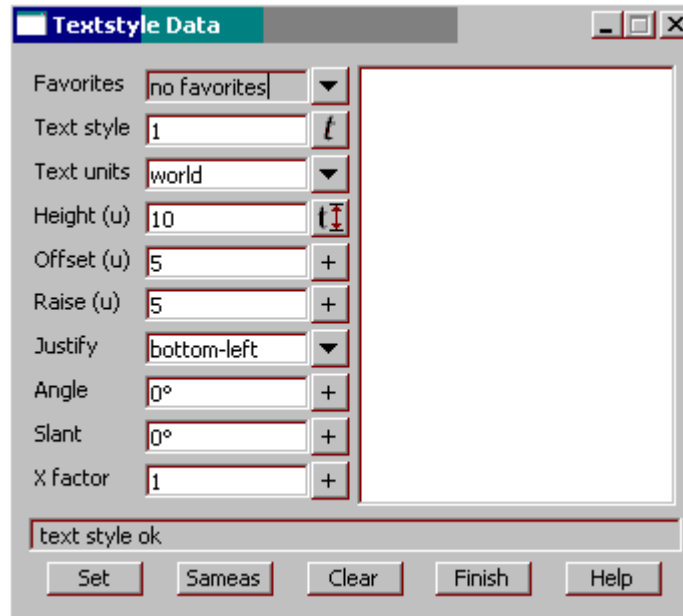
current textstyle names

on pressing the textstyle data button a list of available textdata predefined names read from the `textstyles_name.4d` file are displayed.



If no names exist, the user can edit the current settings by selecting the edit button and bring up the

textstyle data panel. This allows for definition of textstyle, units, height offset raise etc.



The textstyle data panel enables the user to define multiple text parameters.

Suffix input box

if entered, this suffix will be appended to the end of the distance label.

The values in the grid relate to the rounding of distances for labelling. Many different ranges can be specified in the grid with each line representing a valid rounding range.

To(m) input box

*the rounding upper range limit in meters. This value together with the rounding and number of decimals specified, allow the distance to be rounded to a certain value. The first line in the grid is from 0 to the specified distance range. Any following lines in the grid use the **To(m)** value in the previous line for the lower limit to the **To(m)** value in that line.*

Rounding(m) input box

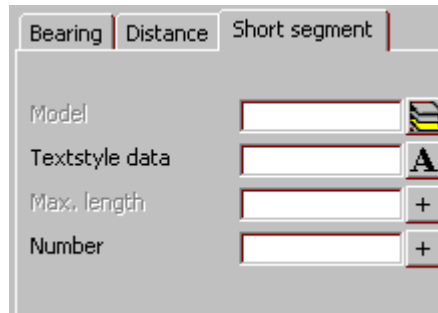
the rounding value given relates to the distance range. Any distance within the distance range specified will be rounded to the value in metres. e.g for a rounding value of 0.05 a distance of 125.261 will be rounded to a value of 125.25

Decimals input box

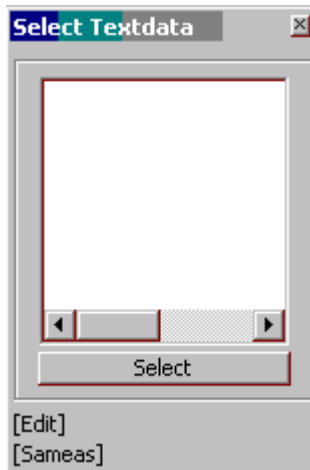
the number of decimal places can be specified. For a distance of 125.261, rounding of 0.05 and Decimals equal to 3, the label will be 125.250.

Short segment tab

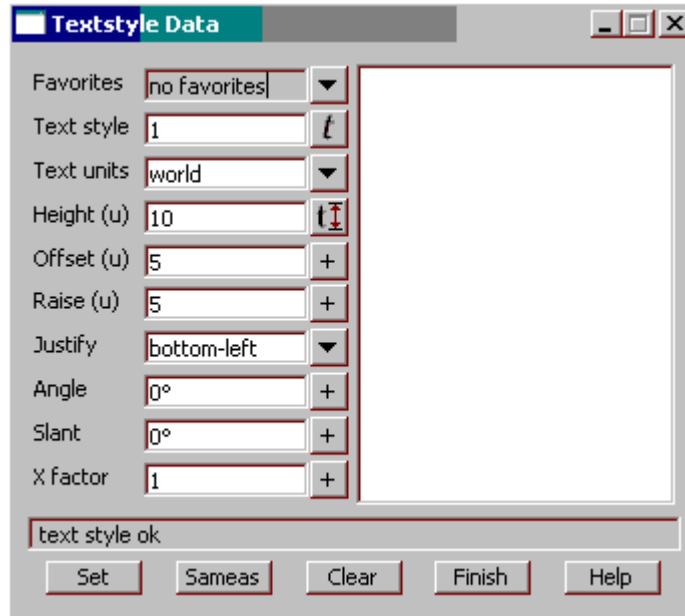
the following fields are located on the short segment tab.



Field Description	Type	Defaults	Pop-Up
Model <i>if a valid model name is specified, the short segment text will be created in that model.</i>	model box		current models
Textstyle data <i>on pressing the textstyle data button a list of available textdata predefined names read from the textstyles_name.4d file are displayed.</i>	textstyle box		current textstyle names



If no names exist, the user can edit the current settings by selecting the edit button and bring up the textstyle data panel. This allows for definition of textstyle, units, height offset raise etc.



The textstyle data panel enables the user to define multiple text parameters.

Max. length input box

if entered, this value will be compared with the selected segment distance. If the selected distance is less than this distance, the short line labelling will override any bearing and distance labelling.

Number input box

if entered, this value will be used for the short segment text.

Pick button

on selection the user can then select a segment/line from a view with direction. The direction will give the bearing direction which is usually +/- 180 degrees different. eg a segment with a bearing of 24 degrees can be labelled with a bearing of 204 by picking in a south west direction.

Projection Bearing/Distance Label

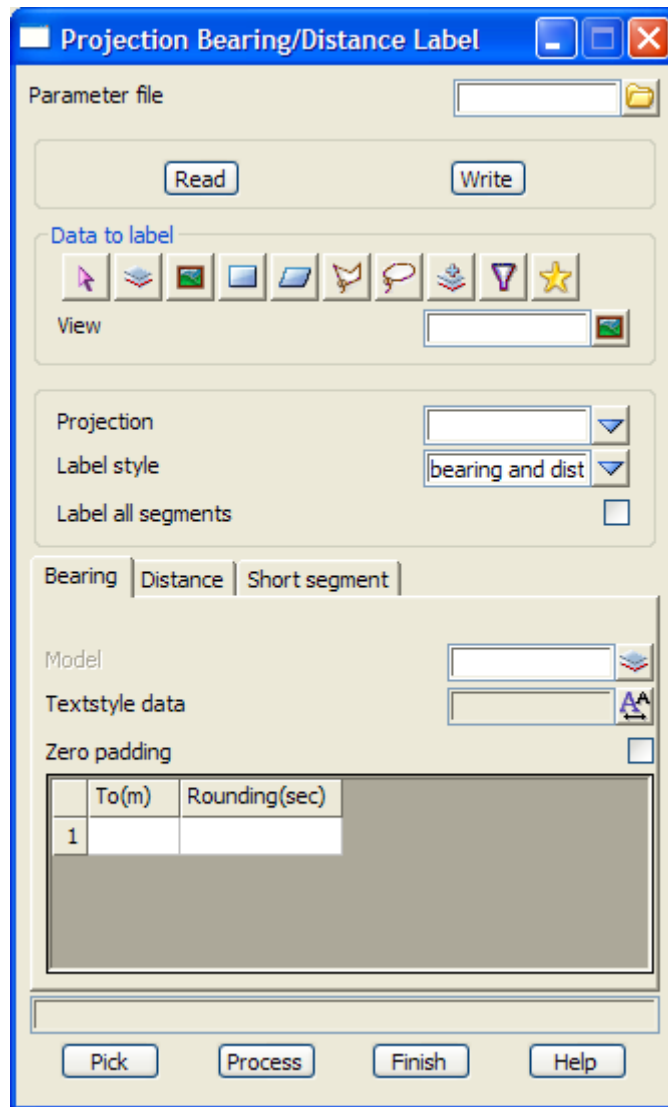
Projection_Bearing_Distance_Label

Position of option on menu: Survey =>Geodetics => Projection bearing/distance label

The Projection bearing/distance label is for the labelling of a selected string with plane bearing and ellipsoid distance information that is in terms of a selected projection. It allows a parameter file to be setup (*.lbf) which can be written and read into the option. This file allows the setting of panel parameters such as rounding, textstyle data etc.

The pick should be with direction. This will effect the bearing that is labelled (+/-180 degrees of actual direction).

On selecting the Projection bearing/distance label option, the **Projection bearing/distance label** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Parameter file	file box		*.lbf files

the parameter file can be read in which will fill in the remaining values within the panel. The user can make changes and save the choices as a different file, thus enabling a library of labelling options to be created.

Read button

if a valid parameter file is entered into the parameter file field, the user can press the read button to load the information in the file into the panel.

Write button

if a valid parameter file name is entered into the parameter file field, the user can press the write button to save the edited panel information into a file so that it can be read in at a later date.

Projection choice current projection available projections

the projection of the data to be used for labelling.

Label style choice box bearing and distance bearing and distance

bearing distance

distance bearing

the label style.

Bearing and distance equates to having the bearing and distance justification point at the same point on the midpoint of the segment (the text justification can make the bearing bottom-middle and the distance top-middle for example to show the bearing above the line and the distance below)

Bearing distance equates to having the bearing and distance justification point along side. For example, a label may be a bearing on the left and a distance on the right

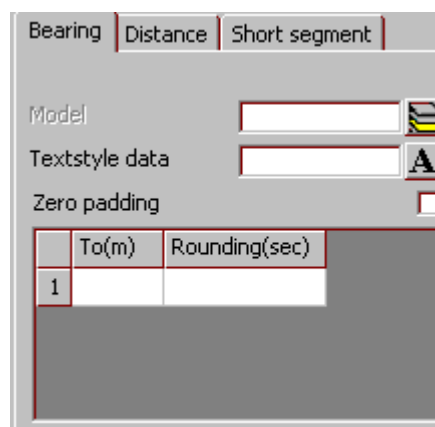
Distance bearing equates to having the distance and bearing justification point along side. For example, a label may be a distance on the left and a bearing on the right

Label all segments tick box unticked

if ticked all the segments of the selected string will be labelled.

Bearing tab

the following fields are located on the bearing tab.



Field Description

Type

Defaults

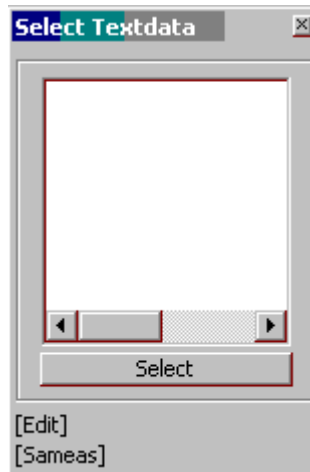
Pop-Up

Model model box

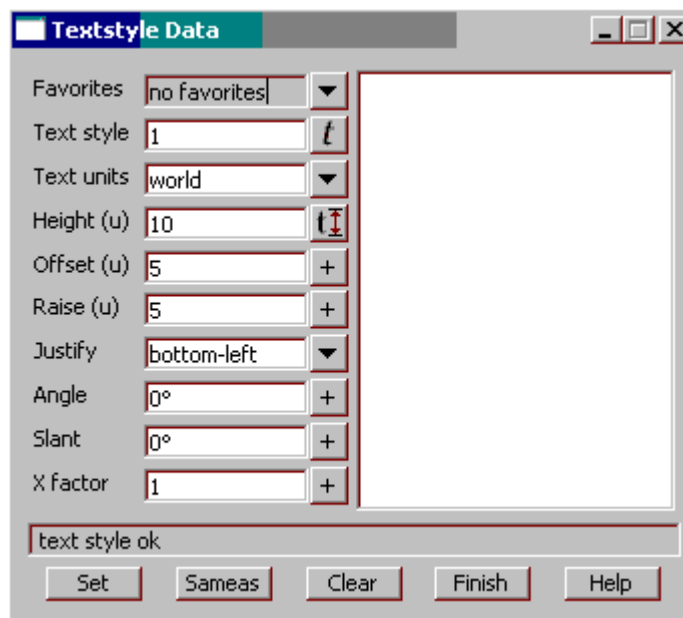
current models

if a valid model name is specified, the bearing text will be created in that model.

Textstyle data textstyle box current textstyle names
on pressing the textstyle data button a list of available textdata predefined names read from the textstyles_name.4d file are displayed.



If no names exist, the user can edit the current settings by selecting the edit button and bring up the textstyle data panel. This allows for definition of textstyle, units, height offset raise etc.



The textstyle data panel enables the user to define multiple text parameters.

Zero padding tick box unticked

if ticked, the labels will have zero's inserted so that at least 2 characters exist for the minutes and second part of the label. For example, A bearing of 10° 6' 5" would become 10° 06' 05" with padding.

The values in the grid relate to the rounding of bearings for labelling. Many different ranges can be specified in the grid with each line representing a valid rounding range.

To(m) input box

the rounding upper range limit in meters. This value together with the rounding specified, allow the bearings between certain distance ranges to be rounded to a certain value. The first line in the grid is

from 0 to the specified distance range. Any following lines in the grid use the **To(m)** value in the previous line for the lower limit to the **To(m)** value in that line.

Rounding(sec) input box

the rounding value given relates to the distance range. Any bearing within the distance range specified will be rounded to the value in seconds. e.g for a rounding value of 60 seconds the bearing will be rounded to the nearest minute.

Distance tab

the following fields are located on the distance tab.

	To(m)	Rounding(m)	Decimals
1			

Field Description

Type

Defaults

Pop-Up

Model

model box

current models

if a valid model name is specified, the distance text will be created in that model.

Textstyle data

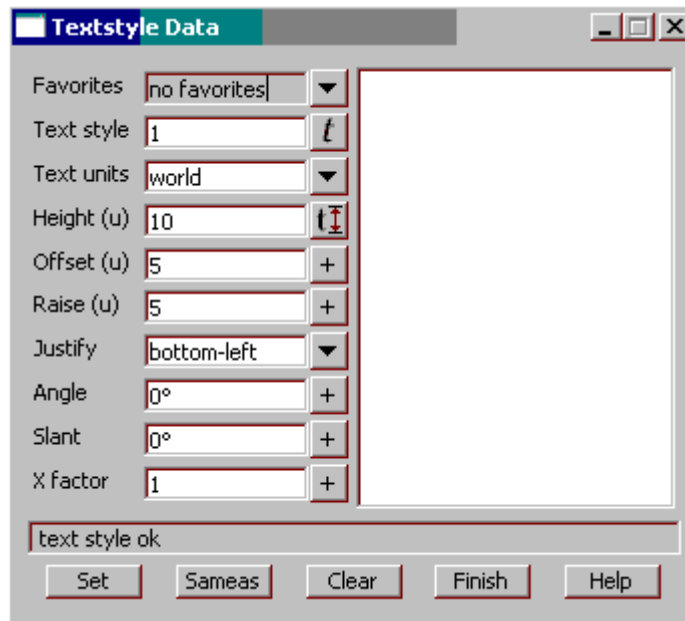
textstyle box

current textstyle names

on pressing the textstyle data button a list of available textdata predefined names read from the `textstyles_name.4d` file are displayed.

If no names exist, the user can edit the current settings by selecting the edit button and bring up the

textstyle data panel. This allows for definition of textstyle, units, height offset raise etc.



The textstyle data panel enables the user to define multiple text parameters.

Suffix input box

if entered, this suffix will be appended to the end of the distance label.

The values in the grid relate to the rounding of distances for labelling. Many different ranges can be specified in the grid with each line representing a valid rounding range.

To(m) input box

the rounding upper range limit in meters. This value together with the rounding and number of decimals specified, allow the distance to be rounded to a certain value. The first line in the grid is from 0 to the specified distance range. Any following lines in the grid use the To(m) value in the previous line for the lower limit to the To(m) value in that line.

Rounding(m) input box

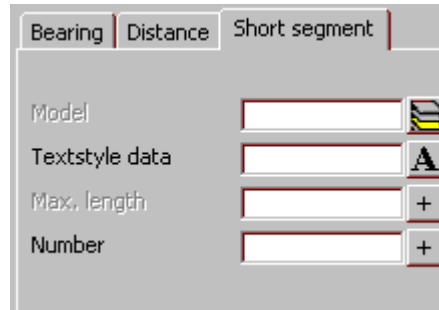
the rounding value given relates to the distance range. Any distance within the distance range specified will be rounded to the value in metres. e.g for a rounding value of 0.05 a distance of 125.261 will be rounded to a value of 125.25

Decimals input box

the number of decimal places can be specified. For a distance of 125.261, rounding of 0.05 and Decimals equal to 3, the label will be 125.250.

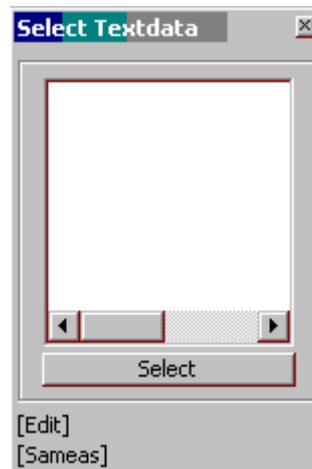
Short segment tab

the following fields are located on the short segment tab.

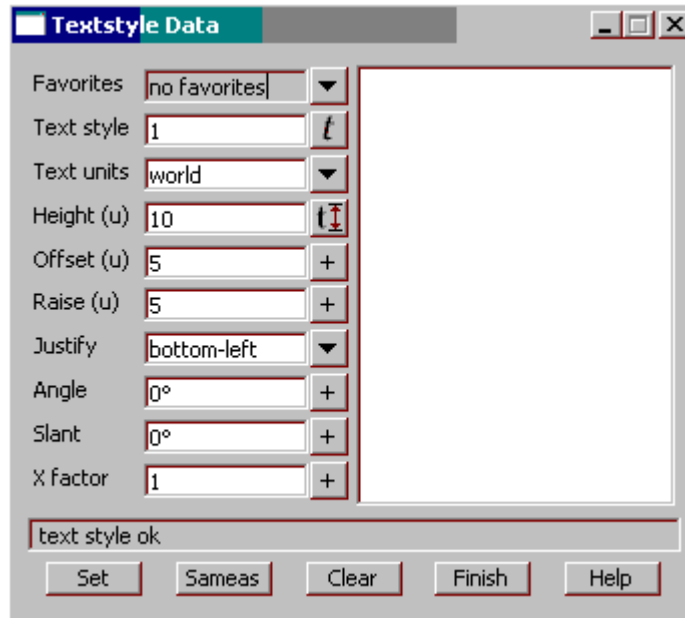


Field Description	Type	Defaults	Pop-Up
Model	model box		current models
<i>if a valid model name is specified, the short segment text will be created in that model.</i>			

Textstyle data	textstyle box		current textstyle names
<i>on pressing the textstyle data button a list of available textdata predefined names read from the <code>textstyles_name.4d</code> file are displayed.</i>			



If no names exist, the user can edit the current settings by selecting the edit button and bring up the textstyle data panel. This allows for definition of textstyle, units, height offset raise etc.



The textstyle data panel enables the user to define multiple text parameters.

Max. length input box

if entered, this value will be compared with the selected segment distance. If the selected distance is less than this distance, the short line labelling will override any bearing and distance labelling.

Number input box

if entered, this value will be used for the short segment text.

Pick button

on selection the user can then select a segment/line from a view with direction. The direction will give the bearing direction which is usually +/- 180 degrees different. eg a segment with a bearing of 24 degrees can be labelled with a bearing of 204 by picking in a south west direction.

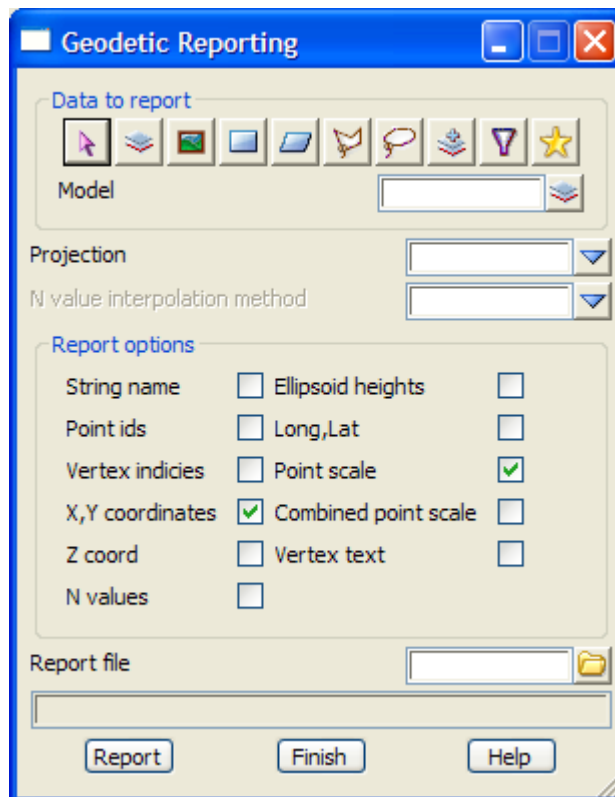
Geodetic reporting

Geodetic_Reporting

Position of option on menu: Survey =>Geodetics => Geodetic reporting

The Geodetic reporting option is for the reporting of selected data (projection coordinates) in terms of geodetic positions and variables. The user can choose from a number of different reporting options including, point scale factor, Longitude and latitude, point ids etc.

On selecting the Geodetic reporting option, the **Geodetic reporting** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Data to report	source box	model	
-----------------------	------------	-------	--

the source of objects to be reported are selected using the data source box. For more information on the data source box see "Data Source" . The selected data must be in terms of the selected map projection.coordinate system.

Projection	choice	current projection	available projections
-------------------	--------	--------------------	-----------------------

the projection of the data to be reported.

N value interpolation method	choice box	currently set method	Available n value methods
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the N value method allows the conversion of non-ellipsoid heights to ellipsoid. The methods are defined in the project n value settings. For more information on the n value settings see the section "N values"

The N value will be used to convert a geoid height (e.g. AHD) into an ellipsoid height. Ellipsoid height = geoid height + N value. The conversion is used for the reporting only. The original z value for the point will remain unchanged

String name	tick box		
--------------------	----------	--	--

if selected, any valid string names will be shown in the report.

- Point Ids** tick box
if selected, any valid point ids will be shown in the report.
- Vertex Numbers** tick box
if selected, vertex numbers will be shown in the report.
- X,Y coordinates** tick box ticked
if ticked, the coordinates of the selected data will be reported.
- Z coord** tick box
if selected, any valid z values will be shown in the report.
- N values** tick box
if ticked, the N value calculated for the given point will be reported (if valid).
- Ellipsoid heights** tick box
if selected, the calculated ellipsoid height will be reported. If no N values are calculated, this will be the same as the Z value.
- Long, Lat** tick box
if selected, the calculated longitude and latitude will be reported.
- Point scale** tick box
if selected, the point scale for each point will be reported.
- Combined point scale** tick box
if selected, the combined point scale for each point will be reported. This combined scale factor is the product of the point scale factor and a height scale factor. The height scale factor is computed from the ellipsoid height of the point.
- Text** tick box
if selected, any valid text values will be shown in the report.
- Report file** input *.rpt
name of the file to report to.

Solar Reduction

Solar_Observations

Position of option on menu: Survey =>Geodetics => Solar reduction

The Solar reduction option allows the reduction of observations to the sun by the hour angle method. The user can specify either limb or the centre of the sun, and a number of observations can be processed together. **The option does not require almanac details as these are processed internally using algorithms supplied by the US naval observatory.** These algorithms will produce accuracy in the order of 2 arc seconds in azimuth for the period AD1800 - 2050

On selecting the Solar reduction option, the **Solar Observations** panel is displayed.

The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
File <i>a filename can be specified for reading or writing a file.</i>	file box		*.ast files
Read <i>if a valid file exists, the file contents can be loaded into the panel.</i>	button		
Write <i>if a valid name is specified and the valid values are entered into all of the fields, the user can write the input data to a file.</i>	button		
Projection <i>a projection can be specified so that a grid convergence value can be computed. This value will be used to compute the grid or projection bearing to the RO. If left blank, only the True azimuth will be reported.</i>	choice	current projection	available projections
Report file	input		*.rpt

name of the file to report to.

Origin station input

name of the origin station

RO station input

name of the reference object station

Origin longitude input

the observation station's longitude should be specified in DMS format.

Origin latitude input

the observation station's latitude should be specified in DMS format.

Date date box current system date

the date of the observations as at the observers position should be entered. This can be by direct entry into the date field or by selecting the day, month, year from a date pop-up panel. The user can scroll through different months by selecting the arrow buttons on the pop-up date panel.

Time zone time zone box major time zones

a valid time zone for the observers position and local time should be selected from the pop-up list.

Timing corr.(hh.mmss) input

the correction to apply for any timing error including stopwatch corrections should be entered. The value should be in a hours, minutes seconds in hp format.

GRID VALUES: input

	Local Time	Horiz obs to RO	Horiz obs to Sun	Limb of sun	Az to Cen. SUN	Az to RO	Conv. angle	Grid brg to RO
1								

Local time input

the local time of the observation specified in 24 hour time in HMS. eg. 18.121002

Horiz obs to RO input

the horizontal angle (bearing) observed to the RO for the set of measurements. A set in this case includes a pointing to the RO and sun (at a certain time) in the same face.

Horiz obs to SUN input

the horizontal angle (bearing) observed to the Sun for the set of measurements.(The observation should not be corrected for the suns semi diameter as this is done internally by the reduction process)

If observation s are made on both faces, a separate line should be entered for each face. e.g Face 1 to RO may be 0.0000 and the face 1 to the sun may be 50.0000 which would be on the same line, then the observer may change face to face 2 and observe to the sun again followed by the RO. The face 2 observations should appear on the next line eg 180.0004 230.0110.

Limb of sun choice box
 Centre
 Left limb
 Right limb

the limb of the sun observed should be specified. This enables the suns semi diameter correction to be applied. This also allows the observations to be read in any order.

Az to cen. SUN output

the true azimuth to the sun will be displayed in this field on successful reduction of the observations.

Az to RO output

the true azimuth to the RO will be displayed in this field on successful reduction of the observations.

Conv. angle output

the convergence angle at the observation point will be displayed in this field if a valid projection is specified and there is a successful reduction of the observations.

Grid brg to RO output

the grid bearing to the RO will be displayed in this field if a valid convergence angle is calculated and there is a successful reduction of the observations. The grid bearing is calculated by:

$$\mathbf{Grid\ brg} = \mathbf{True\ azimuth} + \mathbf{convergence}$$

The fields and buttons used in this panel below the grid have the following functions.

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Average RO azimuth	output		
---------------------------	--------	--	--

if there is as successful reduction, the average RO azimuth value will be reported in this field.

Average RO grid bearing	output		
--------------------------------	--------	--	--

if there is as successful reduction, and the projection given, the average RO grid bearing value will be reported in this field.

Standard deviation in the mean	output		
---------------------------------------	--------	--	--

this is a statistical measure of the reduced observations.

Star Reduction

Star_Observations

Position of option on menu: Survey =>Geodetics => Star reduction

The Star reduction option allows the reduction of observations to the nominated star by the hour angle method. A number of observations can be processed together. **The option does not require almanac details as these are processed internally using algorithms supplied by the US naval observatory.** These algorithms will produce accuracy in the order of 2 arc seconds in azimuth for the period AD1800 - 2050

On selecting the Star reduction option, the **Star Observations** panel is displayed.

The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
File <i>a filename can be specified for reading or writing a file.</i>	file box		*.ast files
Read <i>if a valid file exists, the file contents can be loaded into the panel.</i>	button		
Write <i>if a valid name is specified and the valid values are entered into all of the fields, the user can write the input data to a file.</i>	button		
Star id by	button	FK5 number	General name Constellation Bayer/ Flamsteed number FK5 number SAO number

the star can be identified by a number of different means. The stars available are based on the Fifth Fundamental Catalogue(FK5) catalogue. Cross matching of id's are not possible in some instances. e.g A star may have no known general name.

The selection of an id method will force the changing of the id list so the particular star can be selected.

Star id choice 1st star id in list available id's for that type
the star id can be selected from the list.

Report file input *.rpt
name of the file to report to.

Origin station input
name of the origin station

RO station input
name of the reference object station

Origin longitude input
the observation station's longitude should be specified in DMS format.

Origin latitude input
the observation station's latitude should be specified in DMS format.

Date date box current system date
the date of the observations as at the observers position should be entered. This can be by direct entry into the date field or by selecting the day, month, year from a date pop-up panel. The user can scroll through different months by selecting the arrow buttons on the pop-up date panel.

Time zone time zone box major time zones
a valid time zone for the observers position and local time should be selected from the pop-up list.

Timing corr.(hh.mmss) input
the correction to apply for any timing error including stopwatch corrections should be entered. The value should be in a hours, minutes seconds in hp format.

GRID VALUES: input

	Local Time	Horiz obs to RO	Horiz obs to Star	Az to Star	Az to RO	Conv. angle	Grid brg to RO
1							

Local time input
the local time of the observation specified in 24 hour time in HMS. eg. 18.121002

Horiz obs to RO input
the horizontal angle (bearing) observed to the RO for the set of measurements. A set in this case includes a pointing to the RO and star (at a certain time) in the same face.

If observation s are made on both faces, a separate line should be entered for each face. e.g Face 1 to RO may be 0.0000 and the face 1 to the star may be 50.0000 which would be on the same line, then the observer may change face to face 2 and observe to the star again followed by the RO. The face 2 observations should appear on the next line eg 180.0004 230.0110.

Horiz obs to Star input

the horizontal angle (bearing) observed to the Star for the set of measurements.

Az to Star output

the true azimuth to the sun will be displayed in this field on successful reduction of the observations.

Az to RO output

the true azimuth to the RO will be displayed in this field on successful reduction of the observations.

Conv. angle output

the convergence angle at the observation point will be displayed in this field if a valid projection is specified and there is a successful reduction of the observations.

Grid brg to RO output

the grid bearing to the RO will be displayed in this field if a valid convergence angle is calculated and there is a successful reduction of the observations. The grid bearing is calculated by:

$$\mathbf{Grid\ brg} = \mathbf{True\ azimuth} + \mathbf{convergence}$$

The fields and buttons used in this panel below the grid have the following functions.

Field Description	Type	Defaults	Pop-Up
Average RO azimuth	output		
<i>if there is as successful reduction, the average RO azimuth value will be reported in this field.</i>			
Average RO grid bearing	output		
<i>if there is as successful reduction, and the projection given, the average RO grid bearing value will be reported in this field.</i>			
Standard deviation in the mean	output		
<i>this is a statistical measure of the reduced observations.</i>			

Traverse Spreadsheet

traverse_spreadsheet

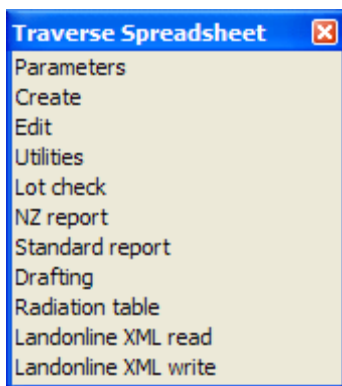
Position of menu: Survey =>Traverse spreadsheet

The **Traverse Spreadsheet** options allow the entry of traverse and radiation blocks from the keyboard, selection of strings from the current view or by reading from a file. Adjustments can then be made including transit, Bowditch, compass or least square adjustment. The adjustment can be for a closed string (loop) or an open string (non-loop). Traverse Spreadsheet will often be abbreviated as TSS.

There are two types of traverse spreadsheets (TSS) - Plane and Projection.

For the Plane TSS, entered distances are multiplied by the scale factor to give final distances and hence calculate co-ordinates, whereas for the Projection TSS, ellipsoid distances are entered and 12d Model calculates the correct co-ordinate position using full projection calculations.

The Traverse spreadsheet walk-right menu contains the traverse spreadsheet options.



Setting parameters for the traverse spreadsheet option
 Create a TSS - Plane or Projection
 Edit an existing TSS
 Utilities for use with existing TSS's
 Run lot checks on typed bearing/distance data
 NZ traverse spreadsheet report
 Standard traverse spreadsheet report
 Traverse spreadsheet drafting
 Creating radiation tables from a TSS
 Reading LINZ XML data
 Writing LINZ XML data

For the option *Parameters* please continue to the section "TSS Parameters"

<i>Create</i>	"TSS Create"
<i>Edit</i>	"TSS Edit"
<i>Utilities</i>	"TSS Utilities"
<i>Lot check</i>	"Lot Check"
<i>NZ report</i>	"NZ TSS Report"
<i>Standard report</i>	"Standard TSS Report"
<i>Drafting</i>	"TSS Drafting"
<i>Radiation table</i>	"TSS Radiation Table Drafting"
<i>Landonline XML read</i>	"Landonline XML Read"
<i>Landonline XML write</i>	"Landonline XML Write"

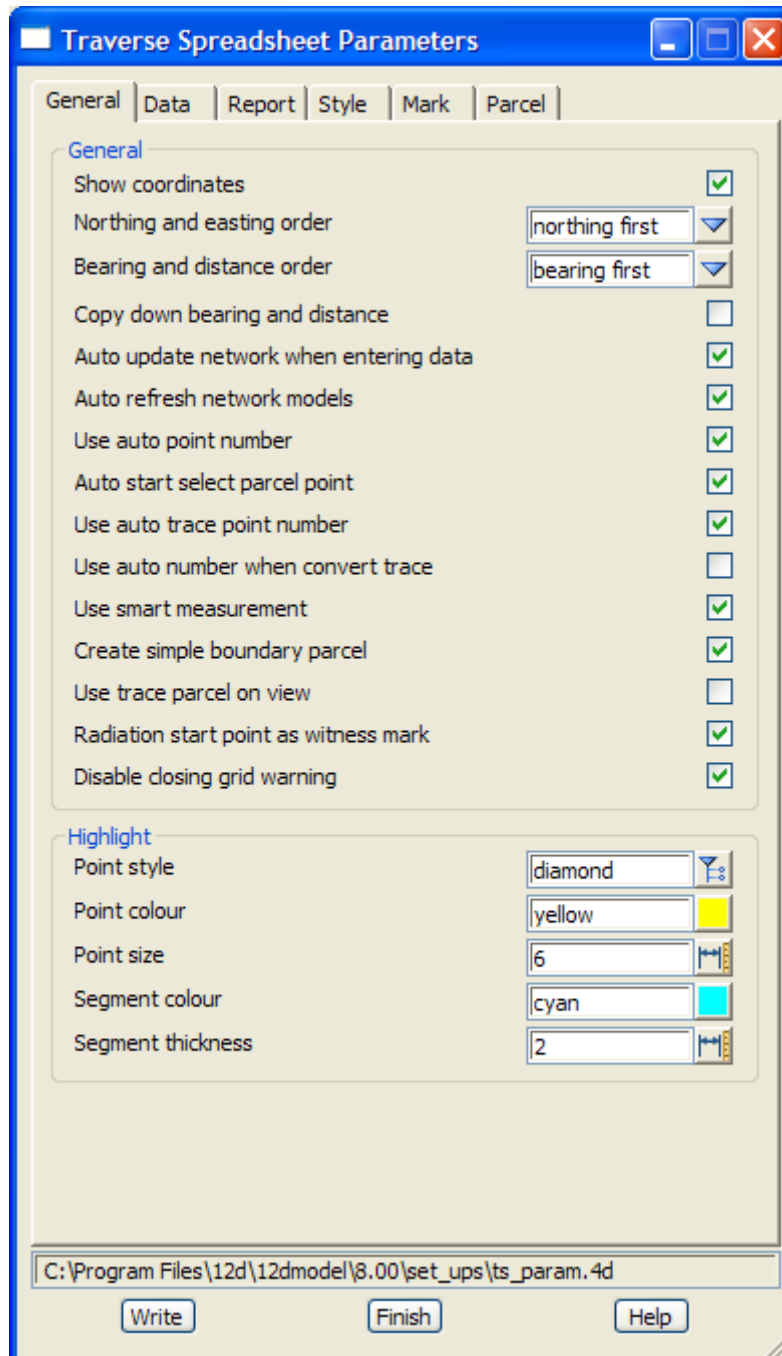
TSS Parameters

traverse_spreadsheet_parameters

Position of option on menu: Survey =>Parameters

The Traverse Spreadsheet Parameters sets the parameters for defining the *look and feel* of the TSS create and edit panels, reports and drafting.

Selecting Parameters brings up the **Traverse Spreadsheet Parameters** panel:



TSS Create

create_traverse_spreadsheet

Position of option on menu: Survey =>Traverse spreadsheet =>Create

A traverse spreadsheet (TSS) can either use a constant scale factor or a cartographic projection to define the relationship between bearings/distances and the (x,y) co-ordinates.

The Traverse Spreadsheet Create option allows the entry of traverse and radiation blocks from the keyboard, selection of strings from the current view or by reading from a file. Adjustments can then be made including transit, Bowditch, compass or least square adjustment. The adjustment can be for a closed string (loop) or an open string (non-loop).

Selecting Traverse Spreadsheet Create brings up the **Create Traverse Spreadsheet** panel:

The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Projection spreadsheet	radio button		
<i>if selected then the Projection field must be filled in.</i>			

Projection	projection box	first projection	project projections
<i>the cartographic projection used in the TSS. For more information on projections go to "Projections" in the chapter "Projects". This is a Projection TSS.</i>			

Scaled spreadsheet	radio button		
---------------------------	--------------	--	--

if selected then the Scale factor field must be filled in.

Scale factor real box

the constant scale factor used in the TSS. This is a Plane TSS.

Details section

Spreadsheet name text box

the name for the TSS

File name text box

*name of the *.tf file to store all the TSS data in. The TSS can be brought back for editing by giving this filename.*

Create button

*create a new traverse spreadsheet using the parameters entered in the above panel field. The appropriate editor (either for a **Projection Traverse Spreadsheet** or a **Plane Traverse Spreadsheet** panel) is then brought up for the TSS data to be entered and/or edited.*

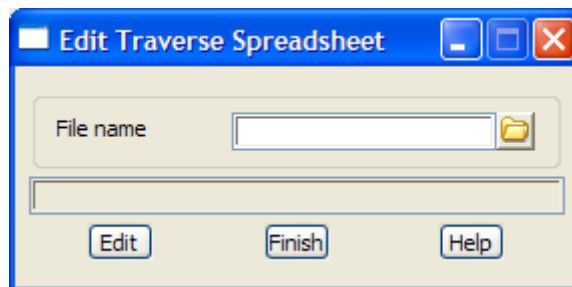
TSS Edit

[edit_traverse_spreadsheet](#)

Position of option on menu: Survey =>Traverse spreadsheet =>Edit

The traverse spreadsheet editor reads in an existing TSS file and loads the information into either the **Projection Traverse Spreadsheet** or the **Plane Traverse Spreadsheet** panel.

Selecting Traverse Spreadsheet Edit brings up the **Edit Traverse Spreadsheet** panel:



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
File name <i>name of the file containing the traverse spreadsheet information to be edited.</i>	file box		*.ts files

Edit button
*read the information in the traverse spreadsheet file and load it into either a **Projection Traverse Spreadsheet** or a **Plane Traverse Spreadsheet** panel.*

For entering/editing either a Projection TSS or Plane TT, please go to the section "Traverse Spreadsheets"

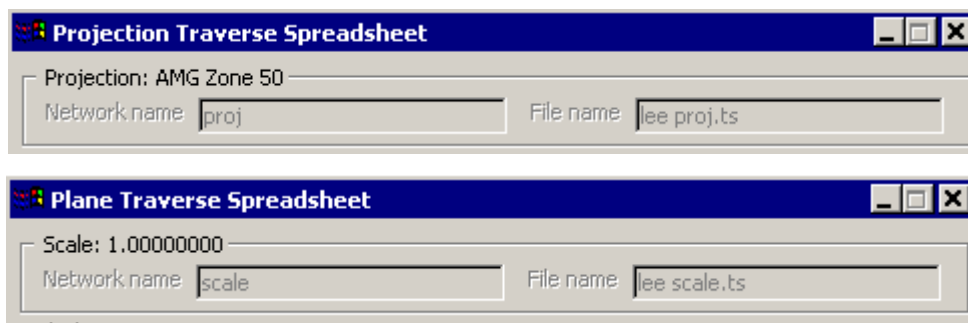
Traverse Spreadsheets

[plane_traverse_spreadsheet](#)

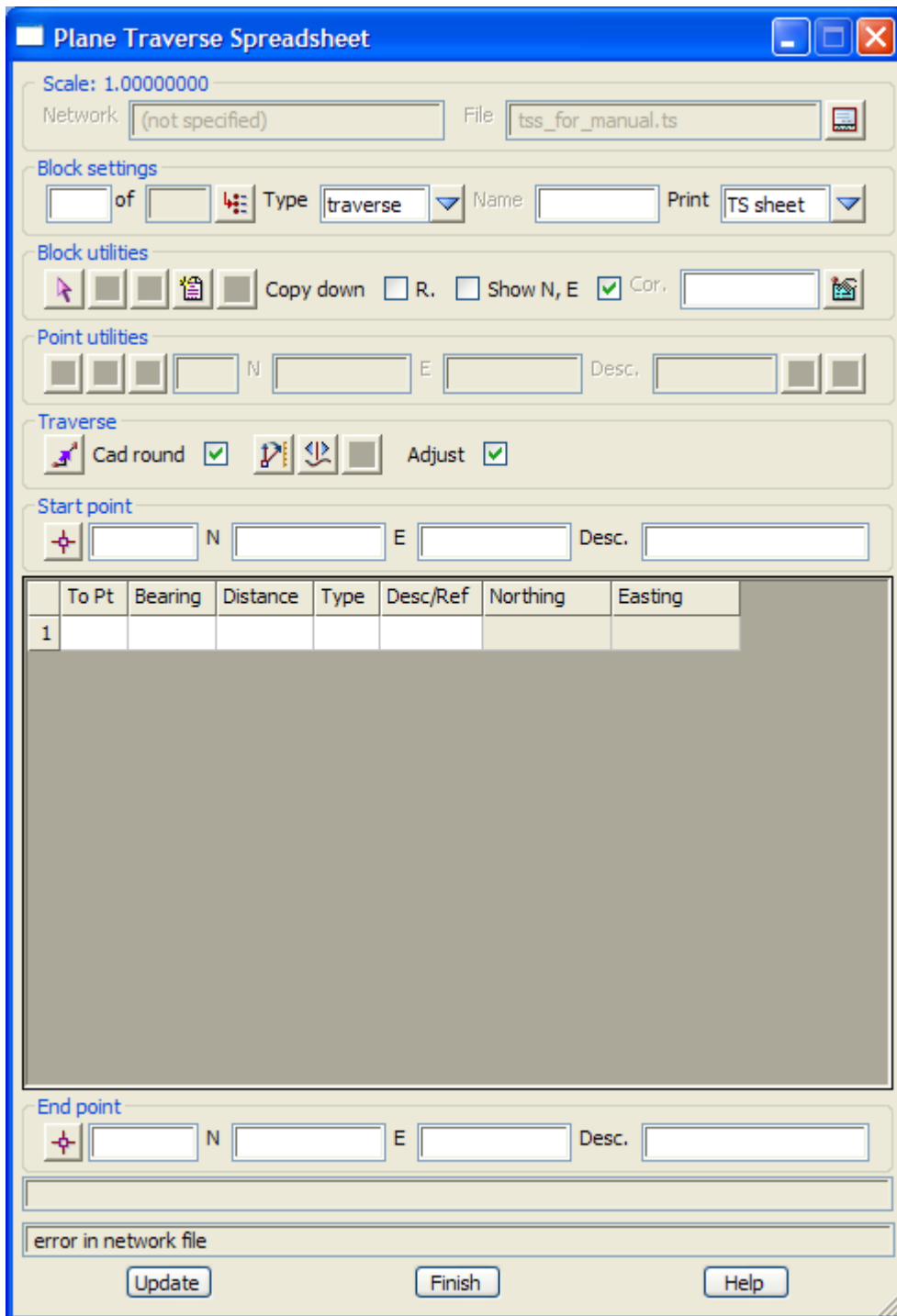
[projection_traverse_spreadsheet](#)

The Projection and Plane TSS panels allows the entry of traverse and radiation blocks from the keyboard, selection of strings from the current view or by reading from a file. Adjustments can then be made including transit, Bowditch, compass or least square adjustment. The adjustment can be for a closed string (loop) or an open string (non-loop).

The two panels are very similar and only the top section is different. The Projection Traverse Spreadsheet requires a Projection rather than a Scale factor.



For more information about terminology used in the projection option, see the Appendix “Geodetics Summary” .



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
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Network name display only

the entire spreadsheet can be given a name for identification purposes. This was defined when the TSS was created and can only be changed using the TSS Utilities option.

File name display only

the file name containing the TSS information. This was defined when the TSS was created and can only be changed using the TSS Utilities option.

The only visible difference between the Plane and Projections Traverse Spreadsheet panel is that the Scale or Projection is given at the top of the panel. All the panel fields are the same.

Of course the calculations are different for the two types of spreadsheets. For the Plane TSS, entered distances are multiplied by the scale factor to give final distances and hence calculated co-ordinates, whereas for the Projection TSS, ellipsoid distances are entered and 12d Model calculates the correct co-ordinate position using full projection calculations.

Block Settings

Position input

the order of a block within the spreadsheet can be specified by nominating the block position. Numbering within the list starts at 1. This parameter is used for inserting new blocks into the list. If a user nominates to insert in position 5 and there is only 2 blocks already defined, the block will be placed at the end of the list (i.e. position 3)

Count input

the number of blocks within the spreadsheet.

Type choice traverse traverse, radiation, radiation backsight, parcel, irregular trace, balance

the type of a block within the spreadsheet can be specified by nominating the block type.

*The **traverse** block is for the entry of loop and non-loop traverses starting and ending at points with known coordinate values.*

For a hanging traverse, i.e. a traverse that does not close onto a known point, the data can be entered by entering a 0 (zero) in the point id field of the grid control, as well as the end point - point id field.

*The **radiation** block consists of a number of radiations or **side shots** from a point with known coordinates. This point may be defined in a previous traverse block or it may be from a known point. A valid coordinate must exist for the radiation start point for the radiation block to be used.*

*A **radiation backsight** block is the same as a radiation block except that the value set to the backsight is included. After adjustment of previous blocks, the coordinates of setup and backsight points often change. This will introduce swing errors into calculations if not accounted for. By entering the backsight value as set in the field, a comparison is made between what was set and the adjusted value. The difference is then applied to the radiations in the block to reflect the corrected angle measurements.*

XXXX - need 12d NZ documentation on TSS

Name input

a spreadsheet can consist of a number of different blocks. For each block, a name can be given which can help identify a particular traverse/radiation block within the spreadsheet.

Flag input

the adjustment mode of the current block. The mode is either adjusted or unadjust. All blocks are set to unadjusted on reading of a file, and the user specifies which blocks are to be adjusted.

Prev button

allows the navigation to the previous block in the list.

Next	button		
	<i>allows the navigation to the next block in the list.</i>		
New	button		
	<i>allows for the definition and entry of a new block in the list.</i>		
Update	button		
	<i>allows for the updating of entries when changes have been made. For example, if a distance measurement were to be changed, pushing the update button will ensure the new value will be used in further calculations and adjustments</i>		
Insert	button		
	<i>allows for the insertion of a block into the list in the position defined by the Block position entry.</i>		
Append	button		
	<i>allows for the insertion of a block at the end of the list.</i>		
Delete	button		
	<i>allows for the deletion of the currently displayed block.</i>		
Show EN	tick box	ticked	
	<i>if ticked the easting and northing columns will be shown in the grid. If unticked the columns will not be shown.</i>		
Copy b dsc	tick box	ticked	
	<i>if ticked the bearing and description from the previous line in the grid will automatically be copied down to the next entered line.</i>		
Pick string	button		
	<i>allows for the loading of the current block by selecting a string from the current view.</i>		
Adjustment method	choice		bowditch, compass, transit, least square
	<i>method of adjustment.</i>		
Loop	tick box	unticked	
	<i>For loop traverses the tick box should be checked. This assumes that the start and end points are the same.</i>		

The fields in this panel define the start and end point details. If the **loop** option is chosen the end point details are assumed to be the same as the start point In this case the end point group is disabled.

Least square tab

The fields in this panel define the values to be used for least square adjustments.

Field Description	Type	Defaults	Pop-Up
Angular std (sec).			
	<i>The standard deviation of a single angular measurement in seconds of arc.</i>		
Linear std (mm)			
	<i>this value is defined by the standard deviation of a single distance measurement (e.g. 5 mm)</i>		
ppm			
	<i>this value is defined by the edm scale error which is dependant on the length of line measured (e.g. 5ppm = 5mm error over a 1km distance)</i>		
Iterations	input box	10	

the calculation of the adjustment can be aborted if a solution is not found after the specified number of iterations.

Coords differ input box 0.0001

the calculation of the adjustment can stopped when the difference between successive calculations meet the defined tolerance.

variance increase tick box ticked

the calculation of the adjustment can stopped when the variance between successive calculations increases

The fields in start point group specify the start point parameters

Start point button/input

the start point can be selected by selecting the button and then selection and acceptance of a point in an open view. If valid a point id, easting, northing and description of the selected point will be copied into the appropriate fields.

If the start point is to be entered manually, the point id should be entered into the field adjacent to the start point button.

N input

the start point's northing value.

E input

the start point's easting value.

Desc input

the start point's description.

the grid control values can be entered using valid inputs into the various fields.

To Point. *The point id of the next traverse station.*

Bearing(dms). *The bearing of the traverse line.*

Distance. *The distance of the traverse line.*

Point Desc. *The description of the traverse point*

Easting *The easting coordinate of the traverse point. NB. This field is only displayed when the calc or adjust buttons are selected.*

Northing *The northing coordinate of the traverse point. NB. This field is only displayed when the calc or adjust buttons are selected.*

The fields in end point group specify the end point parameters

end point button/input

the end point can be selected by selecting the button and then selection and acceptance of a point in an open view. If valid a point id, easting, northing and description of the selected point will be copied into the appropriate fields.

If the end point is to be entered manually, the point id should be entered into the field adjacent to the end point button.

N input

the end point's northing value.

E input

the end point's easting value.

Desc input
the end point's description.

the misclose line near the bottom of the panel have the following functions.

Bearing input box
the closing bearing for the traverses.

Distance input box
the closing distance of the traverse

Delta east input box
the closing vector's delta east component

Delta east input box
the closing vector's delta east component

Misclosure input box
the ratio of the closing distance to the total traverse distance.

the buttons at the bottom of the panel have the following function.

Calc button
*the calc button is used to calculate coordinate values based on the information input into the grid control and the points tab. The block has to be inserted or appended into the list **before** this can be done.*

Adjust button
the adjustment of the current block can be done after the calc stage has been reached. This will use the method of adjustment as stipulated by the user.

Adjust All button
the adjustment of **all** of the blocks in the list can be done after the calc stage has been reached in each of the individual blocks. This will use the method of adjustment as stipulated by the user.

Save button
*saves the current data in the panel to the TSS file (displayed in the **file name** box).*

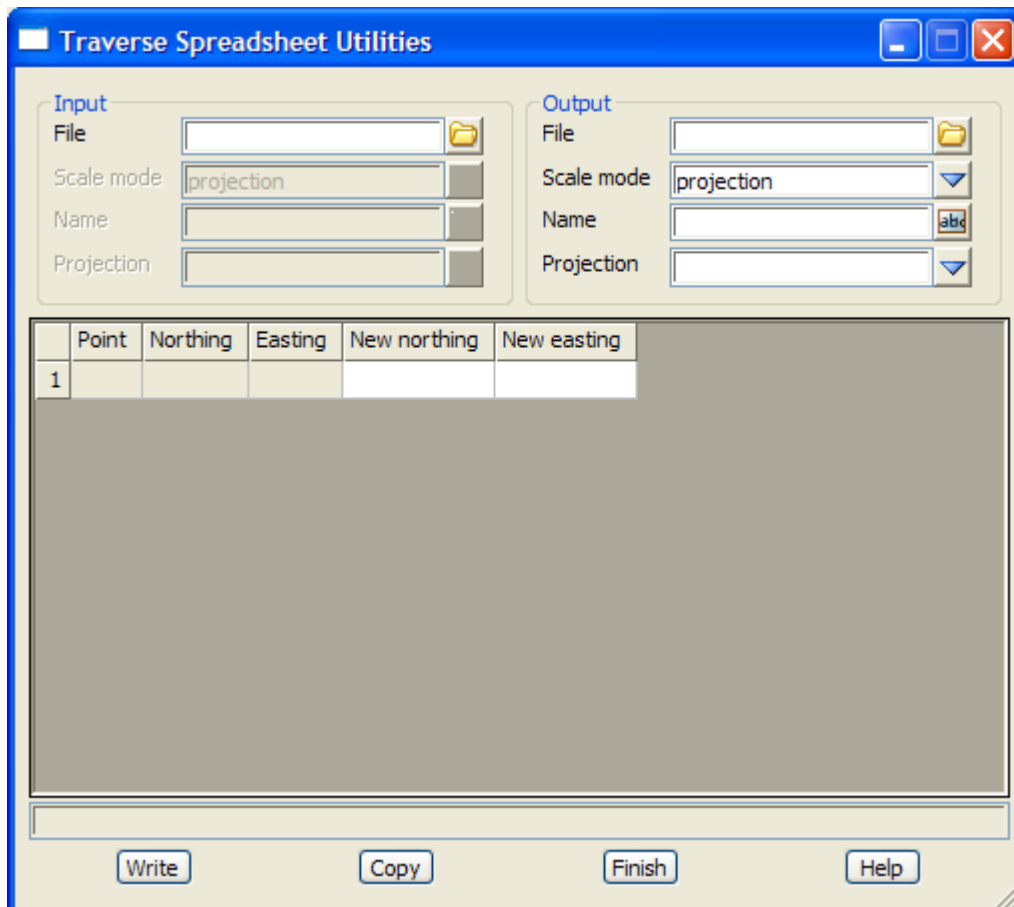
TSS Utilities

traverse_spreadsheet_utilities

Position of option on menu: Survey =>Traverse spreadsheet =>Utilities

The traverse spreadsheet utilities are used to change the file containing a TSS, change the name (TSS), change between Plane (constant scale) or Projection type,

Selecting Traverse Spreadsheet Utilities brings up the **Traverse Spreadsheet Utilities** panel:



Lot Check

lot_check

Position of option on menu: Survey => Traverse spreadsheet => Lot check

The **Lot check** option allows the entry of traverse and radiation blocks from the keyboard, selection of strings from the current view or by reading from a file. Adjustments can then be made including transit, Bowditch, compass or least square adjustment. This option can be used to enter existing plan dimensions to check area calculations as well as ensuring lots are closed to prescribed limits.

Selecting Lot check brings up the **Lot Check** panel

The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

The scale and datum fields are the only difference between the plane and datum lot check panels.

Scale factor	input	project scale factor
---------------------	-------	----------------------

a scale factor can be defined which will be applied to any entered distances. Final distances used in calculations are derived by multiplying the entered distance by the scale factor.

Block count	input	
	<i>the number of blocks within the spreadsheet.</i>	
Desc.	input	
	<i>a spreadsheet can consist of a number of different blocks. For each block, a block description can be given which can help identify a particular traverse/radiation block within the spreadsheet.</i>	
Block flag	input	
	<i>the adjustment mode of the current block. The mode is either adjusted or unadjust. All blocks are set to unadjusted on reading of a file, and the user specifies which blocks are to be adjusted.</i>	
Prev	button	
	<i>allows the navigation to the previous block in the list.</i>	
Next	button	
	<i>allows the navigation to the next block in the list.</i>	
New	button	
	<i>allows for the definition and entry of a new block in the list.</i>	
Update	button	
	<i>allows for the updating of entries when changes have been made. For example, if a distance measurement were to be changed, pushing the update button will ensure the new value will be used in further calculations and adjustments</i>	
Insert	button	
	<i>allows for the insertion of a block into the list in the position defined by the Block position entry.</i>	
Append	button	
	<i>allows for the insertion of a block at the end of the list.</i>	
Delete	button	
	<i>allows for the deletion of the currently displayed block.</i>	
File name	input box	*.ts
	<i>a file name can be defined which will allow for the reading of an existing file and for defining a new file name for reading in the future.</i>	
Read	button	
	<i>the read button allows for the loading of an existing file as specified by the file name box.</i>	
Write	button	
	<i>the write button allows for the saving of the current file as specified in the file name box.</i>	
Pick string	button	
	<i>allows for the loading of the current block by selecting a string from the current view.</i>	
Adjust method	choice	bowditch, compass, transit, least square, none
	<i>method of adjustment.</i>	
Show EN	checkbox	ticked
	<i>if ticked the easting and northing columns will be shown in the grid. If unticked the columns will not</i>	

be shown.

Copy b dsc

if ticked the bearing and description from the previous line in the grid will automatically be copied down to the next entered line.

The fields in this panel define the start and end point details. If the **loop** option is chosen the end point details are assumed to be the same as the start point In this case the end point group is disabled.

Least square tab

The fields in this panel define the values to be used for least square adjustments.

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Angular std (sec).

The standard deviation of a single angular measurement in seconds of arc.

Linear std (mm)

this value is defined by the standard deviation of a single distance measurement (e.g. 5 mm)

ppm

this value is defined by the edm scale error which is dependant on the length of line measured (e.g. 5ppm = 5mm error over a 1km distance)

Iterations 10

the calculation of the adjustment can be aborted if a solution is not found after the specified number of iterations.

Coords differ 0.0001

the calculation of the adjustment can stopped when the difference between successive calculations meet the defined tolerance.

variance increase

the calculation of the adjustment can stopped when the variance between successive calculations increases

The fields in start point group specify the start point parameters

Start point /input

the start point can be selected by selecting the button and then selection and acceptance of a point in an open view. If valid a point id, easting, northing and description of the selected point will be copied into the appropriate fields.

If the start point is to be entered manually, the point id should be entered into the field adjacent to the start point button.

N

the start point's northing value.

E

the start point's easting value.

Desc

the start point's description.

the grid control values can be entered using valid inputs into the various fields.

To Point. The point id of the next traverse station.

Bearing(dms). The bearing of the traverse line.

Distance. The distance of the traverse line.

Point Desc. The description of the traverse point

Easting The easting coordinate of the traverse point. **NB.** This field is only displayed when the calc or adjust buttons are selected.

Northing The northing coordinate of the traverse point. **NB.** This field is only displayed when the calc or adjust buttons are selected.

The fields in end point group specify the end point parameters

end point button/input

the end point can be selected by selecting the button and then selection and acceptance of a point in an open view. If valid a point id, easting, northing and description of the selected point will be copied into the appropriate fields.

If the end point is to be entered manually, the point id should be entered into the field adjacent to the end point button.

N input

the end point's northing value.

E input

the end point's easting value.

Desc input

the end point's description.

the misclose line near the bottom of the panel have the following functions.

Bearing input box

the closing bearing for the traverses.

Distance input box

the closing distance of the traverse

Delta east input box

the closing vector's delta east component

Delta east input box

the closing vector's delta east component

Misclosure input box

the ratio of the closing distance to the total traverse distance.

the buttons at the bottom of the panel have the following function.

Calc button

the calc button is used to calculate coordinate values based on the information input into the grid control and the points tab. The block has to be inserted or appended into the list **before** this can be done.

Adjust button

the adjustment of the current block can be done after the calc stage has been reached. This will use the method of adjustment as stipulated by the user.

Adjust All button

the adjustment of **all** of the blocks in the list can be done after the calc stage has been reached in each of the individual blocks. This will use the method of adjustment as stipulated by the user.

Report button

on selecting this button the NZ traverse spreadsheet report panel appears.

NZ TSS Report

nz_traverse_spreadsheet_report

Position of option on menu: Survey =>Traverse spreadsheet =>NZ report

The NZ report option allows the user to define the report header etc. so as to produce a spreadsheet report which can be printed to a pre-printed NZ sheet.

Selecting NZ report brings up the NZ Traverse Spreadsheet Report panel

The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Input format	choice box	*.ts	*.ts, *.lch

either a TSS file (*.ts) or a lot check file (*.lch) can be reported.

Input file	input box		*.ts
	name of the TSS or lot check file.		
Print	choice box	TS sheet	TS sheet, Calc sheet, Other
	either TS sheet.		
Report parcels	tick box		
	<i>If tick, parcel block types are included in the report.</i>		

Traverse Title section

Traverses of, line 2, line 3, line 4

*The title of the traverses can be entered into the **traverses of** box as well as the following **line 2, line 3** and **line 4** input boxes. Due to the limitation of space on the pre-printed forms supplied by LINZ the number of characters should be limited to 20 characters (inclusive of space characters) for the **traverse of line** and 33 characters (inclusive of space characters) for **lines 2 to 4**.*

*The input into the **traverses for line** is compulsory but for **lines 2 to 4** it is optional.*

Datum Information section

NZ Circuit	choice box	existing NZ circuits
	the circuit in which the current spreadsheet file relates to should be specified.	
Projection	choice box	Geodetic 1949 Geodetic 2000 Old Cadastral

the appropriate NZ geodetic datum should be selected.

Coords in terms of section

these parameters are only required to be entered for the Old cadastral datum case. For other datums, the values are automatically updated.

Point name	input box
	the name of the origin point should be entered.
Northing	input box
	the northing coordinate of the origin point should be entered.
Easting	input box
	the easting coordinate of the origin point should be entered.

Other Details section

Field book	input box	
	the name of the field book used.	
Plan no	input box	
	the plan no to be created if known.	
NZ Land District	choice box	Existing NZ land districts
	the appropriate NZ land district should be selected.	
Report file	files box	*.rpt files
	<i>file name for the report.</i>	

Report file button
a report using the nominated file name is created.

Standard TSS Report

standard_spreadsheet_traverse_report

Position of option on menu: Survey =>Traverse spreadsheet =>Standard report

The **Standard report** allows the user to define the report header etc. so as to produce a standard TSS report which can be printed, saved or edited.

Selecting **Standard report** brings up the **Standard Traverse Spreadsheet Report** panel

The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Input format	choice box	*.ts	*.ts, *.lch
either a TSS file (*.ts) or a lot check file (*.lch) can be reported.			
Input file	input box		*.ts
name of the TSS or lot check file.			
Print	choice box	TS sheet	TS sheet, Calc sheet, Other
either TS sheet.			
Report parcels	tick box		
<i>If tick, parcel block types are included in the report.</i>			

Traverse Title section

Job id	text input box
text to use as the Job id.	

Traverses of, line 2, line 3, line 4

The title of the traverses can be entered into the **traverses of** box as well as the following **line 2, line 3** and **line 4** input boxes. Due to the limitation of space on the pre-printed forms supplied by LINZ the number of characters should be limited to 20 characters (inclusive of space characters) for the **traverse of line** and 33 characters (inclusive of space characters) for **lines 2 to 4**.

The input into the **traverses for line** is compulsory but for **lines 2 to 4** it is optional.

Surveyor id text input box

text to use as the Surveyor id.

Computer operator text input box

text to use as the Computer operator.

Report file files box *.rpt files
file name for the report.

Report file button
a report using the nominated file name is created.

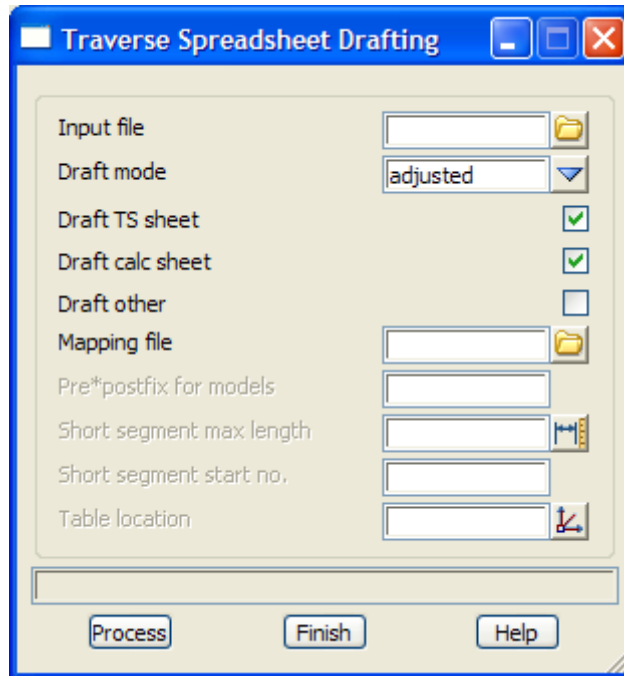
TSS Drafting

traverse_spreadsheet_drafting

Position of option on menu: Survey => Traverse spreadsheet=> Drafting

The Traverse spreadsheet **drafting** produce models, linestyles and colours for data within the TSS.

Selecting **Drafting** brings up the Traverse Spreadsheet Drafting panel



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Input file <i>name of the existing spreadsheet file to create drafting for.</i>	file box		*.ts
Draft mode <i>the draft mode will determine if adjusted strings are used for drafting or if the unadjusted values(initial) values are used</i>	choice box	adjusted	adjusted initial
Draft TS sheet <i>if tick,</i>	tick box		
Draft calc sheet <i>if tick,</i>	tick box		
Draft other <i>if tick,</i>	tick box		
Mapping file <i>mapping file to define the drafting</i>	mapping file box		*.mf
Pre*postfix for models <i>pre and post text to add to the model names given in the mapping file</i>	text input box		

Short segment max length real input box

maximum size for a segment to be considered a short segment. Short segments are labelled with a number and the details placed in a table.

Short segment start no. integer input box

start number for any short segments.

Table location xyz box

world position for the short segment table.

Process button

process the traverse spreadsheet and create the drafting and short segment table.

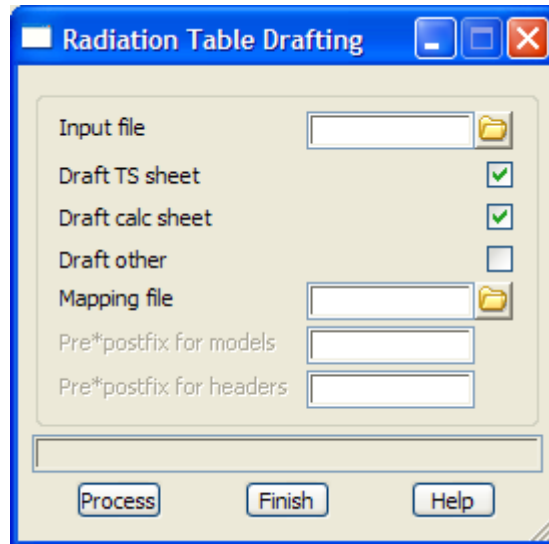
TSS Radiation Table Drafting

radiation_table_drafting

Position of option on menu: Survey => Traverse spreadsheet=> Radiation table

The Traverse spreadsheet radiation table option produces radiation tables for the radiation data in a traverse spreadsheet.

Selecting Radiation table brings up the Radiation Table Drafting panel



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Input file name of the existing spreadsheet file to create radiation tables for.	file box		*.ts
Draft TS sheet <i>if tick,</i>	tick box		
Draft calc sheet <i>if tick,</i>	tick box		
Draft other <i>if tick,</i>	tick box		
Mapping file <i>mapping file to define the drafting</i>	mapping file box		*.mf
Pre*postfix for models <i>pre and post text to add to the model names given in the mapping file</i>	text input box		
Pre*postfix for headers <i>pre and post text to add to the header names for the radiation tables.</i>	text input box		
Process <i>process the traverse spreadsheet and create the radiation tables.</i>	button		

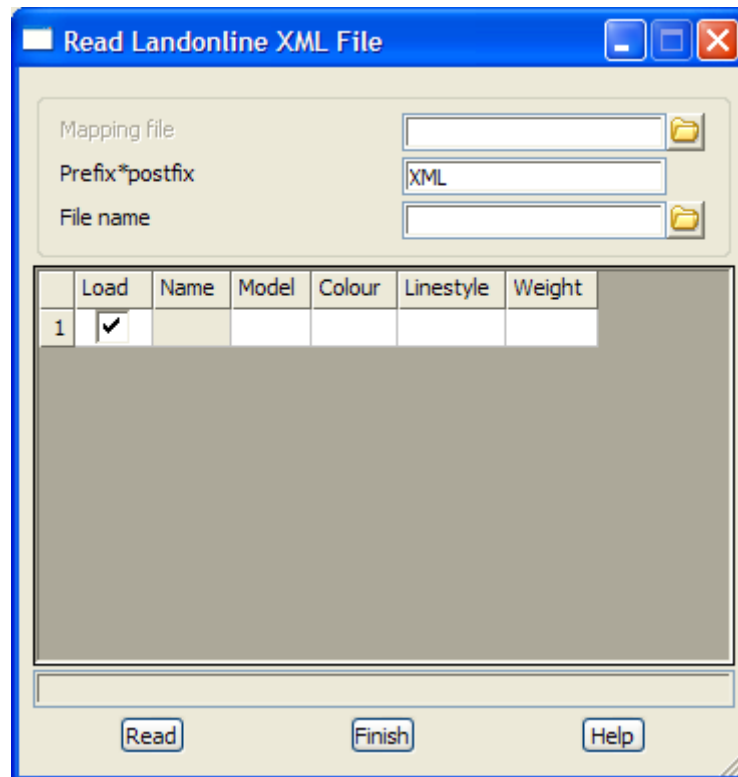
Landonline XML Read

`read_Landonline_xml_file`

Position of menu: Survey => Traverse spreadsheet => Landonline XML read

The Landonline XML Read option reads in data in the XML format for Landonline New Zealand.

Selecting Landonline XML read brings up the Read Landonline XML File panel



Documentation is available from *12d NZ Ltd.*

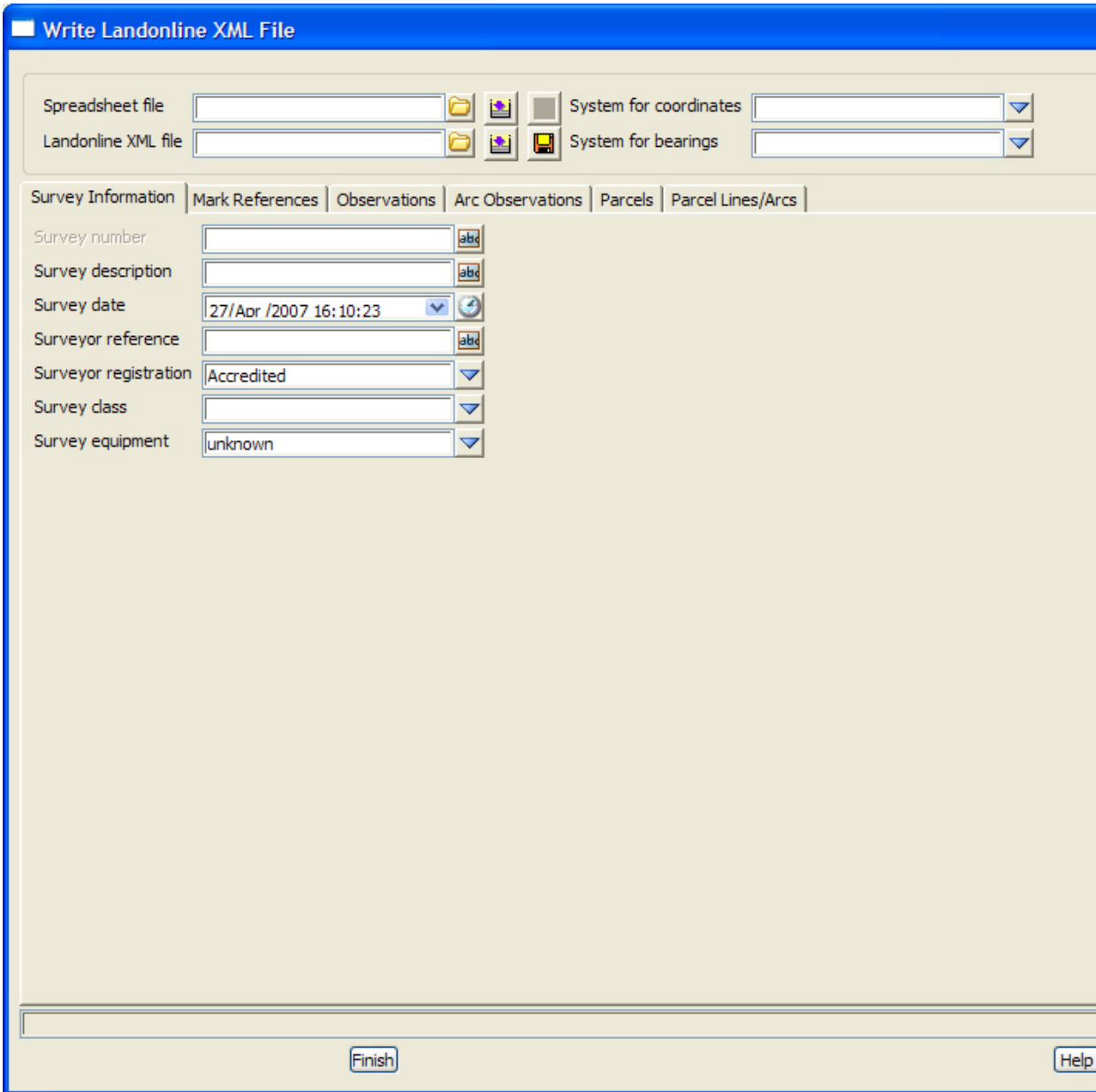
Landonline XML Write

read_Landonline_xml_file

Position of menu: Survey => Traverse spreadsheet => Landonline XML write

The Landonline XML Write option writes out data in the XML format for Landonline New Zealand.

Selecting Landonline XML write brings up the Write Landonline XML File panel



Documentation is available from 12d NZ Ltd.

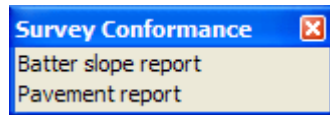
Conformance

survey_conformance

Position of menu: Survey =>Conformance

The Conformance walk-right menu contains survey options for generating conformance reports and models on surveyed points representing as-built batter slopes and pavements, compared against string data representing designed batter slopes and pavements.

The Conformance walk-right menu is



Generate batter slope conformance report
Generate pavement conformance report

For the option *Batter slope report*,
Pavement report,

go to the section:"Batter slope report"
go to the section:"Pavement report"

Batter slope report

Conformance_Report_Batters_panel

Position of option on menu: Survey =>Conformance =>Batter slope report

The **Batter slope report** option generates a conformance report on surveyed points representing an as-built batter slope, compared against string data representing a designed batter slope.

In addition to the conformance report, an output results model of the surveyed points can be generated, grouping the points by colour into their conformance zones (i.e. *within tolerance*, *above tolerance*, *below tolerance*, and *not tested*). The points in the results model can have z-values and vertex text set to show various combinations of point level, point conformance, and point error.

Note1: the term *point conformance* is used here to refer to a point's distance from design (distance from the conformance line on diagram below), while the term *point error* refers to a point's distance out of tolerance. As such, a point that is within tolerance (i.e. a *conformant point*) will, in general, have a non-zero conformance and a zero error, while a point that is out of tolerance (i.e. a *non-conformant point*) will have both a non-zero conformance and a non-zero error.

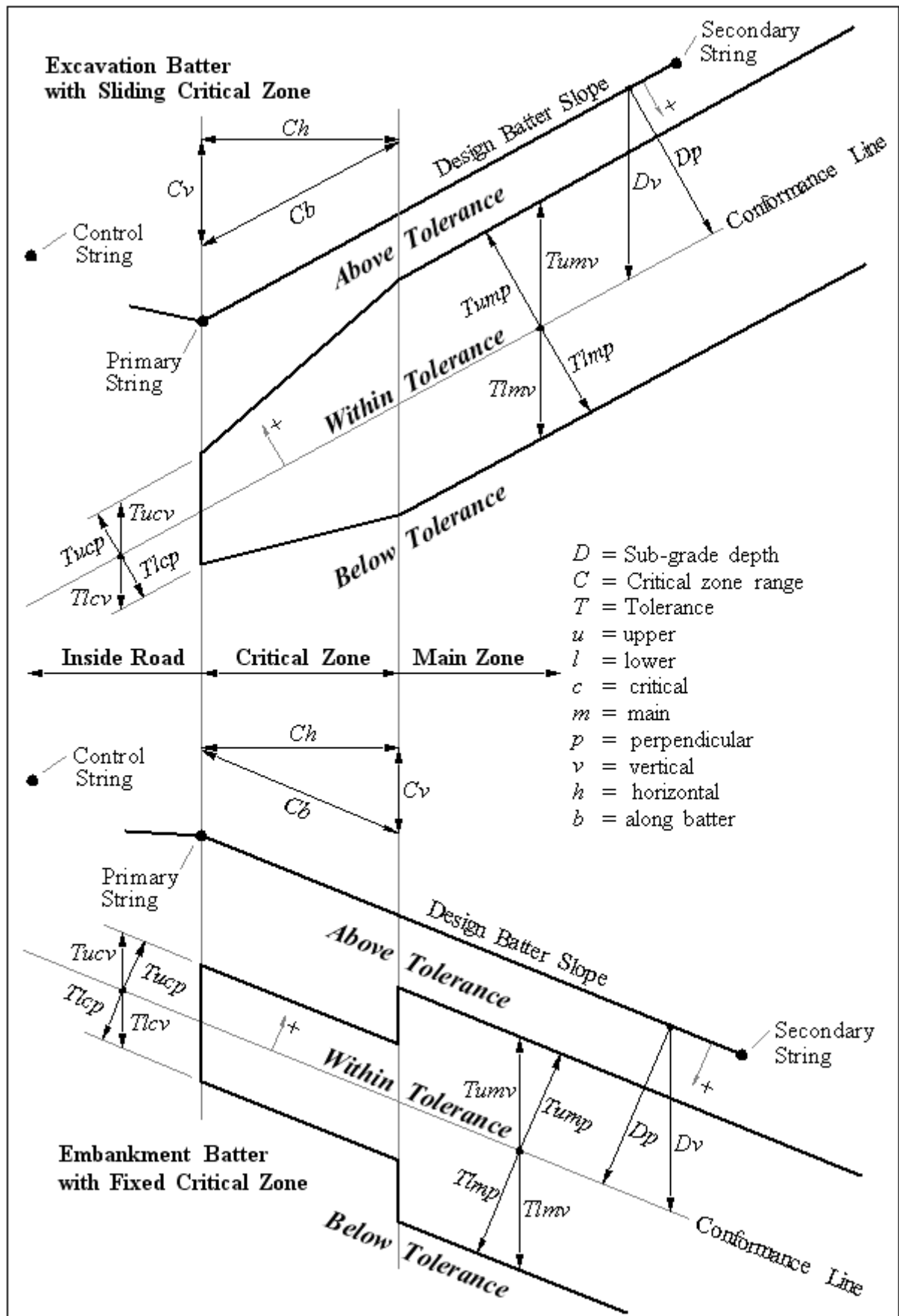
Note2: the point conformances and errors can be measured either vertically or perpendicular to the conformance line. It is perhaps worthwhile to note, especially in the case of the *sliding critical zone*, that the perpendicular measurements are determined from the vertical measurements, and **not** vice versa. That is, if the slope of the conformance line, measured from horizontal, is denoted by the angle A , then a surveyed point Q , has a perpendicular conformance Q_{cp} , and error Q_{ep} , determined from the point's vertical conformance Q_{cv} , and error Q_{ev} , via the following relationships:

$$Q_{cp} = Q_{cv} \cdot \cos A$$

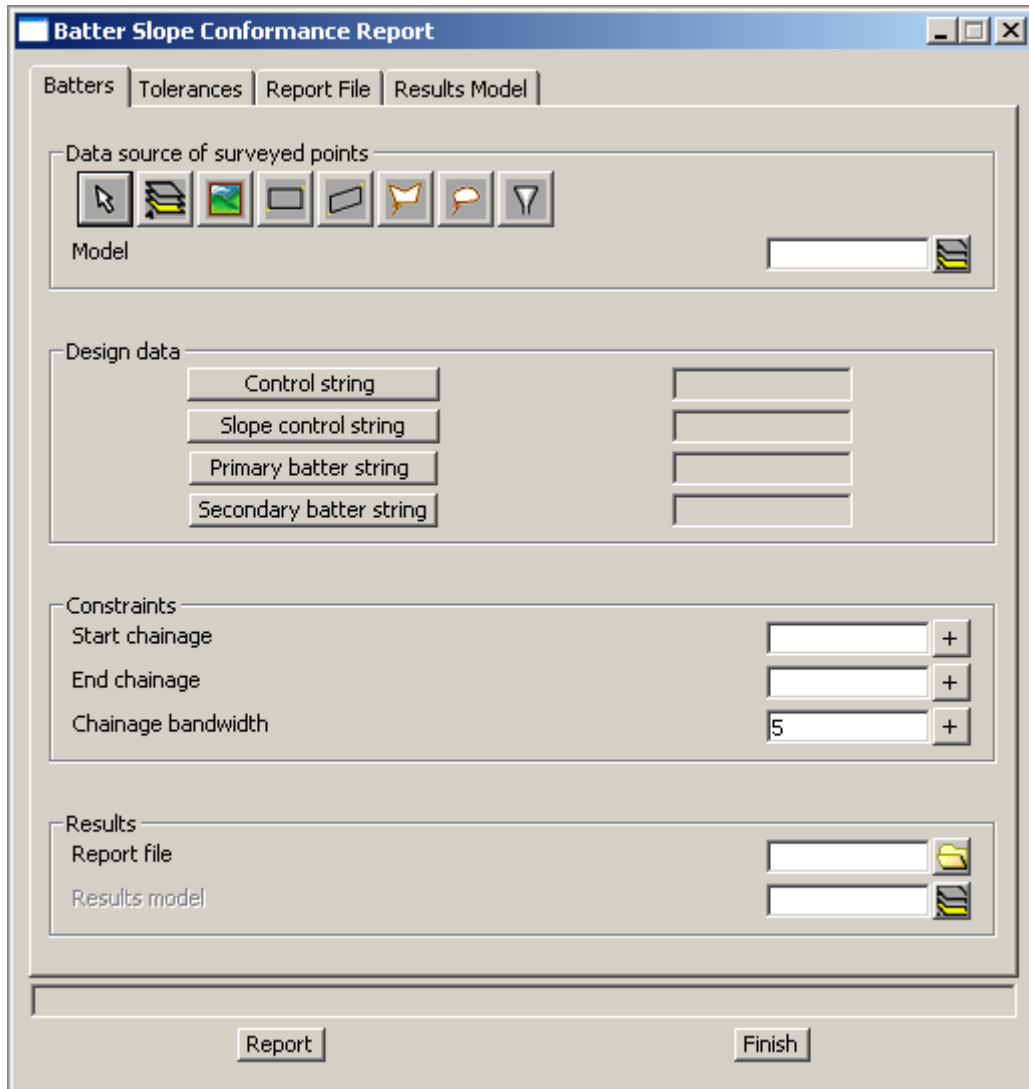
$$Q_{ep} = Q_{ev} \cdot \cos A$$

Note3: the conformance line is the line from which all point conformances and tolerances are measured, and is always parallel to the design batter slope line. When testing a sub-grade survey, the conformance line will normally be below the design batter slope line, but when testing a completed-construction survey, the two lines should normally coincide.

Typical sections through excavation and embankment batters are shown in the diagram below, along with schematics showing how the surveyed points are tested for conformance:



Selecting Batter slope report brings up the Batter Slope Conformance Report panel
 The first tab on this panel is the Batters Tab:



The fields and buttons on the Batters Tab have the following functions:

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Survey data

Data source of points source box

all points selected with this source box (whether they exist in point-string form or line-string form) will be considered as the set of surveyed points to be tested for conformance.

Note: *the data for the Point Description column in the report will be taken from the string names of the selected points. If all the string names are blank, however, the point description data in the report will show point ids representing the sequential order that the points are reported in. The results model (if generated) will always have the string names of each point set to match the reported point description.*

Design data

Control string string box

the string selected with this box should normally represent the road centreline, and will be used to determine the chainage and offset of each surveyed point

Slope control string string box

the Slope control string is optional (and is not shown on the diagram above). If no string is selected, the Primary string, below, will be used as the Slope control string. The line that is formed in plan, from a surveyed point to the nearest point on the Slope control string, defines the vertical plane used to conform that surveyed point. The slope formed between the primary and secondary strings on this vertical plane, is the design slope for that surveyed point.

Primary string string box

the string selected with this box should represent one edge of the designed batter (normally the edge closer to the road - i.e. the toe string of an excavation batter, or the crest string of an embankment batter).

The Primary string represents the start of the Critical Zone, which continues horizontally in the direction of the Secondary string, for a distance specified in the Critical zone range field (on the Tolerances Tab).

Secondary string string box

the string selected with this box should represent the other edge of the designed batter (normally the edge further away from the road - i.e. the interface string)

Constraints**Start chainage** real box

the start chainage of the surveyed points to be conformed. Any point with a chainage less than the start chainage will not be tested. By default, the start chainage is set when the Control string is selected, but a different value can be typed in.

End chainage real box

the end chainage of the surveyed points to be conformed. Any point with a chainage greater than the end chainage will not be tested. By default, the end chainage is set when the Control string is selected, but a different value can be typed in.

Chainage bandwidth real box 5.0

if zero or blank, the surveyed points are simply sorted in ascending chainage order. However, if a value greater than zero is entered, the surveyed points will also be sub-sorted into chainage bands, in ascending offset order. Within each chainage band, the difference between the maximum and minimum chainage will be less than the Chainage bandwidth. This is a useful feature if the surveyed points are set out in rows of roughly equivalent chainage.

Results**Report file** file box *.rpt

the name of the conformance report file to be created. If no extension is given, it will be given an extension of ".rpt".

Results model model box available models

the name of the results model to be created. If blank, the results model is not created.

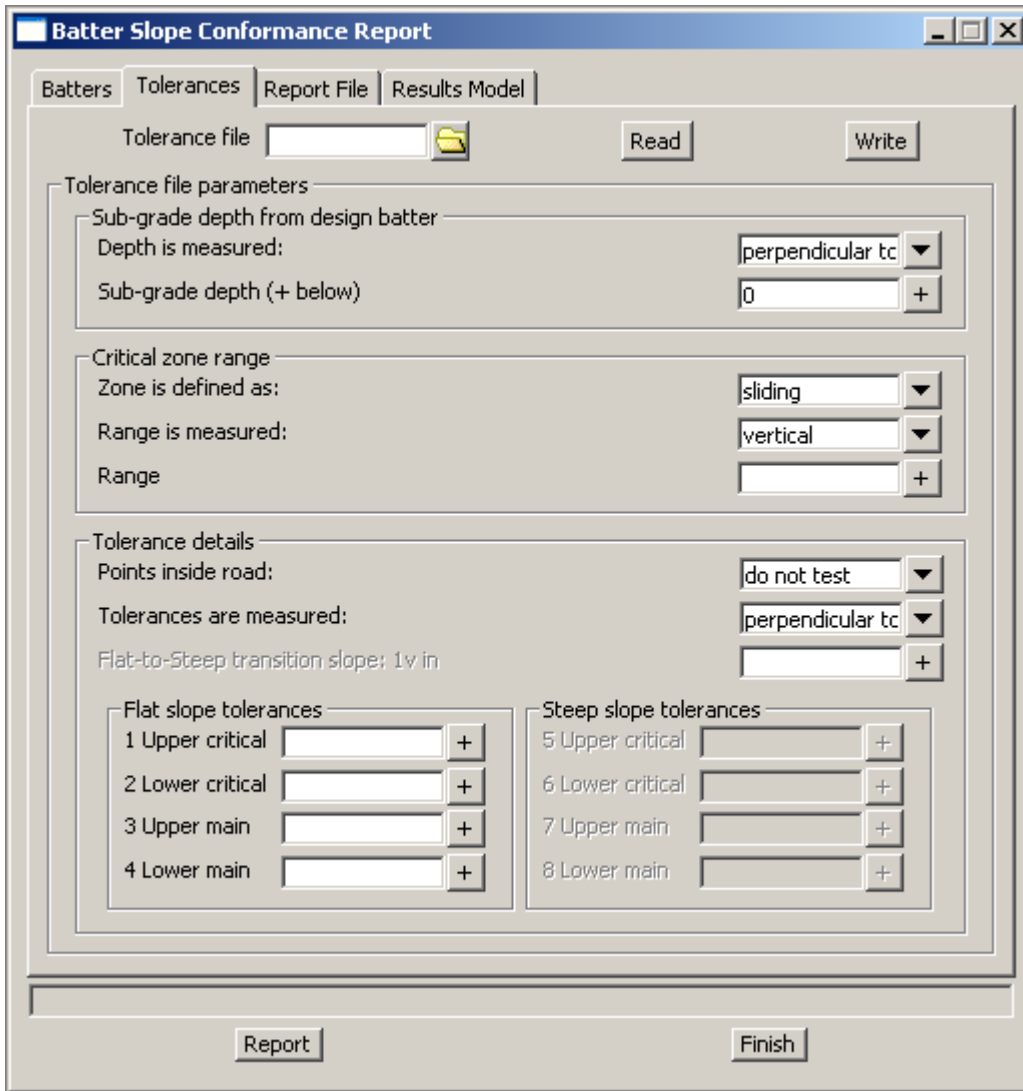
Buttons**Report** button

generates the conformance report file and the results model. This button can be activated regardless of which panel tab is currently active.

Finish button

exits the option and closes the panel. This button can be activated regardless of which panel tab is currently active.

The next tab on the panel is the Tolerances Tab:



The fields and buttons on the Tolerances Tab have the following functions:

Field Description	Type	Defaults	Pop-Up
Tolerance file	file box		*.tol

the name of the tolerance file used to load and/or save the details of the conformance. If no extension is given, it will be given an extension of ".tol". The tolerance file stores the details of every field on the Tolerances Tab, the Report File Tab, and the Results Model Tab. The tolerance file itself is not required to run a conformance test - it is merely provided as a convenience.

Read button

Pressing this button will populate the panel fields on the last three panel tabs, with the data stored in the tolerance file. If data for a particular field is not found, that field remains unaffected.

Write button

Pressing this button will create a new tolerance file or replace an existing one. The contents of all non-blank fields on the last three panel tabs, are written to the file at this time.

Sub-grade depth from design batter

Depth is measured	choice box	perpendicular	perpendicular to batter vertical
-------------------	------------	---------------	-------------------------------------

whether the sub-grade depth is measured perpendicular to the batter or vertically (refer to parameters D_p and D_v on the diagram above)

Sub-grade depth real box 0.0

the depth of the conformance line from the design batter (refer to parameters D_p and D_v on the diagram above). If testing a sub-grade survey, this value will normally be greater than zero. If testing a completed-construction survey, however, this value will normally be zero, and the conformance line will coincide with the design batter slope line.

Critical zone range

Zone is defined as choice box sliding sliding fixed

determines whether the Critical Zone is defined as sliding or fixed (refer to diagram above). For excavation batters, the zone is normally sliding, whilst for embankment batters, it is normally fixed.

Range is measured choice box vertical along batter vertical horizontal

determines how the size of the Critical Zone is measured (refer to parameters C_b , C_v , and C_h on the diagram above)

Range real box

the size of the Critical Zone, measured in the specified direction (refer to parameters C_b , C_v , and C_h on the diagram above). This distance must be zero or greater.

Tolerance details

Points inside road choice box do not test do not test test with zero tolerance test with fixed crit. tolerance

determines what to do with any surveyed points found inside the road. If such points are found, and this field is set to **do not test**, the points will be classified as untested, and in the results model, will have their vertex text set to **INR**.

Note: untested points do not appear in the conformance report.

Tolerances measured choice box perpendicular perpendicular to batter vertical

whether the conformance tolerances are measured perpendicular to the batter or vertically (refer to parameters T^{*p} and T^{*v} on the diagram above). This field also determines whether the reported point conformances and point errors are measured perpendicular or vertically.

Flat-to-Steep transition slope: 1v in real box

It is possible to use two different sets of batter slope tolerances, when producing the conformance report. The Flat slope tolerance set will be used whenever the design slope is equal to the transition slope or flatter, and the Steep slope tolerance set will be used whenever the design slope is steeper than the transition slope. The transition slope must be specified as a positive number, and will be interpreted as a slope in the form

1[v] : transition slope[h]. Leaving this field blank will disable the Steep slope tolerance set, ensuring that only the Flat slope tolerance set will ever be used.

Flat slope tolerances

The following four tolerances are used if the *transition slope* is not specified, or whenever the design slope is equal to the *transition slope* or flatter.

- 1 Upper critical** real box
refer to parameters Tucp and Tucv on the diagram above. This value is normally zero or greater.
- 2 Lower critical** real box
refer to parameters Tlcp and Tlcv on the diagram above. This value is normally zero or less.
- 3 Upper main** real box
the upper allowable distance that a surveyed point, found to be in the Main Zone, may be from the conformance line, in order to be conformant (refer to parameters Tump and Tumv on the diagram above). This value is normally zero or greater.
- 4 Lower main** real box
the lower allowable distance that a surveyed point, found to be in the Main Zone, may be from the conformance line, in order to be conformant (refer to parameters Tlmp and Tlmv on the diagram above). This value is normally zero or less.

Steep slope tolerances

The following four tolerances are used only if the *transition slope* is specified, and the design slope is steeper than the *transition slope*.

- 5 Upper critical** real box
refer to parameters Tucp and Tucv on the diagram above. This value is normally zero or greater.
- 6 Lower critical** real box
refer to parameters Tlcp and Tlcv on the diagram above. This value is normally zero or less.
- 7 Upper main** real box
the upper allowable distance that a surveyed point, found to be in the Main Zone, may be from the conformance line, in order to be conformant (refer to parameters Tump and Tumv on the diagram above). This value is normally zero or greater.
- 8 Lower main** real box
the lower allowable distance that a surveyed point, found to be in the Main Zone, may be from the conformance line, in order to be conformant (refer to parameters Tlmp and Tlmv on the diagram above). This value is normally zero or less.

The next tab on the panel is the Report File Tab:

The fields on the Report File Tab have the following functions:

Field Description	Type	Defaults	Pop-Up
Max lines per page	integer box	70	

the maximum number of report lines that can fit on a printed page. This number is needed so that page breaks (form feed characters) can be inserted into the report file at the appropriate places. The number of lines per page will vary depending on the editor/word-processor used for printing, the desired page size and margin widths, the desired page layout (portrait or landscape), and the desired font and font size. As such, the number needs to be tuned for the user's particular report specifications/requirements.

Note1: you may find that MS Notepad is not a good program for printing out the report file (Notepad doesn't seem to interpret form feed characters).

Note2: if Max lines per page is set to a large enough number, there will be no page breaks in the report file.

Header information

Original survey file input box
optional line of text in the report header to identify the original survey data file

Lot number input box
optional line of text in the report header to identify the lot number

Lot location input box
optional line of text in the report header to identify the lot location

Lot description input box
optional line of text in the report header to identify the lot description

Table options

Show design levels tick box off
whether to show the design levels in the column after the point levels

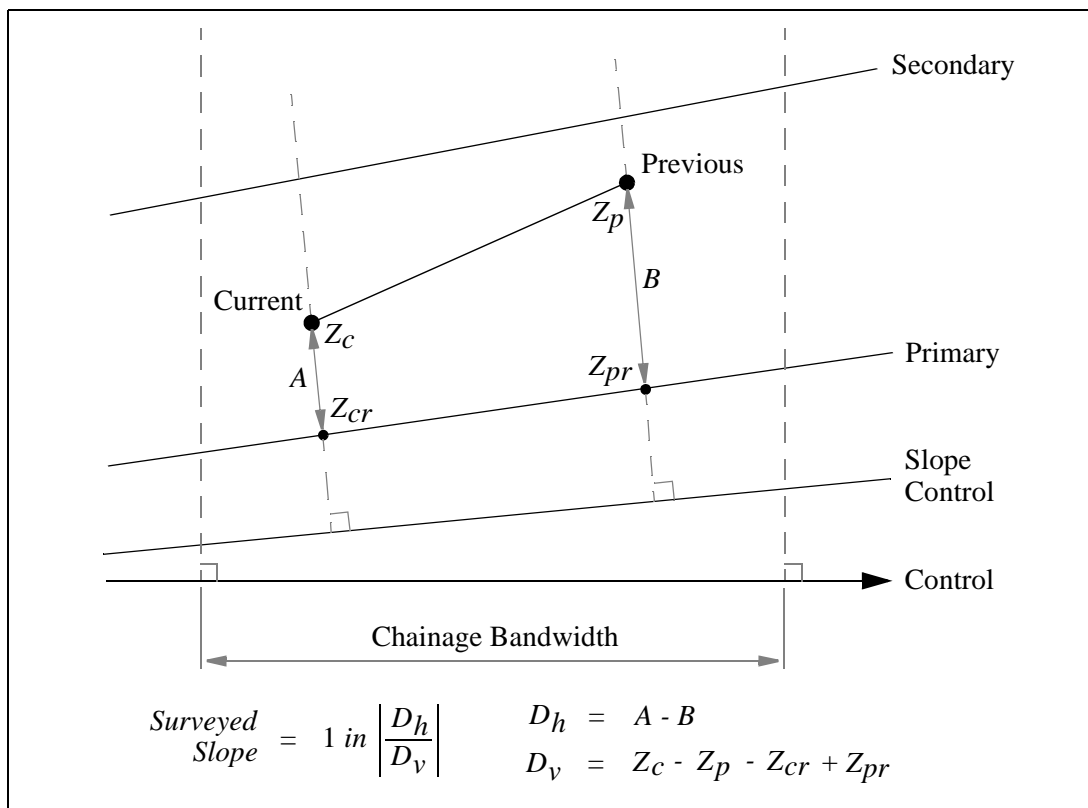
Note: the design levels are always vertically above or below the point levels, even if the tolerances are measured perpendicular to the design slope.

Show non-conformance errors
 tick box off

whether to show the point errors for non-conformant points (i.e. the distances the points are out of tolerance). If turned on, the point errors will appear in parentheses, (=, after the conformance and tolerance details.

Show non-conformance slopes
 tick box off

whether to show the surveyed slopes at non-conformant points. The surveyed slope is the slope between the previous and current point in the report, within a single, offset-sorted chainage band. The slope is calculated as though the previous point lies in the same vertical plane as that of the current point's design slope. As such, the slope is adjusted for any differences in bearing direction between the two design slopes, and for any incline in the road, as shown in the diagram, below:



If turned on, the surveyed slopes will appear in square brackets, [=, after the conformance, tolerance and point error details.

Note: if the Chainage bandwidth on the Batters Tab is zero or blank, then the points will only be sorted by chainage, and not sub-sorted by offset within chainage bands. In this case, surveyed slopes will never be reported.

Footer information

Surveyor name input box
name of the person required to sign the report (optional)

Surveyor title input box
title of the person required to sign the report (optional)

The last tab on the panel is the Results Model Tab:

The screenshot shows a software dialog box titled "Batter Slope Conformance Report". It has four tabs: "Batters", "Tolerances", "Report File", and "Results Model". The "Results Model" tab is selected. The dialog is divided into several sections:

- Results model details:**
 - "Clean results model beforehand": A checkbox that is currently unchecked.
 - "Z values are:": A dropdown menu with "levels" selected.
 - "Vertex text shows:": A dropdown menu with "conformances" selected.
 - "Vertex textstyle data": A text input field with a font icon button.
- Colours:**
 - "Points within tolerance": A color selection box with "green" and a green swatch.
 - "Points above tolerance": A color selection box with "red" and a red swatch.
 - "Points below tolerance": A color selection box with "cyan" and a cyan swatch.
 - "Untested points": A color selection box with "grey" and a grey swatch.
- Create tin of tested results model points:**
 - "Tin name": A text input field with a tin icon button.
 - "Model for tin": A dropdown menu with a model icon button.
 - "Tin colour": A text input field with a color selection icon button.

At the bottom of the dialog, there are two buttons: "Report" and "Finish".

The fields on the Results Model Tab have the following functions:

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Clean results model beforehand

tick box	off
----------	-----

whether to clean the contents of an existing results model before re-running the option

Z values are	choice box	levels	levels conformances errors
---------------------	------------	--------	----------------------------------

determines what z values to give the points generated in the results model

Note: any untested points in the model will have their z values set to their original point levels, regardless.

Vertex text shows	choice box	conformances	levels conformances errors
--------------------------	------------	--------------	----------------------------------

determines what values to show in the vertex text of the points generated in the results model

Note1: any points within tolerance will have a zero error. For these points, if the vertex text is set to errors, no text will be set.

Note2: any untested points in the model will have the vertex text set to show one of four possible error codes, explaining why the point was not tested. The error codes are **NUL** (invalid z-value), **OCR** (outside chainage range), **ERR** (intersection error or similar), and **INR** (inside road).

Vertex textstyle data	textdata box		user textdata favourites
------------------------------	--------------	--	--------------------------

controls the appearance of the vertex text for the points generated in the results model

Colours

Points within tolerance	colour box	green	available colours
--------------------------------	------------	-------	-------------------

colour for points within tolerance

Points above tolerance	colour box	red	available colours
-------------------------------	------------	-----	-------------------

colour for points above tolerance

Points below tolerance	colour box	cyan	available colours
-------------------------------	------------	------	-------------------

colour for points below tolerance

Untested points	colour box	grey	available colours
------------------------	------------	------	-------------------

colour for untested points

Note: untested points do not appear in the conformance report.

Create tin of tested results model points

Tin name	tin box		available tins
-----------------	---------	--	----------------

name of the tin to create. If the tin already exists, a prompt will ask if it should be replaced. If this field is blank, or if the Results model field (on the Batters Tab) is blank, no tin will be created.

Note: the tin will be created only with the set of tested points created in the Results model, and can be used to quickly display contour maps of the results. When creating the tin, an attempt is made to null any triangles outside the "shrink-wrapped" boundary of the tested points. The boundary polygon used for this nulling procedure is determined from the extremity points of each offset-sorted chainage band (see Chainage bandwidth on the Batters Tab).

Model for tin	model box		available models
----------------------	-----------	--	------------------

model for tin to be placed in, for viewing purposes. If blank, the tin is not placed into a model.

Tin colour	colour box		available colours
-------------------	------------	--	-------------------

colour for tin. If blank, the tin will adopt the colour selected for Points within tolerance.

Pavement report

Conformance_Report_Pavement_panel

Position of option on menu: Survey =>Conformance =>Pavement report

The **Pavement report** option generates a conformance report on surveyed points representing the top of an as-built pavement, compared against string data representing the top of a designed pavement (level conformance), and compared against tin data representing the bottom of an as-built pavement (thickness conformance).

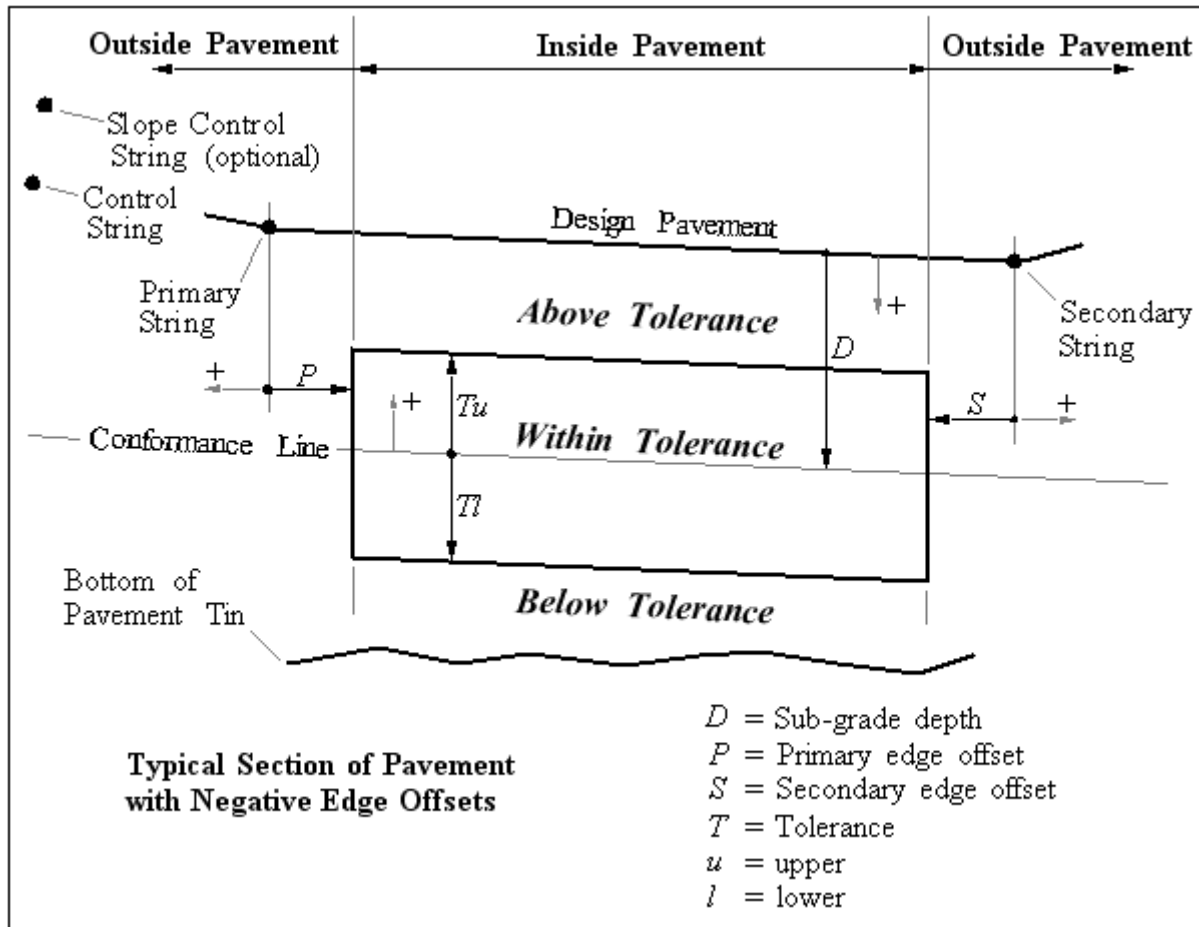
In addition to the conformance report, an output results model of the surveyed points can be generated, grouping the points by colour into their conformance zones (i.e. *within tolerance*, *above tolerance*, *below tolerance*, and *not tested*). The points in the results model can have z-values and vertex text set to show various combinations of point level, point conformance, point error, pavement thickness and pavement thickness error.

Note1: the term *point conformance* is used here to refer to a point's distance from design (distance from the conformance line on diagram below), while the term *point error* refers to a point's distance out of tolerance. As such, a point that is within tolerance (i.e. a *conformant point*) will, in general, have a non-zero conformance and a zero error, while a point that is out of tolerance (i.e. a *non-conformant point*) will have both a non-zero conformance and a non-zero error.

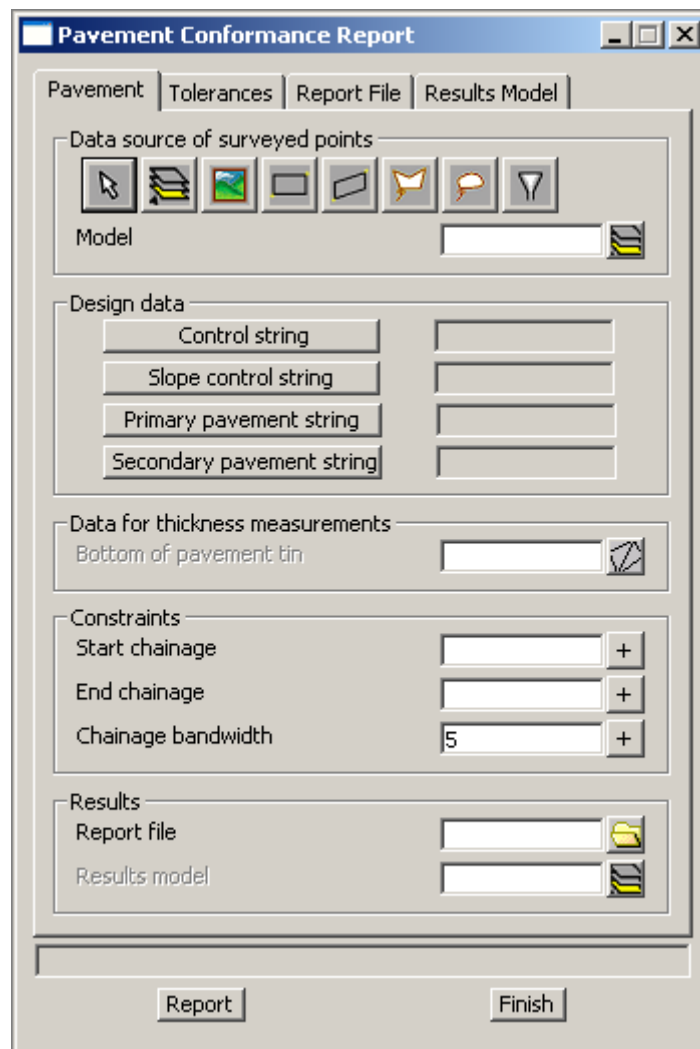
Note2: the point conformances and errors can be measured either vertically or perpendicular to the conformance line. The conformance line is the line from which all point conformances and tolerances are measured, and is always parallel to the design pavement line. When testing a sub-grade survey, the conformance line will normally be below the design pavement line, but when testing a completed-construction survey, the two lines should normally coincide.

Note3: the optional pavement thickness measurements are always made vertically downwards from the surveyed points, to the tin representing the bottom of pavement. Pavement thickness errors will be non-zero wherever the pavement is found to be too thick or too thin. When testing for both level conformance and thickness conformance, both tests must pass for a point to be considered conformant.

A typical section of pavement is shown in the diagram below, along with a schematic showing how the surveyed points are tested for level conformance:



Selecting Pavement report brings up the Pavement Conformance Report panel
The first tab on this panel is the Pavement Tab:



The fields and buttons on the Pavement Tab have the following functions:

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Survey data

Data source of points source box

all points selected with this source box (whether they exist in point-string form or line-string form) will be considered as the set of surveyed points to be tested for conformance.

Note: *the data for the Point Description column in the report will be taken from the string names of the selected points. If all the string names are blank, however, the point description data in the report will show point ids representing the sequential order that the points are reported in. The results model (if generated) will always have the string names of each point set to match the reported point description.*

Design data

Control string string box

the string selected with this box should normally represent the road centreline, and will be used to determine the chainage and offset of each surveyed point

Slope control string string box

the Slope control string is optional. If no string is selected, the Control string, above, will be used as the Slope control string. The line that is formed in plan, from a surveyed point to the nearest point on the Slope control string, defines the vertical plane used to conform that surveyed point. The slope formed between the primary and secondary strings on this vertical plane, is the design slope for that surveyed point.

Primary string string box

the string selected with this box should represent one edge of the designed pavement (normally the edge that is closer to the Control string)

Secondary string string box

the string selected with this box should represent the other edge of the designed pavement (normally the edge that is further away from the Control string).

Note: *If the selected string is the same as the Primary string, or if no string is selected, then the pavement is defined by one string and is considered to be flat (i.e. zero cross-fall), and to have a width defined by the Primary and Secondary edge offsets (on the Tolerances Tab). This feature can be useful for identifying any surveyed points that are close to an edge line.*

Data for thickness measurements**Bottom of pavement tin** tin box available tins

the Bottom of pavement tin is optional. If not selected, the pavement is not tested for thickness conformance. The tin selected with this box should represent the as-built bottom surface of the pavement currently being tested.

Constraints**Start chainage** real box

the start chainage of the surveyed points to be conformed. Any point with a chainage less than the start chainage will not be tested. By default, the start chainage is set when the Control string is selected, but a different value can be typed in.

End chainage real box

the end chainage of the surveyed points to be conformed. Any point with a chainage greater than the end chainage will not be tested. By default, the end chainage is set when the Control string is selected, but a different value can be typed in.

Chainage bandwidth real box 5.0

if zero or blank, the surveyed points are simply sorted in ascending chainage order. However, if a value greater than zero is entered, the surveyed points will also be sub-sorted into chainage bands, in ascending offset order. Within each chainage band, the difference between the maximum and minimum chainage will be less than the Chainage bandwidth. This is a useful feature if the surveyed points are set out in rows of roughly equivalent chainage.

Results**Report file** file box *.rpt

the name of the conformance report file to be created. If no extension is given, it will be given an extension of .rpt.

Results model model box available models

the name of the results model to be created. If blank, the results model is not created.

Buttons

Report button

generates the conformance report file and the results model. This button can be activated regardless of which panel tab is currently active.

Finish button

exits the option and closes the panel. This button can be activated regardless of which panel tab is currently active.

The next tab on the panel is the Tolerances Tab:

The fields and buttons on the Tolerances Tab have the following functions:

Field Description	Type	Defaults	Pop-Up
Tolerance file	file box		*.tol

the name of the tolerance file used to load and/or save the details of the conformance. If no extension is given, it will be given an extension of ".tol". The tolerance file stores the details of every field on the Tolerances Tab, the Report File Tab, and the Results Model Tab. The tolerance file itself is not required to run a conformance test - it is merely provided as a convenience.

Read button

Pressing this button will populate the panel fields on the last three panel tabs, with the data stored in the tolerance file. If data for a particular field is not found, that field remains unaffected.

Write button

Pressing this button will create a new tolerance file or replace an existing one. The contents of all non-blank fields on the last three panel tabs, are written to the file at this time.

Sub-grade depth from design pavement

Depth is measured choice box vertical perpendicular to pavement vertical

whether the sub-grade depth is measured perpendicular to the pavement or vertically (refer to parameter *D* on the diagram above)

Note: since pavements typically have cross-fall slopes of less than 7%, the value of this setting should make very little difference to the results.

Sub-grade depth real box 0.0

the depth of the conformance line from the design pavement (refer to parameter *D* on the diagram above). If testing a sub-grade survey, this value will normally be greater than zero. If testing a completed-construction survey, however, this value will normally be zero, and the conformance line will coincide with the design pavement line.

Pavement edge details

Points outside pavement choice box do not test do not test
test with zero tolerance
test with normal tolerance

determines what to do with any surveyed points found outside the pavement. If such points are found, and this field is set to **do not test**, the points will be classified as untested, and in the results model, will have their vertex text set to **EDG**.

Note: untested points do not appear in the conformance report.

Primary edge offset real box 0.0

the amount to horizontally increase or decrease the width of the design pavement at the Primary string edge (refer to parameter *P* on the diagram above). A negative value decreases the width, which is the more common case, since surveyed points near a pavement edge are normally ignored for the purposes of conformance.

Secondary edge offset real box 0.0

the amount to horizontally increase or decrease the width of the design pavement at the Secondary string edge (refer to parameter *S* on the diagram above). A negative value decreases the width, which is the more common case, since surveyed points near a pavement edge are normally ignored for the purposes of conformance.

Tolerance details

Tolerances measured choice box vertical perpendicular to pavement vertical

whether the conformance tolerances are measured perpendicular to the pavement or vertically (refer to parameters *Tu* and *Tl* on the diagram above). This field also determines whether the reported point conformances and point errors are measured perpendicular or vertically.

Note: since pavements typically have cross-fall slopes of less than 7%, the value of this setting should make very little difference to the results.

Upper tolerance real box

the upper allowable distance that a surveyed point may be from the conformance line, in order to be conformant (refer to parameter *Tu* on the diagram above). This value is normally zero or greater.

Lower tolerance real box

the lower allowable distance that a surveyed point may be from the conformance line, in order to be conformant (refer to parameter T1 on the diagram above). This value is normally zero or less.

Thickness details

Maximum thickness real box

the maximum allowable vertical distance that a surveyed point may be above the Bottom of pavement tin, in order to be conformant. If blank, there will be no upper limit to the pavement thickness.

Minimum thickness real box

the minimum allowable vertical distance that a surveyed point may be above the Bottom of pavement tin, in order to be conformant. If blank, there will be no lower limit to the pavement thickness.

The next tab on the panel is the Report File Tab:

The fields on the Report File Tab have the following functions:

Field Description	Type	Defaults	Pop-Up
Max lines per page	integer box	70	

the maximum number of report lines that can fit on a printed page. This number is needed so that page breaks (form feed characters) can be inserted into the report file at the appropriate places. The number of lines per page will vary depending on the editor/word-processor used for printing, the desired page size and margin widths, the desired page layout (portrait or landscape), and the desired font and font size.

As such, the number needs to be tuned for the user's particular report specifications/requirements.

Note1: you may find that MS Notepad is not a good program for printing out the report file (Notepad doesn't seem to interpret form feed characters).

Note2: if Max lines per page is set to a large enough number, there will be no page breaks in the report file.

Header information

Original survey file input box
optional line of text in the report header to identify the original survey data file

Lot number input box
optional line of text in the report header to identify the lot number

Lot location input box
optional line of text in the report header to identify the lot location

Lot description input box
optional line of text in the report header to identify the lot description

Table options

Show design levels tick box off
whether to show the design levels in the column after the point levels

Note: the design levels are always vertically above or below the point levels, even if the tolerances are measured perpendicular to the design slope.

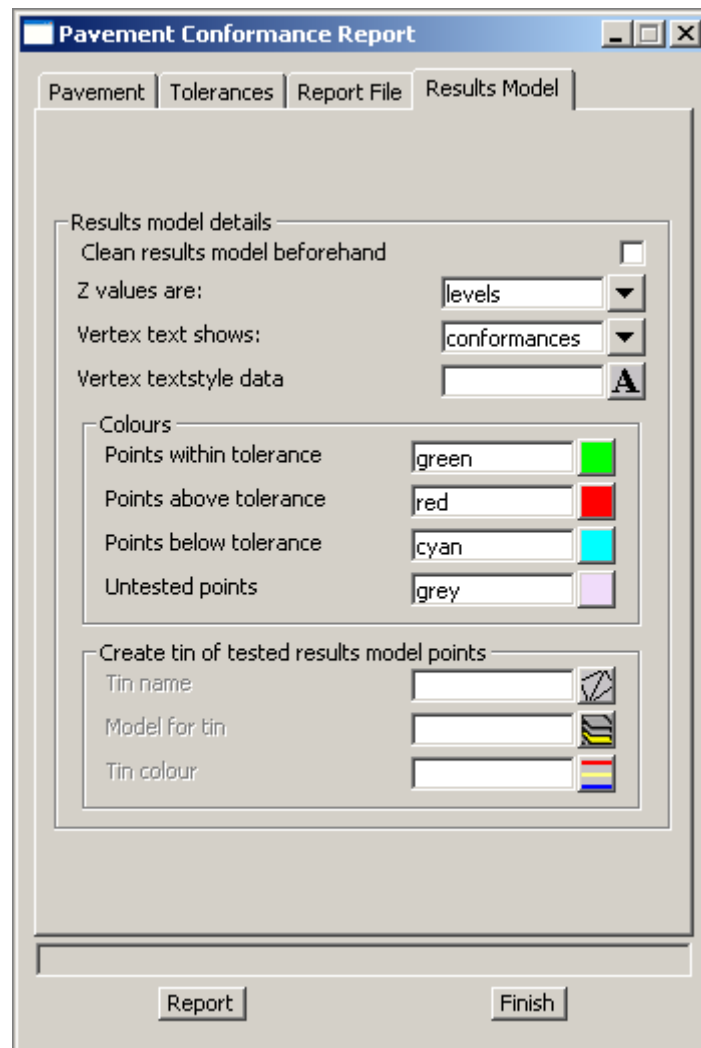
Show non-conformance errors
tick box off
whether to show the point errors and thickness errors for non-conformant points (i.e. the distances the points are out of level and thickness conformance, respectively). If turned on, the point errors will appear in parentheses, (), after the conformance and tolerance details, and the thickness errors will appear in parentheses, (), after the thickness and max/min thickness details.

Footer information

Surveyor name input box
name of the person required to sign the report (optional)

Surveyor title input box
title of the person required to sign the report (optional)

The last tab on the panel is the Results Model Tab:



The fields on the Results Model Tab have the following functions:

Field Description	Type	Defaults	Pop-Up
Clean results model beforehand	tick box	off	
<i>whether to clean the contents of an existing results model before re-running the option</i>			
Z values are	choice box	levels	levels conformances errors thicknesses thickness errors

determines what z values to give the points generated in the results model

Note: any untested points in the model will have their z values set to their original point levels, regardless.

Vertex text shows	choice box	conformances	levels conformances errors thicknesses thickness errors
--------------------------	------------	--------------	---

determines what values to show in the vertex text of the points generated in the results model

Note1: any points that pass the level conformance test will have a zero error. For these points, if the vertex text is set to **errors**, no text will be set. Likewise, any points that pass the thickness conformance test will have a zero thickness error. For these points, if the vertex text is set to **thickness errors**, no text will be set.

Note2: any untested points in the model will have the vertex text set to show one of five possible error codes, explaining why the point was not tested. The error codes are **NUL** (invalid z-value), **OCR** (outside chainage range), **ERR** (intersection error or similar), **EDG** (outside pavement edge), and **NTN** (bottom of pavement tin not defined at point).

Vertex textstyle data textdata box user textdata favorites
controls the appearance of the vertex text for the points generated in the results model

Colours

Points within tolerance colour box green available colours
colour for points within tolerance (i.e. points that pass both the level and thickness conformance tests)

Points above tolerance colour box red available colours
colour for points above tolerance (i.e. points that are above the Upper tolerance or points where the pavement is thicker than the Maximum thickness)

Points below tolerance colour box cyan available colours
colour for points below tolerance (i.e. points that are below the Lower tolerance or points where the pavement is thinner than the Minimum thickness)

Untested points colour box grey available colours
colour for untested points

Note: untested points do not appear in the conformance report.

Create tin of tested results model points

Tin name tin box available tins
name of the tin to create. If the tin already exists, a prompt will ask if it should be replaced. If this field is blank, or if the Results model field (on the Pavement Tab) is blank, no tin will be created.

Note: the tin will be created only with the set of tested points created in the Results model, and (depending on what the points' z-values are set to in the Results model) can be used to quickly display contour maps of the results, or to create a Bottom of pavement tin for the next pavement layer to be tested. When creating the tin, an attempt is made to null any triangles outside the "shrink-wrapped" boundary of the tested points. The boundary polygon used for this nulling procedure is determined from the extremity points of each offset-sorted chainage band (see Chainage bandwidth on the Pavement Tab).

Model for tin model box available models
model for tin to be placed in, for viewing purposes. If blank, the tin is not placed into a model.

Tin colour colour box available colours
colour for tin. If blank, the tin will adopt the colour selected for Points within tolerance.

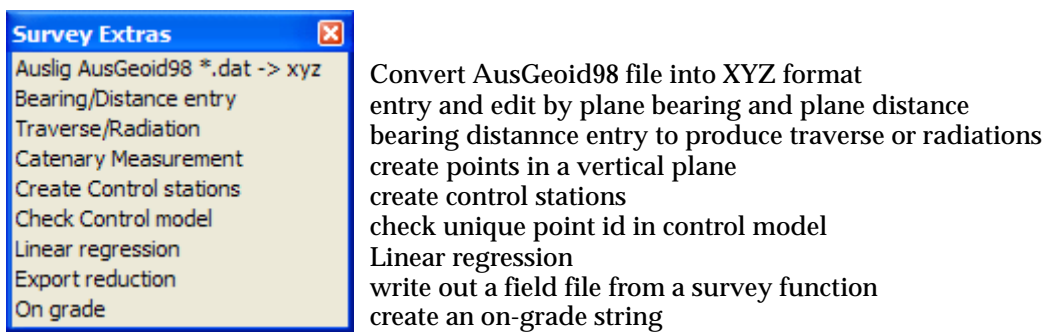
Extras

survey_extras

Position of menu: Survey =>Extras

The extras walk-right menu contains extra survey options. some of which are still being developed.

The extras walk-right menu is



For the option *Auslig AusGeoid98 *.dat ->xyz*, go to the section "AusGeoid98 *.dat -> xyz"

Bearing/Distance entry

"Plane Bearing/Distance Entry"

Traverse/Radiation

"Bearing/Distance Entry for Traverse/Radiation"

Catenary measurement

"Catenary Measurement"

Create Control Station

"Create Control Stations"

Check control model

"Check Control Model"

Linear regression

"Linear Regression"

Reduction to field file

"Survey Function to Field File"

On grade

"On Grade"

AusGeoid98 *.dat -> xyz

auslig_ausgeoid98__dat__xyz

Position of option on menu: Survey =>Extras =>Auslig AusGeoid98 *.dat->xyz

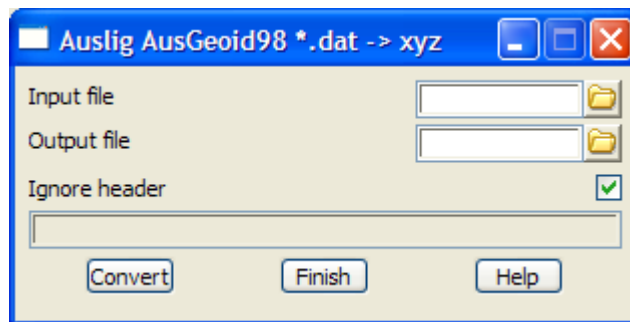
The **Ausgeoid98 *.dat -> xyz** option allows the conversion of a standard AusGeoid98 *.dat file into a XYZ format. This format can then be read into 12d. The values in the XYZ file will have the following meaning

X value will represent the Longitude

Y value will represent the Latitude

Z value will represent the N value

Selecting **Ausgeoid98 *.dat -> xyz** brings up the **Ausgeoid98 *.dat -> xyz** panel



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Input file <i>this filename of the AusGeoid file. The .dat extension is added by default.</i>	file box		*.dat
Output file <i>this filename of the XYZ file to be produced.</i>	file box		
Ignore header <i>if ticked, the first line in the *.dat file is ignored (usually the header)</i>	checkbox	ticked	
Convert <i>convert the file.</i>	button		

For more information about terminology used in this option, see the Appendix "Geodetics Summary" .

Plane Bearing/Distance Entry

bearing_distance_entry

Position of option on menu: Survey =>Extras =>Bearing/distance entry

The bearing/distance entry option allows the input of a traverse by manual input of plane bearings and plane distances or by selecting an existing string.

Selecting Bearing/distance entry brings up the **Bearing/Distance Entry** panel

The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Name	name box		defined names from names.4d file
<i>this field is optional. If non-blank, the name of the new string.</i>			
Model	model box		available models
<i>if non-blank, the model of the new string. If blank, the original string model is used.</i>			
Colour	colour box	red	available colours
<i>if non-blank, the colour of the new string. If blank, the original string colour is used.</i>			
Linestyle	input	1	available line styles
<i>line style of the string.</i>			
Scale factor	input	projection scale	
<i>This value will be applied to any entered distances. i.e. final distance = entered distance * scale factor</i>			

The scale factor could be a point scale factor, a line scale factor or a combined scale factor.
The final distance will be used for coordinate calculations.

Use z- value tick box transit

if **tick**, the z-values for each point can be entered.
If **no tick** then z-values are not entered.

Point id input typed none, auto increment, typed

if **none**, no point ids are entered and the grid control will not show a column for point ids.

If **auto increment** then the values of point ids will be incremented by a value of 1 starting from the specified **Start point id**. If no **Start point id** is specified then no point ids will be allocated. No column for point ids is shown in the grid control.

if **typed** then the values of point ids will be incremented by a value of 1, starting from the specified **Start point id**. If no **Start point id** is specified then no point ids will be allocated unless a value is entered in the grid control on which time the next value in the grid will have a incremented value. The column for point ids is shown in the grid control.

VALUES IN GRID grid box

The columns shown in the grid will depend on the selection of the **Use z- value** and **Point id** fields.

	To Pt.	Bearing (dms)	Distance	Height
1				

To Pt. input

if **none** is selected for the **Point id** field, this column will not be displayed.

if **auto increment** is selected for the **Point id** field, this column will not be displayed.

if **typed** is selected for the **Point id** field, this column will be displayed. In this case, the point id will increment automatically by entering over the field. If a new value is typed into the **To Pt.** field, the next line will increment from that number.

Bearing (dms) angle box

The user should enter the bearing for the segment into this field.

Distance input box

the user should enter the distance of the segment.

Height input box

This column will only be visible in the grid if the **Use z- value** tickbox has been ticked. The user should enter the height of the point. This value will not be used for calculation of the segment. It will simply be assigned to the newly created vertex.

Select button

on pressing the select button, a user is able to pick an existing string from the current view. If a non-traverse type string is selected an option to convert it to a traverse string will be given. The grid control will be filled with the relevant information for the traverse string.

If a traverse string has been modified by some other process (e.g. move) an option will be given to adopt the new characteristics of the string as displayed or revert back to the information that originally defined the traverse string. Depending on which option is selected, the grid will be filled with the relevant information.

Process button

changes to the traverse can be made in the grid control for lines already defined. For example, a distance entry may be incorrectly typed in and edited some time later. By using the process button the traverse string is re-calculated using the current values in the grid control.

Bearing/Distance Entry for Traverse/Radiation

bearing_distance_traverse_radiation_entry

Position of option on menu: Survey =>Extras =>Traverse/Radiation

The Traverse/radiation option allows the input of a traverse or radiations by manual input of plane bearings and plane distances or by selecting an existing string.

Bearing/Distance Traverse/Radiation Entry

Selecting Traverse/Radiation brings up the **Bearing/Distance Traverse/Radiation Entry** panel

The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Name	name box		defined names from names.4d file
			<i>this field is optional. If non-blank, the name of the new string/strings.</i>
Model	model box		available models
			<i>if non-blank, the model of the new string. If blank, the original string model is used.</i>
Colour	colour box	red	available colours
			<i>if non-blank, the colour of the new string. If blank, the original string colour is used.</i>
Linestyle	input	1	available line styles
			<i>line style of the string.</i>
Scale factor	input	projection scale	

*This value will be applied to any entered distances. i.e. final distance = entered distance * scale factor
The scale factor could be a point scale factor, a line scale factor or a combined scale factor.
The final distance will be used for coordinate calculations.*

Start point coords xyz pick box
coordinates of the first point. The bearing/distances start from this point.

Start point id input
if Point ids is auto increment, point id of the first point.

Point id input typed none, auto increment, typed
if none, no point ids are entered and the grid control will not show a column for point ids.

*If **auto increment** then the values of point ids will be incremented by a value of 1 starting from the specified **Start point id**. If no **Start point id** is specified then no point ids will be allocated. No column for point ids is shown in the grid control.*

*if **typed** then the values of point ids will be incremented by a value of 1, starting from the specified **Start point id**. If no **Start point id** is specified then no point ids will be allocated unless a value is entered in the grid control on which time the next value in the grid will have a incremented value. The column for point ids is shown in the grid control.*

Use z- value tick box
*if tick, the z-values for each point can be entered.
If no tick then z-values are not entered.*

Radiation tick box
*if tick, the bearing distances are used to create points that are radiations from the start point.
If no tick the bearing/distances are used to create a traerse string beginning at the start point.*

VALUES IN GRID grid box
*The columns shown in the grid will depend on the selection of the **Use z- value** and **Point id** fields.*

	To Pt.	Bearing (dms)	Distance	Height
1				

To Pt. input
*if none is selected for the **Point id** field, this column will not be displayed.*

*if **auto increment** is selected for the **Point id** field, this column will not be displayed.*

*if **typed** is selected for the **Point id** field, this column will be displayed. In this case, the point id will increment automatically by entering over the field. If a new value is typed into the To Pt. field, the next line will increment from that number.*

Bearing (dms) angle box
The user should enter the bearing for the segment into this field.

Distance input box
the user should enter the distance of the segment.

Height input box
*This column will only be visible in the grid if the **Use z- value** tickbox has been ticked. The user should enter the height of the point. This value will not be used for calculation of the segment. It will simply be assigned to the newly created vertex.*

Select button

on pressing the select button, a user is able to pick an existing string from the current view. If a non-traverse type string is selected an option to convert it to a traverse string will be given. The grid control will be filled with the relevant information for the traverse string.

If a traverse string has been modified by some other process (e.g. move) an option will be given to adopt the new characteristics of the string as displayed or revert back to the information that originally defined the traverse string. Depending on which option is selected, the grid will be filled with the relevant information.

Process button

changes to the traverse can be made in the grid control for lines already defined. For example, a distance entry may be incorrectly typed in and edited some time later. By using the process button the traverse string is re-calculated using the current values in the grid control.

Catenary Measurement

catenary_measurement

Position of option on menu: Survey =>Extras =>Catenary measurement

The Catenary measurements option allows for the picking up of data in the vertical plane between two known points using only a bearing and a vertical angle. For example, picking up wires between towers where a distance measurement to the cable is not possible.

Selecting Catenary measurements brings up the **Catenary Measurements** panel

The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Instrument setup

- | | | | |
|---------------|--|--|--|
| Coords | xyz box | | |
| | <i>the xyz coordinates of the instrument.</i> | | |
| Id | input box | | |
| | <i>the vertex id (point id) of the instrument.</i> | | |

Height input box
the height of the instrument.

1st Attachment

Coords xyz box
the xyz coordinates of the attachment point of the cable on the first tower.

Id input box
the vertex id (point id) of the first tower.

2nd Attachment

Coords xyz box
the xyz coordinates of the attachment point of the cable on the second tower.

Id input box
the vertex id (point id) of the second tower.

Reading

Horizontal angle correction angle box
angle to be subtracted from the Horizontal Angle reading to give true bearing.

Reading No input box
number for the reading.

Horz. Angle angle box
Horizontal Angle reading. The Horizontal angle correction is subtracted from this to give the true bearing.

Vert. Angle angle box
Vertical Angle reading.

Results

Create string tick box ticked
if ticked, a string of the observed points is created.

Name input box
name of the created string.

Model model box available models
name of the model for the created string.

Colour colour box red available colours
the colour of the created string.

Linestyle input 1 available linestyles
linestyle of the created string.

Report file file box *.rpt files
if non-blank, the name of the file to write the report to.

Process button
reduce the angle readings.

Create Control Stations

create_control_stations

Position of option on menu: Survey =>Extras =>Create Control stations

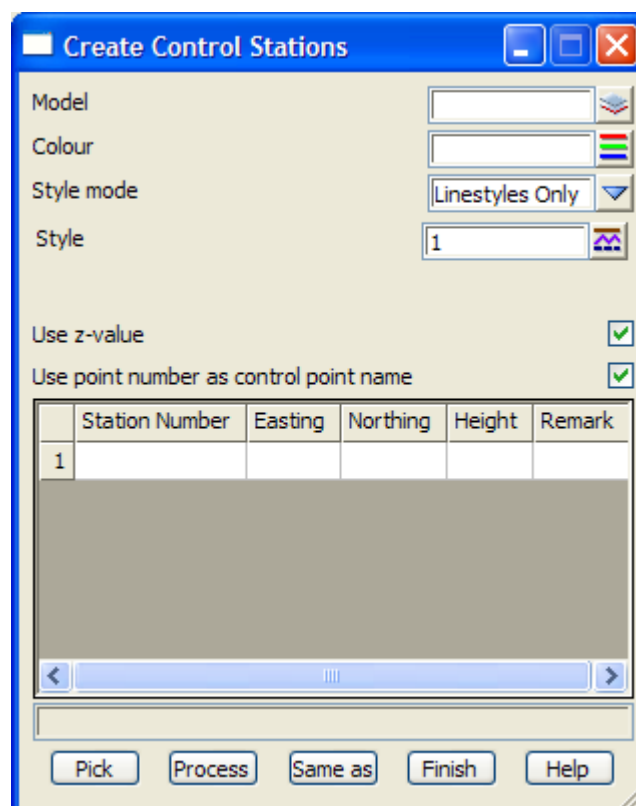
Position of option on menu: Strings =>Create =>Create Control Stations

A *control station* (for surveying) consists of a one point string. For V6, the *point name* is the name of the control station. For V5 and before, the *string name* is used as name of the control station.

Control stations are used when reducing 12d field files in the *Survey Reduction* module.

The Create Control Stations options allows the user to define control stations in a given model. The option checks that the point ids are unique in the control model.

Selecting Create Control Stations brings up the **Create Control Station** panel



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Model <i>name of the model for the control stations.</i>	model box		available models
Colour <i>the colour of the new control stations.</i>	colour box	red	available colours
Line style <i>line style of the control station.</i>	input	1	available line styles
Use z-value <i>if ticked, the height value must be specified for all of the stations.</i>	tick box	ticked	
Use point id as control point name	tick box	ticked	

if ticked, the point names are used as the names of the control points and the **point names** are checked for uniqueness.

If not ticked, the name of the string is used as the names of the control points and the **string names** are checked for uniqueness. This is only for compatibility in pre 12d Model V6.0.

Station name Easting Northing Height Remark

the information for stations to be created is entered into the grid. The stations are created by selecting the **Process** button.

If a station name is typed in and the <enter> key pressed then the Model is searched and if a control station already exists of the same name (either point name or string name depending on the **Use point id as control point name flag**), the co-ordinates are displayed in the grid.

The grid control values can be entered/displayed using valid inputs into the various fields.

Station name. The associated text that identifies the control point.

Easting The easting coordinate of the control point.

Northing The northing coordinate of the control point.

Height The height of the station. (Only displayed if the use z-value tickbox is selected.)

Remark The description of the control station.

Process button

After the **Process** button is chosen, the control stations in the grid are created. If a station of the given name already exists in the control Model, the user is asked if the co-ordinates of the station are to be updated by the values given in the grid.

Same as button

After the **Same as** button is chosen, another string is selected and information about it is used for the Model, Colour and Point style fields in this panel.

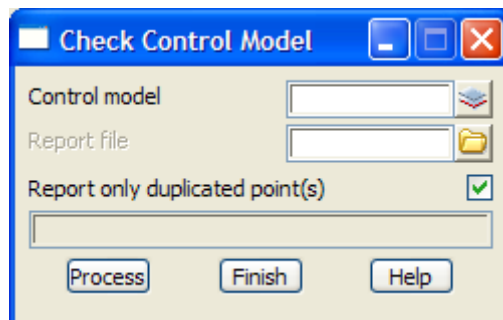
Check Control Model

[check_control_model](#)

Position of option on menu: Survey =>Extras =>Check Control model

The **Check control model** option checks that there are no points in the control model with the same point id. A report of all the points in the control models, or only those with clashing point ids, is created.

Selecting **Check control model** brings up the **Check Control Model** panel



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Control model <i>the model the check for unique point ids.</i>	model box		available models

Report file file box *.rpt files
if non-blank, the name of the file to write the report to.

Report only duplicated point(s) tick box ticked
*if ticked, only those points with duplicated point ids are reported.
If not ticked, all points in the control model are written out.*

Process button
check the Control model for duplicated point ids.

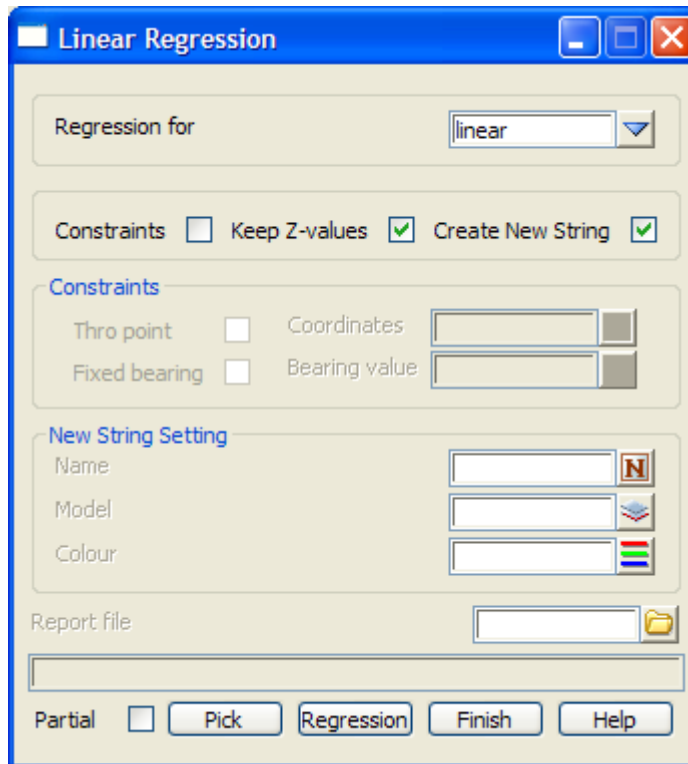
Linear Regression

linear_regression

Position of option on menu: Survey =>Extras =>Linear regression

The linear regression option will create a line, circle or arc of best fit through points on a string. The line can be constrained to go through a selected point or have a given bearing.

Selecting linear regression brings up the **linear regression** panel



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Regression for	choice box	line	line, circle, arc
<i>if line/circle/arc, the line/circle/arc of best fit through the points is created.</i>			

Constraints	tick box		
<i>if tick, the regression line can be restrained to go through a selected point or be given a selected bearing.</i>			

Keep z-values	tick box	tick	
<i>if tick, the z-values of the selected string are used on the regression string.</i>			

Create new string	tick box	tick	
<i>if tick, a new adjusted string is created. If not tick, the selected string is adjusted.</i>			

Constraints

Thro point	tick box	
<i>if tick, the regression line is constrained to go through the point with co-ordinates given in the Coordinates field.</i>		

Coordinates	
<i>if thro point is ticked, the regression line is constrained to go through the point given in this field.</i>	

Fixed bearing tick box

if tick, the regression line is constrained to have the bearing given in the Bearing value field.

Bearing value

*if **thro point** is ticked, the regression line is constrained to have the bearing given in this field.*

Name name box

if non-blank, the name of the new string. If blank, the original string name is used.

Model model box available models

if non-blank, the model of the new string. If blank, the original string model is used.

Colour colour box available colours

if non-blank, the colour of the new string. If blank, the original string colour is used.

Report file *.rpt files

if non-blank, a report for the adjustment is created with this name. If non-blank, no report is created.

Partial tick box

if tick, only part of the string is used in the regression.

Pick button

select the string to create a regression line/circle/arc from.

Regression button

perform the regression.

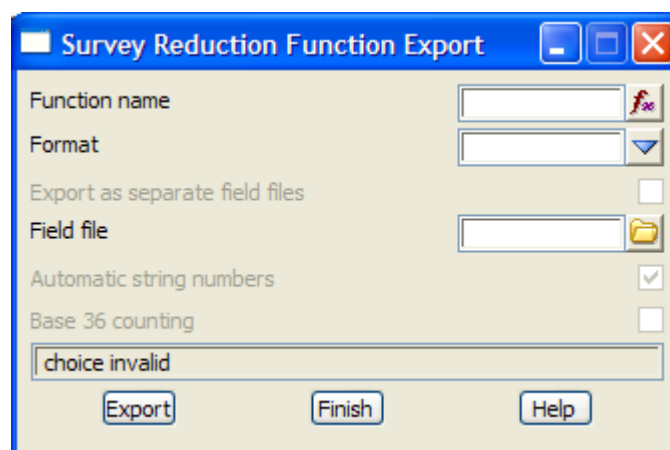
Survey Function to Field File

[survey_reduction_function_export](#)

Position of option on menu: Survey =>Extras =>Reduction to field file

The reduction to field file option writes out the field data from a Survey function to a file in the standard 12d field file format.

Selecting reduction to field file brings up the **survey reduction function export** panel



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Function name	input		available Survey functions

name of the 12d Survey function to write out a 12d field file for.

Field file input *.fld
name of the 12d field file to write out the Survey field data to.

Export button
create the 12d field file.

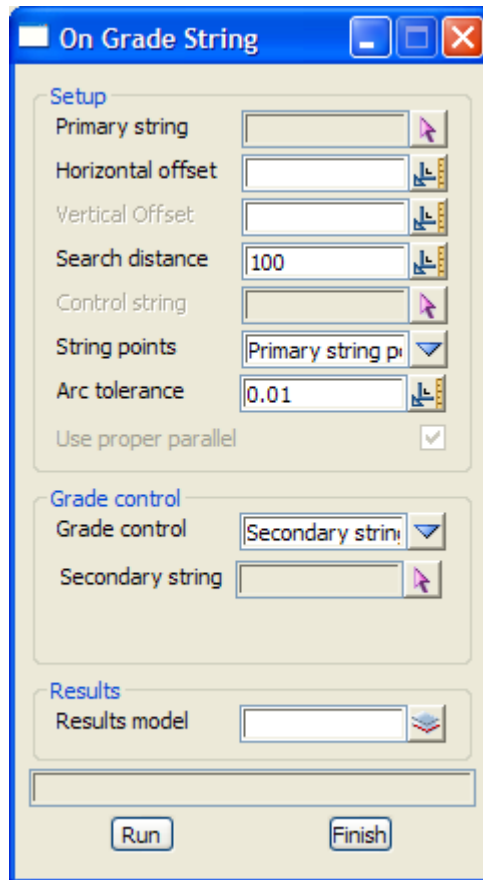
On Grade

on_grade_string

Position of option on menu: Survey =>Extras =>On grade

The on grade option produces a string that is a fixed horizontal distance from a selected string with z-values produced by extrapolating the grade from two strings or from a tin.

Selecting On grade brings up the **On Grade String** panel



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Primary string <i>string to produce the on grade string from</i>	string select		
Horizontal offset <i>horizontal distance to offset the on grade string from the primary string</i>	input		
Vertical offset	input		

vertical distance to offset the on grade string from the primary string

Search distance input

Control string string select

if selected, the horizontal distance is measured at right angles to the control string. In this case, the on-grade may not be parallel to the primary string.

If not selected, the horizontal distance is measured at right angles to the primary string.

String points choice box Primary string points
Chainage interval
Special chainage file

if Primary string points, the on-grade string has vertices on it where ever there is a vertex on the primary string. Extra points will also be include for the given arc tolerance.

Arc tolerance input

if non zero, chord to arc tolerance to use for adding additional vertices

Use proper parallel tick box

if tick, the primary string is paralleled to from the on-grade string

If Chainage interval, vertices are created on the on-grade string corresponding to the given chainage interval along the primary/control string.

Interval input

the chainage interval the use along the primary/control string for creating on-grade vertices.

If Special chainage file, vertices are created on the on-grade string from chainages on the primary or control string, corresponding to the special chainages file.

Special chainages file box .spc files

the chainage interval the use along the primary/control string for creating on-grade vertices.

Grade control choice box Secondary string
Tin

if Secondary string, the grade to use to create z-values on the on-grade string is the grade between the secondary string and the primary string.

Secondary string string select

the grade to use is taken from the secondary to the primary string

If Tin, .

Tin tin box

the tin to use

Offset input

the offset.

Results model model box available models

the model for the created on-grade string

Run button

create the on grade string

Setout

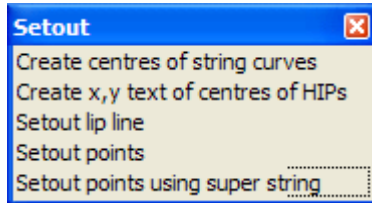
setout

Position of menu: Survey =>Setout

Options still under development.

The setout walk-right menu contains options for creating points numbers and files for uploading to data recorders.

The setout walk-right menu is



setout centres of string curves
create text at centre of HIP's
setout lip line
create setout points
Create setout points using super strings

For *Create centres of string curves*, go to the section "Create Centre Points for Curves of Strings"

Create x,y,z,text of centres of HIPs "Create X Y Text for Centre Points of Alignments" .

Setout lip line "Setout Lip Line" .

Setout points "Create Setout Points" .

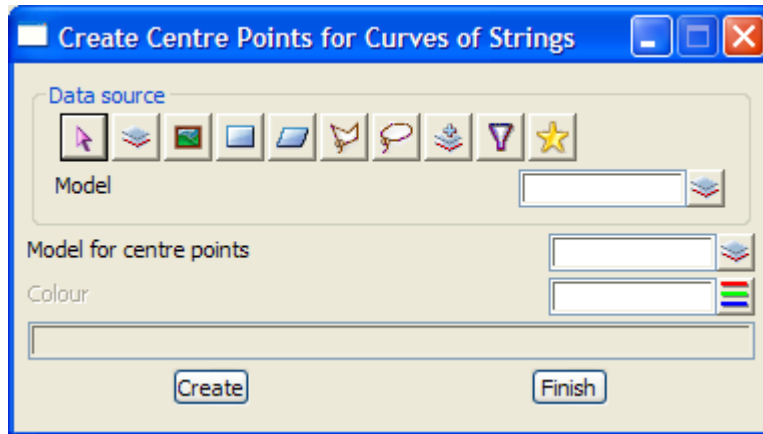
Setout points using super string "Create Setout Points Using Super String" .

Create Centre Points for Curves of Strings

[create_centre_points_for_curves_of_strings](#)

Position of option on menu: Survey =>Setout =>Create centres of string curves

This option is used to create points at the centres of arcs in alignment strings, polylines, arcs or circles.



The fields and buttons used in this panel have the following functions:

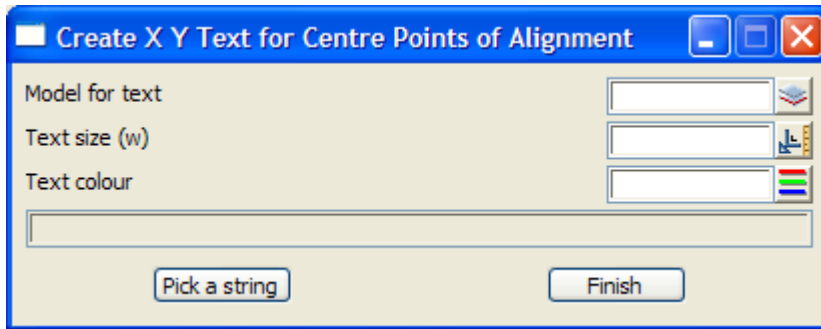
Field Description	Type	Defaults	Pop-Up
Data source type		Model	
<i>data selection type - for a full description go to "Data Source" in the chapter "Tools and Concepts"</i>			
Data source			
<i>data source for strings to process</i>			
Model for centre points	input box		
<i>model for the created points</i>			
Colour	colour box		available colours
<i>colour of centre points</i>			
Create	button		
<i>create the points</i>			

Create X Y Text for Centre Points of Alignments

mark_centre_panel

Position of option on menu: Survey =>Setout =>Create x y text of centres of HIPs

This option creates text for the x and y co-ordinates of the horizontal arcs on an alignment string.



The fields and buttons used in this panel have the following functions:

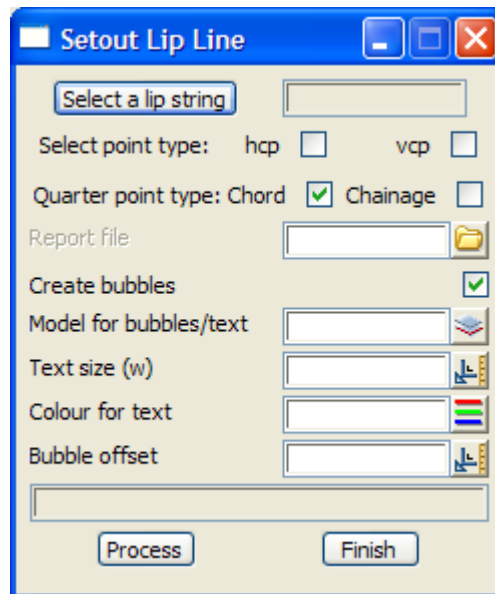
Field Description	Type	Defaults	Pop-Up
Model for text <i>model for the text of the x and y co-ordinates</i>	input box		
Text size (w) <i>size of text in world units.</i>	input box		
Text colour <i>colour of text</i>	input box		
Pick a string <i>select string to create text for.</i>	button		

Setout Lip Line

qtrpts_panel

Position of option on menu: Survey =>Setout =>Setout lip line

This panel is used to create bubbles and/or a report for the critical horizontal and vertical points and quarter points (by chord or by chainage) for any arcs in an alignment string.



The fields and buttons used in this panel have the following functions:

Field Description	Type	Defaults	Pop-Up
Select a lip string <i>pick the alignment string to have bubbles created for.</i>	string select		

Select point type:

hcp <i>if tick, the horizontal tangent points are included.</i>	tick box	
---	----------	--

vcp <i>if tick, the vertical tangent points are included.</i>	tick box	
---	----------	--

Quarter point type:

Chord <i>if tick, the quarter points by chord distance are included.</i>	tick box	tick
--	----------	------

Chainage <i>if tick, the quarter points by chainage distance are included.</i>	tick box	
--	----------	--

Report file <i>name of the report file.</i>	input box	
---	-----------	--

Create bubbles <i>if tick, bubbles are created with the string name and bubble number inside.</i>	tick box	tick
---	----------	------

Model for bubbles/text input box

model for the bubbles and text.

Text size (w) input box

size (in world units) for the text inside the bubble.

Colour for text input box

Colour for the bubble and bubble text.

Bubble offset input box

offset distance from the alignment string to place the bubble.

Process button

run the option.

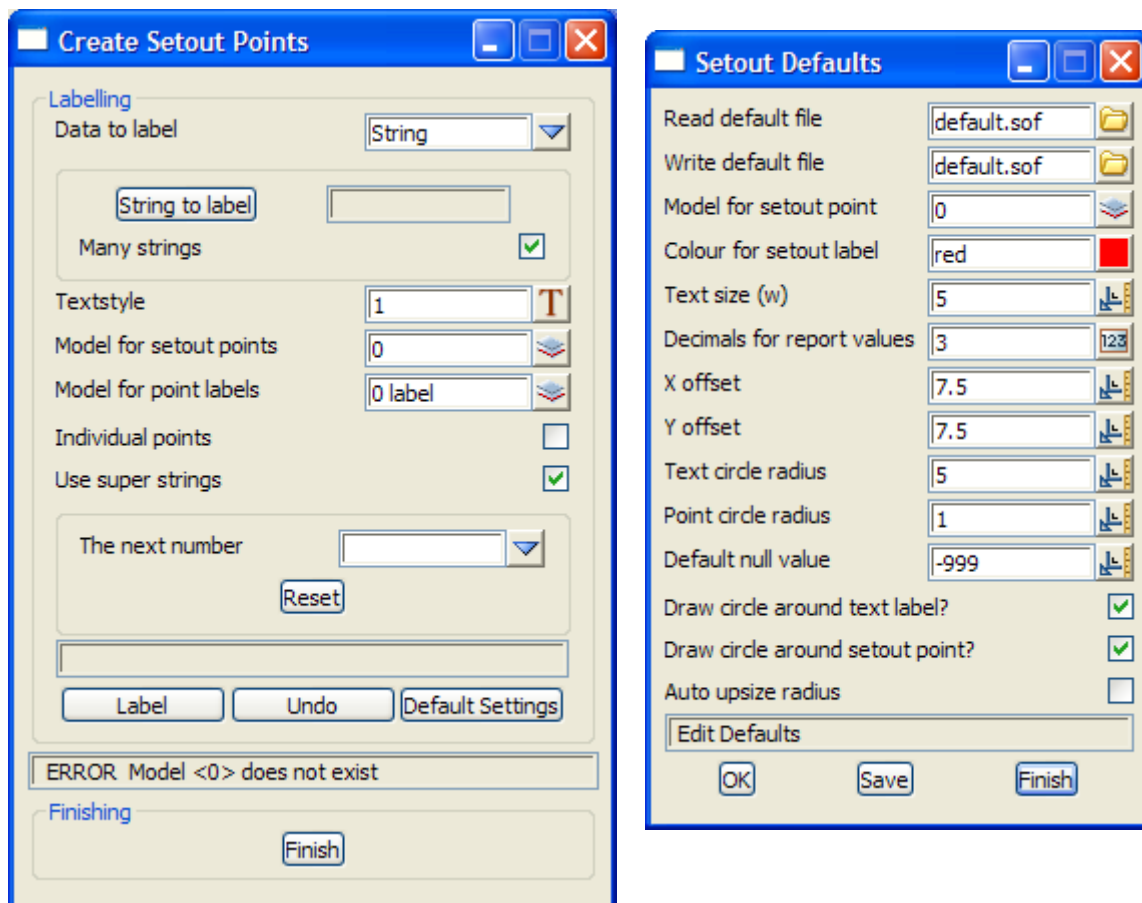
Create Setout Points

setout_panel

Position of option on menu: Survey =>Setout =>Setout points

This panel is used to create points with numbers for use in setting out data. This option is usually run before the option to create an instrument upload file. The setout point is created as a 4d string with the point at the data point and with the point id as the text for the 4d string, with a text size of zero.

Separate text for the numbers and circles surrounding the data points and the text numbers are also created. By default, a file called "defaults.sof" is read in containing settings required for the option.



The fields and buttons used in this panel have the following functions:

Field Description	Type	Defaults	Pop-Up
Textstyle <i>textstyle for the created point ids</i>	input box	1	
Model for setout points <i>model to place the setout points in</i>	input box	0	
Model for points labels <i>model to place the setout point ids and circles in.</i>	input box	0	
Individual points	tick box		

*if tick, the setout points are created as point strings
If not tick, individual one point strings are created.*

Use super strings tick box tick

if not tick, super strings are created for the setout points. The super string point id is set to the setout point id.

If not tick, 4d strings are created for the setout points strings with the 4d text as the setout point id (with text size set to zero).

The next number input box 1 or highest number in model for setout points

*next numeric point id to use for creating point ids. If a **Model for setout points** is given, the model is searched for any super strings or 4d strings with numbers as text and the **The next number** is set to one more than the highest numeric point id in the model.*

Reset button

*reset the **The next number** to the highest point in the model for setout points.*

Data to label input box string string, model, view, point

type of data source.

Model/View/String/Point to output box

data to create point ids for.

Many points/strings tick box tick

*if tick, the each time a string/point is selected, the string/point is processed without having to click on the **Label** button. After a string/point is processed, another string/point can then be selected.*

*If not tick, the **Label** button must be clicked before the selected string/point is processed.*

Label button

create setout points and circles for the selected data.

Undo button

undo the last setout points and s created whilst the panel has been up.

Default settings button

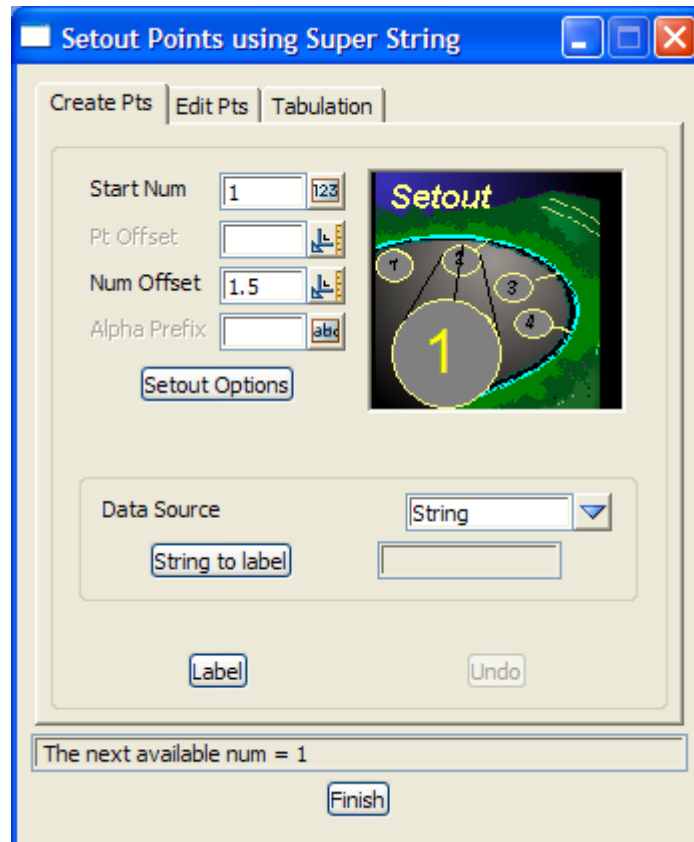
default settings for the s. These can be read in from a file.

Create Setout Points Using Super String

super_setout_panel

Position of option on menu: Survey =>Setout =>Setout points using super string

This panel is used to create points with numbers for use in setting out data. This option is usually run before the option to create an instrument upload file



The fields and buttons used in this panel have the following functions:

Field Description	Type	Defaults	Pop-Up
Not yet documented.			

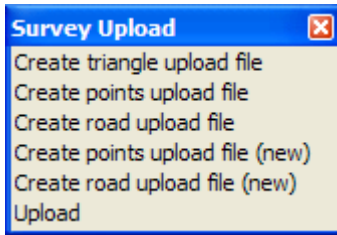
Upload

survey_upload

Position of menu: Survey =>Upload

The Survey Upload walk-right menu contains survey options to upload data the most survey instruments. There are options to upload points, triangulations and road geometry.

The Survey Upload walk-right menu is



- Create triangle upload file
- Create points upload file
- Create roads upload file
- Create points upload file (new) - only for *Trimble Link*
- Create roads upload file (new) - only for *Leica XML* and *Trimble Link*
- Upload data to instrument/device

For the option <i>Create triangle upload file</i>	go to	"Create Triangle Upload File"
<i>Create points upload file</i>		"Create Points Upload File"
<i>Create road upload file</i>		"Create Road Upload File"
<i>Create points upload file (new)</i>		"Create Points Upload File (New)"
<i>Create road upload file (new)</i>		"Create Road Upload File (New)"
<i>Upload</i>		"Survey Data Upload"

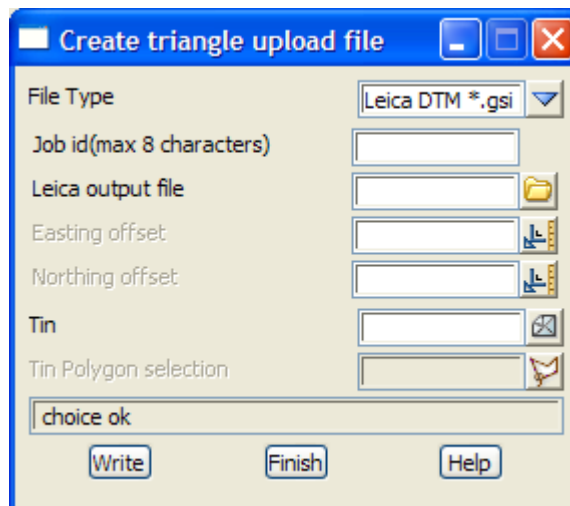
Create Triangle Upload File

create_triangle_upload_file

Position of option on menu: Survey =>Upload => Create triangle upload file

The Create triangle upload file option allows the creation of a triangle file based on a tin. Various file formats can be selected

Selecting Create triangle upload file brings up the Create triangle upload file panel



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Common parameters at bottom:

Tin input
name of tin from which the triangle file will be based.

Tin polygon selection selection
allows the user to select a specific area of the tin to be exported as a triangle file.

Write button
On clicking the write button, 12d Model will write the specified file.

File type	choice box	Trimble binary *.ttm Leica DTM *.gsi 12d xyzs *.dat Ortho 12d *.T12 Sokkia *.tri TP Setout/Stakeout *.tsa LandXML *.xml
-----------	------------	---

file type to be produced.

For Trimble *.ttm format:

Use Trimble Link tick box
if tick, Trimble Link is used to create the data

Upload directly to Trimble device tick box
if tick, the data is uploaded to the Trimble instrument

Job name input
Trimble job name

TTM output file input
name of file to be produced.

For Leica DTM *.gsi format:

Job id input
job id to be included in file. (max 8 characters)

Leica output file input
name of file to be produced

Easting offset input
easting offset to be applied to data. This is important where large coordinate values are used, such as in map projections.


Northing offset input
northing offset to be applied to data. This is important where large coordinate values are used, such as in map projections.

For 12D xyzs *.dat format:

12d output file input
name of file to be produced

For Ortho 12d *.T12 format:


File Type Ortho 12d *.T12

Ortho 12d output file 

Ortho 12d output file input
name of file to be produced

For Sokkia *.tri format:


File Type Sokkia *.tri

Sokkia output file 

Sokkia output file input
name of file to be produced

For TPSetout/Stakeout *.tsa format:

File Type TP Setout/Stake

TP Setout/Stakeout file 

Tp Setout/Stakeout file input
name of file to be produced

For TPSetout/Stakeout *.tsa format:

File Type LandXML *.xml

LandXML file 

LandXML file input
name of file to be produced

Create Points Upload File

instrument_points_upload_panel

Position of option on menu: Survey =>Upload => Create points upload file

The Create points upload file option allows the creation of a file of point ids, x, y and z, for string data (super strings and 4d strings only). Various file formats can be selected

Selecting Create points upload file brings up the **Create Instrument Points Upload File** panel.

Upload files for points can be created for various Leica, Geodimeter, Sokkia, Topcon, UPL, QuikDraw, Trimble XYZ formats as well as a text file of point id, x,y,z data.

The fields and buttons used in this panel have the following functions:

Field Description	Type	Defaults	Pop-Up
Instrument choices <i>type of output format</i>	choice box	report_xyz	available instruments
Output z values <i>if tick, z-values are output - only used for Geodimeter formats</i>	tick box		
Create new job on SDR 33 <i>if tick, create a new job on SDR33 - only used for Sokkia formats</i>	tick box		
Left justify fields	tick box		

if tick, each field is left justified - only used for Sokkia formats

User definable terminator input box &
terminator to use - only used for Geodimeter formats.

Default char for blank name input box z
character used for blank names - only used for Geodimeter formats.

Data source of setout points Model
data selection type - for a full description go to “Data Source” in the chapter “Tools and Concepts”

Data source
data source of setout points to create the upload file from.

Number of decimal places input box 3
number of decimal places for x, y and z values.

Default for null value input box -9999
value to write for null z-values.

Start point id input box
point id to start creating upload file from.

End point id input box
last point id to write to upload file.

Note: Start and End point ids may be left blank, and all point ids (whether numeric or alpha-numeric) will be written to the upload file.

Origin x/Origin y input box
If non-zero, subtract the value from the x/y value before writing out.

Upload file file box
name of the upload file to create.

Get Point Range button
pressing this button will populate the Start and End point id fields with the minimum and maximum (numeric) point ids found in the selected source data. If the selected source data contains a mix of numeric and alpha-numeric point ids, the alpha-numeric point ids are considered to have a numeric value of zero (0), but are ignored when determining the range. If the selected source data contains alpha-numeric point ids only, then the Start and End point id fields will both be set to zero (0).

Write File button
create the upload file

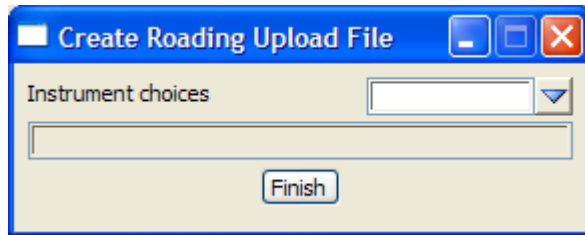
Create Road Upload File

instrument_roads_upload_panel

Position of option on menu: Survey =>Upload => Create roads upload file

The Create roads upload file option allows the creation of a specific roading file. Files can be created for various Leica (8 & 16 formats), Geodimeter, Sokkia, Topcon and Trimble Roding formats.

Selecting Create road upload file brings up the **Create Roding Upload File** panel



The fields and buttons used in this panel have the following functions:

Field Description	Type	Defaults	Pop-Up
Instrument choices	choice box		Geodimeter Roadline 3d Leica Road Plus 8 Leica Road Plus 16 LMGS - D45 Sokkia Roding - Alignment Road Sokkia Roding - String Road Topcon MS2000 Topcon GTS-700 Roads Trimble Roding

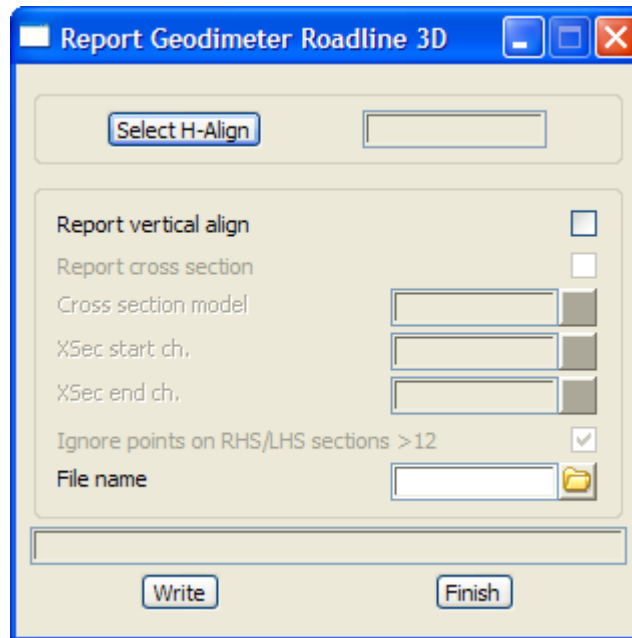
For choice of <i>Geodimeter Roadline 3d</i> , go to the	"Geodimeter Roadline 3D file"
<i>Leica Road Plus 8</i>	"Leica road plus 8 / 16 file" .
<i>Leica Road Plus 16</i>	"Leica road plus 8 / 16 file" .
<i>LMGS - D45 file</i>	"LMGS - D45 file" .
<i>Sokkia Roding - Alignment road</i>	"Sokkia Roding - Alignment Road file" .
<i>Sokkia Roding - String road</i>	"Sokkia Roding - String Road file" .
<i>Topcon MS2000</i>	"Topcon MS2000 Roding file" .
<i>Topcon GTS-700 Roads</i>	"Topcon GT700 Roding File" .
<i>Trimble Roding</i>	"Trimble Roding File" .

Geodimeter Roadline 3D file

Position of option on menu: Survey =>Upload => Create roads upload file, Instrument choice = Geodimeter Roadline 3d

The Geodimeter Roadline 3d option allows the creation of a specific roading file.

Selecting Geodimeter Roadline 3d brings up the **Report Geodimeter Roadline 3D** panel



The Geodimeter (trimble), has certain limitations and criteria associated with the 3d file. These include:

1. Each section template (i.e. right or left) has a max number of 12 points.
2. The first and last segments of the alignment must be a straight (for both horizontal and vertical).
3. The start and end chainages of the horizontal alignment should be the same for the vertical alignment.
4. The alignment string must exist on the xsec's. This allows the calculation of the "zero pt" so we can split the section into left and right templates.
5. The xsec model should be representative of the alignment string used in the macro. i.e. not generated from a different alignment. Therefore the alignment string should have a 0 offset on the xsections.
6. The alignment string cannot exist above or below the xsection. I.e. it should be on the section as per 4)
7. The number of points on assuasive section templates (left and right) should be the same. i.e. if 5 points are on the LHS template for ch0 then the same number of points should exist for the LHS template for ch20. The instruments using this file, cannot handle transitions between different number of points effectively and can give incorrect results. The user should limit the file by using the chainage range between areas where the number of points on each side of the cross sections is the same.

The fields and buttons used in this panel have the following functions:

Field Description	Type	Defaults	Pop-Up
Select H-Align <i>select valid alignment string.</i>	Select box		
Report vertical alignment <i>write vertical alignment details to file mode. If yes vertical alignment details written to the specified file.</i>	tick box	no	
Report cross sections	tick box	no	

if selected, the cross section model box will be enabled.

Cross section model model box

This will ask for the model of cross sections. These sections will be written out to the file.

XSec start ch input box min alignment ch
chainage value to start writing cross sections.

XSec end ch input box max alignment ch
chainage value to end writing cross sections.

Ignore points on RHS/LHS sections >12
 tick box ticked

if ticked, where there are more than 12 points in either the RHS or LHS template (derived from the xsection) the outlying points are ignored. e.g. if there was 14 points on the RHS template, only 12 will be written to the file with 2 pts being ignored.

File name input box
the name to be used for file creation

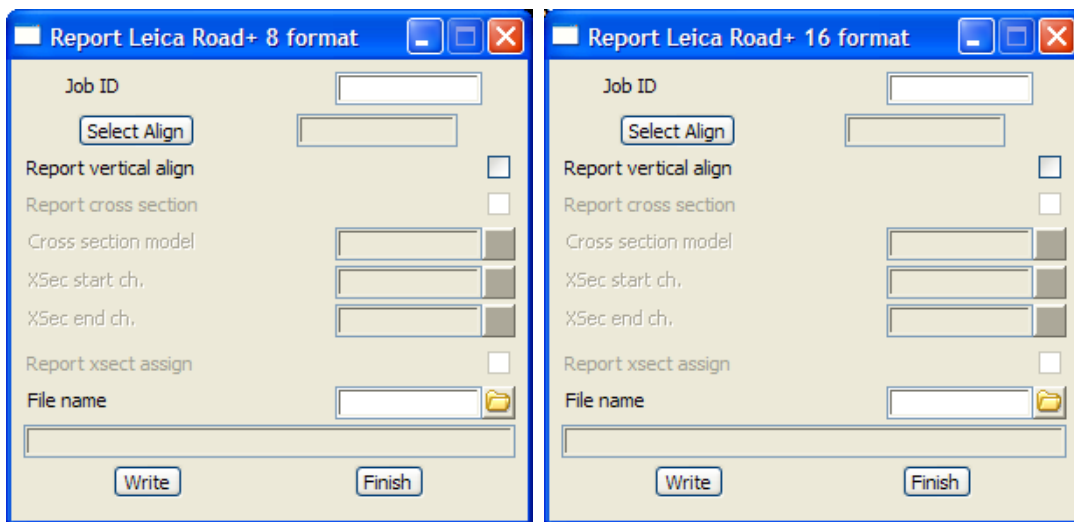
Write button
write appropriate files.

Leica road plus 8 / 16 file

Position of option on menu: Survey =>Upload => Create roads upload file, Instrument choice = Leica roadplus 8 or Leica roadplus 16

The Leica roadplus 8 and Leica roadplus 16 options allow the creation of specific Leica roading files.

Selecting Leica roadplus 8 brings up the **Report Leica roadplus 8** panel.
 Selecting Leica roadplus 16 brings up the **Report Leica roadplus 16** panel.



The 8 and 16 formats are different file formats for the leica range of instruments. The user should be aware of the required format for the particular instrument. Please refer to the Leica documentation for specifications

The fields and buttons used in this panel have the following functions:

Field Description	Type	Defaults	Pop-Up
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- Job id** input box
job id (max 8 characters).
- Select alignment** String select box
select valid alignment string.
- Report vertical alignment** tick box no
*write vertical alignment details to file mode. If yes vertical alignment details written to appropriate file. i.e. (PRF*****.gsi)*
- Report cross sections** tick box no
if selected, the cross section model box will be enabled.
- Cross section model** model box
*This will ask for the model of cross sections. These sections will be written out to the appropriate file. i.e. (CRS*****.gsi)*
- XSec start ch** input box min alignment ch
chainage value to start writing cross sections.
- XSec end ch** input box max alignment ch
chainage value to end writing cross sections.
- Report cross section assignment** tick box no
*If ticked, a cross section assignment file (STA*****.gsi) file will be made.*
- File name** input box
the name to be used for file creation. NB depending on what files are specified, the name given will be appended with the correct prefix eg ALN for alignment file. As Leica only takes 8 character file names, the name may be truncated.
- Write** button
write appropriate files.

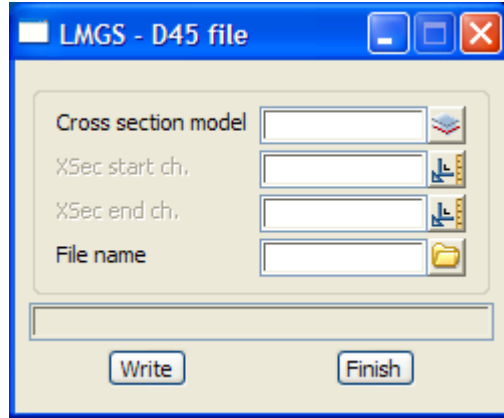
LMGS - D45 file

Position of option on menu: Survey =>Upload => Create roads upload file, Instrument choice = LMGS - D45 file

The LMGS - D45 file option allows the creation of a specific file format suitable for upload to Leica's grader and paver control systems. The format has a number of rules that must be satisfied for correct file creation. These include:

1. There must be an equal number of points on each section
2. Points should not be closer than 5cm in both directions
3. Azimuth changes between cross section points should not be greater than 20gon (18 degrees).

Selecting LMGS - D45 file brings up the **LMGS - D45 file** panel



The fields and buttons used in this panel have the following functions:

Field Description	Type	Defaults	Pop-Up
Cross section model <i>the model of cross sections. These sections will be written out to the file.</i>	model box		
XSec start ch <i>chainage value to start writing cross sections.</i>	input box	min alignment ch	
XSec end ch <i>chainage value to end writing cross sections.</i>	input box	max alignment ch	
File name <i>the name to be used for the file creation. The file will automatically be given a .D45 extension.</i>	input box		
Write <i>write appropriate file.</i>	button		

Sokkia Roding - Alignment Road file

Position of option on menu: Survey =>Upload => Create roads upload file, Instrument choice = Sokkia Roding - Alignment road

The Sokkia Roding - Alignment road option allows the creation of a specific roding file.

Selecting Sokkia Roding - Alignment road brings up the **SDR Roding - Alignment Road** panel

The sdr33 roading file has certain limitations and criteria. These include:

1. The alignment string must exist on the xsec's. This allows us to calculate the "zero pt" so we can split the template into left and right.
2. The xsec model should be representative of the alignment string used in the macro. i.e. not generated from a different alignment. Therefore the alignment string should have a 0 offset on the xsections.
3. The alignment string cannot exist above or below the xsection. I.e. it should be on the section as per 1).
4. The number of points on adjacent section templates (left and right) should be the same. i.e. if 5 points are on the LHS template for ch0 then the same number of points should exist for the LHS template for ch20. The instruments using this file, may not handle transitions between different number of points effectively and can give incorrect results. The user should limit the file by using the chainage range between areas where the number of points on each side of the cross sections are the same.

The fields and buttons used in this panel have the following functions:

Field Description	Type	Defaults	Pop-Up
Select H-Align <i>select valid alignment string.</i>	Select box		
Road Name <i>input road name. If a valid alignment is selected, the name of that alignment will be the default road name.</i>	input box		Name of selected alignment string
Report vertical alignment <i>write vertical alignment details to file mode. If yes vertical alignment details written to the specified file.</i>	tick box	no	
Assume last XSec segment is sideslope			

tick box ticked

if box is selected, the last segments left and right of 0.0 offset are considered to be side slopes, and the default cut and fill slope fields are enabled.

Default cut slope (%) input box

this field is optional. From the section data it is only possible to calculate either the cut or fill sideslope. A default value can be specified to be used for the non calculated value.

*When the segment is rising (i.e has a positive slope) it is considered a cut slope. Similarly, if the grade is negative the sideslope is considered a fill. If a fill sideslope is calculated, the cut sideslope definition in the file will be given the value as entered into the **default cut slope** field. If no value is set for the default, the cut slope in this instance will be given a null value. The default value if entered, should be in whole percent e.g. 50.0 for a 1v in 2h slope.*

Default fill slope (%) input box

this field is optional. From the section data it is only possible to calculate either the cut or fill sideslope. A default value can be specified to be used for the non calculated value.

*When the segment is rising (i.e has a positive slope) it is considered a cut slope. Similarly, if the grade is negative the sideslope is considered a fill. If a cut sideslope is calculated, the fill sideslope definition in the file will be given the value as entered into the **default fill slope** field. If no value is set for the default, the fill slope in this instance will be given a null value. The default value if entered, should be in whole percent e.g. 50.0 for a 1v in 2h slope.*

Cross section model model box

This will ask for the model of cross sections. These sections will be written out to the file.

XSec start ch input box min alignment ch

chainage value to start writing cross sections

XSec end ch input box max alignment ch

chainage value to end writing cross sections

File name input box

the name to be used for file creation

Write button

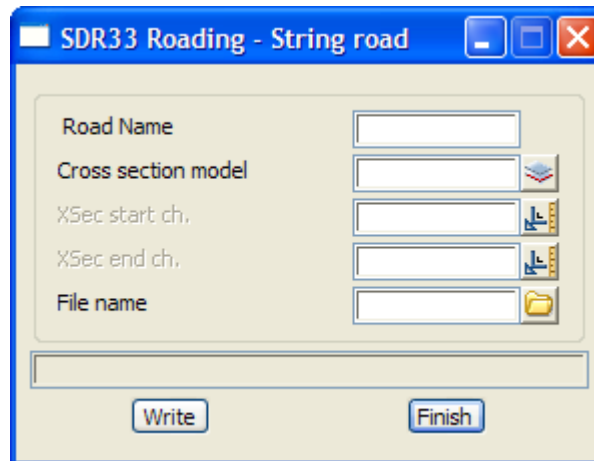
write appropriate file

Sokkia Roding - String Road file

Position of option on menu: Survey =>Upload => Create roads upload file, Instrument choice = Sokkia Roding - String road

The Sokkia Roding - String road option allows the creation of a specific string roading file.

Selecting Sokkia Roding - String road brings up the **SDR Roding - String Road** panel



The fields and buttons used in this panel have the following functions:

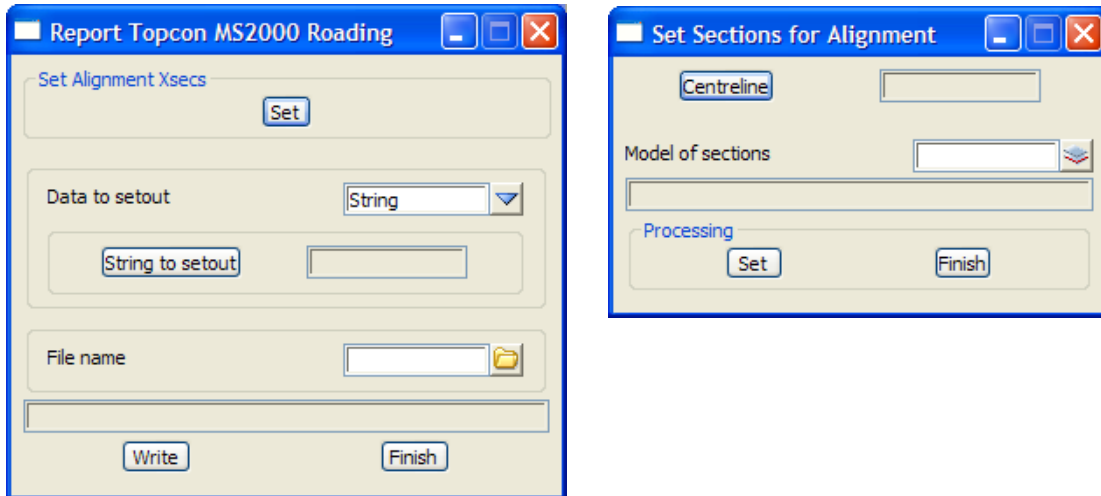
Field Description	Type	Defaults	Pop-Up
Road Name <i>input road name. If a valid alignment is selected, the name of that alignment will be the default road name.</i>	input box	Name of selected alignment string	
Cross section model <i>model of cross sections to write out in SDR33 string format</i>	Model box		available models
XSec start ch. <i>chainage of the first cross sections to write out</i>	input box	min alignment ch	
XSec end ch. <i>chainage of the last cross sections to write out</i>	input box	max alignment ch	
File name <i>the name to be used for file creation</i>	file box		
Write <i>write appropriate file.</i>	button		

Topcon MS2000 Roding file

Position of option on menu: Survey =>Upload => Create roads upload file, Instrument choice = Topcon MS2000

The Topcon MS2000 option allows the creation of a specific roding file.

Selecting Topcon MS2000 brings up the **Report topcon MS2000 Roding** panel



The fields and buttons used in this panel have the following functions:

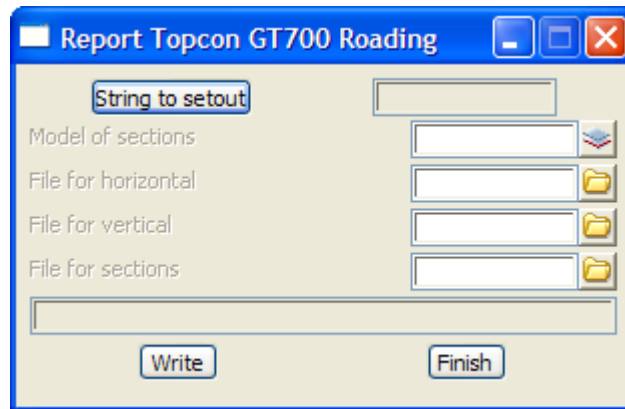
Field Description	Type	Defaults	Pop-Up
Set	button		Set section for alignment panel
<i>the set button will bring up the set sections for alignment panel. This panel allows the user to select multiple alignment/xsection combinations for the one file. The alignment is selected (using the Centreline selection button) followed by the Model of sections for that alignment. The Set button is pressed to accept the selection. This can be repeated for a number of alignments. Finish will close the set sections for alignment panel and return to the original panel</i>			
Data to setout	choice box	string	model view string
<i>the data to be included in the file can be selected by choosing a valid model, view or string. Depending on which data source is selected, the appropriate selection button will appear. The user then selects the button and then the items of interest.</i>			
File name	input box		
<i>the name to be used for file creation</i>			
Write	button		
<i>write appropriate files.</i>			

Topcon GT700 Roding File

Position of option on menu: Survey =>Upload => Create roads upload file, Instrument choice = Topcon GTS-700 Roads

The Topcon GTS-700 Roads option allows the creation of a specific roding file.

Selecting Topcon GTS-700 Roads brings up the **Report Topcon GT700 Roding** panel



The fields and buttons used in this panel have the following functions:

Field Description	Type	Defaults	Pop-Up
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String to setout	select button		
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after pressing the string to setout button, the user can select a valid string. This string will be used for setting out.

Model of sections	model box		
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the model of cross sections. These sections will be written out to the file.

File for horizontal	input box		
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the name to be used for horizontal file creation. The file will automatically be given a .hg extension.

File for vertical	input box		
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the name to be used for the vertical file creation. The file will automatically be given a .vg extension.

File for sections	input box		
--------------------------	-----------	--	--

the name to be used for the section file creation. The file will automatically be given a .xs extension.

Write	button		
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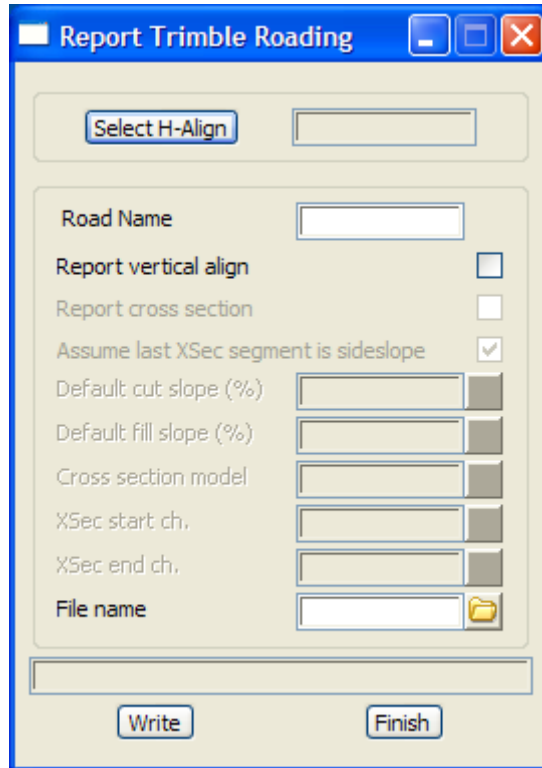
write appropriate files.

Trimble Roding File

Position of option on menu: Survey =>Upload => Create roads upload file, Instrument choice = Trimble Roding

The Trimble Roding option allows the creation of a specific roding file.

Selecting Trimble Roding brings up the **Report Trimble Roding** panel



The trimble DC file has certain limitations and criteria. These include:

1. The alignment string must exist on the xsec's. This allows us to calculate the "zero pt" so we can split the template into left and right.
2. The xsec model should be representative of the alignment string used in the macro. i.e. not generated from a different alignment. Therefore the alignment string should have a 0 offset on the xsections.
3. The alignment string cannot exist above or below the xsection. I.e. it should be on the section as per 1).
4. The number of points on assuasive section templates (left and right) should be the same. i.e. if 5 points are on the LHS template for ch0 then the same number of points should exist for the LHS template for ch20. The instruments using this file, may not handle transitions between different number of points effectively and can give incorrect results. The user should limit the file by using the chainage range between areas where the number of points on each side of the cross sections are the same.

The fields and buttons used in this panel have the following functions:

Field Description	Type	Defaults	Pop-Up
Select H-Align <i>select valid alignment string.</i>	Select box		
Road Name <i>input road name. If a valid alignment is selected, the name of that alignment will be the default road name.</i>	input box		Name of selected alignment string
Report vertical alignment <i>write vertical alignment details to file mode. If yes vertical alignment details written to the specified file.</i>	tick box	no	
Assume last XSec segment is sideslope <i>tick box ticked</i>	tick box	ticked	

if box is selected, the last segments left and right of 0.0 offset are considered to be side slopes, and the default cut and fill slope fields are enabled.

Default cut slope (%) input box

this field is optional. From the section data it is only possible to calculate either the cut or fill sideslope. A default value can be specified to be used for the non calculated value.

*When the segment is rising (i.e has a positive slope) it is considered a cut slope. Similarly, if the grade is negative the sideslope is considered a fill. If a fill sideslope is calculated, the cut sideslope definition in the file will be given the value as entered into the **default cut slope** field. If no value is set for the default, the cut slope in this instance will be given a null value. The default value if entered, should be in whole percent e.g. 50.0 for a 1v in 2h slope.*

Default fill slope (%) input box

this field is optional. From the section data it is only possible to calculate either the cut or fill sideslope. A default value can be specified to be used for the non calculated value.

*When the segment is rising (i.e has a positive slope) it is considered a cut slope. Similarly, if the grade is negative the sideslope is considered a fill. If a cut sideslope is calculated, the fill sideslope definition in the file will be given the value as entered into the **default fill slope** field. If no value is set for the default, the fill slope in this instance will be given a null value. The default value if entered, should be in whole percent e.g. 50.0 for a 1v in 2h slope.*

Cross section model model box

This will ask for the model of cross sections. These sections will be written out to the file.

XSec start ch input box min alignment ch

chainage value to start writing cross sections.

XSec end ch input box max alignment ch

chainage value to end writing cross sections.

File name input box

the name to be used for file creation

Write button

write appropriate files.

Create Points Upload File (New)

create_points_upload_file

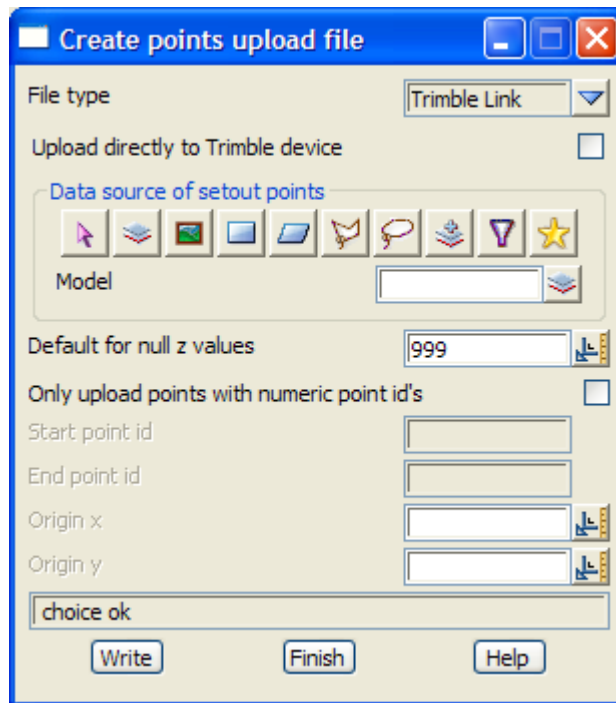
Position of option on menu: Survey =>Upload => Create points upload file (new)

This option is still under development.

The Create points upload file (new) option creates or uploads directly to a Trimble instrument a file of point ids, x, y and z, for string data (super strings and 4d strings only).

Only Trimble file formats is supported as this stage - the option Create points upload file ("Create Points Upload File") is used to create files for most other instruments.

Selecting Create points upload file (new) brings up the **Create Points Upload File** panel.



The fields and buttons used in this panel have the following functions:

Field Description	Type	Defaults	Pop-Up
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Upload directly to Trimble device	tick box		
<i>if tick, the points are uploaded to the attached Trimble instrument</i>			
<i>if not tick, a dc file will be created.</i>			

Data source type		Model	
<i>data selection type - for a full description go to "Data Source" in the chapter "Tools and Concepts"</i>			

Data source		Model	
<i>source of data is to be processed.</i>			

Default for null value	input box	999	
<i>value to write for null z-values.</i>			

Only upload points with numeric point names	tick box		
<i>if tick, only points with numeric (integer) point names are used.</i>			
<i>if not tick, alphanumeric point names are used.</i>			

Start point id	input box		
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point id to start creating upload file from.

End point id input box

last point id to write to upload file.

Note: Start and End point ids may be left blank, and all point ids (whether numeric or alpha-numeric) will be written to the upload file.

Origin x/Origin y input box

If non-zero, subtract the value from the x/y value before writing out.

Upload File button

create the upload file

Create Road Upload File (New)

create_road_upload_file

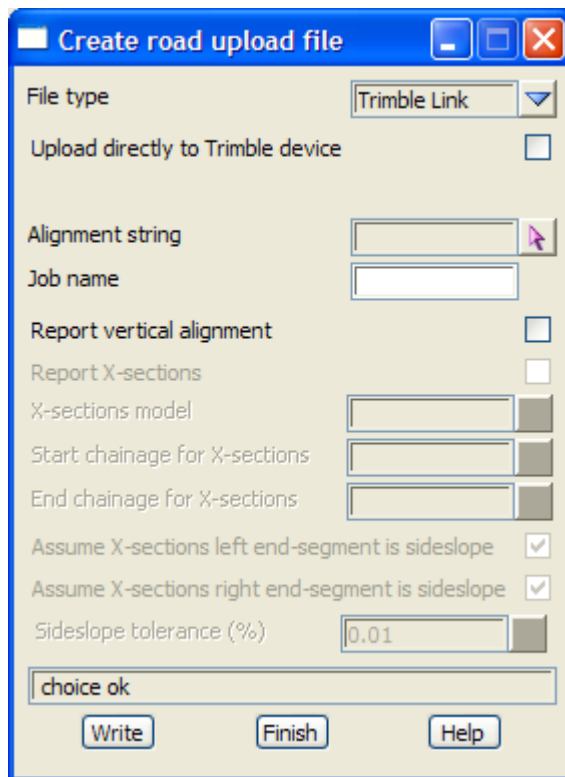
Position of option on menu: Survey =>Upload => Create road upload file (new)

This option is still under development.

The Create road upload file (new) option allows the creation of road files or uploads directly to a Trimble instrument and Leica using *Leica XML* format.

Only *Trimble* and *Leica LandXML* file formats are supported as this stage- the option Create road upload file (“Create Road Upload File”) is used to create files for most other instruments.

Selecting Create road upload file (new) brings up the **Create Road Upload File** panel



The fields and buttons used in this panel have the following functions:

Field Description	Type	Defaults	Pop-Up
File type	choice box		Trimble Link Leica X-sections LandXML

For the choice *Trimble Link*, go to "Trimble Link"
Leica X-Sections LandXML "Leica X-Sections LandXML"

Trimble Link

Position of option on menu: Survey =>Upload => Create roads upload file (new), File type = Trimble Link

The Trimble Link options creates a file in Trimble dc format or uploads the date directly to the instrument using *Trimble Link*.

The fields and buttons used in this panel have the following functions:

Field Description	Type	Defaults	Pop-Up
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Upload directly to Trimble device tick box

*if tick, the points are uploaded to the attached Trimble instrument
if not tick, a dc file will be created.*

Alignment string String select box

select valid alignment string.

Road Name input box Name of selected alignment string

input road name. If a valid alignment is selected, the name of that alignment will be the default road name.

Report vertical alignment tick box

If tick, vertical alignment details written to file.

Report cross sections tick box

if tick, the cross section model box will be enabled.

X- sections model model box

model of cross sections to be written out.

Start chainage for X-sections

chainage value to start writing cross sections. If blank, start with first x-section.

End chainage for X-sections

chainage value to stop writing cross sections. If blank, end with last x-section.

Assume X-sections left end-segment is sideslope tick box

If tick, left end segments are tagged as sideslopes.

Assume X-sections right end-segment is sideslope tick box

If tick, right end segments are tagged as sideslopes.

Sideslope tolerance (%) input 0.01

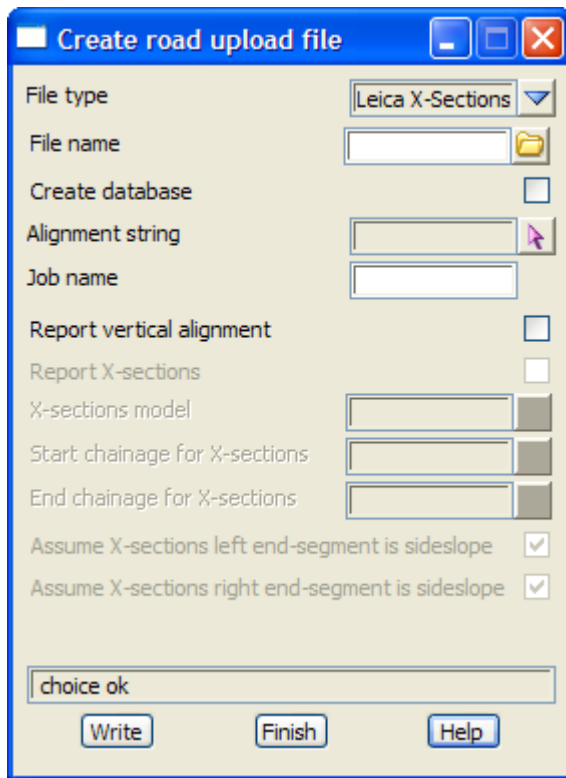
Write button

write out or upload the data.

Leica X-Sections LandXML

Position of option on menu: Survey =>Upload => Create roads upload file (new), File type = Leica X-Sections LandXML

The Leica X-Sections LandXML options creates a file in LandXML format suitable for *Leica* instruments



The fields and buttons used in this panel have the following functions:

Field Description	Type	Defaults	Pop-Up
File name <i>the name of the Leica LandXML file.</i>	input box		*.xml
Create database <i>if tick, a DBX file is created</i>	tick box		
Alignment string <i>select valid alignment string.</i>	string select		
Job Name	input box	name of selected alignment string	

input job name. If a valid alignment is selected, the name of that alignment will be the default job name.

Report vertical alignment tick box

if tick, vertical alignment details written to file.

Report cross sections tick box

if tick, the cross section model box will be enabled.

X- sections model model box

available models

model of cross sections to be written out.

Start chainage for X-sections

chainage value to start writing cross sections. If blank, start with first x-section.

End chainage for X-sections

chainage value to stop writing cross sections. If blank, end with last x-section.

Assume X-sections left end-segment is sideslope tick box

If tick, left end segments are tagged as sideslopes.

Assume X-sections right end-segment is sideslope tick box

If tick, right end segments are tagged as sideslopes.

Write button

write out file.

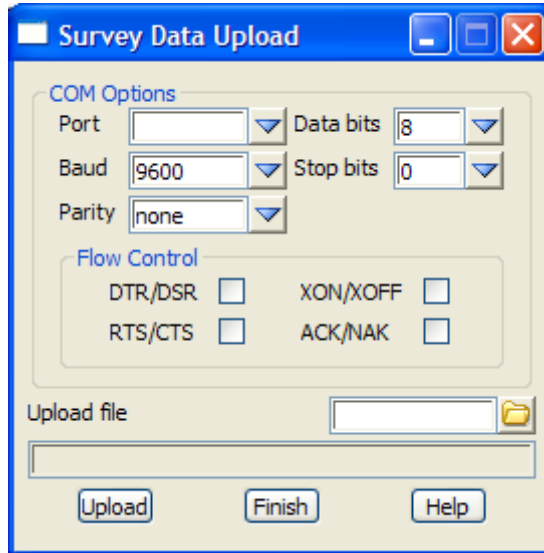
Survey Data Upload

survey_data_upload

Position of option on menu: Survey =>Upload

The **upload** option take data from the computer and sends it to the data collector connected to the computer's serial port.

Selecting **Upload** brings up the **Survey Data Upload** panel



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Port <i>name of the computer serial port that the data collector is connected to. The default port is specified in the data collector configuration file.</i>	input	from configuration file	
Baud rate <i>speed of the serial port</i>	input	from configuration file	
Data bits <i>number of data bits</i>	input	from configuration file	
Stop bits <i>number of stop bits</i>	input	from configuration file	
Parity <i>parity</i>	input	from configuration file	
DTR/DSR <i>if tick, use DTR/DSR flow control</i>	<input type="checkbox"/>	from configuration file	
RTS/CTS <i>if tick, use RTS/CTS flow control</i>	<input type="checkbox"/>	from configuration file	
XON/XOFF <i>if tick, use Xon/Xoff</i>	<input type="checkbox"/>	from configuration file	
ACK/NAK <i>if tick, use ACK/NAK</i>	<input type="checkbox"/>	from configuration file	

Field file input *.fld files

name of the 12d field file that the raw file is to be converted to. The raw file is given the same name but with the extension specified in the configuration file, e.g., ".gre".

Upload button

On clicking the upload button, 12d Model will send the specified file through the serial port and up to the data collector.

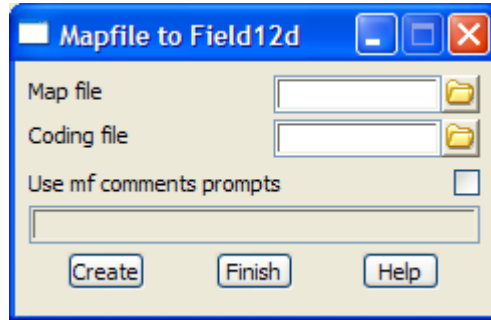
Mapfile to Field 12d

mapfile_to_field12d

Position of option on menu: Survey =>Mapfile to Field 12d

The **Mapfile to Field 12d** option converts a 12d mapfile to an .att file used by Field 12d.

Selecting **Mapfile to Field 12d** brings up the **Mapfile to Field12d** panel



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Mapfile <i>name of the 12d mapfile to convert to an .att file.</i>	file box		*.mf
Coding file <i>name of the attribute file to convert the mapfile to.</i>	file box		*.att
Create <i>convert the file.</i>	button		

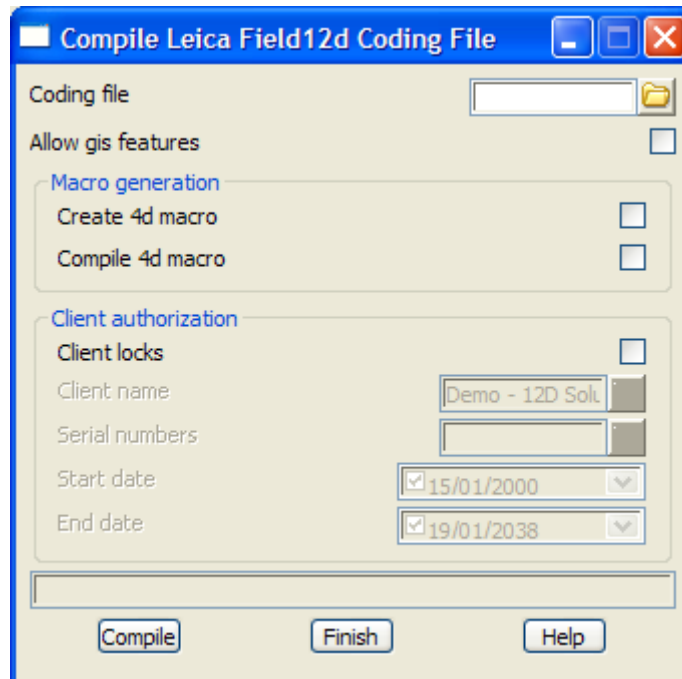
Field 12d

[compile_leica_field12d_coding_file](#)

Position of option on menu: Survey =>Field 12d

The Field 12d option converts a Field 12d .att file to a .bin file for use on the *Leica* (with the Field 12d software).

Selecting Field 12d brings up the **Compile Leica Field 12d Coding File** panel



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Coding file <i>name of the attribute file to create the .bin file for</i>	file box		*.att
Allow gis features <i>if tick, allow gis features in the .bin file</i>	tick box		
Create 12d macro <i>if tick, a 12d Model macro is created</i>	tick box		
Compile 12d macro <i>if tick, the 12d Model macro is compiled</i>	tick box		
Client locks <i>if tick, the 12d Model macro is locked to a particular 12d Solutions client name</i>	tick box		
Client name <i>the 12d Solutions client name that the macro is locked to</i>	input		
Start date <i>start date for running the macro</i>	calendar box		
End date	calendar box		

end date for running the macro

Compile button
create the .bin file and 12d macro (if required).

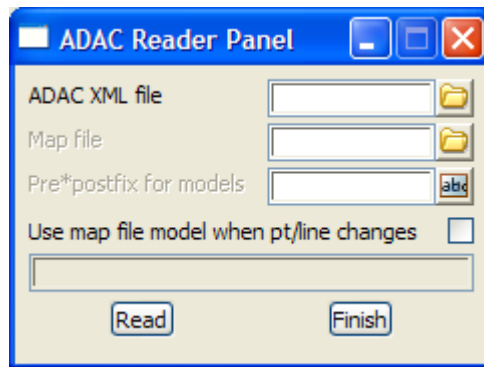
Read Adac XML File

adac_reader_panel

Position of option on menu: Survey =>Adac read

This option is for reading the ADAC XML format. It is under development.

Selecting Adac read brings up the **Adac Reader Panel** panel



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
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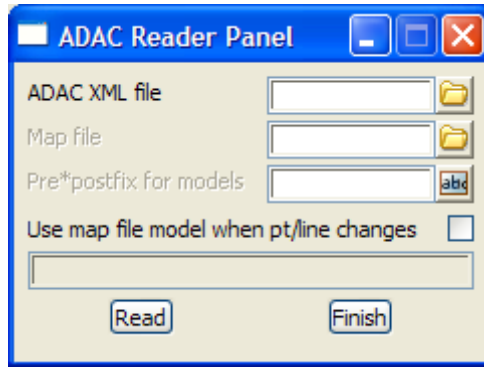
Create Adac XML File

`create_adac_xml_file`

Position of option on menu: Survey =>Adac write

This option is for writing the ADAC XML format. It is under development.

Selecting Adac write brings up the **Write Adac XML File** panel



The fields and buttons used in this panel have the following functions.

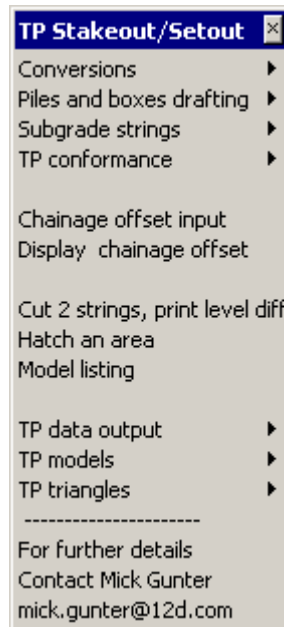
Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

TP Stakeout/Setout

tp_stakeout_setout

The TP Stakeout /Setout menu contains a variety of options provided by Mick Gunter for TP Stakeout and TP Setout users.

For further details, contact Mick Gunter at michael.gunter@bigpond.com

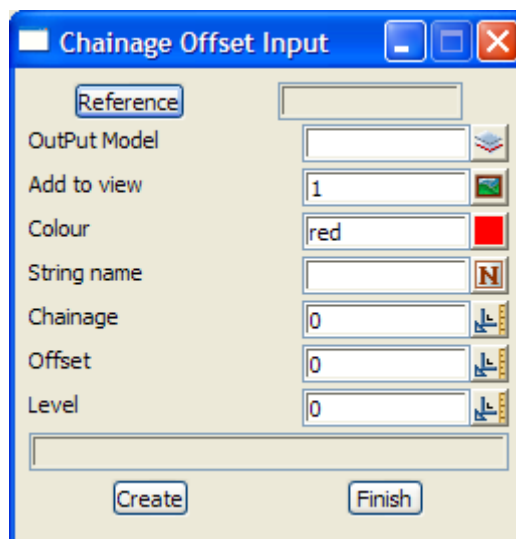


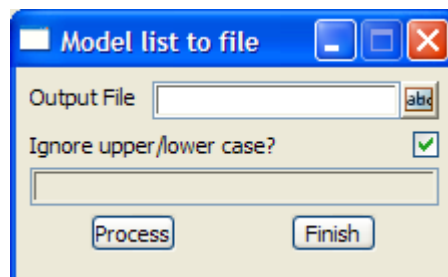
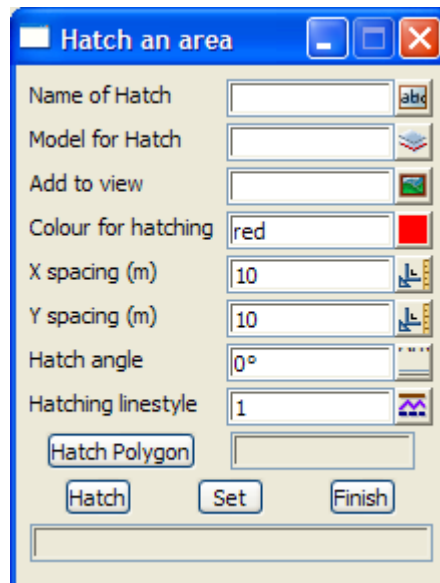
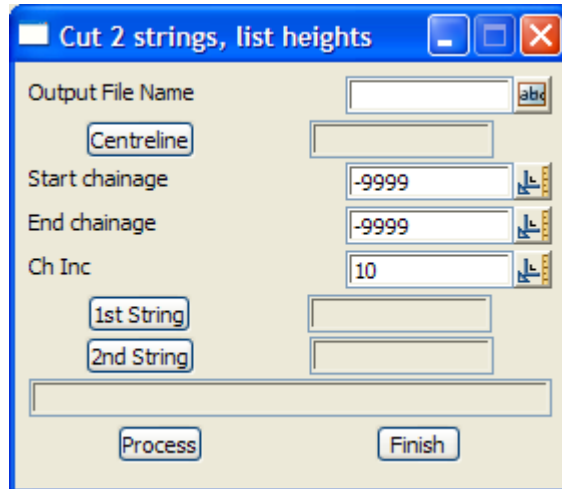
ch_os_input_panel

Cut_2_strings_panel

hatch_panel

list_models_panel





conversions

Conversions

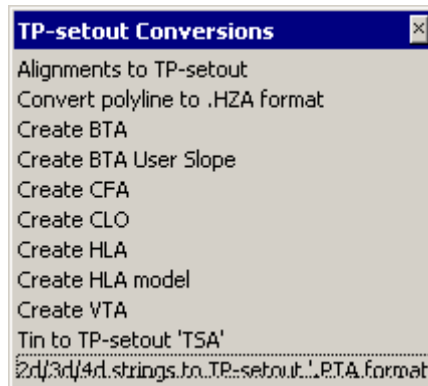
The TP Stakeout /Setout menu contains a variety of options provided by Mick Gunter for TP Stakeout and TP Setout users.

For further details, contact Mick Gunter at michael.gunter@bigpond.com



- tp_setout_conversions
- 4d_to_bta_panel
- 4d_to_bta_set_slope_panel
- 4d_to_cfa_panel
- 4d_to_clo_panel
- 4d_to_hla_panel
- 4d_to_hla_model_panel
- 4d_to_vta_panel
- 4d_tin_tsa_panel

TP Setout Conversions



Create TP-Setout .BTA files

Main Job Name abc

BTA/HLA File Name abc

Centreline

Conversion Tolerance 0.005

Max Ch/Os pairs 10

Start chainage -9999

End chainage -9999

Ch Inc 10

Name of Batter/Lane abc

Top/Toe String

Name of Top/Toe string Name abc

Interface String

Create .BTA files (user sets slope)

Main Job Name abc

BTA/HLA File Name abc

Centreline

Conversion Tolerance 0.005

Max Ch/Os pairs 10

Start chainage -9999

End chainage -9999

Ch Inc 10

Name of Batter/Lane abc

Top/Toe String

Name of Top/Toe string Name abc

Batter Slope 0

Create TP-Setout .CFA files

Main Job Name abc

Conversion Tolerance

Max Ch/Os pairs

Start chainage

End chainage

Ch Inc

Name of X-Fall Alignment abc

Create TP-Setout .CLO files

CLO File Name abc

Conversion Tolerance

Max Ch/Os pairs


Start chainage



End chainage


Ch Inc



Name of string abc



Create TP-Setout .HLA files



Hla File Name 


Conversion Tolerance  

Max Ch/Os pairs 


Start chainage  


End chainage  



Ch Inc  



Name of string 



Create TP-Setout .HLA files from model



Model for Strings 


Hla File Name 

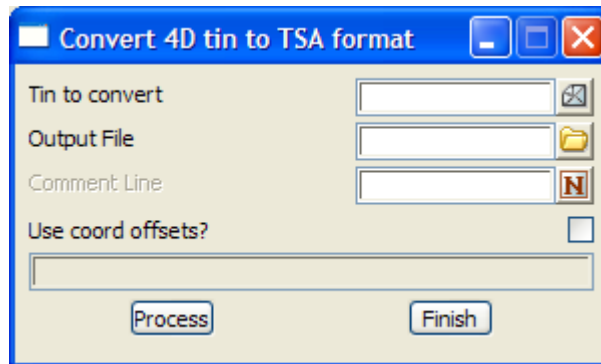
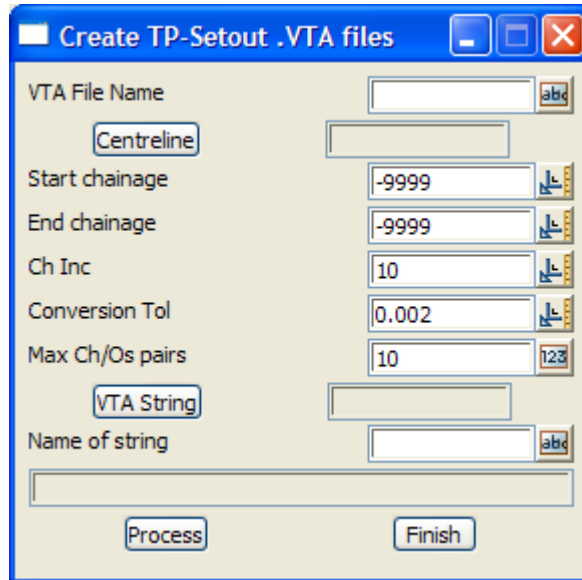
Start chainage  

End chainage  

Ch Inc  

Conversion Tolerance  

Max Ch/Os pairs 

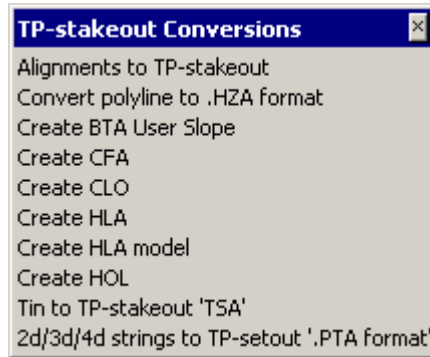


[tp_stakeout_conversions](#)
[4d_to_vta_TP_stakeout_panel](#)
[4d_to_cfa_TP_stakeout_panel](#)
[4d_to_clo_TP_stakeout_panel](#)
[4d_to_hlaTP_stakeout__panel](#)
[4d_to_hla_model_TP_stakeout_panel](#)
[12d_to_hol_TP_stakeout_panel](#)
[4d_tin_tsa_TP_stakeout_panel_01](#)

TP Stakeout Conversions

The TP Stakeout /Setout menu contains a variety of options provided by Mick Gunter for TP Stakeout and TP Setout users.

For further details, contact Mick Gunter at michael.gunter@bigpond.com



Create TP-Stakeout .VTA files

VTA File Name abc

Start chainage abc

End chainage abc

Ch Inc abc

Conversion Tol abc

Max Ch/Os pairs 123

Name of string abc

Create TP-Stakeout .CFA files

Main Job Name abc

Conversion Tolerance abc

Max Ch/Os pairs 123

Start chainage abc

End chainage abc

Ch Inc abc

Name of X-Fall Alignment abc

Create TP-Stakeout .CLO files

CLO File Name abcd

Conversion Tolerance 123

Max Ch/Os pairs 123

Start chainage 123

End chainage 123

Ch Inc 123

Name of string abcd

Create TP-Stakeout .HLA files

Hla File Name abcd

Hza File Name abcd

Conversion Tolerance 123

Max Ch/Os pairs 123


Start chainage 123


End chainage 123


Ch Inc 123


Name of string abcd


Model for Strings


Hla File Name 


Hza File Name 


Start chainage 


End chainage 


Ch Inc 


Conversion Tolerance 


Max Ch/Os pairs 

Max Ch/Os/RL triples 

Start chainage 

End chainage 

HOL File Name 

TPS HZA file 

[piles_and_boxes_drafting](#)

[boxes_panel](#)

[boxes_centres_panel](#)

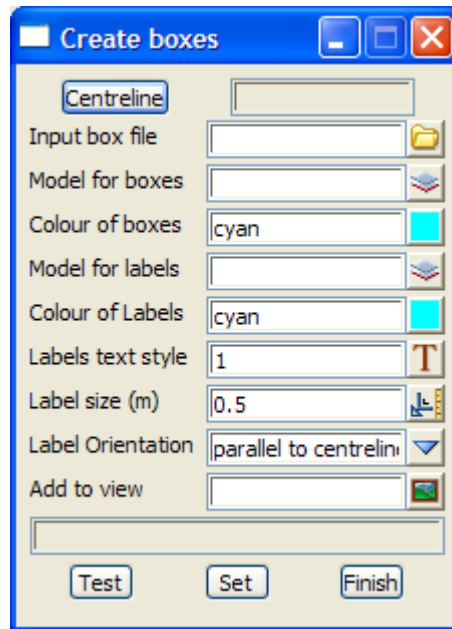
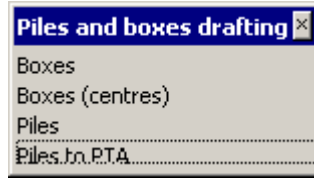
[piles_centres_panel](#)

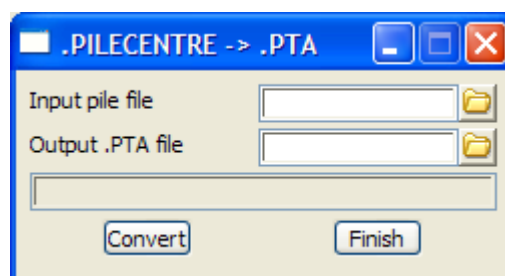
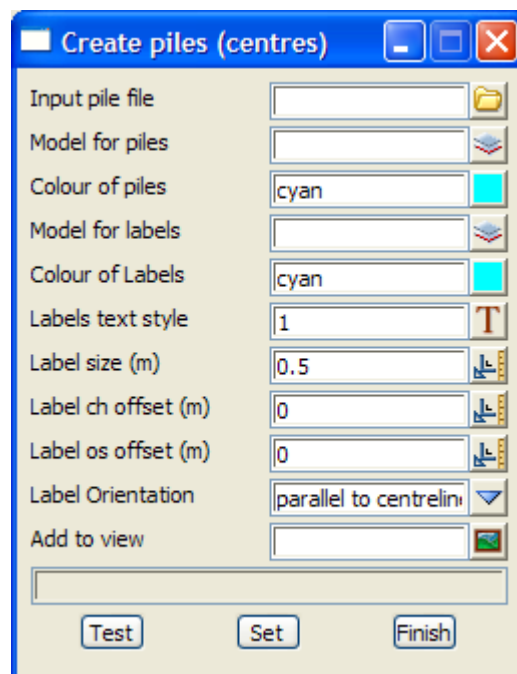
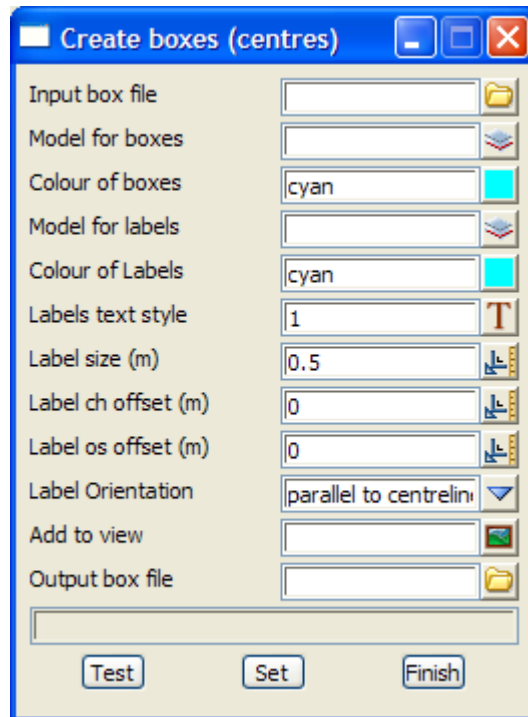
[pilecentre_to_pta_panel](#)

Piles and Boxes Drafting

The TP Stakeout /Setout menu contains a variety of options provided by Mick Gunter for TP Stakeout and TP Setout users.

For further details, contact Mick Gunter at michael.gunter@bigpond.com





subgrade_strings
subgrade_intersections_panel
subgrade_parallel_panel

Subgrade Strings



Create Subgrade Intersections

New String Name abd

New String Model

String Colour

Add to view

Start chainage

End chainage

Ch Inc

Offset 1

Offset 2

Subgrade Parallel

New String Name abd

New String Model

String Colour

Add to view

Start chainage

End chainage

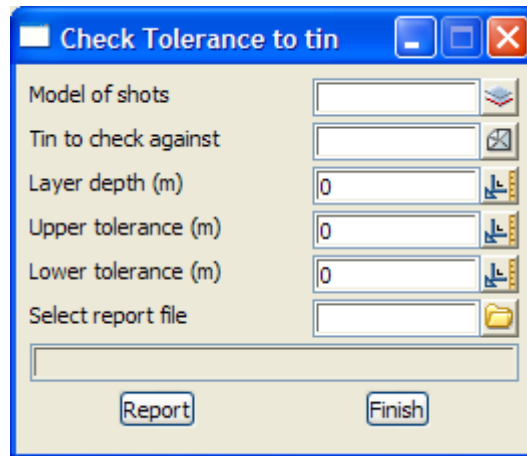
Ch Inc

RL Offset

Parallel Offset

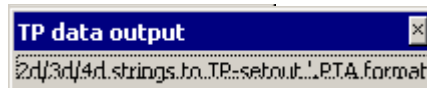
tp_conformance
tin_conform_panel

TP Conformance



tp_data_output

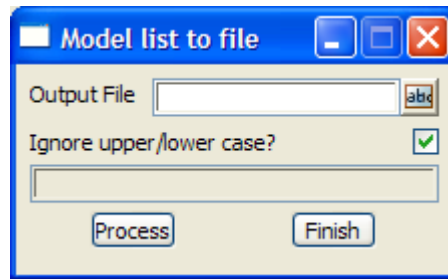
TP Conformance



tp_models
list_models_panel

TP Models



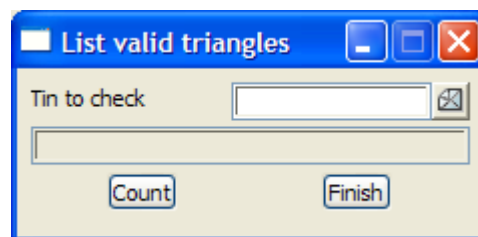
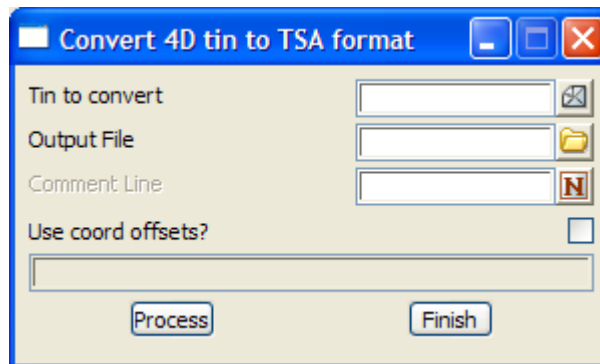


[tp_triangles](#)

[4d_tin_to_tsa_panel](#)

[list_valid_triangles_panel](#)

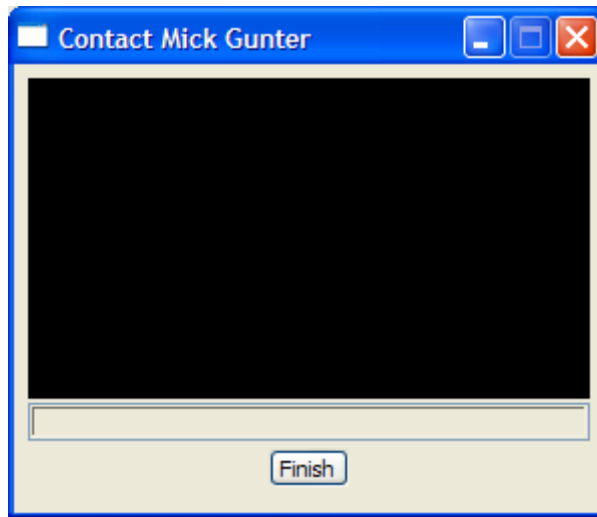
TP Triangles



[contact_mick_gunter_panel](#)

Mick Gunter Details

For further details, contact Mick Gunter at michael.gunter@bigpond.com



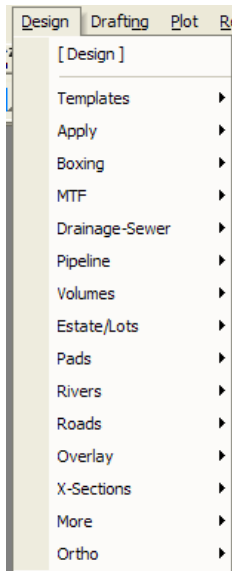
17 Design

design

Position of menu: Design

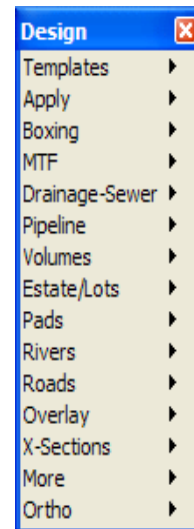
The design walk-right menu is

on Main menu



create floating Design menu
 template creation and utilities
 apply templates, interface, kerb return
 apply boxing to sections
 edit an mtf file
 drainage-sewer options
 pipeline option
 volumes option
 create estate lots
 create pads
 rivers options
 road creation
 overlay design
 cross-sections
 more options
 Ortho 12d output

on 12d Model
 Design floating mer



The options Drainage-Sewer, Pipeline, Volumes and Super alignment (parametric design) will be described in separate chapters of this Reference manual.

The other options in this menu will now be described.

For a description of the definition of a template in 12d Model, please go to the section "Templates in 12d Model" .

For the option *Templates*, please continue to the section "Templates"

<i>Apply</i>	"Apply"
<i>Boxing</i>	"Boxing"
<i>MTF</i>	"MTF"
<i>Drainage-Sewer</i> , go to the chapter	"Drainage and Sewer"
<i>Pipeline</i>	"Pipeline"
<i>Volumes</i>	"Volumes"
<i>Estate lots</i> , go to the section	"Estate Lots"
<i>Pads</i>	"Pads"
<i>Rivers</i>	"Rivers"
<i>Roads</i>	"Roads"
<i>Overlay</i>	"Overlay"
<i>X-Sections</i>	"X-Sections"
<i>More</i>	"More Design"
<i>Ortho</i>	"Ortho 12d"

Templates in 12d Model

In 12d Model, Templates provide a quick and easy method for defining design details along a string for use in conceptual designs and visualizations and even detailed designs.

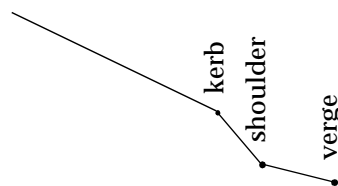
Any easy way of visualising a template is to look at its affect in a cross section.

A template can be thought of as simply a number of links, which are ultimately defined by width and slope, and are connected sequentially (according to rules for each link type) to form a cross section.

The point defined at the end of each link creates a **string** of the given link name when to template is used to create a design. The default colour of the string is the link colour and polygons created for each link are given the link colour.

For example, a template consisting of just the three links kerb, shoulder, verge could look like:

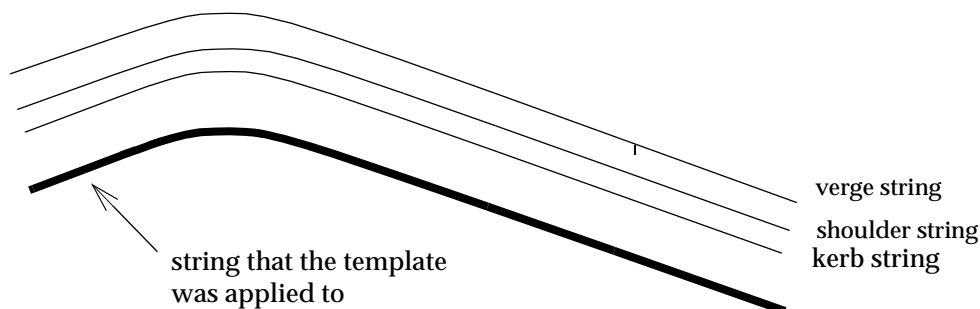
Cross Section View of a Template



Templates are “applied” to a hinge string at right angles to a user selected reference string to produce a design model. That is, for a given string, specified templates are used as the cross-sectional definition of the geometry at a regular chainage interval down the string.

Both design cross sections and longitudinal strings (created by joining together the same points from each cross section) are created. The longitudinal strings are given the name of the template points used to define them

Plan View of a Template Applied to a String



12d Model supports templates with an unlimited number of fixed links, followed by either

(a) a decisions table

or

(b) an unlimited number of variable cut and fill links and a cut/fill slope to be applied at the end of the last cut or fill template link.

The definition of a template with a fixed link table, a cut and fill tables and the final cut/fill links is discussed under the option **create/edit template**. The definition of the **decision table** is given in the chapter “Advanced Design” .

Fixed Template Links

The **fixed template links** are applied to the selected hinge string and are always used when applying the template regardless of whether the template points are in cut or fill. Each link is defined by two of the three variables, width, height and crossfall, and has a name and colour.

At the end of the fixed links, 12d Model checks to see if a **decisions** table exists.

If a **decisions** table exists, then it is used for the rest of the template.

If **no decision** table exist, then the **cut**, **fill** and **final cut/fill** tables are used.

Template Decisions

The decisions table is used for

- ▲ complicated cut and fill requirements including multiple strata, decisions based on depth below one or more strata or strings, multi-level decisions (i.e. depth decisions followed by fixed links, more depth decision etc.); and
- ▲ extended battering including repetitive battering, fixed width batters, and battering relative to a string or strata.

The **decisions** table is documented in the chapter “Advanced Design” .

Cut and Fill Template Links and Final Cut/Fill

When there is **no** decisions table, the **cut**, **fill**, **final cut/fill** tables are used at the end of the fixed links.

If the end of the last link of the fixed template is in cut, the cut links are used and if the end of the fixed template is in fill, the fill links are used. There can be an unlimited number of cut and fill links and they are used sequentially starting with the first link.

If the surface tin is intersected when using a link, the section is terminated at that intersection point. Otherwise, the entire link is included in the section, and next link is then used. This is repeated until the surface is intersected or all the links have been used.

If there is still no intersection with the surface after using all of the cut or fill links, the final cut/fill slope is used to try and intersect with the tin.

The unlimited cut/fill links are called **variable** template links because at each section, a different number of them may be needed - the number of links used varies from section to section.

Applying Templates

Once templates are defined, they can be “applied” to strings to produce the required design model. That is, for a given string, specified templates are used as the cross-sectional definition of the geometry at a regular chainage interval down the string.

Note

Around any curves, the string is approximated by chords spaced at the string's chainage interval or, if it is different, the section separation interval.

If the chord-to-arc distance is greater than the chord/arc tolerance given in the **apply** options panels, then extra points are inserted around the curve so that the chord/arc tolerance is met.

Templates

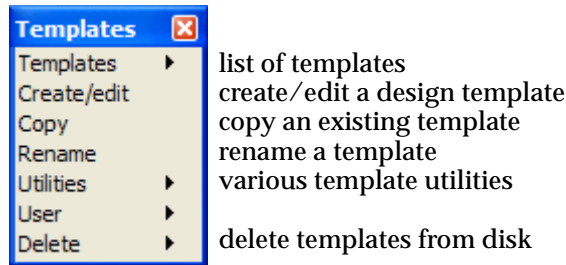
templates

Position of menu: Design =>Templates

The templates walk-right menu provides options create and edit templates, copy, rename and other template utilities.

For a description of the definition of a template in 12d Model, please go to the section “Templates in 12d Model” .

The templates walk- right menu is



For the option *Templates*, go to the section “Templates” .

<i>Create/edit</i>	“Create/Edit” .
<i>Copy</i>	“Copy” .
<i>Rename</i>	“Rename” .
<i>Utilities</i>	“Utilities” .
<i>Delete</i>	“Delete” .

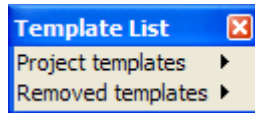
Templates

template_list

Position of option on menu: Design =>Templates =>Templates

The templates walk-right menu provides options to list all the templates added to the project (project templates) and all the templates in the project area but not in the project (removed templates).

The templates walk- right menu is



Project Templates

The project templates walk-right menu provides a list of all the templates in the project.

Removed Templates

The removed templates walk-right menu provides a list of all the templates in the project area that have been removed from the project (using the removed from project option).

Create/Edit

template_create_edit

Position of option on menu: Design =>Templates =>Create/edit

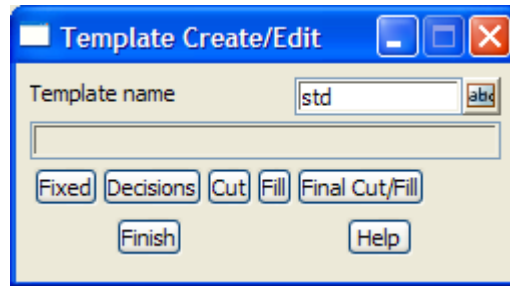
12d Model supports templates with an unlimited number of fixed links, followed by either

- (a) a decisions table
- or
- (b) an unlimited number of cut and fill links and a final cut/fill slope to be applied at the end of the last template link.

To collect the different types of link information needed in the template, the **template create/edit** panel was designed with five buttons **fixed**, **decisions**, **cut**, **fill** and **final cut/fill** used to bring up

and display the panels for creating and editing the fixed, decisions, cut, fill and final cut/fill tables.

On selecting the create/edit option, the **template create/edit** panel is displayed.



The description of the fields and buttons used in the **template create/edit** panel now follows.

The associated panels created by the buttons fixed, cut, fill, final cut/fill will be described in the next four sections and the decisions panel will be described in the chapter “Advanced Design” .

Field Description	Type	Defaults	Pop-Up
Template name	input		available templates
<i>name of the template being created/edited. If the template already exists, then the associated panels will already contain the information for that template. The buttons fixed, decisions, cut, fill and final cut/fill can only be selected after the template name is given.</i>			

Fixed	button		
<i>On selecting this button, the fixed template panel is displayed.</i>			

Decisions	button		
<i>On selecting this button, the Decisions Template panel is displayed. For the complete definition of decisions, please go to the section “Full Definition of Template Decisions” in the Chapter “Advanced Design” .</i>			

Cut or Fill	button		
<i>The variable cut or fill template panel is displayed on selecting this button.</i>			

Final Cut/Fill	button		
<i>The final cut/fill template panel is displayed on selecting this button.</i>			

Note - the buttons can only be selected after the template name has been given in the **template name** panel field.

How to Use the Panel

- A new template is created, or an existing template modified, by first entering the template name into the template field (typed or picked from the pop-up).
- To define or edit the fixed sections of the template, select the **fixed** button and the **fixed template** panel will appear.

Then either:

- use the **decisions** button to define or edit the decisions table
- or
- use the **cut**, **fill** and **final cut/fill** button to define or edit the variable cut, fill or final cut/fill sections of the template respectively.

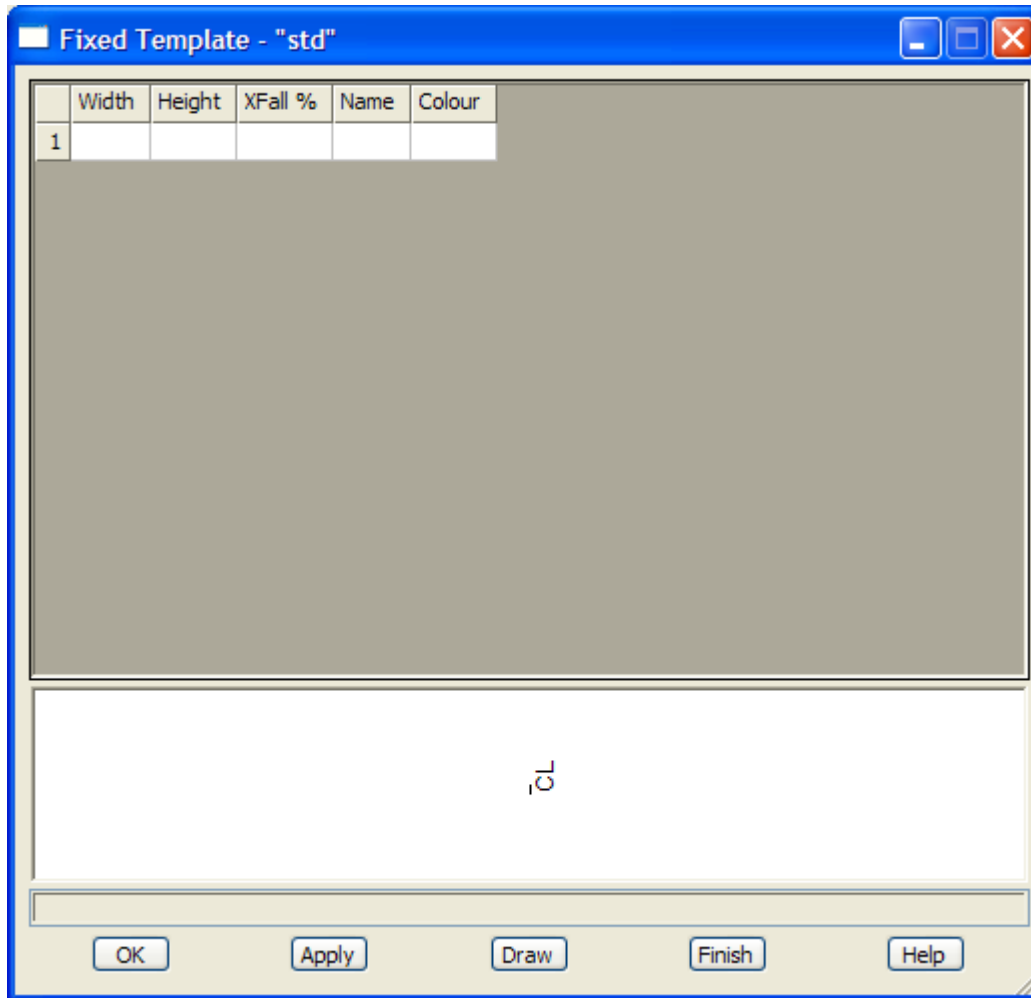
The four panels controlled by the buttons **fixed**, **cut**, **fill** and **final cut/fill** from the **template create/edit** panel will now be described in detail. The **decisions** button will be described in the chapter “Advanced Design” .

Fixed Template

fixed_template

If the template already exists, the current fixed template links will be displayed in the panel. If the template is new, the panel will be empty.

The **fixed template** panel is



An unlimited number of fixed links can be defined in the template. For each link, any two of the three values of width, height and percent crossfall can be used to defined the link. The colour and name are also defined for the link.

The name is given to the sting created by the end of the link and the colour is used as either the string colour, or when a **map file** is used in the **Apply Many** option, is the colour of the created polygon joining the two ends of the link.

The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Width	input/output
--------------	--------------

width of the link being defined

Height input/output

height of the link being defined

NOTE - if height and cross-fall are being used to go down, then define height to be negative and cross-fall to be negative.

X-fall % input/output

percent cross-fall of the link being defined - units are percent grade. Positive is up and negative down.

NOTE - if height and cross-fall are being used to go down, then define height to be negative and cross-fall to be negative.

Colour input/output available colours

colour of the link being defined. If no colour is supplied, the default colour is used.

Name input/output

name of the link being defined - this is used as the name of the string created by the end point of the link.

OK/Apply button

OK stores the values in the fields and exits the panel. Apply stores the values but doesn't exit the panel.

*Warning - If the OK or Apply button is **not** selected, then **no** new information will be recorded.*

Draw button

draws the fixed template at the bottom of the panel. Automatically does a fit.

NOTE - if height and cross-fall are being used to go down, then define height to be negative and cross-fall to be negative.

Variable Cut or Fill Template

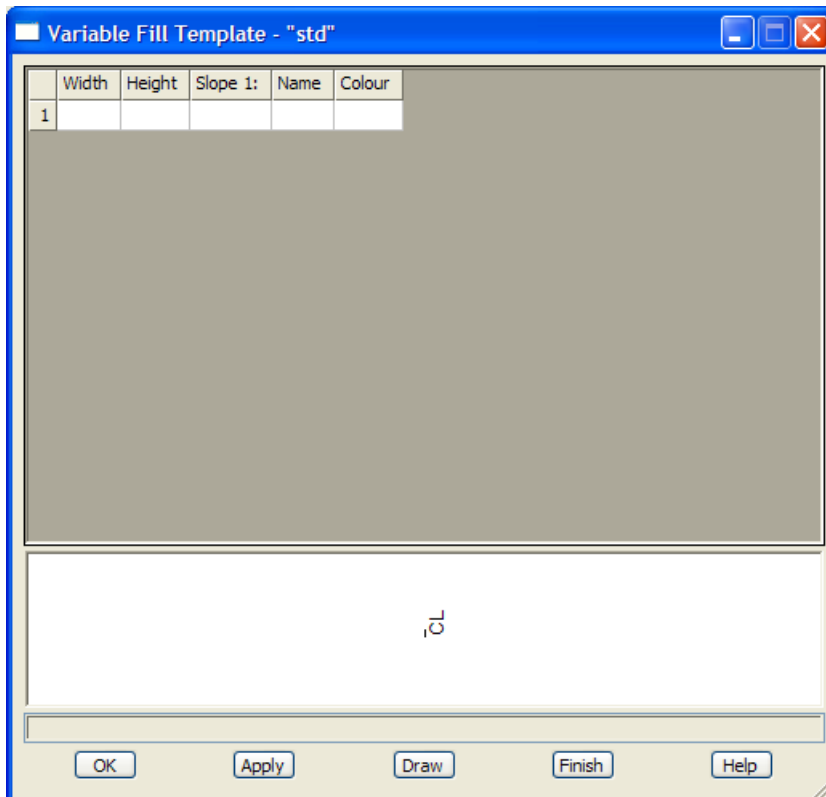
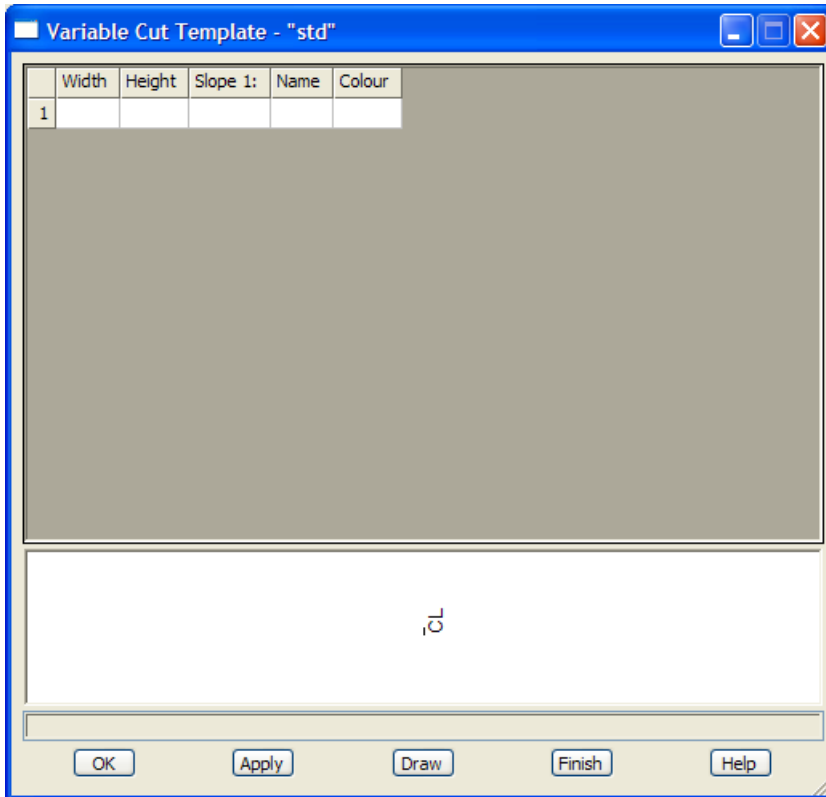
variable_cut_template

variable_fill_template

The definition of the cut or fill template links are similar to the fixed template links except the slope is given as a "one vertical in a user given horizontal value" rather than a percent crossfall.

If the template already exists, the current cut (fill) template links will be displayed in the panel. If the template is new, the panel will be empty.

The **variable cut template** panel and the **variable fill template** panel are similar and look like -



An unlimited number of links can be defined in the variable template. For each link, any two of the three values of width, height and slope can be used to define the link. The colour and name are also defined for the link.

The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Width <i>width of the link being defined</i>	input/output		
Height <i>height of the link being defined</i>	input/output		
Slope 1v in <i>slope of the cut link being defined. The units are "one vertical in the given horizontal value". The value 0 is used to designate a horizontal slope - a vertical slope is not allowed. For cut, positive is up and negative is down For fill, positive is down and negative is up. NOTE -in cut: if height and slope are being used to go down, then define height to be negative and slope to be negative. In fill: if height and slope are being used to go up, then define height to be negative and slope to be negative.</i>	input/output		
Colour <i>colour of the link being defined. If no colour is supplied, the default colour is used.</i>	input/output		available colours
Name <i>name of the link being defined - this is used as the name of the string created by the end point of the link.</i>	input/output		
OK/Apply <i>OK stores the values in the fields and exits the panel. Apply stores the values but doesn't exit the panel.</i>	button		

Warning - If the **OK** or **Apply** button is **not** selected, then **no** new information will be recorded.

NOTE -in cut: if height and slope are being used to go down, then define height to be negative and slope to be negative.

In fill: if height and slope are being used to go up, then define height to be negative and slope to be negative.

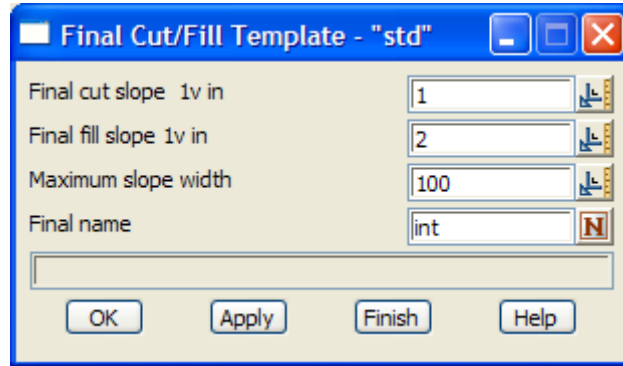
Final Cut/Fill Template

final_cut_fill_template

The final cut/fill template is used if the links in either the cut or fill templates are exhausted without an intersection with the tin being found.

If the template already exists, the current final cut/fill values will be displayed in the panel. If the template is new, the default values are displayed.

The **final cut/fill template** panel is



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Final cut slope 1 v in <i>cut slope for the interface calculation to be done at the end of the last link of the template. A cut slope of one vertical to the given value of horizontal units is used. The value 0 is used to designate a horizontal slope - vertical slopes are not allowed. For final cut slope, positive is up and negative down</i>	input/output	0	no slope, 0,1,2,3,4,5,10
Final fill slope 1 v in <i>fill slope for the interface calculation to be done at the end of the last link of the template. A fill slope of one vertical to the given value of horizontal units is used. The value 0 is used to designate a horizontal slope - vertical slopes are not allowed. For final fill slope, positive is down and negative is up</i>	input/output	0	no slope, 0,1,2,3,4,5,10
Maximum slope width <i>the maximum width for the final slope.</i>	input/output	100	
Final name <i>name for the string created by this link (normally this string lies on the tin - the interface string).</i>	input/output	int	
OK/Apply <i>OK stores the values in the fields and exists the panel. Apply stores the values but doesn't exit the panel.</i>	button		

Warning - If the **OK** or **Apply** button is **not** selected, then **no** new information will be recorded.

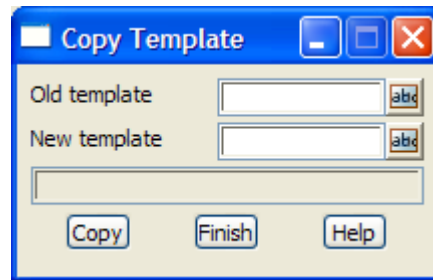
Copy

copy_template

Position of option on menu: Design =>Templates =>Copy

A copy of an existing template can be made using the copy option. This is often useful when a new template that is similar to an existing template is needed. The existing template can be copied and the copy then edited and modified.

On selecting the copy option, the **copy template** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Old template <i>name of the template to be copied.</i>	input		available templates
New template <i>name of the template copy.</i>	input		available templates
Copy <i>after selecting this button, the template given in the old template field will be copied and the copy given the name in the new template field.</i>	button		

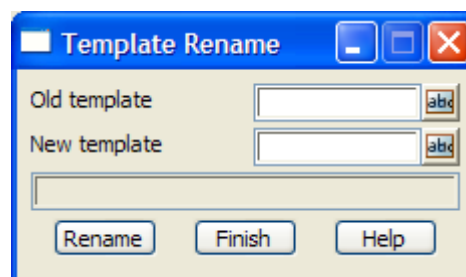
Rename

template_rename

Position of option on menu: Design =>Templates =>Templates =>Rename

On selecting the rename option, the **template rename** panel is displayed.

This panel can be used to change the names of existing templates



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Old template <i>name of the template to be renamed.</i>	input		available templates
New template <i>new name for the template</i>	input		
Rename <i>Change the name of the template in the old template field to the name given in the new template field.</i>	button		

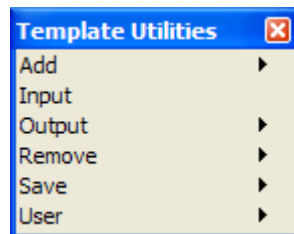
Utilities

template_utilities

Position of menu: Design =>Templates =>Utilities

The utilities menu contains miscellaneous options involving templates.

The utilities walk-right menu is



add templates to project
read in template file
write out templates
remove templates from project
save templates to disk

Each option will now be described.

For the option *Add*, go to the section

Input,

Output

Remove

Save

“Add”

“Input”

“Output”

“Remove”

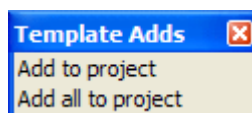
“Save”

Add

template_adds

Position of menu: Design =>Templates =>Utilities =>Add

Removed templates can be added back into the project using the options in the add walk-right menu. The template adds walk-right menu is



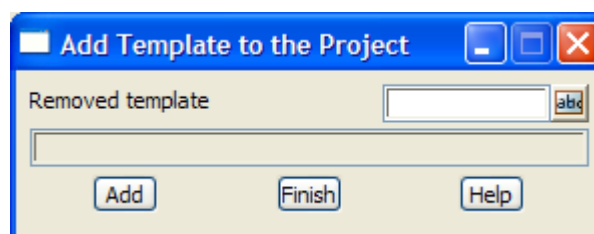
Add

add_template_to_the_project

Position of option on menu: Design =>Templates =>Utilities =>Add =>Add to project

Templates in the working project area but not yet in the project can be added to the project using this option.

On selecting the add option, the **add template to the project** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Removed template <i>name of the template to be added to the project.</i>	input		available templates

Add button
add the template given in the template field to the working project.

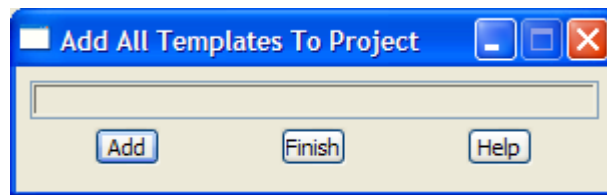
Add All To Project

add_all_templates_to_project

Position of option on menu: Design =>Templates =>Utilities =>Add =>Add all to project

The add all to project option is used to add all the removed templates back into the project.

On selecting the add all to project option, the **add all templates to project** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Add	button		
			<i>after selecting this button, all removed templates in the working project will be added to the project.</i>

Input

This input option is used to read in templates from files in this special 12d Model format.

The option has already been described under **file i/o=>layout input**.

Output

The output option writes out one or all templates in the 12d Model template format.

The option has already been described under **file i/o=>layout output**.

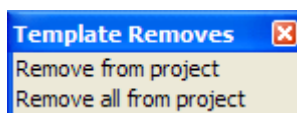
Remove

template_removes

Position of menu: Design =>Templates =>Utilities =>Remove

Templates can be removed from the project using the options in the remove walk-right menu. Removed templates are not deleted but remain in the project area and are no longer accessible in the project.

The template removes walk-right menu is

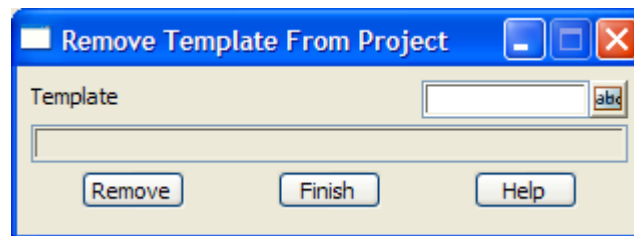


Remove Template from Project

remove_template_from_project

Position of option on menu: Design =>Templates =>Utilities =>Remove => Remove from project

Individual templates can be removed from the project using the remove from project option and on selecting the option, the **remove template from project** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Template <i>name of the template to be removed from the working project.</i>	input		available templates

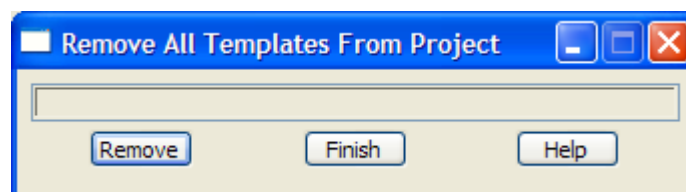
Remove button
after selecting this button, the template given in the template field will be removed from the working project.

Remove All Templates From Project

remove_all_templates_from_project

Position of option on menu: Design =>Templates =>Utilities =>Remove => Remove all from project

All templates can be removed from the project using the remove all option and on selecting the option, the **remove all templates from project** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Remove <i>after selecting this button, all templates in the working project will be removed.</i>	button		

Save

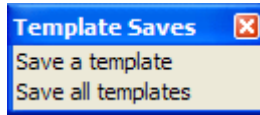
template_saves

Position of menu: Design =>Templates =>Utilities =>Save

Templates can be saved on disk. This is done automatically by the **save** option on the **12d Model**

but this option allows the template alone to be saved.

The template saves walk-right menu is

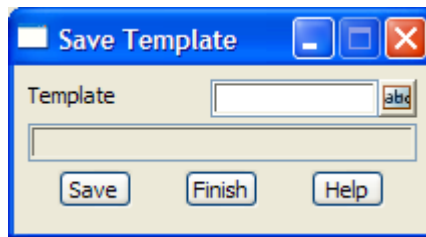


Save Template

save_template

Position of option on menu: Design =>Templates =>Utilities =>Save =>Save a template

On selecting the save a template option, the **save template** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Template <i>name of the template to be saved.</i>	input		available templates

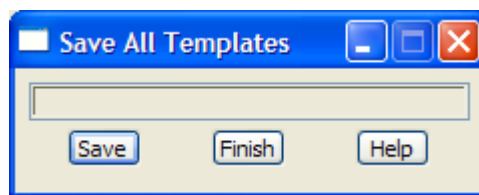
Save button
after selecting this button, the template given in the template field will be saved to disk.

Save All Templates

save_all_templates

Position of option on menu: Design =>Templates =>Utilities =>Save =>Save all templates

On selecting the save all templates option, the **save all templates** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Save	button		

after selecting this button, all templates in the working project will be saved to disk. Unless an error occurs, the panel will be removed after the saving is completed.

Delete

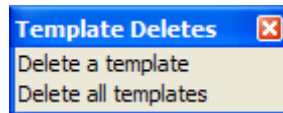
template_deletes

Position of menu: Design =>Templates =>Delete

Using the delete option, templates can be deleted from the project and the computer disk so that they can no longer be accessed or take up disk space.

To help protect the user against disasters, when a template is selected for deletion, a **yes-no** pop-up menu is used to confirm that the user did intend deleting the template.

The template deletes walk-right menu is



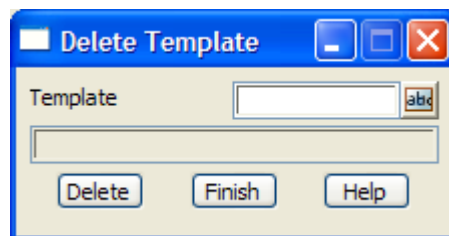
Delete Template

delete_template

Position of option on menu: Design =>Templates =>Delete =>Delete a template

The delete a template option is used to delete individual template from the project.

On selecting the delete a template option, the **delete template** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Template <i>name of the template to be deleted.</i>	input		project templates
Delete	button		

*after selecting this button, the template given in the template field will be deleted from the computer disk. A **yes-no** pop-up is used to confirm that deletion is required.*

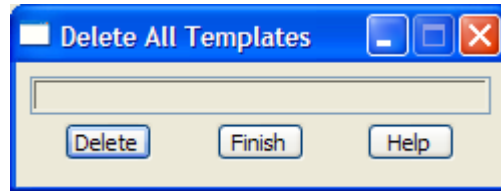
Delete All

delete_all_templates

Position of option on menu: Design =>Templates =>Delete =>Delete all templates

The delete all option will delete all templates in the working project. It does not delete templates that are in the working project area but not yet added to the project.

On selecting the delete all option, the **delete all templates** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Delete	button		
---------------	--------	--	--

*after selecting this button, a **yes-no** pop-up is used to confirm that deletion is required. If it is, all templates in the project will be deleted from disk. Unless an error occurs, the panel will be removed.*

Apply

design_functions

Position of menu: Design =>Apply

The **apply** options are for producing design strings using templates and modifiers to create strings along a reference or reference and hinge string - "applying the template to a string". This method can be used to quickly produce roads, canals, trenches, site batters etc.

When applying the templates, design x-sections and strings are automatically produced, plus the cut and fill volumes for the design.

Creating a design in this way is the first job of the **apply** options.

However, after applying a template and examining the results, it is normally necessary to make changes to either the template, the string that the template was applied to or even the tin used for interfacing.

In all cases, the strings, sections and volumes created during the **apply** will no longer be valid and need to be replaced by new information.

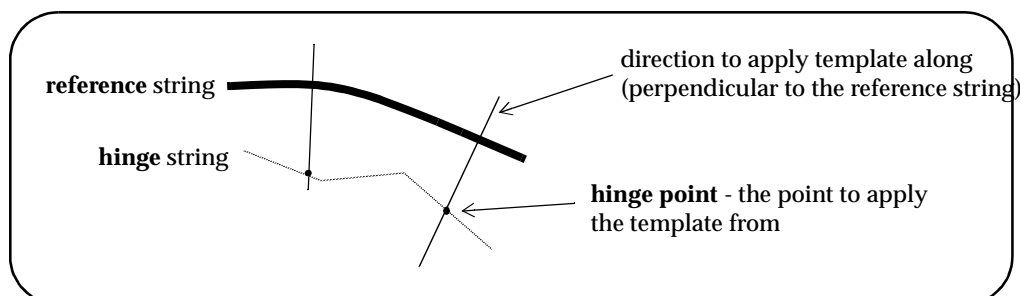
Although this can be accomplished by deleting the incorrect models and replacing them with new ones by re-applying the template, this would be a time consuming if repeated over and over again. Hence in **12dModel**, a concept called **Apply functions** was introduced.

Basically, an **apply function** keeps track of all the information involved in applying a template and all the strings and models created during the **apply/apply many**. If either the template, the tin or the string that the template was applied to is subsequently modified, the apply functions can be re-run and all the old information automatically deleted and replaced by the updated information.

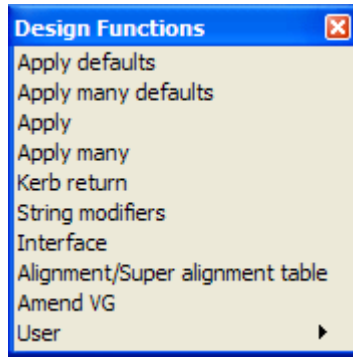
NOTES ABOUT THE STRING CHOSEN TO APPLY TEMPLATES TO

1. If vertical geometry does not exist for the entire length of the string, then the template(s) are only applied to the section of the string where vertical geometry exists.
2. If the horizontal or vertical geometry has overlapping tangent points at any section of the string, then the option terminates without any calculations being made.
3. Any curves will be approximated by chords spaced at chainage interval given by the section separation value. If the chord-to-arc distance for the chords is greater than the chord/arc tolerance given in the **apply/apply many** panel, then extra points are inserted around the curve so that the chord/arc tolerance is met.
4. The **apply** options create sections and strings using a **reference** string to define the chainage and what is perpendicular at each chainage, and a **hinge** string from where the template links are defined. The template defines a point name and colour for each template link.

Cross sections can be created with point names corresponding to the template links, and strings formed by joining the same named points from consecutive cross sections.



The apply walk-right menu is



Each option in this menu will now be described.

For the option *Apply/ Apply many defaults*, go to the section “Apply and Apply Many Defaults” .

<i>Apply,</i>	“Apply”
<i>Apply many,</i>	“Apply Many”
<i>Kerb return</i>	“Kerb Return”
<i>String modifiers</i>	“String Modifiers”
<i>Interface</i>	“Interface”
<i>Alignment/super alignment table</i>	“Alignment & Super Alignment Table” in the chapter “Drafting”
<i>Amend VG</i>	“Amend VG”

Apply and Apply Many Defaults

[apply_template_defaults](#)

[apply_templates_defaults](#)

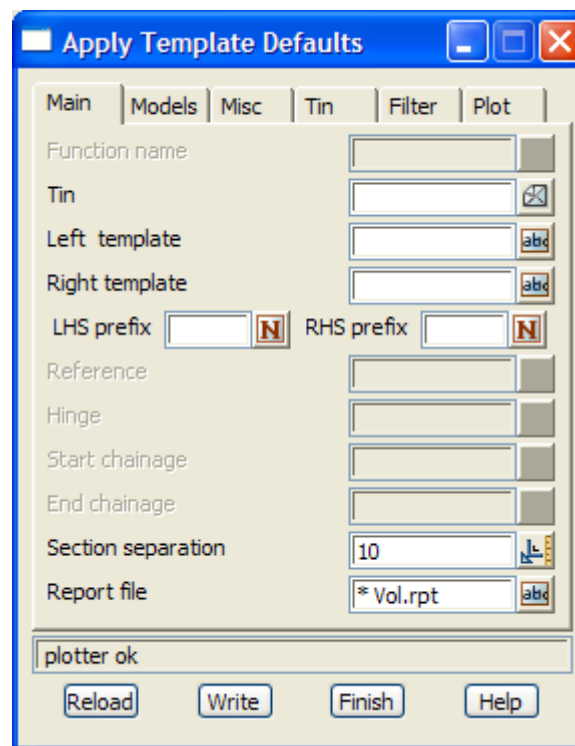
Position of option on menu: Design =>Apply =>Apply defaults

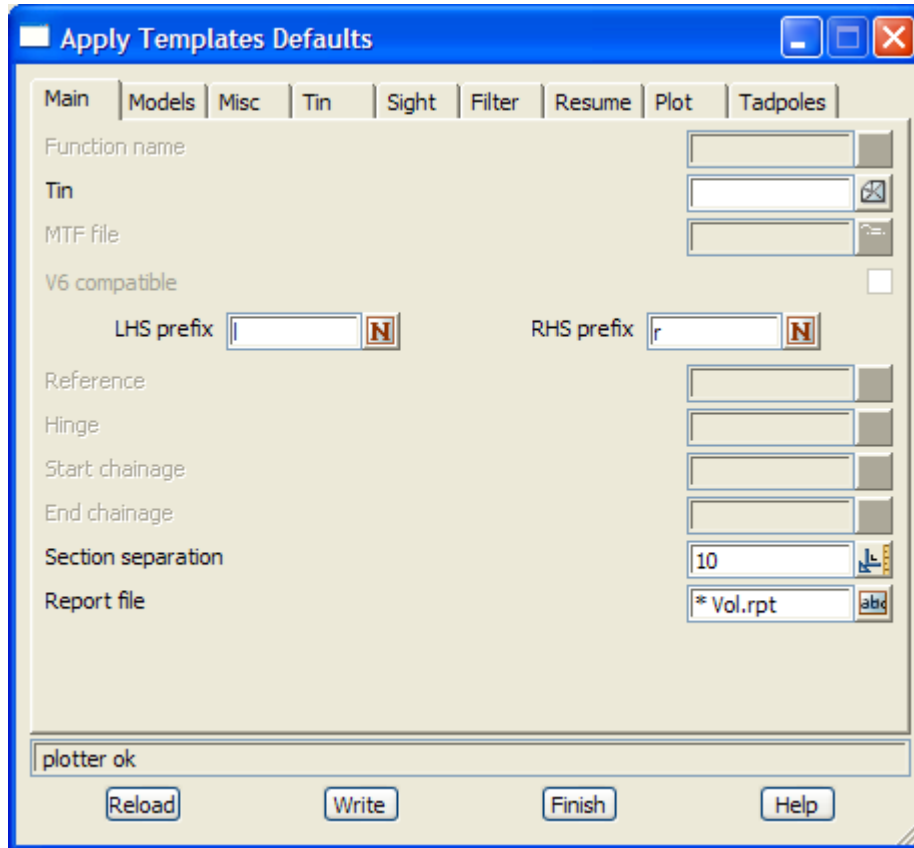
Design =>Apply =>Apply many defaults

There are two files *apply_defaults.4d* and *apply_many_defaults.4d* which contain the **pre** or **post text** to be added to the name of the function to automatically create many entries in the panel fields for *Apply* and *Apply Many* plus default values for all the other panel fields.

After the name of a new function is typed in and an <enter> typed, all the fields mentioned in the default files are automatically filled in using the function name and the defined **pre-post text** as supplied in the file, plus setting any other panel fields from default values supplied in the file. If the files are missing, no panel fields are automatically filled in.

The files can be created and edited using the Apply defaults or Apply many defaults option which brings up the **Apply Template Defaults** or **Apply Templates Defaults** panels respectively.





Apply

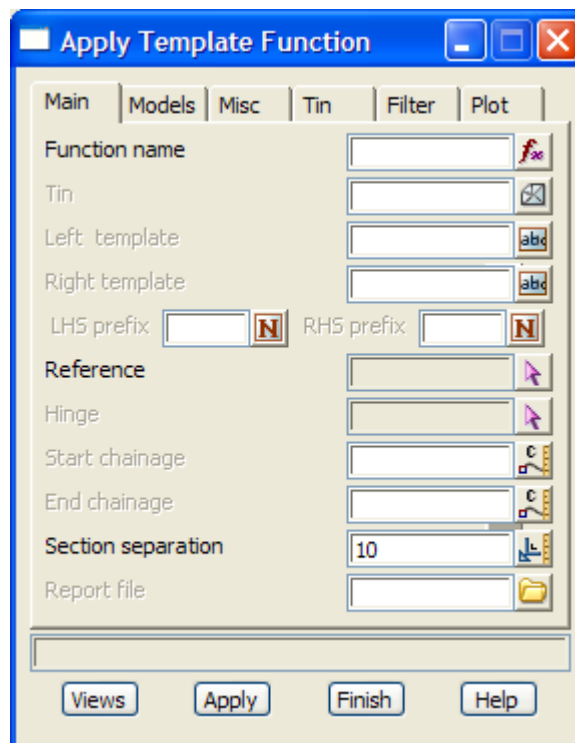
apply_template_function

Position of option on menu: Design =>Apply =>Apply

On selecting the Apply option, the **Apply Template Function** panel is displayed.

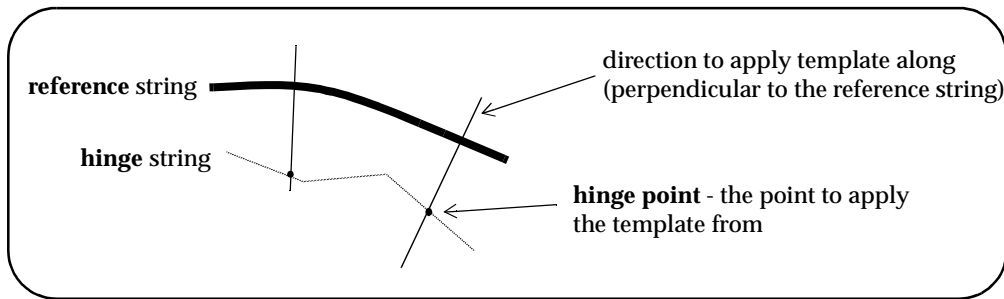
This panel is used to create the information for applying a new template function or to modify the information for an existing template function.

The **Apply Template Function** panel is



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Button at bottom			
Views	button		
<i>perspective views can be defined with respect to chainages on the string. This option is described in more detail in the section "Views"</i>			
Apply	button		
<i>apply the template information to the selected reference and hinge strings, between the start and end chainages. The cut, fill and balance volumes are also calculated and written to the message area.</i>			

**Main tab**

Function name	input	available template functions
<i>name of the function to define the apply for. If the function already exists and is picked from a pop-up or an <enter> is given at the end of the name, the information from the existing function will be placed in the appropriate panel fields.</i>		
Tin	tin box	available tins
<i>if non-blank, the name of the tin to calculate the cut/fill interfaces against at the end of the fixed part of the templates given in the left and right template fields. If blank, then only the fixed part of the templates are used unless a tin is specified in the decisions section of the templates.</i>		
Left/right template	template box	available templates
<i>name of the template to be applied to the left/right of the string. If a template is used on the left/right, the template definitions go from the hinge string out to the left/right.</i>		
LHS/RHS prefix	input	
<i>prefix/postfix (pre*post) to be applied to the left/right template string names. If pretext only, just give the text. If post text is required, precede it by a *.</i>		
Reference	string-select	
<i>the selected string is used to defined the meaning of chainage and bearing for each point in the apply. Sections are defined at right angles to the reference string at the appropriate chainage points on the reference string.</i>		
Hinge	string-select	
<i>the reference string defines chainage and bearing but the templates are actually applied to the hinge string. For a given chainage, a line is taken at right angles to the point of that chainage on the reference string and extended until it cuts the hinge string. The templates are applied at that point on the hinge string along the direction of the line. If no hinge string is selected, the reference string is also the hinge string.</i>		
Start/End chainage	input	
<i>the reference string start/end chainage for applying the template. If blank, the start/end chainage of the reference string is used.</i>		
Section separation	input	10.0
<i>sections are created at right angles to points on the reference string that are the section separation chainage distance apart.</i>		

Report file file box *.rpt
*if non-blank, the name of the file to contain the volume report for the template calculations. If the file already exists, the report will be appended to the file.
 If blank, no report is produced.*

Models tab

Model for strings model box available models
*if non-blank, the name of the model to contain the template and interface strings. The string colour is the template link colour.
 If blank, the strings will not be stored.*

Model for sections model box available models
*if non-blank, the name of the model to contain the design sections generated by the templates.
 If blank, the sections will not be stored.*

Section colour colour box default colour available colours
the colour for the sections strings

Model for polygons input available models
*if non-blank, the name of the model to contain the polygons created for each link of the template. The polygon is given the colour of the template link.
 If blank, the polygons will not be stored.*

Difference model input available models
if non-blank, the sections which are the difference between the tin sections and the template x-sections are retained and placed in the model given in this field. If blank, the sections are not kept.

Difference colour input available colours
colour for the difference sections strings

Misc tab

Strip depth input 0
the stripping depth to be used on the tin before the apply is done.

Create arcs input super arcs no arcs, alignment arcs,
 polyline arcs, super arcs
*if no arcs, the strings are created as 3d strings with no arcs.
 alignment arcs, the strings are created as alignment strings with arcs
 polyline arcs, the strings are created as polyline strings with arcs.
 super arcs, the strings are created as super strings with arcs.*

Chord/arc tolerance input default chord/arc tolerance
the chord to arc tolerance to use on the reference string for determining how many sections are created around horizontal curves.

Volume correction for curves tick box
if tick, volume corrections are made when going around curves.

Sections as 4d tick tick

if **tick**, the section strings will be created as 4d strings with the appropriate template string names as the text at each point of the section. These are needed for boxing and some options on x-section plots.

Copy hinge tick tick

if **tick**, a string with points at the apply chainages is created on top of the hinge string.

Tin tab

Create road tin tick box

if **tick**, the fields in this tab are used to create a road tin

Road tin tin box available tins

name for the tin created from the design strings and sections

Colour for tin colour box available colours

colour of the road tin

Model for tin model box available models

model for the road tin

Create depth range polygons tick box

if **tick**, depth polygons are created

Depth range file file box *.drf files

depth range file used when creating polygons

Model for polygons model box available models

model for the depth polygons

Filter tab

Filter cross-sections tick box

if **tick**, the fields in this tab are used to filter cross sections

Filter sections model model box available models

model for the filtered cross sections

Filtered sections colour colour box available colours

colour of the filtered cross sections

Regular filtering interval input

regular interval to use for filtering the cross sections

Regular culling tolerance input 0

tolerance to use when selecting a cross section

Include start sections tick box

if **tick**, a section at the start chainage is included even if the start chainage is not a regular interval

Include end sections tick box

if **tick**, a section at the end chainage is included even if the end chainage is not a regular interval

Include H tangent sections tick box

if **tick**, a sections at the horizontal tangent points are included even if they are not a regular interval

Include V create/sag sections tick box

if **tick**, a sections at the crest and sag points are included even if they are not a regular interval

Special chainage file file box *.spc files

if non blank, a file of chainages to include sections at even if they are not a regular interval

Plot tab

Generate long section plots tick box

if tick, long section plots are created

Long section PPF file box

*.lplotppf files

binary ppf file to use for the long section plots

Plotter type plotter box

model

available plotters

type of plotter to use for the long section plots

Plot stem

the name to use for the plots - a number will be added when more than one page is produced

Clean plot model beforehand tick box

*if tick and the **plotter type is model**, the plot models are cleaned before the plots are created*

Generate cross section plots tick box

if tick, cross section plots are created

Cross section PPF file box

*.lplotppf files

binary ppf file to use for the cross section plots

Plotter type plotter box

model

available plotters

type of plotter to use for the cross section plots

Plot stem

the name to use for the plots - a number will be added when more than one page is produced

Clean plot model beforehand tick box

*if tick and the **plotter type is model**, the plot models are cleaned before the plots are created*

Views

template_views

Position of option on menu: Design =>Apply =>Apply

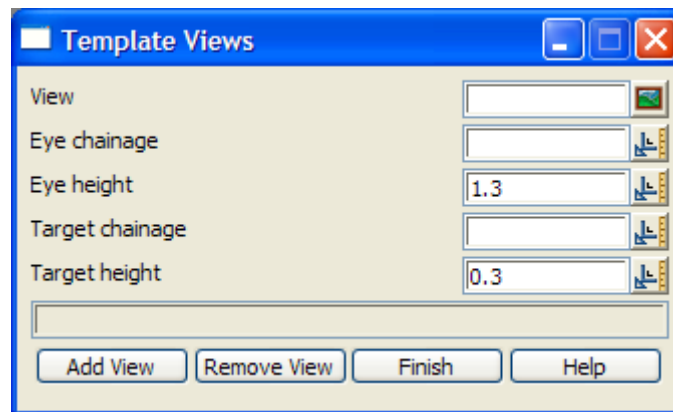
Position of option on menu: Design =>Apply =>Apply many

This option locks perspective views to the reference string of the **Apply/Apply Many** function,

It defines the eye and target co-ordinates for the perspective views in terms of the chainage and height above an existing reference string (as in the perspective view-ops option, string-walk) rather than entering the (x,y,z) eye and target co-ordinates.

If the string is modified, then the perspective eye and target points will also change.

Selecting **Views** fires up the **Template Views** panel.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
View <i>the perspective view to define the eye and target points for.</i>	view box		available views
Eye chainage <i>the string chainage of the eye viewing point.</i>	input		
Eye height <i>height of the eye viewing point above the string.</i>	input	1.3	1.3
Target chainage <i>the string chainage the target viewing point.</i>	input		
Target height <i>height of the target viewing point above the string.</i>	input	0.3	0.3
Add View <i>add the view to the template function and then redraw the view using the above eye and target parameters.</i>	button		
Remove View <i>remove the view from the Apply/Apply Many function.</i>	button		

Apply Many

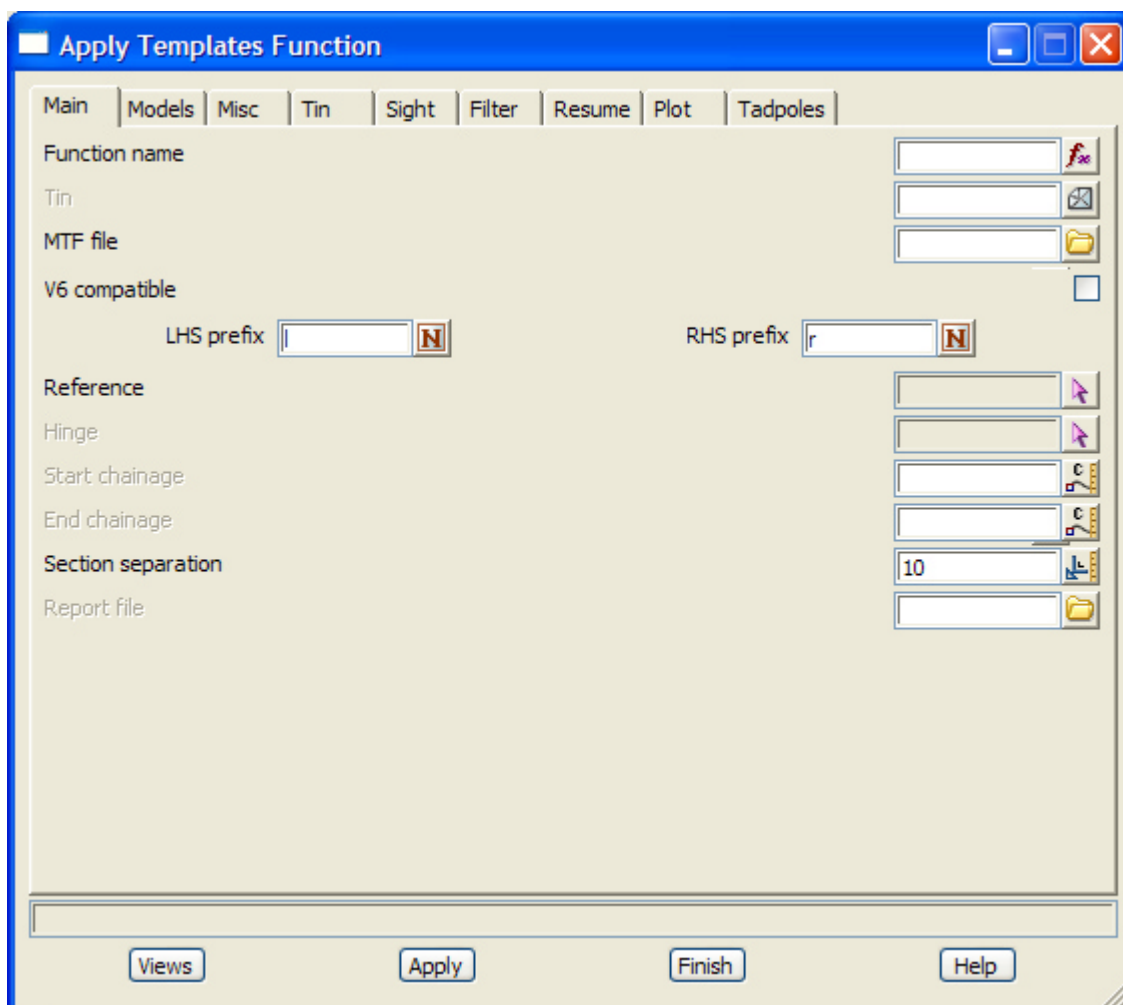
apply_templates_function

Position of option on menu: Design =>Apply =>Apply many

The **apply many** option is used for more complex design work. It includes defining more than one template for defining strings along a string, template modifiers for advanced control of the strings created by the **Apply Many**, stripping depths and boxing, a road tin and depth polygons, sights lines, tadpoles, long section and cross section plots. The **Apply Many** can also create up to eight layers of boxing.

For **Apply Many**, the templates and all the modifiers are supplied in a file called the **Many Templates File** or *mtf* file. The definition of the *mtf* will follow after the description of the **Apply many** option.

Selecting **Apply many** displays the **Apply Templates Function** panel.



This panel can be used to create the information for applying a new template function or to modify the information for an existing template function.

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

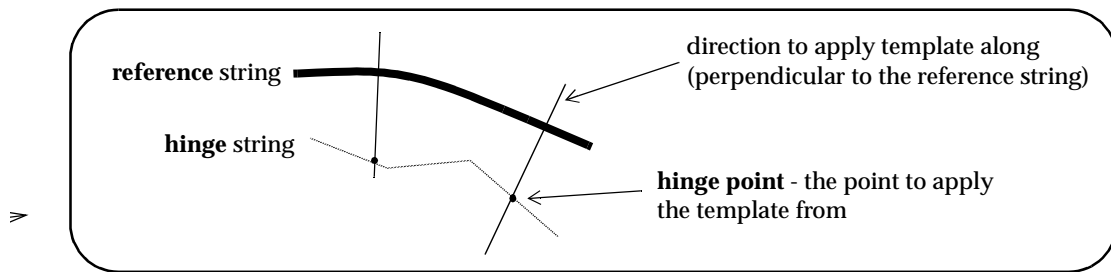
Buttons from bottom

Views	button
--------------	--------

perspective views can be defined with respect to chainages on the string. This option is described in more detail in the next section.

Apply button

apply the template information to the selected reference and hinge strings, between the start and end chainages. The cut, fill and balance volumes are also calculated and written to the message area.

**Main tab**

Function name input available template functions
name of the function to define the apply many for. If the function already exists and is picked from a pop-up or an <enter> is given at the end of the name, the information from the existing function will be placed in the appropriate panel fields.

Tin input available tins
*if non-blank, the name of the tin to calculate the cut/fill interfaces against at the end of the fixed part of the templates given in the template file.
 If blank, then only the fixed part of the templates are used unless a tin is specified in the **decisions** section of the templates.*

MTF file file box available mtf's, edit mtf
*name of the file containing the definitions of where and how templates are applied and modified along the string.
 For more information on the MTF file, go to the section "Many Templates File".*

V6 compatible tick box
if tick,

LHS/RHS prefix input
*prefix/postfix (pre*post) to be applied to the left/right template string names. If pretext only, just give the text. If post text is required, precede it by a *.*

Reference string-select
the selected string is used to defined the meaning of chainage and bearing for each point in the apply. Sections are defined at right angles to the reference string at the appropriate chainage points on the reference string.

Hinge string-select
*the reference string defines chainage and bearing but the templates are actually applied to the hinge string. For a given chainage, a line is taken at right angles to the point of that chainage on the reference string and extended until it cuts the hinge string. The templates are applied at that point on the hinge string along the direction of the line.
 If no hinge string is selected, the reference string is also the hinge string.*

Start/End chainage input
the reference string start/end chainage for applying the template. If blank, the start/end chainage of the

reference string is used.

Section separation input 10.0

sections are created at right angles to points on the reference string that are the section separation chainage distance apart.

Report file input *.rpt

if non-blank, the name of the file to contain the volume report for the template calculations. If the file already exists, the report will be automatically over written. If blank, no report is produced.

Also if boxing is included in the MTF file definition, the Volumes in the report reflect the cut and fill volumes to the boxing sections, not the road surface sections. This always happens even if you do not generate boxing sections.

Models tab

the model tab consists of a grid for defining the design strings forming the road surface and design cross section, up to eight layers of boxing and models for the difference sections between the design and the natural surface.

*The last boxing layer is also referred to as the **subgrade** layer.*

Road Surface:

Strings input available models

if non-blank, the name of the model to contain the design and interface strings. The default string colours are the template link colours but that can be overridden by a map file.

If blank, the strings are stored.

Sections input available models

if non-blank, the name of the model to contain the design sections generated by the apply.

If blank, no sections are stored.

Colour input available colours

the colour for the design sections strings

Boxing Layer 1-8:

if non blank, boxing strings and sections will be created for that layer.

*The last boxing layer is also referred to as the **subgrade** layer.*

Strings input available models

if non-blank, the name of the model to contain the boxing strings for this layer.

If blank, the strings will not be stored.

Sections input available models

if non-blank, the name of the model to contain the boxing sections generated by the templates and boxing rules. If blank, the sections will not be stored.

Colour input available colours

colour for the boxing sections for this layer

Difference

Sections input available models

if non-blank, the sections which are the difference between the tin sections and the template x-sections are retained and placed in the model given in this field.

If blank, the sections are not kept.

Colour input available colours
colour for the difference sections strings

Model for polygons input available models
*if non-blank, the name of the model to contain the polygons created for each link of the template. The polygon is given the colour of the template link.
 If blank, the polygons will not be stored.*

Misc tab

Create arcs choice box super arcs no arcs, alignment arcs, polyline arcs, super arcs
*if no arcs, the strings are created as 3d strings with no arcs.
 alignment arcs, the strings are created as alignment strings with arcs
 polyline arcs, the strings are created as polyline strings with arcs.
 super arcs, the strings are created as super strings with arcs.*

Chord/arc tolerance input default chord/arc tolerance
the chord to arc tolerance to use on the reference string for determining how many sections are created around horizontal curves.

Volume correction for curves tick box
if tick, volume corrections are made when going around curves.

Partial interfaces tick box tick
*if tick, an interface string is not produced when no intersection is made with the tin. The interface may then be broken into a number of interface strings.
 If not ticked, a yellow segment is created in the interface string when no intersection is made with the tin. Only one interface string will then be produced.*

Sections as 4d tick box tick
if tick, the section strings will be created as 4d strings with the appropriate template string names as the text at each point of the section. These are needed for boxing and some options on x-section plots.

Copy hinge tick box tick
if tick, a string with points at the apply chainages is created on top of the hinge string.

Use stripping tick box tick
if tick, the stripping depths in the mtf file are used.

Show detailed stripping volumes tick box
if tick, end area stripping volumes are written to the report file

Calculate natural surface to design volumes tick box tick
if tick, end area volumes between the natural surface and the design strings are written to the report file

Calculate natural surface to subgrade volume tick box tick

if tick, end area volumes between the natural surface to the subgrade (the last boxing layer) are written to the report file

Calculate road to subgrade volumes tick box tick

if tick, end area volumes between the design strings and the subgrade (the last boxing layer) are written to the report file.

Calculate inter-boxing layer volumes tick box tick

if tick, end area volumes between each of the boxing layers are written to the report file.

Map file

file box

*.mf files

*if non blank, the given map file is applied to all the design strings created by the **Apply Many**. The map file overrides any default colours from the templates. The map file can colour strings, apply linestyles, apply hatch patterns to polygons, apply extrudes to super strings etc. For more details on the map file, see "Map File" in the chapter "File I/O".*

Tin tab

*the **Tin** tab controls the creation of a design tin and depth polygons*

Create road tin

tick box

if tick, the fields in this tab are used to create a road tin

Road tin

tin box

available tins

name for the tin created from the design strings and sections

Colour for tin

colour box

available colours

colour of the road tin

Model for tin

model box

available models

model for the road tin

Create depth range polygons tick box

if tick, depth polygons are created

Depth range file

file box

*.drf files

depth range file used when creating polygons

Model for polygons

model box

available models

model for the depth polygons

Sight tab

*the **Sight** tab controls the reporting of sight distance lines between the reference line and a super tin formed from the natural surface tin and the design tin, and barrier lines on the reference line if it is a super alignment. For more information on sight distance calculations and for the option that will also create sight lines/no-lines and take bridge tins into consideration, go to the section "Sight Distance".*

Calculate sight distance tick box

if tick, sight distance lines are created and barrier lines calculated and applied to the reference string if it is a super alignment.

Min sight distance

input

100

minimum chainage distance to use for placing the test target point.

Max sight distance

input

3000

maximum chainage distance to use for placing the test target point.

Eye height input 1.3

height of the eye point above the picked string

Eye offset input 1.3

offset of the eye point from the picked string.

Target height input 0.3

height of the test target point above the picked string

Target offset input 1.3

offset of the target point from the picked string.

Calc interval input 20

chainage increment to move the eye point for the next sight distance calculation.

Trial interval input 10

chainage increment to move to test target point.

Report file file box *.rpt files

if non blank, a sight distance report is produced and written out to this file name.

Create separation/barrier lines tick box

if tick, and the reference string is a super alignment, barrier and separation lines are created and defined in the super alignment.

Barrier distance input

Min barrier road length input

Max barrier road length input

Min between barriers input

Filter tab

*the **Tin** tab controls the filtering of cross sections*

Filter cross-sections tick box

if tick, the fields in this tab are used to filter cross sections

Filter sections model model box available models

model for the filtered cross sections

Filtered sections colour colour box available colours

colour of the filtered cross sections

Regular filtering interval input

regular interval to use for filtering the cross sections

Regular culling tolerance input 0

tolerance to use when selecting a cross section

Include start sections tick box

if tick, a section at the start chainage is included even if the start chainage is not a regular interval

Include end sections tick box

if tick, a section at the end chainage is included even if the end chainage is not a regular interval

Include H tangent sections tick box

if tick, a sections at the horizontal tangent points are included even if they are not a regular interval

Include V create/sag sections tick box

if tick, a sections at the crest and sag points are included even if they are not a regular interval

Special chainage file file box *.spc files

if non blank, a file of chainages to include sections at even if they are not a regular interval

Resume tab

still under development

Plot tab

*the **Plot** tab controls the generation of long section and cross section plots*

Generate long section plots tick box

if tick, long section plots are created

Long section PPF file box *.lplotppf files

binary ppf file to use for the long section plots

Plotter type plotter box model available plotters

type of plotter to use for the long section plots

Plot stem

the name to use for the plots - a number will be added when more than one page is produced

Clean plot model beforehand tick box

*if tick and the **plotter type is model**, the plot models are cleaned before the plots are created*

Generate cross section plots tick box

if tick, cross section plots are created

Cross section PPF file box *.lplotppf files

binary ppf file to use for the cross section plots

Plotter type plotter box model available plotters

type of plotter to use for the cross section plots

Plot stem

the name to use for the plots - a number will be added when more than one page is produced

Clean plot model beforehand tick box

*if tick and the **plotter type is model**, the plot models are cleaned before the plots are created*

Tadpoles tab

*the **Tadpole** tab controls the generation of batters ticks and tadpoles (hachure notation). For more information see the section "Create Cut/Fill Symbols" in the chapter "Drafting".*

Create tadpoles tick box

if tick, cut/fill symbols are created between given strings

Tadpole model model box available models

	<i>model for the created cut-fill symbols</i>		
Interval	input	10	
	<i>chainage distance between the symbols</i>		
Search width	input	50	
	<i>maximum distance to search to cut the strings for creating symbols. This is important for cases such as a bend in a road where multiple sets of string may then exist even when only searching out on one side of the road</i>		
Search side	choice box	both	both, left side only right side only
	<i>side of the reference string to search for strings to apply symbols to.</i>		
String 1	input	50	
	<i>name of the point on the template to start symbol.</i>		
String 2	input	50	
	<i>name of the point on the template to stop symbol.</i>		
Start Ch.	input		
	<i>if blank, use the start chainage of the apply many. If non blank, the chainage to start applying this symbol to.</i>		
End Ch.	input		
	<i>if blank, use the end chainage of the apply many. If non blank, the chainage to stop applying this symbol to.</i>		
Symbol 1	symbol data		
	<i>definition of the symbol to create at the given interval, or at twice the given interval if Symbol 2 is defined</i>		
Symbol 1 %	input		
	<i>if non-blank, percentage of the distance between String 1 and String 2 to apply the symbol. If blank, the symbol is applied to the full distance between String 1 and String 2 (i.e. 100%)</i>		
Symbol 2	symbol data		
	<i>definition of a second symbol to create at twice the given interval</i>		
Symbol 2 %	input		
	<i>if non-blank, percentage of the distance between String 1 and String 2 to apply the symbol. If blank, the symbol is applied to the full distance between String 1 and String 2 (i.e. 100%)</i>		

Many Templates File

The many templates file includes the definition of

1. chainage ranges for the use of templates on the left and right side of the hinge
2. interpolation between templates
3. templates at special chainages
4. template modifiers to further change the hinge and template strings
5. stripping depths along the job
6. boxing

The documentation for chainage ranges and template interpolation (1 and 2) will be given now and the documentation for 3-6 will be given in the later chapter “Advanced Design” .

The templates on the left and right hand sides of the centre line are specified separately in the many templates file. Apart from a key word denoting whether the following part of the definition is for the left side or the right side, the set out for the left-side is identical to the right-side. Hence, only the left-side will be described in detail.

The left-side definition begins with the key words

```
left_side =
```

A list of chainages (in ascending order, one per line) with corresponding template names then follows. This list of chainages and templates is enclosed in curly braces { }.

Note if the template name includes spaces, then the name must be enclosed in quotes “. For example, “left 1”.

The chainage-template lists are assembled as follows

- (a) To represent a template starting at a given chainage, the chainage value followed by the template name is given. The chainage and name are separated by one or more spaces. For example, the template **std** starting at chainage 150 is represented by

```
150      std
```

The template is assumed to apply until the chainage given on the next line of the left-side definition.

If the template is to go to the end of the centre-line, add a line with a chainage greater than or equal to the end chainage. For example,

```
150      std
99999
```

- (b) if no template exists from a chainage, simply include the chainage with no template name following it. For example, if there is no template from chainage 250, this is represented by

```
250
```

The non-existence of a template is assumed to apply until the chainage given on the next line of the left-side definition

- (c) the case of a linear change from one template to another template over a specified chainage range is represented by giving the start chainage of the linear change, followed on the same line by the start template, a comma, and the end template. For example, if the template is to vary linearly between the template **std** and the template **left**, beginning at the chainage 350, then the line in the file would be

```
350      std, left
```

The linear change takes place over the interval beginning at the chainage given on the defining line and ending at the chainage given on the next line of the left-side. Distances and percent cross-falls are interpolated linearly and slopes are interpolated on the radian value of

the slope angles.

Combining these rules, the following lines in a template file

```
left_side = {
    100      std
    200      std , "left 1"
    250      "left 1"
    300
    350      std
    99999
}
```

describes the situation

1. the left-hand side of the centre-line has no template from the beginning of the centre-line until chainage 100.
2. at chainage 100, the template **std** begins and continues until chainage 200.
3. there is a linear change from the template **std** to the template **left 1** between chainage 200 and chainage 250.
4. the template **left 1** goes from chainage 250 to chainage 300.
5. there is a gap between chainage 300 and chainage 350.
6. the template **std** goes from chainage 350 to chainage 99999, or if the end chainage is smaller than 99999, to the end of the centre-line.

The right-side template definition begins with the key word `right_side`. The rest of the definition follows the same rules at the left hand side of the centre-line. For example,

```
right_side = {
    100      std
    200      std , right
    250      right
    300      right , std
    350      std
    400
}
```

The left and right sides can vary independently.

Restrictions on the Template File Definitions

1. If one template stops at the same chainage that another template begins, then the two templates must have the same number of fixed and variable links. The templates will be varied linearly from the stopping template to the starting template over one section separation distance.
2. If there is a linear variation between two templates, the two templates must have the same number of fixed and variable links.
3. If two templates do not have the same number of links, they must be separated by a gap, that is, by a region with no template.

Kerb Return

apply_kerb_return_function

Position of option on menu: Design =>Apply =>Kerb return

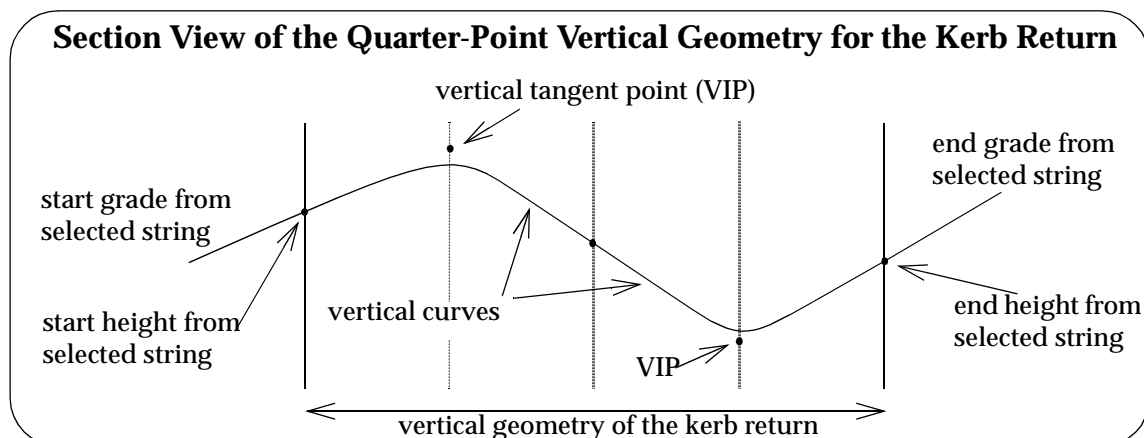
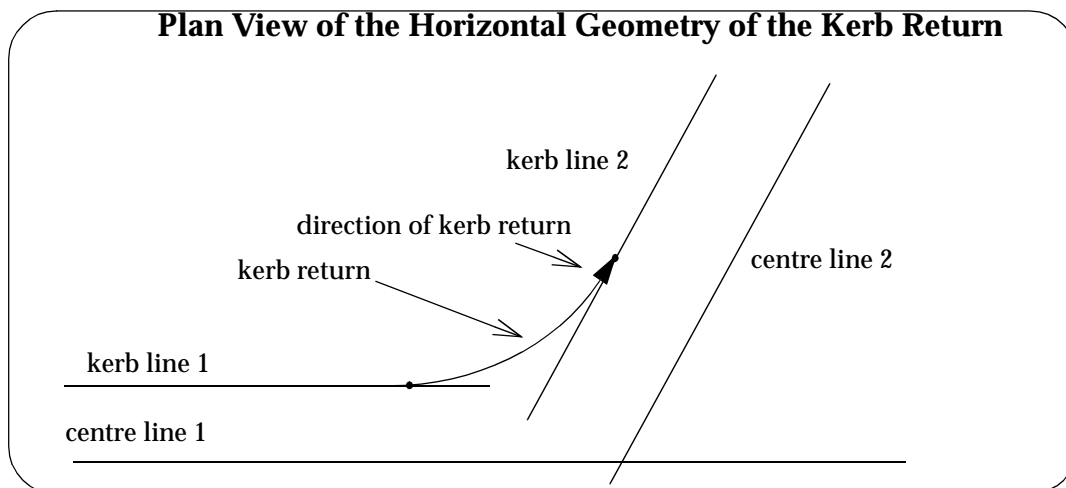
The kerb return option is used to help create the vertical geometry for an alignment string being used as a kerb return.

The standard situation is that in the plan view, the kerb return joins two kerb lines which already have z-values.

It is then necessary to define vertical geometry for the kerb return, usually taking into consideration the z-values and incoming grades from selected strings (often the centre lines and kerb strings).

A standard first guess at the kerb return vertical geometry is known as the quarter point vertical geometry and it is defined by

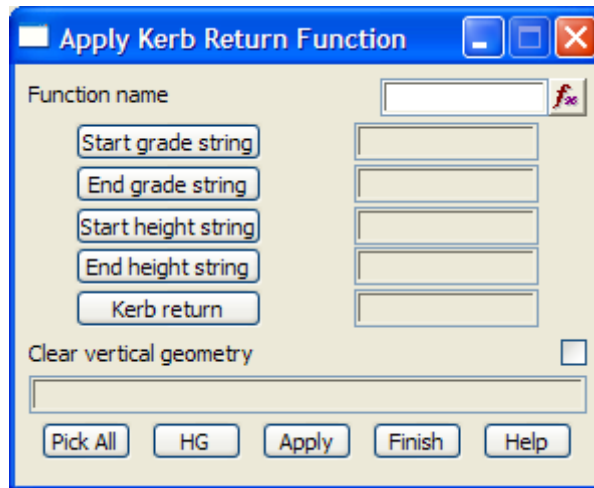
- break the section along the kerb return into four equal pieces
- project the incoming grade from a selected start grade string to intersect the first quarter point line
- project back the outgoing grade from a selected end grade string to intersect the last quarter point line
- join the two projected intersection points
- define vertical intersection points (VIP's) at the intersection points
- create back to back vertical curves for the VIP's



The **kerb return** option creates a function which will automatically create the quarter-point vertical geometry for the kerb return and will recalculate it as required.

Note: the actual **direction** of the kerb is important - start grade and start height apply to the **start** of the kerb and end grade and end height apply to the **end of the kerb** where start and end are determined by the **actual direction** of the kerb (**not the picking direction**).

On selecting the kerb return option, the **apply kerb return function** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Function name <i>name of the function to define the apply for. If the function already exists and is picked from a pop-up or an <enter> is given at the end of the name, the information from the existing function will be placed in the appropriate panel fields.</i>	input		available kerb functions
Start grade string <i>select the string to be used for the in grade at the start of the kerb return.</i>	string-select		
End grade string <i>select the string to be used for the out grade at the end of the kerb return.</i>	string-select		
Start height string <i>select the string to be used for the height at the start of the kerb return - this is used for the z-value at the start of the kerb return.</i>	string-select		
End height string <i>select the string to be used for the height at the end of the kerb return - this is used for the z-value at the end of the kerb return.</i>	string-select		
Kerb return <i>select the alignment string that is the kerb return.</i>	string-select		

Clear vertical geometry tick box

*if **tick**, the vertical geometry of the kerb return string is cleared as soon as the **apply** button is selected, or a recalc done.*

Pick all button

*if **pick all** is selected, the user is asked to sequentially select the four strings: the Start grade string, End grade string, Start height string and End height string. The strings are automatically assigned to the appropriate string-select panel fields.*

HG button

*brings up the kerb return function create **HG** panel. This option is currently under development.*

Apply button

*if the kerb return has no vertical geometry (it will be automatically be deleted if the clear vertical geometry is set to **tick**) or the vertical geometry is the quarter-point geometry for the previous apply, then new quarter-point vertical geometry is created for the kerb return string. Otherwise, nothing happens when the **apply** button is selected. That is, if the kerb return already has vertical geometry which is not the quarter-point geometry for the previous apply, and the clear vertical geometry is set to **no tick**, then **nothing happens** when the **apply** button is selected.*

Note

[kerb_return_function_create_hg](#)

The experimental **kerb return function create HG** panel is

The screenshot shows a dialog box titled "Kerb Return Function Create HG". It contains the following fields and controls:

- Use road widths:
- Use signed widths:
- Road 1 width: [Apply] [Cancel]
- Road 1 X-fall: [Apply] [Cancel]
- Road 2 width: [Apply] [Cancel]
- Road 2 X-fall: [Apply] [Cancel]
- Kerb radius: [Apply] [Cancel]
- Model for kerb: [Apply] [Cancel]
- Colour for kerb: [Color Picker]
- Model for text: [Apply] [Cancel]
- Colour for text: [Color Picker]
- Size for text: [Apply] [Cancel]

At the bottom of the dialog, there is a checkbox for "1/4 pts" and three buttons: "Create HG", "Finish", and "Help".

String Modifiers

string_modifiers_function

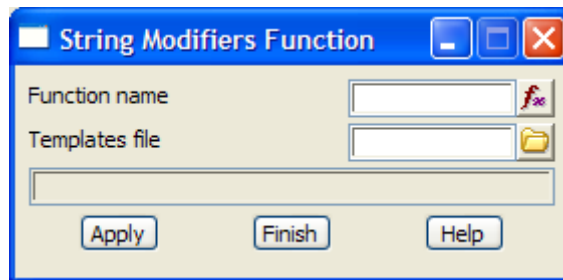
Position of option on menu: Design =>Apply =>String modifiers

The String Modifiers option is used to create vertical intersection points for an alignment string, or heights for a 2d, 3d, 4d, polyline or super string, using projection of heights from a selected string and user given cross-falls or cross-fall between two selected strings.

The **String Modifier** commands are actually part of an mtf file and are documented in “Advanced Design” chapter of this manual.

This option allows the user to run just the **string_modifiers** section of the **mtf** file.

On selecting the String Modifiers option, the **String Modifiers Function** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Function name <i>name of the function to define the apply for. If the function already exists and is picked from a pop-up or an <enter> is given at the end of the name, the information from the existing function will be placed in the appropriate panel fields.</i>	input		available template functions
Template file <i>the name of the many template file to use the string_modifiers section from.</i>	input		available mtf files
Apply <i>apply the string_modifiers section of the many template file.</i>	button		

Interface

interface_function

Position of option on menu: Design =>Apply =>Interface

An **interface** string is where the design meets the natural terrain - it shows the **extent** of the design. The method used for calculating the **interface string** for a given string, tin and cut and fill slopes, is as follows:

For a point on a string, an interface point is calculated by going off at right angles to the string along a line of fixed slope until either the tin is cut or a fixed (plan) distance is travelled. The slope of the line is either the cut or fill slope depending on whether the string point is below the tin (cut point) or above the tin (fill point).

The interface string for a string is constructed by calculating the interface points at regular intervals along the string and then joining the interface points together to form the interface

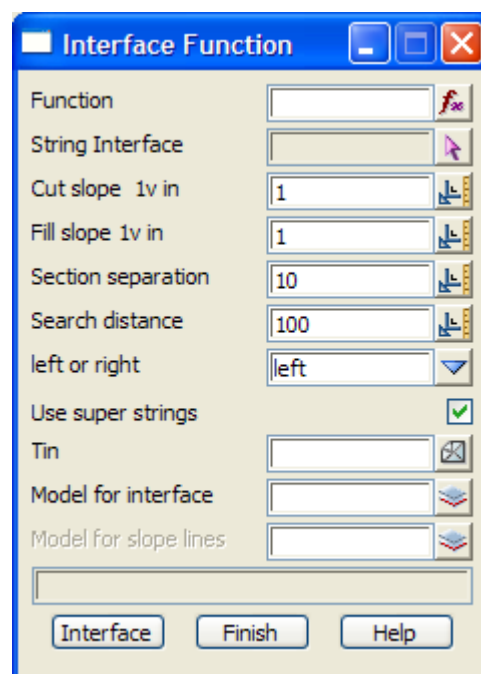
string.

After calculating an interface string and examining the results, it is often necessary to make changes to either the original string, the cut and fill slopes used, or even the tin used for interfacing against. The interface string and slope strings created during the interface would no longer be valid and need to be replaced by new information.

Although this can be accomplished by deleting the incorrect models and replacing them by new ones by re-applying the interface, this is would be time consuming if repeated over and over again. The **interface function** has been introduced to help reduce the work involved when re-calculating an interface string.

Basically, an **interface function** keeps track of all the information involved in creating an interface string and all the strings and models created during the interface. If either the original string, the cut and fill slope or the tin is subsequently modified, the interface functions can be re-run and all the old information automatically deleted and replaced by the updated information.

On selecting interface, the **interface function** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Function <i>name of the function to define the interface for. If the function already exists and is picked from a popup or and an <enter> is given at the end of the name, the information from the existing function will be placed in the appropriate panel fields.</i>	function box		available interface functions
String interface <i>select the string to calculate the interface from.</i>	string select box		
Cut slope 1 v in <i>the slope of the interface line if a point is in cut. A cut slope of one vertical to the given value of horizontal units is used. Positive is up for a cut slope. A value 0 is used to designate a horizontal line.</i>	input	1.0	
Fill slope 1 v in <i>the slope of the interface line if the point is in fill. A fill slope of one vertical to the given value of horizontal units is used. Positive is down for a fill slope. A value 0 is used for a horizontal line.</i>	input	1.0	

Section separation	input	10	
	<i>the distance between the points on the selected string that interface points will be calculated from.</i>		
Search distance	input	100	
	<i>the (plan) distance to search along the interface line to see if the tin has been intersected. If the tin has not been intersected then the z-value at the end of the interface line is taken as the interface point z-value.</i>		
Left or right	input	left	left, right
	<i>the interface point is calculated by going out at right angles to the selected string. It is possible to go to either the left or the right depending on the value of this field.</i>		
Tin	tin box		available tins
	<i>name of the tin that the interface points will be calculated against.</i>		
Model for interface	model box		available models
	<i>name of the model to contain the calculated interface string.</i>		
Model for slope lines	model box		available models
	<i>name of the model to contain the lines connecting the string points with the interface points (the slope lines). If the field is blank, no slope lines are recorded.</i>		
Interface	button		
	<i>An interface string is calculated using the selected string and the parameters defined in the panel. The interface string points are coloured red if the original string point was in cut and green if the original string point was in fill.</i>		

<esc> can be used to abort the interface option.

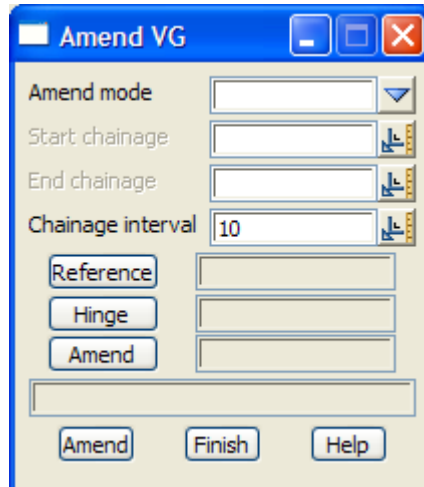
Amend VG

[amend_vg](#)
[amend_linear](#)
[amend_cubic](#)
[amend_vg_linear](#)
[amend_extend_xfall](#)

Position of option on menu: Design =>Apply =>Amend VG

Amend VG is used to modify the vertical geometry of an alignment string using a variety of methods including linear interpolation cubic reverse and circular reverse interpolating or by extending crossfall between two given strings.

Selecting Amend VG, the **Amend VG** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Amend mode	choice box		linear, cubic reverse, circular reverse, VG linear, Extend Xfall

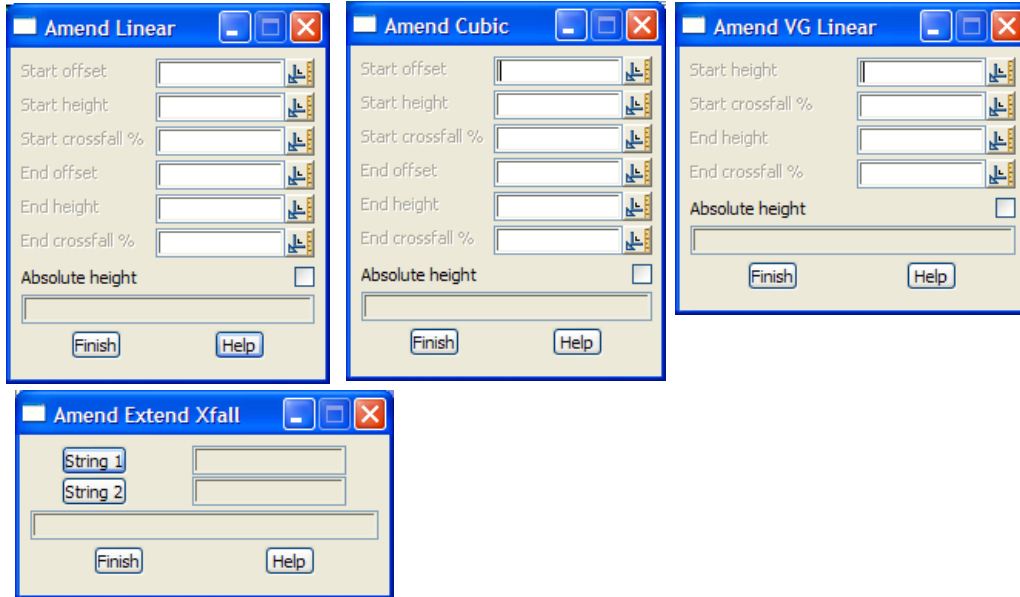
*if linear, a panel to input the values for **Start offset/height/crossfall %**, **End offset/height/crossfall %** and **Absolute height** is displayed and filled in to define how to modifying the vertical geometry of the **Amend** string*

*If cubic reverse, a panel to input the values for **Start offset/height/crossfall %**, **End offset/height/crossfall %** and **Absolute height** is displayed and filled in to define how to modifying the vertical geometry of the **Amend** string*

*If circular reverse, no extra information is needed to define how to modifying the vertical geometry of the **Amend** string*

*If VG linear, a panel to input the values for **Start height/crossfall %**, **End height/crossfall %** and **Absolute height** is displayed and filled in to define how to modifying the vertical geometry of the **Amend** string*

*If Extend Xfall, a panel to select the two strings to extend the crossfall from is displayed and filled in to define how to modifying the vertical geometry of the **Amend** string*



- Start chainage** input
 chainage to start modifying the vertical geometry of a string
- End chainage** input
 chainage to stop modifying the vertical geometry of a string
- Chainage interval** input 10
 chainage interval to apply the vertical geometry modification
- Reference** string select box
 *select the reference string to define chainage and perpendicular. If there is no **Hinge** string, then z-values are only taken from the Reference string.*
 chainage interval to apply the vertical geometry modification
- Amend** string select box
 *select the reference string to define chainage and perpendicular. If there is no **Hinge** string, then z-values are only taken from the Reference string.*
- Hinge** string select box
 if selected, the string to take z-values from
- Amend** string select box
 the string to have its vertical geometry amended
- Amend** button
 amend the vertical geometry of the Amend string between the start and end chainages

Boxing

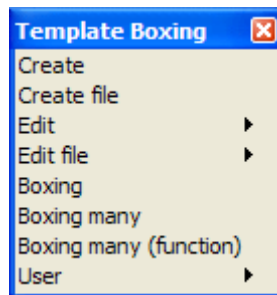
template_boxing

Position of menu: Design =>Boxing

In the Apply many option, **boxing** can be applied at the same time as applying templates by special commands in the many templates file.

However, it is also possible to apply boxing as a post process to a model of x-sections as long as the x-sections were generated in the 4d string format (this can be done by both apply options).

The definition of boxing is given in the chapter “Advanced Design” . The **boxing** walk-right menu is



For the option <i>Create</i> , please continue to the section	“Create”
<i>Create file</i>	“Create File”
<i>Edit</i>	“Edit”
<i>Edit file</i>	“Edit File”
<i>Boxing</i>	“Boxing”
<i>Boxing many</i>	“Boxing Many”
<i>Boxing many (function)</i>	“Boxing Many Function”

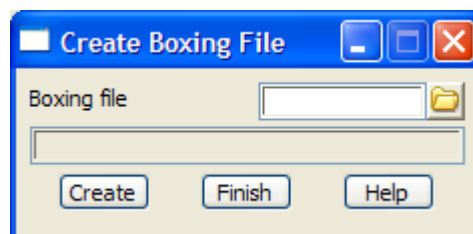
Create

create_boxing_file

Position of option on menu: Design =>Boxing =>Create

The **boxing=>create** option is used to create a new boxing file (*.bf) and add new boxing definitions to the file using **12d** Model panels. The created file is written to disk and can be edited using a standard file editor, or using the **boxing=>edit** option.

Selecting Create brings up the **create boxing file** panel.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Boxing file	input		*.bf files

name of the boxing file to create.

Create button

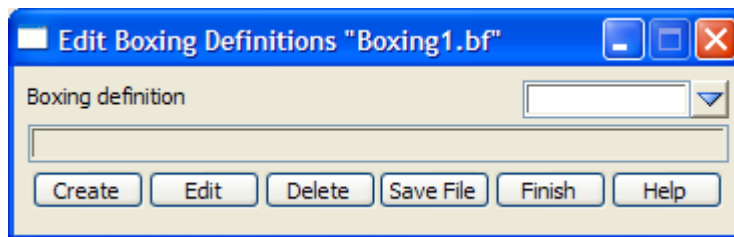
create a boxing file with name given by the boxing file panel fields.

*If the file given in the boxing file field does not exist, then the **edit boxing file** panel is placed on the screen and is used to create and edit the boxing definitions for the boxing file.*

*If the file already exists, then nothing will happen on selecting **create**.*

edit_boxing_definitions

When Create is selected from the **Create Boxing File** panel, it brings up the **Edit Boxing Definitions** panel which is used to create and edit the boxing definitions to be saved in the boxing file.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Boxing definition	input		boxing definitions in file <i>name of the boxing definition (in the current boxing file) to create or edit.</i>

Create button

create a boxing definition with name given by the boxing definition panel field

*If the boxing definition given in the boxing definition field **does not exist**, then the **boxing rules** panel is placed on the screen and is used to create the new boxing definitions for the boxing file.*

*If the boxing definition already exists, then nothing will happen on selecting **create**.*

Edit button

edit an existing boxing definition with name given by the boxing definition panel field

*If the boxing definition given in the boxing definition field **exists**, then the **boxing rules** panel is placed on the screen and is used to edit the existing boxing definitions for the boxing file.*

*If the boxing definition does not exist, then nothing will happen on selecting **edit**.*

Delete button

*delete an existing boxing definition with name given by the boxing definition panel field
A **yes-no** panel confirms the deletion.*

Save file button

save the boxing file with the boxing definitions to disk.

The **Edit Boxing Definitions** panel is described in the section “Edit Boxing File” of chapter “Advanced Design” .

Create File

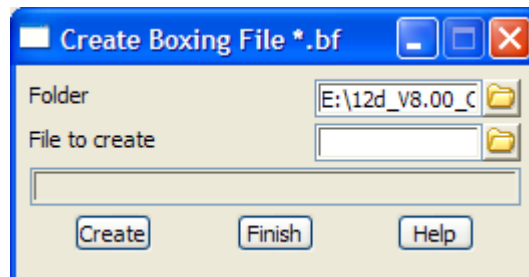
create_boxing_file__bf

Position of option on menu: Design =>Boxing =>Create file

The boxing=>create file option is used to create a new boxing file (*.bf) with the editor pointed to by the EDIT_4D environment variable.

The created file will already have a section header set up for a boxing called "1" (key word and opening and closing brackets).

Selecting create file brings up the **create boxing file *.bf** panel.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Folder <i>name of the folder for the .bf file.</i>	input	current folder	
File to create <i>name of the file to create.</i>	input		*.bf files
Create	button		

create a boxing file given by the folder and file to create panel fields. If the file given in the file to edit field does not exist, then a new file is created which already has a section header set up.

The format for the boxing file is described in the chapter "Advanced Design" .

Edit

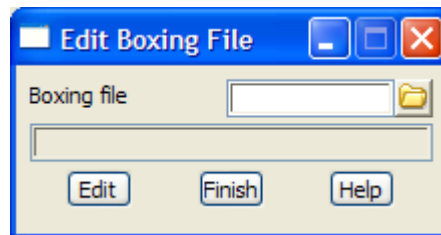
edit_boxing_file

Position of option on menu: Design =>Boxing =>Edit

The boxing=>edit option is used to edit boxing files (*.bf) using 12d Model panels.

The boxing=>edit option has two modes of operation - selecting the boxing=>edit itself, or by activating the boxing=>edit option's walk-right menu, **folder *.bf**.

Selecting boxing=>edit itself brings up the **edit boxing file** panel.



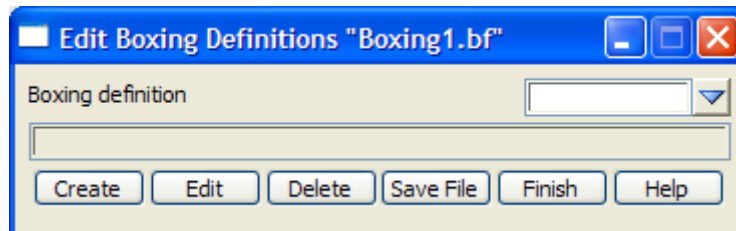
The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Boxing file <i>name of the boxing file to edit.</i>	input		*.bf files

Edit button

edit the file given by boxing file panel field.

*If the file given in the boxing file field exists, then the **edit boxing definitions** panel is brought up to create/edit the boxing definitions in the boxing file.*



*The **edit boxing definitions** panel is described in the "Edit Boxing File" from the chapter "Advanced Design".*

The boxing=>edit walk-right menu provides a list all the boxing files (files ending in .bf) in the current folder. When a file is selected from the list, the **edit boxing definitions** panel is brought up to create/edit the boxing definitions in the boxing file. The **edit boxing definitions** panel is described in the "Edit Boxing File" from the chapter "Advanced Design".

Edit File

edit_boxing_file__bf

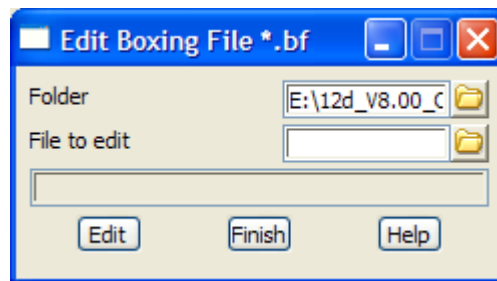
Position of option on menu: Design =>Boxing =>Edit file

The boxing=>edit file option is used to edit boxing files (*.bf) with the editor pointed to by the EDIT_4D environment variable.

The boxing=>edit file option has two modes of operation - selecting the boxing=>edit file itself, or

by activating the boxing=>edit file option's walk-right menu, **folder *.bf**.

Selecting **boxing=>edit file** itself brings up the **edit boxing file *.bf** panel.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Folder <i>name of the folder for the .bf file.</i>	input	current folder	
File to edit <i>name of the file, in folder, to edit.</i>	input		*.bf files
Edit	button	<i>edit the file given by the folder and file to edit panel fields. If the file given in the file to edit field does not exist, then a new file is created which already has a section header set up.</i>	

The **boxing=>edit file** walk-right menu provides a list all the boxing files (files ending in .bf) in the current folder. When a file is selected from the list, it is automatically loaded into the editor.

The format for the boxing file is described in the “Boxing File Format” section of the chapter “Advanced Design” .

Boxing

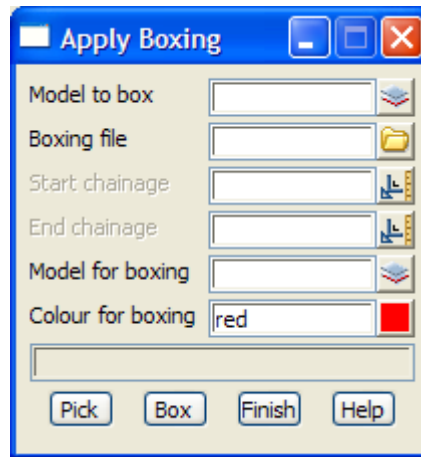
apply_boxing

Position of option on menu: Design =>Boxing =>Boxing

On selecting the boxing option, the **apply boxing** panel is displayed.

This panel can be used to create boxing sections by applying the **boxing definition** to a selected 4d string or model of sections created as 4d strings. Only the one boxing definition is used for all of the sections.

The **apply boxing** panel is



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Model to box <i>model of sections (in 4d string format) to apply the boxing definition to.</i>	input		available models
Boxing file <i>name of the file containing the boxing definition to be applied to the sections in the model to box.</i>	input		*.bf files
Start/End chainage <i>the start/end string chainage for applying boxing. If blank, then the start/end chainage is taken to be the chainage at the beginning/end of the picked string.</i>	input		
Model for boxing <i>model for the created boxing x-sections</i>	input		available models
Pick <i>after picking the pick button, any selected strings will have the boxing applied to them.</i>	button		
Box <i>apply the boxing definition given in the boxing file to the sections in the model to box. between the given start chainage and end chainage.</i>	button		

Boxing Many

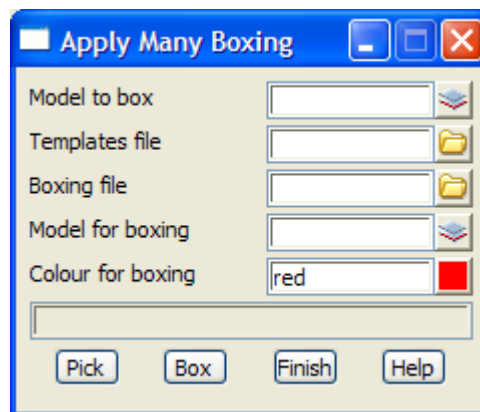
apply_many_boxing

Position of option on menu: Design =>Boxing =>Boxing many

This panel can be used to create boxing sections by applying the **boxing definitions** as specified in a boxing file to a selected 4d string or to a model of sections. If an individual section 4d string is picked, the option uses the boxing defined for the chainage where the section 4d string was created.

The boxing file allows the use of more than one boxing definition.

Selecting boxing many displays the **Apply Many Boxing** panel.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Model to box <i>model of sections (in 4d string format) to apply the boxing definition to.</i>	input		available models
Templates file <i>name of the many templates file which contains the application of the boxing definitions to the sections given in the model to box panel field. If Boxing file is non-blank, then all the boxing definitions referred to in the template file are taken from the Boxing file. If Boxing file is blank, use the boxing file given in the template file. The format of the templates file is the same as the left_boxing and the right_boxing sections in the apply many templates file.</i>	input		*.mtf files
Boxing file <i>The file of boxing definition to be applied to the sections in the model given by the model to box panel field if non-blank, the name of the file containing all the boxing definitions referred to in file given in the template file panel field. The format of the template file is the same as the boxing in the apply many template file. If blank, use the boxing file given in the template file.</i>	input		*.bf files
Model for boxing <i>model for the created boxing x-sections</i>	input		available models
Pick	button		

after picking the **pick** button, any selected strings will have the boxing applied to them.

Box button

apply the boxing as given by the template file, using the boxing definitions in the boxing file, to the 4d sections in the model for boxing field. The new boxing sections are added to the model for boxing.

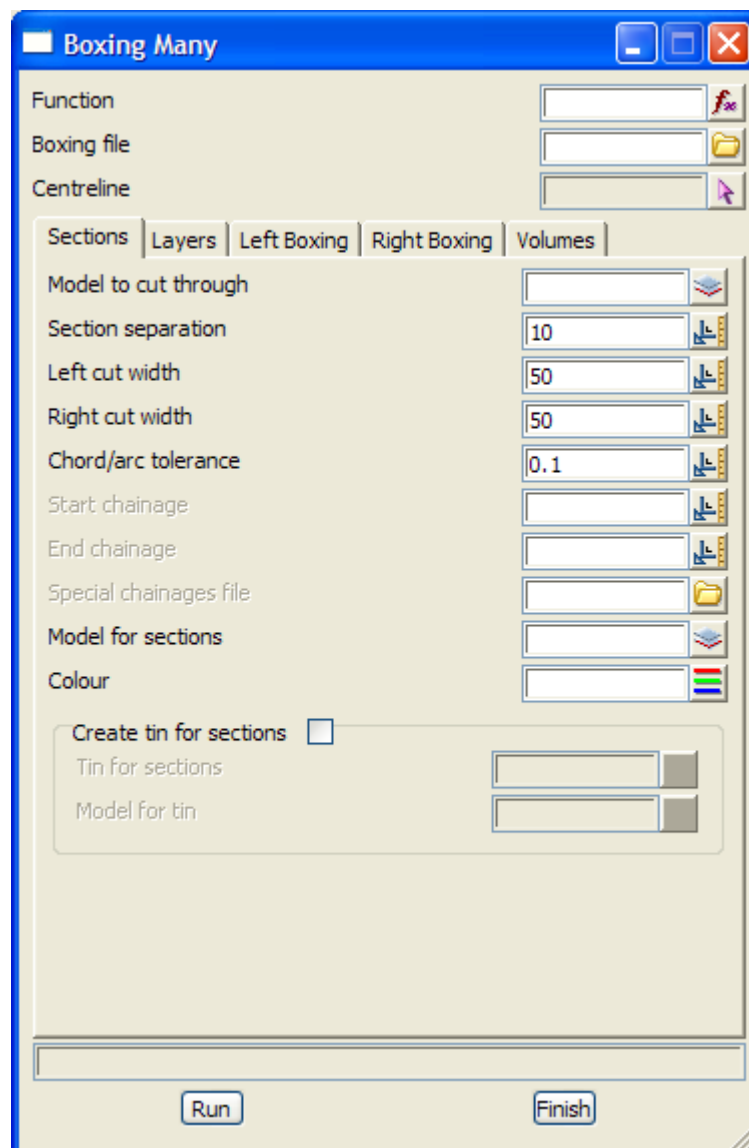
Boxing Many Function

boxing_many

Position of option on menu: Design =>Boxing =>Boxing many (function)

This option is used to cut strings to create sections and then apply up to eight layers of boxing to the cut sections.

Selecting Boxing many (function), the **Boxing Many** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Function <i>name of the boxing function</i>	function box		available boxing functions
Boxing file <i>The file of boxing definition that may be applied to the cut sections</i>	input		*.bf files

Centreline string select

string to use for chainage and perpendicular for cutting crass sections to apply boxing to

Sections tab

Model to cut through model box available models

model of strings to cut sections through

Section separation input 10

the distance along the selected centre line to generate plan section lines to be used to cut through the model or view.

Left/Right cut width input 50

the left/right distance to go out from the centre line for creating a section to cut through the strings.

Chord/arc tolerance input default chord/arc tolerance

the chord to arc tolerance to use on the selected string for determining how many plan sections are created around horizontal curves.

Start/End chainage input

if non-blank then sections for the cuts are restricted to between the given start and end chainage of the selected centreline string

Special chainages file file box *.spf files

a file containing chainages, one per line, that are also used as extra chainages to create cross sections at

Model for sections model box available models

model for the cut cross sections

Colour colour box available colours

colour for the cut cross sections

Create tin for sections tick box

if tick, then a tin of the cross sections is created

Tin for sections tin box available tins

name of the tin of cross sections

Model for tin model box available models

model for the cross sections tin

Layers tab

*the layers tab consists of a grid for defining up to eight layers of boxing strings and sections. The last boxing layer is also referred to as the **subgrade** layer.*

Boxing Layer 1-8:

if non blank, boxing strings and sections will be created for that layer.

Strings input

*if non-blank, pre*post text to use with the function name to create the name of the model for the boxing strings for this layer.*

If blank, the boxing strings will not be stored for this layer.

Sections input available models

*if non-blank, pre*post text to use with the function name to create the name of the model for the boxing sections for this layer.*

If blank, the boxing sections will not be stored for this layer.

Colour input available colours

colour for the boxing sections for this layer

Create subgrade tin tick box

if tick, then a tin of the subgrade strings and sections is created. Note - the subgrade is the last boxing layer.

Subgrade tin tin box available tins

name for the subgrade tin

Subgrade tin model model box available models

model for the subgrade tin

Left Boxing tab

tab for applying left boxing - gives the chainage range and boxing definitions to use for each of the eight layers of boxing

Layer choice box Layer 1, Layer 2 ... Layer 8

as each layer is selected, a grid for defining the chainages and boxing definition that applies to that chainage are given in the grid

For each selected layer:

Chainage input available models

for the selected boxing layer, the chainage range to apply the boxing definition to

Boxing boxing definition box boxing definitions

*the boxing definition to use with the given chainage range. The pop-up lists all the boxing definitions in the **Boxing file***

Comment

record a comment

Right Boxing tab

tab for applying right boxing - gives the chainage range and boxing definitions to use for each of the eight layers of boxing

Layer choice box Layer 1, Layer 2 ... Layer 8

as each layer is selected, a grid for defining the chainages and boxing definition that applies to that chainage are given in the grid

For each selected layer:

Chainage input available models

for the selected boxing layer, the chainage range to apply the boxing definition to

Boxing boxing definition box boxing definitions

*the boxing definition to use with the given chainage range. The pop-up lists all the boxing definitions in the **Boxing file***

Comment

record a comment

Volumes tab

Calculate volumes tick box
*if **tick**, then end area volumes are created*

Tin tin box available tins
name of the natural surface tin - required if volumes to the natural surface are calculated

Model for tin sections model box available models
if non blank, model to put the natural surface sections into

Report file file box *.rpt
*if non-blank, the name of the file to contain the volume report. If the file already exists, the report will be appended to the file.
 If blank, no report is produced.*

Report model choice box Summary, Full
*if **Summary**, the report only contains the final volumes.
 If **Full**, the report contains sections by section areas and volumes as well as the summary of volumes.*

Calculate natural surface to design volumes tick box tick
*if **tick**, end area volumes between the natural surface and the design strings are written to the report file*

Calculate natural surface to subgrade volume tick box tick
*if **tick**, end area volumes between the natural surface to the subgrade (the last boxing layer) are written to the report file*

Calculate design to subgrade volumes tick box tick
*if **tick**, end area volumes between the design strings and the subgrade (the last boxing layer) are written to the report file.*

Calculate inter-boxing layer volumes tick box tick
*if **tick**, end area volumes between each of the boxing layers are written to the report file.*

Run button
run the option

MTF

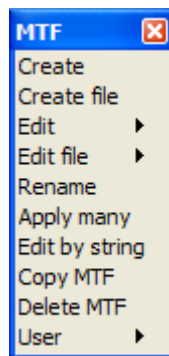
mtf

Position of menu: Design =>MTF

In the apply many option, a **many template file** is used to control the application of templates to the hinge string.

The full definition for the mtf file is given in the chapter “Advanced Design” .

The mtf walk-right menu is



Each option in this menu will now be described.

For the option <i>Create</i> ,	go to the section	“Create MTF”
<i>Create file</i>		“Create File”
<i>Edit</i>		“Edit”
<i>Edit file</i>		“Edit File”
<i>Rename</i>		“Rename MTF”
<i>Apply many</i>		“Apply Many”
<i>Edit by string</i>		“Edit by String”
<i>Copy MTF</i>		“Copy MTF”
<i>Delete MTF</i>		“Delete MTF”

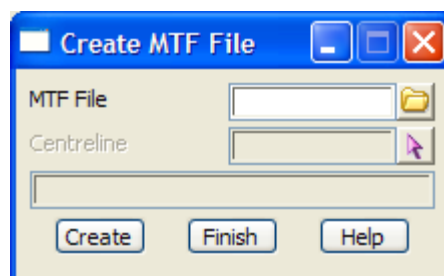
Create MTF

create_mtf_file

Position of option on menu: Design =>MTF =>Create

The mtf=>create option is used to create a new mtf file (*.mtf) using 12d Model panels. The created file is written to disk and can be edited using a standard file editor, or using the MTF=>Edit option.

Selecting Create brings up the **Create MTF File** panel.



The fields and buttons used in this panel have the following functions.

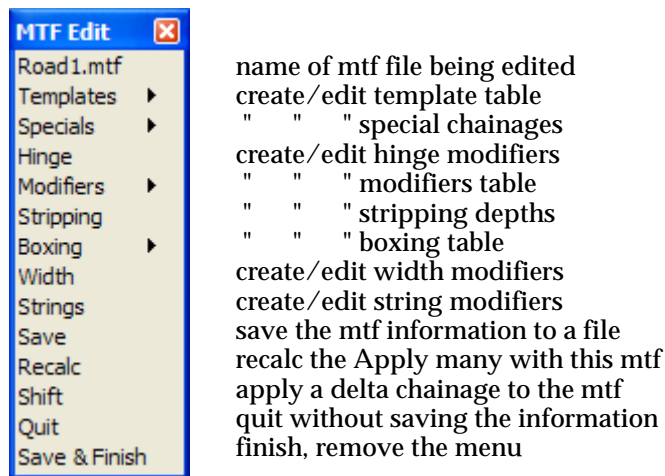
Field Description	Type	Defaults	Pop-Up
MTF file <i>name of the mtf file to create.</i>	file box		*.mtf files

Create button
create an mtf file with name given by the mtf file panel fields.
If the file given in the mtf file field does not exist, then the mtf edit menu is placed on the screen and is used to created and edit the mtf sections in the mtf file.
*If the file already exists, then nothing will happen on selecting **Create**.*

MTF Edit

mtf_edit

When Create is selected from the **Create MTF File** panel, it brings up the **MTF Edit** menu which is used to create and edit the mtf sections to be saved in the mtf file.



The MTF Edit menu is described in the chapter “Advanced Design” .

Create File

create_mtf_file__mtf

Position of option on menu: Design =>MTF =>Create file

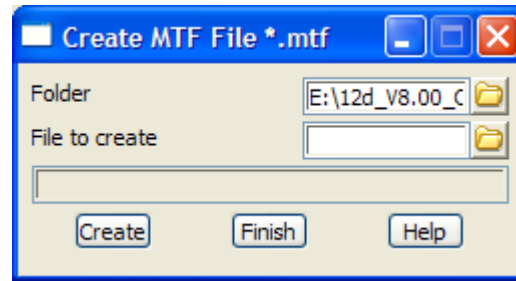
The mtf=>create file option is used to create a new many templates files (*.mtf) with the editor pointed to by the EDIT_4D environment variable.

The created file will already have all the section headers (key words and opening and closing brackets) in it.

Selecting create file brings up the **create mtf file *.mtf** panel.

The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Folder <i>name of the folder for the .mtf file.</i>	input	current folder	



File to create input *.mtf files
name of the file to create.

Create button
create an mtf file given by the folder and file to create panel fields. If the file given in the file to edit field does not exist, then a new file is created which already has each of the section headers set up.
 The format for the mtf file is described in the chapter "Advanced Design" .

Edit

edit_mtf_file

Position of option on menu: Design =>MTF =>Edit

The mtf=>edit option is used to edit mtf files (*.mtf) using 12d Model panels.

The mtf=>edit option has two modes of operation - selecting the mtf=>edit itself, or by activating the mtf=>edit option's walk-right menu, **folder *.mtf**.

Selecting mtf=>edit itself brings up the **edit mtf file** panel.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
MTF file	input		*.mtf files
<i>name of the mtf file to edit.</i>			

Edit button
edit the file given by mtf file panel field.
If the file given in the mtf file field exists, then the mtf edit menu is brought up to create/edit the mtf sections in the mtf file.



name of mtf file being edited
 create/edit template table
 " " " special chainages
 create/edit hinge modifiers
 " " " modifiers table
 " " " stripping depths
 " " " boxing table
 create/edit width modifiers
 create/edit string modifiers
 save the mtf information to a file
 recalc the Apply many with this mtf
 apply a delta chainage to the mtf
 quit without saving the information
 finish, remove the menu

The MTF edit menu is described in the chapter "Advanced Design".

The mtf=>edit walk-right menu provides a list all the mtf files (files ending in .mtf) in the current folder. When a file is selected from the list, the edit mtf file panel is brought up to create/edit the mtf sections in the mtf file.

The MTF edit menu is described in the chapter "Advanced Design".

Edit File

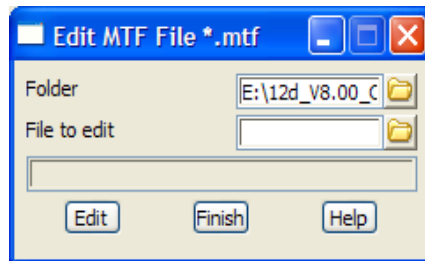
edit_mtf_file__mtf

Position of option on menu: Design =>MTF =>Edit file

The mtf=>edit file option is used to edit many templates files (*.mtf) with the editor pointed to by the EDIT_4D environment variable.

The mtf=>edit file option has two modes of operation - selecting the mtf=>edit file itself, or by activating the mtf=>edit file option's walk-right menu, **folder *.mtf**.

Selecting mtf=>edit file itself brings up the **edit a file *.mtf** panel.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Folder <i>name of the folder for the .mtf file.</i>	input	current folder	
File to edit <i>name of the file, in folder, to edit.</i>	input		*.mtf files
Edit	button		

*edit the file given by the folder and file to edit panel fields. If the file given in the file to edit field does not exist, then a new file is created which already has each of the section headers set up.
The format for the mtf file is described in the chapter “Advanced Design” .*

The mtf=>edit file walk-right menu provides a list all the many template files (files ending in .mtf) in the current folder. When a file is selected from the list, it is automatically loaded into the editor.

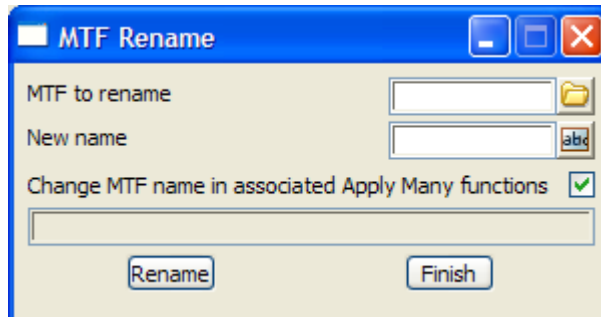
The format for the mtf file is described in the chapter “Advanced Design” .

Rename MTF

mtf_rename

Position of option on menu: Design =>MTF =>Rename

Selecting Rename brings up the **MTF Rename** panel.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
MTF to rename <i>name of the mtf file to rename</i>	file box		*.mtf files
New name <i>new name for the mtf file</i>			
Change MTF name is associated Apply Many functions <i>if tick, rename the mtf in all functions that include it</i>	tick box		
Rename <i>rename the mtf file with the new name</i>	button		

Apply Many

Position of option on menu: Design =>MTF =>Apply many

The **Apply many** option is used to apply a mtf file to a selected hinge string.

The option has already been described under **Design=>Apply=>Apply many**.

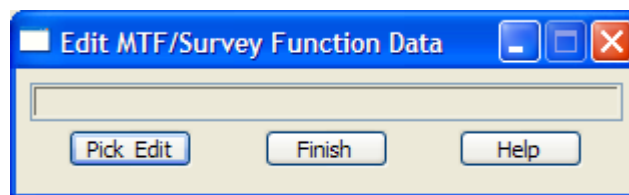
For the option *Apply many*, please go to the section “Apply Many” .

Edit by String

Position of option on menu: Design =>MTF =>Edit by string

The **Edit by string** option is used to edit the *MTF* by selecting a string created from using the *MTF* in an *Apply Many*.

Selecting **Edit by string** brings up the **Edit MTF/Survey Function Data** panel:



After selecting the **Pick Edit** button, a string created by MTF function is selected and the MTF editor is started for the MTF.

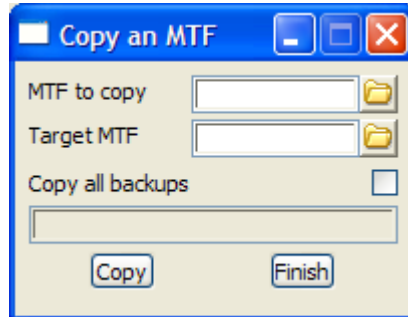
For information on the *MTF Editor*, go to the section “MTF Edit” .

Copy MTF

copy_an_mtf

Position of option on menu: Design =>MTF =>Copy

Selecting Copy brings up the **Copy an MTF** panel.



The fields and buttons used in this panel have the following functions.

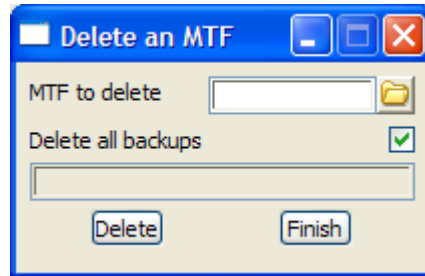
Field Description	Type	Defaults	Pop-Up
MTF to copy <i>name of the mtf file to rename</i>	file box		*.mtf files
Target MTF <i>new name for the mtf file</i>			
Copy all backups <i>if tick, copy all the backup files of the mtf as well</i>	tick box		
Copy <i>copy the mtf file to the new name</i>	button		

Delete MTF

delete_an_mtf

Position of option on menu: Design =>MTF =>Delete

Selecting Delete brings up the **Delete an MTF** panel.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
MTF to delete <i>name of the mtf file to delete</i>	file box		*.mtf files
Delete all backups <i>if tick, delete all the backup files of the mtf as well</i>	tick box		
Delete <i>delete the mtf file</i>	button		

Barwon Sewer

This is a separate chargeable module.

Documentation will be provided when the module is purchased.

The Barwon sewer option is used to place waste water reticulation networks within a subdivision and produce plots and reports to Barwon Water format. The network is placed in three dimensions including manholes and house connections.

If used in conjunction with the services on a section view, interference with neighbouring pipe strings can be taken into consideration when placing the network.

The waste water process consists of a number of steps.

- ▲ creating the sewer network
- ▲ checking that residential blocks are controlled by the network
- ▲ creating the house connections for the sewer
- ▲ producing plots and reports

Note

The "barwon sewer" string can only have straights between manholes. The drainage string described in the chapter, Drainage and Sewer, is a generalization of the sewer string and can have arcs between manholes.

Estate Lots

Position of menu: Design =>Estate/Lots

estate_lots

This module is currently under development.

The Estate Lots module is for creating house lots for an Estate (Subdivision).

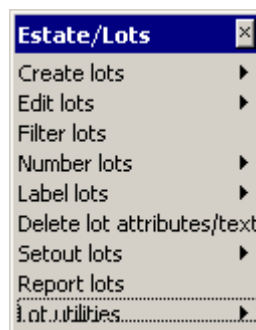
There are options to create and edit lots by a variety of methods. Once the lots are created they can be numbered, given a lot type (see “Lot types”) and labelled.

The labelling includes labelling the side of lots with bearing and distances, lots with areas and lot numbers.

Reports of lot areas and types can be created and lots coloured according to areas.

Finally options exist to create point numbers and reports for setting out the lots.

The Estate/Lots walk-right menu is:



For the option *Create lots*, please continue to the section “Create Lots” .

<i>Edit lots</i>	“Edit Lots”
<i>Filter lots</i>	“Filter Lots”
<i>Number lots</i>	“Number Lots”
<i>Label lots</i>	“Label Lots”
<i>Delete lot attributes/text</i>	“Delete Lot Attributes and Text”
<i>Setout lots</i>	“Setout Lots” .
<i>Report lots</i>	“Report Lots” .
<i>Lot utilities</i>	“Lot Utilities” .

Lot types

Lots can have a **type** which is used in reports. The lot types are defined in a text file called *lottypes.4d* which is searched for in the standard library areas (see “Library, User Library”).

For example of *lottypes.4d* is

```
park
road
other
surround
McDonalds
```

Create Lots

create_lots

Position of menu: Design =>Estate/Lots => Create lots



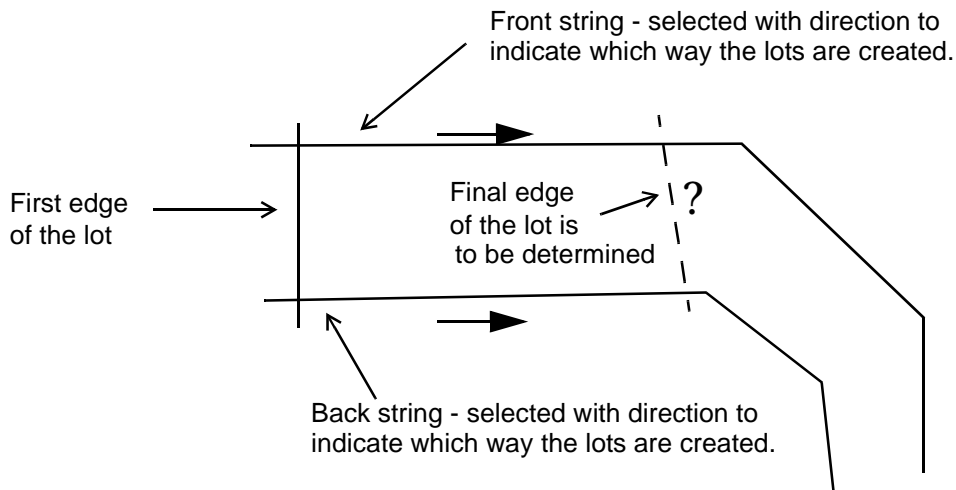
For the option *Create lot*, please continue to the section “Create Lot” .

<i>Create lot from boundaries</i>	“Create Lot from Picking” .
<i>Create lot by picking segments</i>	“Create Lot from Picking Segments” .
<i>Create lot from polygon</i>	“Create Lot from Polygon” .
<i>Read geocomp lots file</i>	“Read Geocomp Lots File” .

Create Lot**lot_creation_panel**

Position of option on menu: Design =>Estate/Lots => Create lots =>Create lot

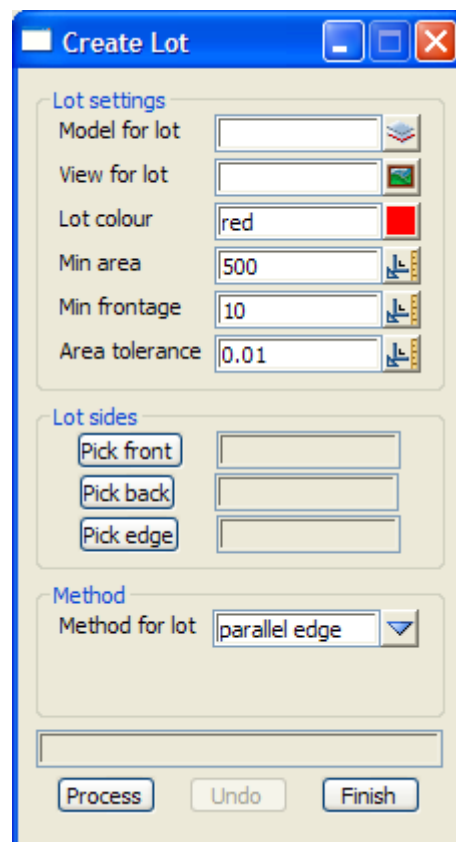
This option creates lots of a user given area using the front and back strings for a number of lots and an initial **straight line edge** of a lot. The final edge of the lot then needs to be determined.



The methods of creating the final edge of lot are:

- parallel the existing side - *parallel edge*. See “Parallel Edge”
- having the same bearing as a selected line - *parallel pick*. See “Parallel Pick”
- having a given bearing - *parallel bear*. See “Parallel Bearing”
- perpendicular to either the front string or the back string - *perpendicular*. See “Perpendicular and Perpendicular Pick”
- perpendicular to either the front string or the back string but starting from a user selected point - *perpen start pt*. See “Perpendicular and Perpendicular Pick” See “Perpendicular and Perpendicular Pick”
- pivoting about a selected point - *pivot pick*. See “Pivot Pick and Pivot Frontage”

- (g) pivoting about the point at minimum frontage - *pivot frontage*. See “Pivot Pick and Pivot Frontage”
- (h) closing a selected string - *close string*. See “Close String”



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Model for lot <i>model for the created lot.</i>	model box		available models
View for lot <i>view to add model of created lot to.</i>	view box		available views
Lot colour <i>colour for the created lot.</i>	colour box		available colours
Min area <i>required area of the created lot.</i>	double box		
Min frontage <i>required minimum frontage of the created lot.</i>	input box		
Area tolerance <i>lot to be created can be within this tolerance of the minimum area.required area of the created lot.</i>	double box		

- Pick front** string select
pick the string to form the front of the created lot.
- Pick back** string select
pick the string to form the back of the created lot.
- Pick edge** string select
*pick the **straight** line to form the edge of the created lot.
 The front, back and edge form three sides of the lot to be created.*
- Method** choice box parallel edge parallel edge, parallel pick
*parallel bear, perpendicular
 pivot pick, pivot frontage
 close string*
pick the string to form the back of the created lot.
- Process** button
use the selected front, back and edged and then create the final side of the lot by the selected method.

Continue to the next section “Creating Lots from a Front and Back String and an Edge” for a full description of each method of creating the lots.

Creating Lots from a Front and Back String and an Edge

Parallel Edge

This method creates a lot of a user specified area using user selected front and back strings and a user selected initial edge. The final edge then needs to be determined to define the lot.

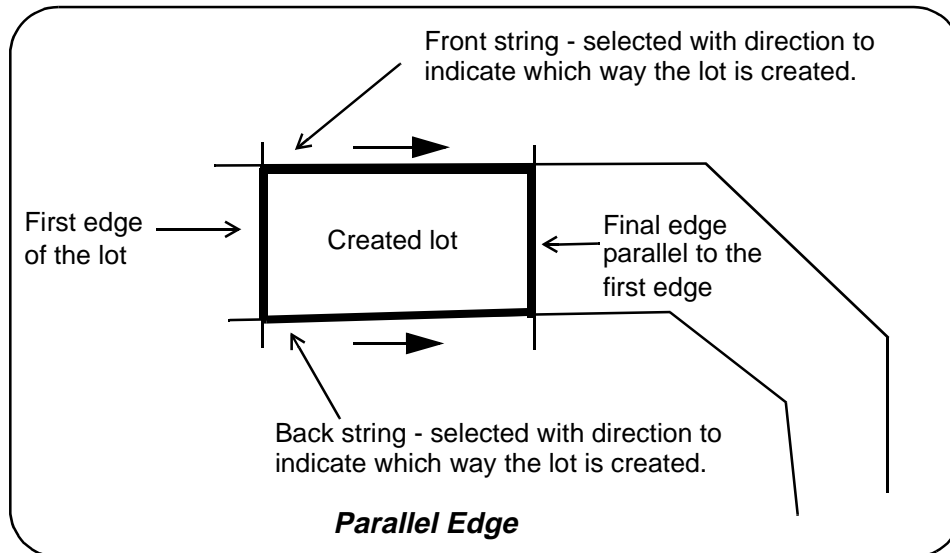
The front and back strings **must** be selected **with direction** to indicate which direction to move along them to form the lot. The front and back strings can not be closed strings and must be different strings. The front and back strings can have more than one segment and can have straight or arc segments.

The initial edge must cut or be very close to cutting the front and back strings. The **initial edge** must be **one straight line segment**. It can not be an arc.

For *Parallel Edge*, the **final edge** is created parallel to the initial edge and is positioned along the front and back strings in their selected direction so that the lot has the user given area (to within the area tolerance).

The lot is only created if the new edge is at least the minimum frontage distance along the front string.

When the lot is created, the final edge is automatically set as the initial edge for the calculation of the next lot.



Parallel Bearing

This method creates a lot of a user specified area using user selected front and back strings and a user selected initial edge. The final edge then needs to be determined to define the lot.

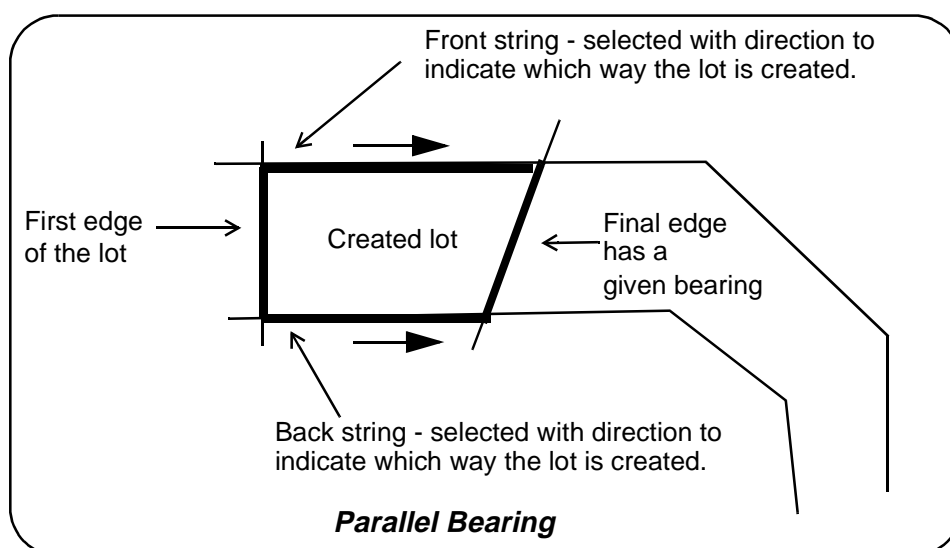
The front and back strings **must** be selected **with direction** to indicate which direction to move along them to form the lot. The front and back strings can not be closed strings and must be different strings. The front and back strings can have more than one segment and can have straight or arc segments.

The initial edge must cut or be very close to cutting the front and back strings. The **initial edge** must be **one straight line segment**. It can not be an arc.

For *Parallel Bear*, the **final edge** is created with a user specified bearing and is positioned along the front and back strings in their selected direction so that the lot has the user given area (to within the area tolerance).

The lot is only created if the new edge is at least the minimum frontage distance along the front string.

When the lot is created, the final edge is automatically set as the initial edge for the calculation of the next lot.



Parallel Pick

This method creates a lot of a user specified area using user selected front and back strings and a user selected initial edge. The final edge then needs to be determined to define the lot.

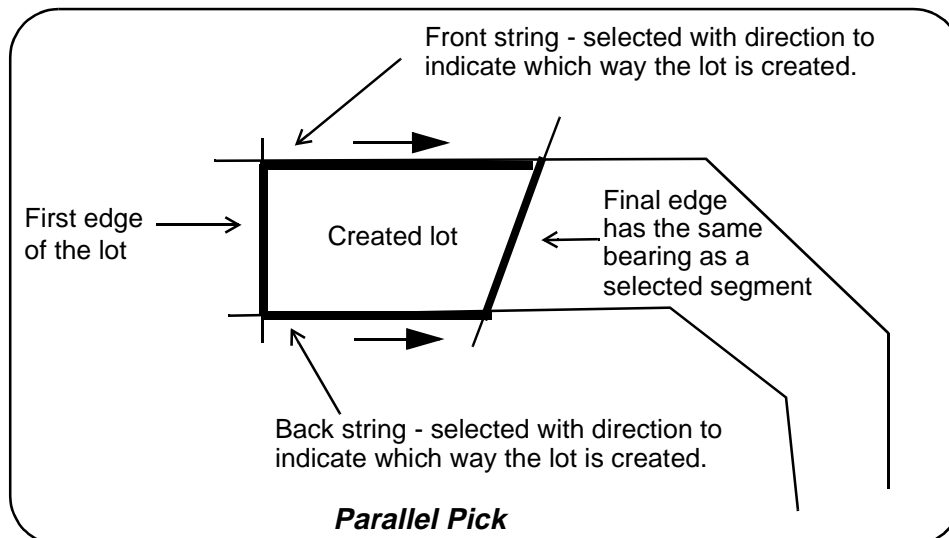
The front and back strings **must** be selected **with direction** to indicate which direction to move along them to form the lot. The front and back strings can not be closed strings and must be different strings. The front and back strings can have more than one segment and can have straight or arc segments.

The initial edge must cut or be very close to cutting the front and back strings. The **initial edge** must be **one straight line segment**. It can not be an arc.

For *Parallel Pick*, the **final edge** is created with the bearing of a user selected segment and is positioned along the front and back strings in their selected direction so that the lot has the user given area (to within the area tolerance).

The lot is only created if the new edge is at least the minimum frontage distance along the front string.

When the lot is created, the final edge is automatically set as the initial edge for the calculation of the next lot.



Perpendicular and Perpendicular Pick

This method creates a lot of a user specified area using user selected front and back strings and a user selected initial edge. The final edge then needs to be determined to define the lot.

The front and back strings **must** be selected **with direction** to indicate which direction to move along them to form the lot. The front and back strings can not be closed strings and must be different strings. The front and back strings can have more than one segment and can have straight or arc segments.

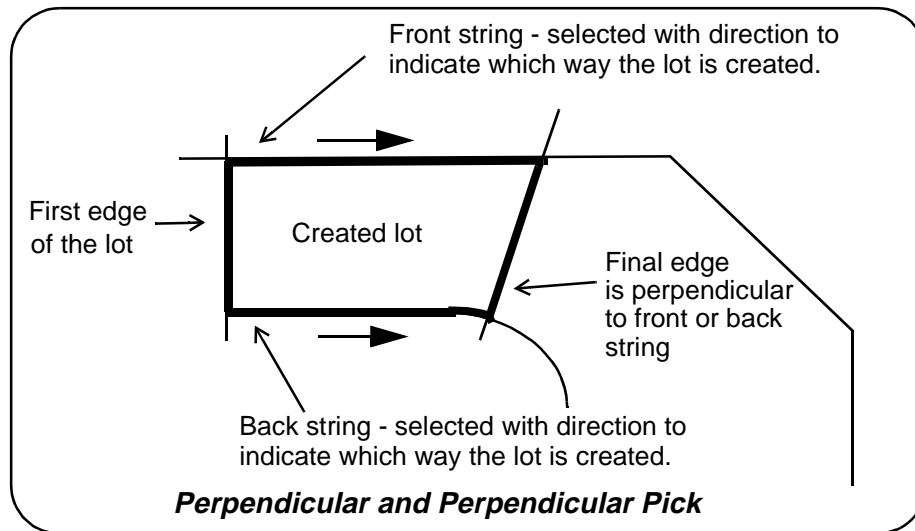
The initial edge must cut or be very close to cutting the front and back strings. The **initial edge** must be **one straight line segment**. It can not be an arc.

For *Perpendicular*, the **final edge** is constrained to be perpendicular to either the front or the back string and is positioned along the front and back strings in their selected direction so that the lot has the user given area (to within the area tolerance).

For *Perpendicular Pick*, a start point is selected on the front/back string and the **final edge** is created past the start point. This option only needs to be used when *Perpendicular* has problems finding a solution due to sharp changes of bearing along the front/back string.

The lot is only created if the new edge is at least the minimum frontage distance along the front string.

When the lot is created, the final edge is automatically set as the initial edge for the calculation of the next lot.



Pivot Pick and Pivot Frontage

This method creates a lot of a user specified area using user selected front and back strings and a user selected initial edge. The final edge then needs to be determined to define the lot.

The front and back strings **must** be selected **with direction** to indicate which direction to move along them to form the lot. The front and back strings can not be closed strings and must be different strings. The front and back strings can have more than one segment and can have straight or arc segments.

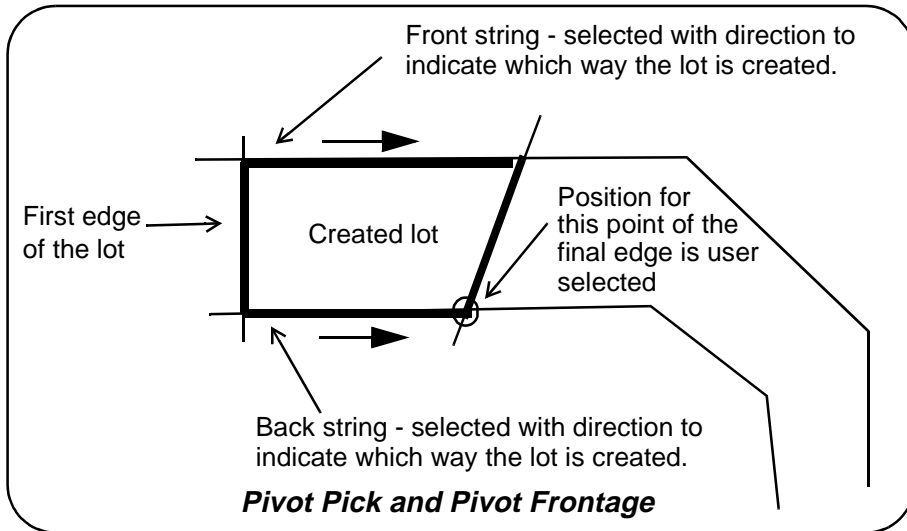
The initial edge must cut or be very close to cutting the front and back strings. The **initial edge** must be **one straight line segment**. It can not be an arc.

For *Pivot Pick*, a position is selected on either the front or back string to be one point of the **final edge**. The other point of the final edge is determined so that the lot has the required given area (to within the area tolerance).

For *Pivot Frontage*, the pivot point is taken to be the position on the front string that is the minimum frontage distance along the front string from the initial edge.

The lot is only created if the new edge is at least the minimum frontage distance along the front string.

When the lot is created, the final edge is automatically set as the initial edge for the calculation of the next lot.



Close String

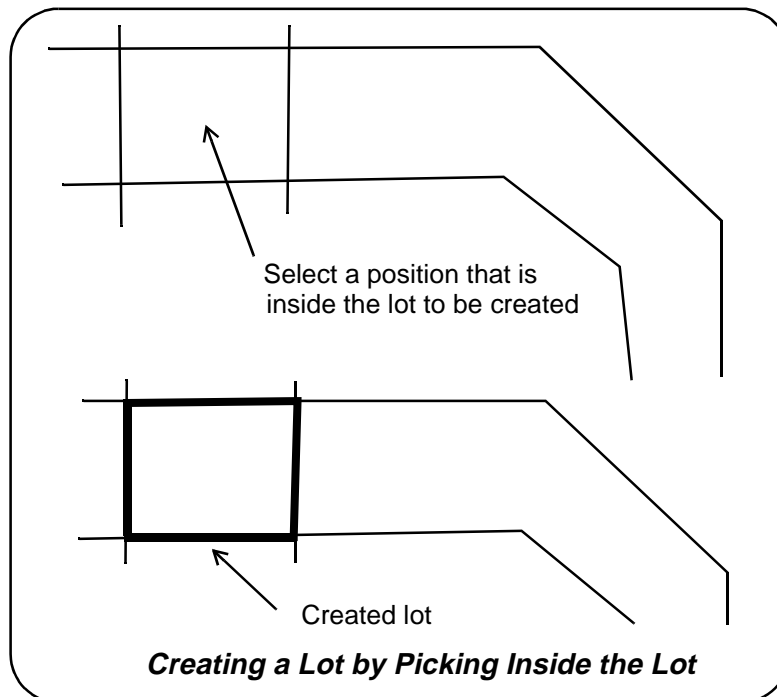
This method simply closes the string that is selected by the user.

Create Lot from Picking

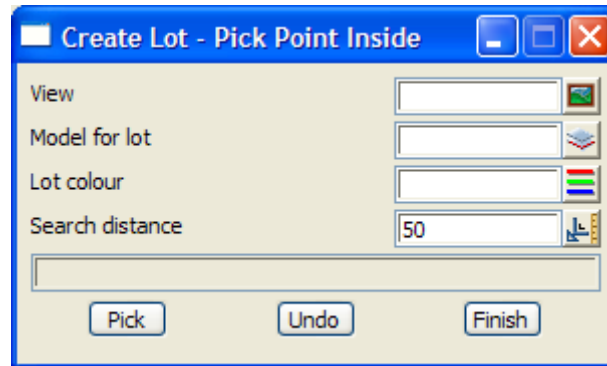
boundary_polyline_panel

Position of option on menu: Design =>Estate/Lots => Create lots =>Picking point inside

This option creates a lot by a picking inside a collection of strings and the lot is created from the closest strings to the picked position. The picked position must be selected so that all sides of the lot can be "seen" from the picked position. That is, a straight line can be drawn from the picked position to the lot side without cutting any other segment.



On selecting the Create lot by picking point inside option, the **Create Lot - Pick Point Inside** panel is displayed.



The fields and buttons used in this panel have the following functions.

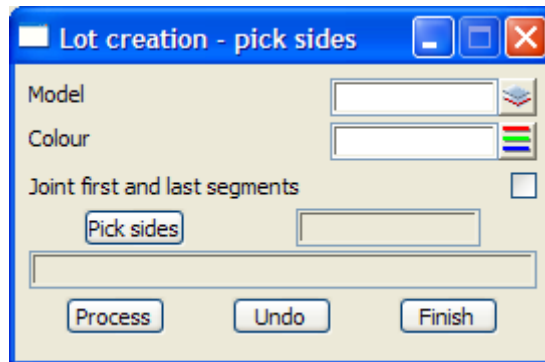
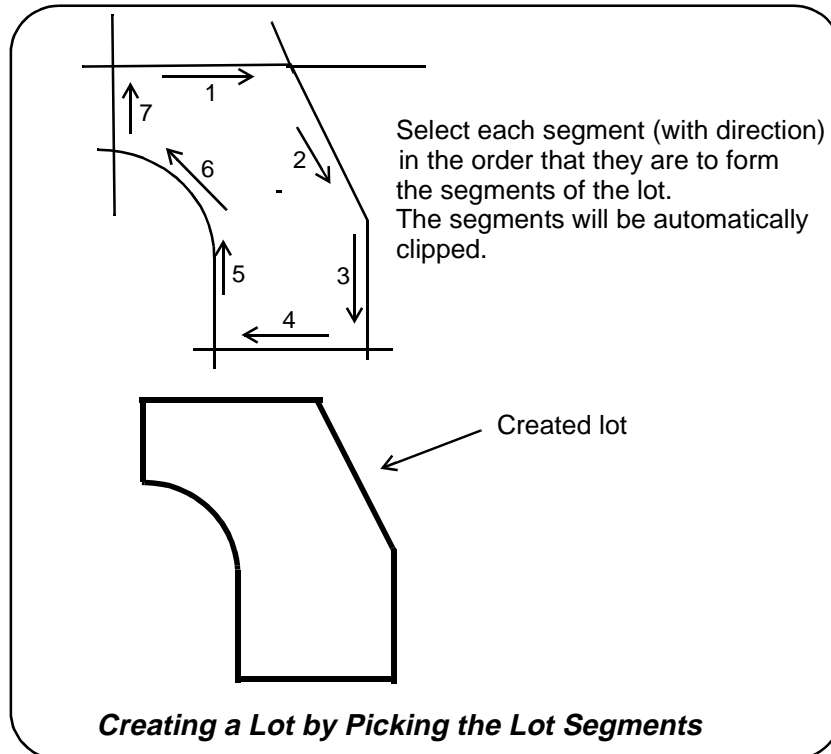
Field Description	Type	Defaults	Pop-Up
View for lot <i>view to add model of created lot to.</i>	view box		available views
Model for lot <i>model for the created lot.</i>	model box		available models
Lot colour/colour for polygon <i>colour for the created lot.</i>	colour box		available colours
Search distance <i>maximum distance to search from the selected point for sides of the lot</i>	double box	20	
Pick <i>pick the position to try and form a lot around.</i>	string select		

Create Lot from Picking Segments

[lot_creation_pick_panel](#)

Position of option on menu: Design =>Estate/Lots => Create lots =>by picking segments

This option creates a lot by a picking each segment in its order (and with direction) around the lot. Segments will be automatically extended or clipped to form the lot.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Model for lot <i>model for the created lot.</i>	model box		available models
Lot colour <i>colour for the created lot.</i>	colour box		available colours
Join first and last segment	tick box		
<i>if tick, join the end of the last selected segment to the start of the first selected segment to form the final side of the lot.</i>			
Pick sides	string select		
<i>pick, with direction, the segments to be joined together to form the sides of the lot.</i>			

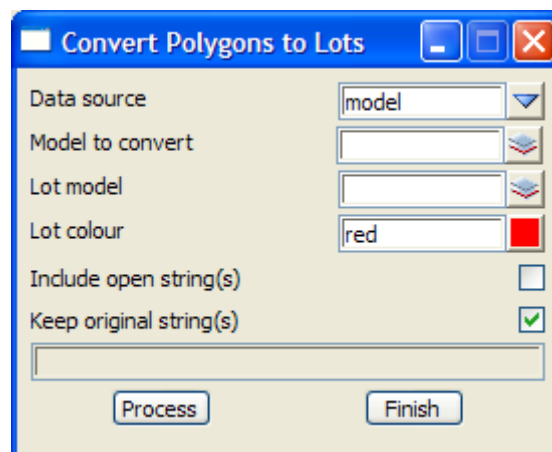
Process button
create the lot from the selected segments.

Create Lot from Polygon

lot_polygon_panel

Position of option on menu: Design =>Estate/Lots => Create lots =>Lots from polygons

This option converts strings to a lot. The strings can be open.



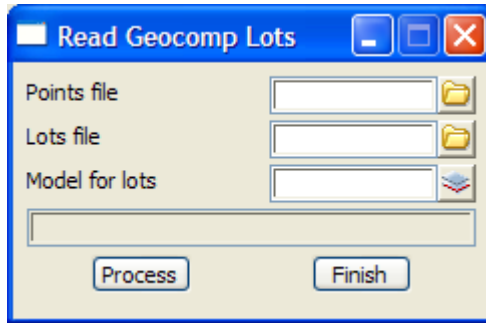
The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Data source type <i>data source type.</i>			
Data source <i>data source for strings to convert to lots.</i>			
Model for lot <i>model for the created lot.</i>	model box		available models
Lot model <i>model for the created lots.</i>	model box		available models
Lot colour <i>colour for the created lots.</i>	colour box		available colours
Include open strings <i>if tick, open strings are used to from lots by making then closed strings. If not tick, open strings are ignored.</i>	tick box		
Process <i>create lots from the selected strings.</i>	button		

Read Geocomp Lots File

lot_geocomp_panel

Position of option on menu: Design =>Estate/Lots => Create lots =>Read geocomp lots file
 This option reads a Geocomp lots file and creates 12d Model lots.



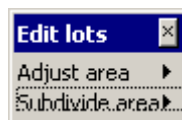
The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Points file <i>name of the Geocomp points file.</i>			*.pts files
Lots file <i>name of the Geocomp lots file - is uses points from the given Geocomp points file.</i>			*.pts files
Model for lot <i>model for the created lot.</i>	model box		available models
Process <i>read in the given Geocomp points and lots file and created 12d Model lots.</i>	button		

Edit Lots

edit_lots

Position of menu: Design =>Estate/Lots =>Edit lots

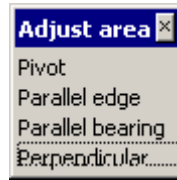


For the menu *Adjust area*, please continue to the section "Adjust Area".
 For the menu *Subdivide area*, please continue to the section "Subdivide Area".

Adjust Area

adjust_area

Position of menu: Design =>Estate/Lots =>Edit lots =>Adjust area



For the option *Pivot*, please continue to the section “Adjust Lot by Pivot” .

Parallel edge

“Adjust Lot by Parallel Edge”

Parallel bearing

“Adjust Lot by Parallel Bearing” .

Perpendicular

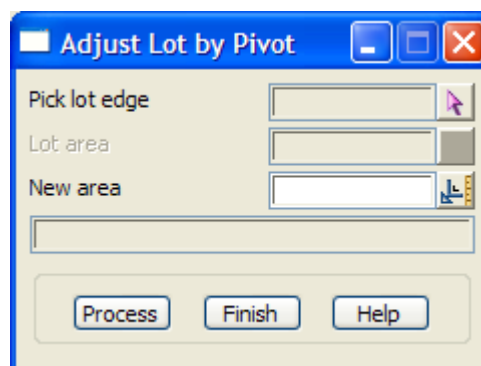
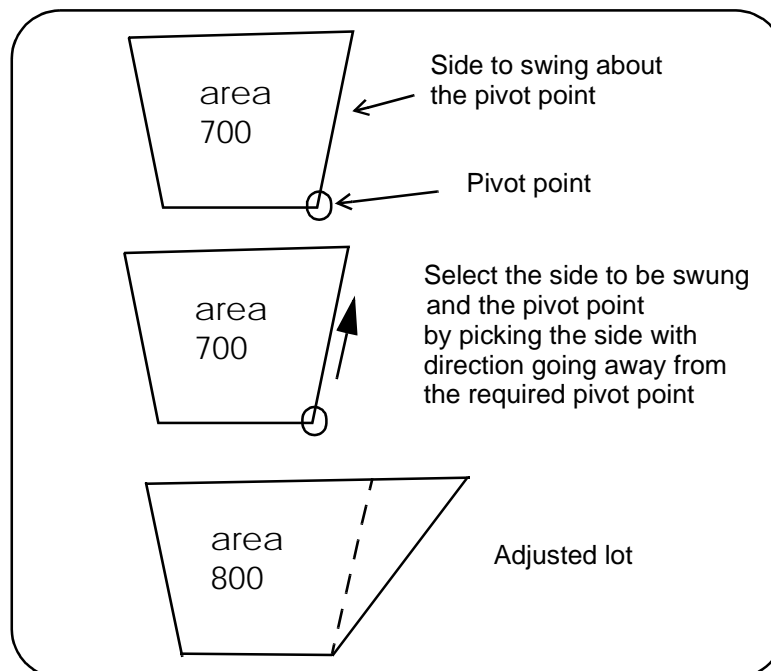
“Adjust Lot by Perpendicular” .

adjust_lot_by_pivot

Adjust Lot by Pivot

Position of option on menu: Design =>Estate/Lots =>Edit lots =>Adjust area =>Pivot

This option adjusts the size of a lot by pivoting one side about one of its end points until the lot area has a new given area.



The fields and buttons used in this panel have the following functions.

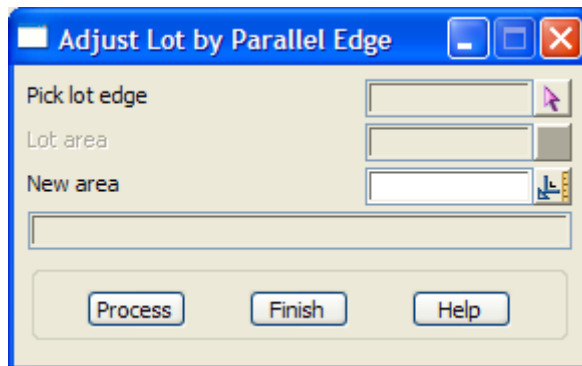
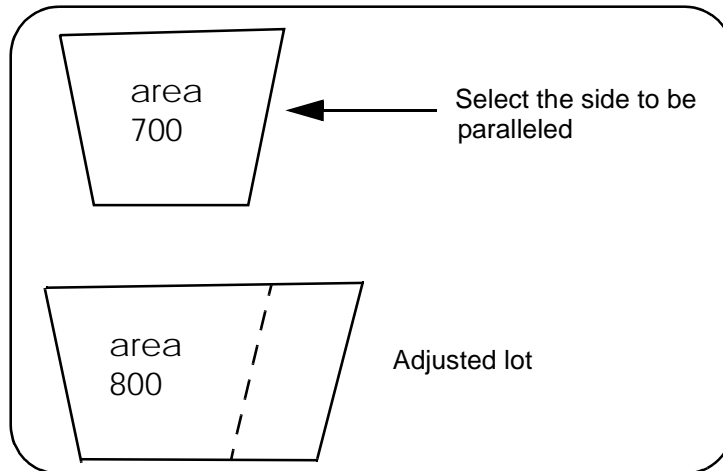
Field Description	Type	Defaults	Pop-Up
Pick lot edge	string select		
<i>pick the lot to adjust by picking a side of the lot with direction. The start of the selected side will be the pivot point.</i>			
Lot area	output box		
<i>area of the selected lot.</i>			
New area	input box		
<i>required area of the adjusted lot. The area can be larger or smaller than the existing lot area.</i>			
Process	button		
<i>adjust the lot by pivoting the side.</i>			

adjust_lot_by_parallel_edge

Adjust Lot by Parallel Edge

Position of option on menu: Design =>Estate/Lots =>Edit lots =>Adjust area =>Parallel edge

This option adjusts the size of a lot by moving a side parallel to itself until the lot area has a new given area.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Pick lot edge string select
pick the lot to adjust by picking the edge of the lot that is to be paralleled.

Lot area output box
area of the selected lot.

New area input box
required area of the adjusted lot. The area can be larger or smaller than the existing lot area.

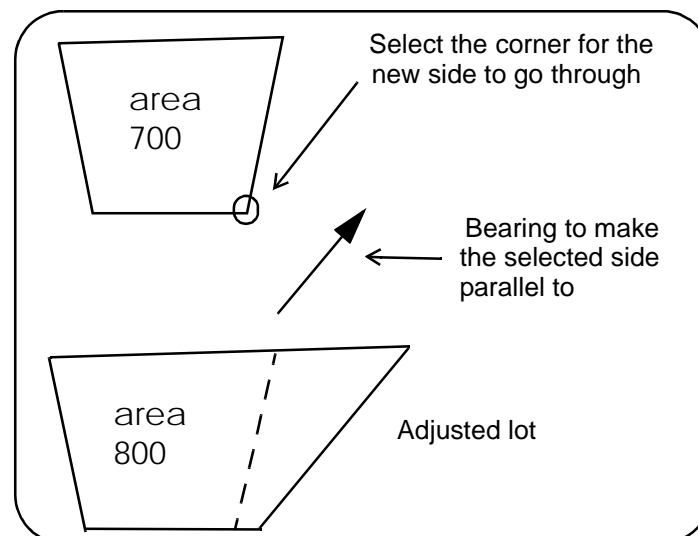
Process button
adjust the lot by paralleling the selected edge.

adjust_lot_by_parallel_bearing

Adjust Lot by Parallel Bearing

Position of option on menu: Design =>Estate/Lots =>Edit lots =>Adjust area =>Parallel bearing

This option adjusts the size of a lot by moving a side parallel to a given bearing until the lot area has a new given area.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Pick lot corner	string select		
<i>pick the lot to adjust by picking the corner of the lot that the side goes through and has the given bearing.</i>			
Lot area	output box		
<i>area of the selected lot.</i>			
New area	input box		
<i>required area of the adjusted lot. The area can be larger or smaller than the existing lot area.</i>			
Bearing	bearing box		
<i>the bearing used for the selected edge.</i>			
Process	button		
<i>adjust the lot by paralleling the selected edge with the given bearing.</i>			

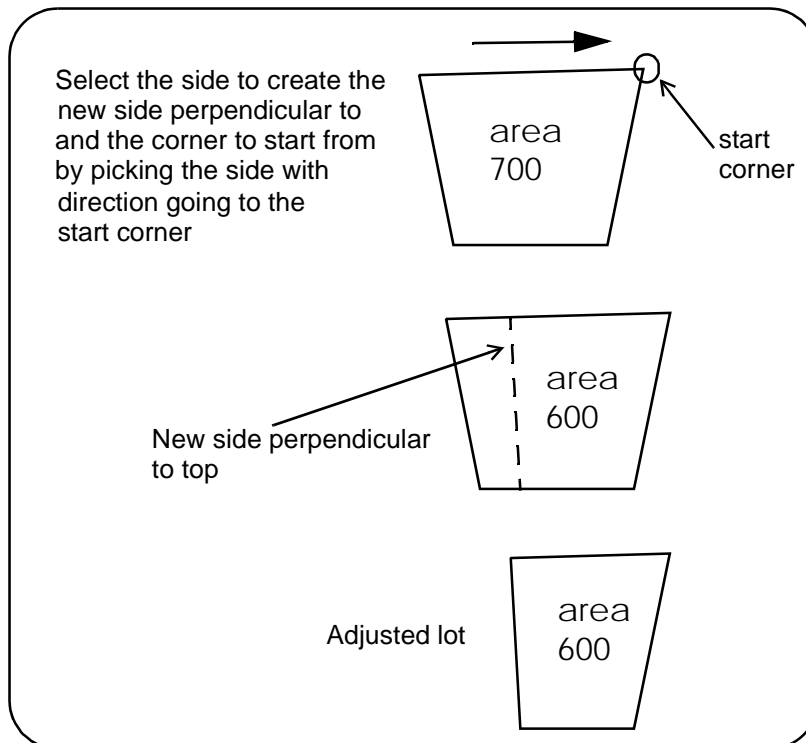
adjust_lot_by_perpendicular

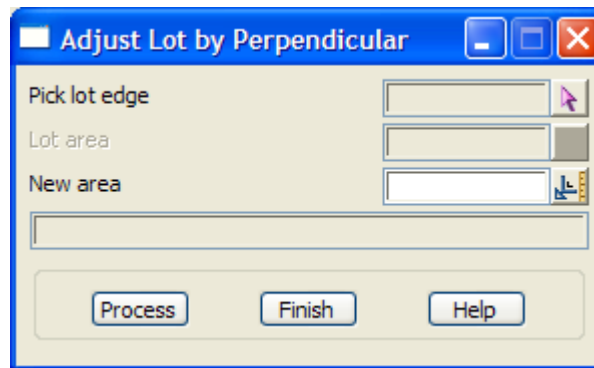
Adjust Lot by Perpendicular

Position of option on menu: Design =>Estate/Lots =>Edit lots =>Adjust area =>Perpendicular

This option adjusts the size of a lot by creating a new side perpendicular to a selected side and then moving the new side until the created lot area has a given area.

Note -the new area must be less than the original area.





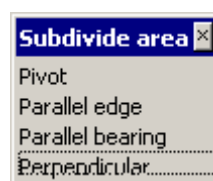
The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Pick lot edge	string select		
<i>pick the side of the lot that a new side will created perpendicular to</i>			
Lot area	output box		
<i>area of the selected lot.</i>			
New area	input box		
<i>required area of the adjusted lot. The area must be smaller than the existing lot area.</i>			
Process	button		
<i>adjust the lot by moving the side whilst keeping it perpendicular to another side.</i>			

[subdivide_area](#)

Subdivide Area

Position of menu: Design =>Estate/Lots =>Edit lots =>Subdivide area



For the option *Pivot*, please continue to the section “Subdivide Lot by Pivot” .

Parallel edge

“Subdivide Lot by Parallel Edge”

Parallel bearing

“Subdivide Lot by Parallel Bearing” .

Perpendicular

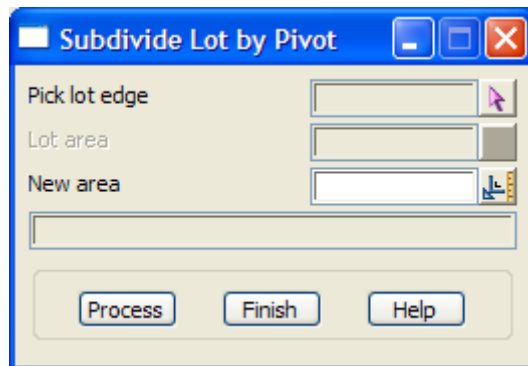
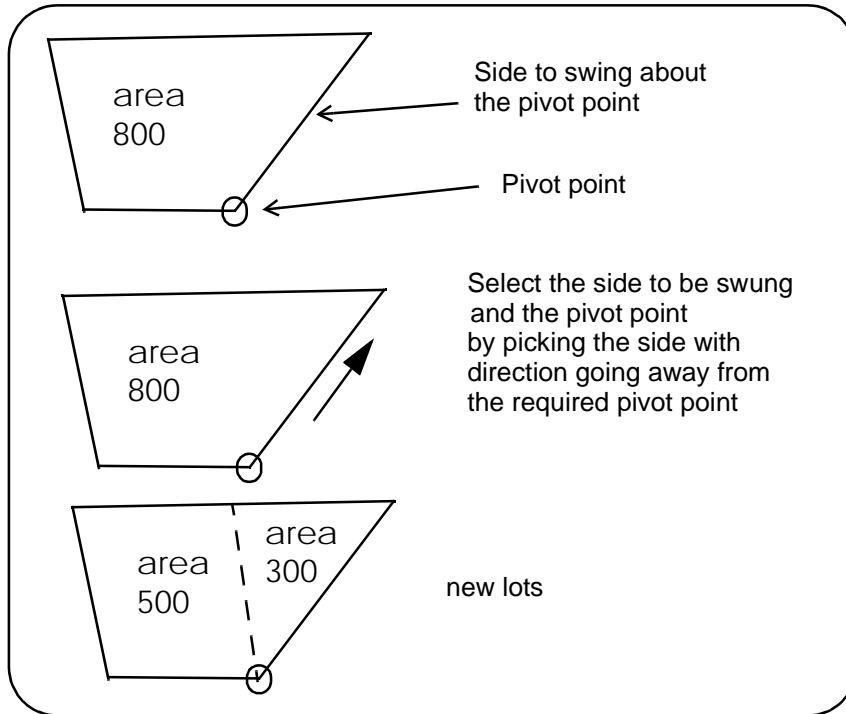
“Subdivide Lot by Perpendicular” .

[subdivide_lot_by_pivot](#)

Subdivide Lot by Pivot

Position of option on menu: Design =>Estate/Lots =>Edit lots =>Subdivide area =>Pivot

This option reduces the size of a lot by pivoting one side about one of its end points until the lot area has a new smaller area. A second lot is created from the remainder of the original lot.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Pick lot <i>pick the lot to adjust by picking a side of the lot with direction. The start of the selected side will be the pivot point.</i>	string select		
Lot area <i>area of the selected lot.</i>	output box		
New area <i>required area of the adjusted lot. The area must be smaller than the existing lot area.</i>	input box		
Process	button		

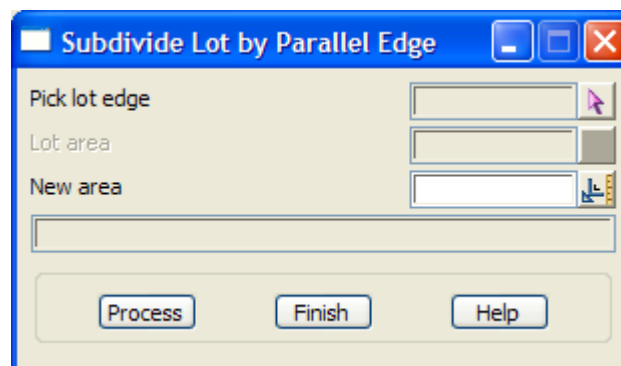
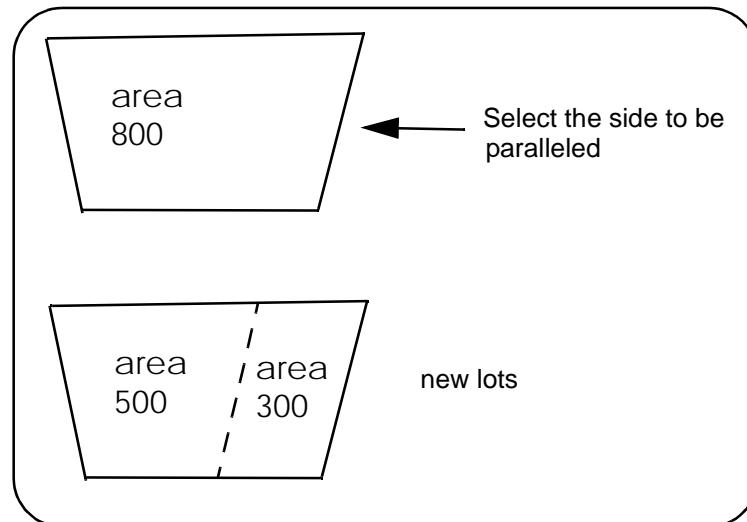
adjust the lot by pivoting the side. A second lot is created from the remainder of the original lot.

subdivide_lot_by_parallel_edge

Subdivide Lot by Parallel Edge

Position of option on menu: Design =>Estate/Lots =>Edit lots =>Subdivide area =>Parallel edge

This option adjusts the size of a lot by moving a side parallel to itself until the lot area has a new smaller area. A second lot is created from the remainder of the original lot.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Pick lot edge	string select		
<i>pick the lot to adjust by picking the edge of the lot that is to be paralleled.</i>			
Lot area	output box		
<i>area of the selected lot.</i>			
New area	input box		
<i>required area of the adjusted lot. The area must be than the existing lot area.</i>			
Process	button		

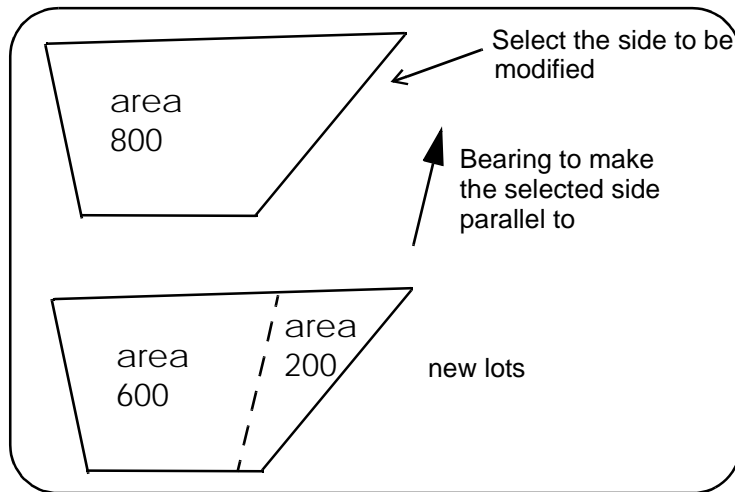
adjust the lot by paralleling the selected edge. A second lot is created from the remainder of the original lot.

subdivide_lot_by_parallel_bearing

Subdivide Lot by Parallel Bearing

Position of option on menu: Design =>Estate/Lots =>Edit lots =>Subdivide area =>Parallel bearing

This option adjusts the size of a lot by moving a side parallel to a given bearing until the lot area has a new smaller area. A second lot is created from the remainder of the original lot.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Pick lot corner	string select		
<i>pick the lot to adjust by picking the edge of the lot that is to be paralleled.</i>			

Lot area	output box		
<i>area of the selected lot.</i>			

New area	input box		
<i>required area of the adjusted lot. The area must be smaller than the existing lot area.</i>			

Bearing bearing box

the bearing used for the selected edge.

Process button

adjust the lot by paralleling the selected edge with the given bearing. A second lot is created from the remainder of the original lot.

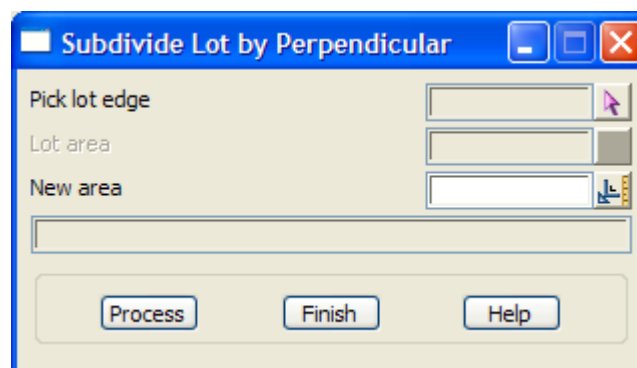
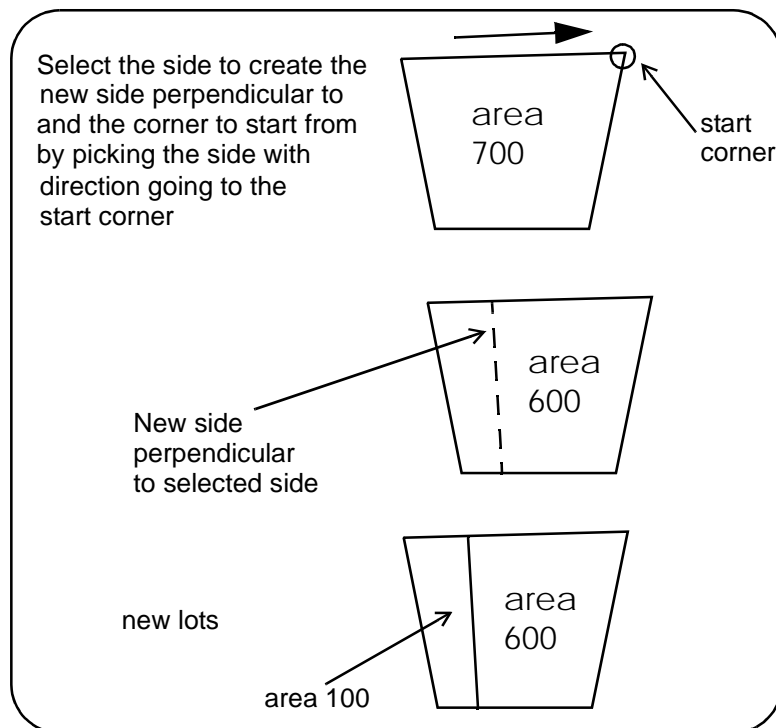
subdivide_lot_by_perpendicular

Subdivide Lot by Perpendicular

Position of option on menu: Design =>Estate/Lots =>Edit lots =>Subdivide area =>Perpendicular

This option adjusts the size of a lot by creating a new side perpendicular to a selected side and then moving the new side until the created lot area has a given smaller area. A second lot is created from the remainder of the original lot.

Note -the new area must be less than the original area.



The fields and buttons used in this panel have the following functions.

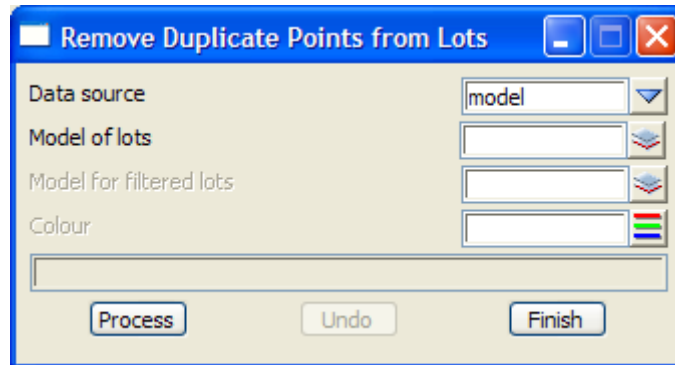
Field Description	Type	Defaults	Pop-Up
Pick lot edge <i>pick the side of the lot that a new side will created perpendicular to</i>	string select		
Lot area <i>area of the selected lot.</i>	output box		
New area <i>required area of the adjusted lot. The area must be smaller than the existing lot area.</i>	input box		
Process <i>adjust the lot by moving a side whilst keeping it perpendicular to another side. A second lot is created from the remainder of the original lot.</i>	button		

Filter Lots

polyline_filter_panel

Position of option on menu: Design =>Estate/Lots => Filter lots

This option is used to remove adjacent duplicate points from lots.



The fields and buttons used in this panel have the following functions.

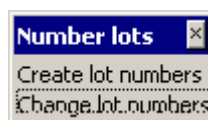
Field Description	Type	Defaults	Pop-Up
Data source type <i>data source type.</i>			
Data source <i>data source for strings to convert to lots.</i>			
Model for filtered lots <i>model for the filtered lots.</i>	model box		available models
Colour <i>if non-blank, the filtered lots are given this colour. Otherwise a filtered lot has the same colour as the non-filtered lot.</i>	colour box		available colours
Process <i>filter the selected lots.</i>	button		

Number Lots

number_lots

After lots are created, they are then numbered. The lot numbers are stored with the lot

Position of menu: Design =>Estate/Lots => Number lots



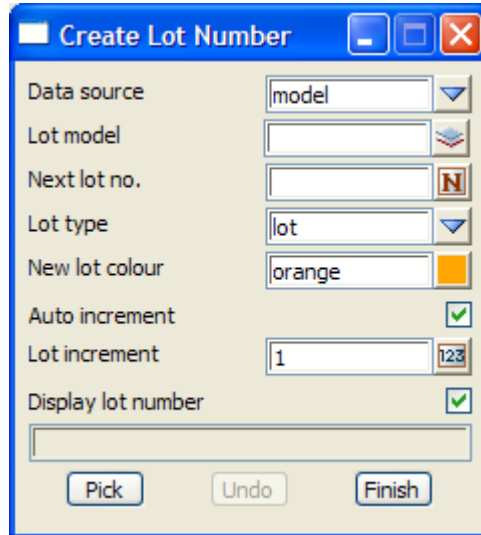
For the option *Create lot numbers*, please continue to the section “Create Lot Numbers” .
Change lot numbers “Change Lot Numbers”

Create Lot Numbers

lot_numbering_panel

Position of option on menu: Design =>Estate/Lots => Number lots =>Create lot numbers

This option creates lot numbers.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Data source type			
<i>data source type.</i>			

Data source

data source for lots that have been numbered. A new lot number cannot be the same as an existing one in the data source.

Next lot no.

the number to give the next lot that is numbered.

Lot type	choice box	user defined	user defined
-----------------	------------	--------------	--------------

type of the lot. The choices are defined by the user in the file. See "Lot types"

New lot colour	colour box		available colours
-----------------------	------------	--	-------------------

colour to created the numbered lot. This is done so that numbered and non-numbered lots can be easily distinguished.

Auto increment	tick box	tick	
-----------------------	----------	------	--

if tick, the Next lot no. is incremented after the lot is numbered.

Lot increment	integer box	1	
----------------------	-------------	---	--

amount to increment the Next lot no if the Auto increment flag is tick.

Display lot numbers	tick box	tick	
----------------------------	----------	------	--

if tick, the lot number is temporarily displayed. Permanent lot numbers are created using the Label Lots options.

Pick string select

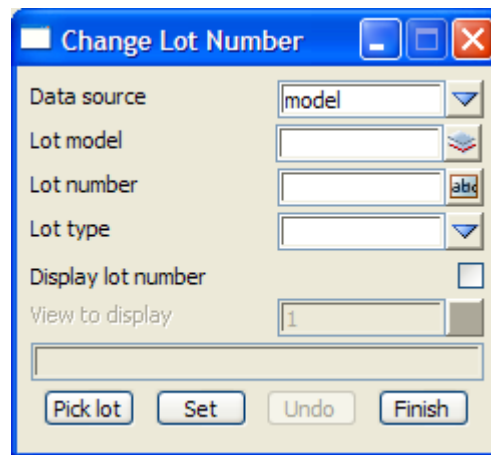
pick the lot the be numbered. After accepting the lot, it is given the Next lot no.

Change Lot Numbers

lot_change_number_panel

Position of option on menu: Design =>Estate/Lots => Number lots =>Change lot numbers

This option changes the lot numbers stored with the lot.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Lot number	text box	number of selected lot	
-------------------	----------	------------------------	--

*when a lot is selected, its lot number is displayed in this field. This can be changed and the selected lot will get the new Lot number when the **Set** button is selected.*

Lot type	choice box	type of selected lot	
-----------------	------------	----------------------	--

*when a lot is selected, its lot type is displayed in this field. This can be changed and the selected lot will get the new Lot type when the **Set** button is selected. See "Lot types"*

Display lot numbers	tick box		
----------------------------	----------	--	--

if tick, the lot numbers are displayed for the selected lots.

View to display	view box		available views
------------------------	----------	--	-----------------

view to temporarily display the lot numbers.

Pick lot	button		
-----------------	--------	--	--

select the lot to change either the lot number or the lot type.

Set	button		
------------	--------	--	--

set the lot number and the lot type of the selected lot to the values given in the Lot number and Lot type fields.

Label Lots

label_lots

After lots are numbers, text for the lot numbers and areas can be displayed.

Position of menu: Design =>Estate/Lots => Label lots



For the option *Lot labelling*, please continue to the section “Create Lot Annotation” .

String b/d labelling

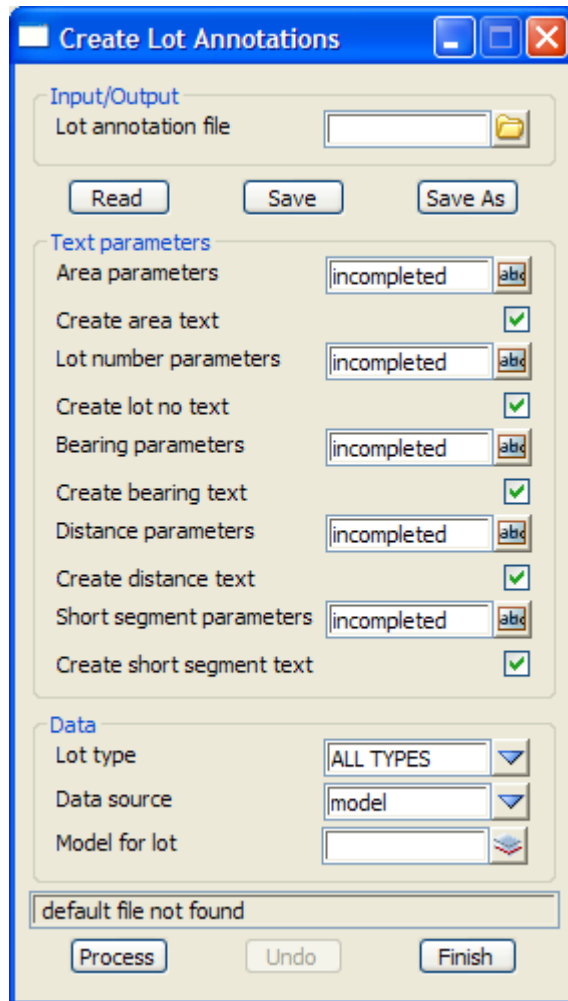
“String Bearing Distance Labelling”

Create Lot Annotation

lot_labelling_panel

Position of option on menu: Design =>Estate/Lots => Number lots =>Lot labelling

This option creates annotation of the lot numbers, lot areas, bearings of the sides and lengths of the sides.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Input/Output parameters

Lot annotation file *.laf files

file of defaults for labelling the lots.

Read button

read in a given lot annotation file.

Save button

write out the current parameters to the given lot annotation file.

Save as button

write out the current parameters to a different lot annotation file.

Text parameters

Area parameters

parameters for labelling the area of a lot.

Create area text tick box tick

if tick, annotation for the areas is created using the Area parameters.

Lot number parameters

parameters for labelling the lot numbers.

Create lot no. text tick box tick

if tick, annotation for the lot numbers is created using the Lot number parameters.

Bearing parameters

parameters for labelling the bearings of the sides of the lots.

Create bearing text tick box tick

if tick, annotation for the lot bearings is created using the Bearing parameters.

Distance parameters

parameters for labelling the lengths of the sides of the lots.

Create distance text tick box tick

if tick, annotation for the lengths of the sides is created using the Distance parameters.

Short segment parameters

parameters for specifying what is a "short Segment" and the parameters for labelling sides of the lots that are short segments.

Create short segment text tick box tick

if tick, annotation for short segments is created using the Short segment parameters.

Data

Data source type

data source type.

Data source

data source for lots to be annotated.

Lot type choice box user defined user defined
of the lots selected by the data source, only lots of this type are labelled. See “Lot types” .

Process button
select all the lots given by the Data source and Lot type and create annotations according the Text parameters.

String Bearing Distance Labelling

Position of option on menu: Design =>Estate/Lots => Label lots =>String b/d labelling

Option to label the bearing and lengths of segments of strings.

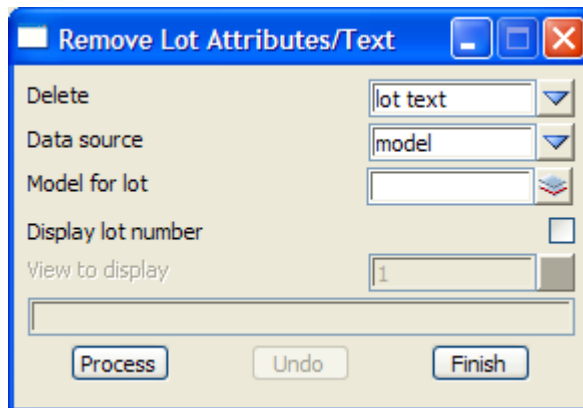
This option is described in the section “Bearing/Distance Labelling” in the chapter “Drafting”

Delete Lot Attributes and Text

lot_delete_number_panel

Position of option on menu: Design =>Estate/Lots => Delete lot attributes/text

This option is used to remove the attributes for a lot which store the lot number, area etc. It can also delete the annotation text that has been created for the lot.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Delete <i>when a lot is selected, its lot type is displayed in this field. This can be changed and the selected lot will get the new Lot type when the Set button is selected.</i>	choice box	lot text	lot text, lot attributes
Data source type <i>data source type.</i>			
Data source <i>data source for lot to delete either the lot text or lot attributes.</i>			
Display lot numbers <i>if tick, the lot numbers are displayed for the selected lots.</i>	tick box		
View to display <i>view to temporarily display the lot numbers.</i>	view box		available views

Process button

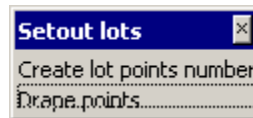
delete the selected attributes from the selected lots.

Setout Lots

setout_lots

Options to create unique point numbers for the vertices at the ends of each segment of the lots, and to create z-values from a given tin for the vertices of the lots.

Position of menu: Design =>Estate/Lots => Setout lots



For the option *Create lot point numbers*, please continue to the section “Create Lot Point Numbers”

Drape points

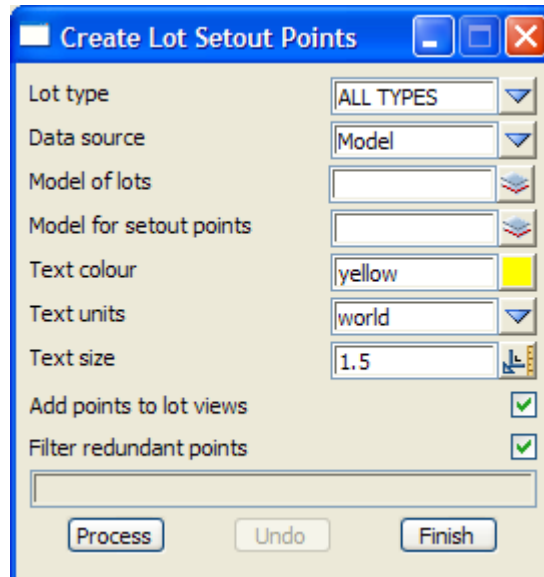
“Drape Points”

Create Lot Point Numbers

lot_setout_panel

Position of option on menu: Design =>Estate/Lots => Setout lots =>Create lot points numbers

This option creates unique point numbers for the vertices at the ends of each segment of the lots. Duplicate vertices are only given one point number.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Lot type	choice box	user defined	user defined
-----------------	------------	--------------	--------------

of the lots selected by the data source, only lots of this type have point numbers created. See “Lot types”

Data source type

data source type.

Data source

data source for lots to have point numbers created.

Model for setout points model box

available models

model for the set out points.

Text colour colour box

available colours

colour of the point numbers.

Text units choice box world

screen, paper, world

units for text size.

Text size double box

Size of the text for the point numbers.

Add points to lot views tick box tick

if tick, add the model of point numbers to the views that the lots are displayed on.

Create short segment text tick box tick

if tick, annotation for short segments is created using the Short segment parameters.

Filter redundant points tick box tick

if tick, then if two adjacent line have the same bearing then the two segments are replaced by one segment. And if two adjacent arc segments could be the one arc, then they are replaced by one arc.

Process button

select all the lots given by the Data source and Lot type and create annotations according the Text parameters.

Drape Points

Position of option on menu: Design =>Estate/Lots => Setout lots =>Drape points

Position of option on menu: Tins =>Drape =>String heights from tin

Option for setting the z-value of points to the z-value from a specified tin.

This option is described in the section “Update Z-values from Tin” in the chapter “Triangles”

Report Lots

lot_report_panel

Position of option on menu: Design =>Estate/Lots => Report lots

The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Data source type <i>data source type.</i>			
Data source <i>data source for lots to be reported.</i>			
Include point numbers <i>if tick, include the point number for each vertex around the lot.</i>	tick box		
Model of point numbers <i>model of the point numbers for the vertices of the lots.</i>	model box		available models
Report type <i>type of report for the selected lots.</i>	choice box		sort by type, sort by number sort by area, setout
Boundary <i>if selected, the boundary string for the lots.If selected then the area of the boundary string is calculated and the total area of the lots compared to the area of the boundary string.</i>	string select	optional	
No. decimals <i>Number of decimal places for co-ordinates and lengths in the report.</i>	integer box		
No. dec for bearings <i>Number of decimal places for bearings in the report.</i>	integer box		
Report file <i>Name of the file for the report.</i>	file box		

Process button

Create the report.

Lot Utilities

lot_utilities

Various lot options.

Position of menu: Design =>Estate/Lots => Lot utilities



For the option *Colour lots by range file*, please continue to the section “Colour Lots by Range File”

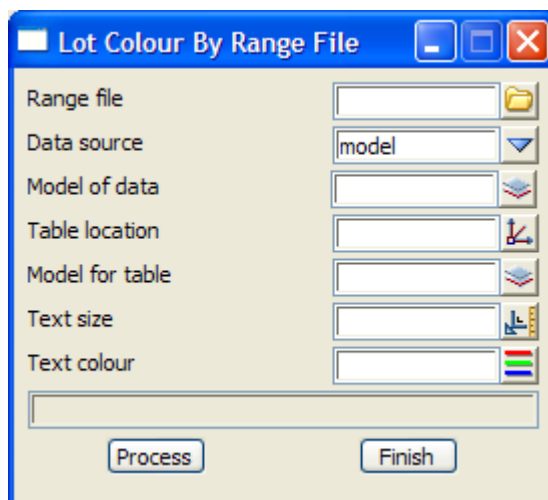
<i>Remove lot colour</i>	“Remove Lot Colour”
<i>Reverse bearing</i>	“Reverse Bearing”
<i>Short line/arc table</i>	“Short Line/Arc Table”
<i>Short line/arc report</i>	“Short Line/Arc Report”
<i>Table utilities</i>	“Short Segment Utilities”

Colour Lots by Range File

colour_lot_by_range_file_panel

Position of option on menu: Design =>Estate/Lots => Lot utilities =>Colour lots by range file

The option colours lots by area using a lot range file (.lrf) to define the colour for each minimum and maximum area. It also creates a table of the statistics for the area ranges.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

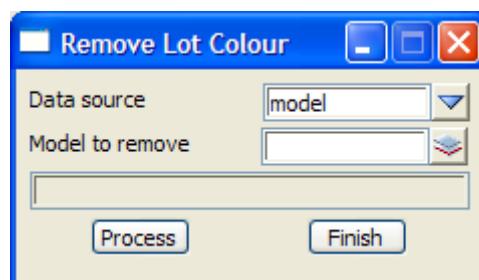
Range file	file box	*.lrf
<i>range file for colouring lots.</i>		
Data source type		
<i>data source type.</i>		
Data source		
<i>data source for lots to be coloured.</i>		
Table location	position select box	
<i>position of the table.</i>		
Model for table	model box	available models
<i>model for the table of statistics on the lot areas.</i>		
Text colour	colour box	available colours
<i>colour of the text.</i>		
Text size (w)	double box	
<i>size of the text for the table.</i>		
Process	button	
<i>select all the lots given by the Data source and Lot type and colour them according to the lot range file.</i>		

Remove Lot Colour

remove_lot_colour_panel

Position of option on menu: Design =>Estate/Lots => Lot utilities =>Remove lot colour

The option removes the colour of all the selected lots.



The fields and buttons used in this panel have the following functions.

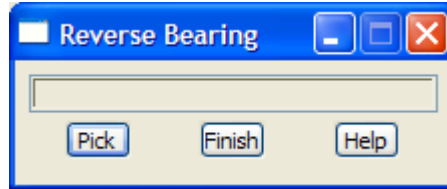
Field Description	Type	Defaults	Pop-Up
Data source type			
<i>data source type.</i>			
Data source			
<i>data source for lots to have their colour removed.</i>			
Process	button		
<i>select all the lots given by the Data source and remove the lot colour.</i>			

Reverse Bearing

reverse_bearing

Position of option on menu: Design =>Estate/Lots => Lot utilities =>Reverse bearing

Option to change the value of the bearing text created by the lot labelling option by adding 180 degrees to the bearing. This is then the bearing of a line in the reversed direction to that represented by the original bearing text. The rounding for the reversed bearing is done according to the lot parameters.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Zero padding	tick box	tick	
<i>if tick, if the minutes and/or seconds are zero then two zeros are written out. If not tick, if the minutes and/or seconds are zero then they are left out.</i>			
Pick	button		
<i>pick the bearing text that is to be modified.</i>			

Short Line/Arc Table

Position of option on menu: Design =>Estate/Lots => Lot utilities =>Short line/arc table

Position of option on menu: Drafting =>Text and Tables =>Short segment table

Option to create a table of all the short segments and/or short arcs.

This option is described in the section "Short Segments Table" of the chapter "Drafting"

Short Line/Arc Report

Position of option on menu: Design =>Estate/Lots => Lot utilities =>Short line/arc report

Position of option on menu: Drafting =>Text and Tables =>Short segment report

Option to create a report of all the short segments and/or short arcs.

This option is described in the section "Short Segment Report" of the chapter "Drafting"

Short Segment Utilities

Position of option on menu: Design =>Estate/Lots => Lot utilities =>Table utilities

Position of option on menu: Drafting =>Text and Tables =>Short segment table utilities

This panel is used modify an existing short segments table.

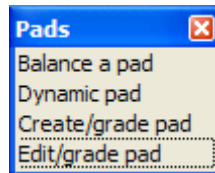
This option is described in the section "Short Segments Table Utilities" of the chapter "Drafting"

Pads

pads

Position of menu: Design =>Pads

The Pads walk-right menu is



For the option *Balance a pad*, go to the section

Dynamic pad

Create/grade pad

Edit/grade pad

"Balance a Pad"

"Dynamic Pad Interface"

"Allotment Pad Create"

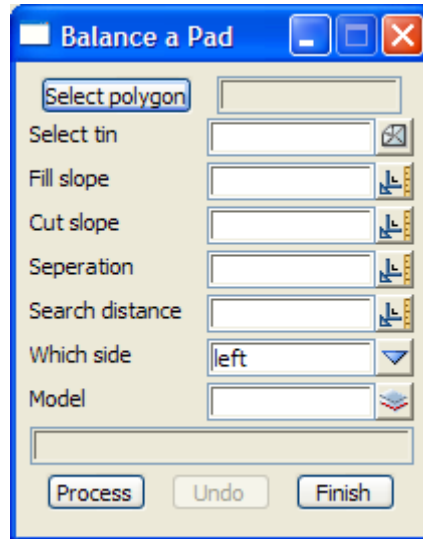
"Allotment Pad Edit"

Balance a Pad

balance_panel

Position of option on menu: Design =>Pads =>Balance a pad

This option takes a pad formed by a string and user given slopes and batters from the pad to a given tin. The pad is moved up or down until a balance is found.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Select polygon <i>select the string to batter from</i>	string select		
Tin to interface <i>tin to batter to.</i>	tin box		
Fill slope 1v in <i>fill slope for interfacing.</i>			
Cut slope 1v in <i>cut slope for interfacing.</i>			
Section separation <i>interval to calculate cut and fill batters.</i>			
Search distance <i>distance for the batter to search to find intersection with the triangles.</i>			
Which side <i>batter to the left or right of the selected string.</i>	choice box	left	left, right
Model <i>model to add the batter strings to.</i>	model box		available models
Process <i>run the option</i>	button		
Undo <i>undo the last set of batter strings created whilst the panel has been up.</i>			

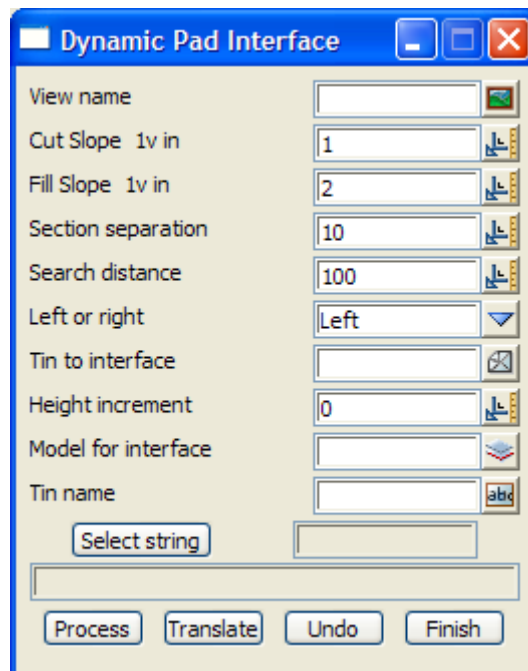
Dynamic Pad Interface

dynamic_pad_panel

Position of option on menu: Design =>Pads =>Dynamic pad

This option is to create a pad by interfacing from a selected string and calculated the volume for the pad. The pad can be moved up or down and the new volumes are calculated.

The pad can also be moved in plan and the new interface and volumes are dynamically calculated.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
View name <i>name of the view to display the pad interface strings.</i>	view box		
Cut slope 1v in <i>cut slope for interfacing.</i>		1	
Fill slope 1v in <i>fill slope for interfacing.</i>		2	
Section separation <i>interval to calculate cut and fill batters.</i>		10	
Search distance <i>distance for the batter to search to find intersection with the triangles.</i>		100	
Left or right <i>batter to the left or right of the selected string.</i>	choice box	left	left, right
Tin to interface <i>tin to batter to.</i>	tin box		
Height increment <i>when process is selected, the pad height is adjusted by the value in this panel field and the new interface and volumes are calculated.</i>		0	

Select string select

select string to batter from

Process button

adjust the height of the pad by the Height increment and recalculate the new interface and volumes.

Translate

when selected the pad will move to the cursor position and dynamically calculate the interface and volumes.

Reset button

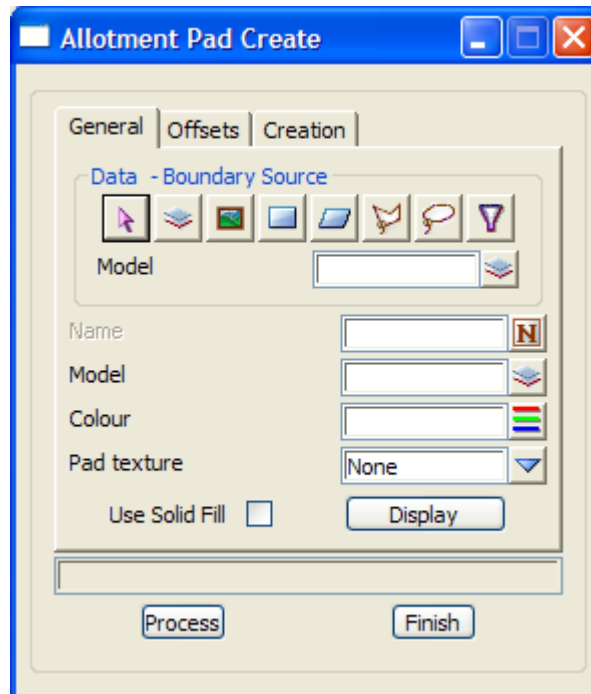
reset the pad height to its original value.

Allotment Pad Create

super_allot_create_panel

Position of option on menu: Design =>Pads =>Create/grade pad

This option and the next *Design =>Pads =>Edit/grade pad* are used to create a pad from surrounding lines, grade the created pad and edit pads already created with this option.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

General tab

Field Description	Type	Defaults	Pop-Up
Data source type <i>data selection type - for a full description go to "Data Source" in the chapter "Tools and Concepts"</i>		Model	
Data source <i>source of data is used to create a pad.</i>	input		
Name <i>the name of the new pad.</i>	input		
Model <i>name of the model that the new pad is in.</i>	model box		available models
Colour <i>the colour of the new pad.</i>	colour box	default colour	available colours
Pad texture <i>the colour of the new pad.</i>	choice box	None	None, some textures
Use solid fill <i>if tick, solid fill the pad</i>	tick box		

Display button
brings up the Display Text Defaults panel

Offsets tab

Global offset input
if other offsets are not given, the distance to offset the sides of the pad from the strings used to create the pad

Offsets model model box
model for the offset lines

Offsets type choice box Segment Segment, Point to Point
*if Segment, define the offset line by picking a segment.
 If Point to Point, define the offset line by picking two points.*

Select button
select an offset line

Creation tab

Pad level type choice box Typed input, Use tin level
 Use bdy/ht, Use bdy/slope
*if typed input, all vertices of the pad are given the height in the Lot level field.
 If use tin level, the height of each vertex of the pad is taken from the tin given in the Tin field.*

If typed input:

Pad level input
the height to use for all the vertices of the pad.

If Use tin level:

Tin tin box available tins
the tin used to give heights to the vertices of the pad.

If Bdy/ht:

Height
the height to be above the selected boundary string

Reference boundary
the selected boundary string for the pad to be a given height above/below

If Use/slope:

Slope 1 in
the slope to be above the selected boundary string

Reference boundary
the selected boundary string for the pad to be a given slope above/below

Single/ Along a string radio buttons single
*if single, a single pad is created from the strings surrounded the selected point.
 If along a string, pads are created surrounding each vertex of selected string.*

Centroid/search distance string select
if single, a point is selected and then a circle is rubber banded until a second point is selected. The pad is created from segments within the circle.

Search dist input

if along a string, then for each vertex, all segments within the distance are processed to create the pad.

Select string select

if along a string, select the string to use. Pads are created surrounding each vertex of this string.

Process button

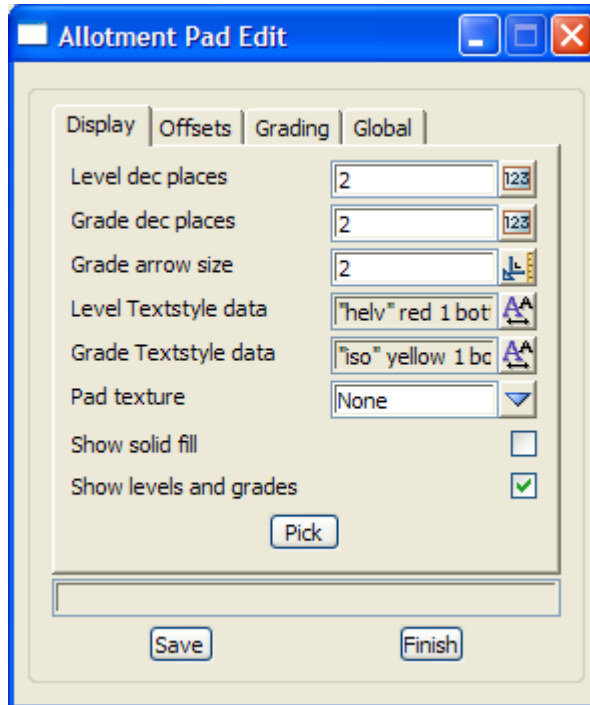
run the option

Allotment Pad Edit

super_allot_edit_panel

Position of option on menu: Design =>Pads =>Edit/grade pad

This option is used to grade a pad created with the previous option, *Design =>Pads =>Create/grade pad*.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Display tab

Level dec places	input		
<i>the number of decimal places used to display the height (level) of the pad vertices.</i>			
Grade dec places	input		
<i>the number of decimal places used to display the grade of the pad sides.</i>			
Grade arrow size	input		
<i>size of the grade arrows</i>			
Level textstyle data	textstyle data box		
<i>the textstyle data used for the displaying the level (height).</i>			
Grade textstyle data	textstyle data box		
<i>the textstyle data used for the displaying the grade.</i>			
Pad texture	choice box	None	None, some textures
<i>the colour of the new pad.</i>			
Show solid fill	tick box		
<i>if tick, solid fill the pad</i>			

Show levels and grades tick box

if tick, turn on the level and grades

Pick button

select the pad to edit

Offset tab

Maintain level/Maintain level on Grade radio buttons

if Maintain level, keep the level when a new offset/boundary is selected

If Maintain level on grade, keep the level on grade when a new offset/boundary is selected

Select new offset string select

select a new offset string

Select new boundary string select

select a new boundary string

Grading tab

Level and/or grade button

Level entire pad button

Level by str/ht button

Level by str/slope button

Level by seg/ht button

Level by seg/slope button

Batter slope button

Surface grading button

Ht

heights to increment the selected pad by

Up button

move the pad up by the give height

Down button

move the pad down by the give height

Pick (ht) string select

select a pad

Batter slope model model box available models

model for the batter slopes

Global tab

Data source type Model

data selection type - for a full description go to "Data Source" in the chapter "Tools and Concepts"

Data source input

source of data is used to create a pad.

Roads

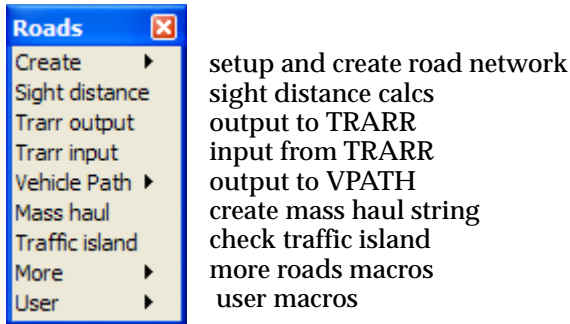
roads

Position of menu: Design =>Roads

The road options include road network creation options and a number of other options for creating road details.

Some of the options are currently under development.

The roads walk-right menu is



Each option in this menu will now be described.

For the option *Create*, please continue to the section "Create Roads"

<i>Sight distance</i>	"Sight Distance"
<i>Trarr output</i>	"Trarr Output"
<i>Trarr input</i>	"Trarr input"
<i>Vehicle path</i>	"Vehicle Path"
<i>Mass haul</i>	"Mass Haul String and Report"
<i>Traffic island</i>	"Create Combined Traffic Island"
<i>More</i>	"More Roads"

Create Roads

create_roads

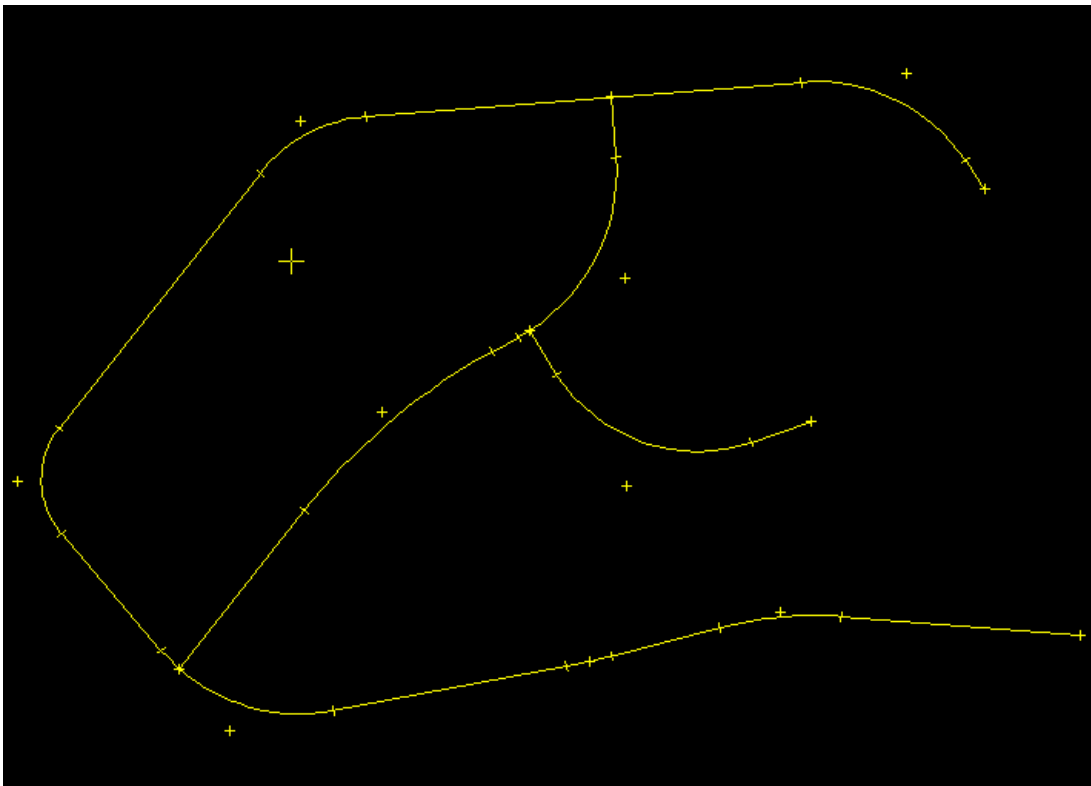
Position of menu: Design =>Roads =>Create

The Create roads function allow the user to start with a model of road centrelines with vertical geometry, and unique string name.

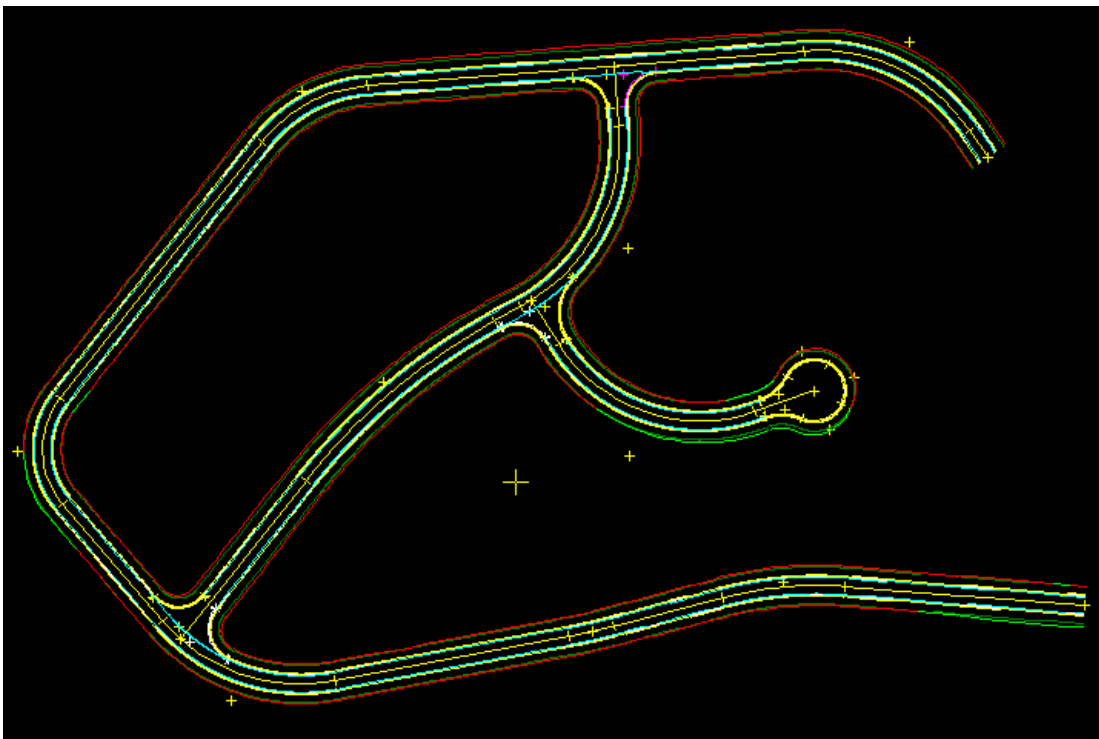
The centrelines can then be tagged with the width of the roads, left and right turn radii for any intersections and the definitions of any culdesacs at the end of a centreline.

The Create option will then create the left and right edges of the roads, create kerb returns and any intersections and the appropriate culdesacs.

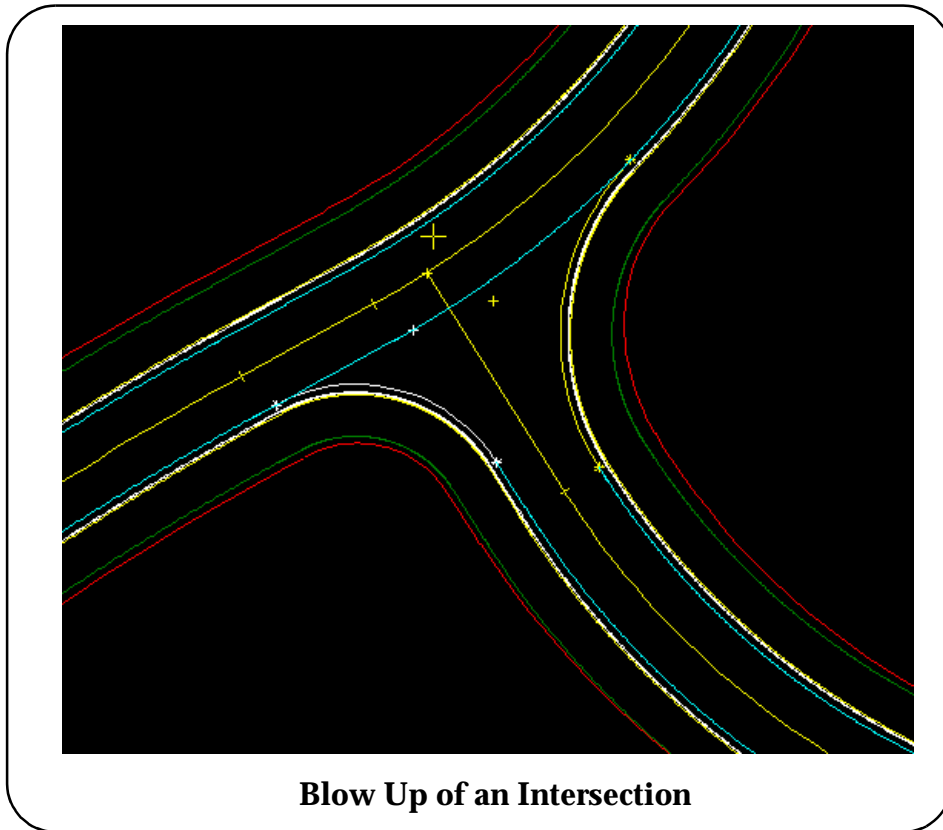
For example



Initial Network of Centrelines



Road Network After Running the Roads Option



Blow Up of an Intersection

The Roads walk-right menu is



construct the roads network
 setups for road network

Each option in this menu will now be described.

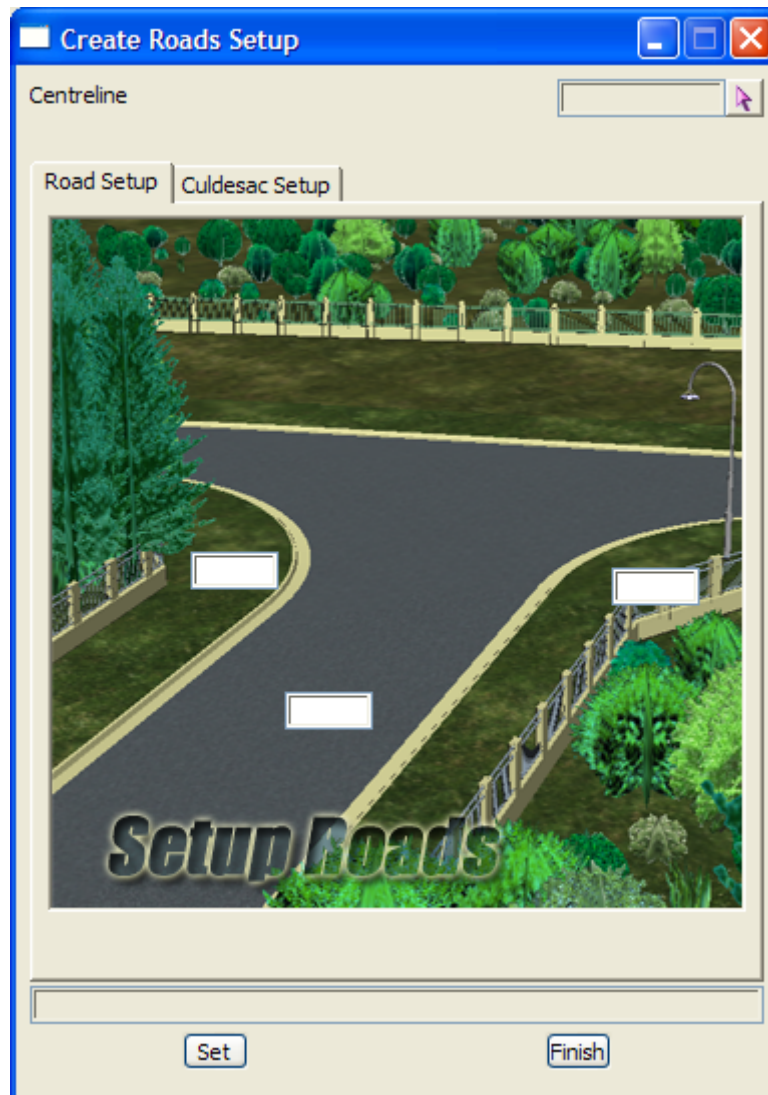
For the option *Create Roads - Manager*, go to the section “Create Roads - Manager” .
Create Roads - Setup “Create Roads - Setup” .

Create Roads - Setup

`create_roads_setup`

In the **Create Roads - Manager** panel there are default values for the road width and road crossfall and turn radius.

If a different road width or crossfall, or a different left turn radius or right hand radius is required, the **Create Roads - Setup** option is used to define the different information for any centreline. **Create Roads - Setup** is also used to define culdesacs.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Road Setup tab			
Centreline	string select		
<i>used to set the left and right turn radii, and the width of the road. This option is used twice to set the different radii for each end of a road by picking the centreline close to the end that is to have the left and right turn radii defined. The left and right turn radii can be different for each end of an alignment.</i>			
Road width			
<i>width of one side of the road for the selected centreline.</i>			
LHS turn radius			
<i>radius to use for filleting between any centrelines on the left.</i>			
RHS turn radius			
<i>radius to use for filleting between any centrelines on the right.</i>			
Set	button		
<i>store the given values in the panel with the selected centreline.</i>			



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Culdesac Setup tab			
Left fillet <i>radius of the fillet between the road and the bulb on the left hand side</i>	input		
Bulb radius <i>radius of the culdesac bulb</i>	input		
Bulb offset <i>offset of the culdesac bulb</i>	input		
Right fillet <i>radius of the fillet between the bulb and the right had side of the road</i>	input		
Left straight <i>distance between the left fillet and the bulb</i>	input		

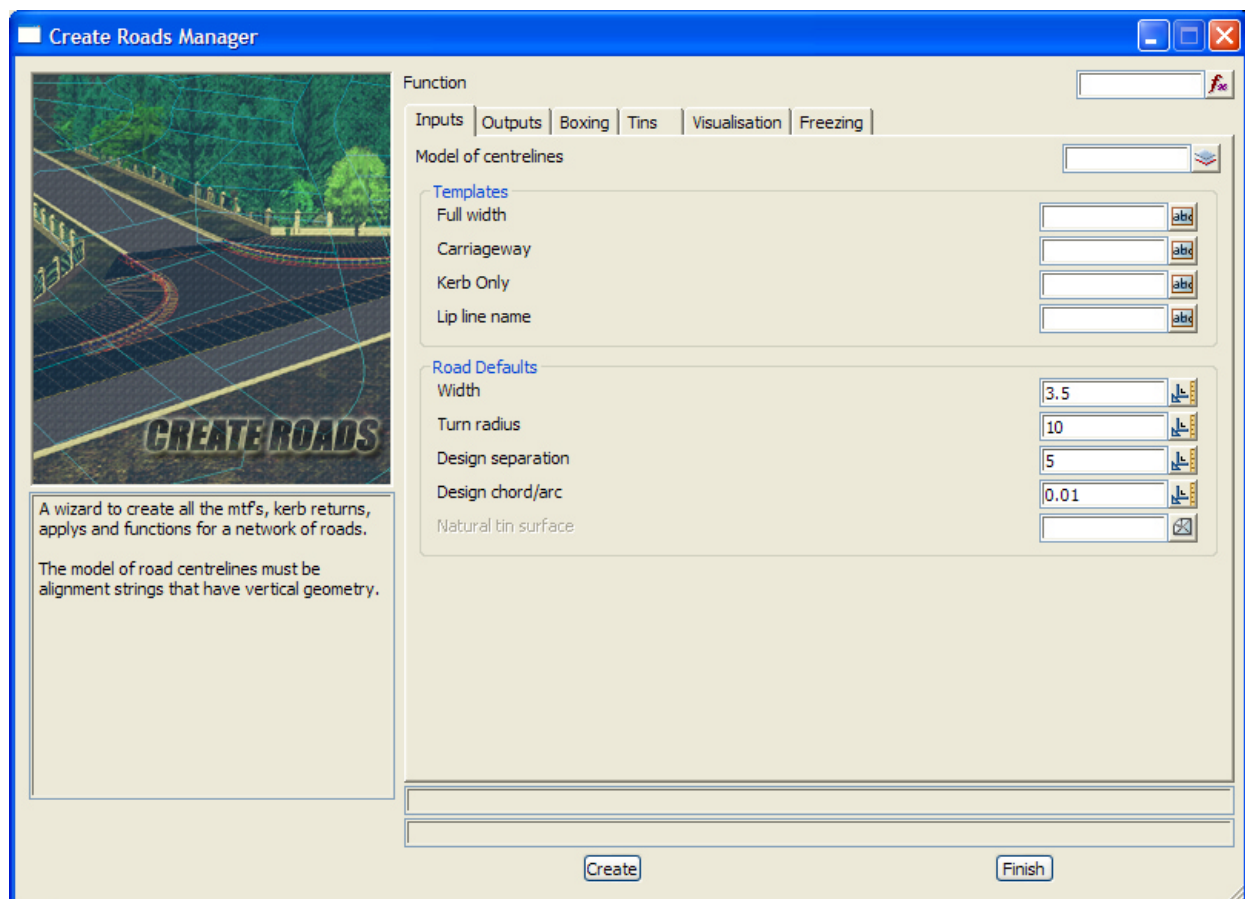
Right straight input
distance between the right fillet and the bulb

Set button
store the panel values the selected centreline.

Create Roads - Manager

create_roads_manager

This option takes all the centrelines in a model and uses road widths and left and right turn radii to form roads on each centreline.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Function	function box		available roads functions
<i>name of the create roads function</i>			

Input tab

Model of centrelines	model box	available models
<i>model of the centreline lines that are to processed to create roads, intersections and culdesac. Each centreline must have a unique name and vertical geometry</i>		

Templates

Full width template box available templates
template with one fixed link and then cut and fill definitions to use for creating the roads. If a centreline has a road width defined, then the template is modified to use those values. The cut/fill section of the template are used to batter as normal.

Carriageway template box available templates
a template with only a fixed part to the end of the carriageway which is applied across any intersections - going from the chainage of the start of the kerb return on one side of the intersection to the chainage at the end of kerb return on the other side of the intersection.

Kerb only template box available templates
a template with no carriageway part. It is applied to any kerb returns

Lip line name

name of the lip line that must exist in each of the full width template and the road template. The kerb returns are created from the lip line on each road and the start height and grades are taken from the lip lines.

Road Defaults**Width**

width of the road to be used if one hasn't been defined for any centrelines

Turn radius

radius to use for filleting between any centrelines that don't have a left or right radius defined

Design separation

chainage distance to use in the Applies for creating the roads along the centrelines

Default chord/arc

chord to arc tolerance to use on curves

Natural surface tin tin box available tins

*if non blank, the tin to use as the natural surface for battering in the Applies.
 If blank, no battering is done.*

Output tab**Model stems**

Road strings input

*pre*post text to use with the function name in the created Applies for the design string models for each centreline*

Road sections input

*pre*post text to use with the function name and the created Applies for the design cross section models for each centreline*

Polygons choice box One model One model, No Polygons
 Model for Centreline

*if **One model**, all the polygons created by the applies are place in one model.
 If **Model for Centreline**, different models are created for the polygons in each apply.
 If **No Polygons**, no polygons are created by the applies.*

Model model box available models

*when **One model**, model for all the polygons created by the Applies.*

Road polygons input

*pre*post text to use with the function name in the created Applies for polygon models for each centreline*

Kerb Returns**Turn separation**

chord/arc tolerance for use in the kerb return Applies

Turn chord/arc

chord to arc tolerance to use on kerb return

Model for kerb returns model box

available models

model for all the kerb returns

Naming choice box

Follow Road Names - LHS driving
 Follow Road Names - RHS driving
 Use Numbers
 Use Letters

method of naming the kerb returns

Just create kerb returns tick box

if tick, only create the kerb returns. Usually only run at the beginning to see if the kerbs look correct.

Just create kerb returns tick box

if tick, only create the kerb returns. Usually only run at the beginning to see if the kerbs look correct.

Kerb return strings and sections in one model tick box

if tick, then all the kerb return strings and sections are place in the one model. The model names are given in the next two fields.

Model for kerb return strings model box

available models

model for all the kerb return strings

Model for kerb return sections model box

available models

model for all the kerb return sections

Delete frozen apply many functions tick box

if tick, the apply many functions are deleted for all the frozen roads. Normally not used

View for models view box

available views

if non blank, view to add all the created models onto.

Error report file box

*.rpt files

file for error messages

Boxing tab

boxing can be created for all the road and kerb return strings. The boxing definitions must have a common centreline name in them which will be replaced by the name of each of the road/kerb return centrelines.

Create boxing tick box

if tick, boxing is applied for all the road and kerb returns. The boxing definitions must have a common centreline name in them which will be replaced by the name of each of the road centrelines or kerb returns.

Default boxing file file box

*.blf files

file of boxing file definitions

Default boxing CL delimiter input

common name in each boxing definition which will be replaced by the name of each road/kerb return centreline

Model stem for boxing strings input

*pre*post text to use with the road/kerb return function name for boxing string models*

Boxing sections input

*pre*post text to use with the road/kerb return function name for boxing section models*

Boxing kerb return sections and strings in one model tick box

*if **tick**, the strings for all the kerb return Applies are place in one model rather than one model for each kerb return. Similarly, the sections for all the kerb return Applies are placed in the one model.*

*If **not tick**, the model names are created in the same way as for the road centrelines. That is, the Model stem for boxing strings and sections are used with the kerb return function name and the layer stems to produce the kerb return boxing strings and sections models.*

Model name for boxing kerb strings input

*when only one model (per layer) for the box kerb strings is used - the base name for the model of kerb strings created for each boxing layer. The pre*post text in the Layer Stem is applied to this name.*

Model name for boxing kerb sections input

*when only one model (per layer) for the box kerb sections is used - the base name for the model of kerb sections created for each boxing layer. The pre*post text in the Layer Stem is applied to this name.*

Boxing Layer 1-8 in the grid:

if non blank, boxing strings and sections will be created for that layer.

*The last boxing layer is also referred to as the **subgrade** layer.*

Layer stem input

*for this boxing layer, the pre*post text used when naming models for boxing sections and strings.*

Road - LHS input

for this boxing layer, the boxing definition to use on the left hand side of road centrelines

Road - RHS input

for this boxing layer, the boxing definition to use on the right hand side of road centrelines

Kerb return input

for this boxing layer, the boxing definition to use on the kerb returns

Intersection - LHS input

for this boxing layer, the boxing definition to use on the left hand side of the road though an intersection. The strings and sections are place in the models for the road centreline going through the intersection.

Intersection - RHS input

for this boxing layer, the boxing definition to use on the right hand side of the road though an intersection. The strings and sections are place in the models for the road centreline going through the intersection.

Tins tab**Create tin** tick box

*if **tick**, create a tin for all the roads, kerb returns and culdesacs*

Road tin tin box

available tins

name for the tin created from the all the strings and sections

Road tin colour colour box

available colours

colour of the road tin

Subgrade tin	tin box	available tins
<i>if non blank, a subgrade tin of this name is created</i>		
Subgrade tin colour	colour box	available colours
<i>colour of the subgrade tin</i>		
Nulling angle	input	
<i>angle for nulling the triangles</i>		
Nulling length	input	
<i>length for nulling the triangles</i>		
Null Seed points:		
Seed X/Y	input	
<i>X/Y coordinate of a nulling seed point</i>		
Seed Point	button	
<i>select a seed point for nulling the tins. The X and Y coordinates are written to the Seed X/Y grid</i>		

Visualisation tab

Create visualisation	tick box	
<i>if tick, the road tin is processed for visualisation</i>		
Apply texture map to tin	tick box	
<i>if tick, the texture map is applied to the road tin</i>		
Draw road tin as solid on view	tick box	
<i>if tick,</i>		
Tin colour to use for cut polygons	colour box	available colours
<i>colour to use for all the cut polygons</i>		
Tin colour to use for fill polygons	colour box	available colours
<i>colour to use for all the fill polygons</i>		
Tin colour to use for transition polygons	colour box	available colours
<i>colour to use for all the polygons in neither cut nor fill</i>		

Freezing tab

Colour for the frozen sections	colour box	available colours
<i>colour to use for the sections of frozen strings. In any view, this gives a quick way of identifying frozen roads.</i>		
Road grid - list of all the centrelines		
Element		available colours
<i>centreline name</i>		
Frozen	tick box	
<i>if tick, the centreline is frozen out of the automatic Create Roads process.</i>		

*For a frozen centreline, when the **Create Roads** function is run, the Apply Many for that centreline is deleted and re-created. However any existing Apply Many for that centreline will be run. Kerb returns are still calculated using the lip line create by running the existing Apply Many for the frozen centreline. Hence the mtf for a frozen centreline can be modified and the changes will **not** be deleted when the Create Roads function is recalced.*

Note - if the two roads used to define a kerb return are both frozen, then the kerb return is automatically frozen and the kerb return is not deleted and recreated when the Create Roads function is recalced. However the existing Apply Many for the frozen kerb return is run on each recalc.

Buttons at bottom

Create button
run the option and create the road network.

Sight Distance

sight_distance

Position of option on menu: Design =>Roads =>Sight distance

The sight distance option calculates the maximum distance that can be seen from an eye point, along a string, against a tin (including a supertin).

In the option, a string and a tin are selected and then an eye point is positioned at the given eye height, at the given start chainage on the selected string.

From the eye point, a target point is placed at a chainage distance equal to the given minimum sight distance along the string, at the given target height above the string.

The target point is then tested for visibility from the eye point, against the given tin. That is, a test is made to see if the target point can be seen from the eye point, against the surface given by the tin.

If the target point is visible, it is moved the given chainage distance, trial interval, further along the string and the visibility test redone.

The process is repeated until either the target point is invisible, or the target point is the given maximum sight distance (in chainage) away from the eye point.

A line joining the eye and final target point position is created and placed in the model for sight lines. The chainage distance between the eye and the final target point is placed as a text string in the model for sight text, positioned at the eye point.

The eye point is then moved the given chainage distance interval along the string, and the process repeated until the eye point is past the given end chainage.

The eye point is then placed at the end chainage and the negative of the trial interval and interval values used to calculate sight distance for the reverse direction along the string.

On selecting the **sight distance** option, the **sight distance** panel is displayed.

The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Tin <i>name of the tin to use as the surface for testing visibility.</i>	input		available tins
Report file <i>if non blank, a report is produced and written out to this file name.</i>	file box		*.rpt files

Centreline tab

Centreline <i>A string to be used for placing the eye and target points, is selected from a view.</i>	string-select		
Interval <i>chainage increment to move to eye point for the next sight distance calculation.</i>	input	100	
Start/end chainage <i>the sight distance is calculated for points on the selected string covering the chainage range given by the start and end chainage fields. If the start/end chainage is blank, the star/end chainage of the selected string is used.</i>	input		
Trial interval <i>chainage increment to move to test target point.</i>	input	10	
Minimum sight distance <i>minimum chainage distance to use for placing the test target point.</i>	input	100	
Maximum sight distance <i>maximum chainage distance to use for placing the test target point.</i>	input	3000	

Eye tab

Height input 1.3
height of the eye point above the picked string

Offset input 1.3
offset of the eye point from the picked string.

Target tab

Height input 0.3
height of the test target point above the picked string

Offset input 1.3
offset of the target point from the picked string.

Bridge Tins tab

Tin grid available tins
name of the tins to use as vertical obstructions when testing visibility.

Forward Direction tab

Sight lines model box available models
*if non-blank, the name of the model to contain the sight lines.
If blank, the sight lines are not created.*

Good colour colour box default colour available colours
when the minimum sight distance is achieved, sight lines are created in the good colour

Bad colour colour box default colour available colours
when the minimum sight distance is not achieved, sight lines are created in the Bad colour

Sight text model box available models
*if non-blank, the name of the model to contain the sight distance text.
If blank, the sight distance text is not created.*

Sight text info text info
definition of the sight text.

Backward Direction tab

Sight lines model box available models
*if non-blank, the name of the model to contain the sight lines when going down the string in the reverse direction Note that the eye and target offsets are then applied in the reverse direction of the string.
If blank, the sight lines are not created.*

Good colour colour box default colour available colours
when the minimum sight distance is achieved, sight lines are created in the good colour

Bad colour colour box default colour available colours
when the minimum sight distance is not achieved, sight lines are created in the Bad colour

Sight text model box available models
*if non-blank, the name of the model to contain the sight distance text.
If blank, the sight distance text is not created.*

Sight text info text info

definition of the sight text.

Sight button

sight lines and text will be calculated for the given string and tin, and placed in the sight line and text models.

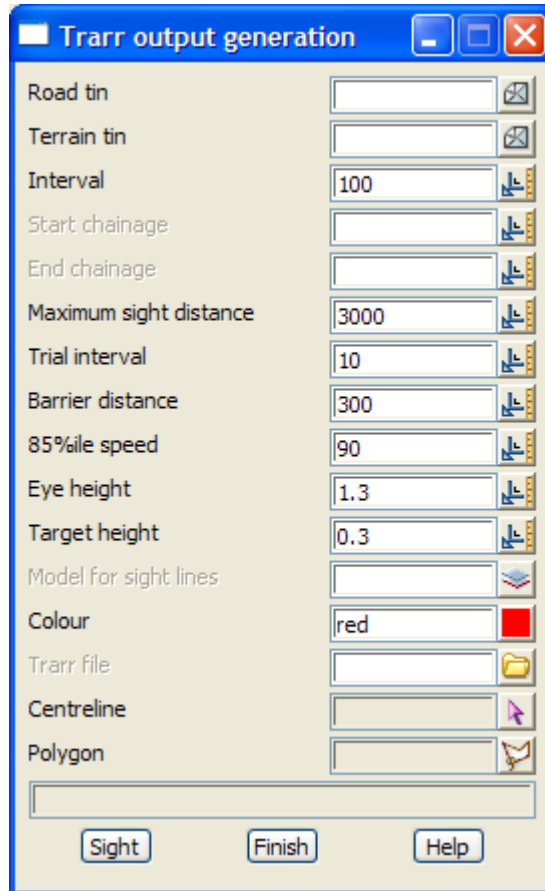
Trarr Output

trarr_output_generation

Position of option on menu: Design =>Roads =>Trarr output

Options to create a file for use with TRARR.

Please contact 12d Solutions if you wish to use this options.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Road tin <i>tin of the road design</i>	tin box		available tins
Terrain tin <i>tin of the terrain</i>	tin box		available tins
Interval <i>interval to calculate sight lines</i>	input		
Start chainage <i>if non blank, start chainage for producing the Trarr file. If blank, start at the beginning of the centreline string.</i>			
End chainage <i>if non blank, end chainage for producing the Trarr file. If blank, go to the end of the centreline string.</i>			

Maximum sight distance	input	
	<i>maximum distance to try and calculate sight lines</i>	
Trial interval	input	
	<i>interval to move ahead to test sight distance to</i>	
Barrier distance	input	
	<i>if sight distance is less than this value then a barrier line is required</i>	
85%ile speed	input	
	<i>85 percentile speed (to write to the Trarr file)</i>	
Eye height	input	1.3
	<i>height of the eye point above the picked string</i>	
Target height	input	0.3
	<i>height of the target point above the picked string</i>	
Model for sight lines	model box	available models
	<i>if non blank, the sight lines are kept and placed in this model</i>	
Colour	colour box	available colours
	<i>colour of the sight lines</i>	
Trarr file	file box	*.rpt files
	<i>if non blank, a Trarr file of this name is produced</i>	
Centreline	string-select	
	<i>string to be used for placing the eye and target points and calculating sight distance, is selected from a view.</i>	
Polygon	string-select	
	<i>boundary polygon for the road tin</i>	
Sight	button	
	<i>calculate sight lines and write out a Trarr file</i>	

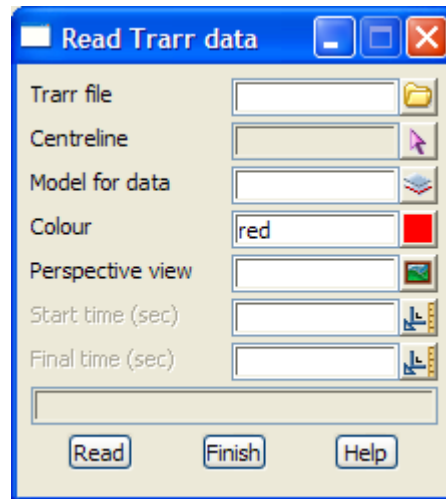
Trarr input

read_trarr_data

Position of option on menu: Design =>Roads =>Trarr input

Options to read in a TRARR file.

Note - this option is under development.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Trarr file <i>the Trarr file to read in</i>	file box		*.traffic files
Centreline <i>string that the Trarr file is for</i>	string-select		
Model for data <i>model to read the Trarr data into</i>	model box		available models
Colour <i>colour for the Trarr data strings</i>	colour box		available colours
Start time (sec) <i>start time in seconds for replaying the data in the Trarr file</i>	input		
Final time (sec) <i>end time in seconds for replaying the data in the Trarr file</i>	input		
Sight <i>calculate sight lines and write out a Trarr file</i>	button		

Vehicle Path

vehicle_path

Position of menu: Design =>Roads =>Vehicle Path

The vehicle path option is used to interface with the vehicle path program, vpath, written by Queensland Department of Main Roads.

The **Vpath** program is a separate chargeable program and is fully described in its own Manual.

To run vpath from within **12d Model**, either the environment variable VEHICLE_PATH_4D must be set to point to the folder where the DOS vpath executable is located or WINDOWS_VEHICLE_PATH_4D is set to point to the folder where the Windows vpath executable is located.

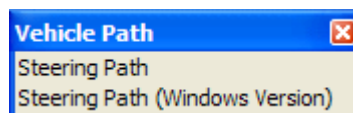
VEHICLE_PATH_4D *folder-path*

or

WINDOWS_VEHICLE_PATH_4D *folder-path*

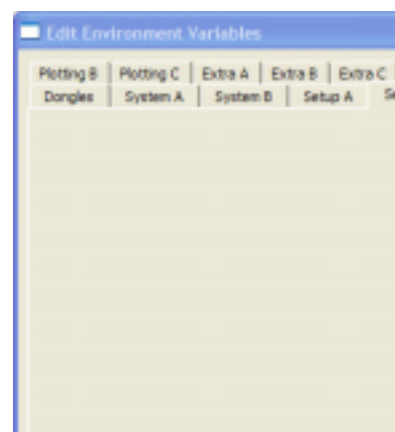
Vpath is the Vehicle Turning Path program written by Main Roads Queensland and is a separate chargeable program.

The vehicle path menu currently contains just one option, steering path.



steering_path **steering_path_windows_version_**

On selecting the steering path option, the **steering path** panel is displayed



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Vehicle type	input	Design Semi	available vehicles in the vehicles.std file

the vehicle type used for generating the swept path.

Friction coefficient	input	0.3	
<i>the coefficient of friction to be used for the vehicle.</i>			
Vehicle on side	input	Left	Left, Right
<i>the side of the vehicle that the selecting steering path represents.</i>			
Draw interval (=none)	input	20	
<i>if non-zero, the position of the vehicle on the steering path is draw the position at this interval.</i>			
Steering path model	input		available models
<i>if non-blank, the steering path including the marking of the tangent points and centres of each circular curve are created and placed in this model.</i>			
Vehicle position model	input		available models
<i>if non-blank, the strings tracing out the vehicle position are placed in this model.</i>			
Swept path model	input		available models
<i>if non-blank, the strings tracing out the swept path of the vehicle are placed in this model.</i>			
Pick	button		
<i>pick</i>			
Run Vehicle Path	button		
<i>run the vpath program and load the results back into the models given in the panel fields.</i>			

Mass Haul String and Report

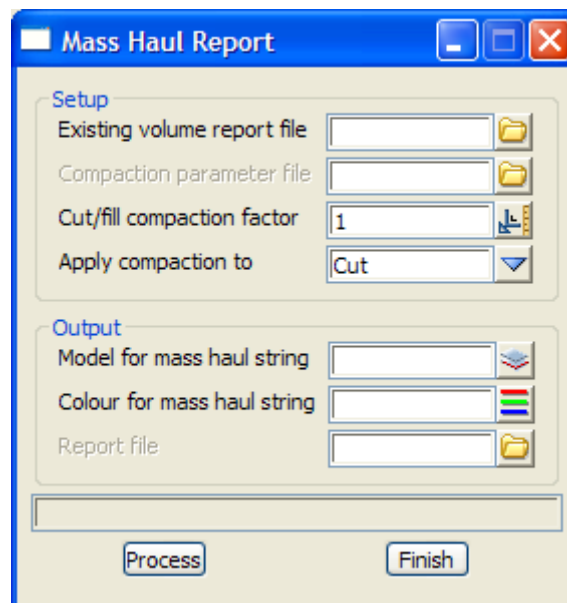
`mass_haul_reportl`

Position of option on menu: Design =>Roads =>Mass haul

This panel is used to read in a volumes report and optionally a cut/fill compaction parameter file and creates a mass haul string and a new volumes report with the compaction volumes.

The compaction parameter file simply contains the compaction factor for given chainage ranges. Either the cut volumes are multiplied by the compaction factor or the fill volumes are divided by the compaction factor, to give the compacted volumes in the new volumes report.

If the existing volume report contains an alignment string and that string can be found in the project then a new alignment string is created with the same horizontal geometry but with the accumulated volumes as the z-values.



The fields and buttons used in this panel have the following functions:

Field Description	Type	Defaults	Pop-Up
Existing volume report file <i>name of the existing volumes report.</i>	file box		*.rpt files
Compaction parameter file <i>file containing compaction factors to be used. See "Format of the Compaction Parameter File".</i>	input		*.mhf files
Cut/fill compaction factor <i>cut/fill compaction factor for any chainages not in the compaction parameter file or if there is no file.</i>	input	1	
Apply compaction factor to <i>if cut, the cut volumes are multiplied by the compaction factors. If fill, the fill volumes are divided by the compaction factors.</i>	choice box	cut	cut, fill
Model for mass haul string <i>model for the created mass haul string.</i>	model box		available models

- Colour for mass haul string** colour box available colours
colour of the created mass haul string.
- Report file** input box
if non-blank, a mass haul volumes file is created.
- Process** button
run the option.

Format of the Compaction Parameter File

```
Format of the
// Sample cut/fill compaction parameter file - the file ending
is .mhf
// All lines starting with // are comments and blank lines are
ignored
//
// A range is specified by a start and end chainage and a compaction
factor.
// A compaction factor of 1.0 means there is no compaction.
// A compaction factor of 0.9 means that 1.0 cubic metres of cut is
equivalent
// to 0.9 cubic metres of fill due to compaction.

// format is
// Start_ch      End_ch      Compaction_factor
           0           100           0.9
          100           500           1.0
          500           2000          1.1
```

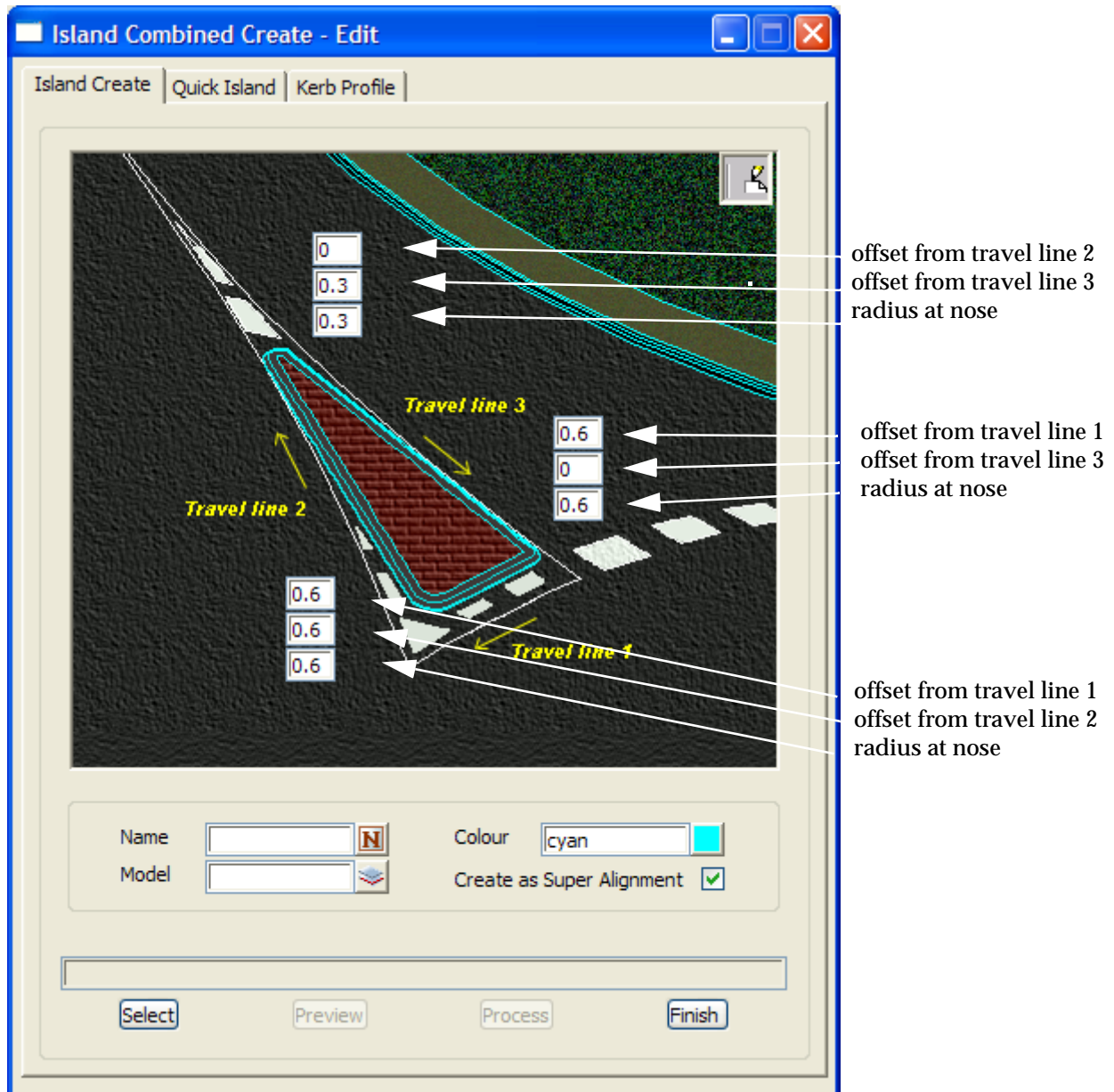

Create Combined Traffic Island

island_combined_panel

Position of option on menu: Design =>Roads =>Traffic Island

Create an alignment string for a traffic island between user selected strings and with user defined offsets from the strings and nose radii. Drape the island onto a tin to give it z-values and then apply a kerb profile to complete the island.

On selecting the traffic island option, the **traffic island alignment creation** panel is displayed.



The position of the panel fields indicate what the values are for. Tool tips appear when the cursor is passed over the panel fields.

The fields and buttons used in this panel have the following functions:

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Buttons at bottom

- Select** strings select
select in order and with direction, the three strings to use in creating the traffic island. Terminate by clicking RB and selecting cancel from the pick ops menu.
- Preview** string select
draw the traffic island with the given parameters in the panel draw box.
- Process** button
create the alignment string

Island Create tab

- Offset from travel lines** input box
offset distance from the selected travel lines.
- Radius at nose** input box
radius of the corner of the traffic island between the selected travel lines
- Name** name box available names
name of the created alignment string.
- Model** model box available models
model for the created alignment string.
- Colour** colour box available colours
colour of the created alignment string.
- Create as super alignment** tick box
*if tick, create the string as a super alignment.
 If not tick, create the string as an alignment.*

Quick Island tab

the quick island tab produces a traffic island of fixed sides but with the given nose radii. The traffic island can be created as a super alignment that can then be easily moved around and modified.

- Radius at nose** input box
radius of the corner of the traffic island
- Name** name box available names
name of the created alignment string
- Model** model box available models
model for the created alignment string
- Colour** colour box available colours
colour of the created alignment string
- Create as super alignment** tick box
*if tick, create the string as a super alignment.
 If not tick, create the string as an alignment.*
- Position** xyz select box
pick two points to indicate the direction that the island will be created.

*Then click on **Process** to create the Traffic Island.*

Kerb Profile tab

- Use island alignment levels instead of Tin** tick box

if **tick**, use the alignments own z-value instead of draping the alignment onto the tin.
If **not tick**, drape the alignment onto the tin to get z-values.

Offset kerb face/top/back input box
offset for kerb face/top/back for the selected kerb type.

Height kerb face/top/back input box
height for kerb face/top/back.

Tin tin box available tins
triangulation to drape the traffic island strings onto.

Kerb type input box
type of kerb to apply to the reference string of the traffic island. If type User is selected from the pop-up list, a file which defines the kerb profile can be selected and used.

File file box *.ukt files
file to read/write the user defined kerb type to.

Read button
read the given File to define a kerb type.

Save button
save the kerb parameters to the given File.

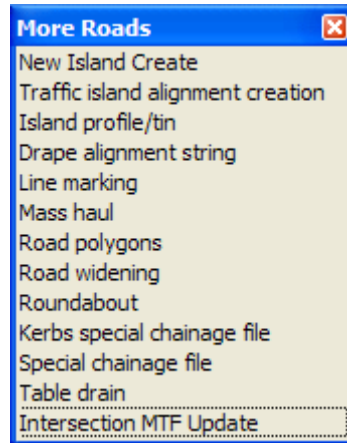
More Roads

more_roads

Position of menu: Design =>Roads =>More

The more roads menu contains macros to create road details such as traffic islands, line marking, mass haul strings.

The more roads walk-right menu is



For *New island create*, go to the section “Create Combined Traffic Island”

For *Traffic island alignment creation*, go to “Alignments” in the chapter “Strings”

<i>Island profile/tin</i>	“Traffic Island Profile and Triangulation Creation”
<i>Drape alignment string</i>	“Drape Alignment (Macro)” in the chapter “Triangles”
<i>Line marking</i>	“Line Marking” in the chapter “Drafting”
<i>Mass haul</i>	“Mass Haul String and Report”
<i>Road polygons</i>	“Polygons from Sections”
<i>Road widening</i>	“Road Widening with Minimum and Maximum Crossfall”
<i>Roundabout</i>	“Create Roundabout”
<i>Kerbs special chainage file</i>	“Kerb Special Chainages File”
<i>Special chainage file</i>	“Special Chainages File”
<i>Table drain</i>	“Table Drain - Intersection of Slopes from Two Strings”

Traffic Island Alignment Creation

Position of option on menu: Design =>Roads =>More =>Traffic island alignment creation

This option creates an alignment string for a traffic island and has already been documented as
Strings => Create => Alignment => Traffic island

For the option *Traffic island*, please continue to the section “Create - Traffic Island” in the chapter “Design” .

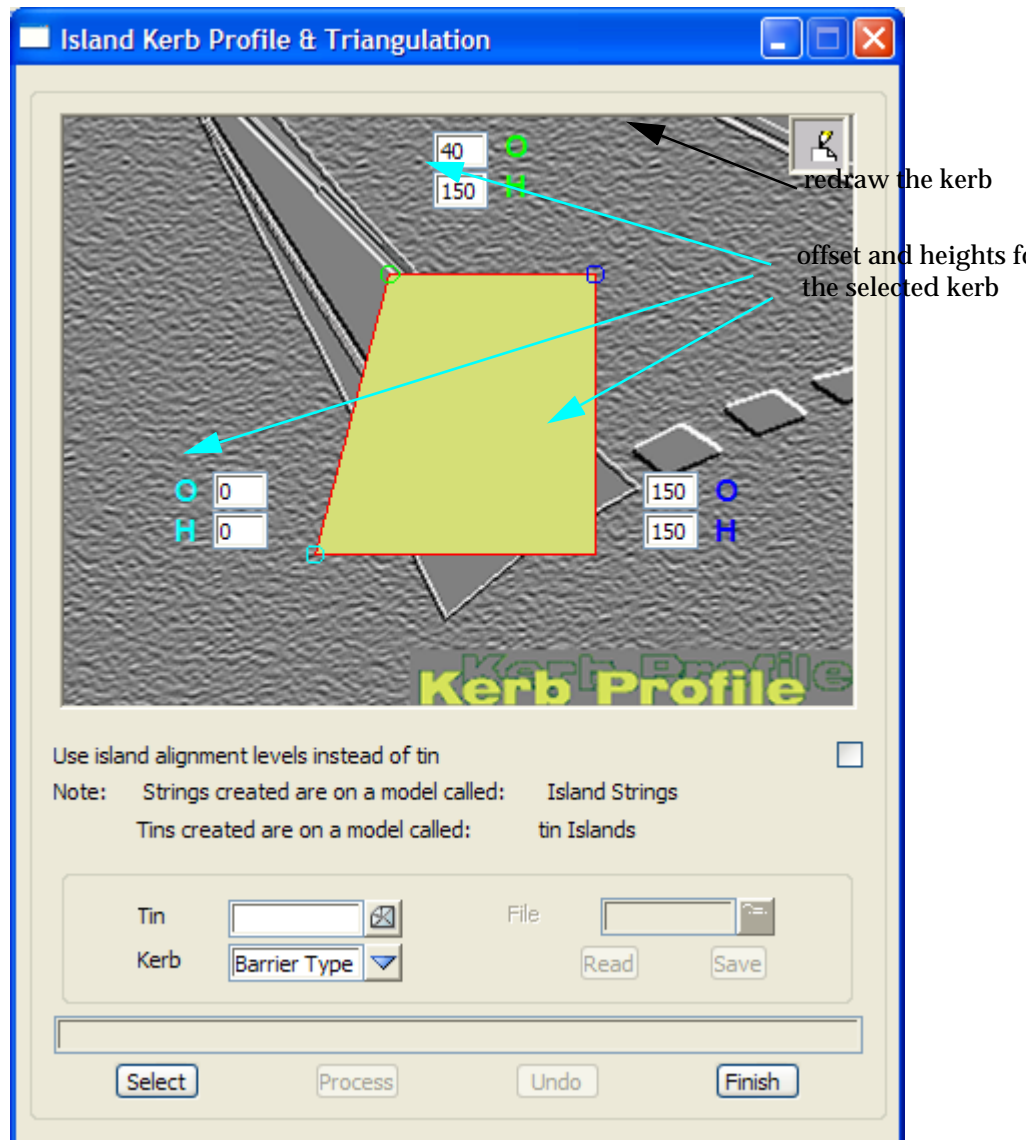
Traffic Island Profile and Triangulation Creation

island_panel

Position of option on menu: Design =>Roads =>More =>Island profile/tin

This option creates strings by offsetting from a selected string using a kerb profile. The resultant

strings are draped onto a given tin and then triangulated to form a traffic island.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Offset kerb face/top/back	input box		
<i>offset for kerb face/top/back for the selected kerb type.</i>			
Height kerb face/top/back	input box		
<i>height for kerb face/top/back.</i>			
Tin	tin box		available tins
<i>triangulation to drape the traffic island strings onto.</i>			
Kerb type	input box		
<i>type of kerb to apply to the reference string of the traffic island. If type User is selected from the pop-up</i>			

list, a file which defines the kerb profile can be selected and used.

File	file box	*.ukt files
	<i>file to read/write the user defined kerb type to.</i>	
Read	button	
	<i>read the given File to define a kerb type.</i>	
Save	button	
	<i>save the kerb parameters to the given File.</i>	
Select	button	
	<i>select the string representing the traffic island.</i>	
Process	button	
	<i>create the traffic island strings and tin.</i>	
Undo	button	
	<i>undo the last traffic island created whilst the option was running.</i>	

Drape Alignment

Position of option on menu: Design =>Roads =>More =>Drape alignment string

This option has already been documented in Tins => Drape=> Drape align.

For the option *Drape align*, please continue to the section "Drape Alignment (Macro)" in the chapter "Triangles".

Line Marking

Position of option on menu: Design =>Roads =>More =>Line marking

This option creates an alignment string for a traffic island and has already been documented as
Drafting => Line marking

For more information on the option *Line marking*, please continue to the section "Line Marking" in the chapter "Drafting".

Create Mass Haul String and Report

masshaul_panel

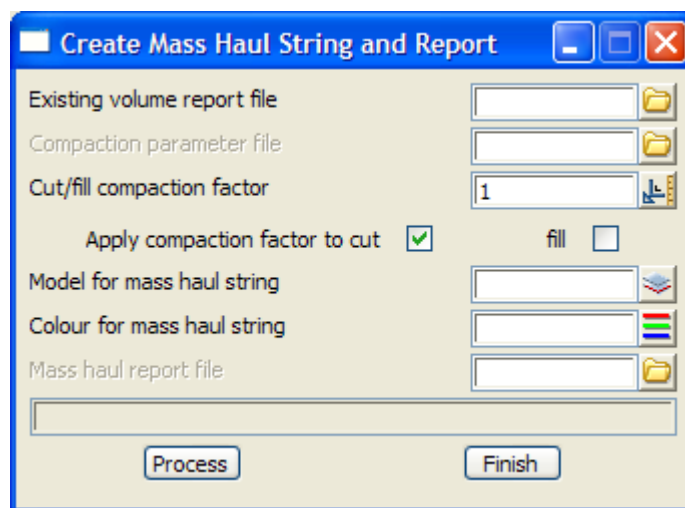
Position of option on menu: Design =>Roads =>More =>Mass haul

This options has been replaced by "Mass Haul String and Report" .

This panel is used to read in a volumes report and optionally a cut/fill compaction parameter file and creates a mass haul string and a new volumes report with the compaction volumes.

The compaction parameter file simply contains the compaction factor for given chainage ranges. Either the cut volumes are multiplied by the compaction factor or the fill volumes are divided by the compaction factor, to give the compacted volumes in the new volumes report.

If the existing volume report contains an alignment string and that string can be found in the project then a new alignment string is created with the same horizontal geometry but with the accumulated volumes as the z-values.



The fields and buttons used in this panel have the following functions:

Field Description	Type	Defaults	Pop-Up
Existing volume report file <i>name of the existing volumes report.</i>	file box		*.rpt files
Cut/fill compaction factor <i>cut/fill compaction factor for any chainages not in the compaction parameter file or if there is no file.</i>	input	1.0	
Compaction parameter file <i>file containing compaction factors to be used.</i>	input		*.mhf files
Apply compaction factor to <i>if cut, the cut volumes are multiplied by the compaction factors. If fill, the fill volumes are divided by the compaction factors.</i>	cut <input checked="" type="checkbox"/> fill <input type="checkbox"/>		
Model for mass haul string <i>model for the created mass haul string.</i>	input		

Colour for mass haul string

colour of the created mass haul string.

Mass haul report file input box

if non-blank, a mass haul volumes file is created.

Process button

run the option.

```
// Sample cut/fill compaction parameter file - the file ending
is .mhf
// All lines starting with // are comments and blank lines are
ignored
//
// A range is specified by a start and end chainage and a compaction
factor.
// A compaction factor of 1.0 means there is no compaction.
// A compaction factor of 0.9 means that 1.0 cubic metres of cut is
equivalent
// to 0.9 cubic metres of fill due to compaction.

// format is
// Start_ch      End_ch      Compaction_factor

           0           100           0.9
          100           500           1.0
          500          2000           1.1
```

Road Polygons

Position of option on menu: Design =>Roads =>More =>Road polygons

This option takes a model of cross-sections and create polygons between specified points on the cross-sections. This option is already documented under

Design => X-Sections =>Polygons from sections

For more information on the option *Polygons from sections*, please continue to the section "Polygons from Sections" in the this chapter

Road Widening with Minimum and Maximum Crossfall**widen_panel**

Position of option on menu: Design =>Roads =>More =>Road widening

This option creates cross sections using the minimum and maximum cross-fall when going out from a selected reference string (usually and alignment string).

Adding these cross sections to a section view when designing the vertical geometry gives an envelope of maximum and minimum crossfall points.

The fields and buttons used in this panel have the following functions:

Field Description	Type	Defaults	Pop-Up
Model name min/max xfall <i>model for minimum/maximum cross fall cross sections.</i>	model box		
Min xfall <i>minimum cross-fall (in %)</i>	input box	-2	
Max xfall <i>maximum cross-fall (in %)</i>	input box	-5	
Max width <i>maximum width to go out at the minimum and maximum cross falls.</i>	input box	10	
Chg interval <i>chainage interval for calculating the minimum and maximum cross fall cross sections.</i>	input box	20	
View to add <i>view to add the created cross sections to.</i>	view box		

Reference string select

pick the reference string with direction for the x-sections to go out from. The cross sections are created to the right of the reference string as defined by the direction that the Reference string is picked. To get the sections on the other side, pick the reference string in the opposite direction.

Process button

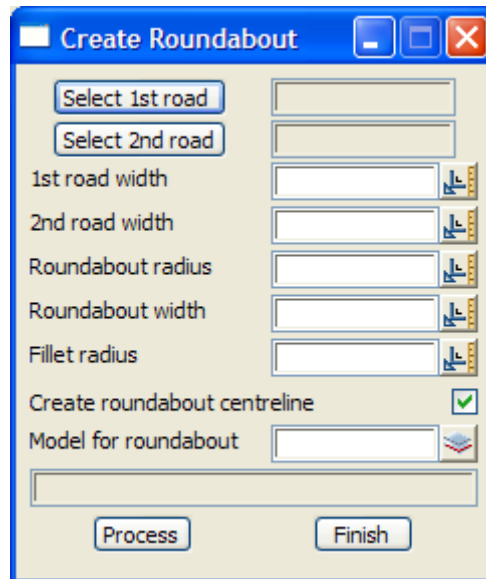
create the minimum and maximum cross fall cross sections.

Create Roundabout

roundabout_panel

Position of option on menu: Design =>Roads =>More =>Roundabout

This option creates a roundabout between two alignment strings. The road widths for the two roads (the distance from the road centre line to the edge of the road) plus the roundabout radius (the distance from the centre of the roundabout to the centreline of the roundabout road), the roundabout width (added and subtracted from the roundabout width to give the inner and outer edges of the roundabout roadway - the inner and outer roundabout radii) and the fillet radius for the turning lanes.



The fields and buttons used in this panel have the following functions:

Field Description	Type	Defaults	Pop-Up
Select 1st road <i>first alignment string for the roundabout.</i>	string select		
Select 2nd road <i>second alignment string for the roundabout.</i>	string select		
1st road width <i>distance from the first alignment string to the edge of the road.</i>	input box		
2nd road width	input box		

distance from the second alignment string to the edge of the road.

Roundabout radius input box

distance from the centre of the roundabout to the centreline of the roundabout road.

Roundabout width input box

distance to add and subtract from the roundabout width to give the inner and outer edges of the roundabout roadway (the roundabout radii).

Fillet radius input box

fillet radius of the turning lanes.

Create roundabout centreline tick box

if tick, an alignment string is created for the centreline of the roundabout.

Model for roundabout input box

model for the created roundabout.

Process button

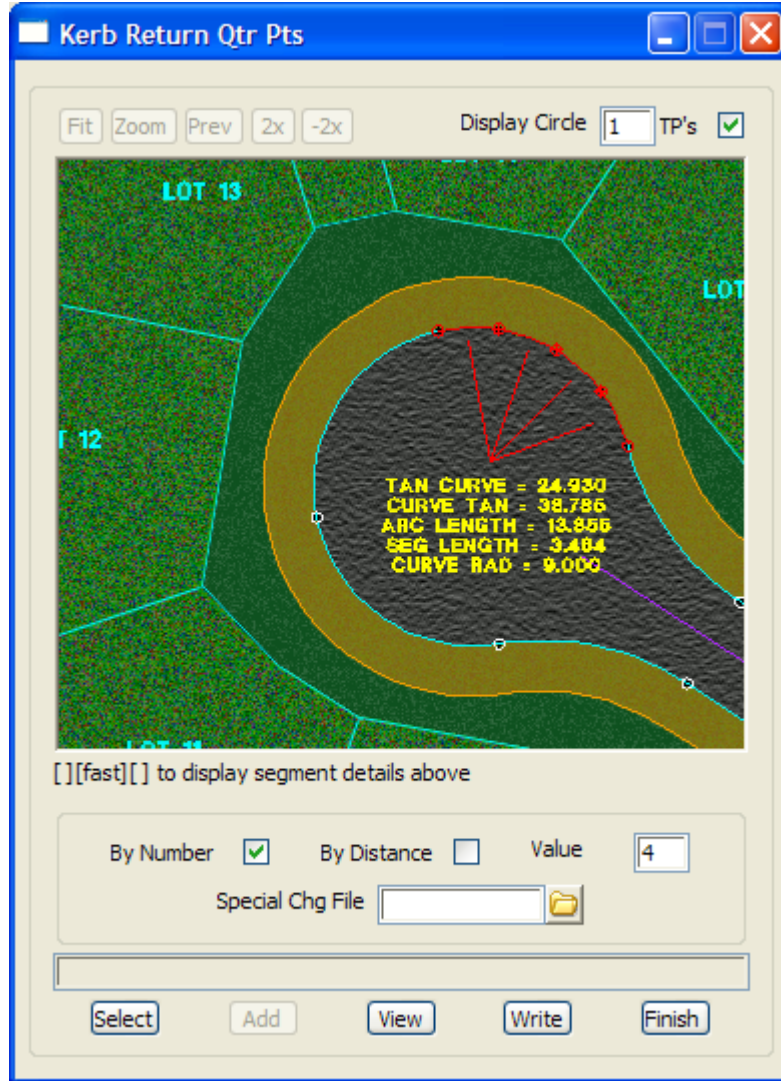
run the option.

Kerb Special Chainages File

[qtr_spec_panel](#)

Position of option on menu: Design =>Roads =>More =>Kerb special chainage file

This option is used to create a special chainage file for an alignment string. The method of creating the chainages is defined differently for each segment of the alignment string.



The fields and buttons used in this panel have the following functions:

Field Description	Type	Defaults	Pop-Up
By number	tick box	tick	
<i>if tick, break the selected segment of the selected string into the number of pieces given by the Value field.</i>			
By distance	tick box		
<i>if tick, break the selected segment of the selected string into pieces of length given by the Value field.</i>			
Value	tick box	tick	
<i>the number of pieces or the chainage length to break the selected segment into.</i>			
Special chg file	file box		
<i>file to write chainages to</i>			
Select	button		

pick the alignment string to create chainages for. The alignment string is then drawn in the panel draw box. Each segment of the alignment string is selected by clicking MB over it in the panel draw box. The special chainages are then defined for that segment.

- Add** button
add the chainages given by number of length to the special chainages list
- View** button
view the special chainages list. The special chainages list can be edited
- Write** button
write the special chainages list to the special chainages file

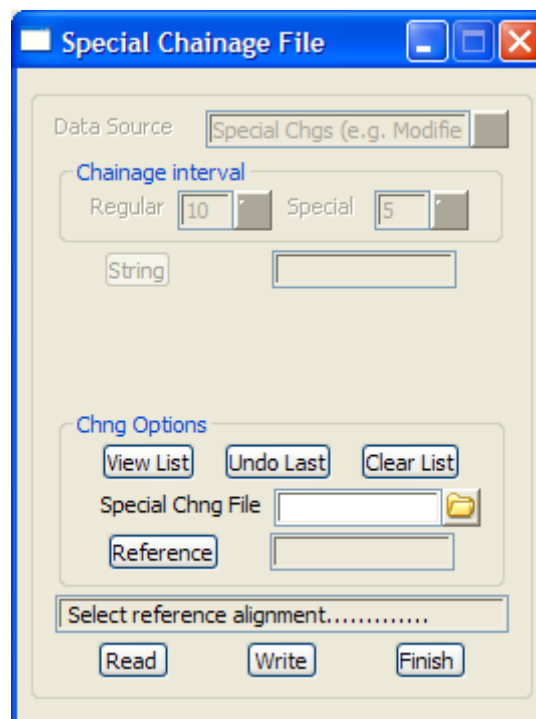
Special Chainages File

special_chg_panel

Position of option on menu: Design =>Roads =>More =>Special chainage file

This option is used to create a special chainage file for an alignment string.

The chainages are created for a selected reference string but can then be defined by dropping strings and/or individual points onto the reference string.



The fields and buttons used in this panel have the following functions:

Field Description	Type	Defaults	Pop-Up
Data source	choice box	Special chainages	Special chainages String Points

Regular

Special

String string select

Reference string select
select the string to create special chainages for.

View list button
view the special chainage list.

Undo last button
undo the last set of created chainages.

Clear list button
clear the chainages list.

Special chng file file box
file to read chainages from or write chainages to

read button
read in a file of special chainages.

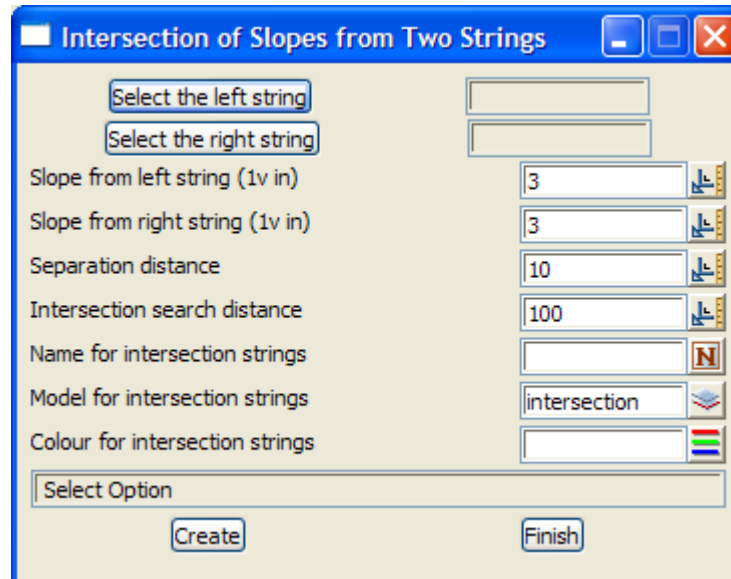
Write button
write the chainages list to the special chainages file.

Table Drain - Intersection of Slopes from Two Strings

[slopes_intersect_panel](#)

Position of option on menu: Design =>Roads =>More =>Table drain

This option is used to create a string which is the intersection of slopes from a left and right string.



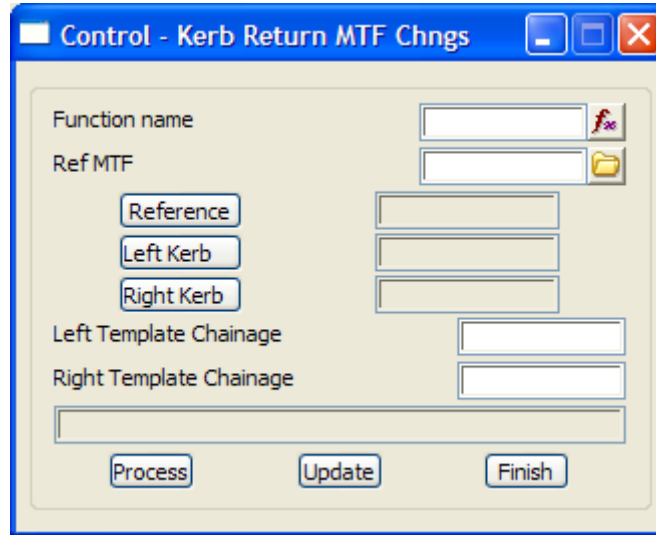
The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Select the left string <i>select the left hand side string</i>	string select		
Select the right string <i>select the right hand side string</i>	string select		
Cross fall (1 in..) from left/right string <i>batter slope to go from left/right string</i>	input box	3	
Separation distance <i>distance to create batter lines and find intersection</i>	input box	10	
Intersection search distance <i>distance to search to find an intersection of the batter slopes</i>	input box	100	
Name for intersection strings <i>name for the strings created by the intersection of the batters</i>	input box		
Model/Colour for intersection strings <i>model/colour for the intersection strings</i>		intersection	available models/colours
Create <i>Create the intersection strings by battering of the left and right strings</i>	button		

Intersection MTF Update

kret_control_chgs_panel

Position of option on menu: Design =>Roads =>More =>Intersection MTF updates



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Function name <i>name for the function</i>	function box		available functions
Ref MTF	file box		*.mtf files
Reference <i>select the reference string</i>	string select		
Left kerb <i>select the left kerb string</i>	string select		
Right kerb <i>select the right kerb string</i>	string select		
Left template chainage	input		
Right template chainage	input		
Process	button		
Update	button		

Overlay

overlay

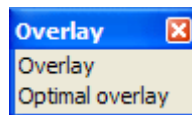
Position of menu: Design =>Overlay

The overlay options are for the design and optimisation of pavement overlay design.

The Overlay options is available to all users with the **Detailed Alignment Design** and **Volumes** modules.

The **Optimal Overlay** is under development and has not been released.

The Overlay walk-right menu is



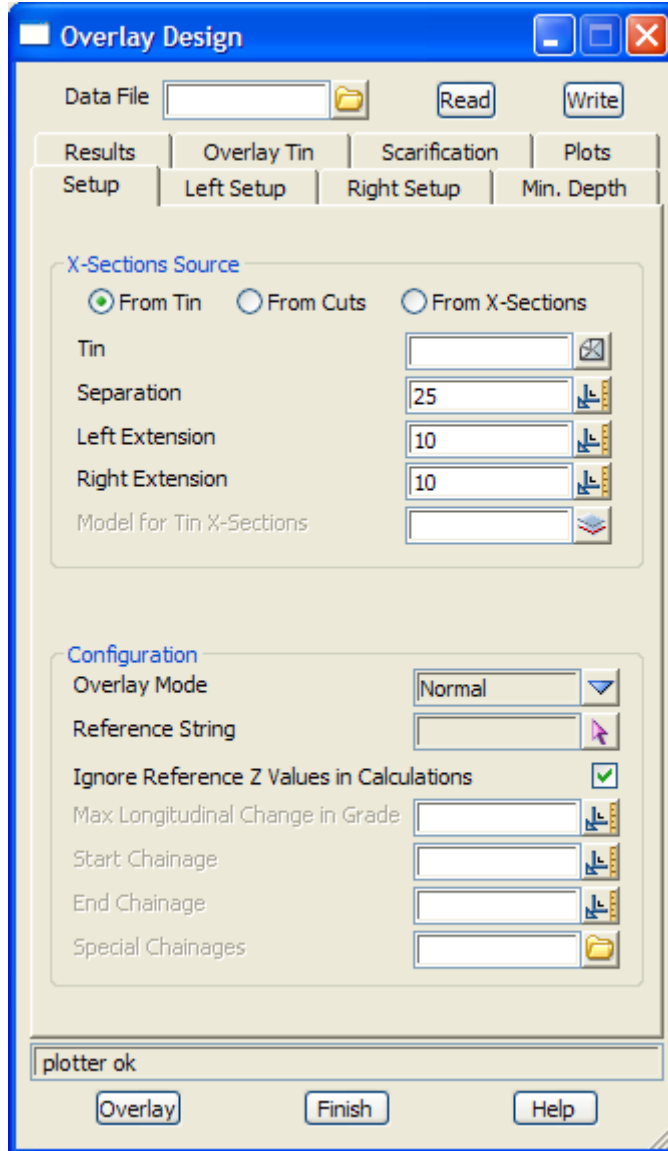
For the option *Overlay*, please continue to the section "Overlay Design" .

Overlay Design

overlay_design

Position of option on menu: Design =>Overlay =>Overlay design

Selecting **Overlay** brings up the **Overlay Design** panel.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Data file	file box		*.ovd files
<i>file with all the settings used in the Overlay panel. Used for storing information between runs.</i>			
Read	button		
<i>read in a data file of settings for the panel</i>			
Write	button		
<i>write out a data file of the settings in the panel</i>			
Buttons at bottom of panel			
Overlay	button		
<i>run the overlay.</i>			

Setup**Radio buttons**

radio buttons to define how cross sections for existing road are produced

From Tin radio button

*if **selected**, the road x-sections are created by taking sections through a tin. The following fields are displayed*

Tin tin box available tins

sections are created through this tin to represent the existing road

Separation input

chainage distance between cross sections

Left/Right extension input

Left/Right distance to define the limits of the cross sections

Model for tin x-sections model box available models

model for the created cross sections

From Cuts radio button

*if **selected**, the road x-sections are created by taking cuts through strings. The following fields are displayed*

Strings model model box available models

sections are created by taking cuts through the strings in this model

Separation input

chainage distance between cross sections

Model for cuts model box available models

model for the created cross sections

From X-sections radio button

*if **selected**, the road x-sections already exist. The following fields are displayed*

X-sections model model box available models

existing model of x-sections to use for the road

Overlay mode choice box Normal Normal, Use Crossfalls Only
Use Reference Z Values and Crossfalls only

*if **Normal**, at each section the left/right z-value is calculated so that the left/right crossfall and minimum overlay is obeyed. The z-value for the section is the maximum of the calculated z-values for the left and right.*

*If **User Crossfalls only**, the crossfalls from the Left and Right Setups tabs are used and no minimum overlay applied.*

*If **Reference Z values and Crossfalls only**, no overlay calculations are performed and the crossfalls in the Left and Rights Setups tabs are applied to the actual z-values on the reference string.*

Reference string string select box

select the string for the centreline of the road

Ignore reference z values in calculations tick box

if not tick, when the z-value is calculated at each section obeying just the minimum overlay criteria then use the maximum of the and the calculated z-value and the reference z-value at that section. If tick, use the calculated z-value at each section.

Start chainage input

chainage to start the overlay calculations

End chainage input

chainage to end the overlay calculations

Special chainages file box

special chainage file to define additional cross sections for overlay processing

Left/Right Setup tab

setup for the left/right side sections

Radio buttons

radio buttons to define how cross sections for existing road are produced

By offset radio button

*if selected, the width of the left/right cross sections is given in the **Offset** field*

Offset input

left/right offset distance to define the edge of the left/right section

By String radio button

*if selected, the width of the left/right cross section is defined by a selected **Edge** string minus the **Cut Back/Extension** value. The following fields are displayed*

Edge string string select

select the left/right edge string

Cut Back/Extension input

value to subtract from the distance to the edge string to define the left/right section

*When **By String** is selected, the Chainage-Minimum X-Fall grid can also be automatically filled in by using the crossfall between the **Road Crown** and the **Edge String**.*

Road crown string select

*select the road crown the use for calculating the cross fall to the **Edge string***

Only critical points tick box

*if tick, the crossfall between the **Road crown** and the **Edge string** is only calculated at the tangent points of the Reference string.*

*If not tick, the crossfall between the **Road crown** and the **Edge string** is calculated at the regular interval given by **Xfall Load Interval** and also at the tangent points of the Reference string.*

Xfall load interval input

regular interval to calculate crossfall

Load Xfalls from Strings button

*when selected, the **Chainage-Minimum X-Fall** grid is automatically filled in by using the crossfall between the **Road Crown** and the **Edge String***

By name radio button

*if **selected**, the width of the left/right cross section is defined by the name of a given string minus the **Cut Back/Extension** value. The following fields are displayed*

Name

name of the string to select as the left/right edge string

Cut Back/Extension input

value to subtract from the distance to the edge string to define the left/right section

Default Xfall input

*if **non blank**, the default crossfall to use for the left/right cross section. If **blank**, the **Chainage-Minimum X-fall** grid is used.*

Chainage- Minimum Xfall grid

*this grid is only used if the **Default Xfall** is **blank***

Chainage input

*chainage to use the **Min xfall***

Min X-fall input

minimum X-fall to use at that chainage

Min. Depth tab

there can be one minimum depth value for the entire job or the minimum depth can vary between chainages

Default depth input

*if **non blank**, the default minimum depth to use for the left and right cross section. If **blank**, the **Chainage-Minimum Depth** grid is used.*

Chainage- Minimum Depth grid

*this grid is only used if the **Default depth** is **blank***

Chainage input

chainage to start the minimum depth

Min Depth input

*minimum depth to start at this chainage and either go to the next chainage **or** if there is a **Min Depth 2**, interpolate to **Min Depth 2** from this chainage to the next chainage*

Min Depth 2 input

minimum depth to end with at the next chainage

Results tab

Transfer Z-values to reference string tick box

*if **tick**, the calculated z-values are used to update the z-values on the reference string*

Clean models before overlay	tick box	
<i>if tick, the models of results are cleaned before the overlay option is run</i>		
Model for overlay x-sections	model box	available models
<i>model for the created overlay x-sections</i>		
Model for overlay strings	model box	available models
<i>model for the created overlay strings</i>		
Colour	colour box	available colours
<i>colour for the created overlay strings</i>		
Model for xfall strings	model box	available models
<i>if non blank, left and right strings with z-value equal to the left/right crossfall are created and placed in this model</i>		
Model for min/max points	model box	available models
<i>if non blank, points for the minimum and the maximum of the calculated z-values for the left and right sections are created and placed in this model</i>		
X-sections depth range file	file box	available depth range files
<i>a depth range file used for colouring x-sections by the depth between the overlay and the road tin</i>		
Overlay report	file box	*.rpt files
<i>report on the overlay</i>		
Volumes report	file box	*.rpt files
<i>volumes of overlay report</i>		
Write volumes as CSV	tick box	
<i>if tick, the volume report is written as a CSV file (for Excel)</i>		

Overlay Tin tab

*the **Overlay Tin** tab controls the creation of an overlay tin and depth polygons*

Create overlay tin	tick box	
<i>if tick, the fields in this tab are used to create an overlay tin</i>		
Tin name	tin box	available tins
<i>name for the tin created from the overlay strings and sections</i>		
Tin colour	colour box	available colours
<i>colour of the overlay tin</i>		
Model for tin	model box	available models
<i>model for the overlay tin</i>		
Create depth polygons	tick box	
<i>if tick, depth polygons are created between the road tin and the overlay tin</i>		
Depth range file	file box	*.drf files
<i>depth range file used when creating polygons</i>		
Model for depth polygons	model box	available models
<i>model for the depth polygons</i>		

Scarification tab

*the **Scarification** tab controls any scarification to be applied to the road sections before calculating overlays*

Perform scarification tick box
if tick, scarification is performed on the road sections before overlay is calculated

Model for scarified x-sections model box available models
if non blank, road x-sections after scarification are created and placed in this model

Colour colour box available colours
colour of the scarified sections

Clean scarification x-sections model tick box
if tick, the clean the model of scarified sections before running calculations

Default scarification depth input
*if non blank, the default scarification depth to use for road cross section.
 If blank, the **Overlay-Depth** grid is used.*

Chainage- Minimum Depth grid
*this grid is only used if the **Default scarification depth** is blank*

Chainage input
chainage to start the scarification depth

Depth input
*scarification depth to start at this chainage and either go to the next chainage **or** if there is a **Depth 2**, interpolate to Min Depth 2 from this chainage to the next chainage*

Depth 2 input
scarification depth to end with at the next chainage

Plots tab

Generate long section plots tick box
if tick, long section plots are created

Long section PPF file box *.lplotppf files
binary ppf file to use for the long section plots

Plotter type plotter box model available plotters
type of plotter to use for the long section plots

Plot stem
the name to use for the plots - a number will be added when more than one page is produced

Clean plot model beforehand tick box
*if tick and the **plotter type is model**, the plot models are cleaned before the plots are created*

Generate cross section plots tick box
if tick, cross section plots are created

Cross section PPF file box *.lplotppf files
binary ppf file to use for the cross section plots

Plotter type plotter box model available plotters
type of plotter to use for the cross section plots

Plot stem
the name to use for the plots - a number will be added when more than one page is produced

Clean plot model beforehand tick box
*if tick and the **plotter type is model**, the plot models are cleaned before the plots are created*

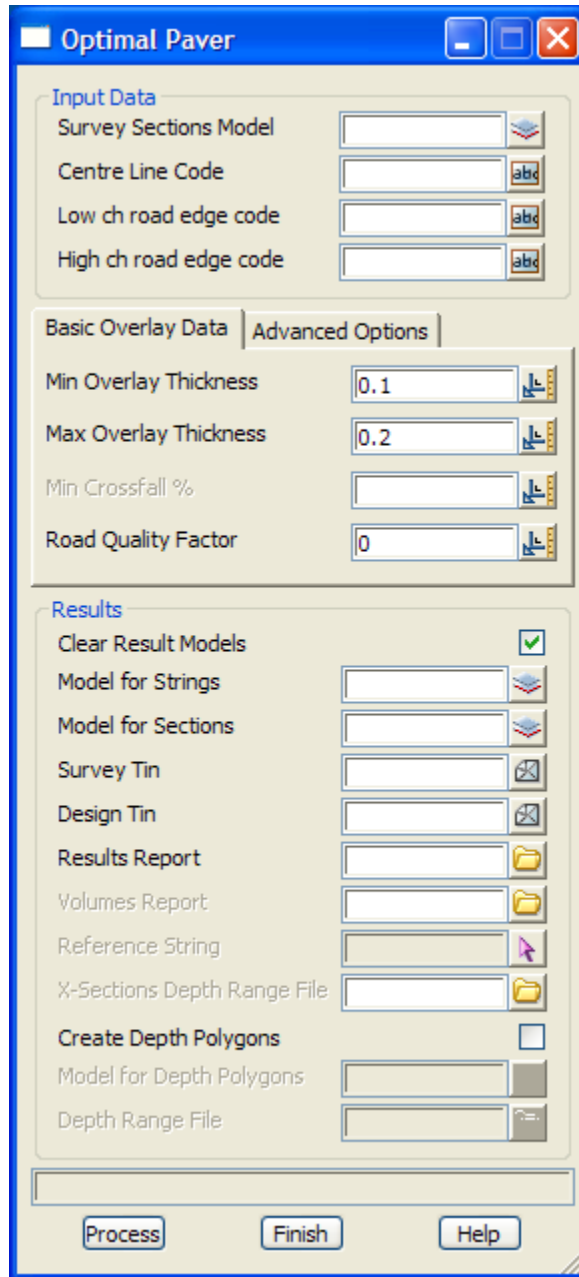
Optimal Overlay

optimal_paver

Position of option on menu: Design =>Overlay =>Optimal overlay

This option is under development and has not been released.

Selecting **Optimal overlay** brings up the **Optimal Paver** panel.



X-Sections

x_sections

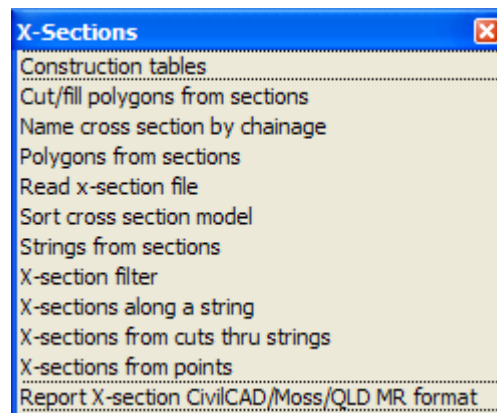
Position of menu: Design =>X-Sections

Cross sections can be created in a variety of ways including

- sections through triangulations created with the options in the menu *Tins =>Sections*.
- sections generated by cutting through strings with the options *Utilities =>A-G =>Cuts*.
- design sections generated from options on the menu *Design =>Apply*
- sections generated by the end area volumes options *Design =>Volumes =>End area*

The x-sections menu contains options to read cross-sections in from a file and for working with cross sections in a variety of way.

Walking right on X-Sections bring up the X-Sections menu:



For the option *Cut/fill polygons from sections*, go to the section "ICut/Fill Polygons from Sections"

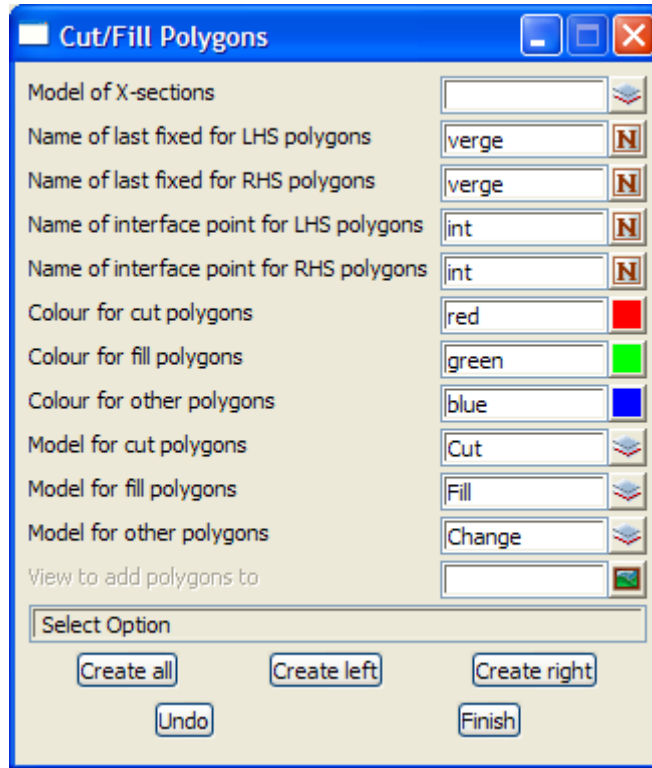
<i>Name cross sections by chainage</i>	"Name Cross Sections by Chainage"
<i>Polygons from sections</i>	"Polygons from Sections"
<i>Read x-section file</i>	"Read X-Section Data"
<i>Sort cross-section mode</i>	"Sort X-Sections in a Model"
<i>Strings from sections,</i>	"Strings from Sections"
<i>X-section filter</i>	"X Section Filter (Sections at Even Chainages)"
<i>X-sections along a string</i>	"X-Sections" in the Chapter "Triangles"
<i>X-sections from cuts thru strings</i>	"Cuts by Centreline" in the Chapter "Utilities"
<i>X-sections from points</i>	"Sections from Points"
<i>Report x-sections</i>	"X-Sections Report" in the chapter "Reports"

ICut/Fill Polygons from Sections

cutfill_polygons_panel

Position of option on menu: Design =>X-Sections =>Cut/fill polygons from sections

This option takes cross sections and by using the user-supplied names of points on the cross section, cut and fill polygons for the strings joining the named points in successive cross sections.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Model of x-sections <i>model containing the cross sections used to define the cut and fill polygons.</i>	model box		available models
Name of last fixed for LHS polygons <i>Name of the cross section point to be the inner point of the left hand side polygons.</i>	input	verge	
Name of last fixed for RHS polygons <i>name of the cross section point to be the inner point of the right hand side polygons.</i>	input	verge	
Name of interface point for LHS polygons <i>name of the cross section point to be the outer point of the left hand side polygons.</i>	input	int	
Name of interface point for RHS polygons <i>name of the cross section point to be the outer point of the right hand side polygons.</i>	input	int	
Colour for cut polygons <i>colour for the cut polygons.</i>	input	red	available colours
Colour for fill polygons <i>colour for the fill polygons.</i>	input	green	available colours
Colour for other polygons <i>colour for the polygons that are neither cut or fill – they are either flat or change from cut to fill.</i>	input	blue	available colours
Model for cut polygons <i>model for the cut polygons.</i>	input	cut	available models
Model for fill polygons <i>model for the fill polygons.</i>	input	fill	available models
Model for other polygons <i>model for the polygons that are neither cut or fill – they are either flat or change from cut to fill.</i>	input	other	available models

View to add polygons	input	available views
<i>if non-blank, the models of polygons are added to the view.</i>		
Create all	button	
<i>run the option and create left and right polygons.</i>		
Create left	button	
<i>run the option and only create the left polygons.</i>		
Create right	button	
<i>run the option and only create the right polygons.</i>		
Undo	button	
<i>undo the last set of polygons created whilst the panel has been up.</i>		
Finish	button	
<i>end the option and remove the panel. The undo capability for the polygons is terminated.</i>		

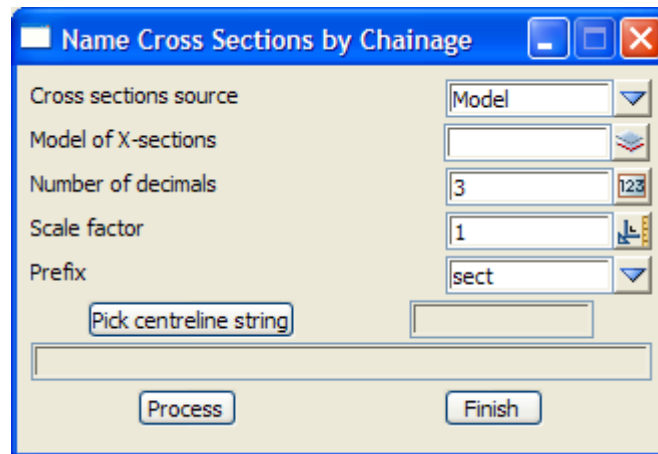
Name Cross Sections by Chainage

xs_name_by_chainage_panel

Position of option on menu: Design =>X-Sections =>Name cross sections by chainage

This option names cross-sections with the chainage from a selected string.

Note that the chainage from the string that the cross section comes from is in the name of the cross section so this option effectively gives the chainage to the cross section.



The fields and buttons used in this panel have the following functions:

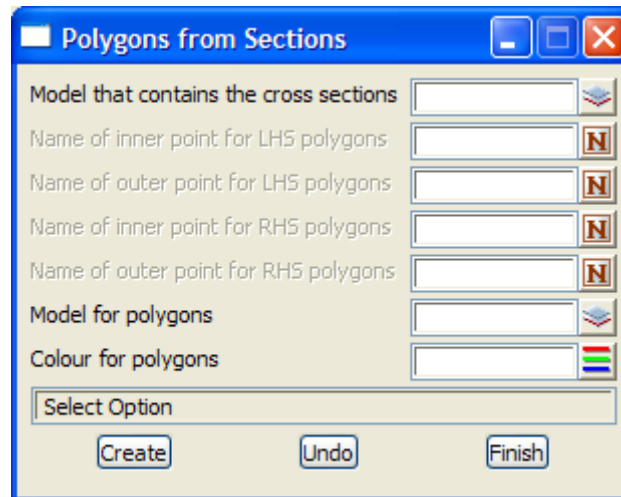
Field Description	Type	Defaults	Pop-Up
Cross sections source <i>type of data source.</i>	choice box	model	string, model, view
Model/String/View of x-sections <i>source of the cross section data.</i>	source box		
Number of decimals <i>number of decimal places to use in the chainage label.</i>	input box	3	
Scale factor <i>factor to multiply the chainage by before creating the label.</i>	input box	1	
Prefix <i>prefix for the chainage value - for cross-section options to work, this should be sect or design.</i>	choice box	sect	sect, design, none
Pick centreline string <i>select the string that is used to find a chainage for the cross sections.</i>	output box		
Process <i>run the option.</i>	button		

Polygons from Sections

road_polygons_panel

Position of option on menu: Design =>X-Sections =>Polygons from sections

Option to take a model of cross-sections and create polygons between specified points on the cross-sections.



The fields and buttons used in this panel have the following functions:

Field Description	Type	Defaults	Pop-Up
Model that contains the cross sections	model box		
<i>model of cross sections</i>			
Name of first/last point for lhs polygons	input box		
<i>name of the first/last point on left hand side of the cross-section to creating polygon for.</i>			
Name of first/last point for rhs polygons	input box		
<i>name of the first/last point on right hand side of the cross-section to creating polygon for.</i>			
Model/colour for polygons	input box		
<i>model/colour of the created polygons.</i>			
Create	button		
<i>create polygons between the first and last points on the left and right side of the cross-sections.</i>			
Undo	button		
<i>undo the last set of polygons created whilst the panel was up.</i>			

Read X-Section Data

read_xsc_panel

Position of option on menu: Design =>X-Sections =>Read x-section file

This option is used to read in cross section data from a file and convert it to x-section strings (4d strings).

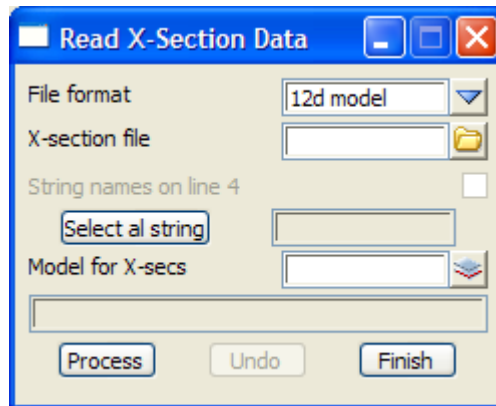
The data in the file is only centre-line chainage values, offset, heights and text (Code) so an alignment string needs to be selected to give an (x,y) position for the centre-line chainage and a direction (at right angles to the alignment string at the chainage) to convert the (offset, height) values into (x,y,z) points on a string.

NOTE - after reading in the x-section data and hence creating 4d strings, the

Design =>X-Sections =>Strings from sections

option can be run to create 3d strings by joining points with the same Code from adjacent x-sections. The created 3d strings are given the string name of the Code that they joined.

Selecting Read x-section file brings up the **Read X-Section Data** panel:



The fields and buttons used in this panel have the following functions:

Field Description	Type	Defaults	Pop-Up
File format	input box	12d Model	12d Model, Alg, Moss, Chainage/Offset/Height/Text

format of the x-section data in the file.

12d Model Format

The 12d Model format is a simple text file format with the text CH followed by one or more spaces and then the alignment chainage (centre line chainage) of the x-section, and then on the following lines, the Offset value followed by one or more spaces, the height at that offset followed by one or more spaces, and then the text (Code) for that point on the x-section. The x-section continues until the next Ch line. For example, the following defines two x-sections at chainage 10 and 20 respectively.

```
ch 10
-3 5 A
0 6 "Second label"
4 7 C
ch 20
-3.5 5.5 A
0 6 D
4.5 7.5 ""
```

Note that if the Code includes a space, then it must be enclosed in quotes. For example "Second label". Also the Code is not optional - if there is no code, put "".

Chainage/Offset/Height/Text Format

The Chainage/Offset/Height/Text format is a very simple text file format with each line containing the alignment chainage (centre line chainage) for the x-section followed by one or more spaces and then on the same line the Offset value followed by one or more spaces, the height at that offset followed by one or more spaces, and then optionally, the text (Code) for that point on the x-section. The x-section continues until the alignment chainage changes. For example, the following defines two x-sections at chainage 10 and 20 respectively.

```
10  -3  5  A
10   0  6  "Second label"
10   4  7  C
20  -3.5 5.5 A
20   0  6  D
20  4.5  7.5 E
```

Note that if the Code includes a space, then it must be enclosed in quotes. For example "Second label". Also the Code is optional (whereas it was compulsory for the 12d Model format).

Moss (MX) Format

Please refer to Moss (MX) documentation or ask the group who supplied the data.

Alg Format

Not documented.

X-section file input box

file of x-section data.

String names on line 4 tick box

ONLY used for the ALG format which is not documented

Select al string string select

select the string that is used to define the (x,y) position of the zero offset of the x-section and also the bearing for the x-section.

Model for x-secs model box

available models

model for the created x-sections

Process button

read the file and create the x-sections

Undo button

undo the last set of x-sections created since the panel has been active

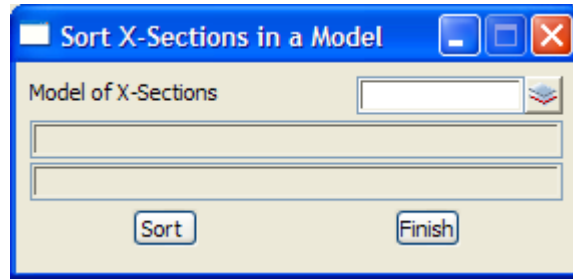
Sort X-Sections in a Model

xs_sort_panel

Position of option on menu: Design =>X-Sections =>Sort cross section model

This option is used to sort cross sections in a model so that they are in the order of the chainages embedded in the cross section name.

Selecting Sort cross section model brings up the **Sort X-Sections in a Model** panel:



The fields and buttons used in this panel have the following functions:

Field Description	Type	Defaults	Pop-Up
Model of x-sections <i>model containing the cross sections to be sorted into chainage order.</i>	model box		available models
Sort <i>run the option.</i>	button		

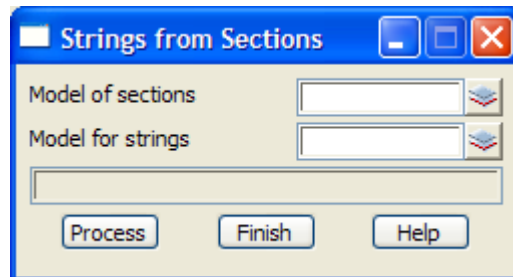
Strings from Sections

[strings_from_sections](#)

Position of option on menu: Design =>X-Sections =>Strings from sections

The strings from sections option creates strings by joining the common named points on successive 4d strings (usually generated as sections).

Selecting strings from sections fires up the **strings from sections** panel.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Model of sections <i>model of the 4d strings (sections) to try and join common points from to form strings.</i>	input		available models
Model for string <i>model for the created strings to go to.</i>	input		available models
Process <i>try and join points with the same name from successive sections to form strings.</i>	button		

Sections from Points

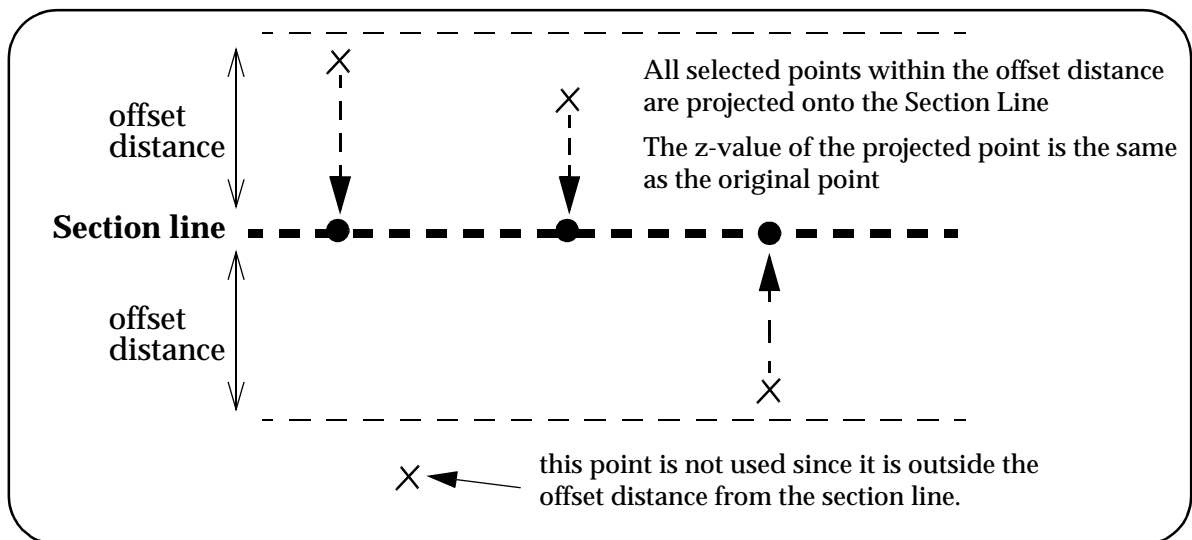
sections_from_points

Position of option on menu: Design =>X-Sections =>X-sections from points

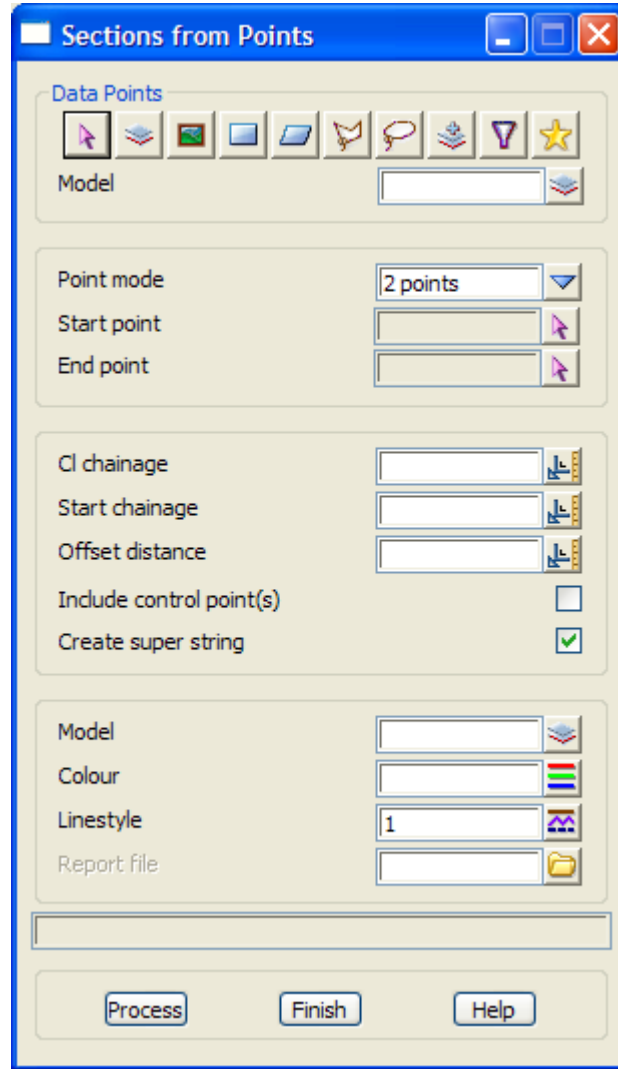
The X-sections from points option creates a cross section by first defining a section line and then dropping all selected points in a user defined offset distance from the section line, onto the section line.

- (a) The z-value for the dropped point is the same as for the original point.
- (b) The Point number (Vertex id) of the dropped point is the Point number (Vertex id) of the original point.
- (c) The Vertex text of the dropped point is the code (string name) of the original point.

The user specifies the start chainage for the created section and the value for the "centreline chainage" of the section.



Selecting Sections from points fires up the **Sections from points** panel.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Data source type			
<i>data source type.</i>			

Data source

data source for points to create sections from.

Point mode	choice box	2 points	2 points, 1 point and bearing point on centreline
-------------------	------------	----------	---

if 2 points, then the Start point and End point are selected. The section goes through the two points. If 1 point and bearing, then the Start point is selected and a Bearing given. The section goes through the start point with the given bearing.

If point on centreline, then a Centreline is selected and a point on the centreline selected. The section goes through the selected point on the centreline and is perpendicular to the selected centreline at the selected point.

If Point mode is **2 points**:

Start point string select

End point string select

If Point mode is **1 point and bearing**:

Start point string select

Bearing angle box

If Point mode is **point on centreline**

Centreline string select

depends on Point mode.

Point on cl string select

depends on Point mode.

CI chainage input

the chainage to give to the created section

Start chainage input

the start chainage to give to the created section.

Offset distance input

distance to search either side of the section for points to project onto the section

Include contrl points(s) tick box

if tick, the selected start and end points are included as part of the section.

Create super string tick box

if tick, then the created section is a super string.

Model model box

available models

model for created sections.

Colour colour box

available colours

colour for the created sections.

Linestyle linestyle box

available linestyles

linestyle for the created sections.

Report file file box

a report.

Process button

create a cross section from the selected points.

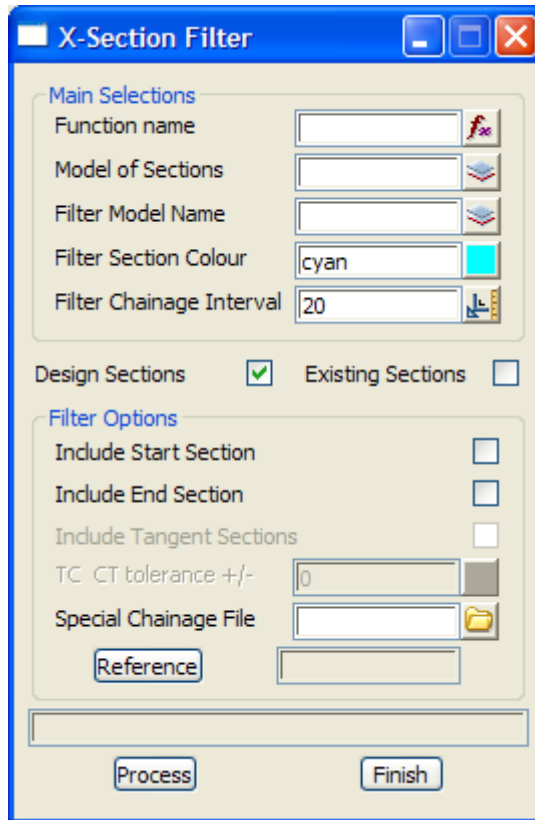
X Section Filter (Sections at Even Chainages)

xs_filter_func_panel

Position of option on menu: Design =>X-Sections =>X-section filter

This panel selects user specified cross-sections from a model of cross-sections and copies them into another model. The cross sections must already exist - no new cross-sections are created.

It is a function so can be recalced when the cross-section model is changed.



The fields and buttons used in this panel have the following functions:

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Function name

name of the function.

Model of sections string select

model of existing cross sections to select some cross sections from.

Filter model name model box

model for the selected cross sections

Filter section colour colour box cyan

colour for the filtered cross sections

Filter chainage interval input 20

*chainage interval to select cross sections. Sections are selected which are multiples of the **filter chainage interval**.*

Design/Existing sections radio button design sections

cross sections are 3d strings with the name

***Design** and the chainage of the cross-section (usually created by an Apply),
or **Sect** and the chainage of the cross-section (usually created by Tins =>Section =>X section)*

*If **Design sections** is selected, then sections starting with the name **Design** are selected.*

*If **Existing sections** is selected, then sections starting with the name **Sect** are selected.*

Include TC_CT sections tick box

*if **tick**, include cross sections at tangent points from the reference string.*

Include start/end section tick box

include a cross section at the start/end chainage of the reference string

TC_CT tolerance +/- input box

*if **non-zero**, then regular cross sections (i.e. those selected by the filter chainage interval) are **not** included if they are closer than the given tolerance distance to a tangent point.*

Special chainage file input box

include cross sections with chainages given in the given special chainage file.

Reference output box

select reference string to use for the filter options requiring tangent points and start/end chainages.

Process button

copy the specified cross-sections to the Filtered Model.

X-Sections Along a String

Position of option on menu: Design =>X-Sections =>X-Sections along a string

This option has already been documented in Tins => Sections=> X-Sections

For the option *X-Sections along a string*, please continue to the section "X-Sections" in the Chapter "Triangles" .

X-Sections from Cuts Through Strings

Position of option on menu: Design =>X-Sections =>X-Sections from cuts thru strings

This option has already been documented in Utilities =>A-G =>Cuts =>by centreline

For the option *X-Sections along a string*, please continue to the section "Cuts by Centreline" in the Chapter "Utilities" .

More Design

more_design

Position of menu: Design =>More

The more design menu contains extra design options.

The more design walk-right menu is



For the option *Culverts from file*, please continue to the section "Culverts from File".

Settlement

"Settlement"

Culverts from File

12d_culvert_panel

Position of option on menu: Design =>More =>Culverts from file

This option is currently under development.

The screenshot shows a dialog box titled "Create Culverts from File". The dialog is organized into several sections:

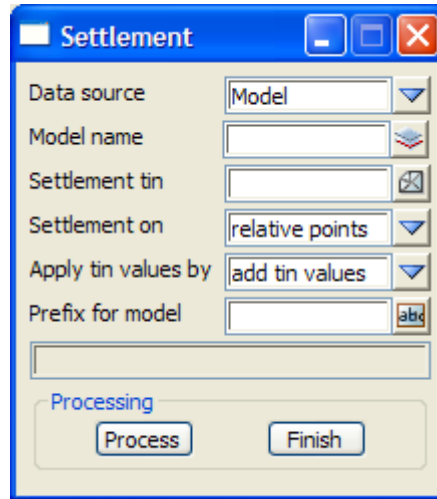
- Culvert Details:** Contains input fields for Alignment, Chainage, Type, Size, and Skew.
- Inlet:** Contains input fields for Level, Side, and Offset.
- Outlet:** Contains input fields for Level, Side, and Offset.
- Input File:** A text field with a folder icon to its right.
- Process all:** A checkbox that is currently checked.
- Buttons:** A row of buttons labeled "Read", "Prev", "Next", "Process", and "Finish".

Settlement

settlement_panel

Position of option on menu: Design =>More =>Settlement

This option uses a tin of settlement values to adjust the z-values of strings.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Data source <i>type of data source.</i>	choice box		model/view
Model/View name <i>source of the data to process. Only 2d, 3d, 4d and super strings from the data source are processed.</i>			
Settlement tin <i>tin of values (settlement values) to be used to reduce/increase the z-values of strings by.</i>			available tins
Settlement on	choice box	relative points	relative points relative strings absolute points absolute strings

if Settlement on is "relative points" then for each point of a string, the value of the settlement string at that (x,y) position is added/subtracted from the z value at the point.

is "relative string" then for each point of a string, the value of the settlement string at that (x,y) position is added/subtracted from the z value at the point plus for each visible segment joining points of the strings then if the segment crosses any edges of triangles from the settlement tin, a new point is inserted into the string which then has the settlement value applied to it (the initial z-value for the inserted point is interpolated from its adjacent points in the string).

is "absolute points" then for each point of a string, the value of the settlement string at that (x,y) position is taken to be the z value at the point.

is "absolute string" then for each point of a string, the value of the settlement string at that (x,y) position is taken to be the z value at the point plus for each visible segment joining points of the strings then if the segment crosses any edges of triangles from the settlement tin, a new point is inserted into the string which is given the settlement value at that point.

Apply tin values by	choice box	add tin values	add tin values subtract tin values
----------------------------	------------	----------------	---------------------------------------

if "add tin values", then the tin values are added to the string values.

If "subtract tin values", then the tin values are subtracted from the string values.

Prefix for models

prefix to apply to the name of each model in the data source to create new models for the processed data.

Process button

adjust the heights of the selected data.

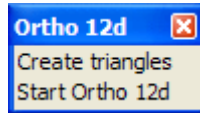
Ortho 12d

ortho_12d

Position of menu: Design =>Ortho 12d

The Ortho 12d menu contains the option to write out tins in a format suitable for the *Ortho 32* rectification software.

The Ortho 12d walk-right menu is



For the option *Create triangles*, please continue to the section “Create Triangles”

Create Triangles

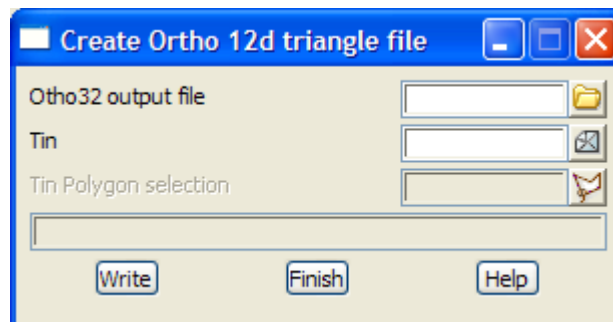
create_ortho_12d_triangle_file

Position of option on menu: Design =>Ortho 12d =>Create triangles

This option writes out a 12d Model tin in a format suitable for the software **Ortho12d** software from Digital Mapping Systems (www.digmapsys.com).

Ortho12d is an image rectification package which can be used for ortho-rectifying photographs.

For more information on *Ortho12d*, please contact Ian Hall from Digital Mapping Systems on ian.hall@digmapsys.com



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Tin <i>tin to write out in Ortho12d format</i>	tin box		available tins
Tin polygon selection <i>if used, only triangles whose centroid is inside the polygon are written out.</i>	Polygon select box		
Ortho12d output file <i>file to write the tin out to</i>	file box		*.T12 files
Write <i>write the tin out in the Ortho12d format</i>	button		

18 Drainage and Sewer

drainage

Position of menu: Design =>Drainage-Sewer

The **Drainage-Sewer** option is used to place drainage and sewer networks within a subdivision. The network is placed in three dimensions including manholes (maintenance holes), and for sewer work, lot controls and house connections can be defined.

If used in conjunction with the services on a section view, interference with neighbouring pipe strings can be taken into consideration when placing the network.

Note that the drainage string and plots is only available with the drainage and sewer options and the sewer extensions (property control, house controls and Melbourne Water plots) are only available with the sewer option.

The **drainage string** is based on a **polyline** string so that **arcs** can exist between manholes (maintenance holes).

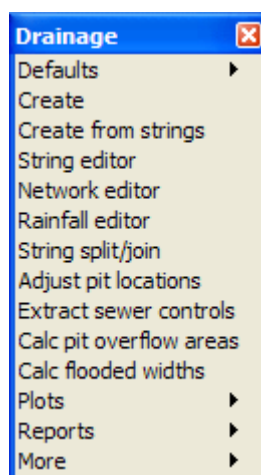
The use of the drainage string for drainage is only a subset of its use for sewer so the steps for the sewer will be given since they cover drainage as well.

The sewer process consists of a number of steps (the drainage process does not use steps 2 and 3):

1. creating the drainage or sewer network
2. checking that residential blocks are controlled by the sewer network
3. creating the house connections for the sewer
4. network design using custom routines, spread sheets or advanced network analysis packages
5. producing plots (plan and long section), material quantity reports, excavation volumes and manhole construction reports

These steps are described in the rest of this chapter.

The **Drainage** walk-right menu is laid out to reflect the standard sequence of placing drainage and wastewater pipes, i.e., creating, editing and plotting.



For a description of the drainage string in 12d Model, please go to the section “Drainage Strings”

For a definition of a drainage network and a junction in 12d Model, please go to the section “Networks and

Junctions” .

For a description of the drainage defaults in 12d Model, please go to the section “Drainage Definitions”

For a description of the drainage design import/export interface, please go to the section "**Drainage import/export**"

For the option *Defaults*, please continue to the section “Defaults” .

Create, please continue to the section “Create” .

Editor, please continue to the section “Editor” .

Plots, please continue to the section “Drainage Plots” .

Reports, please continue to the section “Reports” .

More, please continue to the section "**More Drainage**".

Drainage Strings

A **drainage string** consists of a series of manholes (maintenance holes) at user selected (x,y,z) positions. The manholes can be joined by either straight or curve pipes.

Like all 12d Model strings, the drainage string has an implied direction, starting at the first manhole and going in the direction towards the next manhole in the drainage string. This order is normally determined by the creation order of the manholes.

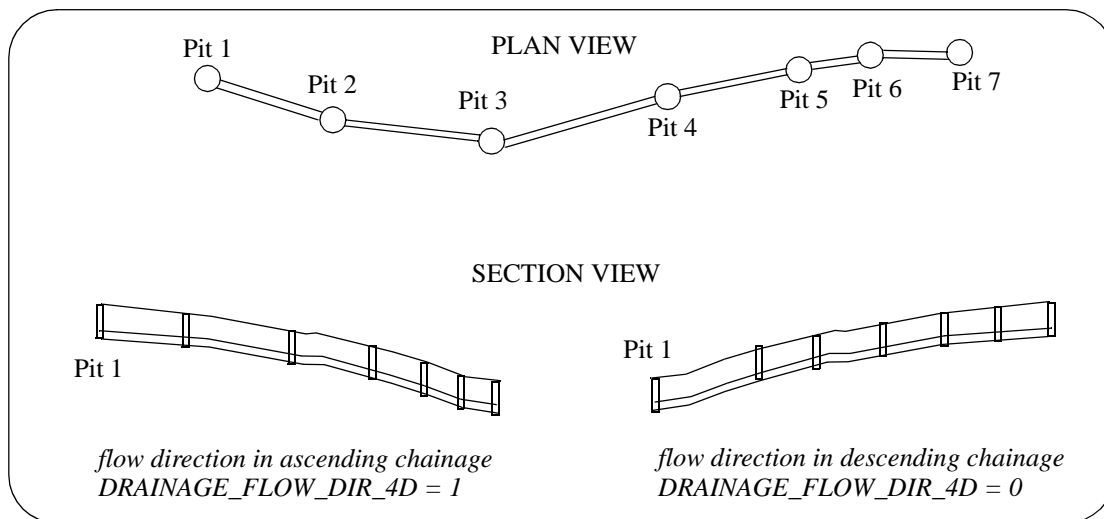
The chainage of the drainage string starts at the **first** manhole and then increases along the direction of the drainage string.

In 12d Model, drainage strings can be entered such that

- (a) the most upstream manhole is entered as the first point of the string and hence the water flows in the direction of ascending string chainage. The flow direction is said to be in ascending chainage.

or

- (b) the most downstream manhole is entered as the first point of the string and hence the water flows in the direction of descending chainage. The flow direction is said to be in descending chainage)



When a drainage string with flow direction in ascending order is profiled in a section view, the left hand side of a manhole is normally upstream and the right hand side of a manhole downstream.

It is recommended that drainage strings are entered with the flow direction in ascending chainage so that the minimum grade and cover can be satisfied as the drainage string is being placed.

That is, if the drainage string flow is in ascending chainage direction, then as manholes are appended, minimum *cover* and minimum *grade* can be automatically maintained.

Please continue to the next section “Networks and Junctions” .

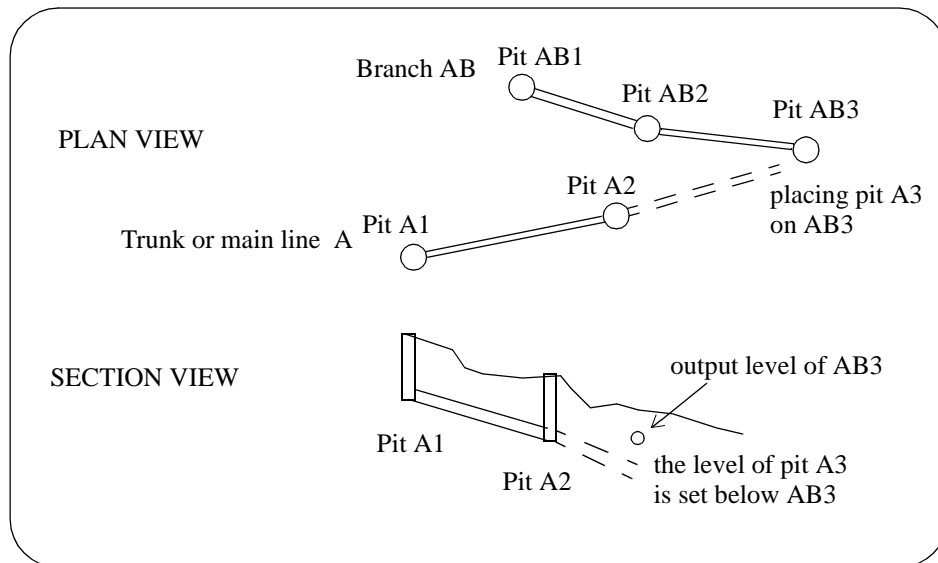
Networks and Junctions

In 12d Model, a **drainage network** consists of one or more drainage strings in the *same* model. Consequently, all the drainage strings in the same model are considered to be part of the same drainage network.

WARNING - All drainage strings in a network **must** be entered with the same flow direction.

If two drainage strings from the same model have a manhole at exactly the same (x,y) location, then 12d Model assumes that the co-incident manholes **are** the same manhole and that the situation represents a **junction**.

Also for a network, if all the drainage strings are entered with the flow direction in ascending chainage, not only can minimum cover and minimum grade be maintained as manholes are appended, but if the branches are laid down before the trunk, then as you connect each branch to the trunk, the invert level for the trunk will be set to below the invert level of the branch line (less the default drop for the manholes).



Please continue to the next section "Drainage Definitions" .

Drainage Definitions

A file of definitions of pipe and manhole (maintenance hole) types can be given to allow tailoring for a particular project.

When 12d Model starts up, it checks to see if an environment variable called DRAINAGE_4D exists and if it does, then the file it points to is used to provide the available types of manholes (maintenance holes) and pits.

If the environment variable is not set, then 12d Model searches for a file called **drainage.4d** in the standard 12d Model search sequence for set up files.

The drainage definitions file format is a simple ascii format and consists of one or more pipe and manhole definitions. Each definition in the file begins with the key word **Pipe** or **Manhole**, followed by the pipe or manhole type and then curly braces { }.

Note

In future versions of 12d Model, this definition will be extended to include special Pipe and Manhole commands within the curly braces.

An example of a typical drainage definitions file is:

```
// -----
// drainage.4d                1/6/96
// Used to define the types of Pipes and Manholes
// -----
Pipe "PVC" {
}

Pipe "VC" {
}
Pipe "PVC Extra Heavy" {
}
Pipe "Plastic" {
}

Manhole "CONC COVER" {
}
Manhole "Gatic" {
}
Manhole "Rubber" {
}
```

Notes

1. spaces in text - any text string that includes spaces or only numbers, must be enclosed in double quotes "".
2. comments - anything after // until the end of the line is ignored.
3. blank lines - blank lines are ignored

Please continue to the next section "Defaults".

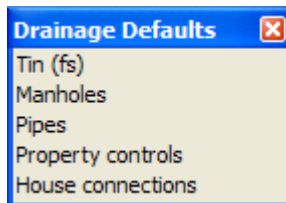
Defaults

drainage_defaults

Position of menu: Design =>Drainage-Sewer =>Defaults

The **defaults** menu sets default tin, manhole (maintenance hole) information, drainage pipe information, property control (sewer module only) and house connection (sewer module only) defaults which are all used when defining drainage networks.

The **Defaults** walk-right menu is



For the option *Tins (fs)*, please continue to the section “Tin (fs)” .

Manholes, please continue to the section “Manholes (Maintenance Holes)” .

Pipes, please continue to the section “Pipes” .

Property controls, please continue to the section “Property Controls” .

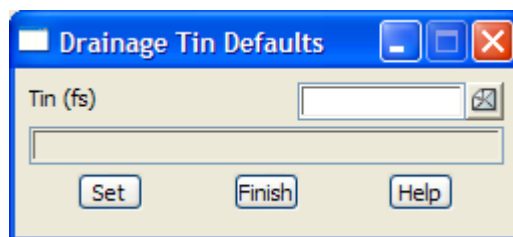
House connections, please continue to the chapter “House Connections” .

Tin (fs)

drainage_tin_defaults

Position of option on menu: Design =>Drainage-Sewer =>Defaults =>Tin (fs)

On selecting the **Tin (fs)** option, the **Drainage Tin Defaults** panel is displayed.



This panel is for setting the default finished surface tin in the **Create Drainage Strings** panel which is used for creating a new drainage string.

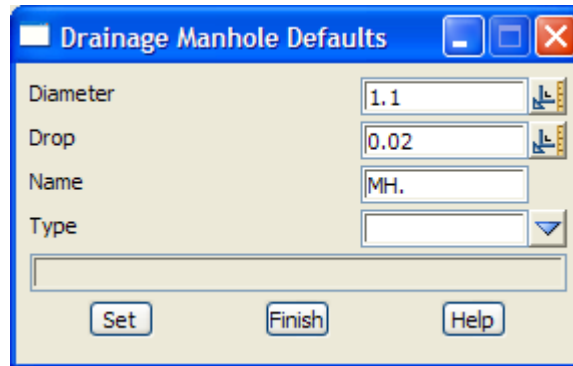
For the drainage string, the finished surface tin is used as the surface that manholes automatically sit on when z float is set on, and for defining cover when placing controls and connections.

Manholes (Maintenance Holes)

drainage_manhole_defaults

Position of option on menu: Design =>Drainage-Sewer =>Defaults =>Manholes

On selecting the **Manholes** option, the **Drainage Manhole Defaults** panel is displayed.



These defaults are used when creating a manhole in a drainage string. The fields and buttons used in this panel have the following functions.

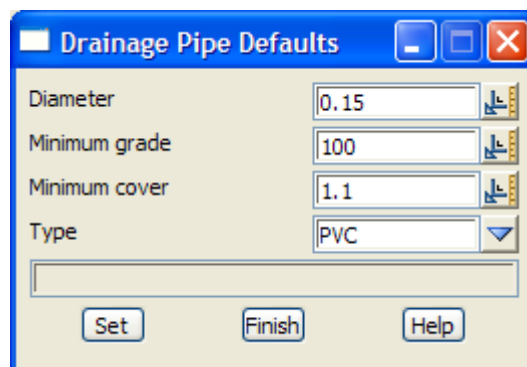
Field Description	Type	Defaults	Pop-Up
Diameter <i>default diameter of a drainage manhole</i>	input	1.1	
Drop <i>drop (metres) through the manhole</i>	input	0.02	
Name <i>default name for the manhole Note that if a manhole name is EOL or eol, then the diameter of the manhole is forced to be zero.</i>	input	MH.	
Type <i>the default cover or lid type of the manholes</i>	input	CONC COVER	CONC COVER, GATIC
Set <i>set the drainage manhole defaults to the values in the above fields.</i>	button		

Pipes

[drainage_pipe_defaults](#)

Position of option on menu: Design =>Drainage-Sewer =>Defaults =>Pipes

On selecting the **Pipes** option, the **Drainage Pipes Defaults** panel is displayed.



This panel is for setting the default drainage pipe diameter, grade, cover and type. These defaults are used when creating a pipe in a drainage string.

The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Diameter <i>default diameter of the pipe.</i>	input	0.1	
Minimum grade <i>the minimum grade (measured as 1: value) used when laying down the pipe.</i>	input	1.0	
Minimum cover <i>the minimum cover, measured in world units from the surface to the top of the pipe (obvert); used when laying down the pipe.</i>	input	1.0	
Type <i>the default type of the pipe</i>	input	PVC	PVC, VC, PVC X/HEAVY
Set <i>set the drainage pipe defaults to the values in the above fields.</i>	button		

IMPORTANT NOTE.

If the drainage string is laid down in the direction of flow (and hence the flow direction is in ascending chainage), then the minimum grade and minimum cover along the pipe are maintained as the drainage string is created. Otherwise the minimum grade and cover cannot be maintained.

Cover for the pipe segment can also be calculated and/or set afterwards by the **pipe=>cover** option in the drainage string editor.

Minimum cover and minimum grade for the pipe segment to the end of the line can be set afterwards by the **pipe=>default grading** option in the drainage string editor.

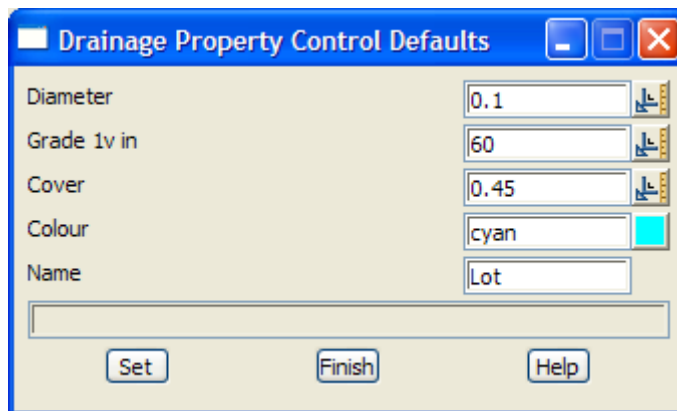
Property Controls

[drainage_property_control_defaults](#)

Position of option on menu: Design =>Drainage-Sewer =>Defaults =>Property Controls

On selecting the **Property controls** option, the **Drainage Property Control Defaults** panel is displayed.

On a section view, the *Profile =>One substring* and *Profile =>Many substrings* options will profile the property control. Note that the centre (axis) of the property control is drawn on the section view, not the invert (bottom) or the obvert (top).



The fields and buttons used in this panel have the following functions.

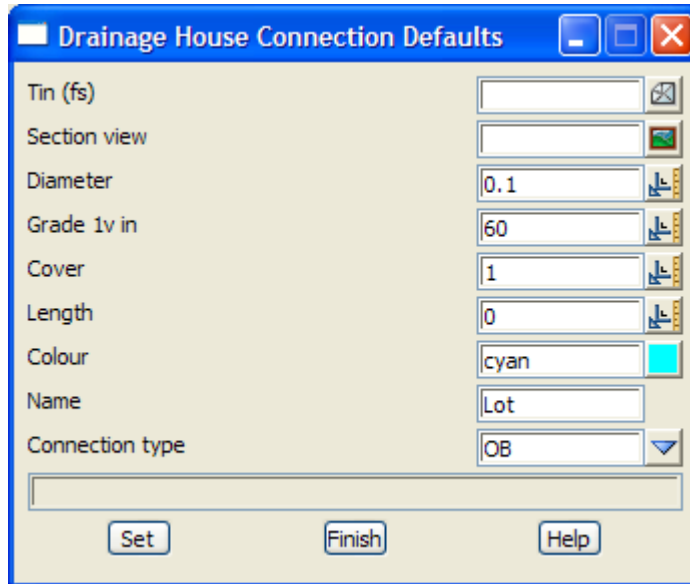
Field Description	Type	Defaults	Pop-Up
Diameter <i>default diameter of the property control.</i>	input	0.1	
Grade 1v in <i>grade (units are "1v in" given value) to use for the property control</i>	input	60	
Cover <i>cover measured from the surface to the top of the property control (world units) to be maintained from the end of the property control in the house block to the drainage string.</i>	input	1.0	
Colour <i>colour to use to draw the property control</i>	input	cyan	available colours
Name <i>name for the property control - usually the lot number</i>	input	Lot	
Set <i>set the property control defaults to the values in the above fields.</i>	button		

House Connections

[drainage_house_connection_defaults](#)

Position of option on menu: Design =>Drainage-Sewer =>Defaults =>House connections

On selecting the **House connections** option, the **Drainage House Connection Defaults** panel is displayed.



This panel is for setting the default information used for connections from the drainage pipe to the house blocks.

The fields and buttons used in this panel have the following functions.

Field	Description	Type	Defaults	Pop-Up
Tin (fs)	<i>name of the tin to automatically add to the section view used for drawing the profile along the house connection.</i>	input	drainage tin	available tins
Section view	<i>the section view used to profile along the house connections as they are placed in plan view.</i>	input		
Diameter	<i>default diameter of the house connection.</i>	input	0.1	
Grade 1v in	<i>grade (units are "1v in") to use for the house connection</i>	input	60	
Cover	<i>cover (world units) to use for the house connection</i>	input	1.0	
Length	<i>length (metres) to use for some types of house connections</i>	input	2.0	
Colour	<i>default colour used for the house connection</i>	input	cyan	available colours
Name	<i>name for the house connection - usually the lot number</i>	input	Lot	

Connection type	input	A special	A, A special, B, C, OB, Special Jump Up
------------------------	-------	-----------	--

the default type of house connection, Please continue to the section “House Connection Types” for a description of each connection type

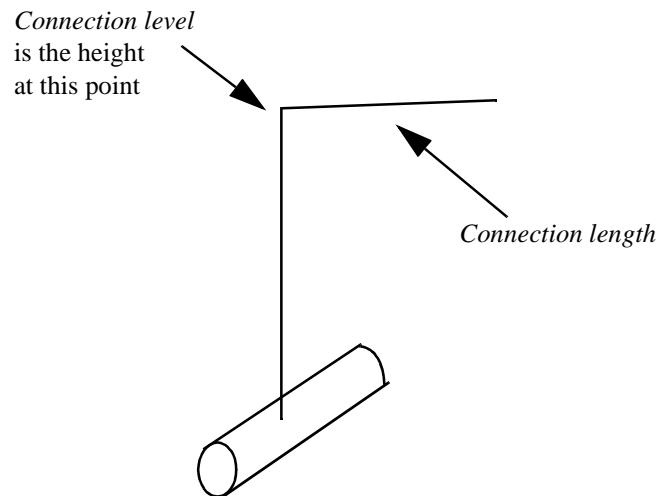
Set button

set the house connection defaults to the values in the above fields.

House Connection Types

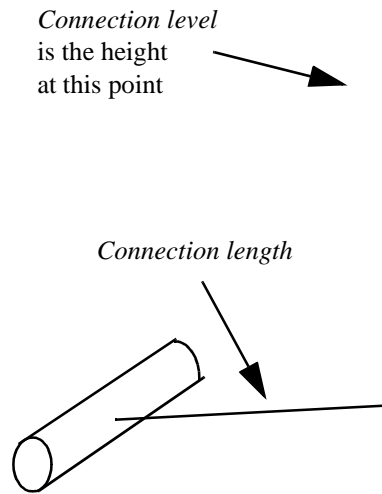
All house connection calculations do not take into account any thickness of pipe, joint sizes or actual entry points into the sewer. Hence they are **approximate only** and should only ever be used as a guide. Any quantities calculations should allow for a suitable margin of error.

House Connection -Type A



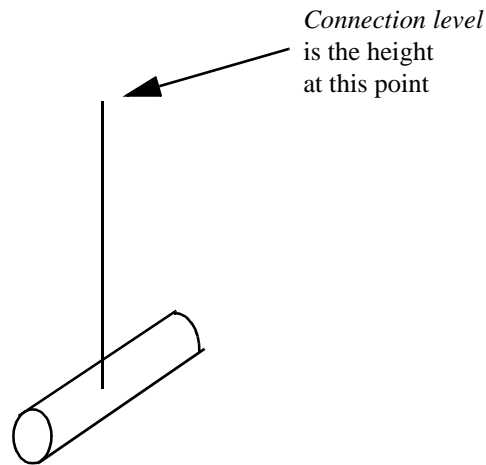
House Connection: Type A

House Connection - Type A Special



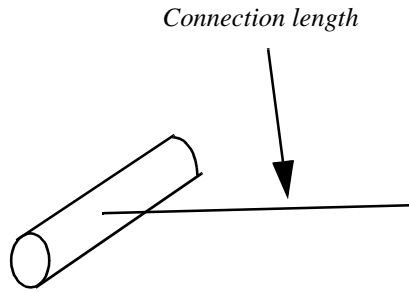
House Connection: Type A Special

House Connection - Type B



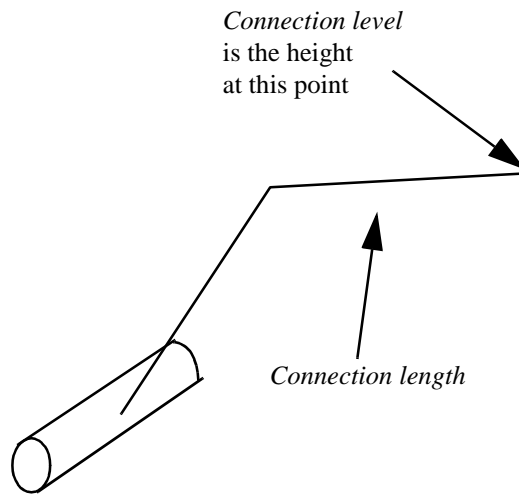
House Connection: Type B

House Connection - Type C



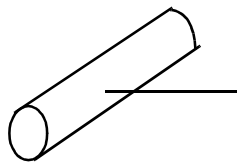
House Connection: Type C

House Connection - Type Special Jump Up



House Connection: Type Special Jump Up

House Connection - Type OB (Oblique)



House Connection: Type OB

Please continue to the next section "Create" .

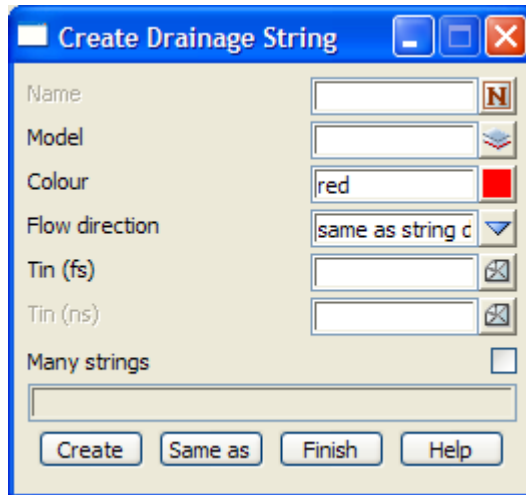
Create

create_drainage_string

Position of option on menu: Design =>Drainage-Sewer =>Create

The **Create** option is used to produce **new** drainage strings and networks. If a drainage string already exists, the **Editor** option is used to modify it.

On selecting the **Create** option, the **Create Drainage String** panel is displayed.



To create a new drainage string, the name, colour, model and style of the new string are entered into the appropriate fields, plus the finished surface triangulation that the manholes are normally flush with, the natural surface triangulation, and the **Create** button selected.

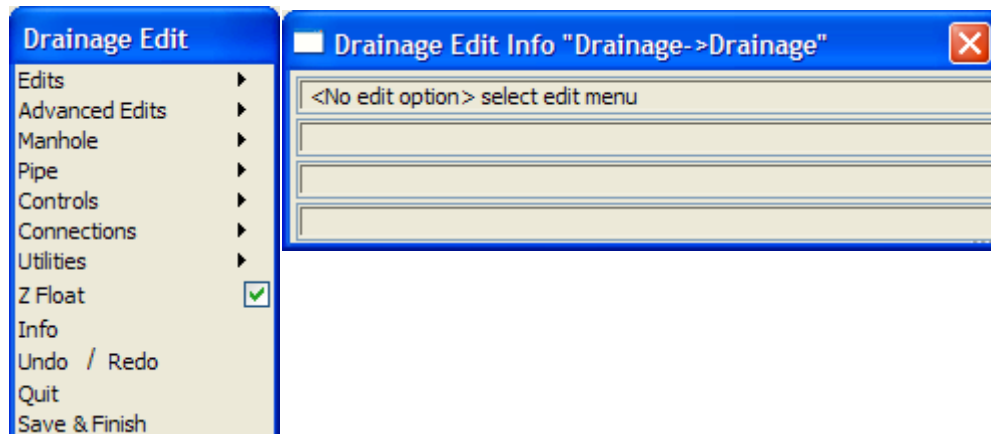
The new fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Flow direction	input	ascending chainage	ascending chainage descending chainage
<i>if ascending chainage, then the flow direction is in ascending chainage (recommended)</i> <i>if descending chainage, then the flow direction is in descending chainage.</i>			
Tin (fs)	input	drainage=>defaults=>tinavailable tins	
<i>the finished surface tin. If manholes are "floating", the top of the manhole is automatically place on the tin surface ("floated" on the surface).</i>			
Tin (ns)	input		available tins
<i>the natural surface tin used in longsection plots.</i>			

The **Create Drainage String** panel is then removed and the **Drainage Edit** menu and **Drainage Edit Info** panel fired up.

As for a 3d string, to create a new drainage string with some of the **same** name, colour, model and style as an existing string (not necessarily a drainage), the **Same as** button is chosen and the appropriate string selected.

The **Drainage Edit** menu contains all the available options for editing a drainage string and its associated block controls and house connections. The **Drainage Edit Info** panel contains information areas. The **Drainage Edit** menu and **Drainage Edit Info** panel are



To create a new drainage string, the user selects the **Append** option from the **Edits** walk right menu on the **Drainage Edit** menu.

Since the **Drainage Edit** menu and **Drainage Edit Info** panel are the same as those used when editing a drainage string, the options will be discussed under the drainage **Edit** option.

For documentation on editing Drainage string, please continue to the next section "Editor".

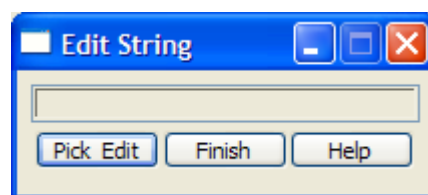
For drainage utilities and import/export see **More Drainage**

Editor

Position of option on menu: Design =>Drainage-Sewer =>Editor

This is the same option as **Editor** from the **Strings** walk-right menu on the **12d Model** menu.

The string editor is used to modify any **12d Model** strings. After selecting the **Editor** option, the **Edit String** panel is placed on the screen to record any error messages.



The option is already in the **pick** mode (the **pick & edit** button only needs to be selected if the pick was cancelled) and the user simply picks and accepts the string to be edited.

From the picked string's type, the editor is able to determine the edits that apply to the string and list them in the string's **edit** menu.

If a drainage string is selected, the **Drainage Edit** menu and **Drainage Edit** panel (as shown in the previous section) are placed on the screen.

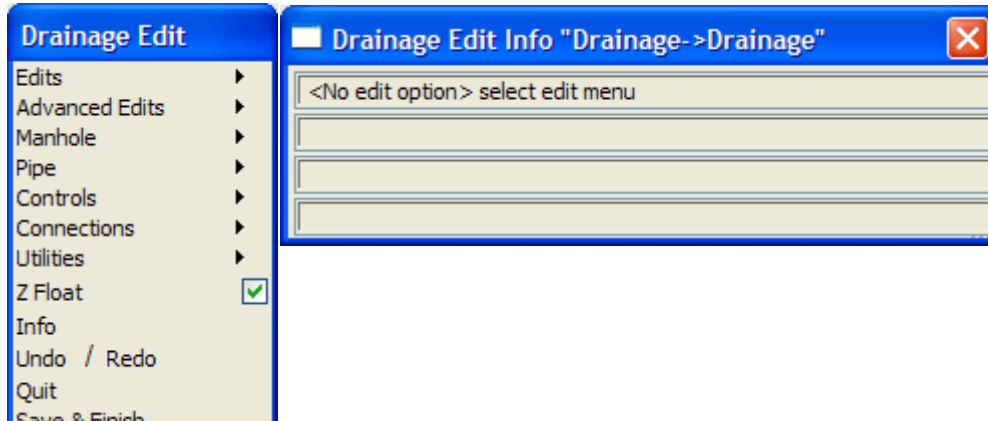
The individual edit operations for a drainage string will now be discussed in detail.

Please continue to the next section "Drainage Edit".

Drainage Edit

[drainage_edit](#)
[drainage_edit_info](#)

On picking a drainage string when in the string **Editor** option, or by selecting **Create** in the **Create Drainage String** panel, the **Drainage Edit** menu and panel are placed on the screen.



The edit is **cancelled** by selecting the **Quit**. No changes to the string are recorded and the **Drainage Edit** option terminates.

The edit is **finished** and the changes recorded when the **Finish** is chosen. The **Drainage Edit** option then terminates.

When either button is selected, a **Yes-No-Cancel** panel is displayed and the user must confirm the selection.

The **Drainage Edit Info** panel is principally used to display information and messages during the creation and editing of the drainage string. It is toggled on and off by **Info** on the **Drainage Edit** menu.

The main message area indicates the purpose of the mouse buttons at each step.

Message area 1 displays the current Drainage Edit option and message area 4 indicate the next step in the edit option.

Message areas 2 and 3 are used to display information about the string as the cursor is moved near the drainage string and the drainage manholes.

Each of the options in the **Drainage Edit** menu will now be described.

For the option *Edits*, please continue to the section “Edits” .

Manholes, please continue to the section “Manhole (Maintenance Hole)” .

Pipes, please continue to the section “Pipe” .

Controls, please continue to the section “House Connections” .

Connections, please continue to the chapter “House Connections” .

Utilities, please continue to the chapter “Utilities” .

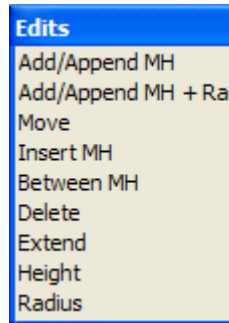
Z float, please continue to the chapter “Z Float” .

Edits

[edits](#)

The options in the **Edits** menu are used for placing the initial manholes of a new drainage string, editing a new drainage string once the initial manholes are placed or editing an existing drainage string.

The **Edits** walk-right menu is



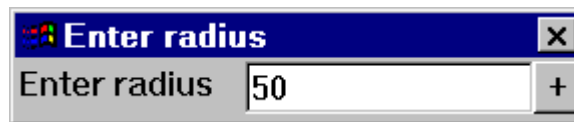
Append, Append+Radius

The **Append**, **Append+Radius** operations for a drainage string are similar to the **Append** options for a polyline string except that manholes are also automatically placed at each added point.

Note - a manhole can be removed from the point afterwards using the **Manhole=>Remove** option. The point will still be there but without a manhole on it.

If the **Append + Radius** option selected, then before each point is appended, an enter radius typed-input box is placed on the screen.

The enter radius typed-input box looks like



The radius is entered into the typed-input box, terminated with <enter>. The entered value is taken as the radius of the arc to the next drainage string point and the arc will be drawn correctly as the cursor is moved to the next point.

A **radius** value of **0** is taken to mean no arc.

If **z Float** is set to tick, then the top of the manhole is automatically placed on the terrain given in the tin field for the drainage string.

If height snap is toggled on in the **Snaps** menu, the height will be displayed as a new height entered but the new height will only be used if **z Float** is turned off for the manhole.

Each manhole in the string is connected by a drainage pipe. The diameter, type and cover at each end of the **drainage pipe** are taken from the **Drainage Pipe Defaults** panel.

The **Append** options are terminated by selecting **Cancel** from the **Pick Ops** menu, or by selecting **Quit**, **Finish**, or a new option from the **Drainage Edit** menu.

Move

If used in a plan view, the **Move** option is used to move the (x,y) position of a manhole.

If used in a section view, the **Move** option can be used to change the height of the top of any manhole or the height of either end of the drainage pipe connecting adjacent manholes in the drainage string.

After the **Move** option is chosen, the user selects either a manhole in a plan view or the top of a manhole or a pipe end in a section view.

If a manhole is selected from a plan view, then the plan position of the selected manhole will move with the cursor. The new position for the top of the manhole can be chosen by either cursor selection or typed input in exactly the same way as for moving a point on a 3d string.

If the top of a manhole or the end of a pipe connecting adjacent manholes is chosen in a section view, then only the height of the selected point can be modified. That is, if a point is selected in a section view, then it

is constrained to move in the z-direction only.

The **Move** option is terminated by selecting **Cancel** from the **Pick Ops** menu, or by selecting **Quit, Finish**, or a new option from the **Drainage Edit** menu.

Insert

The **Insert** option is designed to place a new manhole between two adjacent manholes (note that the inserted manhole does not have to be on the line joining the two adjacent manholes).

To insert a new manhole, the two adjacent manholes are chosen by selecting the line connecting the two manholes. Once the **line** is selected, the new manhole is assumed to be at the current cursor position. As the cursor is moved, the drainage string is redrawn reflecting the changing position of the inserted manhole.

The **Insert** option is terminated by selecting **Cancel** from the **Pick Ops** menu, or by selecting **Quit, Finish**, or a new option from the **Drainage Edit** menu.

Between

The **Between** option is similar to the **Insert** option except that the inserted manhole **does** have to be on the line joining the two adjacent manholes. To accomplish this, the cursor position is projected onto the manhole-manhole line to give the new manhole position.

Note - once the manhole is placed, it is no longer constrained to be on the one straight or arc joining adjacent manholes. If this is required, then the manhole is placed using the **Manhole=>Add** option.

The **Between** option is terminated by selecting **Cancel** from the **Pick Ops** menu, or by selecting **Quit, Finish**, or a new option from the **Drainage Edit** menu.

Delete

The **Delete** option is used to delete manholes/and or points from the drainage string.

The manhole/point to be deleted is selected with the cursor and when the selection is accepted (MB), it is **deleted**.

Once a manhole/point has been deleted, the delete option is still current and can be repeated without re-selecting the **Delete** option.

The string, minus the deleted manhole/point, is redrawn after each deletion.

The **Delete** option is terminated by selecting **Cancel** from the **Pick Ops** menu, or by selecting **Quit, Finish**, or a new option from the **Drainage Edit** menu.

Extend

The **Extend** option is used to move a manhole/point along the line joining the manhole/point to one of its adjacent manhole/point.

That is, the bearing of the manhole/point-manhole/point line is kept constant and the manhole/point moved along that line either **towards** or **away** from its neighbouring manhole/point.

Extending, like moving a manhole/point, is a two step process.

Step (a) - selecting the manhole/point-manhole/point line and the manhole/point to be moved along that line

Step (b) - selecting the final position for the manhole

Both steps are identical to extending an point in a polyline string.

Once the extend is completed, the extend option is still current and can be repeated without re-selecting the extend option.

The **Extend** option is terminated by selecting **Cancel** from the **Pick Ops** menu, or by selecting **Quit, Finish**, or a new option from the **Drainage Edit** menu.

Note - Extend can be used on the end manholes of the drainage string

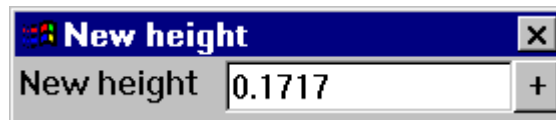
Height

The **Height** option is used to modify the height (z value) of the top of any manhole, or the height of the ends of the pipes connecting adjacent manholes in the drainage string.

The top of the manhole can be selected in either a plan or a section view. The pipe ends can only be selected in a section view.

After the **Height** option is chosen, the user must select the manhole top or pipe end that is going to have its height modified.

Once the manhole or pipe end has been selected, an New height typed-input box is displayed on the screen with the items current height (z value) in it.



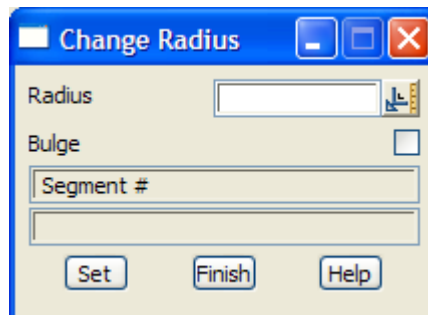
The required height is entered into the typed-input box, terminated with <enter>. The entered value is taken as the height of the manhole or pipe and the string redrawn with the new height at that point. The typed-input box then disappears.

The **Height** option is terminated by selecting **Quit**, **Finish**, or a new option from the **Drainage Edit** menu.

Radius

change_radius

Selecting **Radius** brings up the **Change Radius** panel which is used to modify the radius of any arc/line joining adjacent manhole points.



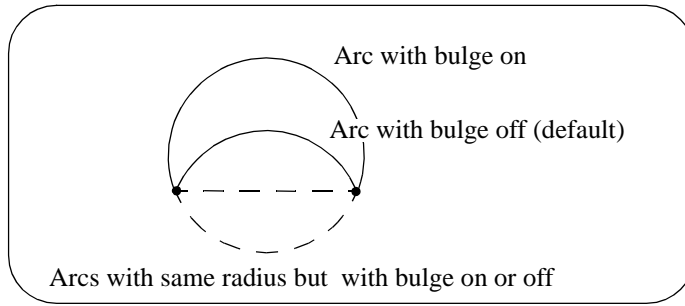
After selecting the **Radius** option, the user selects the arc/straight to be modified and the current arc radius and bulge setting will be displayed in the **Change Radius** panel.

New values can then be entered and the arc modified by selecting the **Set** button.

If the radius is positive, the arc is drawn from the start point to the next point on the polyline in a clockwise direction. If the radius is negative, the arc is drawn from the start point to the next point on the polyline in a counter-clockwise direction.

For a given radius (positive or negative), there are two possible cases for the arc- one where the arc is less than a semi-circle, the other when the arc is greater than a semi-circle.

If bulge is turned on, the larger arc is used. The default is bulge turned off.

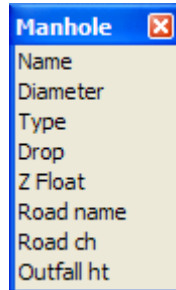


Manhole (Maintenance Hole)

manhole

The options in the **Manhole** menu are used to modify information about individual manholes in the drainage string.

The **Manhole** walk-right menu is



Add

The **add** option is similar to the **Edits=>Between** option in that a new manhole is created that must be on the line or arc between two adjacent manholes.

However, once the manhole is placed, it is **always constrained** to be on the one straight or arc joining its adjacent manholes.

To **add** a new manhole, the two adjacent manholes are chosen by selecting the line connecting the two manholes. Once the **line** is selected, the new manhole is assumed to be at the current cursor position. As the cursor is moved, the drainage string is redrawn reflecting the changing position of the inserted manhole.

The **add** option is terminated by selecting **Cancel** from the **Pick Ops** menu, or by selecting **Quit, Finish**, or a new option from the **Drainage Edit** menu.

Remove

The **Remove** option is used to remove manholes from the drainage string but unlike the **Edits=>Delete** option, the underlying point on the drainage string remains. Hence only the manhole is deleted, but not the polyline point underneath.

The manhole to be removed is selected with the cursor and when the selection is accepted (MB), it is **removed**.

Once a manhole has been removed, the **Remove** option is still current and can be repeated without re-selecting the **Remove** option.

The string, minus the deleted manhole/point, is redrawn after each removal.

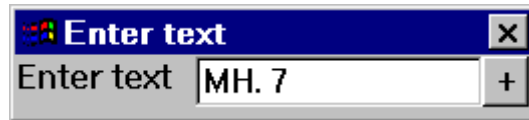
The **Remove** option is terminated by selecting **Cancel** from the **Pick Ops** menu, or by selecting **Quit, Finish**, or a new option from the **Drainage Edit** menu.

Name

The **Name** option is used to change a manhole's label.

After selecting the option, the mouse is used to pick the manhole to have a name change.

Once a manhole has been selected, an Enter text typed-input box is displayed on the screen containing the selected manhole's name.



The new name is entered into the typed-input box, terminated with <enter>. The typed-input box then disappears.

The **Name** option is terminated by selecting **Cancel** from the **Pick Ops** menu, or by selecting **Quit, Finish**, or a new option from the **Drainage Edit** menu.

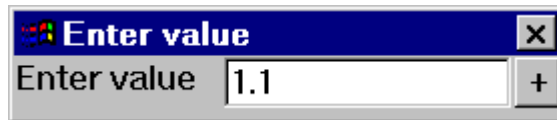
NOTE - if the name of the manhole is *EOL* or *eol* then the diameter of the manhole is forced to zero.

Diameter

The **Diameter** option is used to change a manhole's diameter.

After selecting the option, the mouse is used to pick the manhole to have its diameter modified.

Once a manhole has been selected, an **Enter value** typed-input box is placed on the screen displaying the selected manhole's current diameter.



The new diameter is entered into the typed-input box, terminated with <enter>. The typed-input box then disappears.

The **Diameter** option is terminated by selecting **Cancel** from the **Pick Ops** menu, or by selecting **Quit, Finish**, or a new option from the **Drainage Edit** menu.

Type

The **Type** option is used to change the type of the cover (lid) placed on a manhole.

After selecting the option, the mouse is used to pick the manhole to have its cover type modified.

Once a manhole has been selected, a **Manhole type** typed-input box is displayed on the screen containing the selected manhole's cover type.



The list of common covers for the manhole can be obtained by clicking the [+] in the **Manhole type** input box and getting a menu of valid cover types.

The new cover type is entered into the typed-input box, terminated with <enter>. The typed-input box then disappears.

The **Type** option is terminated by selecting **Cancel** from the **Pick Ops** menu, or by selecting **Quit, Finish**, or a new option from the **Drainage Edit** menu.

Drop

The **Drop** option is used to change the vertical distance between the bottom of the pipes on either side of a manhole, i.e., the difference in the invert levels of the pipe.

Since the drop in simply the difference in vertical distance between two pipes on either side of a manhole, the actual value of the drop can be changed by moving either of the pipes up or down the manhole.

After selecting the option, the end of the pipe to be moved is selected with the mouse.

Once the pipe end been selected, an enter value typed-input box is displayed containing the drop across the manhole that the pipe end connects into.



The new drop type is entered into the typed-input box, terminated with <enter>.

If the end of the pipe was on the upstream side of the manhole (normally the right hand side of a manhole in a section view), the end of the pipe will be moved upward until the drop across the manhole equals the entered value.

If the end of the pipe was on the downstream side of the manhole (normally the left hand side of a manhole in a section view), the end of the pipe will be moved down until the drop across the manhole equals the entered value.

The typed-input box then disappears.

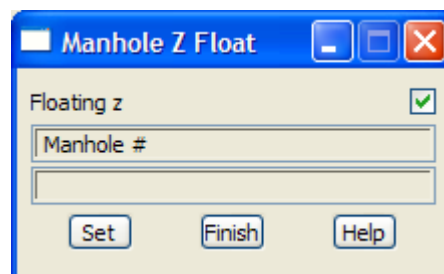
The **Drop** option is terminated by selecting **Cancel** from the **Pick Ops** menu, or by selecting **Quit**, **Finish**, or a new option from the **Drainage Edit** menu.

Z Float

manhole_z_float

A **floating manhole** takes the z-value for the top of the manhole from the tin selected for the drainage string. Hence as a floating manhole moves around in a plan view, the top of manhole will automatically change to suit the new z-value of the drainage string tin.

Selecting **Z float** brings up the **Manhole Z Float** panel which is used to change a manhole from floating to non-floating and vice-versa.



After selecting the **Z Float** option, the user selects the manhole to be modified and the current **floating z status** is displayed in the **Manhole Z Float** panel.

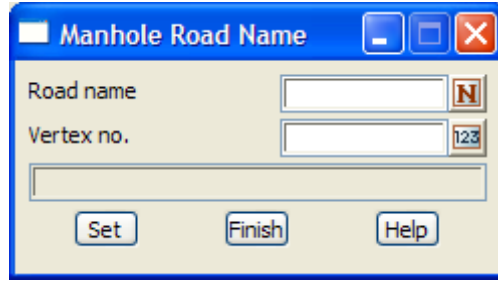
The tick-cross can then be changed and the manhole modified by then selecting the **Set** button.

Road Name

manhole_road_name

A **road name** can be set for a manhole of the line.

Selecting **Road name** brings up the **Manhole Road Name** panel which is used to give and change a road name for a manhole.



The option is running as soon as the panel is on the screen and the user is asked to selected a manhole.

<Select manhole> [picks][Menu]

When the manhole is selected, any existing road name and the manhole number is placed in the road name and vertex no. fields respectively of the **Manhole Road Name** panel.

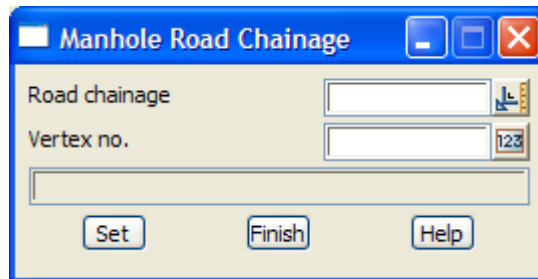
A new **road name** is then typed into the road name panel field and the **Set** button selected to record the road name with the manhole.

Road Chainage

manhole_road_chainage

A **road chainage** can be set for a manhole of the line.

Selecting **Road ch** brings up the **Manhole Road Chainage** panel which is used to give and change a road chainage for a manhole.



The option is running as soon as the panel is on the screen and the user is asked to selected a manhole.

<Select manhole> [picks][Menu]

When the manhole is selected, any existing road chainage and the manhole number is placed in the road chainage and vertex no. fields respectively of the **Manhole Road Chainage** panel.

A new **road chainage** is then typed into the road chainage panel field and the **Set** button selected to record the road chainage with the manhole.

Outfall Height

When a drainage string is created, the furthest downstream is often an outfall and the height of the outfall known.

When the furthest downstream manhole is considered to be an outfall, the **Outfall ht** option is used to set and change the outfall height. Once set, the outfall height is taken to be the height at the *bottom* of the furthest downstream manhole.

If this option is not used, the outfall height is left undefined.

After selecting the option, an enter value typed-input box is displayed on the screen containing the existing outfall height or **null** if no outfall height has been set.

The new outfall height is entered into the typed-input box, terminated with <enter>.

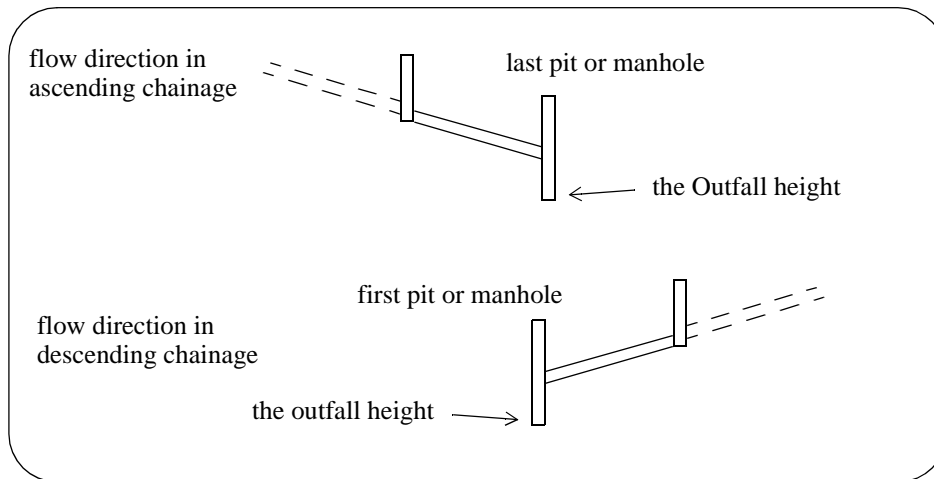
The height of the bottom of the furthest downstream manhole in the drainage string is then set to the given height and the typed-input box removed.

The **Outfall ht** option automatically terminates after use.

Note:

For a drainage string with flow direction in ascending chainage, the furthest downstream manhole is the *last* manhole.

For a drainage string with flow direction in descending chainage, the furthest downstream manhole is the *first* manhole.

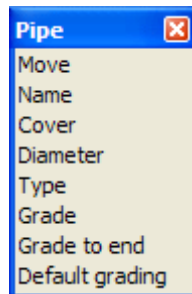


Pipe

pipe

The options in the **Pipe** menu are used to modify information about the pipes joining adjacent manholes in the drainage string.

The **Pipe** walk-right menu is



Move

The **Move** option is used to move a pipe connecting two manholes whilst keeping the grade of the pipe constant.

After selecting the option, the mouse is used to pick the pipe to be moved.

Once a pipe has been selected, the pipe will be moved up or down so that the cursor remains on the pipe (or on the extension of the pipe if the cursor is on the other side of the manholes at either end of the pipe). The grade of the pipe is kept constant.

The manholes at either end of the pipe will also be extended if necessary so that the pipe still connects into the adjacent manholes.

The **Move** option is terminated by selecting **Cancel** from the **Pick Ops** menu, or by selecting **Quit, Finish**, or a new option from the **Drainage Edit** menu.

Name

The **Name** option is used to change a pipe's label.

After selecting the option, the mouse is used to pick the pipe to have a name change.

Once a pipe has been selected, an Enter text typed-input box is displayed on the screen containing the selected pipe's name.



The new name is entered into the typed-input box, terminated with <enter>. The typed-input box then disappears.

The **Name** option is terminated by selecting **Cancel** from the **Pick Ops** menu, or by selecting **Quit, Finish**, or a new option from the **Drainage Edit** menu.

Cover

The **Cover** option is used to place the selected pipe so that minimum cover is maintained along the top of the pipe (obvert) with respect to the finished surface tin (tin (fs)).

After selecting the option, the pipe to set the cover for is selected with the mouse.

Once a pipe has been selected, an Enter value typed-input box is displayed on the screen containing the existing cover.



The new cover is entered into the typed-input box, terminated with <enter>. The typed-input box then disappears and the pipe is adjusted so that the specified cover is maintained for the full length of the pipe at the pipes existing grade.

The **Cover** option is terminated by selecting **Cancel** from the **Pick Ops** menu, or by selecting **Quit, Finish,** or a new option from the **Drainage Edit** menu.

Diameter

The **Diameter** option is used to change a drainage pipe's diameter.

After selecting the option, the mouse is used to pick the pipe to be modified.

Once a drainage pipe has been selected, an Enter value typed-input box is placed on the screen displaying the selected pipe's current diameter.



The new diameter is entered into the typed-input box, terminated with <enter>. The typed-input box then disappears

The **Diameter** option is terminated by selecting **Cancel** from the **Pick Ops** menu, or by selecting **Quit, Finish,** or a new option from the **Drainage Edit** menu.

Type

The **Type** option is used to change the type of material that the pipe is made of.

After selecting the option, the mouse is used to pick the pipe to have its material type modified.

Once a pipe has been selected, a Pipe type typed-input box is placed on the screen displaying the selected pipes material type.



The list of common materials for the pipe can be obtained by clicking B3 in the type input box and getting a menu of valid material types.

The new material type is entered into the typed-input box, terminated with <enter>. The typed-input box then disappears.

The **Type** option is terminated by selecting **Cancel** from the **Pick Ops** menu, or by selecting **Quit, Finish,** or a new option from the **Drainage Edit** menu.

Grade

The **Grade** option is used to specify an exact grade for a drainage pipe. The value for the grade is entered using typed input and is in the units "1v in".

In this option, the new grade is given to a pipe by keeping one end fixed and raising or lowering the other end by the amount required to give the pipe the new grade.

After the **Grade** option is selected, the pipe whose grade is to be modified is selected **at the end that is going to be moved.**

Once the pipe end has been selected, an enter value typed-input box is displayed on the screen containing the current grade of the pipe. The new grade is entered into the typed-input box, terminated with <enter>.

The selected end of the drainage pipe is then moved up or down so that the pipe has the new grade.

If necessary, the manhole at the moved end of the pipe will be lengthened so that the pipe still connects into the adjacent manholes.

The **Grade** option is terminated by selecting **Cancel** from the **Pick Ops** menu, or by selecting **Quit, Finish**, or a new option from the **Drainage Edit** menu.

Grade to End

The **Grade to end** option is used to specify a *fixed* grade for all the drainage pipes from a selected pipe to the **low chainage** end (beginning) of the line. That is, it grades from *right to left* on a long section of the drainage string.

The value for the grade is entered using typed input and is in the units "1v in".

This option was originally written for pipes with flow direction in descending chainage direction which is the reason why it works from the selected pipe back towards the beginning of the line.

Hence **Grade to end** should only be run on pipes with flow in descending chainage direction. If the flow is in ascending chainage direction, use the reverse string option (string=>strings edit=>reverse) before using this option, and then reverse the string again after the option is run. Note that the **Default grading** option looks at maintaining minimum *grade* and minimum *cover* for flow in either ascending or descending chainage direction and supersedes **Grade to end**.

In this option, the new grade is given to a pipe by keeping the high chainage end of the selected pipe fixed and raising or lowering the low chainage end by the amount required to give the pipe the new grade. The minimum cover is over ridden during this process. If necessary, the bottom of the manhole will be lowered so that the pipe still connects into its adjacent manholes.

The next lower chainage pipe is then dropped through the default drop and given the new grade. The drop is measured from the lowest pipe invert of all pipes in the network entering the manhole.

This process is repeated until the low chainage end (beginning) of the line is reached.

After the **Grade to end** option is selected, the first pipe whose grade is to be modified is selected.

Once the pipe end has been selected, an enter value typed-input box is displayed on the screen containing the current grade of the selected pipe. The new grade is entered into the typed-input box, terminated with <enter>. The option then does the grading.

The **Grade to end** option is terminated by selecting **Cancel** from the **Pick Ops** menu, or by selecting **Quit, Finish**, or a new option from the **Drainage Edit** menu.

Default Grading

`default_grading`

The **Default grading** option starts at the given pipe and then works to the end of the line when the flow direction is in ascending chainage, or the beginning of the line when the flow direction is in descending chainage. The **Default grading** option maintains minimum grade and minimum cover.

Default grading is not designed to optimise the placement of the pipes but provides one solution preserving minimum grade and cover.

Property Controls

controls

Property, block or lot **controls** are trial connections from a sewer line (drainage string) to a user specified plan point.

The property controls are used as checks that selected house blocks can be serviced by the sewer line. That is, they are used to test if the house block is under the control of the sewer line.

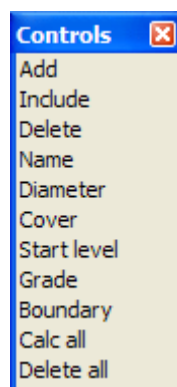
For the trial connection, once the cover (measured from the finished surface to the top of the property connection line) that the property connection must maintain and the grade are specified, the position and depth that the trial property connection must have at the sewer line can be calculated, and where the height of the *centre line* of the property control when it reaches the sewer line is displayed in any section view containing a profile of the sewer line.

If the calculated depth of the trial property connection at the sewer line (drainage string) is below the sewer pipe, then no such connection would be feasible and the house block would not be totally controlled by the sewer line.

On a section view, the *Profile =>One substring* and *Profile =>Many substrings* options will profile the property control. Note that the *centre line* (axis) of the property control is drawn on the section view, not the invert (bottom) or the obvert (top).

NOTE - property controls are only accessible by the *Sewer module*.

The options in the **Controls** menu are used to place and modify the trial connections. The **Controls** walk-right menu is



Add

The **Add** option is used to create a new trial control line going from a selected drainage pipe to a user specified plan position (the free end of the connection).

After selecting the option, the mouse is used to pick the plan position of the connection point on the drainage pipe, and then the points defining the path to the plan position of the free end of the trial connection.

After the free end has been selected, the property name typed-input box is displayed on the screen so that a label for the control can be entered (this usually consists of the lot number).

When the property name box is placed on the screen, it will already have some text in it. This text comes from the name field in the **Drainage Property Control Defaults** panel.



A z-value equal to the drainage tin value minus the default control cover depth is automatically given to the free end of the control. The default control grade is then used to define z-values along the trial path

(ensuring that the default control cover depth is always observed) to give a z-value back at the drainage pipe (the connection height of the control).

A cross at the calculated connection height is displayed whenever the drainage string is profiled on a section view.

The colour for the new control is taken from the **Drainage Property Control Defaults** panel.

The **Add** option is terminated by selecting **Cancel** from the **Pick Ops** menu, or by selecting **Quit, Finish**, or a new option from the **Drainage Edit** menu.

Include

The **Include** option is used to make a control out of an existing polyline string.

The polyline string must start at the connection point on the drainage string and end at the free end (use *Strings=>Strings Edit=>Reverse* if the string's direction is incorrect).

After selecting the option, the mouse is used to pick the polyline string and its plan position is copied and used to define a new control.

A z-value equal to the default drainage tin at that point, minus the default control cover depth is automatically given to the free end of the new control. The default control grade is then used to define z-values along the trial path (ensuring that the default control cover depth is always observed) to give a z-value back at the drainage pipe.

The **Include** option is terminated by selecting **Cancel** from the **Pick Ops** menu, or by selecting **Quit, Finish**, or a new option from the **Drainage Edit** menu.

Delete

The **Delete** option is used to delete a control.

After selecting the option, the mouse is used to pick the block control to be deleted.

Once a block control has been selected, it will be deleted and removed from the screen.

The **Delete** option is terminated by selecting **Cancel** from the **Pick Ops** menu, or by selecting **Quit, Finish**, or a new option from the **Drainage Edit** menu.

Name

The **Name** option is used to change the **Property name** of a control.

After selecting the option, the mouse is used to pick the control that will have a name change.

Once a control has been selected, an enter text typed- input box is displayed on the screen containing the selected control's name.



The new name is entered into the typed-input box, terminated with <enter>. The typed-input box then disappears.

The **Name** option is terminated by selecting **Cancel** from the **Pick Ops** menu, or by selecting **Quit, Finish**, or a new option from the **Drainage Edit** menu.

Diameter

The **Diameter** option is used to change the diameter of a control.

After selecting the option, the mouse is used to pick the control that will have its diameter modified.

Once a control has been selected, an Enter value typed- input box is placed on the screen displaying the

selected control's current diameter.



The new diameter is entered into the typed-input box, terminated with <enter>. The typed-input box then disappears.

The **Diameter** option is terminated by selecting **Cancel** from the **Pick Ops** menu, or by selecting **Quit**, **Finish**, or a new option from the **Drainage Edit** menu.

Cover

The **Cover** option is used to change the distance that the control is below the tin (fs) for the drainage string.

After selecting the option, the cursor is used to pick the control whose cover will be modified.

Once a control has been selected, an Enter value typed- input box is placed on the screen displaying the selected block control's current cover.



The new cover is entered into the typed-input box, terminated with <enter>. The typed-input box then disappears and the new connection height using the new cover calculated.

The **Cover** option is terminated by selecting **Cancel** from the **Pick Ops** menu, or by selecting **Quit**, **Finish**, or a new option from the **Drainage Edit** menu.

Grade

The **Grade** option is used to change the grade of a control (units "1v in").

After selecting the option, the mouse is used to pick the control whose grade will be modified.

Once a control has been selected, an enter value typed- input box is placed on the screen displaying the selected control's grade.

The new grade is entered into the typed-input box, terminated with <enter>. The typed-input box then disappears and the new connection height using the new grade calculated.

The **Grade** option is terminated by selecting **Cancel** from the **Pick Ops** menu, or by selecting **Quit**, **Finish**, or a new option from the **Drainage Edit** menu.

Boundary

The **Boundary** option is used to specify a boundary trap depth which is used as a final drop at the drainage pipe end of the control.

After selecting the option, the mouse is used to pick the control whose boundary depth will be modified.

Once a control has been selected, an Enter value typed- input box is placed on the screen displaying the selected boundary depth.



The new boundary trap depth is entered into the typed-input box, terminated with <enter>. The typed-input box then disappears and the new connection height using the new boundary trap depth is calculated.

The **Boundary** option is terminated by selecting **Cancel** from the **Pick Ops** menu, or by selecting **Quit**, **Finish**, or a new option from the **Drainage Edit** menu.

Calc all

The **Calc all** option is used to re-calculate the connection heights for all controls of the drainage line.

The calculation uses the plan layout of the control, the control's cover, grade and boundary trap depth and the default tin for the drainage line.

The **Calc bc**'s option automatically terminates after use.

Delete All

The **Delete all** option is used to remove all the controls defined for the drainage line being edited.

The **Delete all** option automatically terminates after use.

House Connections

connections

The **Connections** option is used to create the connections from the sewer line (drainage string) to the house blocks in a subdivision.

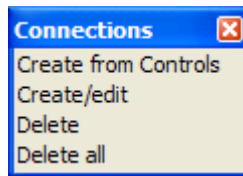
When placing a house connection, the user indicates the two corners of the frontage of the block to allow the cross-fall of the block to be calculated and allow the frontage to be used in positioning the house connection.

When placing house connections, a section view is used to automatically display the connection to facilitate checking the type of connection used and any obstructions that may need to be avoided.

NOTES

1. House connections are only accessible by the *Sewer module*.
2. All house connection calculations do not take into account any thickness of pipe, joint sizes or actual entry points into the sewer. Hence they are *approximate only* and should only ever be used as a guide. Any quantities calculations should allow for a suitable margin of error.

The **Connections** walk-right menu is



The process for creating a house connection will now be described in detail.

Create from Controls

default_house_connections__drainage__drainage_

The **Create from Controls** option is used to create a new house connection from existing controls. or modify an existing house connection.

After selecting the **Create from Controls** option, the **Default House Connections** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Mode	input	update all	remove existing first, update new, update all

if remove existing first, all the existing connections are deleted before new ones are created from the controls.

if update new, connections are only created from controls with names different from any existing connection.

if update all, connections are created from all controls.

Factor of safety input 0.15

the connection height for the control is adjust by this depth from the control connection depth.

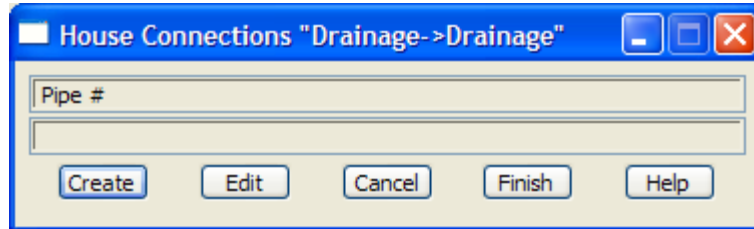
Create button

*after selecting **Create**, the connections are created from the selected controls.*

Create/Edit

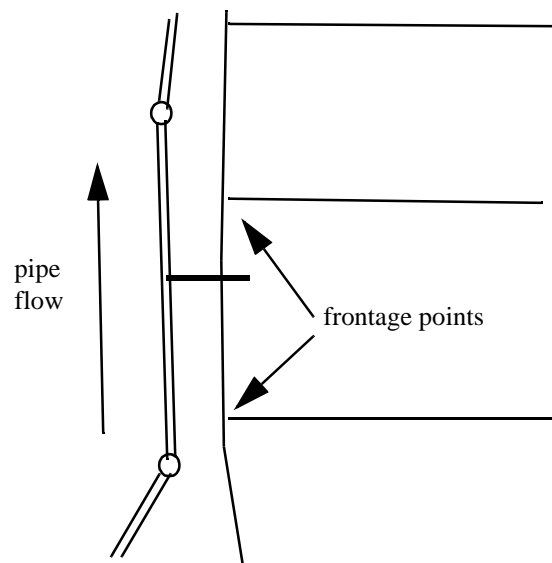
house_connections_edit_panel

The **Create/edit** option is used to create a new house connection or modify an existing house connection. After selecting the **Create/edit** option, the **House Connections** panel is displayed.



The process for creating a house connection will now be described in detail.

Creating A House Connection

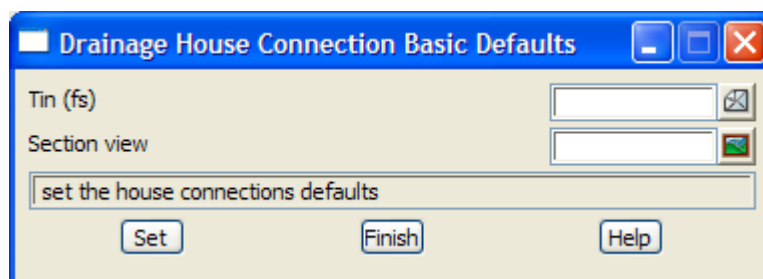


Step 1 Select *Create*

To create a new house connection, the **Create** button is selected from the **House Connections** menu.

drainage_house_connection_basic_defaults

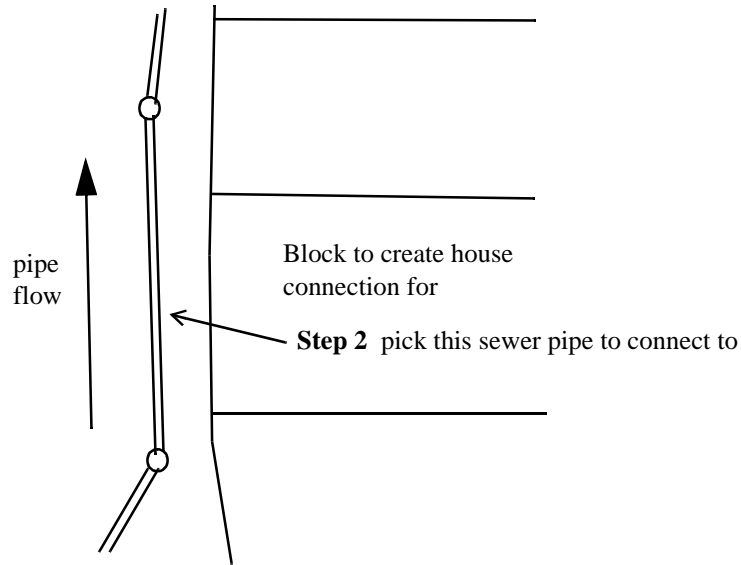
If either the default **drainage tin** or **section view** have not be defined, the **Drainage House Connection Basic Defaults** panel will be placed on the screen after the **Create** button is selected.



The missing values need to be filled in and the **Set** selected. This information is needed so that the house connections can be drawn up in a section view as soon as they are created.

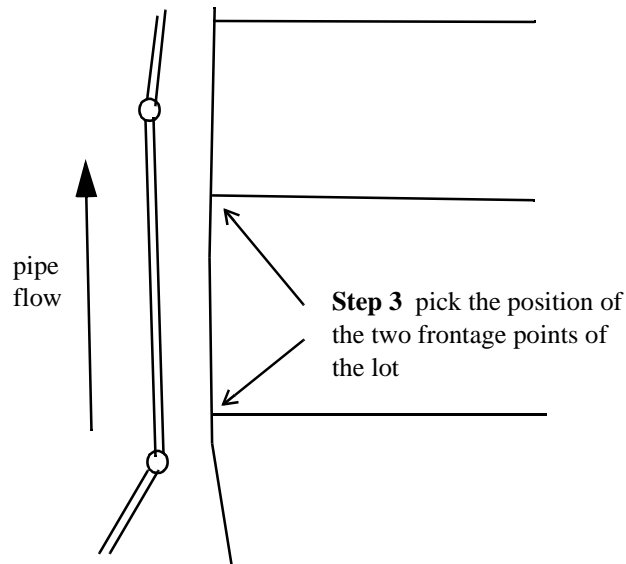
Step 2 Selecting the Sewer (drainage) Pipe to Connect to

The user is then asked to select the sewer pipe to connect into.



Step 3 Selecting the House Lot Frontage

Next the user indicates the two frontage points for the house block.

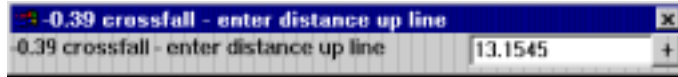


Step 4 Positioning the House Connection on the Sewer Pipe

From the two frontage points and the default drainage tin, the program calculates the crossfall for the block frontage.

The crossfall is displayed in the name of the enter distance up line typed-input box which is now placed on the screen. The distance up line is the distance along the frontage that the house connection will be placed.

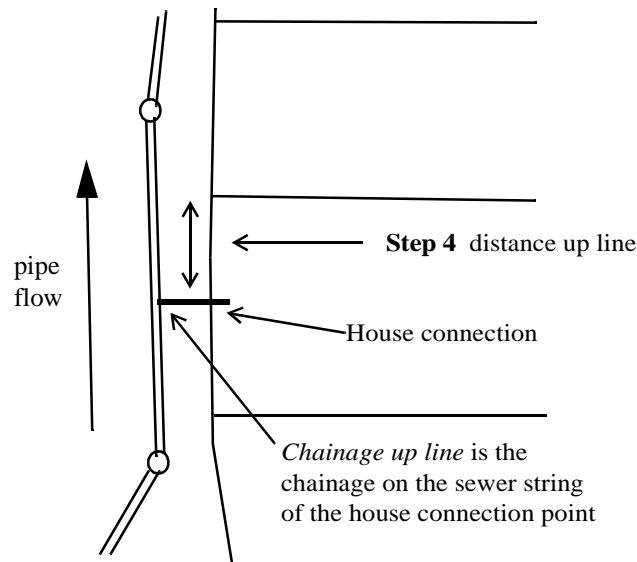
[crossfall_enter_distance_up_line](#)



Depending on the crossfall, a default value for the distance up line is displayed. If the ground crossfall is greater than 1% the lot mid point is the suggested connection location. For crossfalls less than 1%, the connection is located 3m off the *lowest* lot boundary.

A pop-up also exists for placing the connection point at the distance 2.0, 3.0, 5.0 along the frontage, the mid point of the frontage, and the distances 2.0, 3.0 and 5.0 from the other end of the frontage.

The distance up line value is entered into the typed-input box, terminated with <enter>. The typed-input box is then removed from the screen.



Step 5 Defining the House Connection Type

[house_connection_edit_drain](#)

Next the **House Connection Edit** panel is placed on the screen.

Most of the values in the field come from the drainage house connection defaults.

The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Chainage up line <i>the chainage on the sewer string where the house connection is attached to the sewer line.</i>	input/output	chainage of connection	
Lot name <i>name of the house block</i>	input	from drainage defaults	
HCB # <i>a user supplied house connection branch (HCB) number</i>	input		
Material <i>the material used for the house connection.</i>	input	from drainage defaults	PVC, PVC X/HEAVY, VC
Bush required <i>the type of bush used</i>	input	no bush	no bush, PVC to VC
Connection type <i>the type of connection used. Go to the section "House Connection Types" for a description of each connection type</i>	input	from drainage defaults	A, A Special, B, C, OB, Special jump up
Connection side <i>the side of the line to make the connection</i>	input	right side	right side, left side
Connection length <i>length of pipe for the house connection</i>	input	from drainage defaults	
Connection level <i>height of the house connection. When this is first displayed, it is calculated using the invert level of the sewer pipe where the house connection is attached, the house connection type and connection length (if required by the house connection type), the default house connection grade, the default house connection cover and the surface level at the end of the house connection.</i>	input	calculated	
Try <i>using the parameters in the panel fields, create the house connection. Also calculate a section along the house connection and draw it in the drainage default section view.</i>	button		
Finish <i>end the option, remove the panel.</i>	button		

Step 5 Continued

After entering the appropriate values in the **House Connection Edit** panel and then selecting the **Try** button, the house connection will be created.

To help check the house connection parameters, a section along the house connection will automatically be calculated and displayed in the section view given in the drainage defaults panel. Any tins or models on the section view will be included in the section.

Step 6 Modifying the Connection

If any of the fields in the **House Connection Edit** panel are changed, selecting the **Try** button will modify the house connection and redraw the section in the default drainage section view.

Editing A House Connection

To edit an existing house connection, the **Edit** button is selected from the **House Connections** menu and then the appropriate house connection selected.

The **House Connection Edit** panel will then be placed on the screen with the details of the selected house connection.

If any of the fields in the **House Connection Edit** panel are changed, the **Try** is used button to modify the house connection and redraw the section in the default drainage section view.

Delete

The **Delete** option is used to delete a connection.

After selecting the option, the mouse is used to pick the house connection to be deleted.

Once a house connection has been selected and accepted, it is deleted and removed from the screen.

The **Delete** option is terminated by selecting **Cancel** from the **Pick Ops** menu, by selecting a new option from the **Drainage Edit** menu.

Delete all

The **Delete all** option is used to delete all connections.

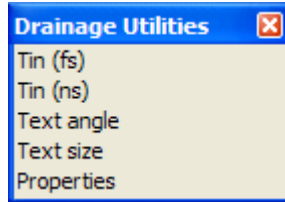
After selecting the option, all the connections are deleted and the option terminates.

Utilities

drainage_utilities

The options in the **Utilities** menu are used to modify default drainage tin, the name, colour, style and start chainage of the drainage string, and the size, angle, and offsets used when displaying the text for the names of all the manholes.

The **Drainage Utilities** walk-right menu is

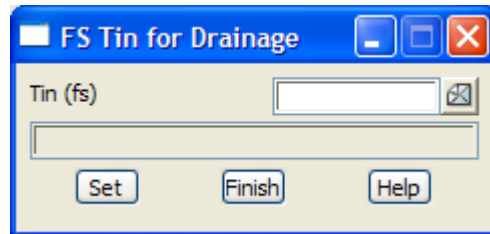


Tin (fs)

FS_tin_for_drainage

The **Tin (fs)** option changes the default finished surface tin (tin (fs)) for the drainage string.

After selecting the option, the **FS Tin for Drainage** panel is displayed.



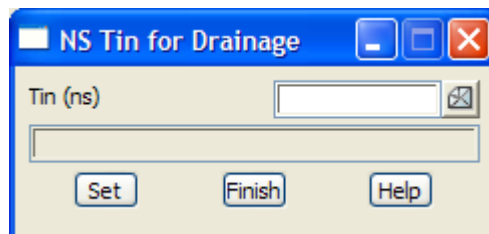
The existing default tin is displayed in the tin panel field. If a new tin is required, simply enter the new tin name into the tin (fs) field and select the **Set** button.

Tin (ns)

ns_tin_for_drainage

The **Tin (ns)** option changes the default natural surface tin (tin (ns)) for the drainage string.

After selecting the option, the **NS Tin for Drainage** panel is displayed.



The existing default tin is displayed in the tin (ns) panel field. If a new tin is required, simply enter the new tin name into the tin field and select the **Set** button.

Angle

The **Angle** option changes the angle of the text for manhole labels.

After selecting the option, an enter angle typed-input box is displayed on the screen containing the current

text angle.

The new angle is entered into the typed-input box, terminated with <enter>. The typed-input box then disappears.

The **Angle** option then terminates.

Size

The **Size** option is used to change the size of the text for manhole labels.

After selecting the option, an enter value typed-input box is displayed on the screen containing the current text size.

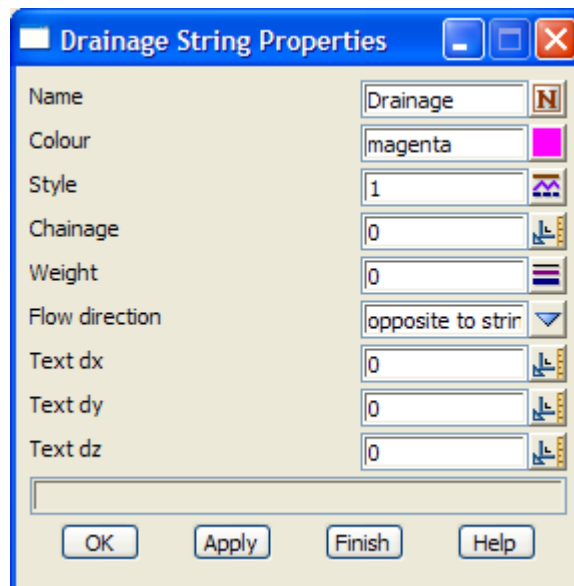
The new size is entered into the typed-input box, terminated with <enter>. The typed-input box then disappears.

The **Size** option then terminates.

Properties

[drainage_string_properties](#)

The **Properties** option brings up the **Drainage String Properties** panel for the current drainage string.



Any of the data in the panel fields can be modified and then set for the drainage string by selecting the **OK** or **Apply** button.

Z Float

The status of **Z Float** is used each time a new manhole is created.

If **Z Float** is set to tick, then the top of the manhole is set to z float which means that automatically sits on the default drainage tin.

If **Z Float** is not set to tick, then the top of the manhole is given a set z value when it is created.

The z float status of the manhole can be changed after it has been created by using the **Drainage Edit=>Manhole=>Z Float** option.

Reports

drainage_reports

Position of menu: Design =>Drainage-Sewer=>Reports

Reports menu contains an option to report on the property controls for the drainage strings and an option produce network quantities.

The **Reports** walk-right menu is



For the option *Network quantities*, please continue to the section “Network Quantities” .

Network report, please continue to the section “Network Report” .

Property control, please continue to the section “Property Controls” .

Barwon quantities, please continue to the section “Barwon Quantities” .

Barwon HC's, please continue to the section “Barwon House Connections” .

Barwon design checks, please continue to the section “Barwon Design Checks” .

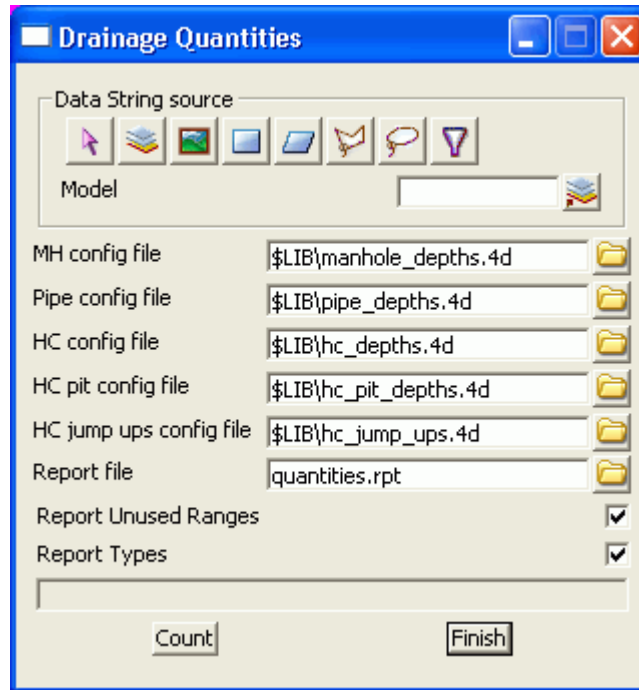
Barwon services reports, please continue to the section “Barwon Services Report”

Network Quantities

drainage_quantities_panel

The **Network quantities** report contains information about the manholes and pipes that make up the selected drainage strings. Configuration files allow the user to specify the depth ranges and sizes of pipes to report on

On selecting **Network quantities**, the **drainage quantities** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Data to check <i>data source type.</i>	choice box	Model	Model, View
Model/View to check <i>data source for the drainage strings to process.</i>			
Quantities config file <i>file giving the size ranges etc. to report on.</i>	file box		
Report file <i>name of the file for the report.</i>	file box		
Report unused ranges <i>if tick, any size ranges given in the config file that have no pipes are reported.</i>	tick box		
Report types <i>if tick, the manhole types are reported.</i>	tick box	tick	
Count <i>run the option.</i>	button		

Network Report

After selecting the **Network report** option, the **Report on Selected Items** panel is displayed.

This is the same as the option **Reports =>Co-ord/ Brd-dst** on the main menu.

For the given model, it prints out the string information for each string in the model.

If a sewer network model is given, each sewer string in the network model is reported on.

For further information, go to “Coordinates or Bearing-Distance” .

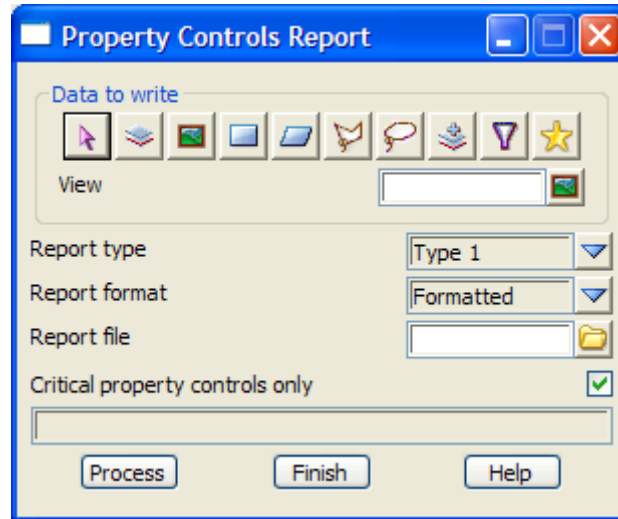
Property Controls

[property_controls_report](#)

Position of menu: Design =>Drainage-Sewer=>Reports=>Property Controls

The property controls report contains information about all the property controls for the selected drainage strings, and if required, denote the critical property control for a lot.

On selecting **property controls**, the **property controls report** panel is displayed.



The fields and buttons used in this panel have the following functions.

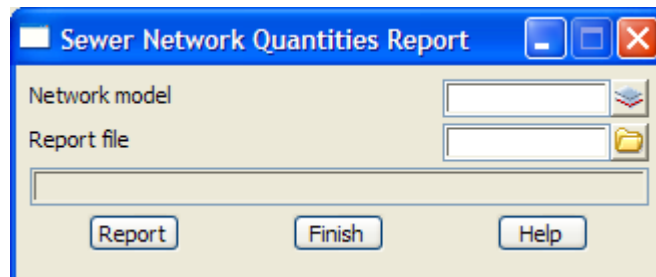
Field Description	Type	Defaults	Pop-Up
Data source type <i>data source type.</i>			
Data source <i>data source for the drainage strings to process.</i>			
Format <i>format for the property control report.</i>	choice box	ascii	ascii, excel spread sheet
Report file <i>name of the file for the report.</i>	file box		
Critical property controls only <i>if tick, only the critical property controls are reported.</i>	tick box	tick	
Process <i>run the option.</i>	button		

Barwon Quantities

[sewer_network_quantities_report](#)

The report generated from this option includes

- s the lengths of each pipe type for each line and the total length for each pipe type for all pipes in the network.
 - s the quantity of concrete used for the manholes in the network.
 - s the number and type of house connections in the network, including caps, bends and bushes.
- After selecting the **Barwon quantities** option, the **Sewer Network Quantities Report** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Network model <i>model containing the sewer strings.</i>			available models
Report file <i>name of the file for the report.</i>	file box		
Report <i>run the option.</i>	button		

Barwon House Connections

[sewer_house_connections_report](#)

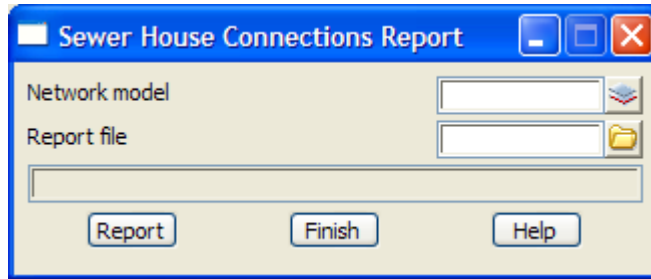
Position of menu: Design =>Drainage-Sewer=>Reports=>House connections

The house connections report contains information about all the house connections for the selected drainage (sewer) strings.

The house connection report includes for each house connection (branch) the

- s name of the sewer line
- s downstream manhole for the house connection
- s lot name
- s house connection number and type
- s chainage of the house connection
- s the invert level at the end of the house connection (IL branch)
- s the invert level of the house connection at the sewer pipe (IL sewer)
- s the drop over the house connection (branch depth)

On selecting **House connections**, the **Sewer House Connections Report** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Network model <i>model containing the sewer strings.</i>			available models
Report file <i>name of the file for the report.</i>	file box		
Report <i>run the option.</i>	button		

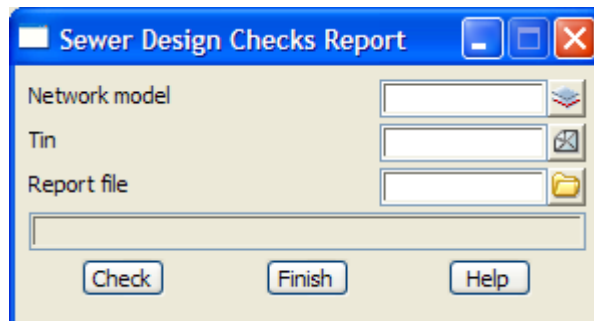
Barwon Design Checks

sewer_design_checks_report

The report generated from this option includes the design checks

- s network validations (checks that there are strings, no closed loops)
- s manholes don't have negative drops
- s other sewer lines connecting in don't have negative drops
- s sewers flows downhill with a minimum grade
- s manholes are not too close together (i.e. on top of each other)
- s a minimum cover for each sewer line
- s block controls are above the pipe invert level

After selecting the **Design checks** option, the **Sewer Design Checks Report** panel is displayed



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up

Network model		available models
	<i>model containing the sewer strings.</i>	
Tin		available tins
	<i>tin used for checking minimum cover against.</i>	
Report file	file box	
	<i>name of the file for the report.</i>	
Report	button	
	<i>run the option.</i>	

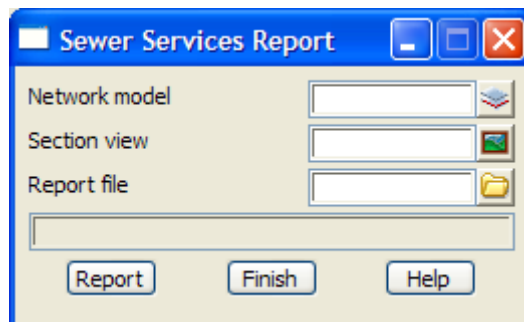
Barwon Services Report

sewer_services_report

For each sewer string in the network, this option generates a report which includes the

- s section through any tins on the section view
- s name and model of any services in the corridor defined by the section view
- s co-ordinates and chainages of the parts of the service in the corridor, and the chainage and offset for each of the point of the parts projected onto the sewer centre-line.
- s clearance at the point where any service goes under or over the sewer string.

After selecting the **Services report** option, the **Sewer Services Report** panel is displayed



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Network model			available models
	<i>model containing the sewer strings.</i>		
Section view			available section views
	<i>section view defining the corridor and service models.</i>		
Report file	file box		
	<i>name of the file for the report.</i>		
Report	button		
	<i>run the option.</i>		

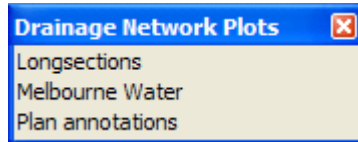
Drainage Plots

drainage_network_plots

Position of menu: Design =>Drainage-Sewer=>Plots

Currently the **Plots** menu contains an option to produce a long section including any HGL values, flows and user defined attributes read in from other sources, and a second option to output the network to Melbourne Water's sewer format.

The **Plots** walk-right menu is



The options **Longsections** and **Melbourne Water** will now be described in more detail.

For the option *Long sections*, please continue to the section "Drainage Longsections".

Melbourne Water, please continue to the section "Melbourne Water".

Drainage Longsections

new_plot_drainage_network drainage_plot_title

Position of menu: Design =>Drainage-Sewer=>Plots=>Longsections

The **Longsections** option is used to generate the longsection plots for all lines in a drainage network.

Given the plot sheet size and the horizontal and vertical scales, the longsections for the drainage lines are plotted starting at the top of the sheet and moving across the sheet. Once one row is full, if there is room the plot moves down the page and begins a new row. When a plot sheet is full, a new plot sheet is automatically begun.

Hence the drainage lines are plotted one after another on one or more plotter sheets.

The drainage lines are plotted in string name alphabetical order.

The drainage longsection plot includes

- s the manholes, drainage pipe and any house connections
- s the height of the finished surface at the manhole
- s manhole names and cover types
- s distances between manholes
- s the invert depth of the pipe on either side of a manhole
- s the grades and types of the pipes
- s any services in the corridor - including their name, invert level and distance from the nearest downstream manhole
- s if the information exists, the velocity, flow, HGL values and diagram

After selecting the **longsections** option, the **new plot drainage network** panel is displayed.

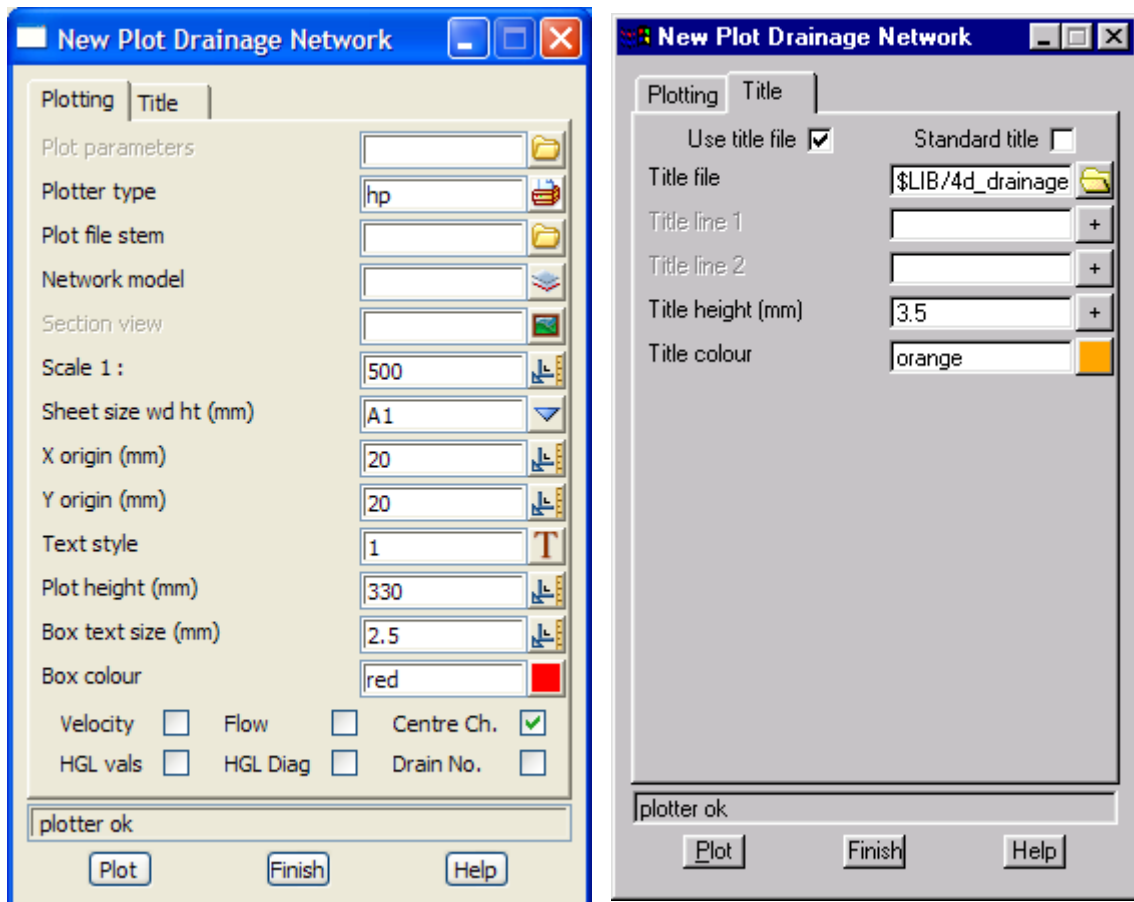
The drainage long section plot is tailored by using the plot parameter file (.ppf file) given in the plot parameters field. A default .ppf file is set by pointing to it with the environment variable

DRAINAGE_PPF_4D

path name of default .ppf file

In the path name to the default .ppf file, \$LIB is used to stand for the library folder set by LIB_4D. For example, "\$LIB/drainage.ppf" is the file drainage.ppf in the library area.

The **title** button on the bottom of this panel controls the use of a title block file and the plotting of a border and two lines of title. If the **title** button is selected, the **drainage plot title** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Plot parameters <i>file of plot parameters used for extra control of the long section plot.</i>	input		*.ppf
Plotter type <i>format for the plot output.</i>	input	hp	model, windows, hp, dxf, postscript etc.
Network model <i>the model containing all the drainage lines for the network.</i>	input		
Section view <i>the section view to be used to define the vertical exaggeration, corridor widths, tins to section through, services models to section etc.</i>	input		
Plot file stem <i>since more than one plot page may be produced, the plot file names are constructed from the stem plus a plot page sequence number, followed by the appropriate plotter type ending.</i>	input		
Scale 1:	input		

horizontal scale for plotting the drainage long section. The vertical exaggeration is taken from the section view given in the section view field.

Sheet size wd ht (mm)	input		available sheet sizes
	<i>the width and height values (separated by space) or the name of a user defined sheet size.</i>		
X origin (mm)	input		
	<i>the x position on the plot sheet for the bottom left hand corner of the longsection plots. Same as left_margin in the plot parameter file.</i>		
Y origin (mm)	input		
	<i>the y position on the plot sheet for the bottom left hand corner of the longsection plots. Same as bottom_margin in the plot parameter file.</i>		
Text style	input	1	available text styles
	<i>the default text style to use in the longsection plot.</i>		
Plot ht (mm)	input		
	<i>the maximum allowable height for a longsection plot for a drainage line. Datum breaks are applied to any part of the longsection that will not fit into the plot ht</i>		
Box text size (mm)	input	3	
	<i>size (in millimetres) to plot the chainages, heights etc. in the boxes in the plots of the drainage longsections</i>		
Box colour	input	cyan	available colours
	<i>colour used for the text and the boxes.</i>		
Velocity	tick-cross	tick	
	<i>if tick, the velocity values for the pipes are drawn on the longsection plot.</i>		
Flow	tick-cross	tick	
	<i>if tick, the flow values for the pipes are drawn on the longsection plot.</i>		
Centre CH.	tick-cross	tick	
	<i>if tick, the road centre line chainages are drawn on the longsection plot.</i>		
HGL vals	tick-cross	tick	
	<i>if tick, the HGL values for the pipes are drawn on the longsection plot.</i>		
HGL diag	tick-cross	tick	
	<i>if tick, lines joining the HGL values for the pipes are drawn on the longsection plot.</i>		
Drain No.	tick-cross	tick	
	<i>if tick, the drainage line names are drawn on the longsection plot.</i>		
Plot	button		
	<i>plot the drainage longsections for the drainage lines in the model given in the network model field.</i>		
The fields and buttons in the <i>title</i> tab are			
Use title file	tick-cross		
	<i>if tick, a user defined title block file is used.</i>		
Standard Title	tick-cross	tick	
	<i>if tick, the standard 12d Model border and two lines of title are placed on the bottom of the plot</i>		
Title file	input		*.tf

if *non-blank* and use title file is set to *tick*, then the file given in this field is used to generate a user defined title block for the plot.

Title line 1/2	input		
	<i>first/second line of title information</i>		
Title height (mm)	input	5	
	<i>height (in millimetres) to draw the characters in the two lines of title information.</i>		
Title colour	input	cyan	available colours
	<i>colour used for the border and the title information.</i>		

Please continue to the next section “Drainage Longsection Plot Parameter File” .

Drainage Longsection Plot Parameter File

The **Longsections plot** option is used to make special long section plots for a **network** of drainage strings. Some of the look of the drainage long section plot can be controlled from the **plot drainage network** panel itself, however a wider selection of control parameters is available by using a drainage long plot, plot parameter file.

The drainage long section plot parameters are placed in a file with ending **.ppf**.

Each parameter consists of a parameter name followed by one or more spaces and then the parameter value. There is only one parameter per line.

Anything on a line after a double forward slash// is considered to be a comment.

The set of all parameters for the drainage long section plot is enclosed within a set of curly brackets { } with the header

```
drainage_long_plot "plot set name"
```

before the curly brackets.

That is,

```
drainage_long_plot "plot set name" {
    plot parameters
    one per line
}
```

If there is more than one *drainage_long_plot* parameter set in the file, only the first set is used.

There may also be parameter sets for other plot types such as *section_x_plot* in the same file. The other sets will be ignored when doing a drainage long section plot.

The plot parameters are documented in following groups:

For the *Plot Sheet layout*, please continue to the section “Plot Sheet Layout” .

Labelling the drainage string name, please continue to the section “Labelling the Drainage String Name on the Plot” .

Boxes area, please continue to the section “Boxes Area” .

Chainages and uprights, please continue to the section “Chainages and Uprights” .

Staggering, please continue to the section “Staggering of Chainages and Uprights” .

Below datum area, please continue to the section “Below Datum Area” .

Arrows area, please continue to the section “Arrow Areas” .

Grade arrows parameters, please continue to the section “Parameters for the Arrows for Grades of the Pipes” .

Pipe diameter arrows parameters, please continue to the section “Parameters for the Arrows for Diameters of the Pipes” .

Pipe velocity arrows parameters, please continue to the section “Parameters for the Arrows for Velocity in the Pipes” .

Pipe flow arrows parameters, please continue to the section “Parameters for the Arrows for Flow in the Pipes” .

Drainage line name arrows parameters, please continue to the section “Parameters for the Arrows giving the Drainage Line Name” .

User defined pipe arrows parameters, please continue to the section “Parameters for the Arrows for User Defined Pipe Attributes” .

Graph area parameters, please continue to the section “Graph Area” .

Top area parameters, please continue to the section “Top Area” .

Bubbles area parameters, please continue to the section “Manhole name, Manhole Types and Surrounding Bubbles” .

Change of direction parameters, please continue to the section “Change of Direction Through Pits and Junctions” .

Symbols at manhole parameters, please continue to the section “Symbols at Manholes” .

House connection parameters, please continue to the section “Labelling House Connections”

Symbols at Property controls parameters, please continue to the section “Symbols at Property Controls” .

Property controls parameters, please continue to the section “Labelling Property Controls” .

Hatching cut and fill parameters, please continue to the section “Hatching Cut and Fill Areas” .

Labelling cuts parameters, please continue to the section “Labelling Cuts of Drainage Through Strings in a Model” .

Title block parameters, please continue to the section “Title Block Information” .

Panel modifying parameters, please continue to the section “Parameters that Modify Fields In the Plot Drainage Network Panel” .

Plot Sheet Layout

The plot sheet is considered to have only positive co-ordinates with the origin (0,0) in the left hand corner. The units for the plot are millimetres.

The overall size of the plot sheet is given by either a defined sheet size, or by the width and height of the plot given in millimetres and separated by one or more spaces.

```
sheet_size          text          // sheet name, or
                    "mm mm"      // sheet size: width height
```

The sheet size name and width and heights can be specified by the user in a file named sheets.4d which is in the normal set up areas, or is pointed to by the environment variable

```
SHEET_SIZES_4D     file          // file of plotter sheets sizes
```

The plotting area is restricted to within the plot sheet by giving the margins

```
left_margin        mm
right_margin       mm
top_margin         mm
bottom_margin      mm
```

The drainage long section plot will break an individual plot up if it doesn't fit across the sheet. There can be one or more rows of plot on the same sheet.

The top row is done first, followed by the second top row, then the third and so on until the bottom row. If there is only one row, it is considered to be the bottom row.

When a sheet is full, a follow on sheet is created.

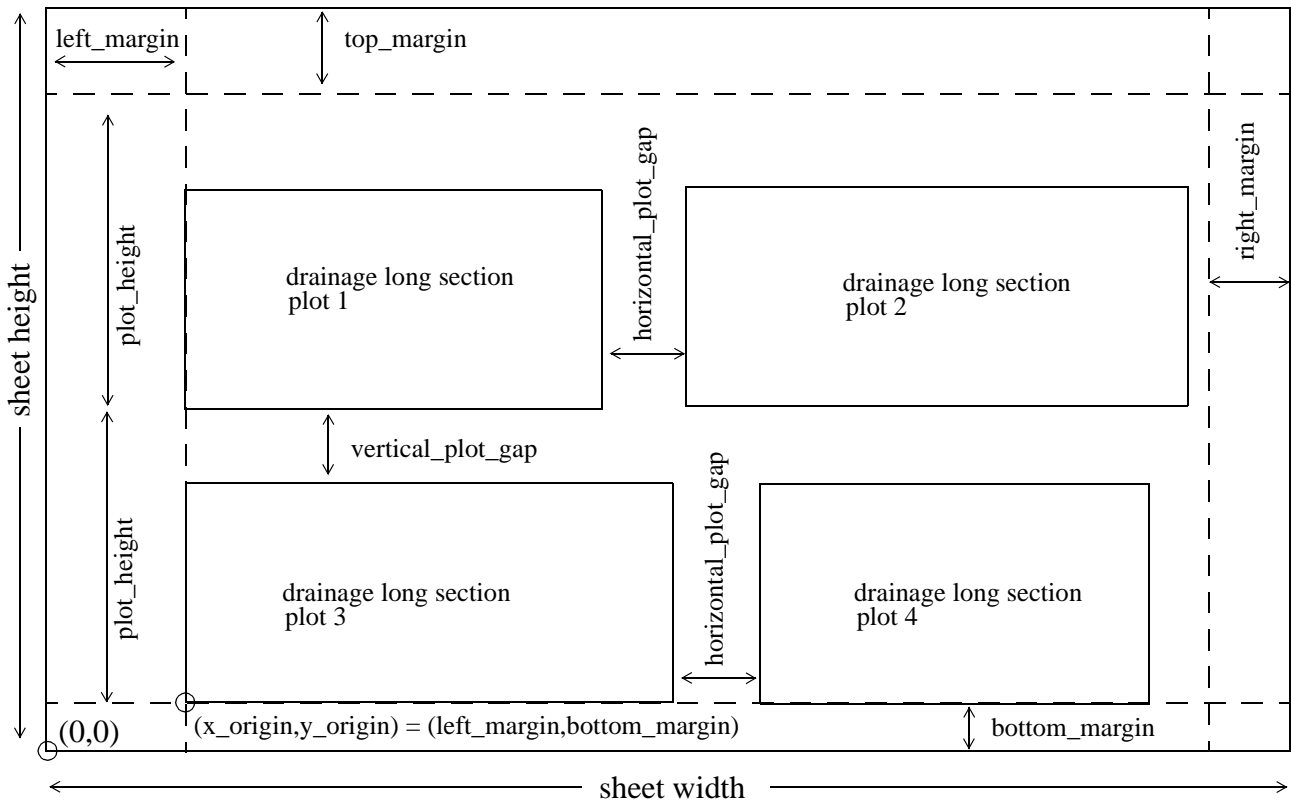
As soon as one drainage string is completed, the next drainage string in the network model is plotted beginning on the same row as the previous drainage string and with a horizontal gap of size *horizontal_plot_gap* between the plots. If there is not enough room on the row to start the next plot, it will

begin on a new row.

The position of the left hand bottom corner of the first plot in the bottom row is given by the parameters, x_origin and y_origin which are the same as $left_margin$ and $bottom_margin$ respectively.

If there are two or more rows of plots, the position of the first plot in each row is given by adding multiples of the $plot_height$ to the y_origin ($bottom_margin$).

network_model	text	// model of drainage strings
x_origin	mm	// Position of the left hand bottom, // same as <i>left_margin</i> .
y_origin	mm	// corner of first plot in the bottom row, // same as <i>bottom_margin</i> .
only_one_line	0 1	// more than one row on a sheet // only one row of plot on a sheet
plot_height	mm	// total height of a plot row. // It includes the <i>vertical_plot_gap</i> .
horizontal_plot_gap	mm	// gap between plots on same row
vertical_plot_gap	mm	// gap between rows of plots, // also the size of the top area



The drainage long plot itself consists of eleven areas. From the bottom up, they are drainage string name, boxes, below datum, arrow 1, bottom stagger, arrow 2, graph, arrow 3, top stagger, arrow 4, top.

The **drainage string name area** is where the name of the drainage string can be plotted.

The **boxes area** is where the chainages and various values for the drainage strings are labelled.

The **below datum area** is a region between the boxes area and the datum line.

The **arrow 1 area** is for drawing arrows where the arrows go between the staggered uprights and below the graph area. The datum line is at the bottom of the arrow 1 area.

The **bottom stagger area** is where the upright line staggers occur before going up from the boxes area to the graph area.

The **arrow 2 area** is for drawing arrows below the graph but where the arrows go between non-staggered uprights.

The **graph area** is the area where the actual plots of the strings are drawn.

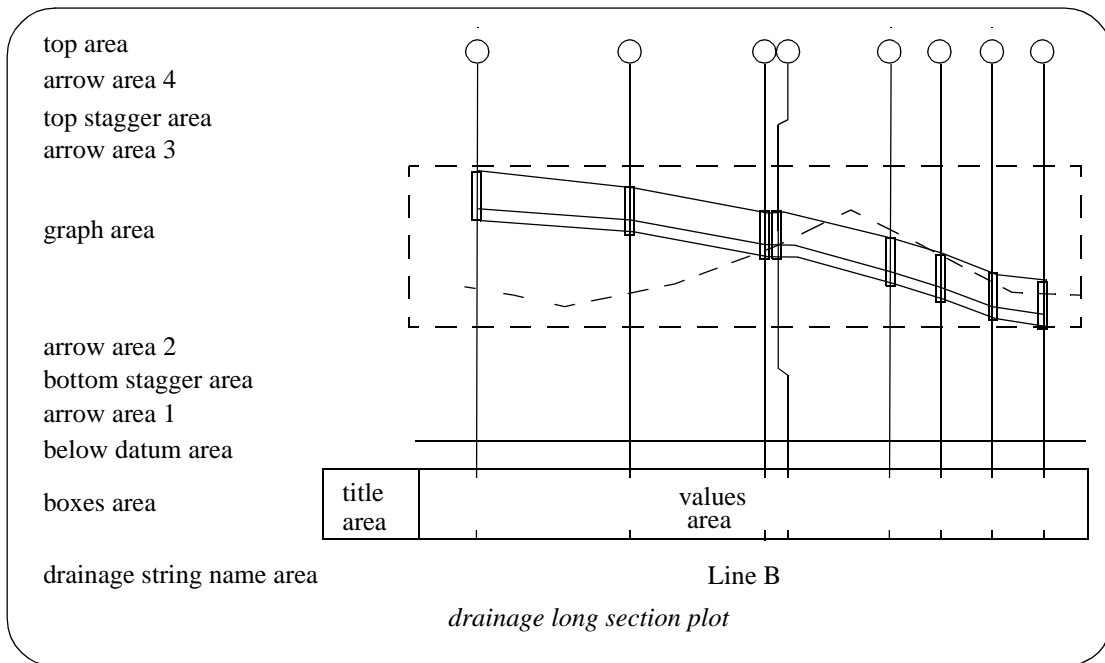
The **arrow 3 area** is for drawing arrows above the graph area and where the arrows go between non-staggered uprights.

The **top stagger area** is where the upright line staggers occur above the graph area.

The **arrow 4 area** is for drawing arrows where the arrows go between the staggered uprights and above the graph area.

The **top area** is an annotation area above the arrow 4 area and is used for bubbles, manhole names (pit names), junctions, deflection angles etc.

The areas and the information in them will now be described in more detail.



Labelling the Drainage String Name on the Plot

The plot can be labelled with the name of the drainage string under the boxes area.

The name is made up of concatenation the text strings:

plot_name_pre_text drainage-string-name plot_name_post_text

The plot name is positioned under the boxes.

```

plot_name_mode            0                    // don't use the drainage string name
                          1                    // use the drainage string name in the
                                                                 // label

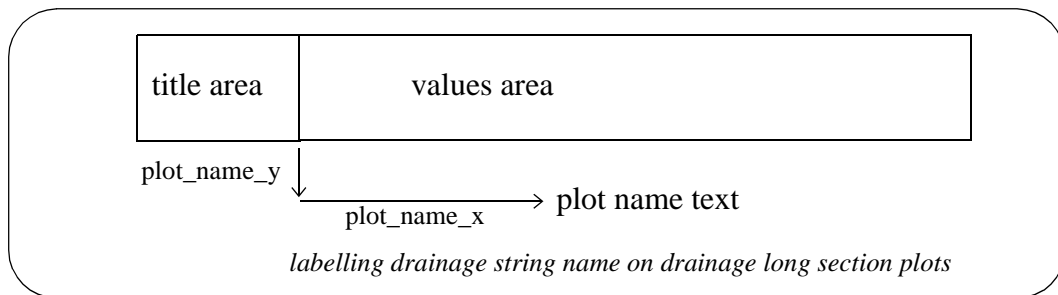
plot_name_pre_text        text
plot_name_post_text       text
plot_name_textstyle       textstyle
plot_name_text_size       mm
plot_name_text_colour     colour
plot_name_x               mm
plot_name_y               mm

```

The *plot_name_x* is measured from the beginning of the height boxes.

The default for *plot_name_x* is centred on the values area.

The *plot_name_y* is measured from the bottom of the box area with positive being **down**.



Example of Labelling Drainage String Name

```

plot_name_pre_text    "Drainage Long Section Plot for String"
plot_name_mode        1
plot_name_post_text    ""
plot_name_text_size    15
plot_name_text_colour  red
plot_name_textstyle    ISO
plot_name_y            30

```

Boxes Area

Many of the drainage string values (invert levels and depth, hgl values, natural and finished surface etc.) can be labelled in the boxes area at the bottom of the drainage long section plot.

Each type of information is plotted in a row made up of a title, and the actual values given at the chainage of each pit in the drainage string.

Each row of information is surrounded by lines to form a box, and the stacked boxes form the boxes area at the bottom of the drainage plot.

The **title** for the information, is drawn in the **title area** of the **boxes area** and the values are drawn in the **values area** of the **boxes area**.

Consequently the boxes area is made up of rows of text consisting of:

title followed by the **values** along the drainage string.

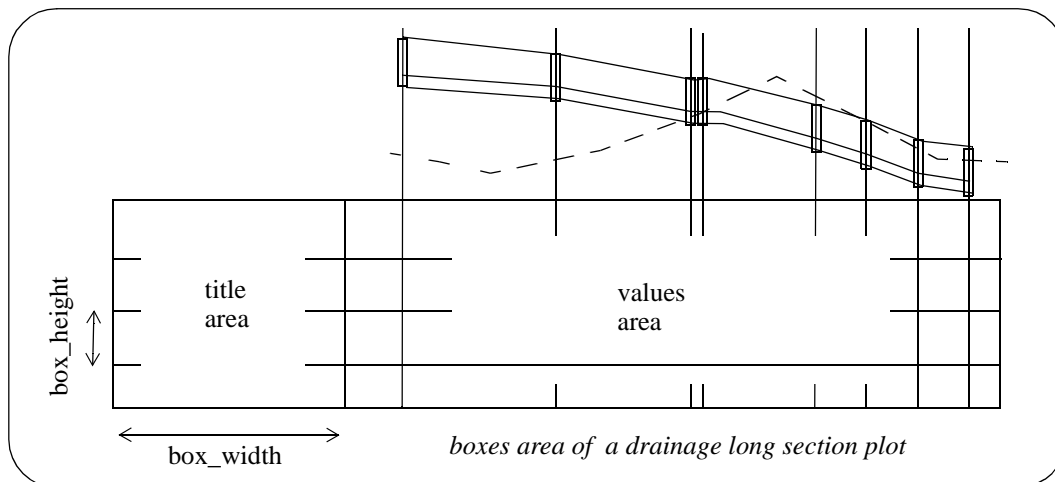
The **titles area** for the left plot in the bottom row starts at the co-ordinate (x_origin, y_origin) and each row is begun by adding the distance *plot_height* to the y_origin (see previous section).

The width of the **title area** is given by the **box_width** parameter and the height of each box is given by **box_height**.

```

box_width          mm          // width of the label boxes.
box_height         mm          // height of each box

```



The colour of the box line work is given by:

```

box_colour         colour      // colour of the lines in the boxes

```

A default text size and colour can be specified for the title text and the values, or sizes, colours and text styles can be given for each individual box (given later in this section).

```

title_box_text_size  mm          // size of title text in boxes
title_box_text_colour colour     // colour of title text in boxes
box_text_size       mm          // size of value text in boxes
box_text_colour     colour     // colour of values in boxes

```

The values text is written at right angles to the bottom of the boxes. It can be either top or bottom justified with respect to the box (*box_text_left_justify*).

The values text can be on the left, right or centred on the uprights and is given by the parameter *box_text_side*.

The width of the values area is determined by the number of chainages to be labelled and whether the values are staggered to prevent over writing (see next section).

```

box_text_left_justify      0           // top justify text in values area
                           1           // bottom justify text in values area

box_text_side              0           // left (default)
                           1           // right
                           2           // centre

```

The default order of the boxes from the bottom up is

0. drainage string chainages
1. road centre line chainages - user choice
2. natural surface heights - user choice
3. finished surface heights - user choice
4. before pit and after pit invert levels
5. before pit and after pit hgl values - user choice
6. before pit and after pit depth to inverts - user choice

There are parameters to change the order for 1-6.

Drainage string chainages is fixed at the bottom (box 0) but what is in the boxes above box 0 is can be set by the *box_n* parameters:

```

box_n          number_from_list      // the n'th box above the drainage string
                                           // chainages will contain given item number
                                           // from the list.

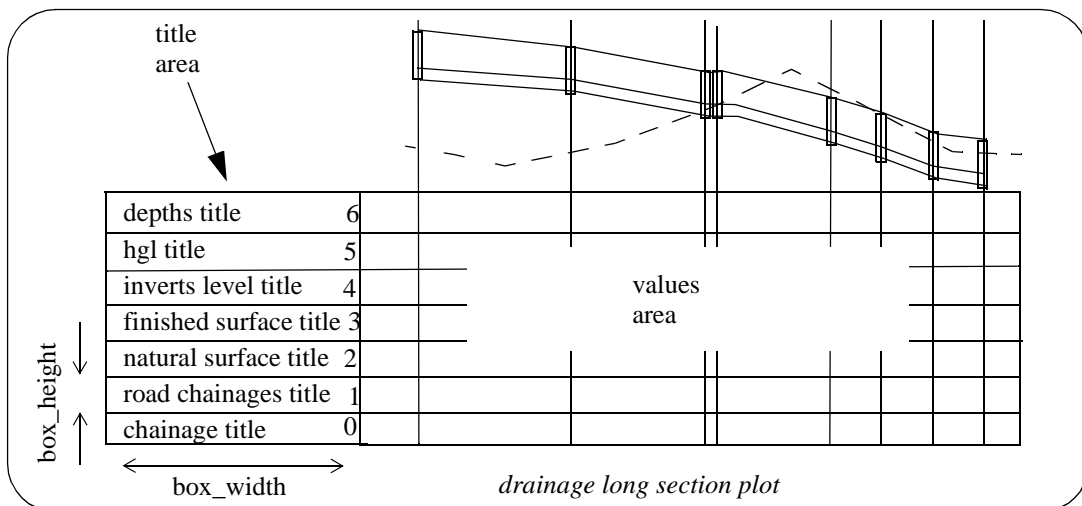
```

For example, to have *finished surface heights* in the first box the drainage string chainages, use:

```

box_1          3           // the (1) will be replaced by (3)

```



```

chainage_box_size          mm           // box height for chainage box
centre_chainage_box_size  mm           // box height for centre chainage box
surface_box_size           mm)         // box height for surface box
f_surface_box_size         mm           // box height for finished surface box
invert_height_box_size     mm           // box height for invert height box
hgl_box_size               mm           // box height for hgl box
invert_depth_box_size      mm           // box height for invert depth box

```

The default for each box size is *box_height*

The boxes (1), (2), (3) and (5) can be suppressed by the parameters

```

draw_centre_chainage      0/1          // 0 = don't have centre line chainages

```

		// box
draw_ns_text	0/1	// 0 = don't draw ns values from // ns tin for drainage string
draw_fs_text	0/1	// 0 = don't draw fs values from // fs tin or top of manhole // for drainage string
draw_fs_mode	0	// 0 = fs_text is from fs tin
	1	// 1 = fs_text is top of manhole
draw_hgl_value	0/1	// 0 = don't have hgl value boxes

The definition of depth to invert and whether box (6) is suppressed or not, are given by the parameter *depth_mode*:

depth_mode	0	// don't draw depth to invert values
	1	// draw depth to invert values to fs tin // for drainage string
	2	// draw depth to invert values to top of // manhole for drainage string
	3	// draw depth to invert values to ns tin // for drainage string

The default for the number of decimal places used in the values in the boxes is:

number_of_decimals	<i>integer</i>	// default number of decimal places
--------------------	----------------	-------------------------------------

The text, size, colour and textstyle for the title text and values text for each box can be set by

(0) drainage string chainages

plot_title_chainage_name	<i>text</i>	// first line of title for chainages box
plot_title_chainage_name_2	<i>text</i>	// second line of title for chainages box
chainage_title_colour	<i>colour</i>	// colour of text
chainage_title_text_size	<i>mm</i>	// size of title in chainage box
chainage_title_textstyle	<i>textstyle</i>	// textstyle for title in chainage box
chainage_text_colour	<i>colour</i>	// colour of chainage values
chainage_text_size	<i>mm</i>	// size of values
chainage_textstyle	<i>textstyle</i>	// textstyle of values
chainage_decimals	<i>integer</i>	// number of decimal places in chainage

(1) road centreline chainages

plot_title_centre_chainage_name	<i>text</i>	// title for road centre // line chainages box
plot_title_centre_chainage_name_2	<i>text</i>	// second line of title for road // centre line chainages box
chainage_title_colour_cl	<i>colour</i>	// colour of text
chainage_title_text_size_cl	<i>mm</i>	// size of title in cl box
chainage_title_textstyle_cl	<i>textstyle</i>	// textstyle for title
chainage_text_colour_cl	<i>colour</i>	// colour of cl values
chainage_text_size_cl	<i>mm</i>	// size of values
chainage_textstyle_cl	<i>textstyle</i>	// textstyle of values
chainage_cl_decimals	<i>integer</i>	// number of decimal places in chainage cl

(2) natural surface values

plot_title_surface_name	<i>text</i>	// title for the drainage ns values box
plot_title_surface_name_2	<i>text</i>	// second line of title for drainage ns values
ns_title_colour	<i>colour</i>	// colour of text
ns_title_text_size	<i>mm</i>	// size of title in ns box
ns_title_textstyle	<i>textstyle</i>	// textstyle for title
ns_text_colour	<i>colour</i>	// colour of ns values
ns_text_size	<i>mm</i>	// size of values

```

ns_textstyle          textstyle          // textstyle of values
ns_decimals          integer          // number of decimal places in ns

```

(3) finished surface values

```

plot_title_finished_name      text          // title for the drainage fs values box
plot_title_finished_name_2    text          // second line of title for drainage fs values
fs_title_colour              colour        // colour of text
fs_title_text_size           mm           // size of title in fs box
fs_title_textstyle           textstyle     // textstyle for title
fs_text_colour               colour        // colour of ns values
fs_text_size                 mm           // size of values
fs_textstyle                 textstyle     // textstyle of values
fs_decimals                  integer       // number of decimal place in fs

```

(4) invert levels

```

plot_title_invert_name        text          // title for the invert levels box
plot_title_invert_name_2      text          // second line of title for the invert levels box
il_title_colour              colour        // colour of text
il_title_text_size           mm           // size of title in il box
il_title_textstyle           textstyle     // textstyle for title
il_text_colour               colour        // colour of il values
il_text_size                 mm           // size of values
il_textstyle                 textstyle     // textstyle of values
il_decimals                  integer       // number of decimal places in il

```

(5) hgl values

```

plot_title_hgl_name          text          // title for hgl values box
plot_title_hgl_name_2        text          // second line of title for hgl values box
hgl_title_colour             colour        // colour of text
hgl_title_text_size          mm           // size of title in hgl box
hgl_title_textstyle          textstyle     // textstyle for title
hgl_text_colour              colour        // colour of hgl values
hgl_text_size                mm           // size of values
hgl_textstyle                textstyle     // textstyle of values
hgl_decimals                 integer       // number of decimal places in hgl

```

(6) depths

```

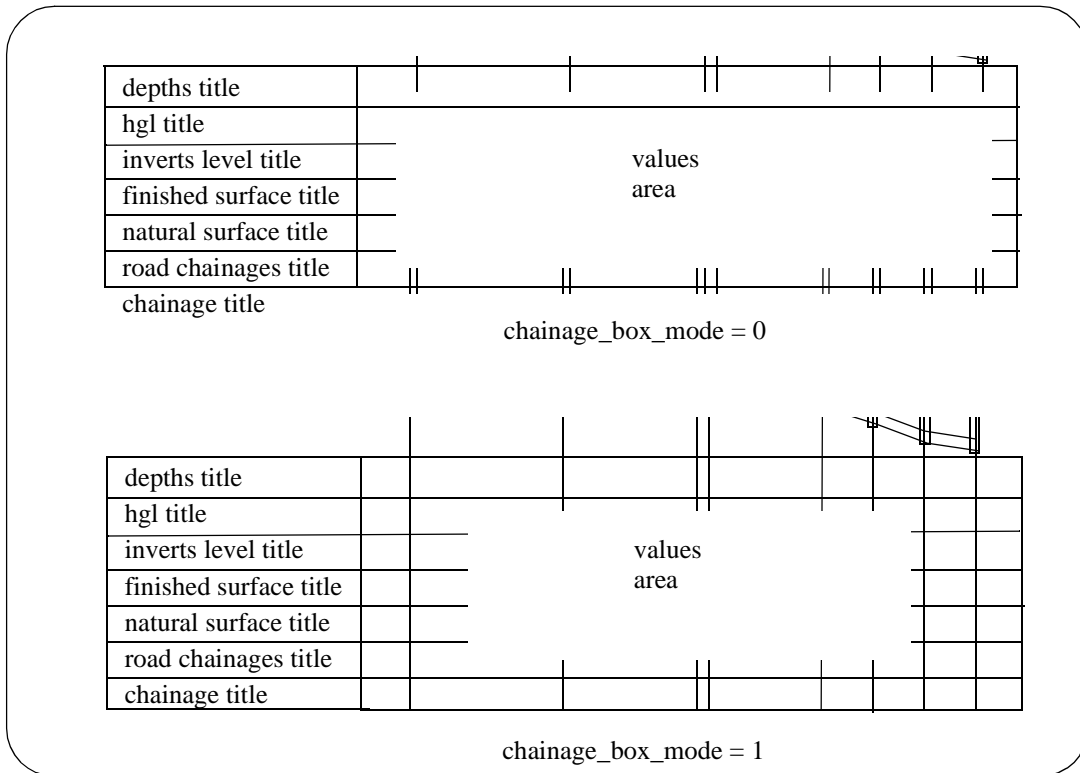
plot_title_depth_name        text          // title for depth of inverts box
plot_title_depth_name_2      text          // second line of title for depth of inverts box
depth_title_colour           colour        // colour of text
depth_title_text_size        mm           // size of title in depth box
depth_title_textstyle        textstyle     // textstyle for title
depth_text_colour            colour        // colour of depth values
depth_text_size              mm           // size of values
depth_textstyle              textstyle     // textstyle of values
depth_decimals               integer       // number of decimal places in depth

```

Drawing the Boxes

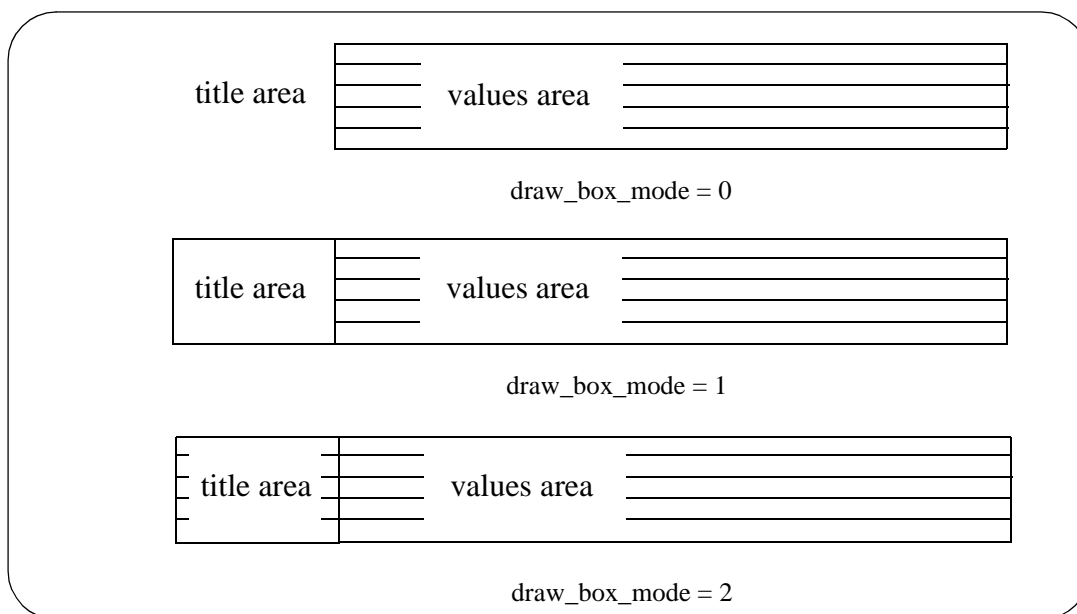
The bottom line from the boxes can be drawn or not drawn:

```
chainage_box_mode    0           // don't draw the bottom line
                    1           // draw all the box line work - default
```



A box can be drawn/not drawn around the title area of the boxes area.

```
draw_box_mode       0           // don't draw the title area box
                    1           // draw the title area box, no lines - default
                    2           // draw title box area with lines
```



Chainages and Uprights

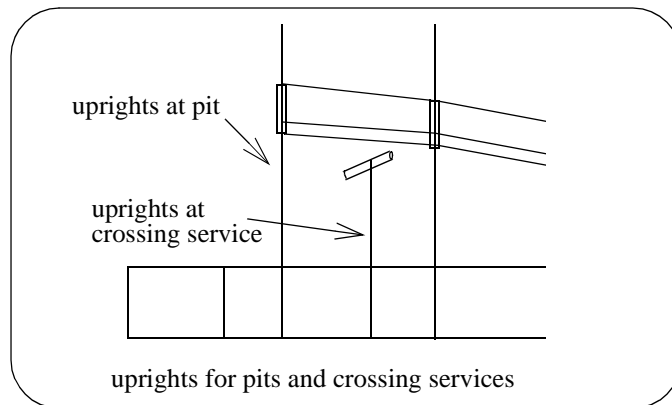
The chainage box contains drainage string chainages for

- the chainages of each pit in the drainage string
- the chainages on the drainage string where any strings in models on the section view are **cut** by the drainage string (crossing services)

For a **pit**, the invert levels, depths, finished and natural surface levels, and hgl of pipes at a pit can all be labelled at the chainage of the pit.

For a **crossing service**, the level of the crossing service and the chainage on the drainage string where the crossing occurs are labelled.

Note - crossing services can also be labelled using cuts of drainage line through strings. However, this does not create a chainage in the chainage box.

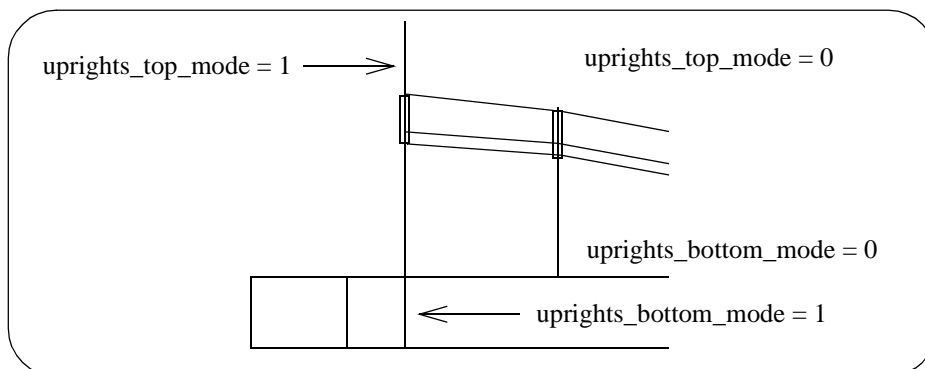


Uprights, or leader lines, can be drawn from the chainage values at the bottom of the boxes to the pit in the graph area, and from the top of the pit to the top area.

Using the parameters *uprights_top_mode* and *uprights_bottom_mode*, it is possible to suppress the drawing from the top of the pit to the top area, and also from the top of the boxes to the bottom of the boxes.

<i>uprights_top_mode</i>	<i>0</i>	// stop at top of pit
	<i>1</i>	// go to top area (default)
<i>uprights_bottom_mode</i>	<i>0</i>	// stop at top of boxes
	<i>1</i>	// go to bottom of boxes (default)

Also uprights can be drawn from the chainage values bottom of the boxes to the crossing service in the graph area.



The chainage values at the uprights for the pits can be running chainage along the drainage string, pipe length chainages (i.e. the chainage starts at zero for each pipe) or both.

chainage_mode	0	//pipe length chainage
	1	// running chainage
	2	// both pipe length and running

If the *chainage_mode* includes "pipe length chainage" (modes 0 and 2), the pipe length can either be labelled with a 0.0 chainage at the start pit for the pipe and the pipe length at the end pit, or just have the length centred between the two pits.

centre_pipe_length	0	// default - 0 at start pit, length at end pit
	1	// centre pipe length

The chainage values for the crossing services can be running chainage along the drainage string, chainage length from the previous pit (i.e. the chainage starts at zero at the previous pit) or both.

service_chainage_mode	0	//pipe length chainage
	1	// running chainage
	2	// both pipe length and running

The colour of the uprights for the pits and crossing services are given by:

manhole_line_colour	<i>colour</i>	// colour of uprights to the pits
service_line_colour	<i>colour</i>	// colour of upright to the crossing // services

The crossing services are labelled with the drainage string chainage of the crossing point, the invert level of the service at the crossing and the name of the service which is made up of:

service diameter name of service invert level at the service at the crossing.

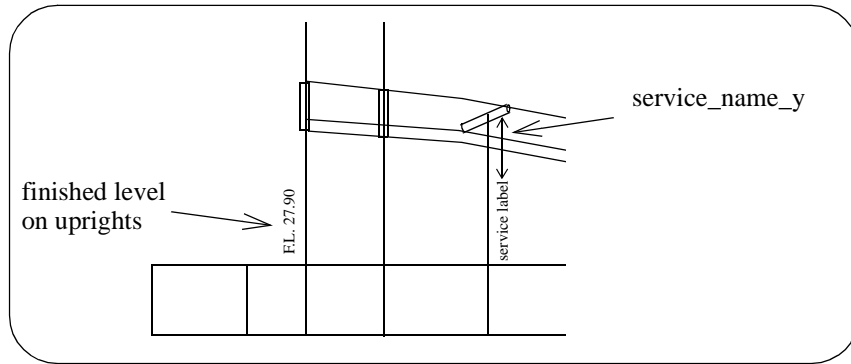
The service label is drawn the distance *service_name_y* below the crossing point:

service_name_y	<i>mm</i>	// def 1, distance of label below crossing point
----------------	-----------	--

The colours, text styles and sizes of the service information is specified by:

service_ch_text_colour	<i>colour</i>	// colour of services ch text
service_ch_text_size	<i>mm</i>	// size of services ch text
service_ch_textstyle	<i>mm</i>	// textstyle of services ch text
service_il_text_colour	<i>colour</i>	// colour of services il text
service_il_text_size	<i>mm</i>	// size of services il text
service_il_textstyle	<i>mm</i>	// textstyle of services il text
service_name_text_colour	<i>colour</i>	// colour of services name
service_name_text_size	<i>mm</i>	// size of services name
service_name_textstyle	<i>mm</i>	// textstyle of services name
service_name_decimals	<i>integer</i>	// number of decimal is il in name

A **finished surface** value or **top of manhole** value can also be written vertically along the uprights.



Whether the value is finished surface level or top of manhole level, the values position, size, colour etc. is controlled by the parameters:

```

draw_fs_vertical      0           // don't draw fs vertical values
                    1           // always draw values
                    2           // only draw values when different -see
                               // draw_fs_vertical_mode

draw_fs_vertical_mode 0           // the fs value is the value from the fs tin
                               // for the drainage string.
                               // When draw_fs_vertical is 1,
                               // always draw the fs value.
                               // When draw_fs_vertical is 2,
                               // only draw fs value when it is
                               // different from the top of manhole value
                    1           // the fs value is the top of manhole
                               // for the drainage string.
                               // When draw_fs_vertical is 1,
                               // always draw the fs value.
                               // When draw_fs_vertical is 2,
                               // only draw fs value when it is
                               // different from the value of the fs tin.
    
```

		draw_fs_vertical_mode	
		0	1
draw_fs_vertical	0	nothing	nothing
	1	fs tin	top of manhole
	2	fs tin when different from top of manhole	top of manhole when different from fs tin

```

fs_vertical_pre_text  text           // text before the vertical fs value
fs_vertical_post_text text           // text after the vertical fs value
fs_vertical_decimals integer        // number of decimals in vertical fs
fs_vertical_colour   colour         // colour of the vertical fs text
fs_vertical_size     mm             // size of the vertical fs text
fs_vertical_textstyle textstyle     // textstyle of the vertical fs
fs_vertical_x        mm             // x adjustment to position of text
fs_vertical_y        mm             // y adjustment to position of text
    
```

Staggering of Chainages and Uprights

If the text values are placed at the real chainage positions at the bottom of the plot, text over writing can easily occur if the chainages are very close together.

To prevent such over writing, the text can be **staggered**.

That is, if the text is going to over write a previous text value, the next text value is actually moved along until there is no over writing.

Since the text is no longer at the correct chainage position, the uprights to the pits and services start at the text position and then bend back to the correct chainage position on the plot. The region where the bending occurs is called the stagger area.

For the drainage plot, there is an area below the graph where the uprights bend backwards from the staggered text position to the real chainage position (bottom stagger area).

And there is a second area above the graph where the uprights bend forwards from the real chainage position to the staggered text position (top stagger area).

Hence annotation above the top stagger area will line up with the staggered values below the bottom stagger area.

The stagger area below the graph area is defined by

stagger_height_1	mm	// distance from the top of arrow_area_1 // to the start of the staggers
stagger_height_2	mm	// distance over which stagger occurs
stagger_gap_bottom	mm	// distance from end of staggers to the // bottom of arrow_area_2

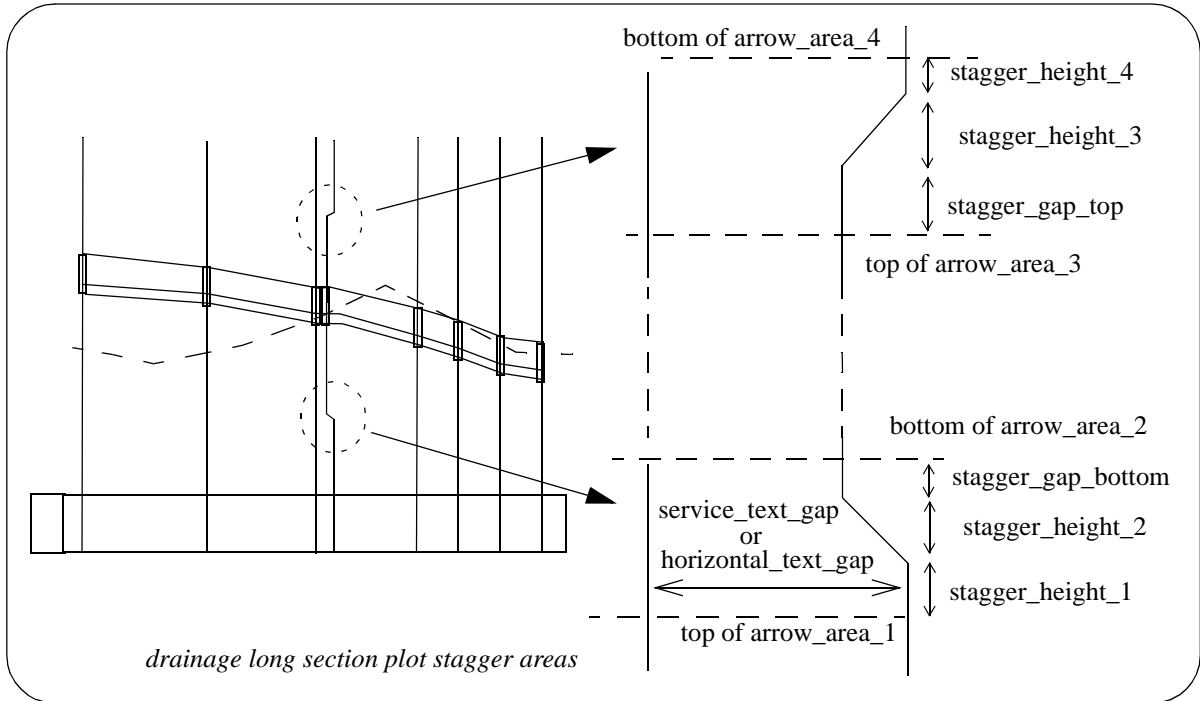
The stagger area above the graph area is defined

stagger_gap_top	mm	// distance from the top of arrow_area_3 // to the start of the staggers
stagger_height_3	mm	// distance over which stagger occurs
stagger_height_4	mm	// distance from end of staggers to the // bottom of arrow_area_4

The distance to be left for text to avoid over writing is:

horizontal_text_gap	mm	// minimum distance to leave for text // after pit values
service_text_gap	mm	// minimum distance to leave for text // after service values

When staggering occurs, it is possible for the values area to be longer than the graph area.

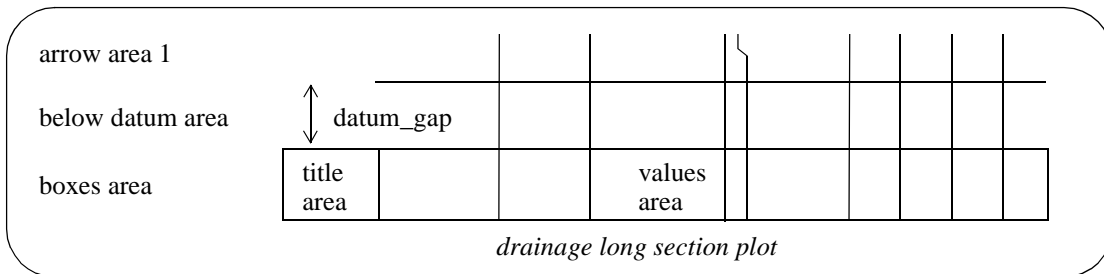


Below Datum Area

The **below datum area** is the region between the boxes area and the arrow_1 area. The datum line is drawn at the top of the below datum area.

The size of the below datum area is

```
datum_gap          mm          // height of the below datum area
```



The datum value is placed above the datum line, preceded by a datum name on the left hand side of the title area.

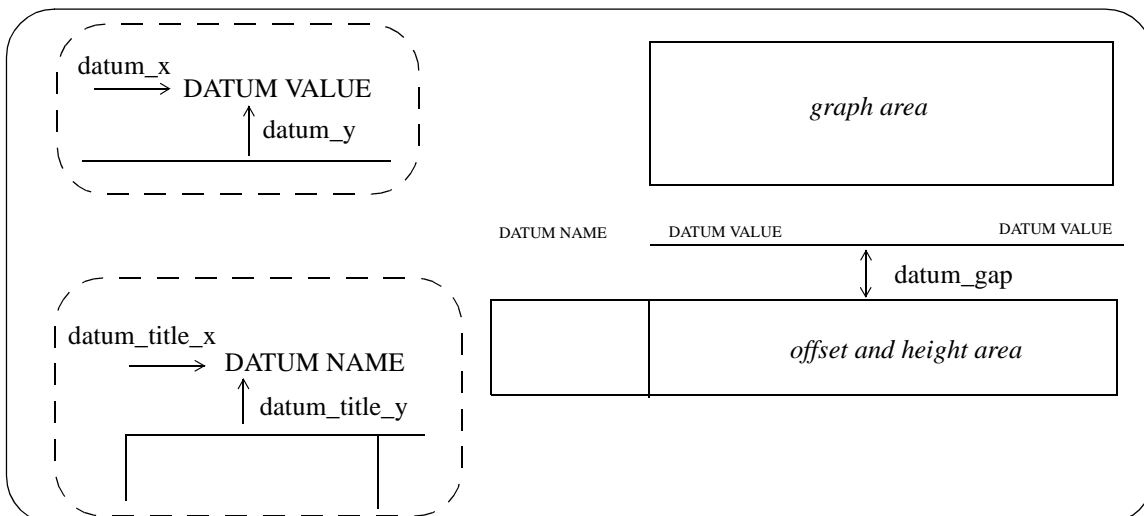
Since the datum value is automatically calculated to try and fit the plot vertically into the graph area, the datum value can change along the plot. When a datum change occurs, the new datum value is written on the datum line at the relevant chainage position.

The datum name, text size, colour and position are controlled by:

```
datum_name          text          // datum title
datum_title_x       mm           // distance to write name from lhs
datum_title_y       mm           // distance above datum line
datum_title_textstyle textstyle  // textstyle of name
datum_title_text_size mm         // text size
datum_title_colour  colour       // text colour
```

The datum value, number of decimal places, text size, colour and position are controlled by:

```
datum_decimals      integer      // number of decimal places in datum value
// >0 drop trailing zeros after decimal point
// < 0 keep trailing zeros
datum_x             mm           // x dist. to write value from manhole
datum_y             mm           // y dist. to write value above datum line
datum_text_size     mm           // size of datum value
datum_textstyle     textstyle    // textstyle for datum
datum_text_colour   colour       // colour of the datum text and line
```



Arrow Areas

Apart from information labelled in the boxes and top areas, the drainage long section plot can place arrows between pits for other information such as

- (a) pipe grade or slope
- (b) pipe diameter
- (c) velocity
- (d) flow
- (e) drainage line name
- (f) user defined pipe attributes

A specific arrow area is defined for each set of arrows.

The **arrow areas** are designed for drawing and labelling arrows between pits.

All the values refer to pipes connecting adjacent pits and the relevant pipe is indicated by drawing an arrow between the uprights from the chainage text to the pits.

Because staggering of the chainage text can occur, the position of the uprights to draw the arrows between can vary depending on whether the arrow is above or below a stagger area.

Hence, there are four arrow areas:

arrow area 1 which is below the graph and the bottom stagger area. The arrows go between the *staggered* chainage positions of the pits.

The datum line is at the bottom of arrow 1 area.

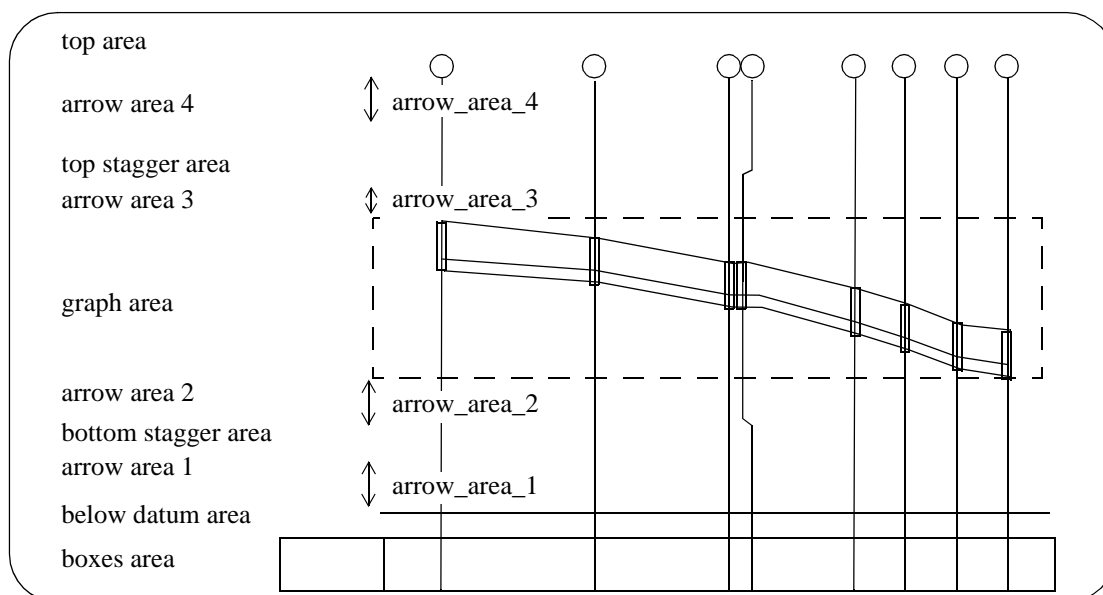
arrow area 2 which below the graph but above the bottom stagger area. Hence the arrows go between the *non-staggered* chainage positions of the pits.

arrow area 3 which is above the graph but below the top stagger area. The arrows go between the *non-staggered* chainage positions of the pits.

arrow area 4 is above the graph and the top stagger area. The arrows go between the *staggered* chainage positions of the pits.

The heights of the four areas (which can be zero) are defined by:

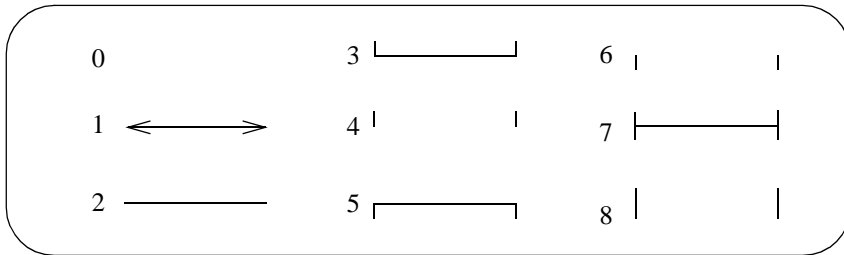
arrow_area_1	mm	// height of arrow_1 area
arrow_area_2	mm	// height of arrow_2 area
arrow_area_3	mm	// height of arrow_3 area
arrow_area_4	mm	// height of arrow_4 area



The parameters for controlling the arrows between manholes and associated text for the values of pipe slope, pipe diameter, flow, velocity, drainage line name and user defined pipe attributes are now given.

Each set of parameters has an arrow_mode with the following values:

..._arrow_mode	0	// no arrow
	1	// arrow
	2	// line
	3	// line with uprights at ends
	4	// uprights, no line
	5	// line with downrights
	6	// downrights, no line
	7	// line with up and downrights at ends
	8	// up and downrights, no line



Parameters for the Arrows for Grades of the Pipes

Parameters specifying the arrow area used and the position of the arrows.

draw_pipe_grade	0	// don't draw pipe grade
	1	// draw pipe grade
pipe_grade_arrow_area	m	// the arrow area for the arrows // m = 1,2,3 or 4
pipe_grade_y	mm	// distance that the arrow is above the // bottom of the arrow area.

For the arrow, the value of the grade can be specified as either **1 in** or **percent** grade:

percentage_grade	0	// the value is a "1 in" grade
	1	// the value is a percent grade

Parameters for the title text on the left hand side of the plot:

pipe_grade_title	text	//title on the left hand side of the arrow
pipe_grade_title_textstyle	textstyle	// textstyle of the title
pipe_grade_title_text_size	mm	// size of the title
pipe_grade_title_text_colour	colour	// colour of the title
pipe_grade_title_offset	mm	//distance to raise or lower the text // from the arrow position
pipe_grade_title_x	mm	// distance from the left hand side of the // plot

Parameters for the arrow type:

pipe_grade_arrow_mode	0	// no arrow
	1	// arrow
	2	// line
	3	// line with uprights at ends
	4	// uprights, no line
	5	// line with downrights
	6	// downrights, no line
	7	// line with up and downrights at ends
	8	// up and downrights, no line
pipe_grade_arrow_colour	colour	// colour of the arrow
pipe_grade_arrow_size	mm	// height of the arrow
pipe_grade_arrow_gap	0	// no gap in arrow
	1	// leave gap in arrow for text

Parameters for the text on the arrow:

pipe_grade_arrow_pre_text	text	// text before the arrows text
pipe_grade_arrow_post_text	text	// text after the arrows text
pipe_grade_arrow_decimals	integer	// The number of decimal places used // when writing out the pipe grade // If > 0, all trailing zeros after the // decimal place are removed. // If < 0, the absolute value is taken as // the number of decimal places and no // trailing zeros are removed after the // decimal point.
pipe_grade_arrow_textstyle	textstyle	// textstyle of arrow text
pipe_grade_arrow_text_size	mm	// size of the text
pipe_grade_arrow_text_colour	colour	// colour of the text
pipe_grade_arrow_text_offset	mm	// distance to raise or lower the text // from the arrow position

Parameters for the Arrows for Diameters of the Pipes

The diameter of the drainage pipes can be plotted between each pit.

Inside 12d Model, the pipe diameter is given a world units (usually metres), but on the diameter arrow, the diameter is multiplied by 1000 and written out as an integer value. This is normally millimetres.

For diameters entered in feet and the plot diameter to be in inches, the following parameter should be set

```
pipe_diameter_scale_factor      12.          // default is 1000.
```

Parameters specifying the arrow area used and the position of the pipe diameter arrows.

```
draw_pipe_diameter             0           // don't draw pipe diameter
                                1           // draw pipe diameter
pipe_diameter_arrow_area       m           // the arrow area for the arrows
                                // m = 1,2,3 or 4
pipe_diameter_y                mm          // distance that the arrow is above the
                                // bottom of the arrow area.
```

Parameters for the title text on the left hand side of the plot:

```
pipe_diameter_title            text        // title on the left hand side of the arrow
pipe_diameter_title_textstyle  textstyle // textstyle of the title
pipe_diameter_title_text_size  mm        // size of the title
pipe_diameter_title_text_colour colour    // colour of the title
pipe_diameter_title_offset     mm        // distance to raise or lower the text
                                // from the arrow position
pipe_diameter_title_x          mm        // distance from the left hand side of the
                                // plot
```

Parameters for the arrow type:

```
pipe_diameter_arrow_mode      0           // no arrow
                                1           // arrow
                                2           // line
                                3           // line with uprights at ends
                                4           // uprights, no line
                                5           // line with downrights
                                6           // downrights, no line
                                7           // line with up and downrights at ends
                                8           // up and downrights, no line
pipe_diameter_arrow_colour     colour    // colour of the arrow
pipe_diameter_arrow_size       mm        // height of the arrow
pipe_diameter_arrow_gap       0           // no gap in arrow
                                1           // leave gap in arrow for text
```

Parameters for the text on the arrow:

```
pipe_diameter_arrow_pre_text   text        // text before the arrows text
pipe_diameter_arrow_post_text  text        // text after the arrows text
```

On the arrow, the pipe type can be also plotted after the pipe_diameter_arrow_post_text:

```
pipe_type_mode                 0           // don't include the pipe type
                                1           // include the pipe type after the
                                // post_text
pipe_diameter_arrow_textstyle  textstyle // textstyle of arrow text
pipe_diameter_arrow_text_size  mm        // size of the text
pipe_diameter_arrow_text_colour colour    // colour of the text
pipe_diameter_arrow_text_offset mm        // distance to raise or lower the text
                                // from the arrow position
```


Parameters for the Arrows for Velocity in the Pipes

Parameters specifying the arrow area used and the position of the arrows.

```
draw_pipe_velocity      0           // don't draw pipe velocity
                        1           // draw pipe velocity
pipe_velocity_arrow_area  m           // the arrow area for the arrows
                        // m = 1,2,3 or 4
pipe_velocity_y         mm          // distance that the arrow is above the
                        // bottom of the arrow area.
```

Parameters for the title text on the left hand side of the plot:

```
pipe_velocity_title     text         //title on the left hand side of the arrow
pipe_velocity_title_textstyle  textstyle // textstyle of the title
pipe_velocity_title_text_size  mm     // size of the title
pipe_velocity_title_text_colour colour // colour of the title
pipe_velocity_title_offset  mm     //distance to raise or lower the text
                        // from the arrow position
pipe_velocity_title_x    mm     // distance from the left hand side of
                        // the plot
```

Parameters for the arrow type:

```
pipe_velocity_arrow_mode  0           // no arrow
                        1           // arrow
                        2           // line
                        3           // line with uprights at ends
                        4           // uprights, no line
                        5           // line with downrights
                        6           // downrights, no line
                        7           // line with up and downrights at ends
                        8           // up and downrights, no line
pipe_velocity_arrow_colour colour     // colour of the arrow
pipe_velocity_arrow_size  mm     // height of the arrow
pipe_velocity_arrow_gap   0           // no gap in arrow
                        1           // leave gap in arrow for text
```

Parameters for the text on the arrow:

```
pipe_velocity_arrow_pre_text  text     // text before the arrows text
pipe_velocity_arrow_post_text text     // text after the arrows text
pipe_velocity_arrow_decimals integer // The number of decimal places used
                        // when writing out the pipe velocity
                        // If > 0, all trailing zeros after the
                        // decimal place are removed.
                        // If < 0, the absolute value is taken as
                        // the number of decimal places and no
                        // trailing zeros are removed after the
                        // decimal point.
pipe_velocity_arrow_textstyle textstyle // textstyle of arrow text
pipe_velocity_arrow_text_size mm     // size of the text
pipe_velocity_arrow_text_colour colour // colour of the text
pipe_velocity_arrow_text_offset mm   // distance to raise or lower the text
                        // from the arrow position
```

Parameters for the Arrows for Flow in the Pipes

Parameters specifying the arrow area used and the position of the arrows.

draw_pipe_flow	0	// don't draw pipe flow
	1	// draw pipe flow
pipe_flow_arrow_area	m	// the arrow area for the arrows // m = 1,2,3 or 4
pipe_flow_y	mm	// distance that the arrow is above the // bottom of the arrow area.

Parameters for the title text on the left hand side of the plot:

pipe_flow_title	text	// title on the left hand side of the arrow
pipe_flow_title_textstyle	textstyle	// textstyle of the title
pipe_flow_title_text_size	mm	// size of the title
pipe_flow_title_text_colour	colour	// colour of the title
pipe_flow_title_offset	mm	// distance to raise or lower the text // from the arrow position
pipe_flow_title_x	mm	// distance from the left hand side of // the plot

Parameters for the arrow type:

pipe_flow_arrow_mode	0	// no arrow
	1	// arrow
	2	// line
	3	// line with uprights at ends
	4	// uprights, no line
	5	// line with downrights
	6	// downrights, no line
	7	// line with up and downrights at ends
	8	// up and downrights, no line
pipe_flow_arrow_colour	colour	// colour of the arrow
pipe_flow_arrow_size	mm	// height of the arrow
pipe_flow_arrow_gap	0	// no gap in arrow
	1	// leave gap in arrow for text

Parameters for the text on the arrow:

pipe_flow_arrow_pre_text	text	// text before the arrows text
pipe_flow_arrow_post_text	text	// text after the arrows text
pipe_flow_arrow_decimals	integer	// The number of decimal places used // when writing out the pipe flow // If > 0, all trailing zeros after the // decimal place are removed. // If < 0, the absolute value is taken as // the number of decimal places and no // trailing zeros are removed after the // decimal point.
pipe_flow_arrow_textstyle	textstyle	// textstyle of arrow text
pipe_flow_arrow_text_size	mm	// size of the text
pipe_flow_arrow_text_colour	colour	// colour of the text
pipe_flow_arrow_text_offset	mm	// distance to raise or lower the text // from the arrow position

Parameters for the Arrows giving the Drainage Line Name

Parameters specifying the arrow area used and the position of the arrows.

draw_drainage_line	0	// don't draw drainage line arrow
	1	// draw drainage line arrow
drainage_line_arrow_area	m	// the arrow area for the arrows
		// m = 1,2,3 or 4
drainage_line_y	mm	// distance that the arrow is above the
		// bottom of the arrow area.

Parameters for the title text on the left hand side of the plot:

drainage_line_title	text	// title on the left hand side of the arrow
drainage_line_title_textstyle	textstyle	// textstyle of the title
drainage_line_title_text_size	mm	// size of the title
drainage_line_title_text_colour	colour	// colour of the title
drainage_line_title_offset	mm	// distance to raise or lower the text
		// from the arrow position
drainage_line_title_x	mm	// distance from the left hand side of
		// the plot

Parameters for the arrow type:

drainage_line_arrow_mode	0	// no arrow
	1	// arrow
	2	// line
	3	// line with uprights at ends
	4	// uprights, no line
	5	// line with downrights
	6	// downrights, no line
	7	// line with up and downrights at ends
	8	// up and downrights, no line
drainage_line_arrow_colour	colour	// colour of the arrow
drainage_line_arrow_size	mm	// height of the arrow
drainage_line_arrow_gap	0	// no gap in arrow
	1	// leave gap in arrow for text

Parameters for the text on the arrow:

drainage_line_arrow_pre_text	text	// text before the arrows text
drainage_line_arrow_post_text	text	// text after the arrows text
drainage_line_arrow_textstyle	textstyle	// textstyle of arrow text
drainage_line_arrow_text_size	mm	// size of the text
drainage_line_arrow_text_colour	colour	// colour of the text
drainage_line_arrow_text_offset	mm	// distance to raise or lower the text
		// from the arrow position

Parameters for the Arrows for User Defined Pipe Attributes

There can be up to twenty sets of parameters which are used to define arrows for *user defined attributes* on the pipes.

Each *user defined attribute* is referred to by a given *user name* and it is this *user name* that is specified by a parameter and links the set of parameters to the information in the drainage string.

Note: *user defined attributes* on drainage pipes are usually set by special macros.

The parameters for the n'th set (n=1,2, ... 20) are:

Parameters specifying the pipe attribute used for this set of arrows and the arrow area used.

draw_pipe_attr_n	0	// don't draw nth set of arrows
	1	// draw the nth set of arrows
pipe_attr_n_name	text	// the name of the attribute to be labelled // on the n'th set of arrows
pipe_attr_n_arrow_area	m	// the arrow area for the arrows // m = 1,2,3 or 4
pipe_attr_n_y	mm	// distance that the arrow is above the // bottom of the arrow area.

Parameters for the title text on the left hand side of the plot:

pipe_attr_n_title	text	//title on the left hand side of the arrow
pipe_attr_n_title_textstyle	textstyle	// textstyle of the nth attribute's title
pipe_attr_n_title_text_size	mm	// size of the nth attribute's title
pipe_attr_n_title_text_colour	colour	// colour of the nth attribute's title
pipe_attr_n_title_offset	mm	//distance to raise or lower the text // from the nth arrow position
pipe_attr_n_title_x	mm	// distance from the left hand side of the // plot

Parameters for the arrow type:

pipe_attr_n_arrow_mode	0	// no arrow
	1	// arrow
	2	// line
	3	// line with uprights at ends
	4	// uprights, no line
	5	// line with downrights
	6	// downrights, no line
	7	// line with up and downrights at ends
	8	// up and downrights, no line
pipe_attr_n_arrow_colour	colour	// colour of the nth arrow
pipe_attr_n_arrow_size	mm	// height of the nth arrow
pipe_attr_n_arrow_gap	0	// no gap in arrow
	1	// leave gap in arrow for text

Parameters for the text on the arrow:

pipe_attr_n_arrow_pre_text	text	// text before the arrows text
pipe_attr_n_arrow_post_text	text	// text after the arrows text
pipe_attr_n_arrow_decimals	integer	// Only if the attribute is a real number. // The number of decimal places used // when writing out the value of the // attribute. // If > 0, all trailing zeros after the // decimal place are removed. // If < 0, the absolute value is taken as // the number of decimal places and no // trailing zeros are removed after the // decimal point.

pipe_attr_n_arrow_textstyle	<i>textstyle</i>	// textstyle of arrow text
pipe_attr_n_arrow_text_size	<i>mm</i>	// size of the text
pipe_attr_n_arrow_text_colour	<i>colour</i>	// colour of the text
pipe_attr_n_arrow_text_offset	<i>mm</i>	// distance to raise or lower the text
		// form the nth attribute's arrow position

Graph Area

The **graph area** is the area where the actual plots of the drainage strings are drawn.

The length of the graph area is determined by the length of the drainage string to be plotted, the horizontal scale (given by scale) of the plot and the sheet width.

```

scale          value          // 1:value - horizontal scale
                                   // The vertical scale is determined by the
                                   // horizontal scale and the vertical
                                   // exaggeration for the section view.
    
```

The vertical exaggeration is taken from the section view specified for the plot by the parameter:

```

view_name          text
    
```

The tins to be sectioned through by the drainage strings and any service models and corridor settings for the graph area are also taken from the specified section view.

The height of the graph is **calculated** by subtracting the height of the other nine boxes from the plot height.

If the plot will not fit horizontally into a row on the sheet, then the plot will be broken at an appropriate pit and the plot continued on another row.

Datum breaks at pits are used to try and fit the plot vertically into the graph area but if the plot still cannot fit, then it will be truncated at the bottom.

The types of strings that can be drawn in the graph area of the drainage long section plot are:

- (a) drainage string the strings from the network model
- (b) tins sections of the drainage string through any tins on the section view.
- (c) hgl hydraulic grade line values from the drainage string
- (d) services parts of strings from any models on the section view that cut the corridor for the section view.

Whether to draw the hydraulic grade line is controlled by:

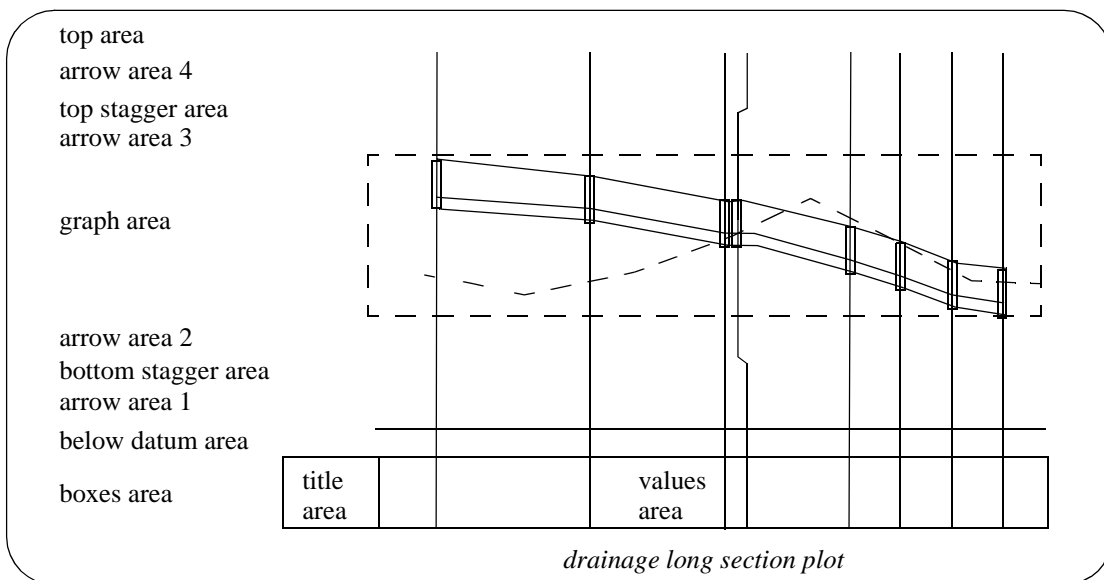
```

draw_hgl_diag          0/1          // 1 = draw hydraulic grade line
    
```

The **colour** of the strings in the plot is the actual string colour for case (a) and (d), the colour of the tin used for the section in case (b) and user specified colour for (c).

```

hgl_colour          colour
    
```



Top Area

The **top area** is an annotation area above the arrow_4_area at the top of the plot.

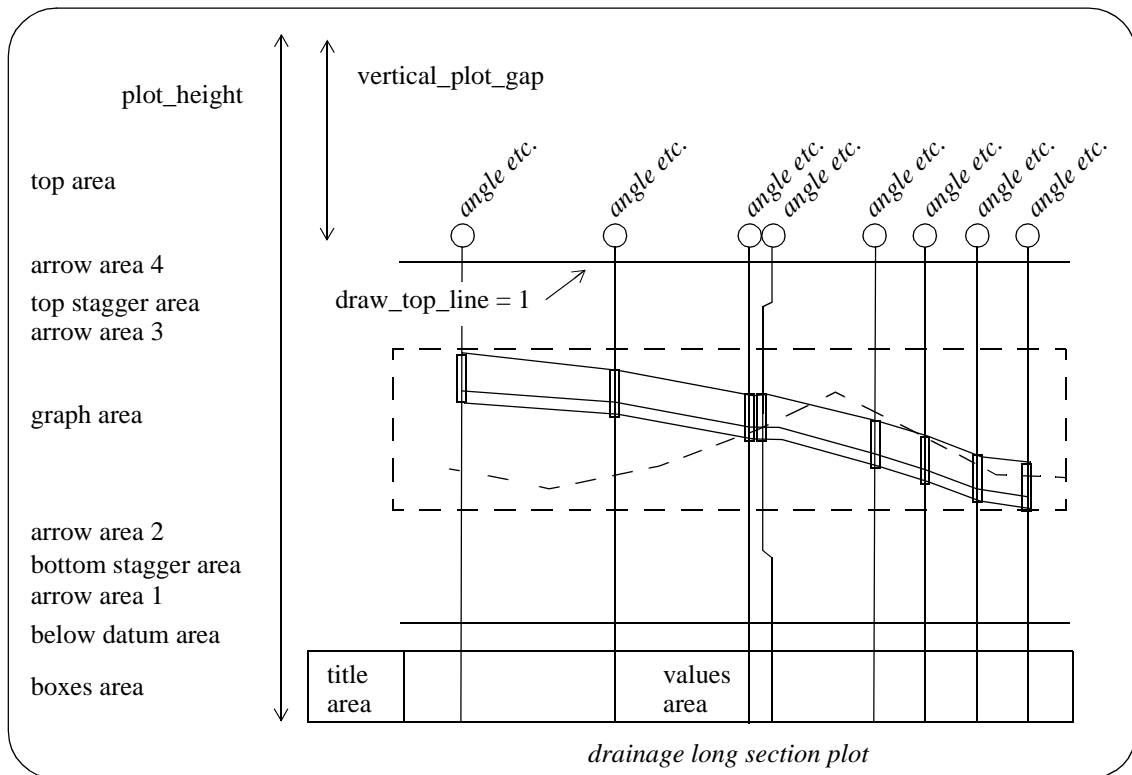
It can be used for pit names, pit types, line names, junctions and deflection angles through pits.

The height of the top area is given by

```
vertical_plot_gap          mm          // size of the top area. If it is not large
                               // enough, the text will over write the
                               // plot in the row above.
```

A line can be drawn at the bottom of the top area:

```
draw_top_line             0/1         // 1= draw line at bottom of top area
                               // (i.e. top of arrow_4_area)
```



Manhole name, Manhole Types and Surrounding Bubbles

The drainage string name, the manhole name (pit number) and manhole type (pit type) can be drawn on the drainage long section plot, with or without a bubble around it.

The bubble text is made up of

line_name / pit_name pit_type

where the bits actually used are controlled by

draw_line_name	0/1	// 1 = include line name. The "/" is only // included if the line_name is drawn.
draw_pit_name	0/1	// 1 = include pit_name
draw_pit_type	0/1	// 1 = include pit type

The size, colour and text style of the bubble text is given by:

bubble_text_size	mm	// size of text in bubble def angled_text_size
bubble_text_colour	colour	// colour of text def angled_text_colour
bubble_textstyle	textstyle	// textstyle for text def angled_text_textstyle
bubble_text_x	mm	// horizontal distance from the default // position (at the pit or in top area)
bubble_text_y	mm	// vertical distance from the default // position (at the pit or in top area)
bubble_pre_text	text	// default ""
bubble_post_text	text	// default ""
bubble_text_angle	value	// default 0
bubble_text_justify	value	// the default is centre justified

A bubble is drawn of radius **bubble_radius** is drawn around the bubble text.

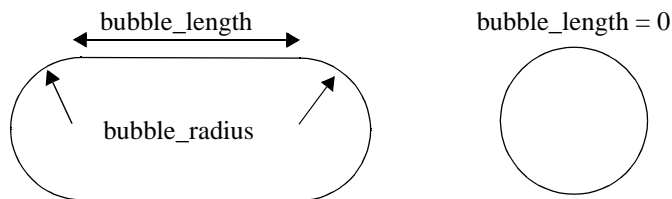
If **bubble_radius** is zero, then no bubble is drawn.

If the *bubble_radius* is zero, the bubble text is still drawn but without the enclosing bubble.

bubble_radius	mm	// if non-zero a bubble of this radius is // drawn around the text
bubble_colour	colour	// colour of bubbles

The "bubble" can be drawn as two semi-circles and two straight lines

bubble_length	mm	// length of the straight line in between // the semi-circles
---------------	----	--



The bubble text (and bubble) can be positioned at the bottom of the **top area**, or can be placed a fixed distance above the top of the corresponding manhole.

If the bubble text is drawn at the bottom of the top area, the upright is automatically drawn up to the bubble text.

If the bubble text is drawn above the pit, it is positioned by the *distance_above_pit* parameter **plus** the top stagger distances, *stagger_gap_top*, *stagger_height_3* and *stagger_height_4*.

This is necessary because the bubble text may need to be staggered.

draw_text_at_pit	0	// draw bubble and/or text in the top
------------------	---	---------------------------------------

	<i>1</i>	// area. // draw it above the pit
distance_above_pit	<i>mm</i>	// distance to add to the top stagger area // heights to draw the bubble above the // pit.
uprights_top_mode	<i>0/1</i>	// 1 = draw line from pit to bubble. Used to be // draw_line_to_text

Change of Direction Through Pits and Junctions

If there is a change of direction of the pipes of the plotted drainage string going through the pit, the deflection angle (in degrees, minutes and seconds) is drawn above the bubble text.

The deflection angle text is made up:

```
angled_pre_text  deflection angle  angled_post_text
```

Also any junctions at a pit in the plotted drainage string can be labelled with the name of the drainage strings coming into the pit, and the angle of the pipes at the junction.

Hence the junction text is made up of **two** lines:

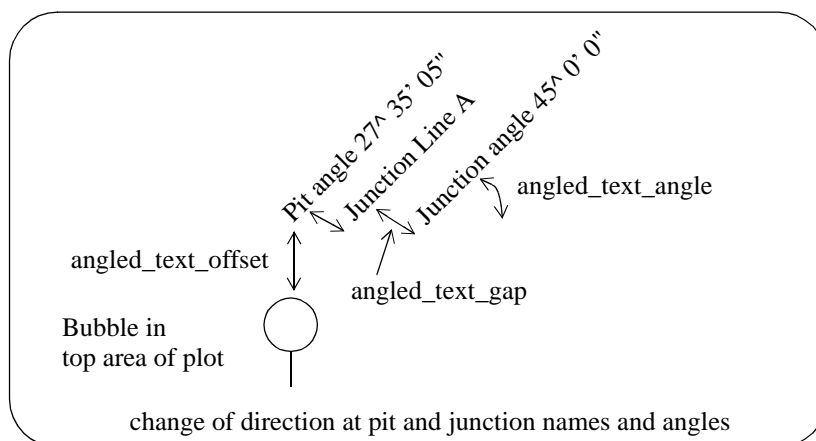
```
junction_pre_text  line_name  junction_post_text
junction_angle_pre_text  junction angle  junction_angle_post_text
```

If bubbles are drawn, the deflection angle and junction name and angle are drawn at the distance *angled_text_offset* above the bubble and with the distance *angled_text_gap* between the lines of information.

If bubbles are not drawn, the bubble text and the deflection angle and junction name and angle is placed the distance *angled_text_offset* above bottom of the top area. Each line of text is separated by the distance *angled_text_gap*.

The deflection angle and junction name and angle are drawn at an angle of *angled_text_angle*.

<i>angled_text_offset</i>	<i>mm</i>	// distance of text above bubble text // or above bottom of top area
<i>angled_text_gap</i>	<i>mm</i>	// distance between text to the right // of bubble text.
<i>angled_text_angle</i>	<i>value</i>	// angle of text



The pre and post text, colour, size and text style for the deflection angle of the drainage string pipes going through the pit are controlled by:

<i>angled_pre_text</i>	<i>text</i>	// default " "
<i>angled_post_text</i>	<i>text</i>	// default " "
<i>angled_text_colour</i>	<i>colour</i>	// colour of deflection angle text
<i>angled_text_size</i>	<i>mm</i>	// size of deflection angle text
<i>angled_textstyle</i>	<i>textstyle</i>	// textstyle of deflection angle text

The junction drainage string name can be included/not included in the first line of junction information:

junction_name_mode	0	// don't include the junction string name
	1	// default - use junction string name

The pre and post text, colour, size and text style for the junction name and the angle that the junction makes at the pit are controlled by:

junction_pre_text	text	// default "JUNCTION "
junction_post_text	text	// default " "
junction_text_colour	colour	// colour of junction name text
junction_text_size	mm	// size of junction name text
junction_textstyle	textstyle	// textstyle for junction name text
junction_angle_pre_text	text	// default " "
junction_angle_post_text	text	// default " "
junction_angle_text_colour	colour	// colour of junction angle text
junction_angle_text_size	mm	// size of junction angle text
junction_angle_textstyle	textstyle	// textstyle for junction angle text

Symbols at Manholes

Manholes can be labelled with symbols which depend on the manhole type. There can be up to twenty (20) sets of manhole symbols.

manhole_symbol_n_type	<i>mh_type</i>	// manhole type to have symbols
manhole_symbol_n_mode	0	// cross
	1	// up from centre of box
	2	// up and down from centre of box
	3	// square
	4	// triangle, base at bottom
	5	// circle
	6	// use a 12d symbol

0 + 1 | 2 | 3 □ 4 △ 5 ○

predefined symbols for manhole_symbol_n_modes 0 to 5

manhole_symbol_n_position	1	// at top of manhole - default
	3	// above top of boxes
	4	// above highest point
	100	// to primary string
	101	// to first found tin
manhole_symbol_n_size	<i>mm</i>	// size
manhole_symbol_n_x	<i>mm</i>	// x adjustment to position - default 0
manhole_symbol_n_y	<i>mm</i>	// y adjustment to position - default is 0
manhole_symbol_n_style	<i>text</i>	// the name of the linestyle (symbol)
manhole_symbol_n_angle	<i>value</i>	// default value is 0
manhole_symbol_n_colour	<i>colour</i>	//

For example:

manhole_symbol_1_type	"CONC COVER"	// manhole type to use
manhole_symbol_1_position	1	// on top of manhole
manhole_symbol_1_mode	6	// use 12d symbol
manhole_symbol_1_style	"shrub"	// name of 12d symbol
manhole_symbol_1_size	1	
manhole_symbol_1_x	0	
manhole_symbol_1_y	0	

Labelling House Connections

NOTE - house connections are only accessible by the *Sewer module*.

The house connections can be drawn from the pipe to the house connection level, with a line across the top (a T). The full width the T can be specified by the user.

draw_house_connections	yes/no
house_connection_width	value

The lot name for the house connection and the connection type can be labelled above the house connection. The house connection label is made up as:

connection_pre_text lot_name *connection_mid_text* connection_type *connection_post_text*

where lot_name and connection_type are stored with the house connection on the drainage string.

The parameters controlling the drawing of the house connection label are

```

house_connection_mode      0          // don't label the house connection
                           1          // label the house connection with name
                               // and type(default)
                           2          // label the house connection with name only

connection_pre_text        text       // default " "
connection_mid_text        text       // default " "
connection_post_text       text       // default " "
connection_text_colour     colour     // colour of connection label
connection_text_size       mm         // size of connection label
connection_textstyle       textstyle  // textstyle connection label
connection_text_x          mm         // x adjustment to position of text - def 0
connection_text_y          mm         // y adjustment to position of text - def 0
connection_text_justify    text       // default is Bottom_left
connection_text_angle      value     // default vertical 90
connection_text_position   1          // above point height value
                           3          // above top of boxes
                           4          // above highest point
                           100         // to primary string
                           101        // to first found tin

```

Label connection type:

(this is used when the house_connection_mode is turned off, only the connection type is labelled)

```

house_connection_type_mode 0          // default, don't label connection type
                           1          // label connection type

connection_type_text_x     mm         // x adjustment to position of text - def 0
connection_type_text_y     mm         // y adjustment to position of text - def 0
connection_type_pre_text   text       // text before type - def " "
connection_type_post_text  text       // text after type - def " "
connection_type_text_size  mm         // def box_text_size
connection_type_text_colour colour    // def box_text_colour
connection_type_textstyle  text       //
connection_type_text_justify text     //
connection_type_text_angle value     // def vertical 90
connection_type_text_position 1        // above point height value - default
                           3          // above top of boxes
                           4          // above highest point
                           100         // to primary string
                           101        // to first found tin

```

Label the distance from the down stream pit to the house connection

```

house_connection_ds_pit_mode 0         // default, don't label chainage
                             1         // label from down stream
                             2         // label from up stream
                             3         // label from left
                             4         // label from right

connection_ds_pit_text_x    mm         // x adjustment to position of text
connection_ds_pit_text_y    mm         // y adjustment to position of text
connection_ds_pit_pre_text  text       // ("") text before type
connection_ds_pit_post_text text       // ("") text after type
connection_ds_pit_text_size mm         // def box_text_size
connection_ds_pit_text_colour colour    //def (box_text_colour
connection_ds_pit_textstyle text       //
connection_ds_pit_text_justify text     // default Bottom_Left
connection_ds_pit_text_angle value     // default is vertical (90)
connection_ds_pit_text_position 1        // above point height value - default
                             3         // above top of boxes

```

```

4 // above highest point
100 // to primary string
101 // to first found tin
connection_ds_pit_decimals value // def number_of_decimals

```

Label the connection depth from the finished surface

```

house_connection_depth_mode 1 //default, label house connection depth
0 // don't label house connection depth
connection_depth_text_x mm // x adjustment to position of text - def 0
connection_depth_text_y mm // y adjustment to position of text - def 0
connection_depth_pre_text text // text before type - def " "
connection_depth_post_text text // text after type - def " "
connection_depth_text_size mm // default box_text_size
connection_depth_text_colour colour // default box_text_colour
connection_depth_textstyle text //
connection_depth_text_justify text // default Bottom_left
connection_depth_text_angle value // default is vertical (90)
connection_depth_text_position 1 // above point height value - default
3 // above top of boxes
4 // above highest point
100 // to primary string
101 // to first found tin
connection_depth_decimals value // default number_of_decimals

```

Label the finished surface:

```

house_connection_fs_mode 1 //default, label house connection finished
// surface
0 // don't label house con finished surface
connection_fs_text_x mm // x adjustment to position of text - def 0
connection_fs_text_y mm // y adjustment to position of text - def 0
connection_fs_pre_text text // text before type -def " "
connection_fs_post_text text // text after type - def " "
connection_fs_text_size mm // default box_text_size
connection_fs_text_colour colour // default box_text_colour
connection_fs_textstyle text //
connection_fs_text_justify text // default Bottom_left
connection_fs_text_angle value // default (vertical 90)
connection_fs_text_position 1 // above point height value - default
3 // above top of boxes
4 // above highest point
100 // to primary string
101 // to first found tin
connection_fs_decimals integer // default number_of_decimals
// If > 0, all trailing zeros after the
// decimal place are removed.
// If < 0, the absolute value is taken as
// the number of decimal places and no
// trailing zeros are removed after the
// decimal point.

```

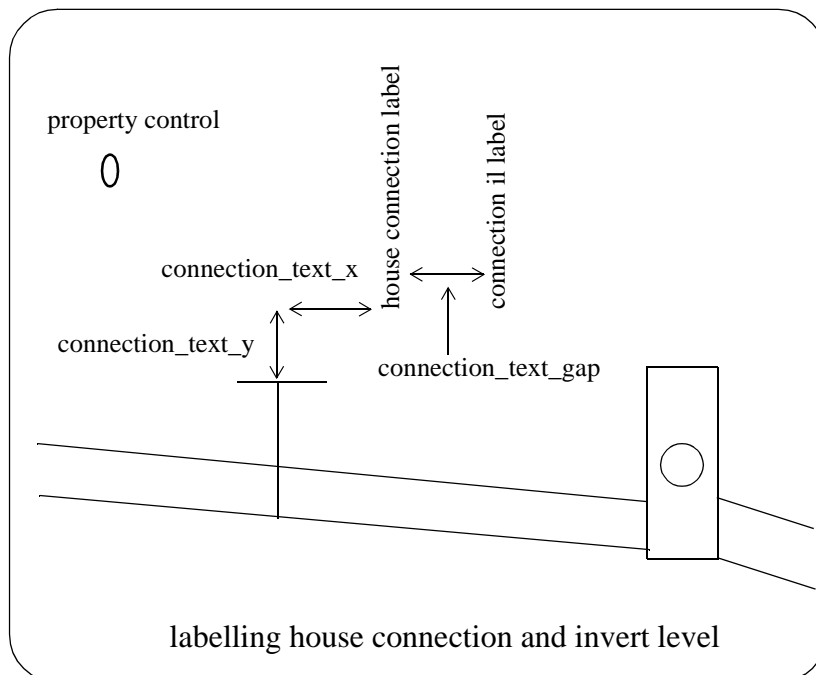
The invert level of the house connection can also be plotted. The house connection invert level label is made up as:

```
connection_il_pre_text connection_invert_level connection_il_post_text
```

The parameters controlling the drawing of the house connection invert level label are:

```
house_connection_il_mode 1 // default, label the house connection il
```

	0	// don't label the house connection il
connection_il_text_position	1	// above point height value - default
	3	// above top of boxes
	4	// above highest point
	100	// to primary string
	101	// to first found tin
connection_il_text_x	mm	// x adjustment to position of text - def 0
connection_il_text_y	mm	// y adjustment to position of text - def 0
connection_text_gap	mm	// distance from connection label and il label
connection_il_decimals	integer	// def -3, number of decimal places in il value
		// >0 drop trailing zeros after decimal point
		// < 0 keep trailing zeros
connection_il_pre_text	text	// default " ", text before type
connection_il_post_text	text	// default " ", text after type
connection_il_text_colour	colour	// colour of connection il - def box_text_colour
connection_il_text_size	mm	// size of connection il - def box_text_size
connection_il_textstyle	textstyle	// textstyle connection il
connection_il_text_justify	text	//
connection_il_text_angle	value	// (vertical 90)



Symbols at Property Controls

NOTE - property controls and house connections are only accessible by the *Sewer module*.

The position of the property controls can be drawn as circles (which will display as an oval depending on the vertical exaggeration) with the diameter of the property control.

draw_property_controls yes/no

The position of the property control can also be indicated by placing a symbol at the property control.

The position of the property control at the drainage string can be labelled with symbols. There can be up to twenty (20) sets of property control symbols.

property_control_symbol_n_mode	0	// cross
	1	// up from centre of box
	2	// up and down from centre of box

3	// square
4	// triangle, base at bottom
5	// circle
6	// use a 12d symbol

0 + 1 | 2 | 3 □ 4 △ 5 ○

predefined symbols for property_control_symbol_n_modes 0 to 5

property_control_symbol_n_position	0	// at bottom (invert) of property control
	1	// at top (obvert) of property control
	2	// at centre (axis) of property control
property_control_symbol_n_size	mm	// size
property_control_symbol_n_x	mm	// x adjustment to position - default 0
property_control_symbol_n_y	mm	// y adjustment to position - default is 0
property_control_symbol_n_style	text	// the name of the 12d symbol
property_control_symbol_n_angle	value	// default value is 0
property_control_symbol_n_colour	colour	//colour of the symbol

For example:

property_control_symbol_1_position	0	// at bottom of prop control
property_control_symbol_1_mode	6	// use 12d symbol
property_control_symbol_1_style	"shrub"	// name of 12d symbol
property_control_symbol_1_size	1	
property_control_symbol_1_x	0	
property_control_symbol_1_y	0	

Labelling Property Controls

NOTE - property controls and house connections are only accessible by the *Sewer module*.

The property control can be labelled with its name where the property control is at the drainage string. The property control name label is made up as:

property_control_pre_text property_control_name *property_control_post_text*

where *property_control_name* is the stored with the property control on the drainage string.

The parameters controlling the labelling the property control are

property_control_mode	0	// don't label the property control with name
	1	// label the property control with name
property_control_pre_text	text	// default " "
property_control_post_text	text	// default " "
property_control_text_colour	colour	// colour of label
property_control_text_size	mm	// size of label
property_control_textstyle	textstyle	// textstyle label
property_control_text_x	mm	// x adjustment to position of text - def 0
property_control_text_y	mm	// y adjustment to position of text - def 0
property_control_text_justify	text	// default is Bottom_left
property_control_text_angle	value	// default vertical 90
property_control_text_position	1	// above pc centre height value
	3	// above top of boxes
	4	// above highest point
	100	// to primary string

101 // to first found tin

Label the distance from the down stream pit to the property control

```

property_control_ds_pit_mode      0          // default, don't label chainage
                                  1          // label from down stream
                                  2          // label from up stream
                                  3          // label from left
                                  4          // label from right
property_control_ds_pit_text_x    mm         // x adjustment to position of text
property_control_ds_pit_text_y    mm         // y adjustment to position of text
property_control_ds_pit_pre_text  text      // ("") text before type
property_control_ds_pit_post_text text      // ("") text after type
property_control_ds_pit_text_size mm        // def box_text_size
property_control_ds_pit_text_colour colour   //def (box_text_colour
property_control_ds_pit_textstyle text      //
property_control_ds_pit_text_justify text    // default Bottom_Left
property_control_ds_pit_text_angle value     // default is vertical (90)
property_control_ds_pit_text_position 1      // above pc centre height value - default
                                  3          // above top of boxes
                                  4          // above highest point
                                  100        // to primary string
                                  101        // to first found tin
property_control_ds_pit_decimals  value     // def number_of_decimals

```

Label the depth from the finished surface to the invert level of the property control:

```

property_control_depth_mode      1          //default, label property control depth
                                  0          // don't label pc depth
property_control_depth_text_x    mm         // x adjustment to position of text - def 0
property_control_depth_text_y    mm         // y adjustment to position of text - def 0
property_control_depth_pre_text  text      // text before type - def " "
property_control_depth_post_text text      // text after type - def " "
property_control_depth_text_size mm        // default box_text_size
property_control_depth_text_colour colour   // default box_text_colour
property_control_textstyle       text      //
property_control_depth_text_justify text    // default Bottom_left
property_control_depth_text_angle value     // default is vertical (90)
property_control_depth_text_position 1      // above pc centre height value - default
                                  3          // above top of boxes
                                  4          // above highest point
                                  100        // to primary string
                                  101        // to first found tin
property_control_depth_decimals  value     // default number_of_decimals

```

Label the finished surface:

```

property_control_fs_mode      1          //default, label pc finished surface
                                  0          // don't label pc finished surface
property_control_fs_text_x     mm         // x adjustment to position of text - def 0
property_control_fs_text_y     mm         // y adjustment to position of text - def 0
property_control_fs_pre_text   text      // text before type -def " "
property_control_fs_post_text  text      // text after type - def " "
property_control_fs_text_size  mm        // default box_text_size
property_control_fs_text_colour colour   // default box_text_colour
property_control_fs_textstyle  text      //
property_control_fs_text_justify text    // default Bottom_left
property_control_fs_text_angle value     // default (vertical 90)
property_control_fs_text_position 1      // above pc centre height value - default
                                  3          // above top of boxes

```

```

4 // above highest point
100 // to primary string
101 // to first found tin
property_control_fs_decimals integer // default number_of_decimals
// If > 0, all trailing zeros after the
// decimal place are removed.
// If < 0, the absolute value is taken as
// the number of decimal places and no
// trailing zeros are removed after the
// decimal point.

```

The invert level of the property control at the drainage string can also be plotted. The property control invert level label is made up as:

```
property_control_il_pre_text property_control_invert_level property_control_il_post_text
```

The parameters controlling the drawing of the property control invert level label are:

```

property_control_il_mode 1 // default, label the pc il
0 // don't label the pc il
property_control_il_text_position 1 // above pc centre height value - default
3 // above top of boxes
4 // above highest point
100 // to primary string
101 // to first found tin
property_control_il_text_x mm // x adjustment to position of text - def 0
property_control_il_text_y mm // y adjustment to position of text - def 0
property_control_text_gap mm // distance from pc name label and il label
property_control_il_decimals integer // def -3, number of decimal places in il value
// >0 drop trailing zeros after decimal point
// < 0 keep trailing zeros
property_control_il_pre_text text // default " ", text before type
property_control_il_post_text text // default " ", text after type
property_control_il_text_colour colour // colour of pc il -def box_text_colour
property_control_il_text_size mm // size of pc il - def box_text_size
property_control_il_textstyle textstyle // textstyle pc il
property_control_il_text_justify text //
property_control_il_text_angle value // (vertical 90)

```

Hatching Cut and Fill Areas

This option is used to hatch cut and/or fill areas between sets of tins.

For each set, the name of the two tins, the hatch linestyle, colour and separation and whether cut and/or fill regions are required are all user definable.

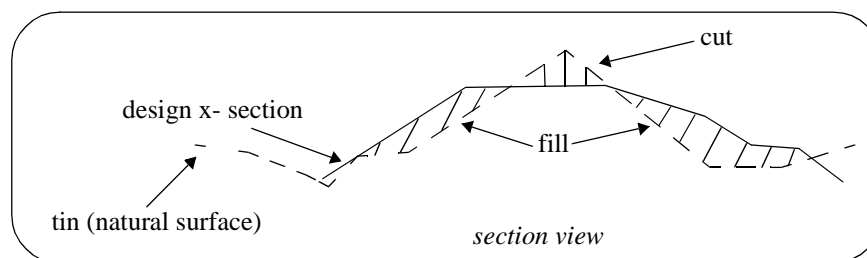
Up to twenty (20) separate sets of tins be hatched.

The parameters for labelling cuts and/or fill regions between tins are given by:

hatch_original_tin_n	<i>tin_name</i>	// tin_name for original surface
hatch_new_tin_n	<i>tin_name</i>	// tin_name for final surface
hatch_cut_separation_n	<i>mm</i>	// distance between cut hatch lines
	0	// don't do cut hatching
hatch_cut_angle_n	<i>degrees</i>	// angle in degrees of cut hatching
hatch_cut_colour_n	<i>colour</i>	// colour of the cut hatching
hatch_cut_linestyle_n	<i>linestyle</i>	// linestyle for cut hatching
hatch_cut_draw_sides_n	1/0	// 1 = draw sides of cut regions
hatch_cut_draw_original_n	1/0	// 1 = draw original tin in cut regions
hatch_cut_draw_new_n	1/0	// 1 = draw new tin in cut regions
hatch_fill_separation_n	<i>mm</i>	// distance between fill hatch line
	0	// don't do fill hatching
hatch_fill_angle_n	<i>degrees</i>	// angle in degrees of fill hatching
hatch_fill_colour_n	<i>colour</i>	// colour of the fill hatching
hatch_fill_linestyle_n	<i>linestyle</i>	// linestyle for fill hatching
hatch_fill_draw_sides_n	1/0	// 1 = draw sides of fill regions
hatch_fill_draw_original_n	1/0	// 1 = draw original tin in fill regions
hatch_fill_draw_new_n	1/0	// 1 = draw new tin in fill regions

Notes

- (a) cut is when the new tin is below the original tin.
fill is when the new tin is above the original tin.
- (b) cut hatching is turned off by setting hatch_cut_separation_n to 0.0.
fill hatching is turned off by setting hatch_fill_separation_n to 0.0.



Labelling Cuts of Drainage Through Strings in a Model

The cuts that the drainage string makes through any strings in user given models can be automatically labelled on the long section plots.

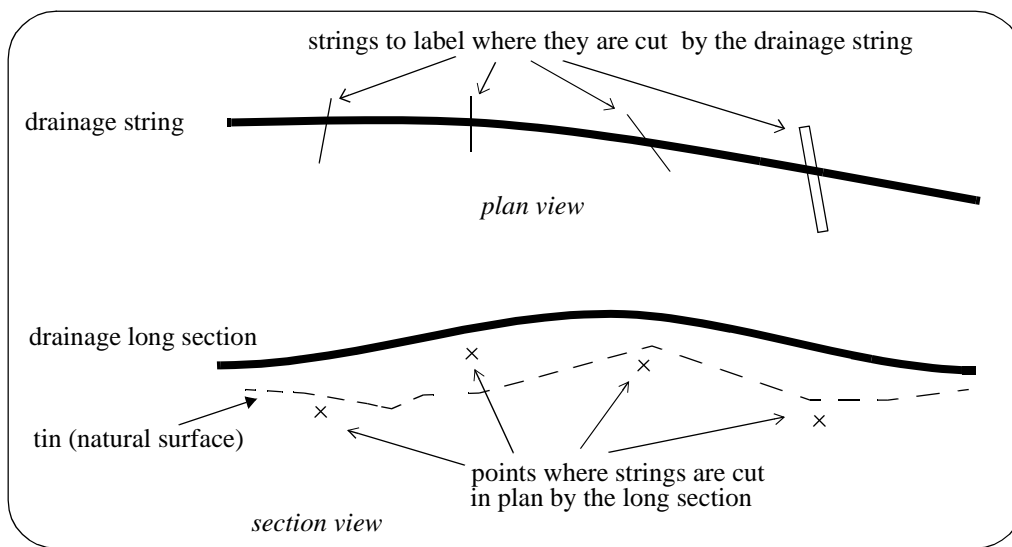
The **height**, **chainage** and **name** of the cut string can be labelled as well as a **symbol** drawn. The height of tins at the same offset value can also be labelled.

The chainage position for the labelling is the chainage of the cut string.

The height position for the labelling can be specified as the

- (a) top of the boxes on the long section
- (b) height value of the cut string
- (c) height of the primary string
- (d) height of a tin.

The actual position of the label is defined relative to the above point.



Note:

Only case (b) involves the actual height of the cut string. For all other cases, only the chainage of the cut string is used. Hence for all cases except (b), the string does need to have a sensible height to be used for cuts through strings.

For example, a boundary string may have null heights but only the chainage is required and the height of the tin at that chainage can be used as the height (case (d)).

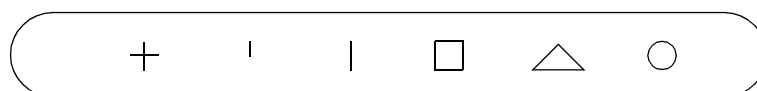
Text justification refers to the actual position and is given by

- | | | |
|---------------|-----------------|----------------|
| “top-left” | “top-centre” | “top-right” |
| “middle-left” | “middle-centre” | “middle-right” |
| “bottom-left” | “bottom-centre” | “bottom-right” |

A choice of six special symbols and/or any 12d symbols can be drawn at the cut point.

The special 12d Model symbols of size one millimetre are drawn in a square box centred on (0,0) with sides of length two millimetres. That is, the box co-ordinates are (-1,-1), (1,1), (1,-1), (-1,-1).

The six special shapes are



Up to twenty five (25) separate models of strings can be cut and labelled.

Parameters for Labelling Where the Drainage Line Cuts Strings in a Model

The method for specifying which strings are to be checked for cuts is by first specifying the **model** which contains the strings, and then a **name mask** which is used to restrict the strings in the model to only those whose name matches the name mask.

Up to twenty five different sets of models and name masks can be used so that different cut sets can be labelled in different ways.

The parameters for selecting and labelling the n'th set (where n can be from 1 to 25) of cuts of the design string with the strings in the model are given by:

```
cuts_n_model          model_name          // model of strings to be cut
```

The selection of the strings from the model *model_name* whose cut points are to be labelled is all the strings whose name satisfies the name mask *cuts_n_mask*:

```
cuts_n_mask          name_mask          // strings to check for cuts
                                     // and if a cut occurs,
                                     // parameters show how to
                                     // label the cut
```

where *name_mask* is a text string containing the name masks, each separated by one or more spaces, to test the string name against. Each mask can include wild cards and wild characters.

For example

```
cuts_1_mask          "ke*"
or cuts_1_mask          "?bank*"
or, if both masks are required,
   cuts_1_mask          "ke* ?bank*"
```

If *cuts_n_mask* is missing, then all strings in the model are used. This is equivalent to *name_mask* being "*".

All strings in the model *cuts_n_model* whose name satisfy the name mask *cuts_n_mask* are then checked for cuts with the drainage strings, and if a cut occurs, the cut point will be labelled according to the rest of the parameters in the n'th set.

The parameters for drawing a **symbol** at the cut points are

```
cuts_symbol_n_mode    0          // cross
                     1          // up from centre of box
                     2          // up and down from centre of box
                     3          // square
                     4          // triangle, base at bottom
                     5          // circle
                     6          // use a 12d symbol
```

0 + 1 | 2 | 3 □ 4 △ 5 ○

predefined symbols for cut_symbol_n_modes 0 to 5

If *cuts_symbol_n_mode* is 6, then the 12d symbol is given by

```
cuts_symbol_n_style  plotsymbol      // 12d symbol to draw at cut
```

Important Note

The plot symbol of name *plotsymbol* is defined in the file given by:

- (a) the parameter *plot_symbols* in the ppf file

plot_symbols *filename*

or if *plot_symbols* is not defined, then

(b) in the file pointed to by the environment variable PLOT_SYMBOLS_4D
PLOT_SYMBOLS_4D *filename* // default *plotsym.4d*

or if *PLOT_SYMBOLS_4D* is not defined, then

(c) in the file *plotsym.4d*
which is searched for in the standard set up file sequence

If none of the above files are defined, or if the symbol does not exist in the above files, then it will be searched for in the standard 12d symbols file which is:

(d) either pointed to by the environment variable SYMBOLS_4D
SYMBOLS_4D *filename* // default *symbols.4d*

or if the environment variable *SYMBOLS_4D* does not exist, in the file, *symbols.4d*

The position of the symbol or plot symbol is given by:

cuts_symbol_n_position	1	// above point height value
	3	// above top of boxes
	100	// to primary string
	101-500	// to tin1 or tin2 etc.

The symbol can be adjusted by the parameters:

cuts_symbol_n_x	<i>mm</i>	// offset adjustment to position
cuts_symbol_n_y	<i>mm</i>	// height adjustment to position
cuts_symbol_n_angle	<i>degrees</i>	// rotation about point
cuts_symbol_n_colour	<i>colour</i>	// colour of symbol

and for all values of *cuts_symbol_n_mode* other than 6:

cuts_symbol_n_size	<i>mm</i>	// size of symbol, 0 don't draw
--------------------	-----------	---------------------------------

The value of the **chainage** of the cut string can be labelled using the parameters

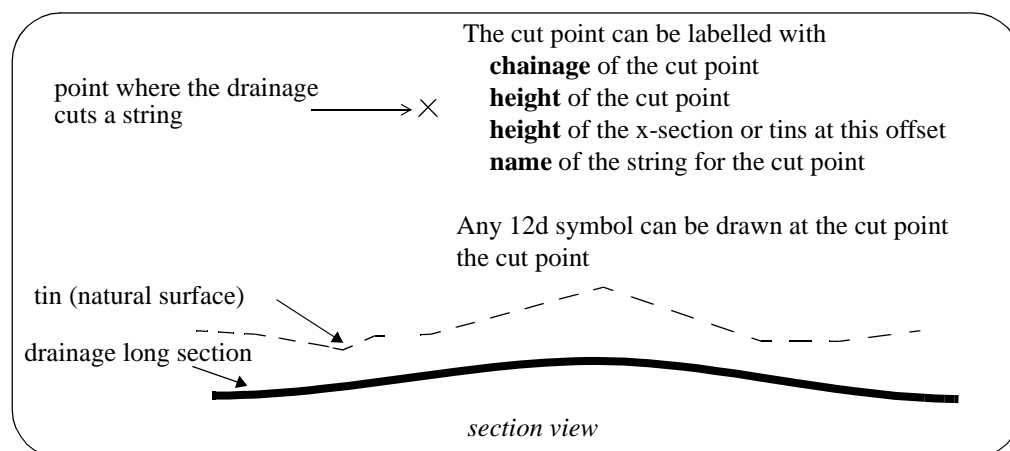
cuts_chainage_n_position	1	// above cut strings height value
	3	// above top of boxes
	100	// to primary string
	101-500	// to tin1 or tin2 etc.
cuts_chainage_n_x	<i>mm</i>	// chainage adjustment to position
cuts_chainage_n_y	<i>mm</i>	// height adjustment to position
cuts_chainage_n_angle	<i>degrees</i>	// rotation about point
cuts_chainage_n_size	<i>mm</i>	// size of text, 0 don't label
cuts_chainage_n_colour	<i>colour</i>	// colour of text
cuts_chainage_n_textstyle	<i>text</i>	// textstyle of text chainage
cuts_chainage_n_pre_text	<i>text</i>	// text before the chainage value
cuts_chainage_n_post_text	<i>text</i>	// text after the chainage value
cuts_chainage_n_justification	<i>justification</i>	// justification of the text
cuts_chainage_n_no_decimals	<i>integer</i>	// number of decimals in chainage

The value of a **height** at the chainage of the point can be calculated and labelled using the parameters

cuts_height_n_mode	1	// use height of cut point itself
	3	// use real world height of position
		// above boxes
	100	// height of primary string
cuts_height_n_position	101-500	// use height of to tin1 or tin2 etc.
	1	// at points position
	3	// above top of boxes
	100	// to primary string
	101-500	// to tin1 or tin2 etc.
cuts_height_n_x	mm	// chainage adjustment to position
cuts_height_n_y	mm	// height adjustment to position
cuts_height_n_angle	degrees	// rotation about point
cuts_height_n_size	mm	// size of text, 0 don't label
cuts_height_n_colour	colour	// colour of text
cuts_height_n_textstyle	text	// textstyle of text height
cuts_height_n_pre_text	text	// text before the height value
cuts_height_n_post_text	text	// text after the height value
cuts_height_n_justification	justification	// justification of the text
cuts_height_n_no_decimals	integer	// number of decimals in height

A **label** which can include the **name** of the cut string is drawn by using the parameters

cuts_label_n_position	1	// above cut strings height value
	3	// above top of boxes
	100	// to primary string
	101-500	// to tin1 or tin2 etc.
cuts_label_n_mode	0	// don't include cut string name
	1	// include cut string name in label
cuts_label_n_x	mm	// chainage adjustment to position
cuts_label_n_y	mm	// height adjustment to position
cuts_label_n_angle	degrees	// rotation about point
cuts_label_n_size	mm	// size of text, 0 don't label
cuts_label_n_colour	colour	// colour of text
cuts_label_n_textstyle	text	// textstyle of text label
cuts_label_n_pre_text	text	// text before the string name
cuts_label_n_post_text	text	// text after the string name
cuts_label_n_justification	justification	// justification of the text



Title Block Information

The plot can have a standard 12d Model title block or a user defined title block.

The standard title block consists of a simple border around the plot and two lines of text in a box underneath the plot. For a user defined title block, all the line work and text is defined by the user.

Standard Title Block

For the standard 12d Model title block, there are extra parameters for two lines of text and text size and colour. The standard title block is turned on or off by the parameter *plot_border*.

<i>plot_border</i>	<i>yes/no</i>	<i>// yes plots a standard title block</i> <i>// default yes</i>
<i>title_1</i>	<i>text</i>	
<i>title_2</i>	<i>text</i>	
<i>title_text_size</i>	<i>value</i>	
<i>title_colour</i>	<i>colour</i>	

User Title Block

For the user defined title block, the title block drawing commands are kept in a file whose name is supplied by the user. The title block drawing commands are almost identical to the linestyle drawing commands and is given at the beginning of chapter Advanced Plotting.

Hence for a user defined title block, there are just two parameters - one to say a title block file is being used and the other to give the name of the title block file. The *plot_border* parameter should also be set to *no* so that the standard title block is not also drawn.

<i>use_title_file</i>	<i>yes/no</i>	<i>// yes draws the title block given in title_file</i> <i>// default no</i>
<i>title_file</i>	<i>filename</i>	
<i>plot_border</i>	<i>no</i>	<i>// turn off standard title block</i>

Some special plot parameters are used to pass information down to variables in a user defined title block

For example, inside the title block file it is possible to have runtime user defined text variables. The actual text values for these text variables are passed down to the title block file from the plot parameter file via the parameters *user_text_n* ($n = 1, 2, \dots, 1000$)

<i>user_text_n</i>	<i>text</i>
--------------------	-------------

The special plot parameters are:

<i>time_format</i>	<i>text</i>	<i>// format for \$time</i>
<i>user_text_n</i>	<i>text</i>	<i>// where n = 1, 2, ... 1000</i> <i>// passed down to \$user_text_n</i>
<i>title_1</i>	<i>text</i>	<i>// passed down to \$title_1</i>
<i>title_2</i>	<i>text</i>	<i>// passed down to \$title_2</i>
<i>start_page_number</i>	<i>integer</i>	<i>// used as the starting value for</i> <i>// \$page_number. If missing,</i> <i>// \$page_number starts at 1.</i>
<i>start_drawing_number</i>	<i>integer</i>	<i>// added to \$drawing_number in title</i> <i>// block file. If missing,</i> <i>// \$drawing_number starts at 1.</i>
<i>drawing_number_prefix</i>	<i>text</i>	<i>// passed down to</i> <i>// \$drawing_number_prefix</i>
<i>drawing_number_postfix</i>	<i>text</i>	<i>// passed down to</i> <i>// \$drawing_number_postfix</i>

Parameters that Modify Fields In the Plot Drainage Network Panel

A number of parameters match those in the **plot drainage network** panel.

When the plot parameter file is first read, any parameters in the panel will be replaced by the values of any corresponding parameters from the parameter file.

However, if the parameter is subsequently modified in the panel, the panel value will be the value used for the parameter.

The plot parameters that also occur in the **plot drainage network** panel are:

network_model	<i>text</i>
scale	<i>value</i>
plotter_type	<i>text</i>
plot_stem	<i>text</i>
view_name	<i>text</i>
sheet_size	<i>text</i> or "width height"
plot_height	<i>mm</i>
x_origin	<i>mm</i>
y_origin	<i>mm</i>
global_textstyle	<i>textstyle</i>
box_text_size	<i>mm</i>
box_colour	<i>colour</i>
plot_border	<i>yes/no</i>
title_1	<i>text</i>
title_2	<i>text</i>
title_text_size	<i>value</i>
title_text_colour	<i>colour</i>
use_title_file	<i>yes/no</i>
title_file	<i>filename</i>

Melbourne Water

Position of menu: Design =>Drainage-Sewer=>Plots=>Melbourne Water

The **Melbourne Water** option is used to generate the longsection plots for all lines in a drainage network to the Melbourne Water sewer standards.

Given the plot sheet size and the horizontal and vertical scales, the longsections for the drainage lines are plotted starting at the top of the sheet and moving across the sheet. Once one row is full, if there is room the plot moves down the page and begins a new row. When a plot sheet is full, a new plot sheet is automatically begun.

Hence the drainage lines are plotted one after another on one or more plotter sheets.

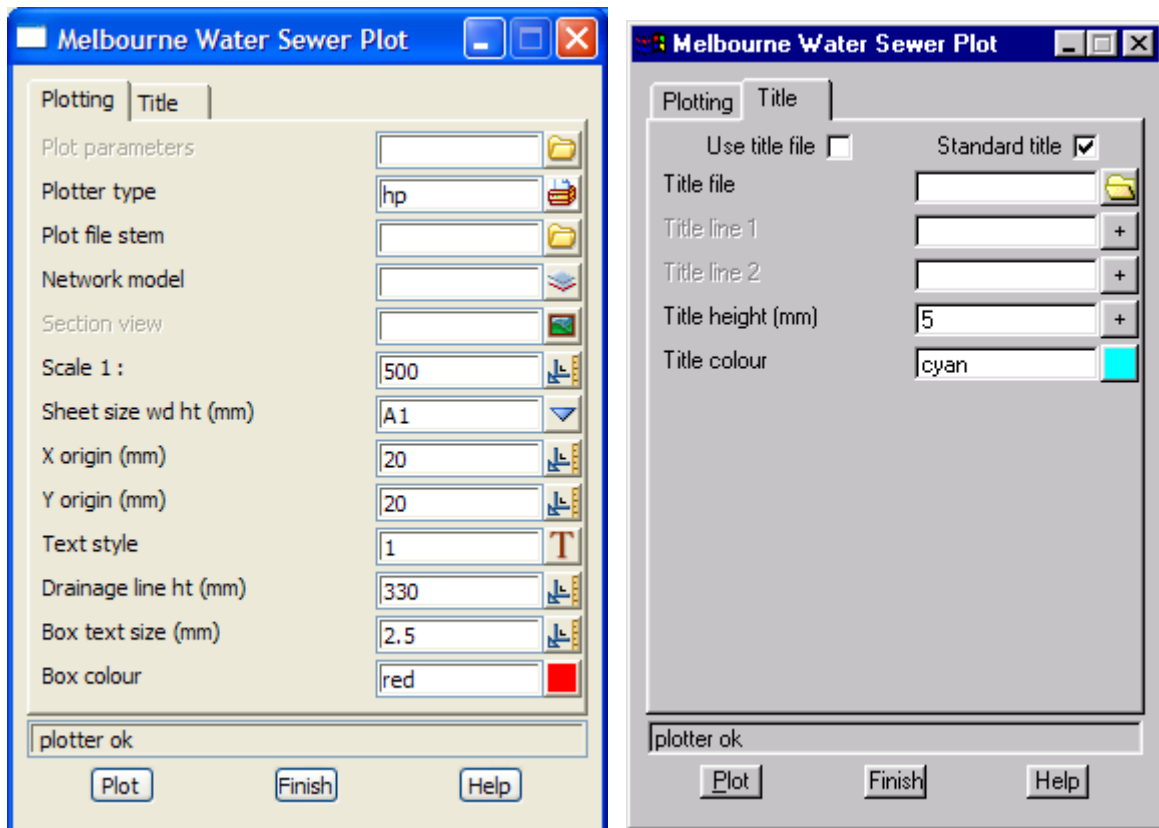
The drainage lines are plotted in string name alphabetical order.

The drainage longsection plot includes

- s the manholes, drainage pipe and any house connections
- s the height of the natural surface at the manhole
- s manhole names and cover types
- s distances between manholes
- s the invert depth of the pipe on either side of a manhole
- s the grades and types of the pipes
- s any services in the corridor - including their name, invert level and distance from the nearest downstream manhole

[melbourne_water_sewer_plot](#) [melb_water_plot_title](#)

After selecting the **Melbourne Water** option, the **Melb plot drainage network** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Plot parameters <i>file of plot parameters used for extra control of the long section plot.</i>	input		*.ppf
Plotter type <i>format for the plot output.</i>	input	hp	hp, dxf, postscript etc.
Network model <i>the model containing all the drainage lines for the network.</i>	input		
Section view <i>the section view to be used to define the vertical exaggeration, corridor widths, tins to section through, services models to section etc.</i>	input		
Plot file stem <i>since more than one plot page may be produced, the plot file names are constructed from the stem plus a plot page sequence number, followed by the appropriate plotter type ending.</i>	input		
Scale 1: <i>horizontal scale for plotting the drainage long section. The vertical exaggeration is taken from the section view given in the section view field.</i>	input		
Sheet size wd ht (mm) <i>the width and height values (separated by space) or the name of a user defined sheet size.</i>	input		available sheet sizes
X origin (mm) <i>the x position on the plot sheet for the bottom left hand corner of the longsection plots.</i>	input		
Y origin (mm) <i>the y position on the plot sheet for the bottom left hand corner of the longsection plots.</i>	input		
Drainage line ht (mm) <i>the maximum allowable height for a longsection plot for a drainage line. Datum breaks are applied to any part of the longsection that will not fit into the drainage line ht.</i>	input	boxes	boxes, centreline
Box text size (mm) <i>size (in millimetres) to plot the chainages, heights etc. in the boxes in the plots of the drainage longsections</i>	input	3	
Box colour <i>colour used for the text and the boxes.</i>	input	cyan	available colours
Plot <i>plot the drainage longsections for the drainage lines in the model given in the network model field.</i>	button		
The fields and buttons in <i>title</i> tab are:			
Use title file <i>if tick, a user defined title block file is used.</i>	tick-cross		
Standard Title <i>if tick, the standard 12d Model border and two lines of title are placed on the bottom of the plot</i>	tick-cross	tick	
Title file <i>if non-blank and use title file is set to tick, then the file given in this field is used to generate a user defined title block for the plot.</i>	input		*.tf

Title line 1/2	input		
	<i>first/second line of title information</i>		
Title height (mm)	input	5	
	<i>height (in millimetres) to draw the characters in the two lines of title information.</i>		
Title colour	input	cyan	available colours
	<i>colour used for the border and the title information.</i>		

Please continue to the next section “Melbourne Water Plot Parameter File” .

Melbourne Water Plot Parameter File

The **Melbourne Water plot** option is used to make special long section plots for a **network** of new drainage strings to Melbourne Water sewer standards.

Some of the look of the long section plot can be controlled from the **Melb plot drainage network** panel itself, however a wider selection of control parameters is available by using a Melbourne Water long plot, plot parameter file.

Because the Melbourne Water format is so fixed, most of the parameter have sensible default values and can be left out. However, for completeness, all the parameters are given.

The Melbourne Water Sewer (MWS) long section plot parameters are placed in a file with ending **.ppf**.

Each parameter consists of a parameter name followed by one or more spaces and then the parameter value. There is only one parameter per line.

Anything on a line after a double forward slash // is considered to be a comment.

The set of all parameters for the Melbourne Water sewer long section plot is enclosed within a set of curly brackets { } with the header

```
melb_water_sewer_long_plot "plot set name"
```

before the curly brackets.

That is,

```
melb_water_sewer_long_plot "plot set name" {
    plot parameters
    one per line
}
```

If there is more than one melb_water_sewer_long_plot parameter set in the file, only the first set is used.

There may also be parameter sets for other plot types such as section_x_plot in the same file. The other sets will be ignored when doing a Melbourne Water long section plot.

The plot parameters are documented in following groups:

For the *Plot Sheet layout*, please continue to the section “Plot Sheet Layout” .

Chainages, staggering and uprights, please continue to the section “Chainages, Staggering and Uprights” .

Boxes area, please continue to the section “Boxes Area” .

Datum area, please continue to the section “Datum Value” .

Arrows area, please continue to the section “Arrow Areas” .

Graph area parameters, please continue to the section “Graph Area” .

Top area parameters, please continue to the section “Top Area” .

Manhole parameters, please continue to the section “Manholes” .

Junctions parameters, please continue to the section “Junctions” .

Services parameters, please continue to the section “Services” .

Property controls and house connection parameters, please continue to the section “Property Controls and House Connections” .

Symbols at manhole parameters, please continue to the section “Symbols at Manholes” .

Hatching cut and fill parameters, please continue to the section “Hatching Cut and Fill Areas” .

Labelling cuts parameters, please continue to the section “Labelling Cuts of Drainage Through Strings in a Model” .

Title block parameters, please continue to the section “Title Block Information” .

Panel modifying parameters, please continue to the section “Parameters that Modify Fields In the Melbourne Water Network Panel” .

Plot Sheet Layout

The plot sheet is considered to have only positive co-ordinates with the origin (0,0) in the left hand corner. The units for the plot are millimetres.

The overall size of the plot sheet is given by either a defined sheet size, or by the width and height of the plot given in millimetres and separated by one or more spaces.

```
sheet_size          text          // sheet name, or
                   "mm mm"       // sheet size: width height
```

The sheet size name and width and heights can be specified by the user in a file named sheets.4d which is in the normal set up areas, or is pointed to by the environment variable

```
SHEET_SIZES_4D    file          // file of plotter sheets sizes
```

The Melbourne Water long section plot will break an individual plot up if it doesn't fit across the sheet. There can be one or more rows of plot on the same sheet.

The top row is done first, followed by the second top row, then the third and so on until the bottom row. If there is only one row, it is considered to be the bottom row.

When a sheet is full, a follow on sheet is created.

As soon as one drainage string is completed, the next drainage string in the network model is plotted beginning on the same row as the previous drainage string and with a horizontal gap of size `horizontal_plot_gap` between the plots. If there is not enough room on the row to start the next plot, it will begin on a new row.

The position of the left hand bottom corner of the first plot in the bottom row is given by the parameters, `x_origin` and `y_origin`.

If there are two or more rows of plots, the position of the first plot in each row is given by adding multiples of the `plot_height` to the `y_origin`.

```
network_model      text          // model of sewer strings
x_origin           mm           // Position of the left hand bottom
y_origin           mm           // corner of first plot in the bottom row.
only_one_line      0            // more than one row on a sheet
                   1            // only one row of plot on a sheet
plot_height        mm           // total height of a plot row.
                   // It includes the vertical_plot_gap.
horizontal_plot_gap mm           // gap between plots on same row
vertical_plot_gap  mm           // gap between rows of plots
```

A `textstyle` can be specified which is used for all the text in the plot.

```
global_textstyle   textstyle    //used for all plot text
```

The Melbourne Water long plot itself consists of nine areas. From the bottom up, they are boxes, arrow 1, bottom stagger, arrow 2, graph, arrow 3, top stagger, arrow 4, top.

The **boxes area** is where the chainages and various values for the drainage strings are labelled.

The **arrow 1 area** is for drawing arrows where the arrows go between the staggered uprights and below the graph area. The datum line is at the bottom of the arrow 1 area.

The **bottom stagger area** is where the upright line staggers occur before going up from the boxes area to the graph area.

The **arrow 2 area** is for drawing arrows below the graph but where the arrows go between non-staggered uprights.

The **graph area** is the area where the actual plots of the strings are drawn.

The **arrow 3 area** is for drawing arrows above the graph area and where the arrows go between non-staggered uprights.

The **top stagger area** is where the upright line staggers occur above the graph area.

The **arrow 4 area** is for drawing arrows where the arrows go between the staggered uprights and above the graph area.

The **top area** is an annotation area above the arrow 4 area and is used for manhole names, junctions, deflection angles etc.

Although the arrow areas exist, the Melbourne Water plot does not have any arrows in them.

Chainages, Staggering and Uprights

All of the labelling of the Melbourne Water sewer plot is done at the chainages of the manholes on the drainage line. For example, the invert levels, depths and natural surface of pipes at a manhole are all labelled at the chainage of the manhole.

The labels for these values are done at an angle of zero degrees rather than ninety degrees for the sewer plots.

Uprights, or leader lines, are drawn from the values at the bottom of the plot to the manhole in the graph area.

If the text values are placed at the real chainage positions at the bottom of the plot, text over writing can easily occur if the chainages are very close together.

To prevent such over writing, the text can be **staggered**. That is, if the text is going to over write a previous text value, the next text value is actually moved along until there is no over writing.

Since the text is no longer at the correct chainage position, the uprights to the manholes and services start at the text position and then bend back to the correct chainage position on the plot. The region where the bending occurs is called the stagger area.

For the Melbourne Water plot, there is an area below the graph where the uprights bend backwards from the staggered text position to the real chainage position (bottom stagger area).

And there is a second area above the graph where the uprights bend forwards from the real chainage position to the staggered text position (top stagger area).

Hence annotation above the top stagger area will line up with the staggered values below the bottom stagger area.

The stagger area below the graph area is defined by

stagger_height_1	mm	// distance from the top of arrow_area_1 // to the start of the staggers
stagger_height_2	mm	// distance over which stagger occurs
stagger_gap_bottom	mm	// distance from end of staggers to the // bottom of arrow_area_2

The stagger area above the graph area is defined

stagger_gap_top	mm	// distance from the top of arrow_area_3 // to the start of the staggers
stagger_height_3	mm	// distance over which stagger occurs
stagger_height_4	mm	// distance from end of staggers to the // bottom of arrow_area_4

The distance to be left for text to avoid over writing is:

horizontal_text_gap	mm	// minimum distance to leave for text // after manhole values
services_text_gap	mm	// minimum distance to leave for text // after service values

When staggering occurs, it is possible for the values area to be longer than the graph area.

The **colour** of the uprights that are drawn from the text to the manholes is given by:

manhole_line_colour	colour	// colour of uprights to the manholes
---------------------	--------	---------------------------------------

Boxes Area

The drainage string values invert level, depth to invert and surface level can be labelled in the Melbourne Water plot with one line of title, and the actual values given at the chainage of each manhole in the drainage string.

The title or **label** for the strings, is drawn in the **labels area** of the **boxes area** and the values are drawn in the **values area** of the **boxes area**.

Consequently the boxes area is made up of rows of text consisting of:

labels followed by the **values** along the string.

Thus the boxes area is built up as a series of individual boxes and the **boxes area** is made up of two areas side by side - the **labels area** and the **values area**.

The order of the boxes from the bottom up is

- (a) chainage values
- (b) upstream and downstream depth to inverts
- (c) upstream and downstream invert levels
- (d) natural surface heights

The label text size and colour are specified by

```
plot_title_text_size      mm           // size of label text in boxes
plot_title_text_colour   colour       // colour of label text in boxes
```

The width of the label box is given by the **box_width** parameter and the height of each box is given by **box_height**.

```
box_width      mm           // width of the label boxes.
box_height     mm           // height of each box
```

The label text for each box can be set by

```
plot_title_chainage_name  text       // label for chainages box
plot_title_surface_name   text       // label for the sewer ns values
plot_title_invert_name    text       // label for the invert levels
plot_title_depth_name     text       // label for depth of inverts
```

For the Melbourne Water plots, there are also additional parameters for special Melbourne Water labels. They are

```
plot_title_item_name      text       // label for item line
plot_title_d_and_g_name   text       // label for diameter and grade
plot_title_detail_name    text       // label for detail line at top of plot
```

The pipe type can also be included with the diameter and grade values

```
label_pipe_type          yes/no
```

The **labels area** for the left plot in the bottom row starts at the co-ordinate (x_origin,y_origin) and each row is begun by adding the distance plot_height to the y_origin.

```
x_origin      mm           // x coord of bottom lh corner of bot row
y_origin      mm           // y coord of bottom lh corner of bot row
```

The **values area** starts at the end of the label area.

As for the label boxes, the height of each individual box area is given by the box_height parameter.

The width of the heights area is determined by the number of chainages to be labelled and whether the values are staggered to prevent over writing.

```
box_text_size      mm           // size of value text
box_text_colour    colour       // colour of values in boxes
```

The colour of the box line work is given by:

```
box_colour         colour       // colour of the lines in the boxes
```

The total height of the boxes area is simply given by number of boxes drawn multiplied by the height of

one box).

The total width of the boxes area is the width of the labels area plus the width of the values area which depends on the amount of staggering that occurs.

Datum Value

The datum value is placed above the top of the natural surface heights box.

Since the datum value is automatically calculated to try and fit the plot vertically into the graph area, the datum value can change along the plot. When a datum change occurs, the new datum value is written on the datum line at the relevant chainage position.

The datum name, text size and colour are controlled by:

datum_name	<i>text</i>	// text to write before the datum value
datum_text_size	<i>mm</i>	// size of datum text and value
datum_colour	<i>colour</i>	// colour of the datum text and line
datum_value_pre_text	<i>text</i>	// text before the datum value
datum_value_post_text	<i>text</i>	// text after the datum value
		// (default " m")
datum_value_decimals	<i>integer</i>	// number of decimal places in the
		// datum value.
		// If > 0, trailing zeros are removed.
		// If < 0, the absolute value is taken as
		// the number of decimal places and no
		// trailing zeros are removed.

Arrow Areas

The **arrow areas** were designed for drawing arrows between manholes and labelling them with values such as pipe slope, pipe diameter, flow, velocity and drainage line name.

These are not required for the Melbourne Water sewer plot.

However, values can still be given to defined the sizes of the arrow areas.

There are four arrow areas:

arrow_1_area which is below the graph and the bottom stagger area. The arrows go between the staggered positions of the manhole chainages.

The datum line is at the bottom of the arrow 1 area.

arrow_2_area which below the graph but above the bottom stagger area. Hence the arrows go between the non-staggered chainage positions of the manholes.

arrow_3_area which is above the graph but below the top stagger area. The arrows go between the non-staggered chainage positions of the manholes.

arrow_4_area is above the graph and the top stagger area. The arrows go between the staggered chainage positions of the manholes.

The heights of the four areas (which can be zero) are defined by:

arrow_area_1	<i>mm</i>	// height of arrow_1 area
arrow_area_2	<i>mm</i>	// height of arrow_2 area
arrow_area_3	<i>mm</i>	// height of arrow_3 area
arrow_area_4	<i>mm</i>	// height of arrow_4 area

Graph Area

The **graph area** is the area where the actual plots of the drainage strings are drawn.

The length of the graph area is determined by the length of the drainage string to be plotted, the horizontal scale (given by scale) of the plot and the sheet width.

```
scale                value                // 1:value - horizontal scale
// The vertical scale is determined by the
// horizontal scale and the vertical
// exaggeration for the section view.
```

The vertical exaggeration is taken from the section view specified for the plot by the parameter:

```
view_name            text
```

The tins to be sectioned through by the sewer strings and any service models and corridor settings for the graph area are also taken from the specified section view.

The height of the graph is **calculated** by subtracting the height of the other nine boxes from the plot height.

If the plot will not fit horizontally into a row on the sheet, then the plot will be broken at an appropriate manhole and the plot continued on another row.

Datum breaks at manholes are used to try and fit the plot vertically into the graph area but if the plot still cannot fit, then it will be truncated at the bottom.

The types of strings that can be drawn in the graph area of the sewer long section plot are:

- (a) drainage string the strings from the network model
- (b) tins sections of the drainage string through any tins on the section view.
- (c) services parts of strings from any models on the section view that cut the corridor for the section view.

The **colour** of the strings in the plot is the actual string colour for cases (a) and (c), and the colour of the tin used for the section in case (b).

Top Area

The **top area** is an annotation area above the arrow_4_area at the top of the plot.

It can be used for manhole names, manhole types, pegs, junctions and deflection angles through manholes.

The height of the top area is given by

```
vertical_plot_gap    mm                // size of the top area. If it is not large
// enough the text will over write the
// plot in the row above.
```

Manholes

The manhole name, manhole type, special manhole symbol and the change of direction of the pipes going through the manhole can all be displayed at the top of the plot.

The manhole name and type are drawn first, followed by the angle of any change of direction of the pipes going through the manhole (the angle is in degrees, minutes and seconds) and finally any junction information.

The text is drawn at the distance **angled_text_y_offset** above the top of the plot, **angled_text_x_offset** to the right of the manhole position and each piece of information is spaced horizontally by the distance **angled_text_gap** to the right of the manhole name if the **angled_text_angle** is zero, or the distance **angled_text_gap** below the previous text if **angled_text_angle** is non-zero.

The size of the manhole names and type is given by **angle_text_size** and the size of the change of direction angle is given by **manhole_angle_text_size**.

The colour of the manhole names, type and change of direction angle is given by **angle_text_colour**.

label_manhole_type		<i>yes/no</i>	// include manhole type
angled_text_size		<i>mm</i>	// size of manhole name text
manhole_angle_text_size		<i>mm</i>	// size of text for change of // angle through manhole
angled_text_x_offset	<i>mm</i>		// distance of text above top of the plot
angled_text_y_offset	<i>mm</i>		// distance of text to the right of manhole
angled_text_gap	<i>mm</i>		// distance of text to the right of previous // text
angled_text_angle	<i>value</i>		// angle of text
angled_text_colour	<i>colour</i>		// colour of text

The symbol at the manhole is controlled by the manhole name.

manhole_symbol_n_size		<i>mm</i>	
manhole_symbol_n_colour		<i>colour</i>	
manhole_symbol_n_y		<i>mm</i>	// distance above top line
manhole_symbol_n_repeats		<i>integer</i>	// draw the symbol this // many times with a // decreasing size)
manhole_line_colour		<i>colour</i>	// colour of line through // manhole

Junctions

Any junctions at the manhole are also labelled with the name of the lines coming into the manhole.

The junction text is made up of two lines:

```
JUNCTION LINE    line_name
angle of the junction
```

The junction text is at the same height as the manhole and angle text and at a distance **angled_text_gap** to the right of the manhole and angle text, or a previous junction label. The size of the text is given by

junction_angle_text_size	<i>mm</i>
--------------------------	-----------

When a junction does occur, the incoming pipe is drawn at the correct position on the manhole of the main line.

Services

Any services in the corridor are drawn on the plot and if the service actually cuts the drainage string, then a line is drawn to the cut point and the line labelled with the service name. The name is drawn below the cut point and is right justified.

<i>service_text_size</i>	<i>mm</i>	// size of the text for the service name
<i>service_text_x_offset</i>	<i>mm</i>	// adjustment to the drawing position
<i>service_text_y_offset</i>	<i>mm</i>	// for the service name
<i>service_text_colour</i>	<i>colour</i>	// colour of the service name
<i>service_line_colour</i>	<i>colour</i>	// colour of the line to the cut point

Property Controls and House Connections

The position of the property controls can be drawn on the plot and can have a user specified diameter.

<i>draw_property_controls</i>	<i>yes/no</i>
<i>property_control_diameter</i>	<i>value</i>

The house connections can be drawn from the pipe to the house connection level, with a line across the top (a T). The full width the T can be specified by the user.

<i>draw_house_connections</i>	<i>yes/no</i>
<i>house_connection_width</i>	<i>value</i>

Symbols at Manholes

Manholes can be labelled with symbols which depend on the manhole type. There can be up to twenty (20) sets of manhole symbols.

manhole_symbol_n_type	<i>mh_type</i>	// manhole type to have symbols
manhole_symbol_n_mode	0	// cross
	1	// up from centre of box
	2	// up and down from centre of box
	3	// square
	4	// triangle, base at bottom
	5	// circle
	6	// use a 12d symbol

0 + 1 | 2 | 3 □ 4 △ 5 ○

predefined symbols for manhole_symbol_n_modes 0 to 5

manhole_symbol_n_position	1	// at top of manhole - default
	3	// above top of boxes
	4	// above highest point
	100	// to primary string
	101	// to first found tin
manhole_symbol_n_size	<i>mm</i>	// size
manhole_symbol_n_x	<i>mm</i>	// x adjustment to position - default 0
manhole_symbol_n_y	<i>mm</i>	// y adjustment to position - default is 0
manhole_symbol_n_style	<i>text</i>	// the name of the 12d symbol
manhole_symbol_n_angle	<i>value</i>	// default value is 0
manhole_symbol_n_colour	<i>colour</i>	//

For example:

manhole_symbol_1_type	"CONC COVER"	// manhole type to use
manhole_symbol_1_position	1	// on top of manhole
manhole_symbol_1_mode	6	// use 12d symbol
manhole_symbol_1_style	"shrub"	// name of 12d symbol
manhole_symbol_1_size	1	
manhole_symbol_1_x	0	
manhole_symbol_1_y	0	

Hatching Cut and Fill Areas

This option is used to hatch cut and/or fill areas between sets of tins.

For each set, the name of the two tins, the hatch linestyle, colour and separation and whether cut and/or fill regions are required are all user definable.

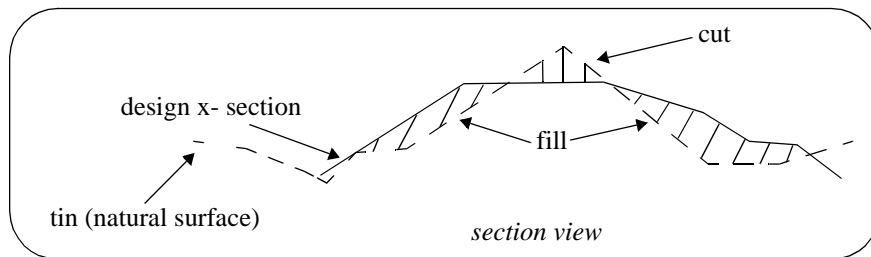
Up to twenty (20) separate sets of tins be hatched.

The parameters for labelling cuts and/or fill regions between tins are given by:

hatch_original_tin_n	<i>tin_name</i>	// tin_name for original surface
hatch_new_tin_n	<i>tin_name</i>	// tin_name for final surface
hatch_cut_separation_n	<i>mm</i>	// distance between cut hatch lines
	0	// don't do cut hatching
hatch_cut_angle_n	<i>degrees</i>	// angle in degrees of cut hatching
hatch_cut_colour_n	<i>colour</i>	// colour of the cut hatching
hatch_cut_linestyle_n	<i>linestyle</i>	// linestyle for cut hatching
hatch_cut_draw_sides_n	1/0	// 1 = draw sides of cut regions
hatch_cut_draw_original_n	1/0	// 1 = draw original tin in cut regions
hatch_cut_draw_new_n	1/0	// 1 = draw new tin in cut regions
hatch_fill_separation_n	<i>mm</i>	// distance between fill hatch line
	0	// don't do fill hatching
hatch_fill_angle_n	<i>degrees</i>	// angle in degrees of fill hatching
hatch_fill_colour_n	<i>colour</i>	// colour of the fill hatching
hatch_fill_linestyle_n	<i>linestyle</i>	// linestyle for fill hatching
hatch_fill_draw_sides_n	1/0	// 1 = draw sides of fill regions
hatch_fill_draw_original_n	1/0	// 1 = draw original tin in fill regions
hatch_fill_draw_new_n	1/0	// 1 = draw new tin in fill regions

Notes

- cut is when the new tin is below the original tin.
fill is when the new tin is above the original tin.
- cut hatching is turned off by setting hatch_cut_separation_n to 0.0.
fill hatching is turned off by setting hatch_fill_separation_n to 0.0.



Labelling Cuts of Drainage Through Strings in a Model

The cuts that the drainage string makes through any strings in user given models can be automatically labelled on the long section plots.

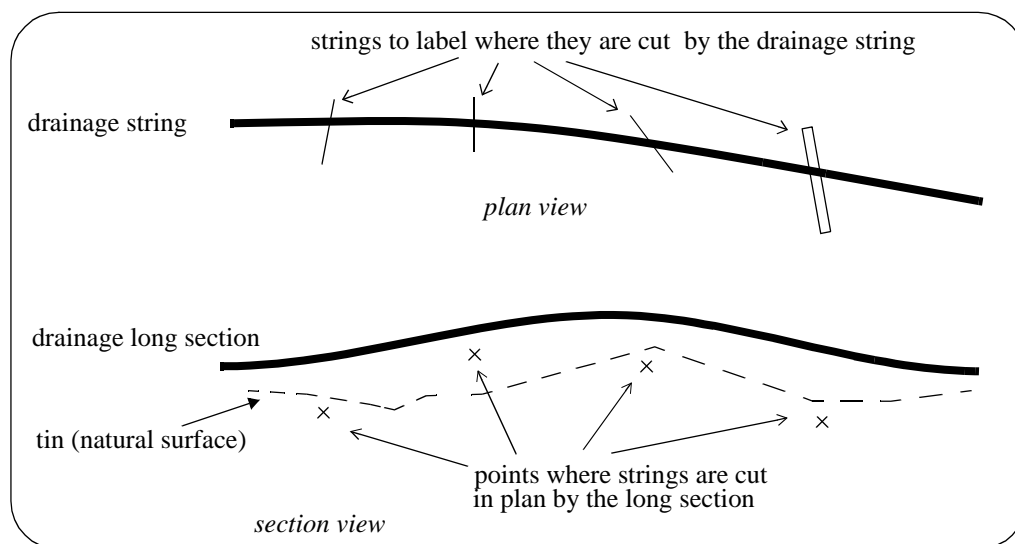
The **height**, **chainage** and **name** of the cut string can be labelled as well as a **symbol** drawn. The height of tins at the same offset value can also be labelled.

The chainage position for the labelling is the chainage of the cut string.

The height position for the labelling can be specified as the

- (a) top of the boxes on the long section
- (b) height value of the cut string
- (c) height of the primary string
- (d) height of a tin.

The actual position of the label is defined relative to the above point.



Note:

Only case (b) involves the actual height of the cut string. For all other cases, only the chainage of the cut string is used. Hence for all cases except (b), the string does need to have a sensible height to be used for cuts through strings.

For example, a boundary string may have null heights but only the chainage is required and the height of the tin at that chainage can be used as the height (case (d)).

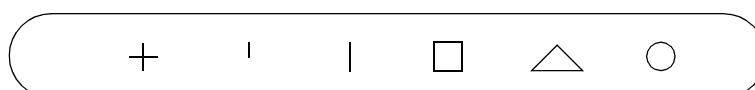
Text justification refers to the actual position and is given by

“top-left”	“top-centre”	“top-right”
“middle-left”	“middle-centre”	“middle-right”
“bottom-left”	“bottom-centre”	“bottom-right”

A choice of six special symbols and/or or any 12d symbols can be drawn at the cut point.

The special 12d Model symbols of size one millimetre are drawn in a square box centred on (0,0) with sides of length two millimetres. That is, the box co-ordinates are (-1,-1), (1,1), (1,-1), (-1,-1).

The six special shapes are



Up to twenty five (25) separate models of strings can be cut and labelled.

Parameters for Labelling Where the Drainage Line Cuts Strings in a Model

The method for specifying which strings are to be checked for cuts is by first specifying the **model** which contains the strings, and then a **name mask** which is used to restrict the strings in the model to only those whose name matches the name mask.

Up to twenty five different sets of models and name masks can be used so that different cut sets can be labelled in different ways.

The parameters for selecting and labelling the n'th set (where n can be from 1 to 25) of cuts of the design string with the strings in the model are given by:

```
cuts_n_model          model_name          // model of strings to be cut
```

The selection of the strings from the model *model_name* whose cut points are to be labelled is all the strings whose name satisfies the name mask *cuts_n_mask*:

```
cuts_n_mask          name_mask          // strings to check for cuts
                                     // and if a cut occurs,
                                     // parameters show how to
                                     // label the cut
```

where *name_mask* is a text string containing the name masks, each separated by one or more spaces, to test the string name against. Each mask can include wild cards and wild characters.

For example

```

                                     cuts_1_mask          "ke*"
or                                     cuts_1_mask          "?bank*"
or, if both masks are required,
                                     cuts_1_mask          "ke* ?bank*"

```

If *cuts_n_mask* is missing, then all strings in the model are used. This is equivalent to *name_mask* being "*".

All strings in the model *cuts_n_model* whose name satisfy the name mask *cuts_n_mask* are then checked for cuts with the drainage strings, and if a cut occurs, the cut point will be labelled according to the rest of the parameters in the n'th set.

The parameters for drawing a **symbol** at the cut points are

```
cuts_symbol_n_mode    0          // cross
                     1          // up from centre of box
                     2          // up and down from centre of box
                     3          // square
                     4          // triangle, base at bottom
                     5          // circle
                     6          // use a 12d symbol
```

0 + 1 | 2 | 3 □ 4 △ 5 ○

predefined symbols for cut_symbol_n_modes 0 to 5

If *cuts_symbol_n_mode* is 6, then the 12d symbol is given by

```
cuts_symbol_n_style   plotsymbol      // 12d symbol to draw at cut
```

Important Note

The plot symbol of name *plotsymbol* is defined in the file given by:

- (a) the parameter *plot_symbols* in the ppf file

```
plot_symbols          filename
```

or if *plot_symbols* is not defined, then

- (b) in the file pointed to by the environment variable PLOT_SYMBOLS_4D

```
PLOT_SYMBOLS_4D      filename      // default plotsym.4d
```

or if *PLOT_SYMBOLS_4D* is not defined, then

- (c) in the file *plotsym.4d*

which is searched for in the standard set up file sequence

If none of the above files are defined, or if the symbol does not exist in the above files, then it will be searched for in the standard 12d symbols file which is:

- (d) either pointed to by the environment variable SYMBOLS_4D

```
SYMBOLS_4D          filename      // default symbols.4d
```

or if the environment variable *SYMBOLS_4D* does not exist, in the file, *symbols.4d*

The position of the symbol is given by:

```
cuts_symbol_n_position    1          // above point height value
                          3          // above top of boxes
                          100        // to primary string
                          101-500    // to tin1 or tin2 etc.
```

The symbol can be adjusted by the parameters:

```
cuts_symbol_n_x          mm          // offset adjustment to position
cuts_symbol_n_y          mm          // height adjustment to position
cuts_symbol_n_angle      degrees     // rotation about point
cuts_symbol_n_colour     colour      // colour of symbol
```

and for all values of *cuts_symbol_n_mode* other than 6:

```
cuts_symbol_n_size       mm          // size of symbol, 0 don't draw
```

The value of the **chainage** of the cut string can be labelled using the parameters

```
cuts_chainage_n_position  1          // above cut strings height value
                          3          // above top of boxes
                          100        // to primary string
                          101-500    // to tin1 or tin2 etc.

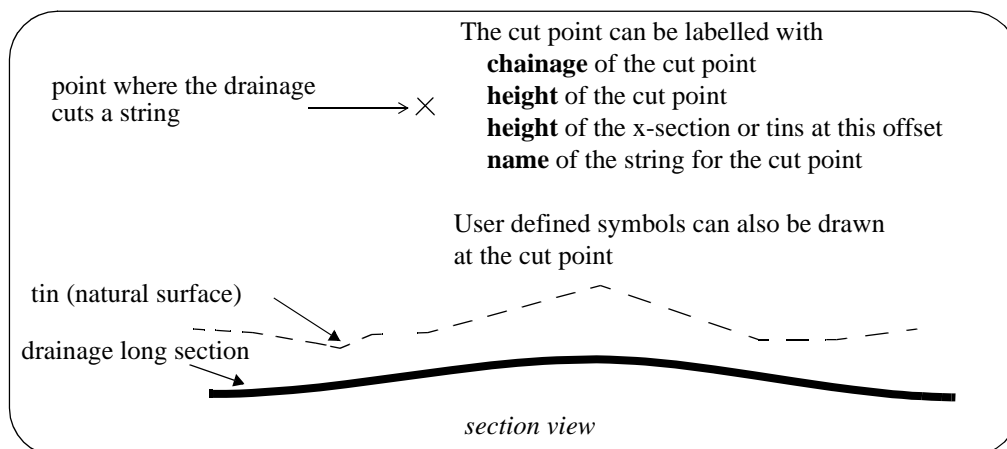
cuts_chainage_n_x        mm          // chainage adjustment to position
cuts_chainage_n_y        mm          // height adjustment to position
cuts_chainage_n_angle    degrees     // rotation about point
cuts_chainage_n_size     mm          // size of text, 0 don't label
cuts_chainage_n_colour   colour      // colour of text
cuts_chainage_n_textstyle text       // textstyle of text chainage
cuts_chainage_n_pre_text text       // text before the chainage value
cuts_chainage_n_post_text text       // text after the chainage value
cuts_chainage_n_justification justification // justification of the text
cuts_chainage_n_no_decimals integer   // number of decimals in chainage
```

The value of a **height** at the chainage of the point can be calculated and labelled using the parameters

cuts_height_n_mode	1	// use height of cut point itself
	3	// use real world height of position // above boxes
cuts_height_n_position	100	// height of primary string
	101-500	// use height of to tin1 or tin2 etc.
	1	// at points position
	3	// above top of boxes
cuts_height_n_x	100	// to primary string
	101-500	// to tin1 or tin2 etc.
cuts_height_n_x	mm	// chainage adjustment to position
cuts_height_n_y	mm	// height adjustment to position
cuts_height_n_angle	degrees	// rotation about point
cuts_height_n_size	mm	// size of text, 0 don't label
cuts_height_n_colour	colour	// colour of text
cuts_height_n_textstyle	text	// textstyle of text height
cuts_height_n_pre_text	text	// text before the height value
cuts_height_n_post_text	text	// text after the height value
cuts_height_n_justification	justification	// justification of the text
cuts_height_n_no_decimals	integer	// number of decimals in height

A **label** which can include the **name** of the cut string is drawn by using the parameters

cuts_label_n_position	1	// above cut strings height value
	3	// above top of boxes
	100	// to primary string
	101-500	// to tin1 or tin2 etc.
cuts_label_n_mode	0	// don't include cut string name
	1	// include cut string name in label
cuts_label_n_x	mm	// chainage adjustment to position
cuts_label_n_y	mm	// height adjustment to position
cuts_label_n_angle	degrees	// rotation about point
cuts_label_n_size	mm	// size of text, 0 don't label
cuts_label_n_colour	colour	// colour of text
cuts_label_n_textstyle	text	// textstyle of text label
cuts_label_n_pre_text	text	// text before the string name
cuts_label_n_post_text	text	// text after the string name
cuts_label_n_justification	justification	// justification of the text



Title Block Information

The plot can have a standard 12d Model title block or a user defined title block.

The standard title block consists of a simple border around the plot and two lines of text in a box underneath the plot. For a user defined title block, all the line work and text is defined by the user.

Standard Title Block

For the standard 12d Model title block, there are extra parameters for two lines of text and text size and colour. The standard title block is turned on or off by the parameter *plot_border*.

<i>plot_border</i>	<i>yes/no</i>	<i>// yes plots a standard title block</i> <i>// default yes</i>
<i>title_1</i>	<i>text</i>	
<i>title_2</i>	<i>text</i>	
<i>title_text_size</i>	<i>value</i>	
<i>title_colour</i>	<i>colour</i>	

User Title Block

For the user defined title block, the title block drawing commands are kept in a file whose name is supplied by the user. The title block drawing commands are almost identical to the linestyle drawing commands and is given at the beginning of chapter Advanced Plotting.

Hence for a user defined title block, there are just two parameters - one to say a title block file is being used and the other to give the name of the title block file. The *plot_border* parameter should also be set to *no* so that the standard title block is not also drawn.

<i>use_title_file</i>	<i>yes/no</i>	<i>// yes draws the title block given in title_file</i> <i>// default no</i>
<i>title_file</i>	<i>filename</i>	
<i>plot_border</i>	<i>no</i>	<i>// turn off standard title block</i>

Some special plot parameters are used to pass information down to variables in a user defined title block

For example, inside the title block file it is possible to have runtime user defined text variables. The actual text values for these text variables are passed down to the title block file from the plot parameter file via the parameters *user_text_n* ($n = 1, 2, \dots, 1000$)

<i>user_text_n</i>	<i>text</i>
--------------------	-------------

The special plot parameters are:

<i>time_format</i>	<i>text</i>	<i>// format for \$time</i>
<i>user_text_n</i>	<i>text</i>	<i>// where n = 1, 2, ... 1000</i> <i>// passed down to \$user_text_n</i>
<i>title_1</i>	<i>text</i>	<i>// passed down to \$title_1</i>
<i>title_2</i>	<i>text</i>	<i>// passed down to \$title_2</i>
<i>start_page_number</i>	<i>integer</i>	<i>// used as the starting value for</i> <i>// \$page_number. If missing,</i> <i>// \$page_number starts at 1.</i>
<i>start_drawing_number</i>	<i>integer</i>	<i>// added to \$drawing_number in title</i> <i>// block file. If missing,</i> <i>// \$drawing_number starts at 1.</i>
<i>drawing_number_prefix</i>	<i>text</i>	<i>// passed down to</i> <i>// \$drawing_number_prefix</i>
<i>drawing_number_postfix</i>	<i>text</i>	<i>// passed down to</i> <i>// \$drawing_number_postfix</i>

Parameters that Modify Fields In the Melbourne Water Network Panel

A number of parameters match those in the **New Melb Plot Drainage Network** panel.

When the plot parameter file is first read, any parameters in the panel will be replaced by the values of any corresponding parameters from the parameter file.

However, if the parameter is subsequently modified in the panel, the panel value will be the value used for the parameter.

The plot parameters that also occur in the **Melb plot drainage network** panel are:

network_model	<i>text</i>
scale	<i>value</i>
plotter_type	<i>text</i>
plot_stem	<i>text</i>
view_name	<i>text</i>
sheet_size	<i>text</i> or "width height"
plot_height	<i>mm</i>
x_origin	<i>mm</i>
y_origin	<i>mm</i>
global_textstyle	<i>textstyle</i>
box_text_size	<i>mm</i>
box_colour	<i>colour</i>
plot_border	<i>yes/no</i>
title_1	<i>text</i>
title_2	<i>text</i>
title_text_size	<i>value</i>
title_text_colour	<i>colour</i>
use_title_file	<i>yes/no</i>
title_file	<i>filename</i>

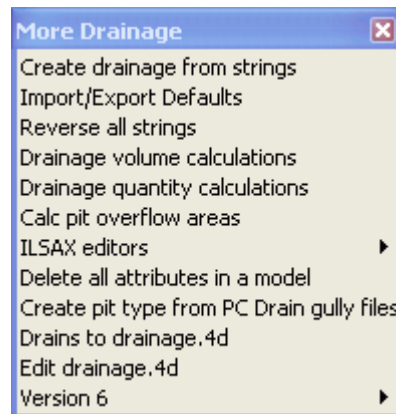
More Drainage

[more_drainage](#)

Position of menu: Design =>Drainage-Sewer=>More

The More Drainage menu items contain the drainage import export routines and tools that enhance the basic drainage functions on the Drainage Sewer menu.

The **more drainage** walk-right menu is:



Frequently Asked Questions (FAQ)

Drainage Overview

The following are the basic steps from creating a urban drainage network to producing your plan/drainage longsection drawings and pit layout table. The optional catchment area models and bypass flow model will be discussed afterwards.

Set drainage defaults

Draw the drainage strings

Set zero chainage to downstream end of the pipe string (Reverse drainage strings) (optional)

Automatically assign pit names

Define catchment areas (optional)

Define Pit/manhole Inlet Capacities via Overland flow strings (optional)

Hydraulic/hydrology calcs via spreadsheets, Drains, RAT2000, PCdrain, XP SWMM or ILSAX

Drainage longsection plots

Pit layout/construction schedules

Manhole and Pipe Table of Quantities (summarise by type, depth and size)

Drainage line excavation volume calculations

Roadway flooded width calculations

Drainage Export and Import to Design Software

Copy/Paste from spreadsheets

Running Drains

Running PCdrain (Windows)

Running Micro Drainage - Win DES

Running XPSWMM

Running RAT2000

Training Course Notes

Drainage and *Advanced Drainage* training course notes (Adobe PDF format for printing) and sample 12d data sets are available on the installation CD. The training course moves through a worked example in detail. The course notes are also included below for your reference.

Drainage Course Notes

Advanced Drainage Course Notes

Drainage FAQ

Why do the **obvert/invert levels not change** when I import data via the "pit/pipe interface"?

On the interface panel there is an **Options** button that displays a panel with the "**hold obverts on import**" option. The default is off but if it is selected the pipe obverts will not change even if import data has new levels. Note that the invert levels will change if the pipe diameters change.

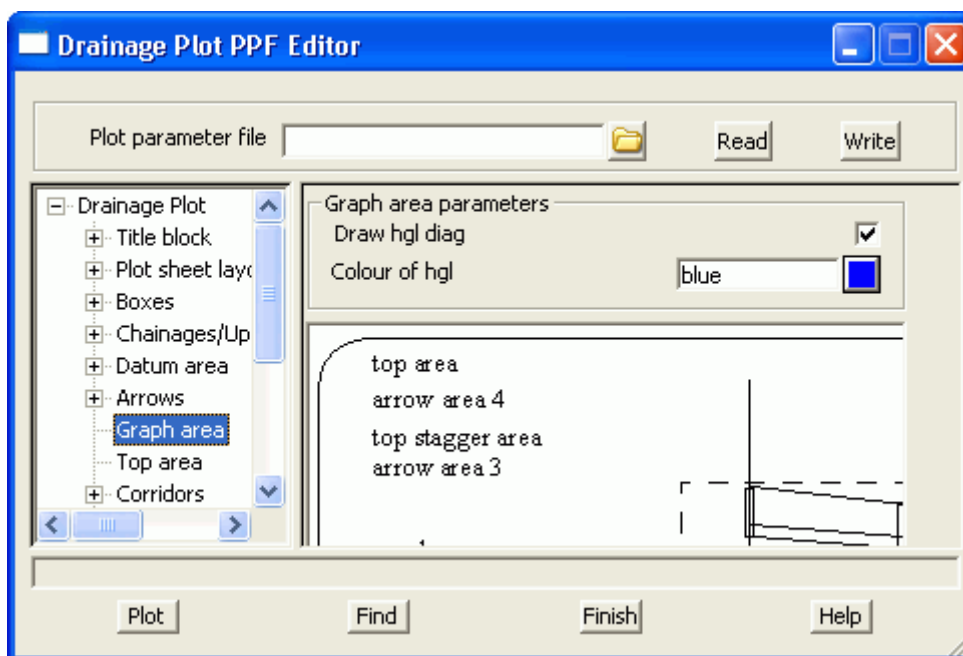
Can I **manually enter catchment areas** in the drainage design programs?

Yes. The catchment strings are optional in 12d. If no catchment string has been linked to a manhole and there has been no manhole "area" attribute a default area of 0.0001 will be sent. When results are imported back into 12d the total areas from the design package will be saved in the manhole "area" attribute.

How do I include/exclude the **hydraulic grade line** on drainage longsections. .

First, there must be HGL results. These may come from the 12d rational drainage design, imported from another design package (including spreadsheets) or manually entered as manhole/pipe attributes. If HGL results exist then they may be viewed in the section view of the drainage line.

Second, the HGL results may be added to the drainage longsection drawings by editing the plot parameter file (ppf) as shown below.



Creating Drainage Strings

Drainage strings may be created in 12d in a number of ways.

1. **Import 2d strings** from other drawing packages and convert them to drainage string inside 12d.
2. **draw the string in 12d** using a design tin to the manhole cover levels and pipe inverts.
3. Enter the details in a **spreadsheet format** and paste the spreadsheet into 12d.

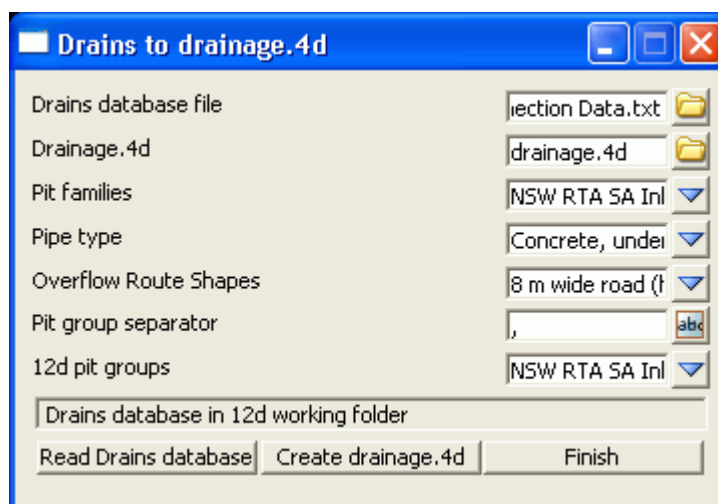
Regardless of the method, take the time to **set your defaults** before you start. You can always change the data later.

Creating a drainage.4d file from the Drains database dump

Drainage_drains_to_drainage4d_panel

Position of option on menu: Design =>Drainage-Sewer =>More=>Drains to drainage.4d

On selecting the Drains to drainage.4d option, the Drains to drainage.4d panel is displayed.



Key Points

1. Select **Read Drains database** (12d will search the usual locations for the Drains database)
2. Review the Drains pit families list to identify the pit group separator and then enter it in the **Pit group separator** field. **PRESS THE ENTER KEY!**
3. Check the **12d pit groups** and if they are acceptable select **Create drainage.4d**.

The Details

The Drains database dump file **Drains Connection Data.txt** is copied into the 12d working folder and read. The choices for the **Pit families**, **Pipe types** and **Overflow Route Cross Section Shapes** are loaded into the panel. The user must select a **Pit group separator** to separate the road grades and crossfalls from the pit family names. The resulting **12d Pit Groups** will be calculated and displayed in the choice box. **Create drainage.4d** will create a **drainage.4d** file that may then be edited to specify the road grade and crossfall threshold values. Once the file is created you may review/edit it by selecting the **More Info** icon then **Edit** on the **Drainage.4d** field. The **Overland route shapes** are not exported to the drainage.4d file and are presented for your information only.

YOU MUST RESTART 12D FOR THE NEW DRAINAGE.4D FILE TO BECOME ACTIVE!

Field Description	Type	Defaults	Pop-Up
Drains database file	file	Drains Connection Data.txt	

You must update this file from Drains before each use of this panel. Inside Drains select Project=>Overflow Route database. Then select OK and then YES. This will cause Drains to export the database to the file "Drains Connection Data.txt".

*Selecting **Enter** in this field or selecting **Read Drains database** will cause the panel to search for the database dump in the folders C:\Program Files\Drains\Program and C:\Program Files\Drains\Demo\Program. If the Drains program is installed in another folder then you must browse for the file. After reading the file choice boxes below will be populated. Drains Connection Data.txt will be copied into the 12d working folder.*

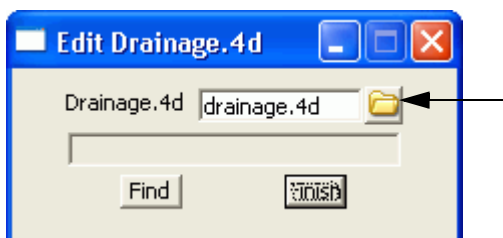
- | | | |
|--|--------|---------------------|
| Drainage.4d | file | drainage.4d |
| <i>The drainage.4d will be created in the 12d working folder unless otherwise specified. It will only be used for 12d projects in this folder.</i> | | |
| Pit families | choice | Drains pit families |
| <i>These are the Drains pit families that will be exported to the drainage.4d file. The 12d pit groups will be created from this list.</i> | | |
| Pipe type | choice | Drains pipe types |
| <i>These are the Drains pipe types that will be exported to the drainage.4d file.</i> | | |
| Overflow Route Shapes | choice | Drains Route Shapes |
| <i>These are the Drains Route Shapes and are for information only.</i> | | |
| Pit group separator | input | |
| <i>These characters will be used to remove the road grade crossfall data from the Pit families above. The data before this character will become the 12d pit groups. Press Enter or select Read Drains database to create a new list of 12d pit groups.</i> | | |
| 12d pit groups | choice | 12d pit groups |
| <i>These are created from the Pit family list above by deleting all text after the Pit group separator. This should delete all of the road grade and crossfall information from the pit group names.</i> | | |
| Read Drains database | button | |
| <i>Searches for the Drains database (see general description above) and populates the choices fields.</i> | | |
| Create drainage.4d | button | |
| <i>Create a local copy of the drainage.4d file.</i> | | |

Editing a drainage.4d file

Drainage_Edit_drainage4d_panel

Position of option on menu: Design =>Drainage-Sewer =>More=>Edit drainage.4d

On selecting the Edit drainage.4d option, the Edit drainage.4d panel is displayed.



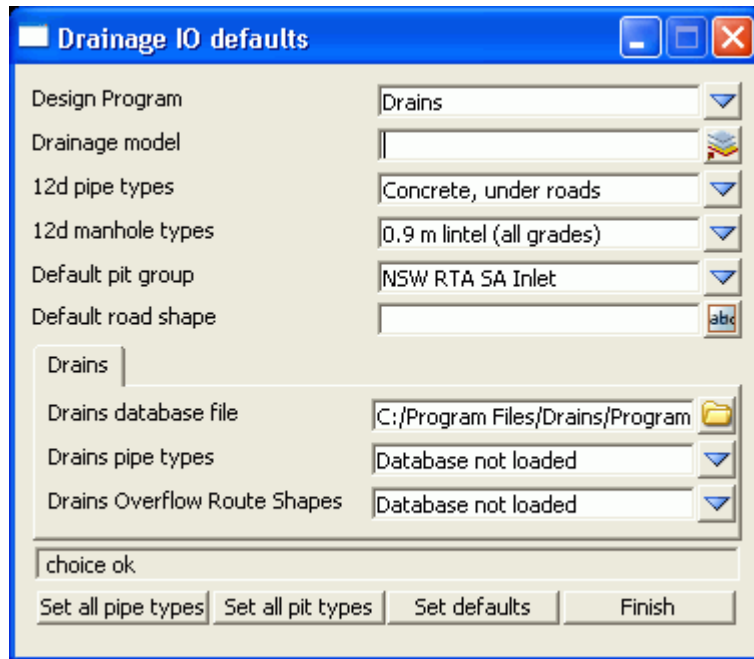
Select the **Find** button to search the 12d path for the current **drainage.4d** file. Select the **More info** button and then **Edit** to edit the file.

Drainage IO Defaults

Drainage_io_defaults_panel

Position of option on menu: Design =>Drainage-Sewer =>More=>Drainage IO Defaults

On selecting the Drainage IO Defaults option, the Drainage IO Defaults panel is displayed.



The routine changes ALL of your manhole and pipe types in a model to a single value. If you have changed your drainage.4d file after creating you drainage network, the manhole and pipe types you originally selected may no longer be valid (i.e. in the drainage.4d file).

Field Description	Type	Defaults	Pop-Up
Design Program	choice	Drains	Drains,PCdrain
<i>The drainage model to be updated.</i>			
Drainage model	file		
<i>The drainage model to be updated.</i>			
12d pipe types	choice		values from drainage.4d
<i>Set all pipe types will set all pipes in the model to this value</i>			
12d manhole types	choice		values from drainage.4d
<i>Set all pit types will set all manholes in the model to this value</i>			
Default pit groups	choice		values from drainage.4d
<i>manhole definitions in the drainage.4d file that have group as a prefix are included.</i>			
Default road shape	choice		values from drainage.4d
<i>type the desired name or if using Drains select the desired shape from the Drains Overflow route shapes.</i>			

Drains Tab

- Drains database file file
pressing enter in this field will start a search for the Drains database dump. The search path is the specified folder, C:\Program Files\Drains\Program then C:\Program Files\Drains\Demo\Program. If the file is found the choice fields below are populated. It is highly recommended that this file be in the 12d working folder.
- Drains pipe types choice 1 values from Drains file
the pipe types are retrieved from the last Drains database dump. Changing this value will update the 12 pipe types above.
- Drains Overflow Route Shapes choice values from Drains file
*the overflow route shapes are retrieved from the last Drains database dump. Changing this value will update the **Default road shape** above.*
- Set all pipe types button
all pipe types in model are set to this value
- Set all pit types button
all pit types in model are set to this value
- Set defaults button
*the defaults for the **Drains Overflow Route Shapes** and **12d pit group** are set*
- Finish button
removes the panel

Drainage Network Editor

Drainage_Network_Editor

Position of option on menu: Design =>Drainage-Sewer =>Drainage Network=>Drainage network editor

The drainage network editor enables the user to edit all of the drainage strings in a model (a network). There are five main tabs and plus function buttons on the bottom of the panel.

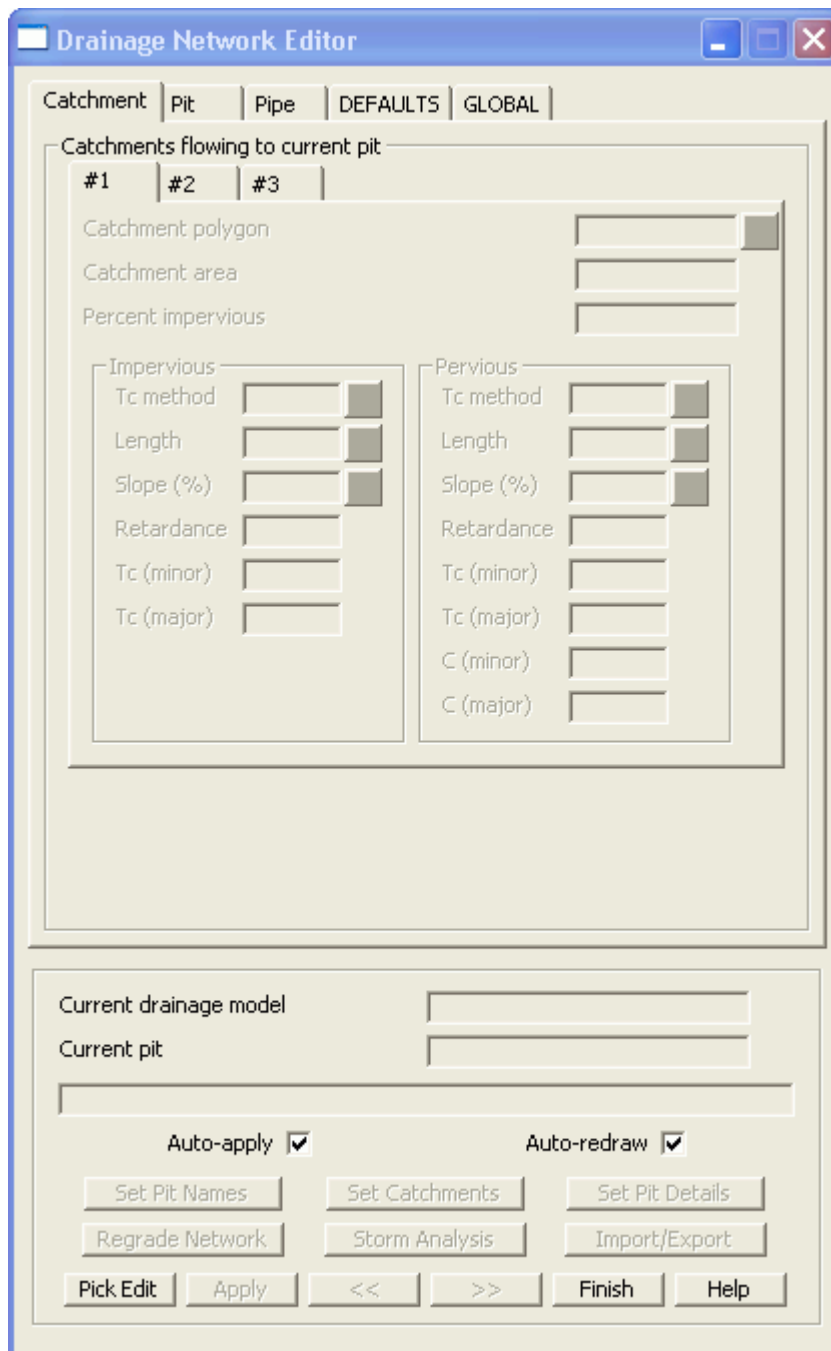
Using the Drainage **Network Editor**

Recommended order to use the tabs and Buttons.

(This is not required but it will lead you through the process in an systematic method.)

<u>Tab</u>	<u>Function Buttons</u>
1. Global tab	3. Set Pit Names
2. Defaults tab	4. Set Catchments
5. Pipe tab	8. Set Pit Details
6. Pit tab	9. Regrade Network
7. Catchment	Storm Analysis
	Import/Export

On selecting the Drainage network editor option, the Drainage network editor panel is displayed.



Global Tab

Design values for the hydrology and hydraulics calculations are set either globally (one value for the entire network) or via Defaults for the manholes or pipes. Defaults values may be overridden by explicit settings found on the catchment, pits or pipes tab. Explicit manhole/pipe settings need only be specified if the default value is not desired.

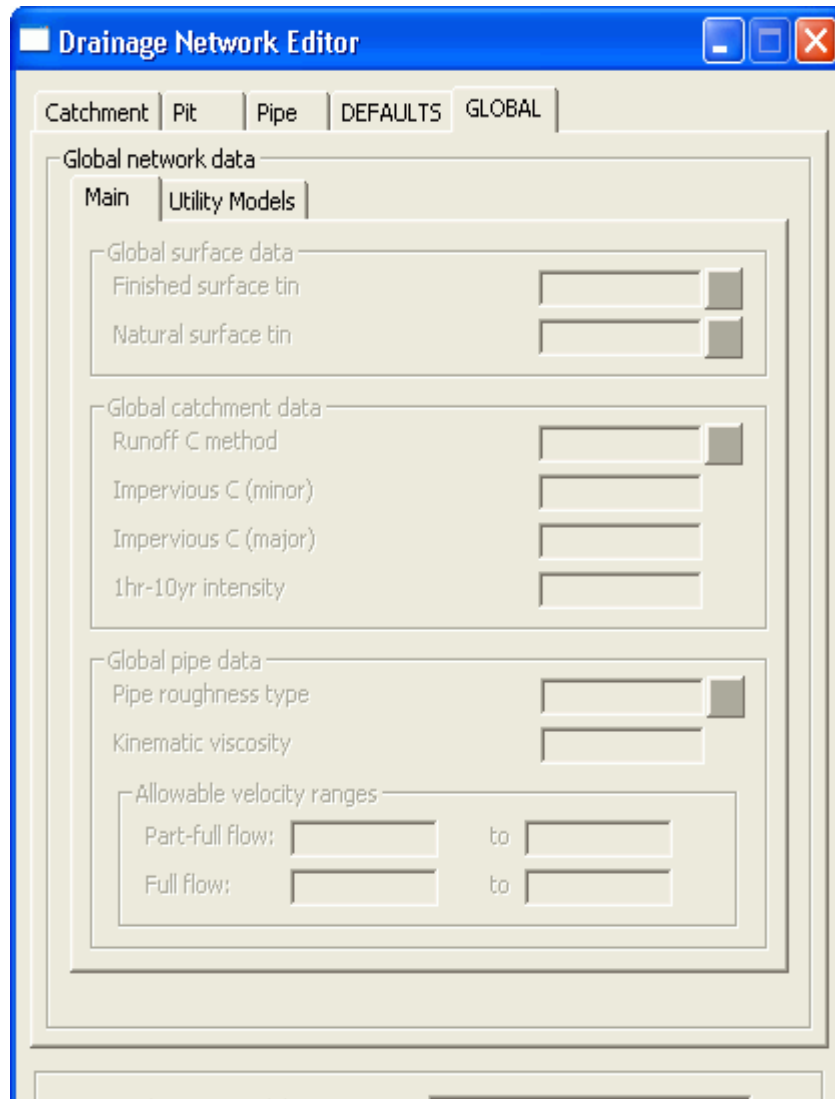
There are 2 sub tabs. See **Main tab** and **Utility Models tab**

Main tab

The **Global surface data**. The **Finished surface tin** is used for determining pipe cover and surface levels for the manholes. The **Natural surface tin** is specified so that it can be included on the drainage longsection plots.

For **Global catchment data** see **Coefficients of Runoff**

For **Global pipe data** see **Pipe Friction Method**.



Utility Models tab

The utility models tab is used to specify the following data:

Catchment polygons, the catchment slope strings, catchment labelling data

Bypass flow strings

Road setout strings., road centre line strings and crossfall/grade offsets

Service/utility models and the allowable clearances

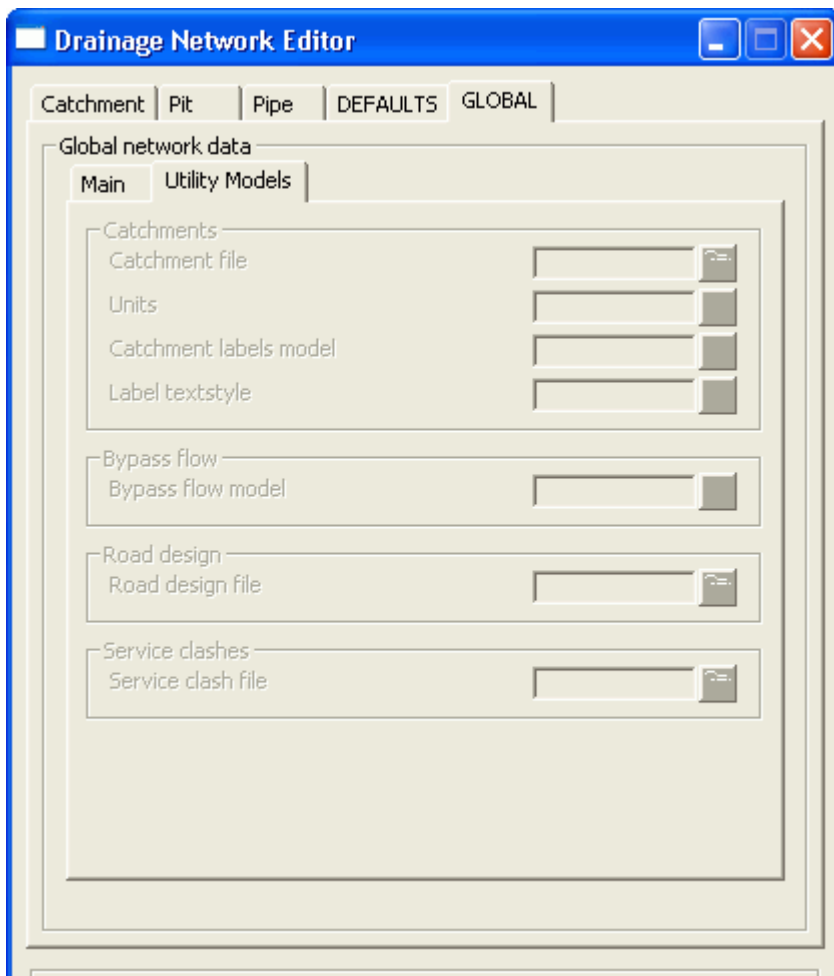
Additional details

Catchments Areas

Bypass flow

Manhole setout via setout strings

Service and Utility Clashes



Defaults tab

See **Default Settings**

Pit tab

Pipe tab

Catchment tab

Regrade Network

Set Pit Details

Set Pit Names

[Drainage_Network_Editor_Set_Pit_Names](#)

The **Set pit name** selection names the pits and pipes for the drainage model (both pits and pipes can be named). Three numbering schemes are available:

drainage strings names are used as the prefix followed by the pit number (ex A-1)
 drainage strings names are used as the suffix followed by the pit number (ex 1/A)
 the pits are sequentially numbered. (ex 1,2,3....)

The names can have pre-text added to the beginning of the pit name and a separator between the string name and the pit number (/ - etc.) if desired.

Design Program Notes:

PCdrain users: Since catchments contain only 3 characters do not use separators. Using the letters A-Z for strings and numbers 1-99 will give you 26 strings and up to 99 pits on each string. Using the numbered stem works very well in PC Drain.

Micro Drainage users: Pits and pipes are numbered separately in Micro drainage. The pipes must use the numbered sequence with the most upstream pipes numbered with the smallest numbers. Number of digits must be set to 3.

ILSAX users: You must use alphabetic characters for your string names and no more than 3 characters

See Also

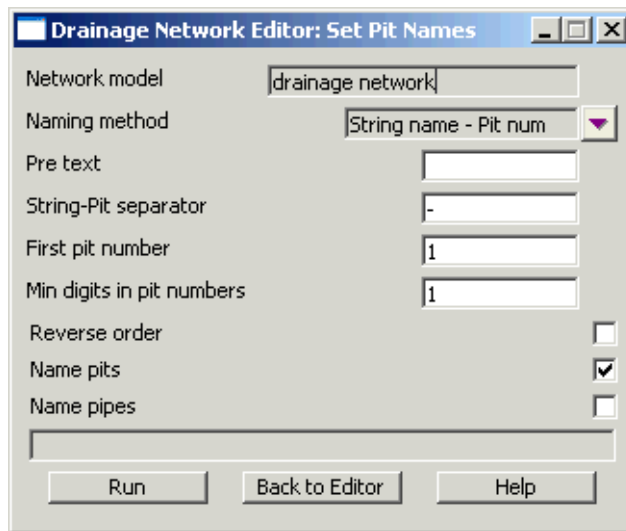
- Labelling a drainage network
- Displaying the Auto Pit Names
- Drainage overview

Usage

The selection is found on the drainage **network editor** and is accessed through the main menu by selecting

Design=>Drainage-Sewer=>Drainage Network=>Drainage=>Network editor

Select the **Set Pit Names button** and the following panel will appear.



The fields and buttons used in this panel have the following functions:

Field Description	Type	Defaults	Pop-Up
Model	Model box		drainage model from main dialogue
Naming Method	Choice box		
		<i>Pit num - String name for string A manhole 1 the name is 1A</i>	
		<i>String name - Pit num for string A manhole 1 the name is A1</i>	

Sequential numbering the strings names are sorted alpha-numerically and the manholes are numbered starting at **First pit number**

Pre text input box

this text will precede the pit name (ex Pit A01)

String/pit separator input box

the character that separates the string name from the pit number. For example if pit names A/01, A/02 etc. where desired a "/" would be entered. You may omit the separator if none is desired.

First Pit Number integer box

the starting pit number on the drainage lines. For drainage strings with the flow direction set as descending chainage the first pit is the junction pit.

Min digits in pit numbers integer box

a non zero value will pad the pit numbers with leading zeros. (ex if 2 is entered, pit 1 is not A/1 but rather A/01)

Reverse numbering order tick box

*Unselected, pit **First pit number** is at the low chainage end of the line. Selected, pit **First pit number** is the second pit from the high chainage end of the line.*

Number pits tick box

the pits are assigned names. This allows the pit and pipes to be names differently.

Number pipes tick box

the pipes are assigned names. This allows the pit and pipes to be names differently.

Run button

name the pits/pipes. The pit at the high chainage of the string is not labelled. The only time you will need to name this pit is when it is the outlet from the system.

Back to Editor button

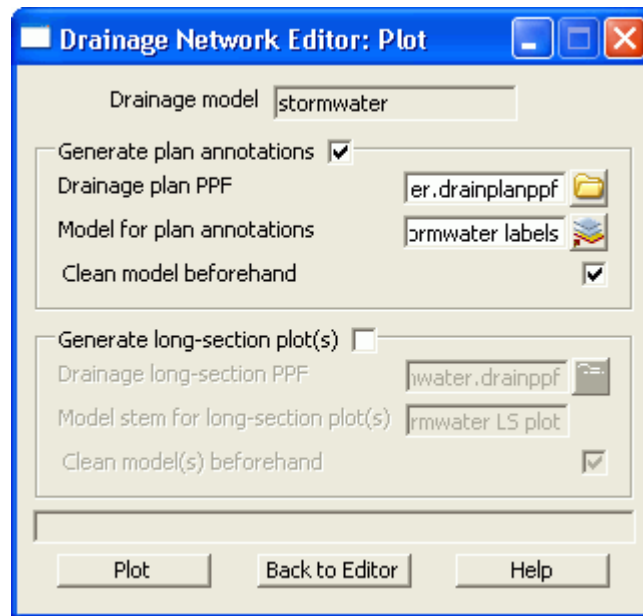
return to the network editor.

Help button

display this page.

Plot

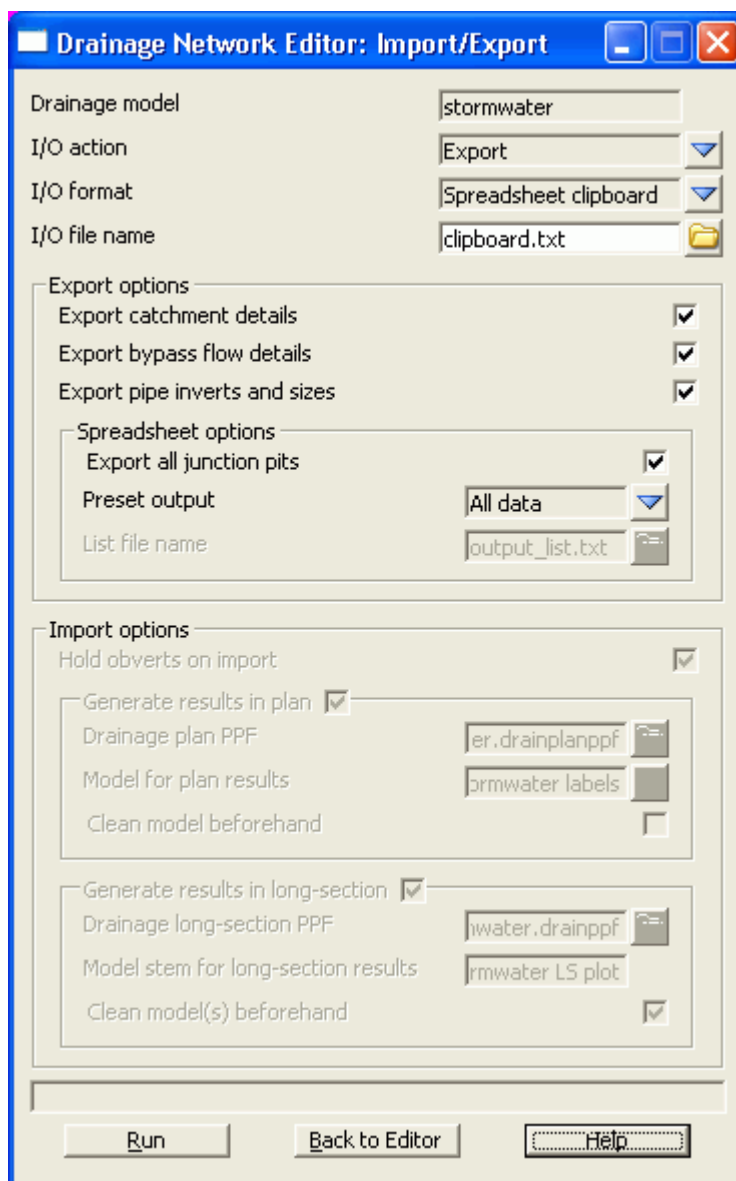
[Drainage_Network_Editor_Plot](#)



See [Using Drainage Network Plot Button](#)

Import/Export

[Drainage_Network_Editor_Import_Export](#)



See **Drainage Export and Import to Design Software**

Drainage Rainfall File Editor

Rainfall_file_editor

Position of option on menu: Design =>Drainage-Sewer =>Drainage Network=>Drainage Rainfall Editor

Also see Using **Rainfall Editor**

On selecting the Drainage Rainfall Editor option, the Drainage Rainfall Editor panel is displayed.



These defaults are used when creating a manhole in a drainage string. The fields and buttons used in this panel have the following functions.

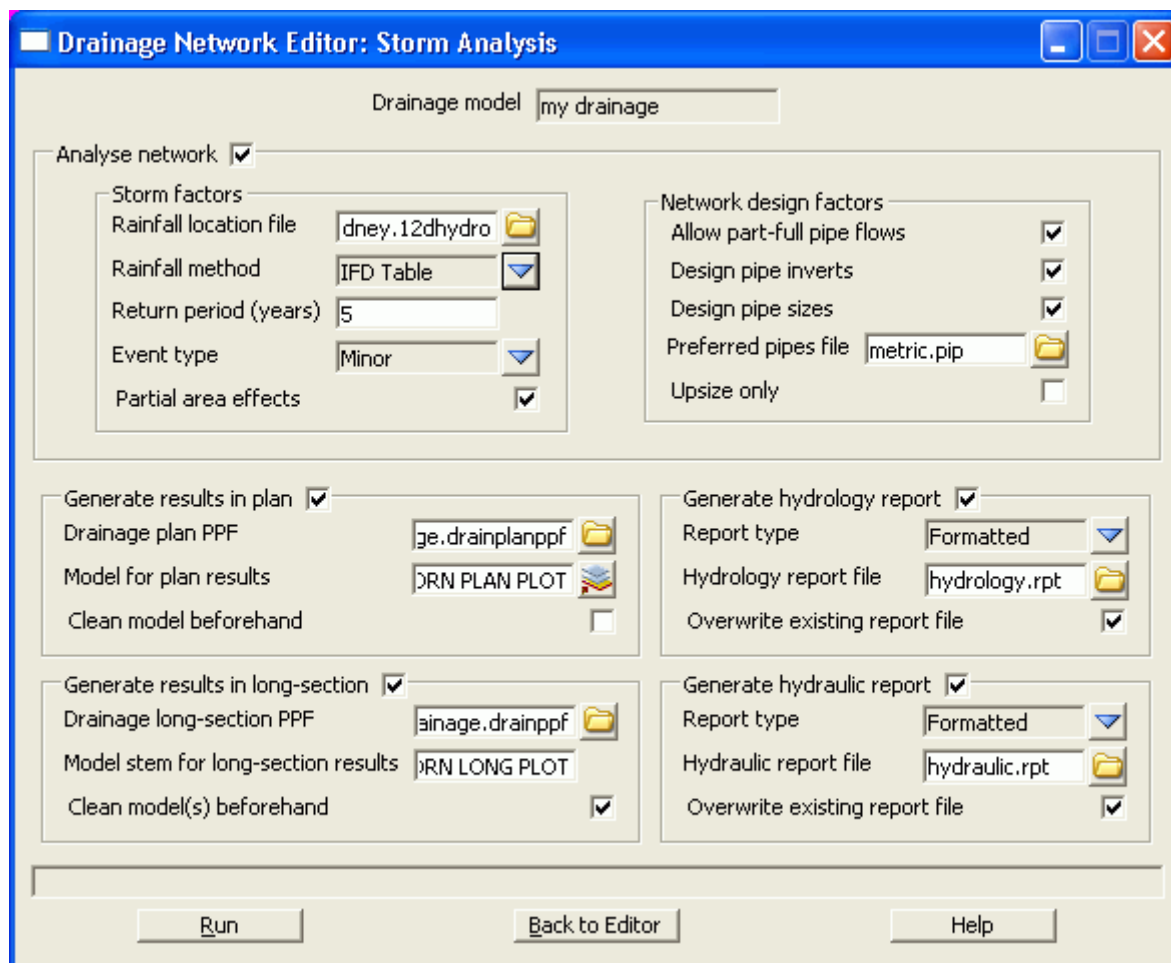
Field Description	Type	Defaults	Pop-Up
Rainfall location file	file		
<i>Each file contains the rainfall data for a specific location. Browse to the 12s library for examples.</i>			
Read	button		
<i>You must select this to load the selected Rainfall location file.</i>			
Write	button		
<i>Select this to save the changes you have made to the Rainfall location file.</i>			
Find	button		
<i>not used in this editor</i>			
Finish	button		
<i>removes the panel</i>			
Help	button		
<i>launches this help screen</i>			

Drainage Network Design

Drainage_Network_Editor_Storm_Analysis

See Also Using **Drainage Design in 12d Drainage Design**

On selecting the Storm Analysis button, the Drainage Network Design panel is displayed.



Field Description	Type	Defaults	Pop-Up
Run	button		
<i>Run 12d hydrology and hydraulic check routine</i>			
Edit	button		
<i>return to the Drainage Network Editor</i>			
Finish	button		
<i>removes the panel</i>			
Help	button		
<i>displays this help page</i>			

Convert to drainage strings

[drainage_create_from_strings_panel](#)

Position of option on menu: **Design =>Drainage-Sewer=>More=>Create drainage from strings**

This function converts 2d strings to 12d drainage strings.

See Also

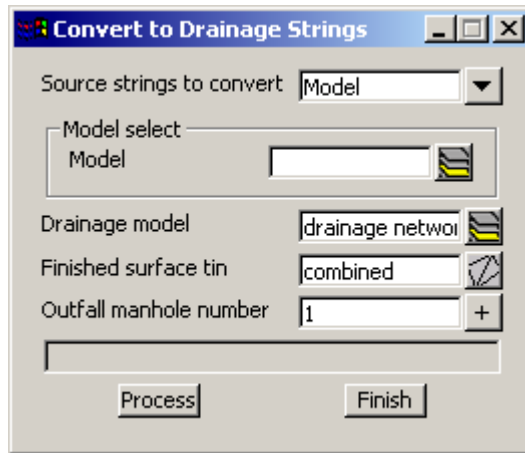
Drainage overview

Usage

From the menu select

Design->Drainage-Sewer->More->Create drainage from strings

The following panel will appear.



The fields and buttons used in this panel have the following functions:

Field Description	Type	Defaults	Pop-Up
Data source <i>data source for strings to be converted</i>	choice box	model	view,model,string
Select <i>Model containing strings to be converted</i>	input box		
Drainage model <i>The new drainage strings will be added to this model. If it does not exist it will be created.</i>	model box		
Finished surface tin <i>This tin should be the same as your tin default for the drainage strings.</i>	tin box		
Outfall manhole number <i>The network will be numbered using a numerical method. The most upstream manhole of the outlet line will be assigned this manhole number. This numbering system can be changed if desired.</i>	real input box		
Process <i>Converts the strings to the drainage strings.</i>	button		

Finish

button

Removes the panel from the screen.

Important notes:

The imported strings must be drawn in the direction the water flows.

Manholes are created at all vertices on the strings.

Trunk lines must have a vertex where the branch lines join.

Integer string names can be used to control the order in when the drainage lines are numbered. These names will be transferred to the 12d drainage strings. **Naming the strings is highly encouraged.**

The drainage lines must have string names to use the **Set Pit Names** feature on the **network editor**.

Manholes can always be renamed in 12d after the import is complete.

Set zero chainage to downstream end of line (Reversing the strings)

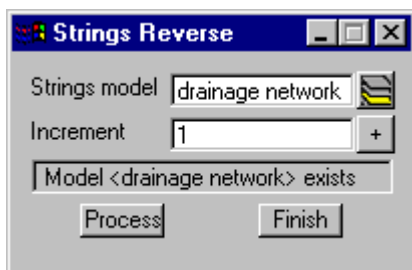
[string_reverse_panel](#)

Position of options on menu: **Design =>Drainage-Sewer=>More=>Reverse all strings**

For drainage direction of flow see **Reversing the strings**

If desired, the reverse function may be used to move the zero chainage to the downstream end of the line. This should be done after entering all of the drainage strings and before naming the pits. From the main menu select

Design=>Drainage-sewer=>More=>Reverse all strings



This will also change the drainage flow direction attribute from **ascending chainage to descending chainage**.

Leave the **Increment** as 1.

Displaying the Auto Pit Names

Importing and Exporting

See Also

- Drainage overview
- Drainage Misc Utilities
- Spreadsheet clipboard**
- Running Drains
- Running PCdrain (Windows)
- Running Micro Drainage - Win DES
- Running XPSWMM
- Running RAT2000

Spreadsheet clipboard

Spreadsheets are an effective method to manage the numerous variables urban drainage designers create in the modelling process. Spreadsheet data can be transferred to and from 12d in tab delimited files and stored within 12d as “user definable attributes”. These attributes are linked to the pit and pipes within a network. Drainage long section plots can display the pipe attributes in the “arrows” data area and pit attributes in the bubbles area. Drainage plan drawing can also show these pit and pipe attributes.

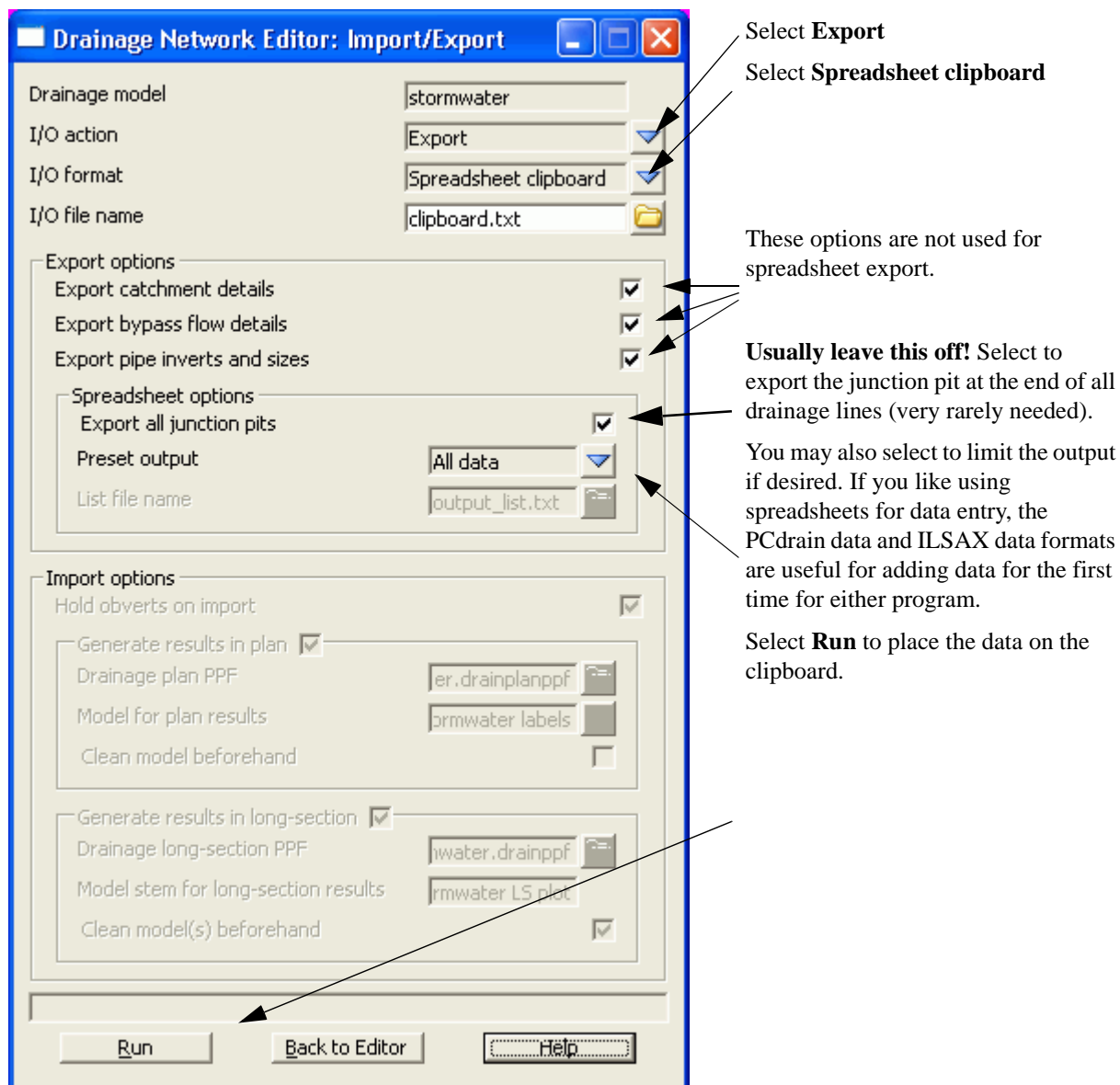
Drainage strings will be created if they do not exist in the model but manholes cannot be added to existing strings.

See also

- 12d to spreadsheet transfers
- Spreadsheet to 12d update and create
- Spreadsheet options

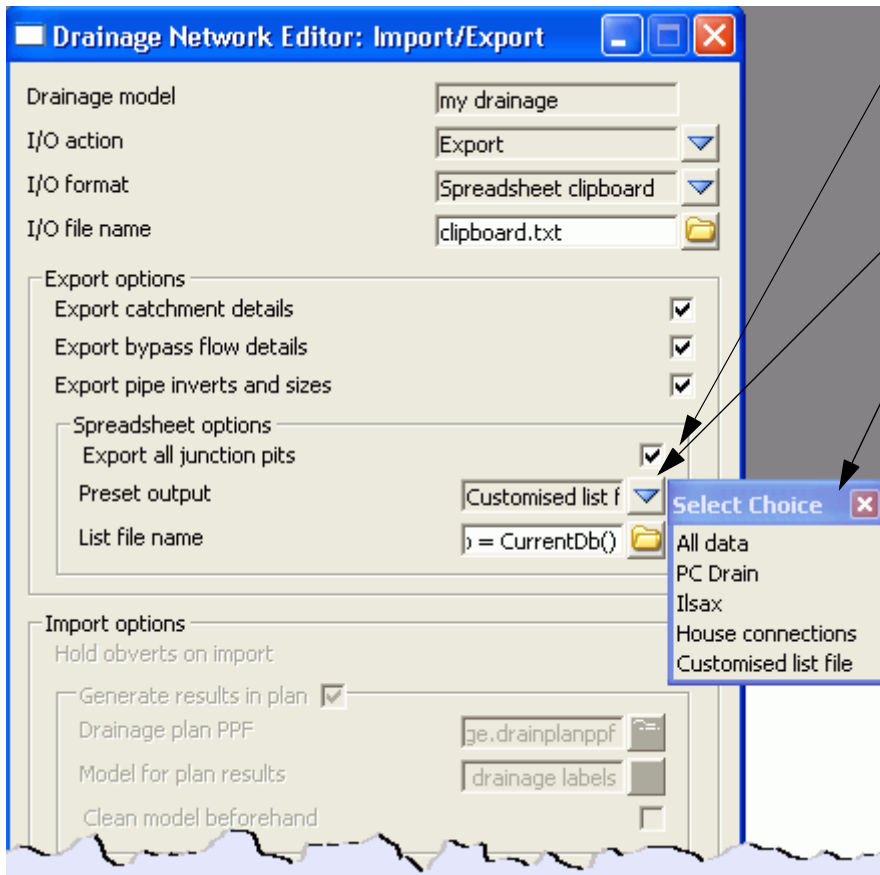
12d to spreadsheet transfers

This interface is accessed the **Import/Export** button on the **Drainage Network Editor**.



Options

The **Spreadsheet Options** section allows the user to define the amount of data exported.



Export all junction pits when selected will repeat the data for the junction pit at the end of each branch line.

Preset Output this choice box offers the following choices:

All Data: All of the 12d drainage string data and the user defined attributes will be exported to the clipboard in a tab delimited format. The 12d data names and the user defined attribute names will appear at the top of the spreadsheets columns.

ILSAX: For the ILSAX program, the spreadsheet column headings will change depending on the pipe and catchment indicators (P2 card) and the inlet type (P3 card). Therefore, use the ILSAX pipe editor macro to set up one pit/catchment for the type of data you wish to enter. Now when you export the pipe network data the column headings will include the names of the relevant parameters.

User defined below: The **Customised list file name** is used to define the drainage values, their order and format you desire.

The **customised list file** is a text file where each line contains a drainage variable or a spreadsheet IO command (blank lines are ignored unless preceded by the header command). The spreadsheet IO commands available are:

header	to define a line of text to be exported
blank	to leave a blank column in the output
pipe data	to specify the following user defined attributes are pipe data
pit data	to specify the following user defined attributes are pit data.
variable name	a 12d drainage variable names
factor	the following variable is multiplied by this factor

The simplest way to create your own customised tab delimited file is to set the **Preset Output** field to **All data** and leave the **customised list file name** field blank. Selecting **Set, Finish** and then **Copy** from the main dialogue. The data will be placed on the clipboard and a **customised list file**, named **output_list.txt** will be created containing the names of all of the drainage variables in the 12d model. Use a text editor to add/or delete the variable names, change their order and/or add spreadsheet IO commands. **Save the file with a new name!** The **output_list.txt** file is overwritten on every export.

A listing of a customised list file follows. Note the words in the header file have a “tab” between them so that they will be spaces across the spreadsheet columns.

header

Pipe Details

header

Name Length U/S IL D/S IL Slope(%) Class Dia I.D. Rough Pipe Is No. Pipes

pit data

*pit name

pipe data

*length

low ch invert

high ch invert

factor

100

*grade

pipe type

factor

1000

diameter

After creating your customised list file, select **Options** again and change the **Preset Output** field to **User Defined below** and enter the new **customised list file** name that you saved above. Select **Set** then **Finish** and finally **Copy** to put the formatted data onto the clipboard.

The data can be pasted into a spreadsheet program for checking or additional formatting.

CUSTOM FORMATED DATA MIGHT NOT BE PASTED BACK INTO 12d!

The data must be in the “12d drainage spreadsheet” format to be read into 12d.

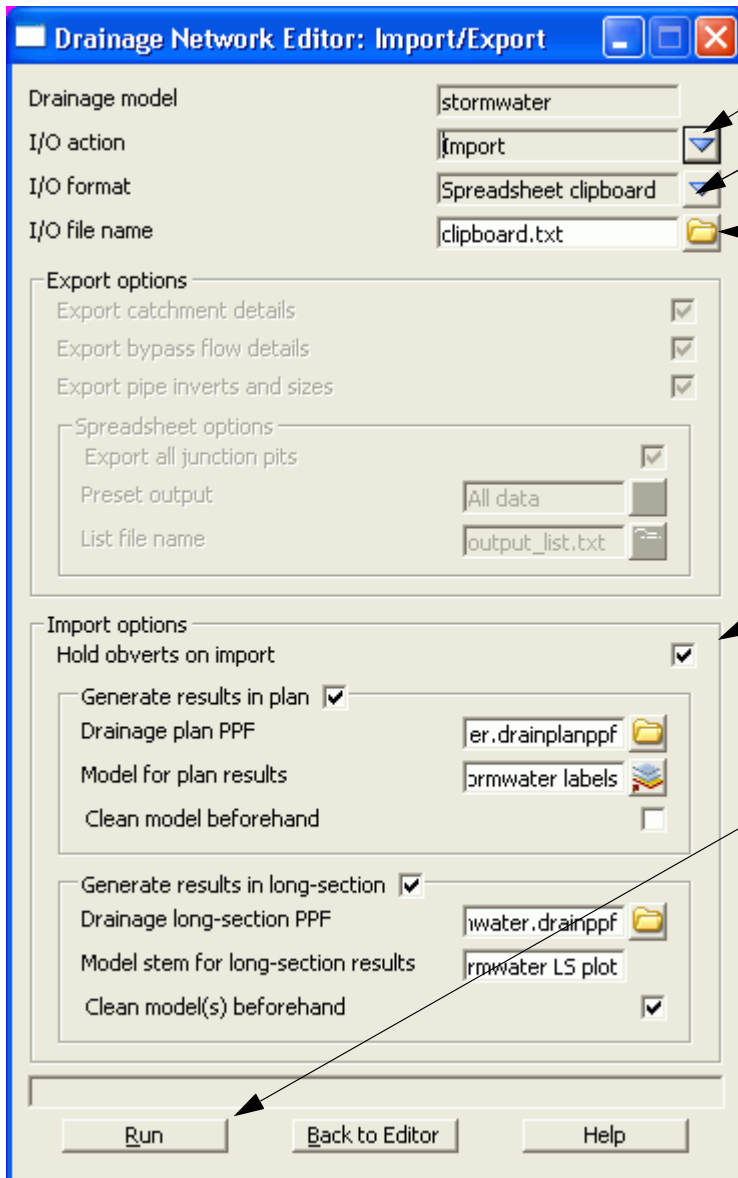
Caution with manhole names in the form 1-1 or 1/1. Some spreadsheets will interpret these values as dates. If you use these formats for your manhole names you will have to paste command them in once, format the columns that contain the manholes names as text data and then paste the information in again.

One final word on using the copy/paste commands in the Microsoft Excel program. The Paste Special command using the “Skip Blanks” option will allow you to copy a large block of 12d data (with blanks in it) on top your data so that your data is preserved where it coincides with the blanks. To use this option paste the data into a blank spreadsheet and then select copy again. The Paste special option with “Skip Blanks” will now be available.

Spreadsheet to 12d Update and Create

This item is accessed from the **Import/Export** button on the **Drainage Network Editor**.

The following panel will appear.



Select **Import**

Select the **Spreadsheet clipboard** format.

The file field is ignored.

This is ignored on spreadsheet imports.

Select **Run** to update the drainage model.

Tab delimited, “12d drainage spreadsheet” format or “from to” format data must be on the clipboard in order to update a 12d drainage model or create a new model. These format are described below.

Updating an Existing Model

The data usually is generated by 12d using the **Export** option, pasted into a spreadsheet and then copied back to the clipboard so that 12d can be updated.

When 12d exports the drainage model to a spreadsheet it includes a column for the unique string identifier and a unique manhole identifier (unique to the drainage model not the 12d project). The names of the strings and manholes may be changed via the spreadsheet if these columns are present at import time.

If the manhole id column is not present, 12d will search the drainage model for a matching manhole name. When the manhole is a junction between drainage lines, only the trunk line will be the data updated.

Creating a New Model

It is possible to create a new string or an entire drainage network using this format. However, manholes cannot be added to an existing string. The entire drainage string must be created at once. Two formats are available, the “from-to manhole” format and the “12d drainage spreadsheet” format.

At present the network editor must select a drainage string to become active. Therefore, if you are not

adding strings to a network, you will have to create a drainage network with one “dummy” manhole. Select this one “dummy” manhole to activate the editor. After importing the data and the new drainage lines are created the “dummy” manhole may be deleted.

12d drainage spreadsheet Format

The top left cell in the clipboard data must be the text “12d” to specify this format. The minimum amount of data required to create a new string is the string name, manhole name, x and y coordinates. You can add as much additional data as you have available. This would include pipe diameters inverts etc. The manholes must be listed from upstream to downstream order. If the string is to join a trunk line, the junction manhole must be included for both the tributary and the trunk line.

An example file exists called **new_network.txt** is supplied in the library. Open this file in a spreadsheet or a text editor and copy it to the clipboard. Set the **I/O Action** to **Import** and select **Run**. The new drainage lines will exist in the model currently being edited.

From-to Manhole Format

The top left cell in the clipboard data must be the text “from to” to specify this format. The minimum amount of data required to create a new string is the upstream pit name (*pit name) , the downstream pit name (*ds pit name) and the x(x location) and y(y location) coordinates of the upstream pit. If the string is to join a trunk line, the junction manhole must be included for both the tributary and the trunk line.

An optional column for the manhole cover elev (cover elev) may be specified. Once the network has been created additional pipe and manhole data may be added using the “12d drainage spreadsheet” format described above.

An example file exists called **new_from_to_network.txt** is supplied in the library. It is shown below. Open this file in a spreadsheet or a text editor and copy it to the clipboard. Enter a new model name in the **Drainage model** field and select paste. The new drainage model will now exist.

from to	pit	pit	pit	pit
*pit name	*ds pit name	x location	y location	cover elev
text	text	real	real	real
E/1	A/3	5309.458	7336.935993	29.2173
D/1	A/4	5277.189	7336.935989	28.5071
C/1	B/3	5251.238738	7423.99485	31.5257
A/1	A/2	5354.629222	7336.935998	30.2115
A/2	A/3	5340.019987	7322.035996	29.89
A/3	A/4	5293.458002	7322.035991	28.8652
A/4	A/5	5250.182625	7322.035986	27.9127
A/5	A/6	5217.194202	7322.035983	27.1867
A/6	A/7	5183.458002	7322.035979	26.4442
A/7		5152.698693	7322.035975	25.7672
B/1	B/2	5289.42875	7422.289079	32.7197
B/2	B/3	5264.638564	7393.947083	30.7948
B/3	B/4	5249.738564	7384.207593	30.4187
B/4	B/5	5249.738564	7351.201545	29.1444
B/5	A/5	5233.426685	7336.935984	27.544

“12d drainage spreadsheet” Format

Each column of data is used for a 12d drainage variable or a user defined attribute. Each row represents a manhole and the downstream pipe (controlled by the direction of flow variable) within the drainage network. A sample is shown below.

12d	pit	pit	pit	pit	pit	pit
*string Name	*pit name	pit type	pit low ch invert	pit high ch invert	pit id	string id
text	text	text	real	real	integer	integer
E	E/1	SA2	28.108	28.108	1	67389
E	A/3	SA2	27.7559	27.7559	2	67389
D	D/1	SA2	27.3961	27.3961	3	68100
D	A/4	SA2	26.8018	26.8018	4	68100
C	C/1	SA2	30.67	30.67	5	72072
C	B/3	SA2	29.563	29.563	6	72072
A	A/1	SA2	29.1026	29.1026	7	82469
A	A/2	SA2	28.7811	28.7311	8	82469
A	A/3	SA2	27.7652	27.7059	9	82469
A	A/4	SA2	26.8127	26.7518	10	82469
A	A/5	SA2	26.0867	26.0244	11	82469
A	A/6	SA2	25.3442	25.2942	12	82469
A	A/7	SA2	24.6672	24.6672	13	82469
B	B/1	SA2	31.2759	31.2759	14	192066
B	B/2	SA2	29.351	29.301	15	192066
B	B/3	SA2	29.123	29.073	16	192066
B	B/4	SA2	28.0444	27.8951	17	192066
B	B/5	SA2	26.3447	26.2947	18	192066
B	A/5	SA2	26.0744	26.0744	19	192066

Duplicate Definitions

Strings Variables such as “direction” are may be defined for numerous manholes on the same string. Searching in a top down direction through the file, the last definition found for the string will be set.

Invert levels may be set via pipe data or pit data or combined. It is recommended that the user only use one method and not combine them. Both are exported so delete the ones you are not going to use. The variables are processed from left to right, so if duplicate definitions of an invert level or found the right most data will be set.

The format definition

- 1.Row1, column 1 must contain either “12d”, or “from to”. Therefore, the first column must be a 12d drainage variable (cannot be a user defined attribute).
- 2.Row 1. The text <pit> at the top of the column indicates the column contains a user defined pit attribute and similarly <pipe> indicates a user defined pipe attribute.
- 3.Row 2. This row contains the names of the 12d drainage variable names and the pit/pipe attributes. All names are case sensitive so be careful where you use capital letters. A list of 12d drainage variables is found below.

Names beginning with an asterix (*) will not be processed (except pit/string names when unique identifiers are present in the data). 12d drainage variables names beginning with an asterix indicate that this data was calculated at export time and cannot be read back into 12d (for example, pipe length, pipe grade and deflection angle).

Prefixing an user defined attribute name with “DELETE ” (no quotes, note the space after the DELETE) will cause the attribute to be deleted from all pits/pipes within the model.

- 4.Row 3. The text in this row define the type of attribute to be stored within 12d. The only valid choices are;

integer
real
text

If you want to change an attribute type you must delete the attribute and create it again. If you simply change the attribute type in the third row then that attribute will not be updated.

5. Blank lines may be inserted as desired.
6. You are not required to fill in all of the cells in the spreadsheets. Blank cells are ignored (you must use a space to remove all data from text attributes (the space will not be stored).
7. Pipe names are included in the data so that they can be changed but they are **not** used to identify the pipe. Pipe data will always be assigned to the pipe following the pit in the direction of **ascending** chainage. If flow directions is ascending then the pipe data will be for the downstream pipe. If the flow direction is descending then the pipe data will apply to the upstream pipe.

12d Drainage Variable Names

Manhole Variables	Pipe Variables	String Variables
*string Name	pipe name	direction
*pit name	pipe type	fs tin
pit type	low ch invert	ns tin
pit diameter	high ch invert	string id
pit low ch invert	diameter	
pit high ch invert	*length	
pit road chainage	*grade	
pit road name	low hgl	
*pit angle	high hgl	
*pit drop	pit hgl	
*pit depth	flow	
*pit chainage	velocity	
x location		
y location		
cover elev		
*fs elev		
*ns elev		
pit id		

Quick Check Lists for Drainage Design Software

The drainage design software packages each have their specific requirements regarding the manhole types, names and then method they use to model pit inlet capacities. The following section details the specific requirement for each package.

Drains Version 2+ Requirements and Notes

Drains clipboard - Ver 5 Rational

Drains clipboard - Ver 5 ILSAX

See also Drainage overview

Basic Check List

1. All manholes must have a unique name (Manhole names cannot begin with "O ")
2. The pipe type used in 12d must exist in the Drains pipe database

Overland flow with Inlet Capacity Check List

1. Make sure you are using Drains Version 2-5 clipboard data. Inside Drains select **Project=>Pit database**. The pit family selection should be available. (CAP1 etc. is Version 1).
2. All Overflow route shapes, pit families and pit types used in 12d must exist in the Drains pit database
3. Overland flow lines must be within 1.0 metres/feet of the manhole

Running Drains - Version 2+

Key Points

1. The Drains database (each project has its own) and the 12d database (drainage.4d) must be synchronised (**More**).
2. For bypass flow, 12d selects pit families for Drains in the following way

The users selects pit group in 12d and at export the pit group is scanned in the drainage.4d file using the road data to select the Drains pit families
3. Data is copied from 12d to the Windows clipboard and then pasted into Drains. 12d can not delete any objects in Drains, it can only add and update.
4. When updating 12d from Drains, always copy the DATA to 12d before the results. 12d will update the network but will not add or delete manholes.

Drains Interface Overview

The Drains program performs the rational and ILSAX hydrology calculations as well as hydraulic grade line calculations that determine pipe sizes and pipe invert levels.

The data sent to Drains includes

- s manhole names and types, easting and northing data with surface levels
- s finished surface profile along the centre line of the pipes
- s optional - bypass manholes, road grades/crossfalls and SAG inlet ponding volumes and depths. Pit family selection using road grade and crossfall data.
- s optional - composite catchment area create from three 12d areas per manhole
- s optional - default catchment characteristics, k values and overland travel times
- s optional - pipe sizes, type and invert levels

Data is copied from 12d to the Windows clipboard and then pasted into Drains (**Edit=>Paste data from spreadsheet**). 12d can not delete any objects in Drains, it can only add and update.

The Drains menu selection **Run=>Design** is used to design the network. Once the drainage network has been designed in Drains the updated design data (**Edit=>Copy data to spreadsheet**) and/or the hydraulic results (**Edit=>Copy results to spreadsheet**) are sent back to 12d via the clipboard.

Always copy the DATA to 12d before the results as the results are deleted inside 12d with every update of the data!

A demonstration version of the Drains program is included on the 12d distribution CD in the directory

Other_Software\Drains

The version is limited in the number of pits allowed.

Synchronising the Drains database and the drainage.4d file.

The Drains database and the 12d drainage.4d file must be synchronised as follows.

All Cases	
Drains database	drainage.4d
Pipe type	Pipe type entries
Only if bypass flow is required	
Drains database	drainage.4d
Pit family	12d manhole group with road data to lookup Drains pit family
Overland route database	One default value set (not in drainage.4d)

Every Drains file begins with a default database and uses that database for the life of the project. This database must be synchronised with the **drainage.4d** file in 12d to ensure the Drains pit families, pit sizes, pipe types and overflow route types.

The following 5 steps will help ensure 12d is synchronised with Drains. More details are given in the sections below.

1) Export the Drains database from your Drains file

Inside Drains select **Project=>Overflow Route database**. Then select **OK** and then **YES**. This will cause Drains to export the database to the file "Drains Connection Data.txt".

2) Create a drainage.4d file from the Drains file

- s From the 12d menu select **Design->Drainage-Sewer->More->Drains to drainage.4d**.
- s Select **Read Drains database**,
- s review the Drains pit families list to identify the character (usually a comma or -) that separates the pit group from the road data and then enter it in the **Pit group separator** field.
- s Check the **12d pit groups** and if they are acceptable
- s select **Create drainage.4d**. The Drains database dump file is copied to the 12d working folder and a drainage.4d file is created in the 12d working folder.
- s **More details below**.

3) Edit the drainage.4d file

From the 12d menu select **Design->Drainage-Sewer->More->Edit drainage.4d**. Select **Find** then edit from the file **more info** button. Set the road grade and crossfalls for the 12d manhole groups. **More details below**.

4) Restart 12d

From the 12d menu select **Project->Restart**.

5) Set the Overflow shape, Update Manhole and Pipe type.

A single global overflow route shape can be specified in 12d via the following routine and then it can be modified in the Drains program. The import operation of the interface will read modified values and store them so that the next export operation will export the modified values.

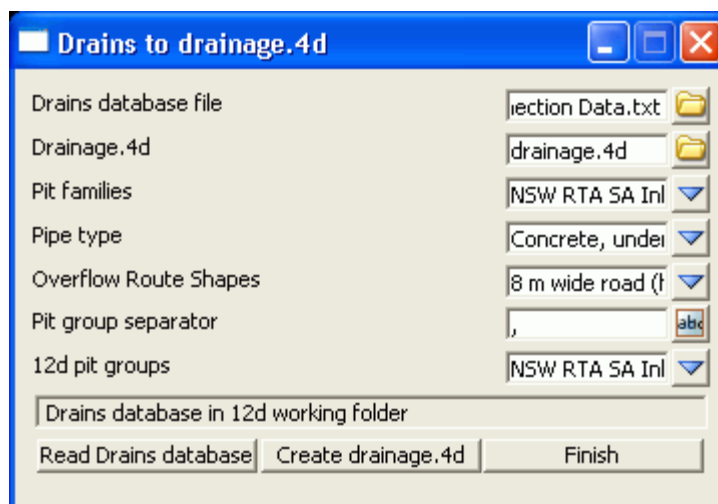
If the network has already been created, using manhole and pipe types that no longer exist in the drainage.4d file, they will have to be updated before the export to Drains can occur. You may update them using the drainage network editor or you may set **all** of the manhole and pipes types to **one value** using this

routine. Later you may change them individually using the **Drainage network editor**.
 From the 12d menu select **Design->Drainage-Sewer->More->Drainage io defaults**.
More details below.

Drains to drainage.4d file

Position of option on menu: Design =>Drainage-Sewer =>More=>Drains to drainage.4d

On selecting the Drains to drainage.4d option, the Drains to drainage.4d panel is displayed.



Key Points

1. Select **Read Drains database (12d will search the usual locations for the Drains database)**
2. Review the Drains pit families list to identify the pit group separator and then enter it in the **Pit group separator** field. **PRESS THE ENTER KEY!**
3. Check the **12d pit groups** and if they are acceptable select **Create drainage.4d**.

The Details

The Drains database dump file **Drains Connection Data.txt** is copied into the 12d working folder and read. The choices for the **Pit families**, **Pipe types** and **Overflow Route Cross Section Shapes** are loaded into the panel. The user must select a **Pit group separator** to separate the road grades and crossfalls from the pit family names. The resulting **12d Pit Groups** will be calculated and displayed in the choice box. **Create drainage.4d** will create a **drainage.4d** file that may then be edited to specify the road grade and crossfall threshold values. Once the file is created you may review/edit it by selecting the **More Info** icon then **Edit** on the **Drainage.4d** field. The **Overland route shapes** are not exported to the drainage.4d file and are presented for your information only.

YOU MUST RESTART 12D FOR THE NEW DRAINAGE.4D FILE TO BECOME ACTIVE!

Field Description	Type	Defaults	Pop-Up
Drains database file	file	Drains Connection Data.txt	

You must update this file from Drains before each use of this panel. Inside Drains select Project=>Overflow Route database. Then select OK and then YES. This will cause Drains to export the database to the file "Drains Connection Data.txt".

*Selecting **Enter** in this field or selecting **Read Drains database** will cause the panel to search for the*

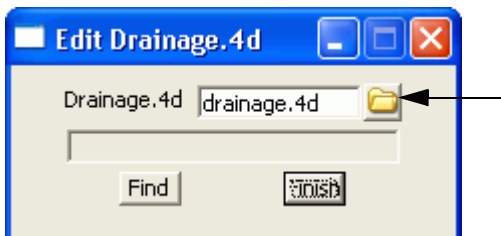
database dump in the folders **C:\Program Files\Drains\Program** and **C:\Program Files\Drains\Demo\Program**. If the Drains program is installed in another folder then you must browse for the file. After reading the file choice boxes below will be populated. Drains Connection Data.txt will be copied into the 12d working folder.

- | | | |
|--|--------|---------------------|
| Drainage.4d | file | drainage.4d |
| <i>The drainage.4d will be created in the 12d working folder unless otherwise specified. It will only be used for 12d projects in this folder.</i> | | |
| Pit families | choice | Drains pit families |
| <i>These are the Drains pit families that will be exported to the drainage.4d file. The 12d pit groups will be created from this list.</i> | | |
| Pipe type | choice | Drains pipe types |
| <i>These are the Drains pipe types that will be exported to the drainage.4d file.</i> | | |
| Overflow Route Shapes | choice | Drains Route Shapes |
| <i>These are the Drains Route Shapes and are for information only.</i> | | |
| Pit group separator | input | |
| <i>These characters will be used to remove the road grade crossfall data from the Pit families above. The data before this character will become the 12d pit groups. Press Enter or select Read Drains database to create a new list of 12d pit groups.</i> | | |
| 12d pit groups | choice | 12d pit groups |
| <i>These are created from the Pit family list above by deleting all text after the Pit group separator. This should delete all of the road grade and crossfall information from the pit group names.</i> | | |
| Read Drains database | button | |
| <i>Searches for the Drains database (see general description above) and populates the choices fields.</i> | | |
| Create drainage.4d | button | |
| <i>Create a local copy of the drainage.4d file.</i> | | |

Editing the Drainage.4d file

Position of option on menu: Design =>Drainage-Sewer =>More=>Edit drainage.4d

On selecting the Edit drainage.4d option, the Edit drainage.4d panel is displayed.



Select the **Find** button to search the 12d path for the current **drainage.4d** file. Select the **More info** button and then **Edit** to edit the file.

The drainage.4d file contains Manhole and Pipe commands. 12d also uses the Manhole commands to specify a manhole group by using the prefix "group". Details follow.

Pit Families and Manhole Groups

Version 2+ of the Drains clipboard interface uses a **pit family** to describe the kerb shape. Optionally, the Drains pit families also have the road crossfall and/or grade attached as a suffix to the name with a special character between them (pit group separator). Therefore there may be many pit families that have the same kerb shape but different road grades and cross falls. All of these pit families with the same prefix are brought together in 12d as a **manhole group**.

An example manhole group is the drainage.4d file is shown below. The 12d group is called **NSW RTA Pits** and 12d uses the road grade to select which pit family should be sent to Drains. In this example the road crossfall would not be used in selecting the pit family.

The **pit group separator** is a "-". This character separates the pit group from the road data.

It is up to the user to decide the grade when the next pit family should be used. In this case the threshold value for the gutter grade is set midway between the published values of the inlet curves. For example at a gutter grade of 2% 12d starts sending the *NSW RTA Pits - 3% slope* pit family.

This pit families listed on the right must match exactly with those in the Drains pit database.

```
Manhole "group NSW RTA Pits" {
//   cross fall, gutter grade, cap1, cap2, cap3, cap4pit family
//4d   0,      1,    0,    0, 0.0, 1.0      NSW RTA Pits - 1% slope
//4d   0,      2,    0,    0, 0.0, 1.0      NSW RTA Pits - 3% slope
//4d   0,      4,    0,    0, 0.0, 1.0      NSW RTA Pits - 5% slope
//4d   0,      6,    0,    0, 0.0, 1.0      NSW RTA Pits - 7% slope
//4d   0,      8,    0,    0, 0.0, 1.0      NSW RTA Pits - 9% slope
}
```

An example with crossfalls follows.

```
Manhole "group NSW RTA Pits" {
//   cross fall, gutter grade, cap1, cap2, cap3, cap4
//4d   1,      1,    0,    0, 0.0, 1.0      NSW RTA Pits - 1% crossfall, 1%
slope
//4d   1,      3,    0,    0, 0.0, 1.0      NSW RTA Pits - 1% crossfall, 3%
slope
//4d   1,      5,    0,    0, 0.0, 1.0      NSW RTA Pits - 1% crossfall, 5%
slope
//4d   1,      7,    0,    0, 0.0, 1.0      NSW RTA Pits - 1% crossfall, 7%
slope
//4d   1,      9,    0,    0, 0.0, 1.0      NSW RTA Pits - 1% crossfall, 9%
slope

//4d   3,      1,    0,    0, 0.0, 1.0      NSW RTA Pits - 3% crossfall, 1%
slope
//4d   3,      3,    0,    0, 0.0, 1.0      NSW RTA Pits - 3% crossfall, 3%
slope
//4d   3,      5,    0,    0, 0.0, 1.0      NSW RTA Pits - 3% crossfall, 5%
slope
//4d   3,      7,    0,    0, 0.0, 1.0      NSW RTA Pits - 3% crossfall, 7%
slope
//4d   3,      9,    0,    0, 0.0, 1.0      NSW RTA Pits - 3% crossfall, 9%
slope
```

}

The Drains pit family names must match the names in the last column EXACTLY!

Manhole Types and Pit Sizes

Each Drains pit family has several pit sizes. The Drains pit sizes link to the 12d manhole types and therefore all Drains pit sizes should exist in the 12d drainage.4d file.

The pit size will be read back from Drains into 12d as the pit type so that it can be placed on the drainage long sections and pit schedules.

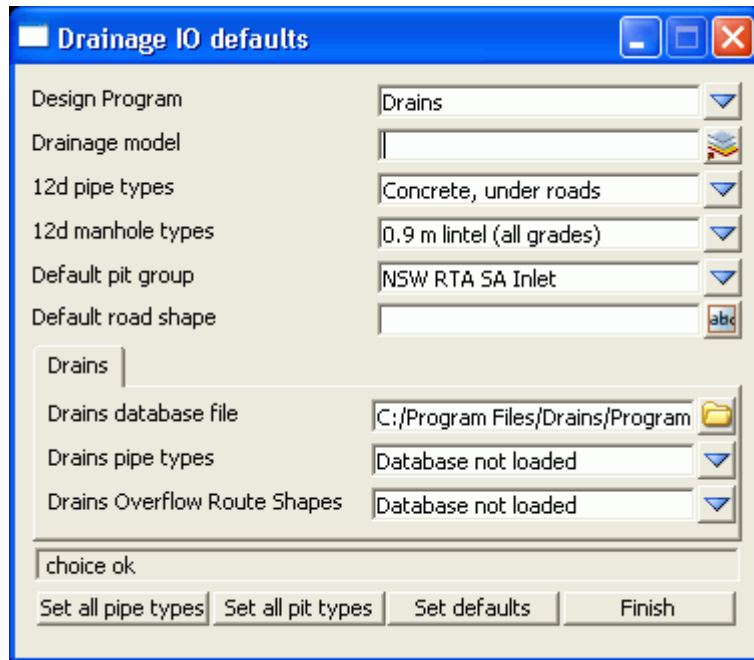
Pipe Types

The pipe type selected in 12d must exist in the pipe database inside Drains. Simple “2” for class 2 or “RCP” do not exist in Drains.

Setting the Overflow Route, the Pit and Pipe types

Position of option on menu: Design =>Drainage-Sewer =>More=>Drainage IO Defaults

On selecting the Drainage IO Defaults option, the Drainage IO Defaults panel is displayed.



The routine changes ALL of your manhole and pipe types in a model to a single value. If you have changed your drainage.4d file after creating you drainage network, the manhole and pipe types you originally selected may no longer be valid (i.e. in the drainage.4d file).

Field Description	Type	Defaults	Pop-Up
Design Program	choice	Drains	Drains,PCdrain
Drainage model	file		
12d pipe types	choice		values from drainage.4d

Set all pipe types will set all pipes in the model to this value

12d manhole types choice values from drainage.4d

Set all pit types will set all manholes in the model to this value

Default pit groups choice values from drainage.4d

*manhole definitions in the drainage.4d file that have **group** as a prefix are included.*

Default road shape choice values from drainage.4d

*type the desired name or if using Drains select the desired shape from the **Drains Overflow route shapes**.*

Drains Tab

Drains database file file

*pressing enter in this field will start a search for the Drains database dump. The search path is the specified folder, C:\Program Files\Drains\Program then C:\Program Files\Drains\Demo\Program. If the file is found the choice fields below are populated. **It is highly recommended that this file be in the 12d working folder.***

Drains pipe types choice 1 values from Drains file

*the pipe types are retrieved from the last Drains database dump. Changing this value will update the **12 pipe types** above.*

Drains Overflow Route Shapes choice values from Drains file

*the overflow route shapes are retrieved from the last Drains database dump. Changing this value will update the **Default road shape** above.*

Set all pipe types button

all pipe types in model are set to this value

Set all pit types button

all pit types in model are set to this value

Set defaults button

*the defaults for the **Drains Overflow Route Shapes** and **12d pit group** are set*

Finish button

removes the panel

Drains Version 2+ Requirements

Manhole Names

The 12d manhole names cannot be more than 9 characters long. 12d uses 2 additional characters to the manhole name at export time create names for the pipes, overflow routes and catchments. For example manhole "A-1" will have a bypass route "F A-1", a catchment "C A-1" and a downstream pipe "P A-1".

Bypass Flow (Overland Flow Routes)

There are 3 requirements for Drains bypass flow.

1. Select **Default pit group** (Network editor->Defaults->Pits->Pit group). The Drains and 12d databases must be in sync.

2. Bypass strings in the **Bypass route model** specified (Network editor->Global->Utility Models->Bypass flow model. For more details see **Bypass Flow**.)
3. Road grade and crossfall calculated (Network editor->Global->Utility Models->Road design file)

The overland flow strings are not allowed to pass through the outlet pit on the network.

SAG Inlet Calculations

SAG inlets are manholes where the water ponds at the surface rather than flowing past. If a SAG inlet has a catchment string the overflow depth and volume are calculated. The catchment string from Set #1 is draped onto the design tin and the lowest point is found on the draped string (stored as a 12d pit attribute **overflow level**). The storage volume inside the string up to this point is measured and stored as a 12d pit attribute **overflow volume from level**. The pit cover level and **Setout to grate offset** are subtracted from the lowest point on the catchment string to determine the Max Ponding Depth.

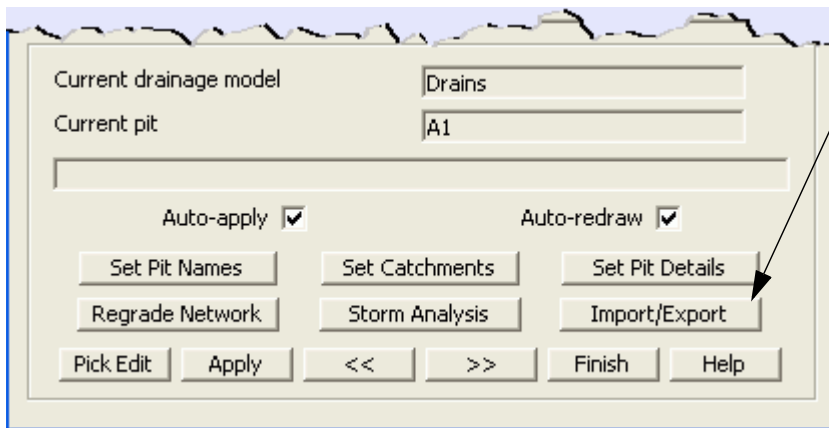
Results

Drains exports the maximum data from all of the rainfall events analysed. Therefore, ensure you analyse only the rainfall events desired before copying the results to the clipboard. To verify the data that is being sent to 12d, copy the data into a spreadsheet so you can view it there first. The pit sizes selected in Drains will be stored in 12d as the manhole type. Therefore the pit sizes in Drains should exist as manhole types in the drainage.4d file. If pit families are changed in Drains the pit group in 12d will be updated by search for the pit family in the drainage.4d file.

12d to Drains

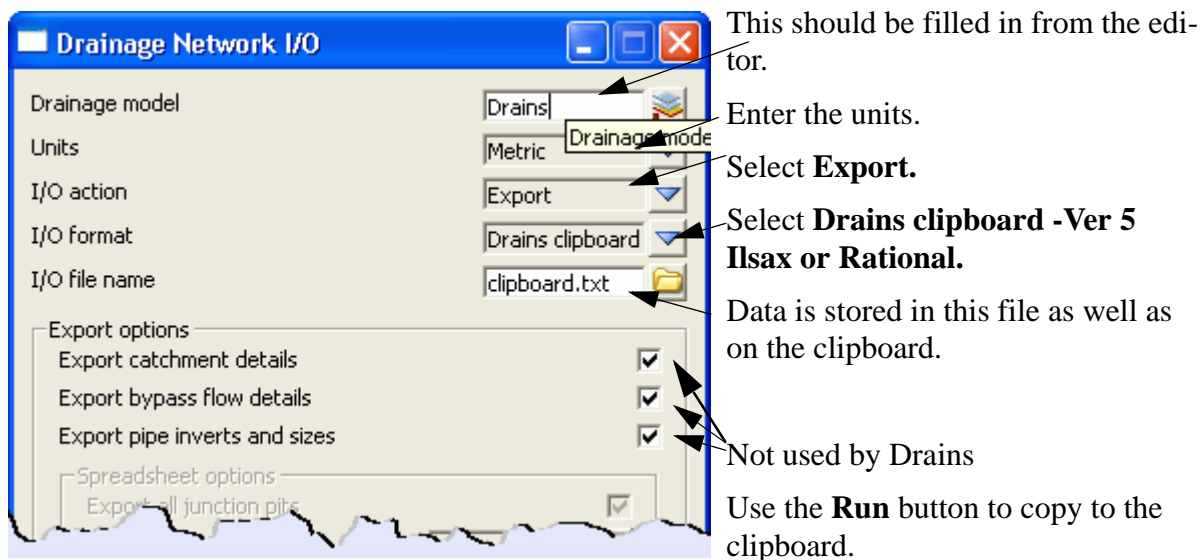
Setup your drainage network models and ensure they have been assigned pit names.

1. Copy the data to the clipboard



From the Drainage network editor select the **Import/Export** button.

The following interfaces dialogues will appear.



2. From within the Drains program select **Edit =>Paste data from spreadsheet**. If you paste the data into a Drains project that has a hydrological model and rainfall data already defined the project will be ready to run.
3. Use the Drains Run=>Standard design to design your pipe sizes and invert levels. The Run=>Advanced Design will select the size of the manholes as well.

Drains to 12d Update

The following steps are required to update the 12d model with the Drains hydraulic results and changes to the pipe sizes and inverts.

1. To update the pipes and invert levels in 12d, select **Edit->Copy Data to Spreadsheet** from the Drains menu.
2. From within the 12d Drainage network editor select **Import/Export**.

This should be filled in by the editor.

Not used on import.

Select **Import**

Select Drains clipboard - Version 5

Leave as clipboard.txt

This will ignore the invert levels read from Drains and the current pipe obverts will remain fixed.

Plan and long section drawings may be created at the import time so that you can see the results on the drawings.

Select **Run** to update the drainage model. To see the changes in the section views you will have to select **Regen** on the section view toolbar.

To return to the network editor select **Edit**

IMPORTANT: THE DATA MUST BE PASTED BEFORE THE RESULTS!

12d erases the hydraulic and hydrology data when the physical data is updated. Therefore, always paste the data before the results.

PCdrain Requirements

PC Drain Int (Windows)

See also Drainage overview

Basic Check List

1. All manholes must have a unique name
2. Only one outlet allowed in the drainage model
3. First export should have “**Export default catchment/pit/overland parameters**” selected
4. Pit types in used in 12d must exist in the PCdrain Inlet gully file selected.

Overland flow with Inlet Capacity Check List

1. A gutter profile named “4d” must exist in PCdrain before the interchange file is read. This gutter profile may be created in PCdrain from the menu selection **Data=>Gutter profiles** then **New**.
2. Overland flow lines must be within 1.0 metres/feet of the manhole

Data is exchanged to and from PCdrain via the interchange (*.int) file. Gutter profiles and inlet type must be specified in PCdrain before the interchange file is read into PCdrain.

The data sent to PCdrain includes

- s manhole names and types, easting and northing data with surface levels
- s pipe deflection angles at manholes
- s finished surface profile along the centre line of the pipes
- s optional - crossing services - level, size and location along the pipes
- s optional - bypass manholes, road grades and SAG inlet ponding depths
- s optional - up to 2 catchment areas per manhole
- s optional - default catchment characteristics, k values and overland travel times
- s optional - pipe sizes and invert levels

PCdrain Requirements

Manhole names

The manhole name from 12d is assigned to both the structure and catchment name in PCdrain. These names cannot exceed 7 characters.

Manhole type

The 12d manhole type is transferred to the structure type in PCdrain. These names must match those specified in the PCdrain Inlet charts selected (**Data=>Inlet charts**). Select the desired inlet charts BEFORE importing the interchange file.

12d manhole types with an “S” in the name are treated by 12d and PCdrain as a SAG inlet pit. 12d will strip off all characters after the “S” before adding the ponding depth. If a catchment string in set #1 is available for the SAG pit then the ponding depth will be calculated. The 12d manhole type will remain unchanged. A typical example would be a manhole type “ITC” with the sag tick box on would become “ITC0.100” if a ponding depth of 0.1 was calculated.

Bypass Flow

When a catchment string is specified for the manhole, the maximum depth before bypass flow commences

is calculated. The lowest point on the catchment string is determined by draping it onto the drainage strings tin. The maximum depth before bypass is calculated manhole setout level less the setout to grate offset less the lowest point on the catchment string.

PCdrain differentiates between manholes (no surface inflow) and gully pits via the 12d manhole type. The bypass flow strings can only be drawn within 1 manhole diameter of the gully pits. Keep the bypass flow strings away from the PCdrain manholes.

Catchments

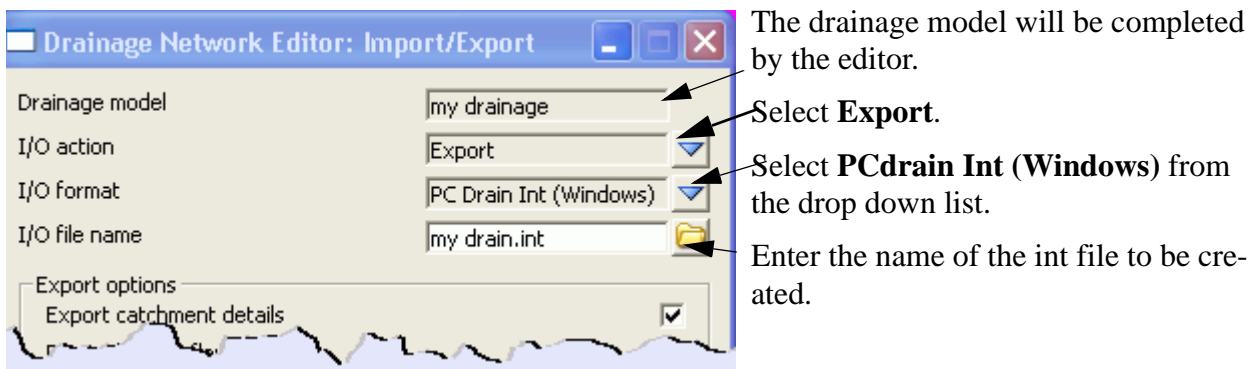
Again, since PCdrain differentiates between inlets and manholes (using the 12d manhole type), ensure that catchments are only drawn for gully inlet and NOT manholes.

12d to PCdrain

1. Export the data to PCdrain selected via the Network editor

Design=>Drainage-Sewer=>Drainage Network Editor

After selecting the drainage network, select the **Import/Export** button and the following dialogue will appear.



Select the **Run** button and the interface file will be created.

2. Launch the PCdrain for Windows program. If you have a project set up with the design parameters, rainfall data, inlet charts and gutter profiles then open it now and skip to step 8. Otherwise continue with step 5.
3. The Design Parameters can be set as desired with the menu selection **Data=>Design Parameters**.
4. Select the rainfall data using the **Data=>Rainfall** menu selection.
5. Select the inlet charts using the **Data=>Inlet Charts** menu selection. The manhole types specified in 12d must be included in these settings. **More - PCdrain to 12d pit converter**
6. At least one gutter profile in PCdrain needs to be defined. These are set through the menu selection **Data=>Gutter Profiles**. The default gutter section name (**Road ID**) from 12d is **4d** and therefore it is recommended you create a profile with this name and your own description. If you have changed the profile names in 12d (through the spreadsheet interface or the Attribute editor) these new profile names will have to exist in PCdrain.
7. Save this file now so that you can retrieve it later if required. It can be used as a starting template for new jobs.
8. **File=>Import** from the menu. Select the file exported in step 1. The information from 12d may be viewed by selecting **Data=>Network** and then selecting the desired tabs.
9. The HGL level and the pipe elevation at the outlet should be set using the menu selection **Data=>Outlet**.
10. If you have not exported pipe data then the pipe size must be determined. Use the menu selection **Proc-**

ess=>Select Pipe Sizes.

PCdrain data values

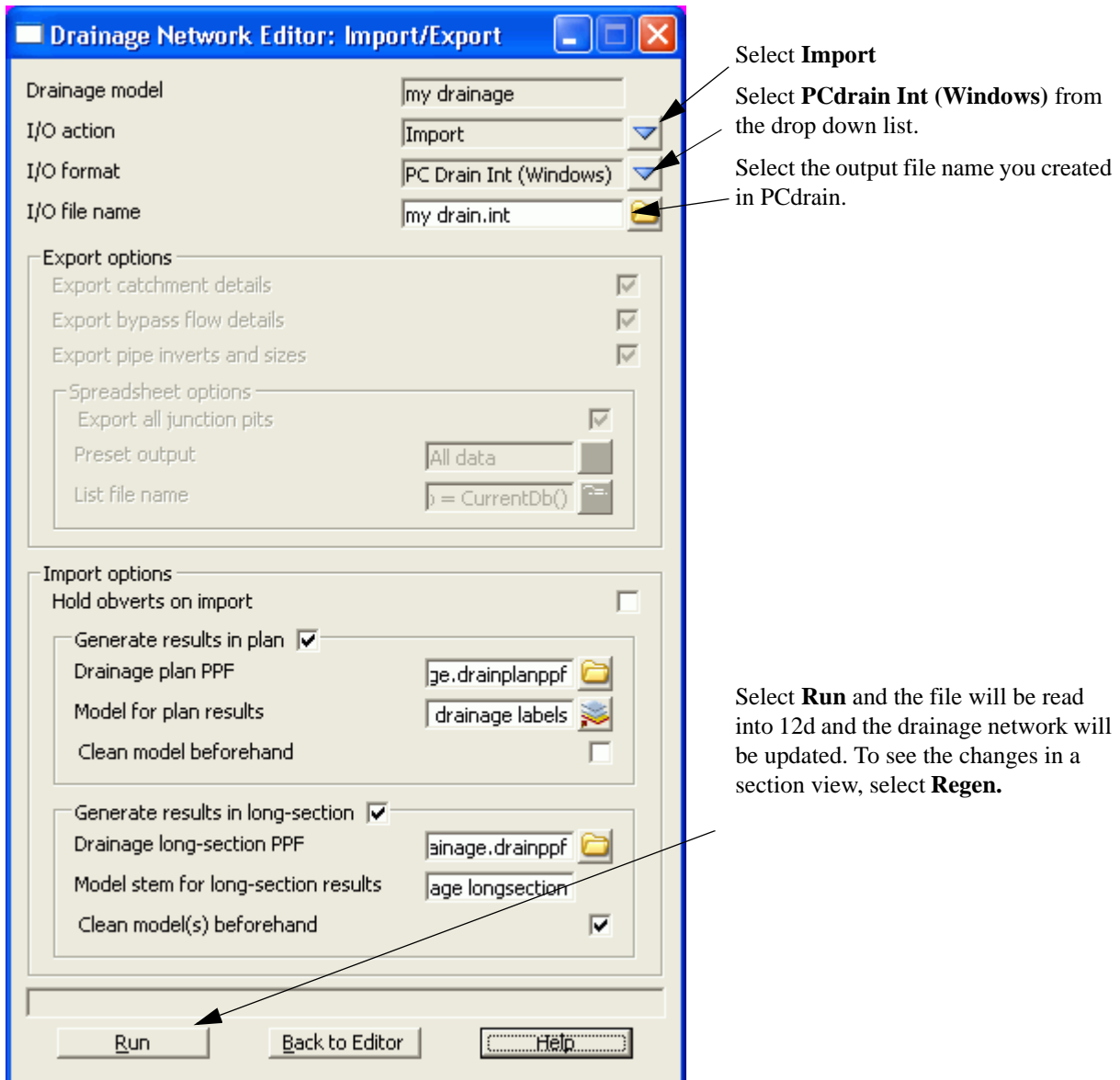
Some PCdrain data values are not available in the 12d network editor. Prior to an import from PCdrain, **initial export values** are used. On the first **import** from PCdrain, 12d attributes are created to hold the PCdrain variables for subsequent exports to PCdrain. These data values are usually changed in the PCdrain menus but may be changed in 12d using the Attribute editor.

PCdrain	12d editor	12d attribute	initial export value
Kw	not available	kw	12d ku value
Minor Coef	Catch Set 1 - Pervious C (minor)	c minor pervious	default
Major Coef	Catch Set 1 - Pervious C (major)	c major pervious	default
Minor Coef2	Catch Set 2- Pervious C (minor)	c minor pervious2	default
Major Coef2	Catch Set 2- Pervious C (major)	c major pervious2	default
Tc overrider	Catch Set 1 - Pervious Tc (minor)	tc minor pervious	default
Length of overland flow	Catch Set 1 - Pervious length	catchment length pervious	default
Grade of overland flow	Catch Set 1 - Pervious slope (%)	catchment grade pervious	default
Length of gutter flow	Catch Set 1 - Impervious length	catchment length impervious	default
Grade of gutter flow	Catch Set 1 - Impervious slope (%)	catchment grade impervious	default
Road XSections left	not available	overland profile name	4d
Road XSections right	not available	overland profile name right	4d

PCdrain to 12d

Export the results to 12d using the **File=>Export** menu selection. Note the name of the interchange file you are creating as you will need to enter it inside 12d.

Return to 12d and select **Import/Export** from the network editor and the following dialogue will appear,



A listing of the data imported is stored on the 12d output window.

Manholes that have been specified as SAG inlets will have the ponding depth removed from the end of the PCdrain structure type before the data is stored as the 12d manhole type.

RAT2000 Requirements

RAT2000

See also Drainage overview

Basic Check List

1. All manholes must have a unique name (they become nodes in RAT2000)
2. Only one outlet allowed in the drainage model
3. First export should have “**Export default catchment/pit/overland parameters**” selected
4. First export should have “**Export pipe diameters and Inverts**” selected
5. Outlet conditions must be set in RAT2000.

6. Start-up data may be specified in the file **drainage startup.xpx** (the standard 12d system file path will be searched).

Overland flow with Inlet Capacity Check List

1. Overland flow lines must be within 1.0 metres/feet of the manhole
2. If inlet capacity curves are to be used then the curve name must match the 12d pit type with the road grade/crossfall data added.

Running RAT2000

Data is exchanged to and from RAT2000 via the interchange (*.xpx) file. The data exported from the 12d drainage model is appended to the xpx startup data specified in the file **drainage startup.xpx** (the standard 12d system file path will be searched). This file may be edited using a text editor or you may create your own default file by exporting your RAT2000 global data this file.

RAT2000 Requirements

Manhole names

All manholes will become nodes in RAT2000 and therefore they must have a unique name inside 12d.

Manhole Types

The manhole types are used to determine the pit inlet capacities if overland flow routes are selected. Fixed inlet capacities values may be set in the drainage.4d file while inlet capacities curves must be included in the drainage_startup.xpx file. The range of available curves for 12d to choose from are set in the drainage.4d file and the curves are determined using the pit type, road grade and road crossfall.

Pipe Types

Pipe types are not transferred to RAT2000.

Overland Flow

When an overland flow model is selected the pit inlet capacities and bypass routes are calculated.

12d to RAT2000

1. Export the data to RAT2000 by selecting
Design=>Drainage-Sewer=>More=>Pit/Pipe Design Interface

The following dialogue will appear.

Select RAT2000 from the drop down list.

Select your drainage model

Enter the name of the xpx file to be created.

Optional.

Specify catchment units **acres** or **ha**.

Not supported in RAT2000.

See overland flow section

Usually leave this selected

See notes below on **Updating an existing RAT2000 file**

Used to set default data and calculations at export time.

The **Export Pipe Diameters and inverts** option should be ticked for if you want the 12d pipe sizes sent to RAT2000. This should always be selected the the first time you create the RAT2000 file. RAT2000 will increase pipe sizes but will not decrease them.

The **Export default catchment/pit parameters** will instruct 12d to export default catchment parameters. This is usually only done on the first export. Catchment areas will always be sent if a catchment string exists for the manhole.

Select the **Write** button and several checks will be made on the drainage network at this time. CAUTION notes will be given... **read them**. If asked, fix any errors that are reported. The interface file will be created.

Updating an existing RAT2000 file

Adding new Nodes and Pipes

If new manholes and pipes have been added to 12d then these new entities will now be included in the xpx file and imported into the RAT2000 project. 12d identifies the nodes in XP by the node names. Therefore if nodes names are changed in either program then they must be manually changed in both programs.

If a manhole is to be inserted in an existing link then the existing link must be deleted in RAT2000 so that the new links and manholes may be created in the void.

WARNING! If the tick box Export catchment/pit/overland flow default data is selected for the update then any changes to these defaults in RAT2000 will be lost. Two options are available to the user.

Option 1 - Preferred method if updating pipe lengths, invert levels for your design.

De select the tick box and export the data. The new node and links created in RAT2000 will not have all

the defaults set but the existing nodes and links will not have revisions to defaults overwritten.

Option 2 - Preferred method if you have created numerous new links and nodes.

Leave the tick box selected but export the RAT2000 to a temporary xpx file first. This will save the existing setting. After RAT2000 is launched and loaded with the new data, import your temporary xpx file you just created to restore the original data.

Deleting Nodes and Pipes

If a node or link is to be deleted then delete the entity from both 12d and RAT2000.

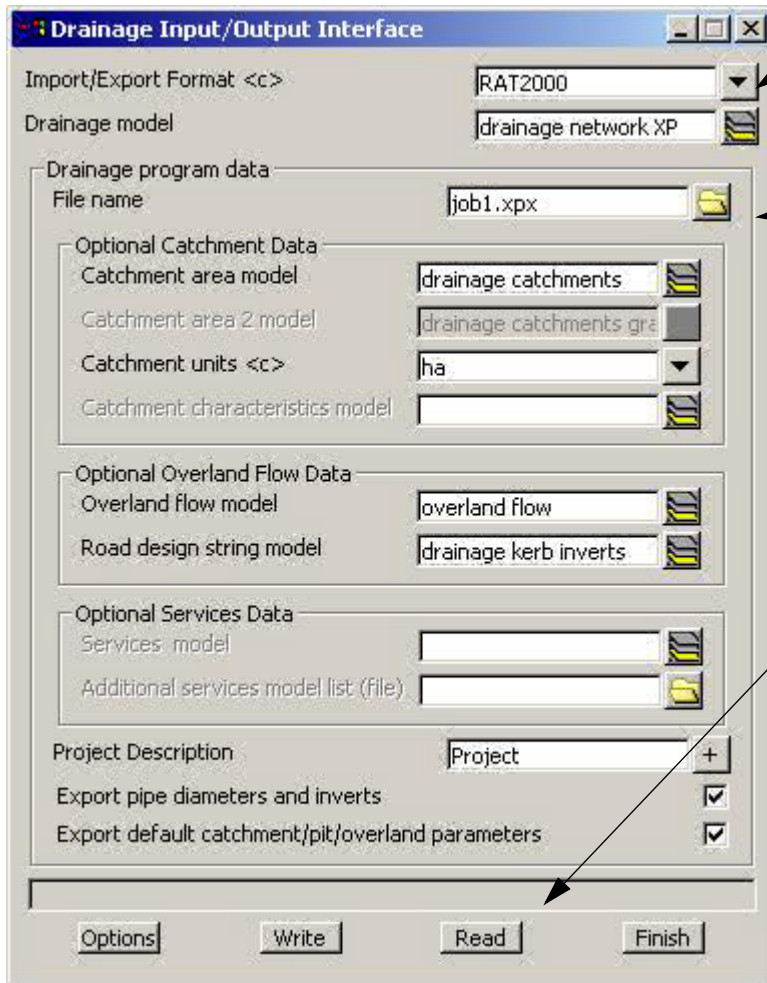
RAT2000 Results to update 12d

If RAT2000 is launched automatically using option 1 above then as soon as RAT2000 is exited an interface file is automatically created (using the same name as the import xpx file). This file will now be read back into 12d to update the pipe network and import hydraulic results for drainage longsection plots.

Return to 12d and select

Design=>Drainage-Sewer=>More=>Pit/Pipe Design Interface

The following dialogue will appear,



Select **RAT2000** from the drop down list.

Select the model containing the drainage network.

Select the output file name you created in RAT2000.

The remaining fields are not used for the import process.

Select **Read** and the file will be read into 12d and the drainage network will be updated. To see the changes in a section view, select **Regen**.

A listing of the data imported is stored in the file **printout.txt** which can be found in the directory above the project.

XP SWMM Program Requirements

XP SWMM

See also Drainage overview

Basic Check List

1. All manholes must have a unique name (they become nodes in XP SWMM)
2. Only one outlet allowed in the drainage model
3. First export should have “**Export default catchment/pit/overland parameters**” selected
4. First export should have “**Export pipe diameters and Inverts**” selected
5. Outlet conditions must be set in XP SWMM.
6. Start-up data (run times and hydrology data) may be specified in the file **master_drainage.xp** (the standard 12d system file path will be searched).

Running RATHGL/RAT2000 and XP-SWMM

The drainage design with all three of the XP software programs follows the same methodology. The process is substantially automated with the XP-SWMM program so that the XPX file is automatically read by XP-SWMM and automatically created when leaving XP-SWMM.

Drainage design with XP programs includes the following steps.

1. 12d creates an XPX file that is read by the XP programs.
2. The XP program is then run in the design mode to determine the pipe sizes and invert levels.
3. If bypass and overland flows are to be modelled then the inlet capacities need to be defined and then run the XP program in the Full Analysis Model.
4. The XP program creates an XPX file for 12d to import.

XP Program Requirements

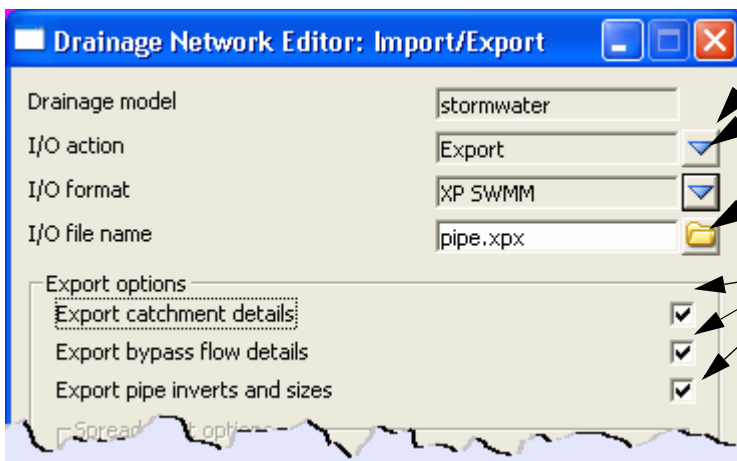
12d to the XP Programs

The x,y pit layouts and the cover/surface levels are obtained from your drainage network while the catchment and overland flow data comes from the models specified in the drainage interface dialogue.

The steps required to transfer the data to the XP programs are as follows.

1. Setup your drainage network models.
2. To create the XPX file for XP programs start the Drainage Network Editor and select **Import/Export**

The following interfaces dialogues will appear.



Select **Export**

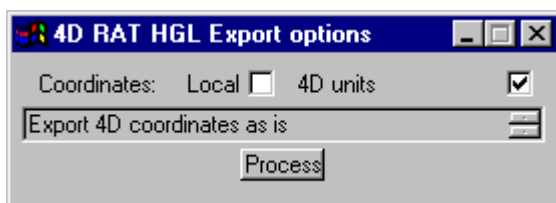
Select **XPSWMM** or **RAT HGL** from the drop down list.

Enter the name of the xpx file to be created.

Not used at this time.

Finally, Select the **Run** button to create the file.

If exporting to RAT-HGL the following dialogue will appear.



If you are using old versions of RAT-HGL (1996 or earlier) select use **Local** otherwise select **4D units** (eastings and northings).

Select process.

3. The XP SWMM program will automatically startup and load the XPX file.

From within RAT-HGL, either select **File =>New** and follow the input prompt or load a file that contains all of the pit inlet rating curves, hydrological and design data without a pipe network. Many users

have such RAT-HGL files setup so as to streamline the design process.

The xpx file for RAT2000 will have the file startup.xpx added to it so that you may include all the startup global data that you require. The

Fixed inlet capacities and rating curve names indicating road grade and crossfall may be set in the **drainage.4d** file. The format for these names is pit name-crossfall-road grade (ex SA2-3-4). These curves must exist in this file.

4. To read in the pipe file created above, select **Special =>Import Data** and select the xpx data file. Warnings will be given stating that several fields are inactive. This is expected as more data is sent to RAT-HGL than is needed at this time. Select the **Close Square** on the Help title area and the pipe network and catchments should now appear on the screen.
5. If you want RAT-HGL to redesign you network, change the analysis mode to Design mode by selecting **Special=>Job Control** and **Select Design mode**. Do not do this if you want to analyse the network you layed out in 12d (used for existing systems).
6. Select the rainfall events to design/analyse and the **LB** (twice) on **OK** to return to the layout. Now select the outlet and enter the starting tailwater levels.
7. Now you can run RAT-HGL (**Special =>Solve**).

XP Programs to 12d

Once you have your design finished, the following steps are required to update your 12d model. Your design may contain several return periods in the analysis (Rp1 to Rp7) but 12d reads only the results from Rp1. The following table is taken from the RATHGL output file (*.out extension) and the results indicated are read back into 12d via the xpx file.

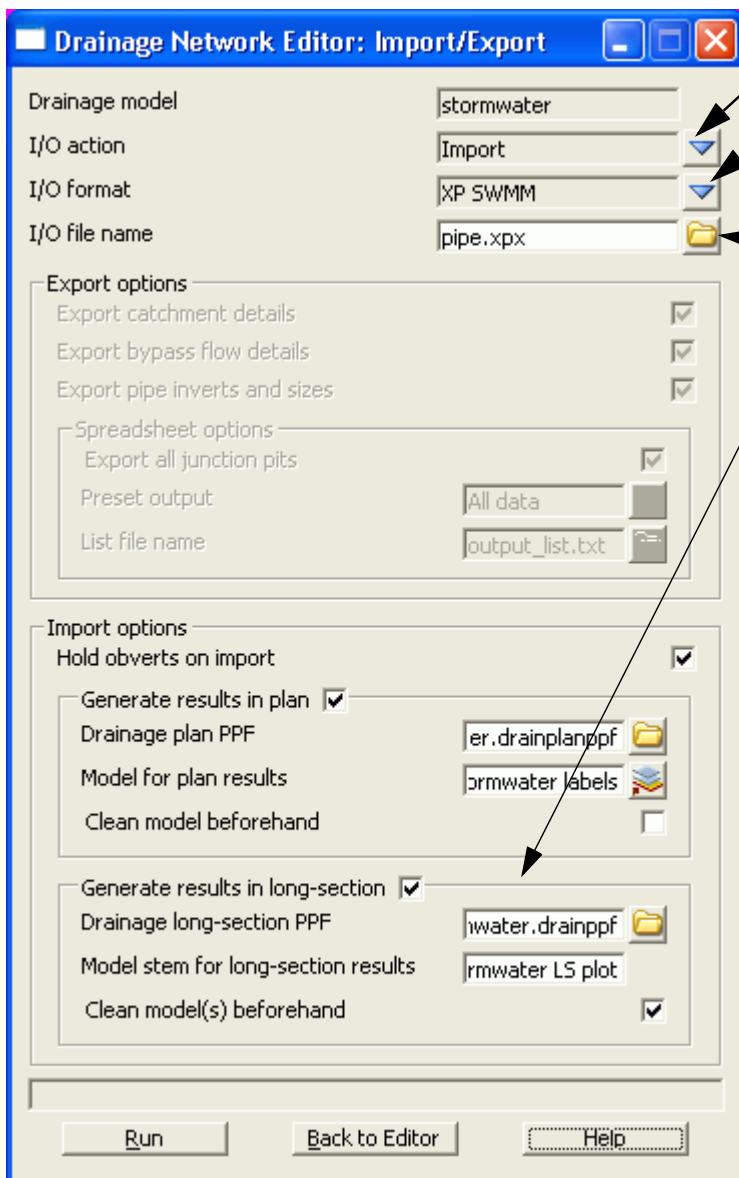
HGL PIPE NETWORK ANALYSIS SUMMARY RETURN PERIOD 5 YEARS
 PROJECT:12d DRAINAGE LAYOUT

 |ITEM DIM| RESULT

RN	-	1	2	3	4	5	6	
NN	-	1-1	2-1	1-2	3-1	1-3	1-4	
DN	-	1-2	1-2	1-3	1-3	1-4	1-4	
MT	-	99	99	99	99	99	0	
DHGL	M	29.258	29.258	28.139	28.139	27.269	.000	DS HGL
DD	M	.225	.375	.375	.300	.450	.000	Diameter
DCTL		HGL	HGL	HGL	HGL	HGL		
DO	M	.225	.375	.375	.300	.450	.450	
QO	M3/S	.033	.181	.237	.075	.334	.353	Flow
VELD	M/S	.826	1.639	2.148	1.065	2.100	.000	
NORM	M	.106	.264	.271	.153	.289	.000	
CRIT	M	.152	.314	.345	.215	.396	.000	
KP	-	.00	.00	.00	.00	.00	.00	
SF	M/M	.0040	.0082	.0140	.0046	.0107	.0000	
LEN	M	45.93	18.44	54.65	31.31	49.91	.00	
HGLP	M	29.444	29.409	28.905	28.284	27.802	.000	US HGL
DU	M	.225	.375	.375	.300	.450	.000	
VELU	M/S	.826	1.639	2.148	1.065	2.100	.000	Velocity
UCTL		HGL	HGL	HGL	HGL	HGL		
KU	-	1.50	1.50	1.50	1.50	1.50	.00	Ku
KL	-	1.50	1.50	1.50	1.50	1.50	.00	
KR	-	1.50	1.50	1.50	1.50	1.50	.00	
KW	-	1.50	1.50	1.50	1.50	1.50	.00	Kw
UHGL	M	29.496	29.615	29.258	28.370	28.139	27.269	
LHGL	M	29.496	29.615	29.258	28.370	28.139	27.269	
RHGL	M	29.496	29.615	29.258	28.370	28.139	27.269	

In addition to the results, the following input data is read back into the 12d model so that it may be exported back to RATHGL in the future (if required). 100% of your RATHGL data is not included in the XPX formats and the contents of the XPX file will depend upon your design mode. Therefore, use caution if you read an XPX file into an existing RATHGL model and check your data once inside RATHGL.

1. From within RAT-HGL, produce an XPX file for 12d to read by selecting **Special=>Export Data** and following the default prompts.
2. From within 12d, select the **Import/Export** button on the Drainage Network Editor. The following panel will appear.



Select Import.

Select to select **RATHGL** or **XP-SWMM**.

Select the file name specified in step 1

Select **Run** to update the drainage model and import hydraulic/hydrological results.

Running Micro Drainage - Win Des

Micro Drainage (*.sws)

Micro Drainage (*.fws)

See also Drainage overview

Basic Check List

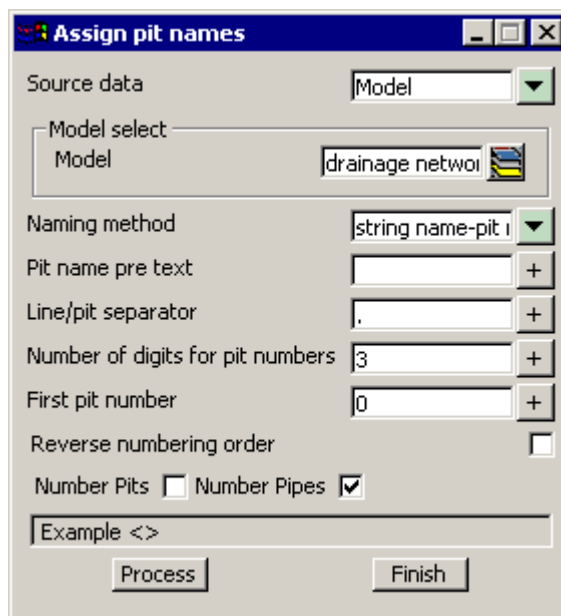
1. All manholes must have a unique name (they become nodes)
2. Only one outlet allowed in the drainage model
3. First export should have “**Export default catchment/pit/overland parameters**” selected
4. First export should have “**Export pipe diameters and Inverts**” selected
5. Outlet conditions must be set in Win DES.

Micro Drainage - WinDes Requirements

Manhole - Pipe names

The pipe names are used in the WinDes interface NOT the manhole names. Therefore the pipes are often named separately to follow the WinDES required naming convention.

The pipes must use the numbered sequence with the most upstream pipes numbered with the smallest numbers starting at 0. Number of digits must be set to 3. If this numbering system is not followed 12d will renumber the strings and request the user to run the drainage misc utilities to rename the pipes and manholes. The panel below shows the naming convention used in misc utilities.



The *.sws or *.fws files may be open directly inside WinDes.

Open channel drainage design.

Win Des can (hydraulically) model any shape of conduit. The conduits are given numbers between 1 and 100. 12d selects these conduits by setting the **pipe type** to **WINDES** (case sensitive) and pipe diameter to

the WinDes conduit number divided by 1000. (examples 0.032 indicates WinDes conduit 32).

12d can create the conduit shape by applying a template to the drainage string. The user must create a template with the same name as the WinDes shape number (32 for example). The templates are created from the main menu

Design->Template->Create Edit

For more information about template design please refer to the 12d training manual.

Once the template has been created it is applied to the drainage string to create the cross sections and strings to represent the conduit shape..

From the main menu **Design=>Drainage-Sewer=>User=>Drainage Volume Calculations**

For more information see **Drainage line excavation volume calculations.**

Drainage Excavation Quantities

Drainage_excavation_volumes_panel

Position of option on menu: Design => Drainage => Reports => Excavation Quantities

See Also

Drainage overview

This routine calculates the excavation volume for all of the drainage strings in a model. Since templates are used for the calculations trench shapes can be customised by depth and over excavation for bedding materials can be included. Net area calculations to exclude pipe area is not supported.

Key points

1. One template for each pipe size (mm)
2. Carefully consider the tin selected.
3. Box culverts should have their own pipe type

A template must exist for each pipe size in the model (pipe size x 1000). For example a 0.3m pipe will require a template to exist named 300. A 0.5ft pipe would require a template named 500. Sample templates are included in the courses section of 12djobs (\12djobs\courses\7.00\drainage). These may be copied to your *.project directory and then added to your project using **Design=>Templates=>Utilities=>Add=>All all to project.**

The templates are run along the strings and the total volumes are reported. Volumes for each strings are given in the report file. An example follows.

-----BEGIN APPLY TEMPLATE REPORT -----

apply template to string report -

```
string      E
tin         design
separation  10.000
left template 375
right template 375
cut volumes and areas are negative
fill volumes and areas are positive
```

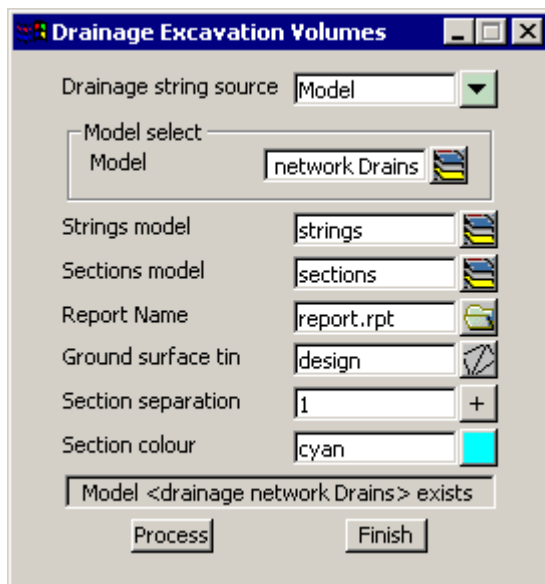
chainage- -----sectional information----- -----intermediate information---- -----accumulative

If a tin is created from these strings then volumes by depth can be determined using **Design=>Volumes=>Exact=>Tin to tin**

Usage

This panel is accessed from the menu selection

Design => Drainage => Reports => Excavation Quantities



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
drainage string source model <i>drainage string selection</i>	choice box	model	View,model,string
drainage model <i>Model to contain all of the pit and pipe network to be worked on.</i>	input box		
Strings model <i>Strings generated from the templates will be stored in this model</i>	model box		
Sections model <i>Sections generated from the templates will be stored in this model</i>	model box		
Report name <i>cut and fill volumes will ne sent to this report</i>	input box		
Ground Surface Tin <i>tins from which the volumes will be calculated</i>	tin box		
Section separation <i>distance between the sections</i>	real box		
Sections colour <i>Sections generated from the templates will be assigned this colour (strings colours are defined in the templates)</i>	colour box		

Pit Schedules

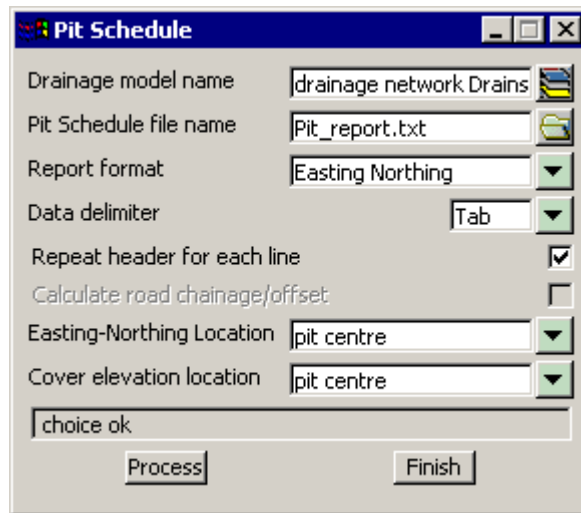
[drainage_pit_schedule_combined_v7_panel](#)

See Also

- Selecting design string or tin?
- Drainage overview

Usage

This panel is accessed from the menu selection
 Design => Drainage => More Drainage => Pit schedule



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Drainage model name <i>model containing the drainage strings</i>	input box	drainage network	
Pit schedule file name <i>file to be created</i>	input box	pit report	
Report Format <i>file format</i>	choice box	Road change...,Easting...	
Data delimiter <i>tab delimiters are best for spreadsheets and space for some text editors</i>	choice box	Tab, Space	
Repeat header for each line <i>when selected, the column headings will be printed each drainage line</i>	tick box	selected	
Calculate road chainage/offset <i>only used for road chainage-offset format. When selected, the road chainages and offset calculation panel will be displayed so that the this data can be updated before the report is generated. (see below)</i>	tick box	selected	

Easting Northing Location choice box pit centre, road design string

easting northing data can be from the manhole centre or the x,y location on the road design string that the manhole has been linked to

Cover elevation location choice box pit centre, road design string

*the cover level elevation can be from the manhole centre or the elevation on the road design string that the manhole has been linked to (if a link has been made then these values should be the same). Note that the road design string data is **NOT** caclulated at this time. These are the vaules calculated from the Drainage Misc Utilities or the last drainage data export.*

Process button

Create the pit report

Finish button

remove the panel from the screen

Notes:

The columns of data may be separated by spaces or a tab. (tab is used for spreadsheet transfers). The internal width and length data are retrieved from the **drainage.4d** file for the pit type specified. If you want a longer description for the pit then the type used inside 12d this can also be entered in the drainage.4d file. The remarks for each pit are entered as user defined pit attribute named **remarks** and may be set using the attribute editor (on the drainage menu) or via a spreadsheet.

Easting Northing Sample

```
.PIT SCHEDULE
Pit
No TYPE EASTING NORTHING INTERNAL WD LEN DIA INLET INV LEV DIA OUTLET INV LEV FIN RL DEPTH PIT
REMARKS
B1 SA2 5302.458 7336.936 450.000 900.000 375 27.470 28.210 29.387 1.177
A2 SA2 5264.372 7322.036 450.000 900.000 375 27.470 28.646 1.226
C1 SA2 5224.155 7336.936 450.000 900.000 375 26.690 27.863 1.173
A3 SA2 5187.910 7322.036 450.000 900.000 375 25.930 27.158 3.628
A1 SA2 5309.458 7321.100 450.000 900.000 225 28.550 29.577 1.027
A2 SA2 5264.372 7322.036 450.000 900.000 225 27.470 375 27.420 28.646 1.226
A3 SA2 5187.910 7322.036 450.000 900.000 375 25.930 375 23.530 27.158 3.628
A4 SA2 5157.411 7321.332 450.000 900.000 375 23.090 26.714 3.624
outlet to existing system
NOTE:
1. ALL SETOUT POINTS QUOTED TO CENTRE OF PIT
```

Road Chainage Offset Example

DRAINAGE LINE A

PIT/PIT LOCATION		LOCATION OFFSETS			TYPE	REMARKS
No.	EASTING NORTHING	STATION	CTRL	OFFS		
A/15354.629	7336.936	231.171	d002	-7.450		
A/25340.691	7320.911	217.233	d002	8.575		
A/35293.458	7320.886	170.000	d002	8.600		
A/45250.131	7320.886	126.673	d002	8.600		
A/55217.194	7322.036	93.736	d002	7.450		

A/65183.458	7322.036	60.000	d002	7.450
A/75152.699	7322.036	29.241	d002	7.450

Notes

The Set pit details must be run at least once to before printing the report. If the pits are moved or the designed strings changed then this option must re rerun.

The Road Chainage and Offset Pit Schedules use two user defined attributes for each pit. The first is **ctrl string** which identifies the string that the pit will be offset from and the second is **ctrl model** which contains the model name for the control string. These may be manually created/modified using a spreadsheet or the attribute editor.

The easting northing data obtained for the **road design string** option is obtained by dropping the manhole centre perpendicular onto the selected road design string. This data is stored as pit attributes **setout x** and **setout y**. It is calculated when the manhole cover levels are recalculated (drainage misc utilities and during drainage export (recalc level option must not be turned off)).

The cover elevation data obtained for the **road design string** option is obtained by dropping the manhole centre perpendicular onto the selected road design string and obtaining the elevation at this point. This data is stored as pit attribute **level z**. It is calculated when the manhole cover levels are recalculated (drainage misc utilities and during drainage export (recalc level option must not be turned off)).

Attribute Editor

attribute_edit_panel

Position of option on menu: Design => Drainage => More => Top Ten attributes editor

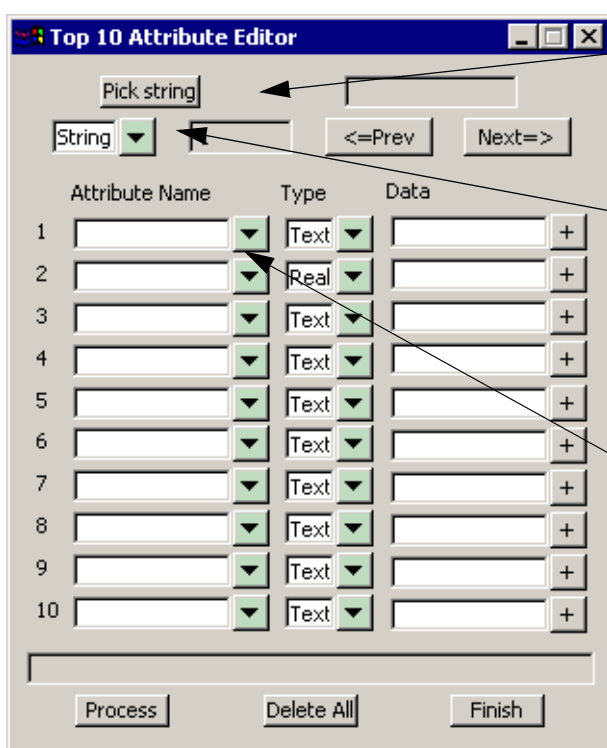
Most of the detailed catchment data is stored within 12d as user defined attributes. These attributes are automatically created by 12d when required but you are free to change them or add more as desired. The attributes may be exported to a spreadsheet and edited and then imported back into 12d or edited inside 12d using this panel.

See Also

Drainage overview

Usage

From the menu select **Design => Drainage => More => Top ten attribute editor**



First Select **Pick** to select the string that contains the user attributes (the drainage string). The strings will be highlighted in white when they are selected.

All catchment data is store with the pits in drainage strings. To access the pit attributes, select the drop down icon and then select **Pit**. A circle will be drawn around the pit selected. **Next** and **Prev** will now move you from pit to pit.

Select the drop down icon and then select the **Attribute Name** from the list of existing user defined attributes. These attributes include all of the attributes in the model that the string exists in.

The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
pick string <i>used to pick the initial string in a model</i>	button		
string-pit-pipe <i>select the type of attribute to be displayed. Pit and pipe attributes are only available for drainage strings.</i>	choice box		string,pit,pipe
attribute name <i>3 top 10 attributes lists are maintained (pit, pipe and string). The attributes that you can select from are</i>	input box		

*all of the attributes that exist on all of the strings in the model. If the attribute does not exist for the string/pit/pipe that you are displaying the **data** field will display **Not found**.*

type choice box **Text, Real, Integer**

for existing attributes this will display Text, Real or Integer.

When defining a new attribute select the type of data to be stored in the attribute

data input box

the data stored in the attribute is displayed/edited/created in this field.

<= prev button

*move to next string in the model
pit on the string
pipe on the string*

next => button

*move to next string in the model
pit on the string
pipe on the string*

process button

updates the attributes displayed in the dialogue.

Notes:

First LB select Pick to select the string that contains the user attributes. All catchment data is stored with the pits in drainage strings. The strings will be highlighted in white when they are selected.

To access the pit attributes **LB** this field then select **Pit**. A circle will be drawn around the pit selected.

LB the **Attribute Name** field and then select from the list of existing user defined attributes. These attributes include all of the attributes in the model that the string exists in. They may not be defined for the string you are editing. If the string does not have that attribute defined **not found** will be displayed in the **Data** field.

To change the value for the attribute enter the new value in the **data** field. If the attribute does not exist, deleting the **not found** text and adding data will create it. The following message will be displayed whenever you are creating a new attribute.

Delete All Attributes in a Model

[drainage_att_delete_panel](#)

Position of option on menu: Design => Drainage => More => Delete all attributes in a model

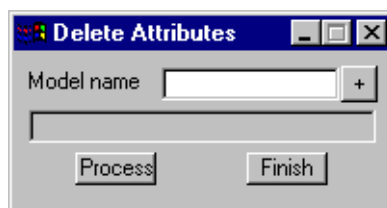
See Also

Drainage overview

This option deletes all model, string, pit and pipe attributes in the model specified. This option allows the user to "start from scratch" while maintaining the drainage, catchment and bypass flow strings.

Usage

From the menu select **Design => Drainage => More => delete all attributes in a model**



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
model name	input box		
<i>the model specified will have all of its attributes and all of the strings attributes deleted</i>			
process	button		
<i>Deletes all of the attributes</i>			

Notes: THERE IS NO UNDO!

Flooded Width Flow Analysis and HEC-RAS

drainage_utilities_panel analyse flooded width

The Calculate Flooded width procedure creates cross sections along the **bypass flow** paths and then calculates the flooded width at each section using Manning's normal depth calculations. A HEC-RAS project (same name as the bypass flow string) is also created for each line. The flooded width is indicated on each section as a blue line if it is less than a user defined width and a red line if the flooded width exceeds the limit. Details of the calculations such as the velocity, depth, wetted perimeter and slope can be exported to a spreadsheet for further analyse (velocity times depth calculations for example). The discharges imports from the urban stormwater design packages are shown in the following table.

Design Program	Discharge Event
PCdrain Drains	Minor ARI Maximum flow event analysed
ILSAX	Maximum flow event analysed
RAT HGL	First return period analysed

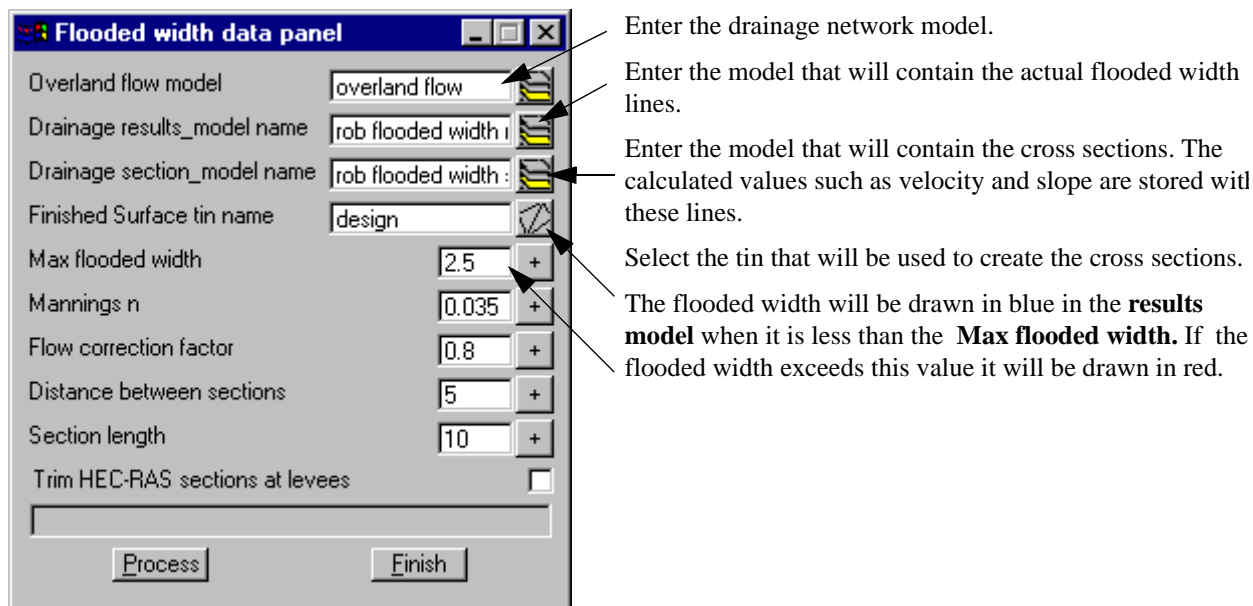
The user defines the length of these sections and the interval at which they are to be spaced. 12d calculates the normal flow depth interpolating the pit approach and bypass flows from the hydrology models (ILSAX, Drains, PC Drains or RAT HGL). The cross sections are taken perpendicular to the flow line and the slope is for the normal depth calculations is determined using the distance along the flow line and the change in elevation between the two lowest points in the primary flow channel. The flow line need not intersect the low points on the section but the flow line does mark the primary flow channel. If the depth of the flow exceeds the banks of the primary channel, then all adjacent flow channels will be considered as active flow area.

Limitations where overland flow lines join

Where overland flow lines converge at a manhole, 12d does not know the flow split between the 2 approaching paths. Therefore, 12d uses the total flow from all lines as the flow at the manhole for each line. This may overestimate the flooded width along the flow lines at these points.

Limitations at SAG pits

The flow width are not shown adjacent the sag inlets. The depth of flow due to ponding and the approach flow coming from several directions may overestimated flooded width in these areas. Therefore not flood depths are caclulated approaching SAG inlets.



Manning's n is the n value to be used in the normal depth calculations.

The **Flow correction factor** is the factor described in ARR 1987 for calculating depths of flow in gutter channels.

Distance between sections specifies the interval at which cross sections and therefore flooded width will be calculated along the flow path.

Section Length defines the length of each cross section. The cross section will be centred on the overland flow path.

Trim HEC-RAS sections at levee is used for super critical flow calculations in HEC-RAS. If you plan to do super critical flow calculations then check this box. A levee point is the crest in the cross section found as you move away from the flow line location. If a levee point is encountered then the section is trimmed here. This is a feature because HEC-RAS has problems with cross sections with levees.

Cross Sections and Discharges

The analyse flooded width will proceed along each flow path and identify every pit on the line. Cross sections will be constructed in the model with the length and interval entered in the input dialogue. These cross sections may be plotted using the main menu selection **Plot=>X plot=>X plot**. The **Sort Sections** must **not** be selected for these sections to be plotted.

Discharges will be determined for each cross section by pro-rating the discharge dependant on the distance between the pits. The bypass discharge will be taken from the upstream pit and the approach discharge of the downstream pit.

12d will give warning messages in the output window when it encounters the following conditions and these messages will be stored as string attributes on the flooded width strings. Descriptions of these messages follow.

Inverts do not go downhill

12d locates the lowest point (adjacent to the flow line without moving over a local crest) on each cross section to calculate the slope between the cross sections. This message indicates that the downstream minimum elevation is higher than the upstream minimum elevation.

Sometimes flow lines will go uphill. If you have specified an overflow from a SAG location then the flow line will go uphill until it crosses the overflow crest.

If the flow line is not supposed to be going uphill at this section, check to see where the flow line intersects the cross section located upstream of the one identified in the warning message. If it is in a local sag point

that is not the lowest point on the section, move the flow line.

The program will use a slope of 0.5% to calculate a width at this location. This results in very wide flooded width sections to draw the user's attention to the problem area.

Vertical Walls Assumed at the Ends of the Cross Sections

If the depth of flow exceeds the ground surface elevation at the ends of the cross section a warning message the warning message shown above is shown. The cross sections causing the warning follows.

The vertical wall is placed at cross section chainage -20. Note that the flow line is always at chainage 0

Convert Drainage String to Polyline

drainage_drainage_to_polyline_panel

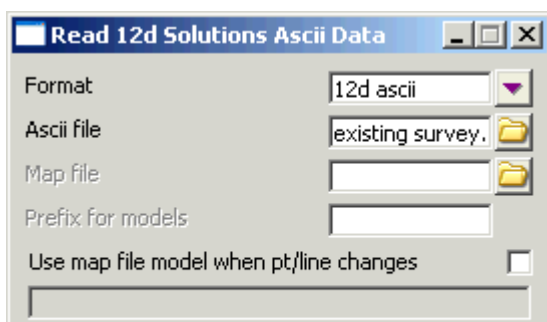
Position of option on menu: Design => Drainage => More=> Convert drainage string to polyline

See Also

Drainage overview

All drainage strings in the specified model are exported to a 4d ascii file. When this ascii file is imported back into 12d model the strings will be converted to polylines. Import the strings using

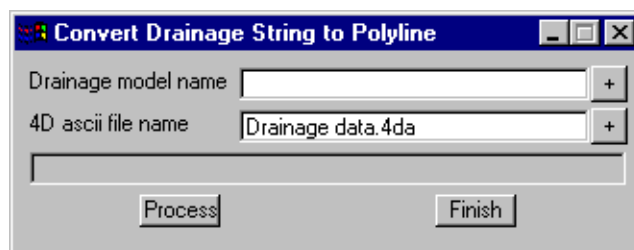
File_io=>Data Input=>12da/4da data



Specify a prefix for the model when it is read back in. Otherwise the strings will be placed in the same model as the originals.

Usage

From the menu select **Design => Drainage => More=> Convert drainage string to polyline**



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
drainage model name <i>Drainage model containing the drainage strings</i>	input box		
4D ascii file name <i>A temporary file that will hold the converted string data.</i>	input box	drainage data.4da	
process <i>Exports the drainage strings and converts the file to polylines.</i>	button		

Drainage.4d file

A sample pit entry in the drainage.4d file is as follows:

Enhancements have been made if exporting to the Drains program. See **Pit Families and Pit Groups**

The drainage.4d file controls many of the settings for the pit and pipes types inside 12d. This section details the format of the drainage.4d file. Changes to this model take effect only after 12dmodel has been restarted.

The original **drainage.4d** file is found in the “program file\12d\12dmodel\7.00\set_ups” directory. **Do NOT** change this file. Copy it into “program file\12d\12dmodel\7.00\user” directory and edit it there. Files in the user directory are used by preference and they are never over written by a 12d update.

```
Manhole "SA2" { // internal pit size data (width, length)
//SIZE 100, 200
//DESC "2m lintel - grate and side entry"
// pit inlet capacities from Mathematical Description of Pit Entry Capacities Feb 1992
// cross fall, gutter grade, cap1, cap2, cap3, cap4
//4d 1, 1, 0, 0, 0.230, .621
//4d 1, 3, 0, 0, 0.225, .604
//4d 1, 5, 0, 0, 0.215, .577
//4d 1, 7, 0, 0, 0.200, .538
//4d 1, 9, 0, 0, 0.235, .593

//4d 3, 1, 0, 0, 0.495, .819
//4d 3, 3, 0, 0, 0.270, .568
//4d 3, 5, 0, 0, 0.290, .599
//4d 3, 7, 0, 0, 0.400, .727
//4d 3, 9, 0, 0, 0.330, .649

//4d 5, 1, 0, 0, 0.540, .793
//4d 5, 3, 0, 0, 0.480, .747
//4d 5, 5, 0, 0, 0.460, .744
//4d 5, 7, 0, 0, 0.450, .729
//4d 5, 9, 0, 0, 0.420, .704
```

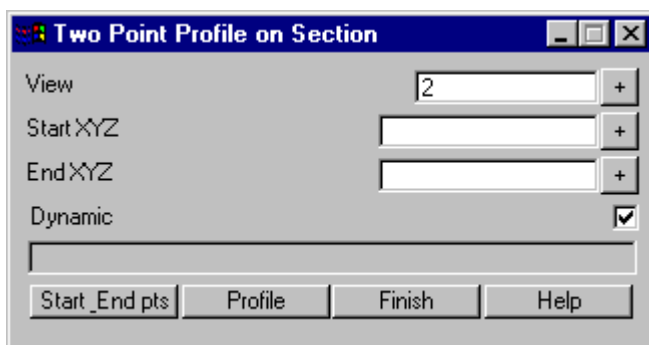
The format of the entries is as follows.

1. All lines are to be blank or begin with //. This is not the normal 12d convention.
2. //SIZE indicates the values to be read and stored in the user defined pit attributes **pit internal width** and **pit internal length** when the pit schedule macro is run. A comma is used to separate the two values.
3. //DESC indicates that the following quoted text will be read and stored in the user defined pit attribute **pit type description** when the pit schedule macro is run.
4. The pit inlet capacity table data must begin //4d and commas are used to separate the data (comma delimited).
5. SAG pit names must begin with the 3 letters SAG.
6. The sample data provided is taken from the paper, “Mathematical Description of Pit Entry Capacities”, Feb 1992, by Geoffrey O’Loughlin *et al.*

Two Point Dynamic Profiles

If at any time you want to obtain a temporary section view, 12d has a dynamic profiling capability (2 point profile). First, add your tin design model to the section view.

Next RB on the section view title area and then LB select 2 points. The following panel will appear.



Select **Start_End pts** to begin and then pick/accept a point on a Plan View Now as you move your cursor the section view will be dynamically updated (the dynamic box should be checked on and a surface tin model added to the section view). When you obtain the cross section you want LB select then accept (MB) the second point.

LB select Finish when done.

ILSAX Editors

[ilsax_editors](#)

Position of menu: **Design => Drainage => More => ILSAX Editors**

The ILSAX editors walk-right menu is



ILSAX Pipe/Catchment Editor

[drainage_ilsax_pipe_editor_panel](#)

Position of option on menu: **Design => Drainage => More=> ILSAX editor=>ILSAX pipe editor**

See Also

ILSAX Rainfall File Editor
 Drainage overview

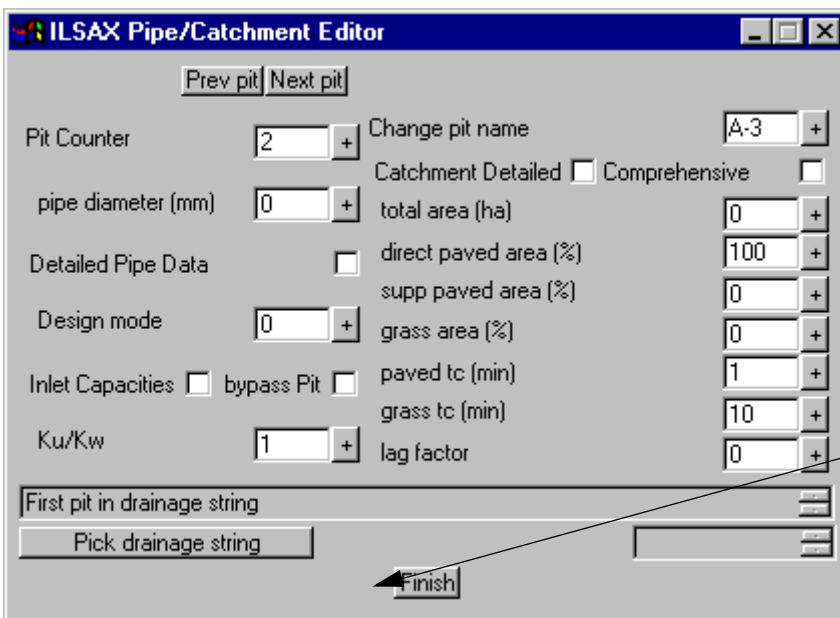
The ILSAX pipe data editor allows the user to edit pipe and catchment parameters. Most commonly used functions are supported but some of the less used functions are not included at this time. The same names have been used as those in the ILSAX drainage manual for easy reference.

Unlike the rainfall editor, all of the data in the pipe data editor is stored with the drainage string as user attributes. These user attributes can be changed using the editor (recommended for the novice user) or they may be output to a spreadsheet, changed and then read back into 12d.

CAUTION: If the drainage string is deleted then all of the attributes are deleted at the same time.

Usage

The ILSAX pipe data editor is accessed by selecting **Design=>Drainage-Sewer=>More=>ILSAX Editors=>ILSAX Pipe file editor**. The following dialogue will appear.



The panel to the left is only an example of what the editor panel may look like. This dialogue will change in size and complexity depending on the check boxes selected. The left side of the dialogue is reserved for pipe and pit data while the right side contains catchment data. The first step is to select the drainage string to be edited. Click on **Pick drainage string** and then select the drainage string from one of the views.

There are two ways to move between pits. The **Prev pit** and **Next pit** will move the user between the pits

with the current pit name been shown in the **Change pit name** field. Do not use the **Change pit name** field to move between pits. It will not work! This field is used to manually change the pit name. Entering the **pit number** and pressing **Enter** is the second method for selecting pits. This is a good way to move between pits on long drainage lines (from pit 20 to pit 1 for example).

The **pipe diameter** will change the diameter of the pipe leaving the pit in the direction of increasing chainage. Note that the invert level of the pipe will remain fixed as the obvert level changes.

The most common **Design mode** is 1 for design. This ignores the present pipe size and resizes the pipe as required.

When the **Inlet capacity** and **Bypass pit** tick boxes are checked, additional fields are added to the dialogue. These will be discussed in the section 5.0 above

The **Catchment Detailed** and **Comprehensive** tic boxes also add additional fields to the dialogue. Again, the ILSAX drainage manual contains detailed descriptions of these parameters.

ILSAX Rainfall File Editor

[drainage_ilsax_rainfall_editor_panel](#)

Position of option on menu: Design => Drainage => More => ILSAX Editor=>ILSAX rainfall file editor

The ILSAX rainfall file editor assists in the creation and editing of the ILSAX rainfall files. It is truly a file editor and no data is stored inside the 12d model. Most common features of the ILSAX rainfall file are included but some have been omitted as they have been rarely used. The files can be created using the editor and then manually edited using a word processor if required.

See Also

ILSAX pipe editor
Drainage overview

Usage

This panel is accessed from the menu selection **Design => Drainage => More=> ILSAX editors => Ilsax rainfall file editor**

The **Rainfall file name** must be specified before the **Read** or **Write** buttons will operate. If you want to create a file, fill in the **Rainfall file name** field and then **LB** select **Write** to save the data.

Intermediate Files and **Separate Rain/pipe files** must be ticked to have ILSAX run within 12d.

The minimum value for **Num Rainfall Events** is 1.

The remaining data in the left column is the data for the ILSAX R3 and R4 cards and the data in the right column is the data for the ILSAX R2,R6, R6B and R8 cards. Please refer to the ILSAX manual for a description of these values. The fields are not in the same order as the ILSAX files but instead the fields at the top of the column are those changed most frequently between rainfall events.

The **Prev Rainfall** and **Next Rainfall** buttons select the rainfall events up to the number specified in **Num rainfall events**. If you wish to add or decrease the number of events analysed change the **Num rainfall events** value.

CAUTION: the **Finish** button does not perform a save so make sure you click **Write** before **Finish**.

The fields and buttons used in this panel are described in the ILSAX users manual.

PCdrain to 12d pit converter

Drainage_pits_pcdrain_to_12d_panel

Position of option on menu: Design => Drainage Sewer => More=>Create Pit type from PC Drain gully files

This option is used to read a PCdrain gully file and create the same pit type in the 12d drainage.4d file. The sag pits in the gully file have an "S" added as a suffix as they are imported.

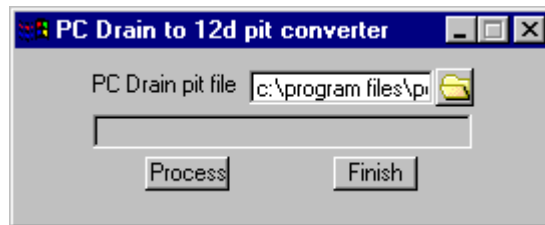
Important: 12d must be restarted to see the new pit types.

See Also

Drainage overview

Usage

This panel is accessed from the menu selection **Design => Drainage Sewer => More=>Create Pit type from PC Drain gully files**



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
PCdrain pit file <i>the PCdrain gully file to be imported into 12d</i>	file box		
Process <i>import the data file</i>	button		
Finish <i>removes the dialogue from the screen</i>	button		

Drainage Network Quantities

Drainage_quantities_panel

Position of option on menu: Design => Drainage => Reports=> Network Quantities

This option creates quantity tables for manholes, pipes and house connections.

The manholes/pipes/house connections are summarised by user defined depths and types.

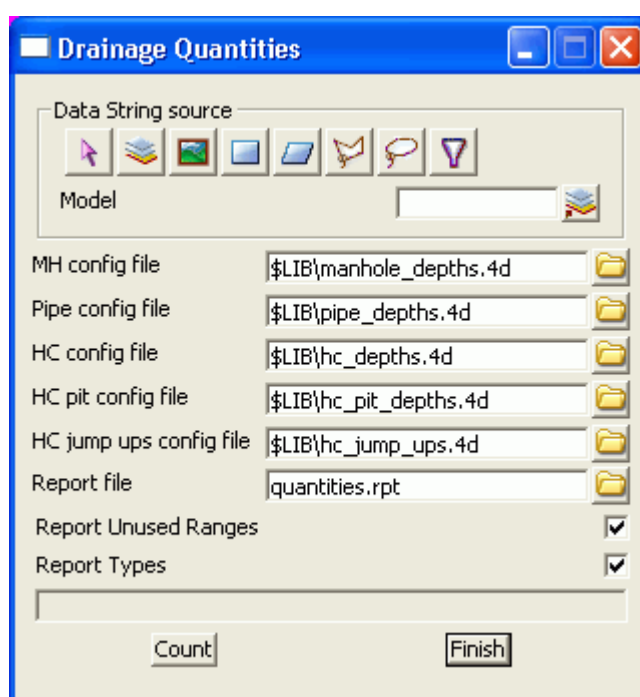
See Also

Drainage overview

Usage

This panel is accessed from the menu selection

Design => Drainage Sewer => Reports=> Network Quantities



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Data String Source	Choice		
---------------------------	--------	--	--

usually the entire model is selected but view is also available for combining models

MH config file	file box		
-----------------------	----------	--	--

This file specifies the types and depth ranges for the manholes. Details of this file are contained below.

Pipe config file	file box		
-------------------------	----------	--	--

This file specifies the types and depth ranges for the pipes. Details of this file are contained below.

HC config file	file box		
-----------------------	----------	--	--

This file specifies the types and depth ranges for the house connections. Details of this file are contained below.

HC pit config file file box

This file specifies the types and depth ranges for the HC pits. Details of this file are contained below.

HC jump ups file file box

This file specifies the types and depth ranges for the house connections jump ups. Details of this file are contained below.

Report file file box

a sample report file is given below.

Report unused ranges tick box

*the depth ranges for the manhole/pipe/house connections are defined in the *.4d files. Selecting this option will cause the depth ranges in the file to be printed even if there are no manhole/pipe/house connections in these depth ranges (zero quantity values will be shown).*

Report types tick box

*Selecting this option will cause the manhole/pipe/house connection types used in the model types to be listed (even if quantities are not requested in the *.4d files). Since this is a complete of the type used in the model, the list informs the user what types have not been included in the quantity calculation.*

Count button

executes the option.

Finish button

removes the dialogue from the screen

The *.4d files listed above are contained in the 12d **library** directory. Each line is the file performs a count (count lines). No items are counted twice. Therefore, if an item is counted its type and then a count line is found the wild card is used for the type, the type already counted will not be included in the count.

The format for a count line is three or four values (space delimited) per line. Size is optional.

`<type (from drainage.4d)> <size> <starting depth> <ending depth>`

Notes:

All **types** with spaces in the name must be enclosed in quotes The wild card * may be used.

The **size** is optional and if omitted the all sizes will be counted in this group (do not use the * for a wild card).

The **starting depth** and **ending depth** are required for all count lines.

Sample count lines for manholes follow.


```
// sum concrete cover manholes is various ranges

"CONC COVER" 0.0 1.6
"CONC COVER" 1.5 3.0
"CONC COVER" 3.0 999.9 // this is expected to be zero
"CONC COVER" -999.0 0.0 // trap errors

// any that are not Concrete cover will be counted here

* 0.0 1.6
* 1.6 3.0
* 3.0 999.9
```

Manhole Quantities
=====

CONC COVER	0.00	1.60	13	16.506
CONC COVER	1.60	3.00	1	1.510
CONC COVER	3.00	999.9	0	0.000
CONC COVER	-999.0	0.0	0	0.000
*	0.00	1.60	0	0.000
*	1.60	3.00	0	0.000
*	3.00	999.9	0	0.000

Since the **Report unused ranges** tick box was selected, these lines were printed even though there were no manholes in the data ranges.

total length = 18.016

Types Used

CONC COVER

Diameters Used

1.100

This data results from selecting the **Report types** tick box.

Sample count lines for pipes follow.

```
// sum class 2 pipes by diameter and for various ranges

// count 375

2 0.375 0.0 2.0
2 0.375 2.0 5.0
2 0.375 5.0 999.

// count 450

2 0.450 0.0 2.0
2 0.450 2.0 5.0
2 0.450 5.0 999.

// count 525

2 0.525 0.0 2.0
2 0.525 2.0 5.0
2 0.525 5.0 999.

// count pipe sizes that were missed

2 * 0.0 2.0
2 * 2.0 5.0
2 * 5.0 999.

// count all other missed pipes

* 0.0 999.
```

Calc pit overflow areas

Drainage_pit_volume_panel

Position of option on menu: Design => Drainage Sewer => More=>Calc pit overflow areas

This option is used to graphically display the overflow storage volume at a sag pit. The following pit attributes must exist for the flood extents to be calculated.

overflow volume	value greater than zero required.
sag pit	must be equal to 1.
catchment model id	set by labelling catchments
catchment string id	set by labelling catchments

The maximum storage volume is read from the drainage pit attribute "overflow volume". This may be entered manually using the **Attribute Editor** or it will be created when data is read from the drainage design programs Drains or XP SWMM design programs.

This routine locates the lowest point on the catchment string by draping the string on the tin specified and adds the overflow limit specified to this value. This becomes the **overflow limit**.

The volume at this level is calculated and the compared to the **overflow volume** read from the user defined attribute. If the overflow volume is less than the volume in the catchment then the routine iterates to find the flood level for the overflow volume.

If the overflow volume is greater than the volume in the catchment, the results depend of the **Use overflow limit** tick box.

If the box is selected, the **overflow limit** (calculated above) is reported at the flood level in the catchment.

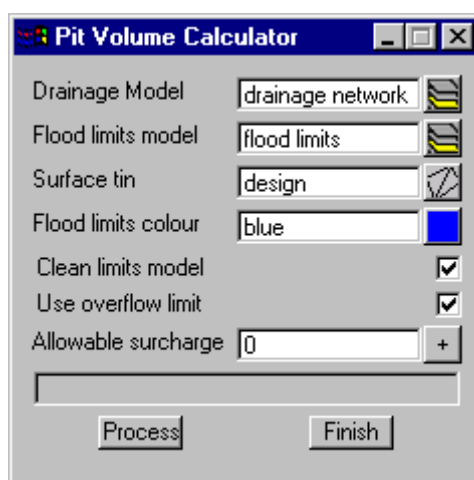
If the tick box is not selected the routine iterates to find the flood level where the storage equals the **overflow volume** read. This option allows the user to see the maximum flood level should the catchment low point become blocked.

See Also

Drainage overview

Usage

This panel is accessed from the menu selection **Design => Drainage Sewer => More=>Calc pit overflow areas**



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Drainage model	model box		
<i>all pits in this model that have a non zero "overflow volume" and "sag pit" set to 1 will be processed</i>			
Flood limits model	model box		
<i>flood limits strings will be created in this model</i>			
Surface Tin	tin box		
<i>ground surface tin used to calculate the volumes and flood limits</i>			
Flood limits colour	colour box		
<i>flood limits strings will be created using this colour</i>			
Clean limits model	tick box		
<i>if selected all strings in the Flood limits model will be deleted before the calculations commence.</i>			
Use overflow limit	tick box		
<i>if the elevation calculated from the storage volume is higher than the lowest point on the catchment string then the allowable surcharge value below will be added to the lowest point on the catchment string and this elevation will be used to determine the flooding limits</i>			
Allowable surcharge	real box		
<i>this value is used only if Use overflow limit is ticked. Its purpose is described in the field above.</i>			
Process	button		
<i>executes the option.</i>			
Finish	button		
<i>removes the dialogue from the screen</i>			

Stormwater Design - Introduction

The 12d drainage module contains functions to perform the following steps in the drainage design and documentation process:

- s set drainage defaults and layout a drainage network,
- s use the powerful 12d drainage network editor to avoid service clashes, grade pipes, align oberts, minimise depth and many other design tools,
- s automatically assign names to the pit/pipes in the network,
- s designate catchment areas and produce catchment plans,
- s transfer data to and from electronic spreadsheets to enable the user to easily review the data and add user defined data to the 12d pipe network. This data may include such data as pipe bedding types and trench width,
- s create pit layout schedules to export to spreadsheets or word processors for final formatting.
- s produce long section drainage profiles including HGL data, flows, invert levels, service crossings
- s create plan drawings with pipe sizes, flows, manhole symbols, linestyles for pipe sizes, design parameters for manhole and pipes and user defined data
- s locate pits/manholes at exact chainage and offset locations

This user manual will lead the user through the steps itemised above.

In addition to this manual there is the *Advanced Stormwater Design* training manual which includes the following topics.

- s drainage trench exvavation volume calculations
- s pipe and manhole quantity calculation
- s customising the drainage.4d file
- s design or evaluate the drainage system using 12d Drainage or create input files for the XP SWMM/RAT2000, Micro drainage, Drains and PCdrain drainage design packages,
- s read the output from the drainage design packages (automatic if using 12d Drainage), update the drainage network and store the hydraulic data, such as hgl (hydraulic grade line) levels, peak pipe flows and pipe capacities,
- s pit inlet capacity calculations and over land flow
- s flooded width analysis
- s surcharge volumes at SAG pits
- s and detailed drainage plan labelling

The terms pit, catch basin and manhole are used interchangeably throughout this document. The type, dimensions and inlet capacities of the structures are set in the drainage.4d file.

Setup Files and Their Locations

The drainage module consists of the optional 12d Drainage engine, utilities, startup configuration files for RAT2000, XP SWMM and the 12d drainage configuration file (drainage.4d). Demonstration versions of Drains, RAT2000 and PCdrain have been included on the CD along with a copy of the ILSAX hydrology package. Manuals for the ILSAX program may be obtained from the Civil Engineering Department at the University of Technology Sydney.

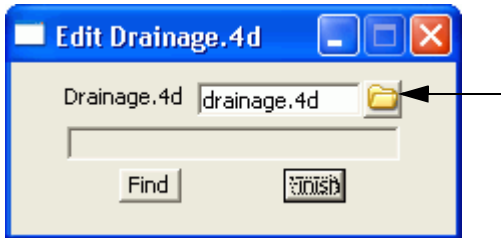
All setup files have been configured for the training version. However, when you start working on real projects you may want to customise the drainage module. **More - Customising the drainage module**

The **drainage.4d** file contains pipe types (RCP, Class 2 etc.) and example pit inlet capacity tables for RTA (NSW Road and Traffic Authority) standard pits. Detailed pit type descriptions and internal pit dimensions can be included in this file to be inserted into your pit schedules. For PCdrain users there is a routine to read your gully pit file and include these pit types in 12d **More**.

REVIEW THIS DATA CAREFULLY! The **drainage.4d** file may be customised for any additional inlet capacity data you may have.

To edit the **drainage.4d** file, from the main menu select

Design->Drainage-Sewer->More->Edit drainage.4d



Select the **Find** button to search the 12d path for the current **drainage.4d** file. Select the **More info** button and then **Edit** to edit the file.

Survey data and design surfaces (TINs)

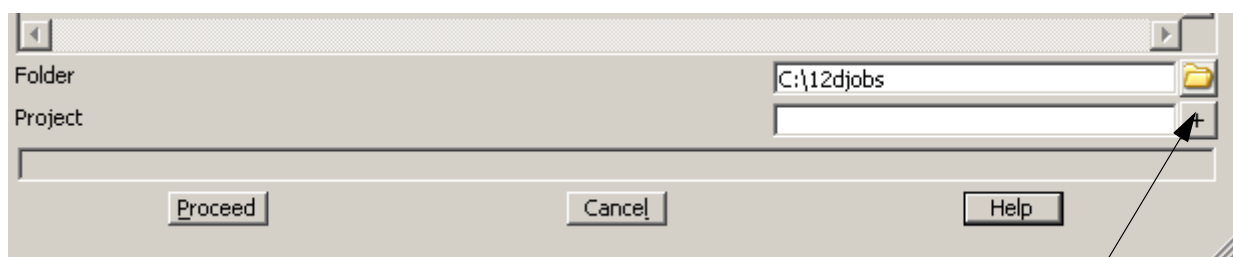
We will begin a 12d project from scratch by first creating the project and then reading in the survey design data. The design can then be triangulated so that we have a final surface profile to design the drainage for. Start up the 12d model by selecting the courses icon from your desktop.



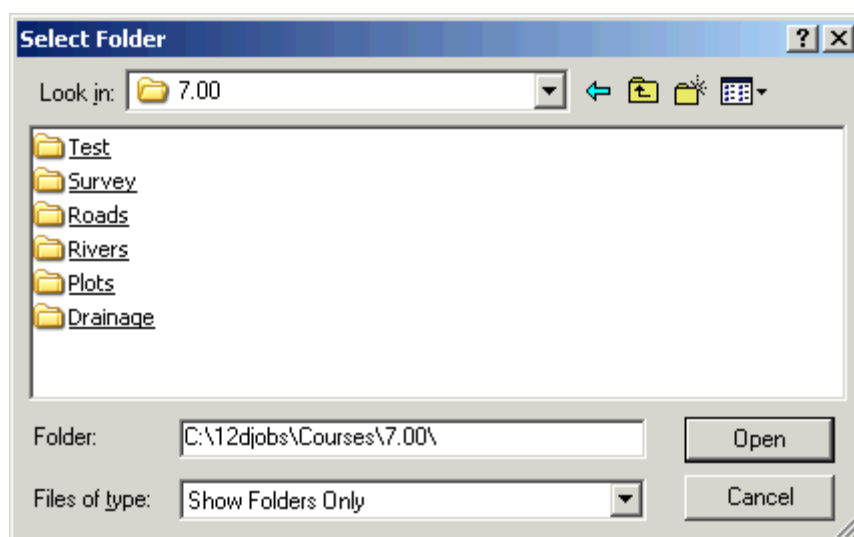
The project selection panel will appear. The bottom corner of the panel is shown below

Note: If you are using the practice version the folder will be:

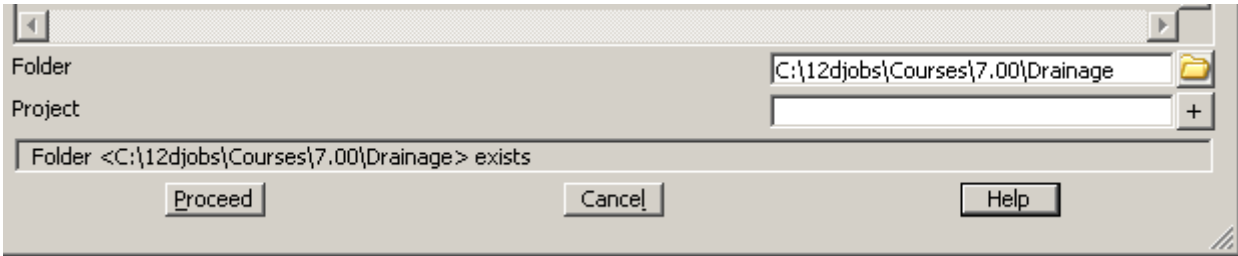
C:\12d Model v7.00 Practise\courses\7.00



LB select the icon and the following panel will appear.



12d works with a folder **NOT** a single file. Therefore, to open the folder we are going to work in, double click the **Drainage** folder and then select **Open**.

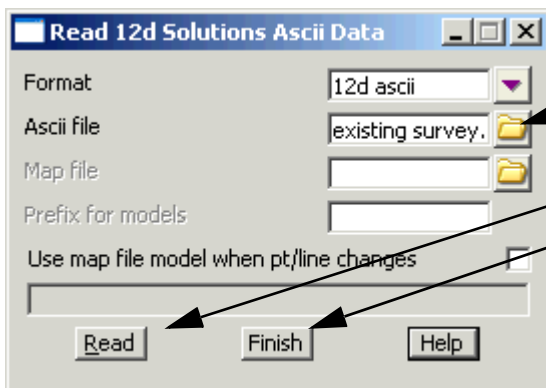


In the **Project** field type the name for your new project and then select **Proceed**. 12d will create a sub folder with this name. All of the 12d files that you should not touch will be created in this sub folder. Please stay out of the sub folder. All files created for the user will be kept in the folder that you opened (i.e. c:\12jobs\Courses\7.00\Drainage).

Importing the Raw Survey Data

You have created a new project into which we will import the survey data. From the main menu select.

File I/O => Data input => 12da/4da data



LB select to display the file list.
Select the file **existing survey**.

Select **Read** to read the data
then Select **Finish** to remove
the panel

To add all of the data to the view select **Menu** icon in the **plan view title area** and then from the drop down menu select

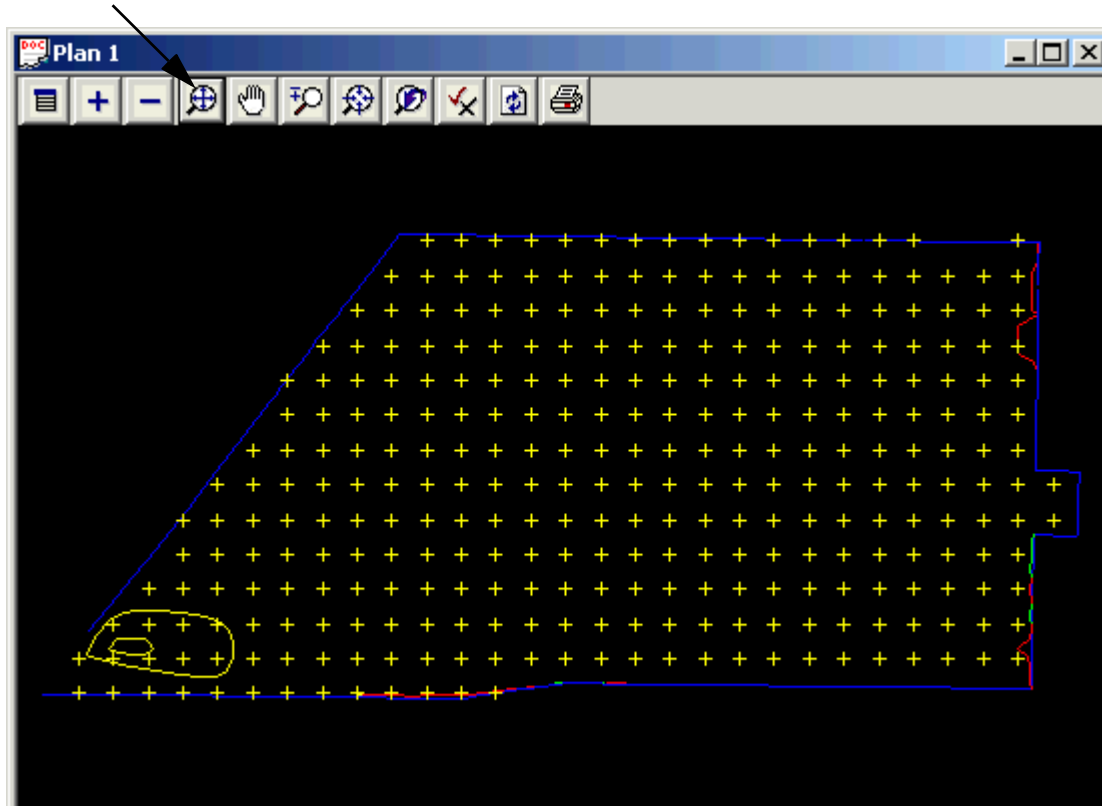
Models=> Add all models

or

select this "+" icon and select **existing survey data**.



Next select **Fit** on the **plan view title area**. You should see the following data.

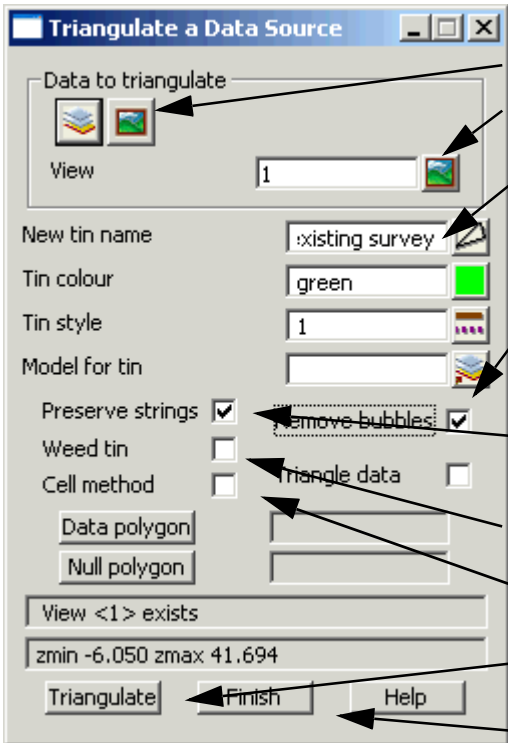


The view will contain survey data.

Creating the existing Ground Surface

From the main menu select

Tins=>Create=> Triangulate data



Select the **View** button

LB select then **LB** the view to be triangulated.

Type a new tin name, not the model for the tin. Remember a tin is like a string and it must reside in a model. Press enter and the **Model for tin** field will be filled in for you.

Select if creating a tin with contour data.

Preserve strings will make the string one side of the triangle thereby preserving the levels along the string all duplicate points are removed from the tin database

The cell method is a good enhancement for data that is in a grid type pattern but it is not required.

Select **Triangulate** to create the tin.

Select **Finish** to remove the panel from the screen.

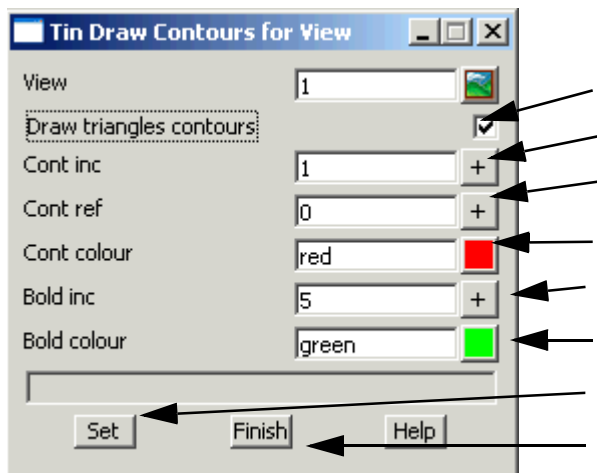
Now we are ready to look at the existing surface tin. Place your pointer over the “+” sign on the **plan view title area** and press the **t** key. All of the models beginning with lower case t will appear. **Double click** on **tin existing survey** to add it to the view.

The tin will be shown with the tin edges turned on. This is the default when you have all tin display modes turned off. Let us now turn on the fast contours and the fast flow arrows. Select **Toggle** on the **plan view title area** and then **LB** on **Tin contours**. The contours will be shown on the view. **LB Toggle** on the **plan view title area** and then **LB** on **Tin flow**. Now the flow arrows will be shown on the view.



To change the contour intervals and the contour colours select the **Menu** button on the **plan view title area** and then select.

Settings=>Tins=>Contours and the following dialog will appear.



Turns the contours on or off

Minor contour interval.

Value for first bold contour (usually 0)

Minor contour colour.

Major interval.

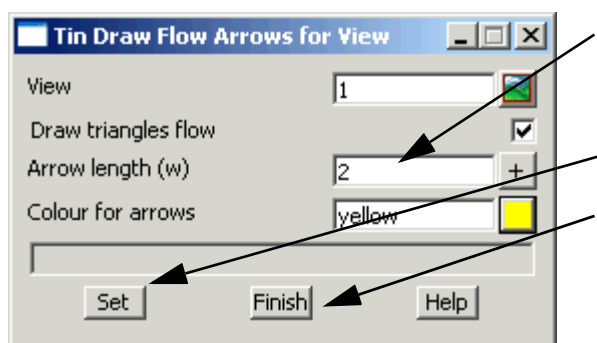
Major contour colour.

LB to observe the new settings on the view.

If you like the settings **LB** on **finish** to remove the select.

To change the length and the colour of the flow arrows select the **Menu** button on the **plan view title area** and then select.

Settings=>Tins=>Flow Arrows and the following dialog will appear.



A length of about 2 units looks very small now but it is good when you are zooming into the actual catchments.

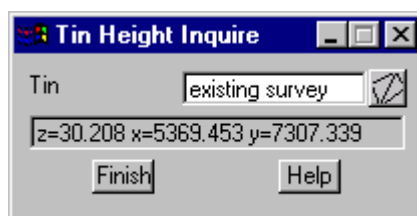
LB to observe the new settings on the view.

If you like the settings **LB** on **Finish** to remove the panel.

Inquiring about Heights on the Surface

The elevation anywhere on the tin can be obtained by simply moving the pointer over the desired spot. To obtain the tin elevations select,

Tins=>Inquire=>Height



You will see that data in the panel change as you move the pointer around the screen,

Viewing the Surface Tin in a 3d Perspective

To create a 3d perspective view select

View=>New=>Perspective and a perspective view will appear.

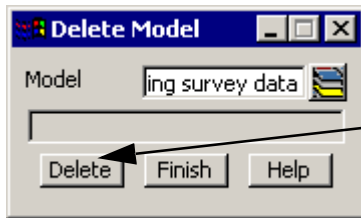
Add the model **tin existing surface** to the view and then **toggle** the **shading** on. You may also want to **toggle** the **contours** on as well.

Now remove the tin from the view as it is not needed for the next steps (Hint: use the “-” button).

Reducing the number of points for the 12d Practice Version

We can delete the survey data to save space for those using the practice version of 12d. If you have a full version of 12d this is not required. From the main menu select.

Models=>Delete=>Delete a Model and the following dialog will appear.



LB then select the model **existing survey data** and then LB to delete the model and then Select **yes** to confirm the deletion.

Importing the Road Design Data and Creating the Design TIN

Repeat the process of importing the 12da data.

File I/O => Data input => 12d ascii

(file is road design.12da).

Remove all of the models from the view and then add the road design models onto the view.

Road Centrelines
Road Strings
Road sections

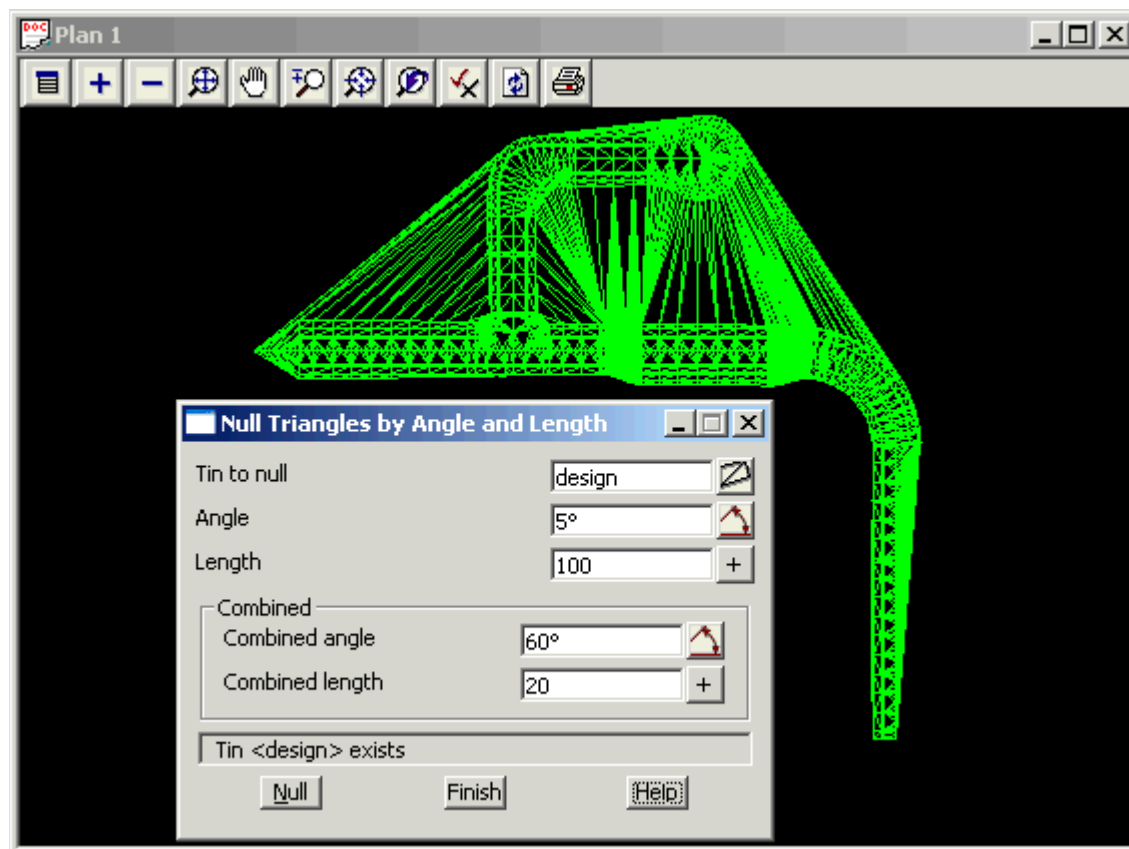
Now create a new tin called design using the **TINS->Create->Triangulate data** option.

Nulling the long Triangles

Add the tin that you just created onto the view. Toggle the **tin contours** off and the **tin flow** off. Now toggle the **tin edges** on. Notice the long triangles around the edge of the design.

To remove the long triangles select

Tins->Null->by angle/length



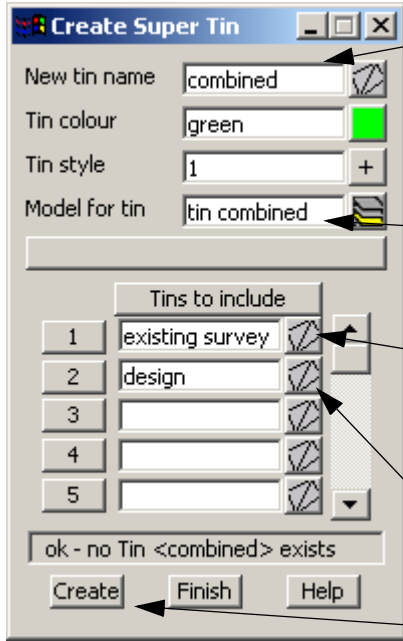
Select the design tin and then select **Null**. Using the default values removes most of the long triangles. Note that this option removes triangles from the outside inwards and it stops whenever it reaches a breakline.

Now reduce the **Length** value to 1 and then select **Null** again. Any exterior triangles with a length greater than 1 have now been removed!

Creating a Super Tin from the Survey and Design Data.

To create a tin that is the combination of the survey data and the design data you will need to create a super tin. From the main menu

Tins=>Create=>supertin



Enter a name for the super tin and press **Enter**.

The model field will be auto completed for you because you pressed **Enter** above. A new model will be created.

Now select the tins to combine. Tin 1 is the tin on the bottom (like the levels in a building) and tin 2 is above. i.e. wherever tin 2 exists it will be used. If there is no tin 2 at a location then tin 1 will be used.

Select the tins using the icon and then click **Create** to create the supertin.

Changing the Colour of a Tin



To change the colour of the design tin use

Tins->Colour->Colour of tin

Select the design tin and choose a new colour and then select **Colour** to change the tin colour (you may have to do a **Menu->redraw** on the view to see the new colour).

Drainage Layout

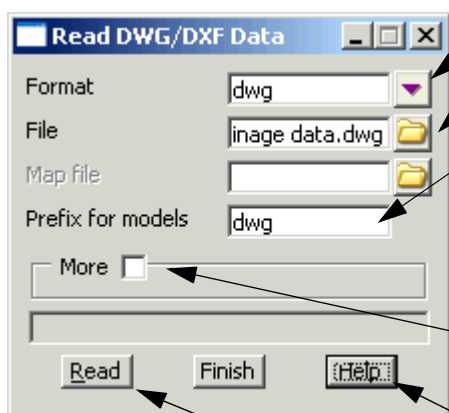
Where a drainage designer chooses to start their design is depends a great deal on the project and the designer. Identifying overland flow routes is essential because it is on these routes that the manholes are to be placed. Inlet manholes are then placed at critical locations (sag points, upstream of pedestrian crossings etc.), and then the spacing of additional manholes is determined by the size of the catchments. Finally, the pipe drainage system can be created linking the drainage manholes.

However, during training, most users want to get straight to the manhole and pipes. Therefore, lets import a pipe layout that was drawn in AutoCAD along with the overland flow routes and catchment areas (These could have been created in 12d as well). When these were drawn the following rules were followed.

- 1.polylines were used
- 2.lines drawn from upstream to downstream (direction of flow)
- 3.a vertex was placed at every manhole location

From the main menu select

File IO->Data Input=>DWG/DXF.



Verify setting as dwg

Select the dwg file (drainage data.dwg)

Entering a prefix for the models will help organise the layers that will be read from AutoCAD. Every layer goes into a separate model in 12d. If you specify a prefix then all of the layer names will be prefixed with this text. The prefix used is `dwg<space>`.

There are many optional settings not required at this time.

The rest of the data can remain as the default value. Refer to the **Help** button if more detail is desired.

Select **Read** to import the data. **The data will not immediately appear on the plan view.** The new models have to be added to the view using the “+” on the view tool bar. Every time you press the **Read** button the data will be imported again and you will get duplicate, tripllicate...etc data.

All of the models imported will begin with dwg.

The models that have been created are,

```
dwg d catchments
dwg d overland flow
dwg drainage network
```

Remove all of the models from the view and add the model **dwg drainage network**. This is a 2d drainage layout that we will use to locate the manholes in our drainage design.

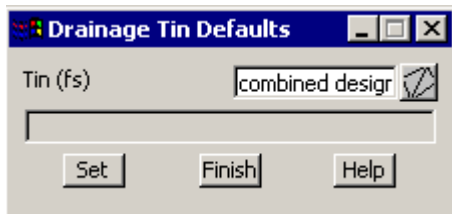
Setting Drainage Defaults

The defaults for the drainage network are accessed through three panels; pipe defaults, manhole defaults and Tin defaults. They may be accessed through the menu system as

Design =>Drainage-Sewer =>Defaults

Warning! You **must** click the **Set** button to set the default values. **Finish** alone will **not** set the defaults. If you plan to export to other drainage software packages you will have additional defaults to set before you export. See **Drainage Import/Export**.

Tin Default

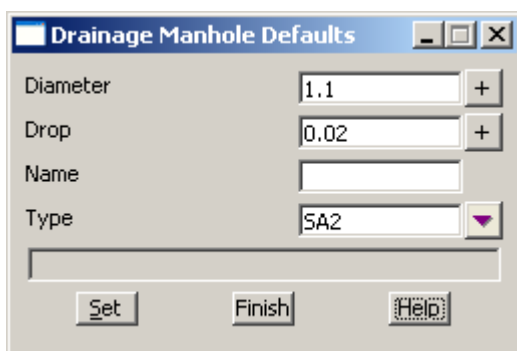


The default TIN is used to set the initial setout level of the manhole and the pipe invert levels. Super tins may be used if you want to place manholes on both the existing and the design ground surface (see Creating Super tins). Select the icon to choose from a list of existing TINs. Note that the panel will list the tins not the models that contain the tin. Remember a tin is like a string. It has a name and is stored in a model.

Warnings about using tins. If you place a manhole outside the tin boundary:

- s then no elevation will be set for the top of manhole, (it can be set later manually or by linking it to a design string).
- s Pipe invert levels cannot be set using the default cover. Pipe invert levels must be set manually as 12d cannot automatically determine cover levels without a TIN.
- s Finally, if your drainage design package accepts surface levels along the string, then an error message will be displayed at export time. The message will say that the surface level string is shorter than the pipe length.

Manhole Defaults



The manhole diameter is specified in metres/feet **not** mm/inches. Although most stormwater manholes are rectangular, 12d uses circular manholes to eliminate problems showing the alignment of the manhole. If the actual size and orientation of the manhole need to be drawn on the final construction drawings a symbol may be used in the use drainage plot annotations. The actual internal manhole dimensions and a detailed manhole description can be added to your **drainage.4d** file so that they can be added to your manhole schedules.

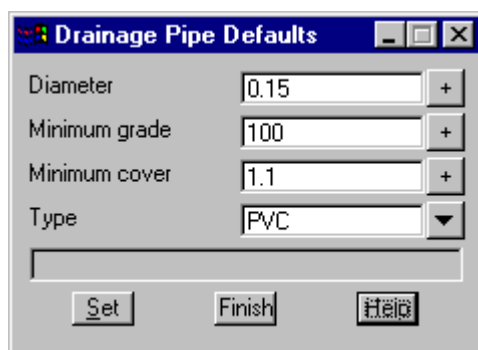
The **drop** will be used to set the invert level of the outlet pipe relative to the invert level of the inlet pipe. The drop should always be entered as a positive value. The **network editor** has many more options for aligning the pipe inverts at the manholes.

Generally, do not use a default name. Leave all of the manholes unnamed and then use the **Set Pit Names** function on the drainage network editor.

The manhole **type** is selected from a list by selecting the icon beside the **Type**. This list is obtained from the **drainage.4d** file. This manhole type will be used by ILSAX, PCdrain and RAT-HGL, RAT2000 and XP SWMM to identify the inlet capacity of the manholes. This value is not exported to the Drains program but it will be imported after a Drains design run. See **Drainage Import/Export**. It is best to set this to the most common manhole type and then change the few that are different later in the **network editor**.

You **must** click the Set button to set the default values. Finish alone will **not** set the defaults.

Pipe Defaults



The pipe **diameter** is set in metres or feet **not** mm or inches. Set this to a minimum pipe diameter for your project and then your drainage design package can increase them if required. To model an existing system enter the most common pipe size and then alter as required in the **network editor**.

Allowing for Pipe Thickness

When 12d set the pipe inverts it checks the **minimum cover** from the obvert of the pipe to the finished ground surface at both manholes. If the grade of the pipe is less than the **minimum** grade, the grade of the pipe is increased. Finally, 12d checks if there is anywhere along the pipe length that has less than the **minimum cover**. If there is such a low point in the design surface, the pipe is shifted vertically downwards to achieve the cover required. 12 defines cover as

$$\text{Cover} = \text{surface level} - \text{diameter} - \text{invert}$$

Therefore, an allowance for pipe thickness may be added to the minimum cover.

When using the network editors to change the pipe diameters the invert levels will remain fixed and the obverts will change. The inverts may be reset using **Regrade Network** on the **network editor**.

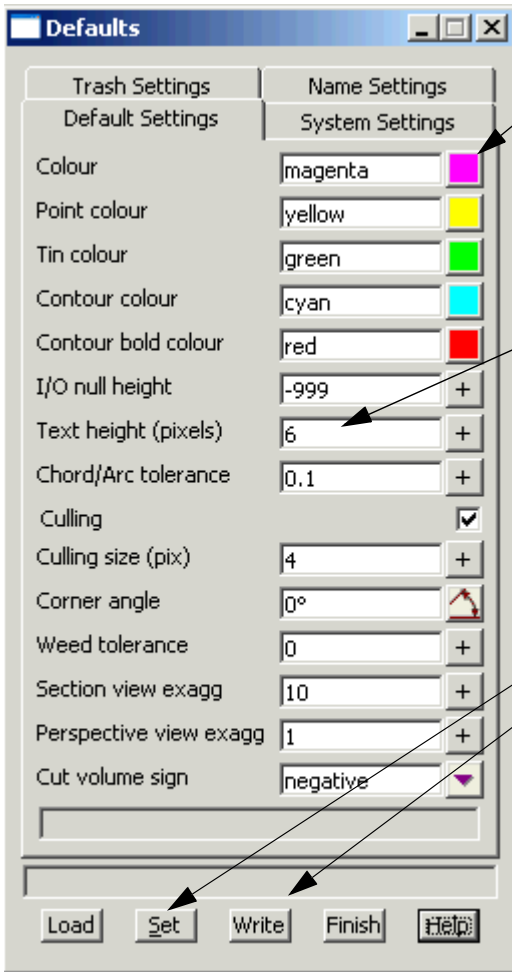
Select the drop down icon beside the **Type** field to select from a list of pipe **types**. These pipe types will be sent to your drainage design package so make sure you use the same names in 12d as you plan on using in the design package. The list of available pipe types is set in the **drainage.4d** file.

You **must** click the **Set** button to set the default values. Finish alone will **not** set the defaults.

String Colour and manhole Label Text Size/location (string defaults)

12d can automatically label the manholes at a fixed offset from the manhole using **view text** OR you can use the network editor **Set Catchments** to create text labels that can be moved/rotated etc.

For view text, the default line colour and text size are set by selecting **Utilities =>Defaults**. The following panel will appear.



LB to set the colour of the drainage string and man-hole labels.

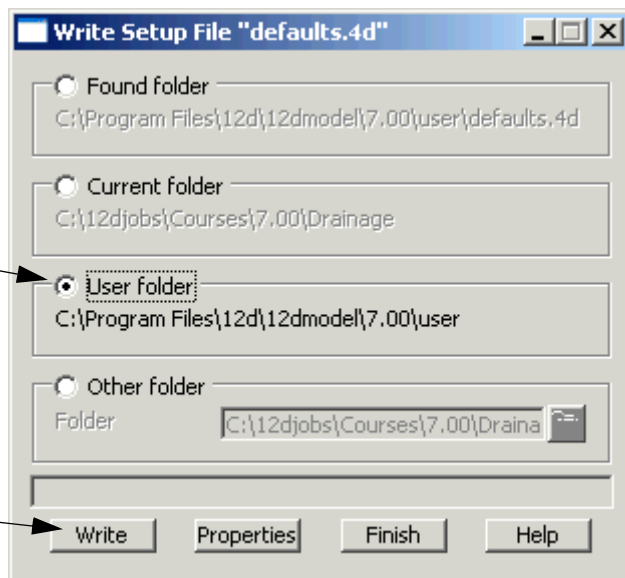
The default size of the text is set in the **Text height (pixels)** field. A text size of 6 to 8 pixels is generally adequate. Your choice will depend on your screen resolution and the age of your eyes.

Select **Set**
Select **Write**
the following panel will appear.

Selecting **Current folder** will save ALL these defaults for projects in this working folder only. The defaults set in the **user** or **setups** directories will not be used if you select this option.

Selecting **User folder** will save your defaults so that all other 12d projects will use this defaults. This is the most common option (unless your network administrator has not given you write access to this area (check **Properties**)).

Select **Write** then **Finish**



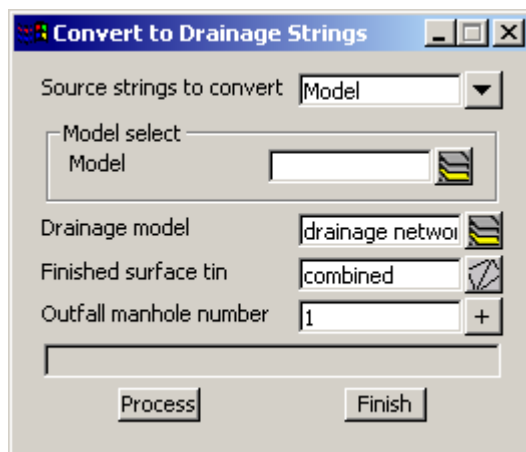
Create the drainage strings from the dwg strings

12d will convert the import strings into 12d drainage strings. The default pipe, manhole and tin data will be used to set the levels for the network

From the menu select

Design->Drainage-Sewer->More->Create drainage from strings

The following panel will appear.



The fields and buttons used in this panel have the following functions:

Field Description	Type	Defaults	Pop-Up
Data source <i>data source for strings to be converted</i>	choice box	model	view,model,string
Select <i>Model containing strings to be converted</i>		input box	
Drainage model <i>The new drainage strings will be added to this model. If it does not exist it will be created.</i>	model box		
Finished surface tin <i>This tin should be the same as your tin default for the drainage strings.</i>	tin box		
Outfall manhole number <i>The network will be numbered using a numerical method. The most upstream manhole of the outlet line will be assigned this manhole number. This numbering system can be changed if desired.</i>	real input box		
Process <i>Converts the strings to the drainage strings.</i>		button	
Finish <i>Removes the panel from the screen.</i>		button	

Important notes:

The imported strings must be drawn in the direction the water flows.

Manholes are created at all vertices on the strings.

Trunk lines must have a vertex where the branch lines join.

Integer string names can be used to control the order in when the drainage lines are numbered. These names will be transferred to the 12d drainage strings. **Naming the strings is highly encouraged.**

The drainage lines must have string names to use the **Set Pit Names** feature on the **network editor**.

Manholes can always be renamed in 12d after the import is complete.

Drawing the Drainage Network in 12d

The following method of drawing the drainage pipe systems has proved very efficient in the past. However, many people will have their own, “tricks of the trade”. Therefore, the rationale behind the following procedure will be important for the user to understand when they want to try out their own procedures.

Key Points

1. Draw the pipes where they actually are! Do not place the manhole centres at the setout point and have the pipes in the wrong location (pipe cover will be affected). Use setout strings for setout points!
2. Draw all drainage lines in the same direction. Either all uphill to downhill (flow in the direction of increasing/ascending chainage) or downhill to uphill (flow in the direction of decreasing/descending chainage). You choose but they all must be the same.

If you choose **descending chainage** then you must select Pipe=>Default Grading then Grade to have the grading applied to the drainage string.

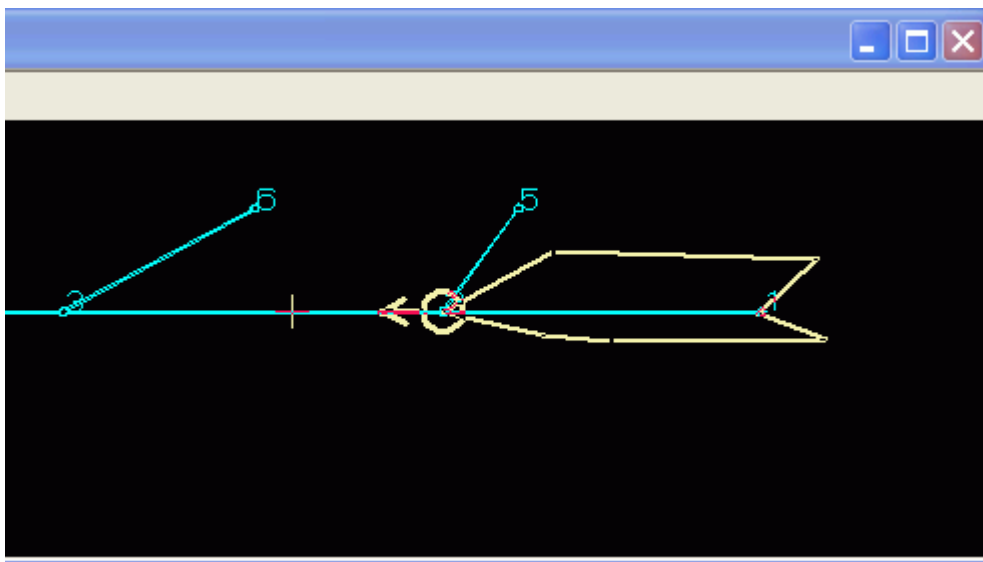
The 12d drainage network editor and the drainage design software packages have sophisticated algorithms to set pipe inverts as well. Consider this grading a preliminary estimate.

3. Begin creating the smaller branch lines before the trunk lines and terminate the branch lines where you plan to join the trunk line. This method ensures that when the trunk line is laid down, it will be low enough to accept flows from the branch lines. If you decide to create the trunk line first, you will have to select the **Regrade Network** later to adjust its levels.

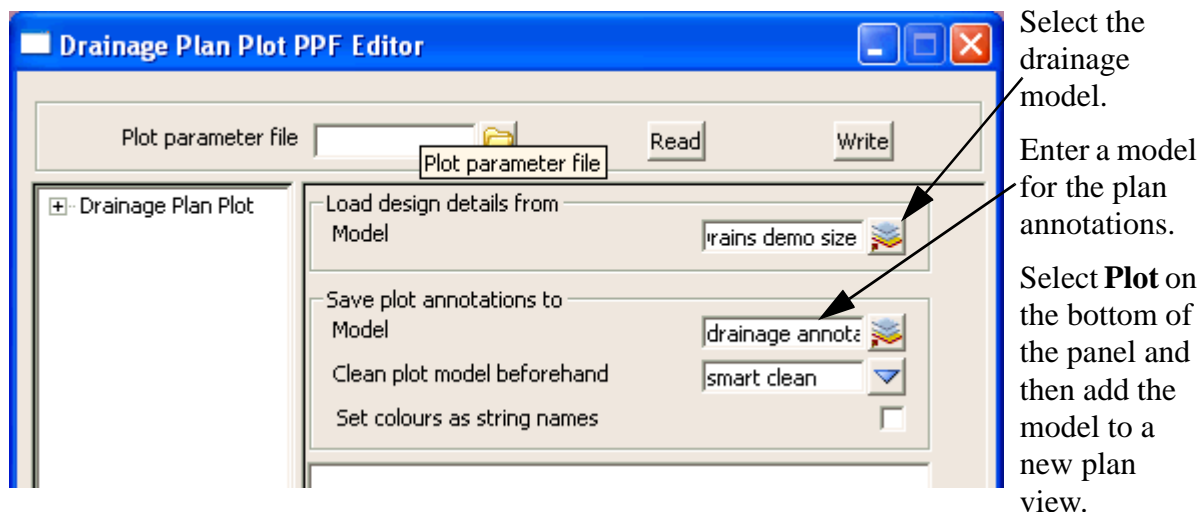
Flow in the Wrong Direction

The direction of flow is used by 12d to determine where the outlet is on the drainage line.

The direction of flow will be indicated with the arrow when using the **Drainage Network Editor** and you have selected an manhole (all but the outlet).



Also, the **Drainage=>Plot=>Plan annotation** option can be used to label the network with the direction of flow.



If one of the arrows in the plan annotations is going in the wrong direction then the direction of flow flag must be changed. From the main menu select

Strings=>Properties=>String

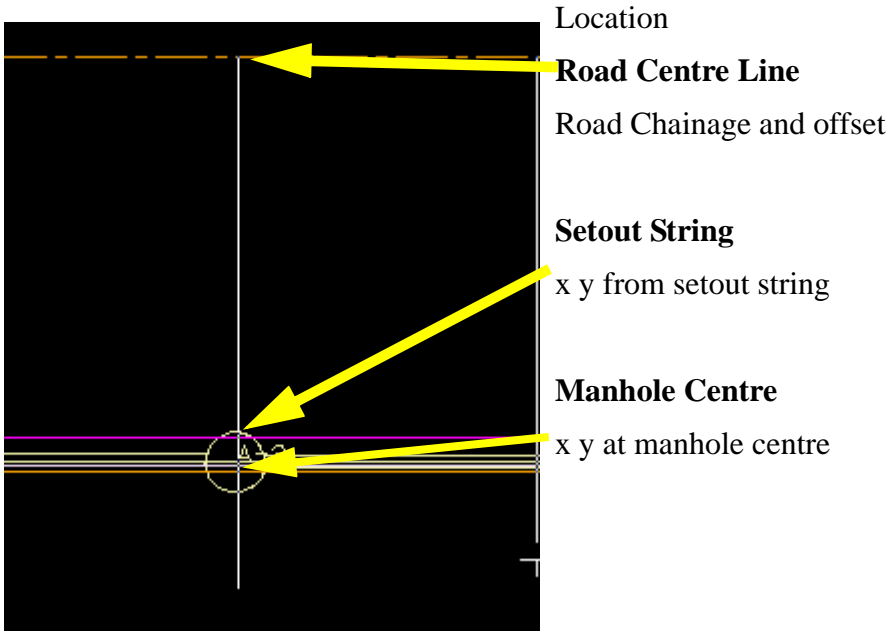
and change the **Flow direction** to the other value (there are only 2 options). You may replot the annotations if you want to confirm the change.

Manhole Setout Point, setout strings and selecting the location for the manhole centre

The centre of the manhole (x,y and z) need not be the **manhole setout point** used in the setout tables. The setout location can also be set independently of the level. It is recommended that you place the manhole so that the pipes are shown in the desired location and then use the desired option for setout. The default settings for the manhole setout location are found on the **network editor-defaults-pits-setout** data.

Key Points in Using Setout Strings

1. Enter the road models and the strings names (identifies) via the **Network Editor, Global-Utility Models** tab, **Road design file**.
2. Specify that these strings are to be used. Select **Setout string** for the XY or Z setout modes on the **Defaults->Pits setout** area or **Pits->Setout** tab.
3. Select the **Set Pit Details** button.



X,Y Option 1 Manhole Centre

The x,y location will be the centre of the manhole.

X,Y Option 2 Road Centre Line

The road chainage and offset are measured perpendicular to the road centre line out to the manhole centre or setout point.

X,Y Option 3 Setout string

The manhole centre is dropped perpendicular onto the set out string to obtain the x and y.

Z Option 1 FS tin

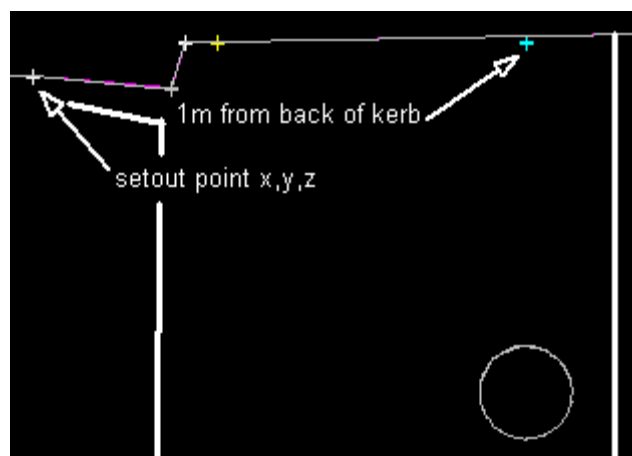
The manhole setout level is obtained from the finished surface tin at the manhole centre.

Z Option 2 Setout String

The manhole centre is dropped perpendicular onto the setout string and the level is obtained from the elevation on the string.

Example

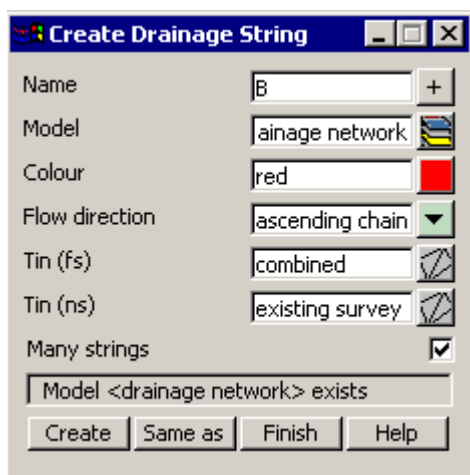
In the diagram below the setout point is lip of kerb. The setout x,y location level z will be obtained from the setout string and the pipe will be shown at its proper position.



Creating the Drainage Strings in 12d

Drainage strings can also be created in 12d. A drainage string is created by selecting

Design =>Drainage-Sewer =>Create



TIP: If you have already created a drainage string, click the **Same as** button and select the drainage string to obtain the panel values from that string. After selecting the string, change the string **Name**.

Each drainage string in the model must have a unique **Name** if you plan on using the **Set Pit Names** option after all of the strings have been drawn. The name of the string should be kept short, for example, as it will be used as the prefix or suffix for the manhole names. Examples of manhole naming schemes available for a string labelled, , are B1, B2, B3 ... ,or 1B, 2B,3B...or 1/B,2/B, 3/B... etc.

Sequential numbering all of the manholes (1,2,3 etc.) is also an option. The manholes on the string named **1** will be labelled first and then **2** and so on. If you insert a new string with a name in the middle an existing series (i.e. add a new string 2 when strings 1,2 and 3 already exist) then name the new string 1.1 (for this example) and then use the **Strings=>User=>Set String Name by number** command.

Drainage String Create Panel



For auto manhole naming, every drainage string must have a different **name**.

All drainage strings for the one outlet should be in the same **model**. Only drainage strings should be created in this model. If the model does not exist it will be created.

Colour will be the colour used in the drainage longsection drawings.

Flow direction should be **ascending chainage** if drawing uphill to downhill or **descending chainage** if drawing downstream to upstream. All of the strings in the model can have their direction changed later using the **Design=>Drainage-Sewer=>More=>Reverse all strings** command. To graphically check the flow direction of all strings see **Flow in the Wrong Direction**.

The **Tin (fs)** field will be completed for you with the default value you entered in **Design=>Drainage-Sewer=>Defaults=>Tin(fs)**. The finished surface levels on your long section plots will be obtained from

this tin.

The **Tin (ns)** field is optional. By specifying a natural surface tin, natural surface levels can be shown on your drainage long section profiles.

Selecting **Many strings** will have the panel re-appear, ready to go again, after creating each string.

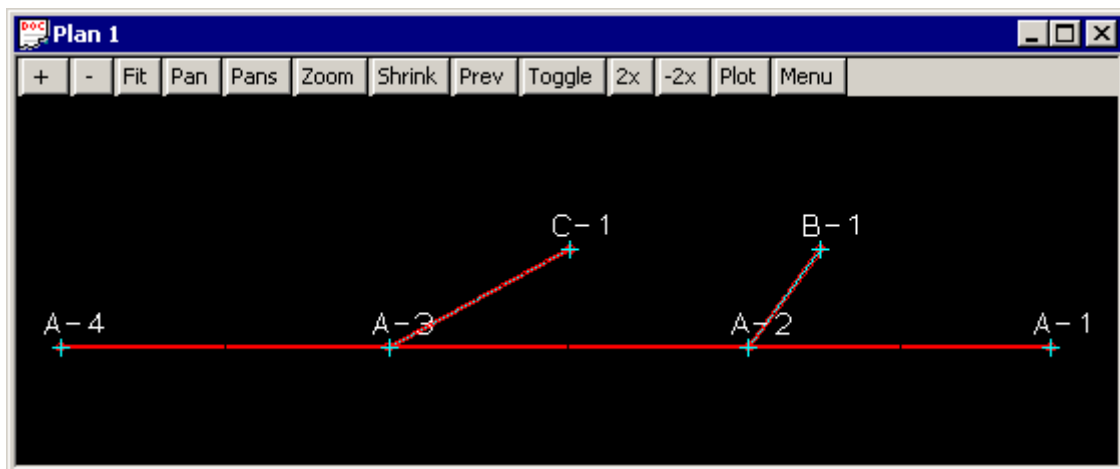
Click the **Create** button to begin creating the drainage string. The following panel will appear.



To create your first manhole, select **Edits =>Append**. A + will appear with your pointer.

We are going to place our manholes on the vertices of the layout that we imported. **Toggle the vertices on** (just to help you see where the manholes are going to be placed), turn your **line snap** off and the **point snap** on.

The first line we will create is the branch line on the east (Line B) then the branch line to the west (Line C) and finally the trunk line running from east to west (Line A). The drawing below shows the manhole names. You will not see these as you draw the strings but we will create them later.



Click and accept the point labelled B-1 and then click and accept the point labelled A-2. Since this is the end of the branch line, select **Finish** from the **Drainage Edit** panel. If you have other edits to make to the string do not select **Finish** yet (i.e. set some specific invert levels) **RB** then select **Cancel** from the menu. This will leave the edit menu active for further changes.

The **Create Drainage String** panel will appear again for you to create additional drainage strings.

Create line C in a similar fashion. When this line is finished, start on line A but only place the first manhole, A-1. manhole A-2 is a junction manhole and requires some special attention.

Exact Methods for Placing Manholes

To place your manholes on a kerb line string, turn the **line snap on** and the **point snap off**. Keep the **height snap off**.

For locating manholes at specific x, y coordinates, simply start typing the x coordinate instead of clicking onto a location. An input panel will appear for you to enter the x and y coordinate separated by a space.



To place the manholes at a specified distance from a point use the **RB** and select **SNAPS COGO=>Locate=>Offset**. Follow the prompts given in the message area (bottom left corner of the screen). You will need experience with the 12d “directional pick” to use this capability.

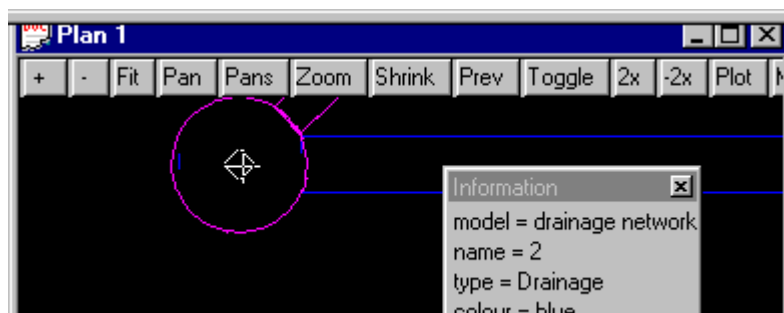
Junction manholes on Trunk Drainage Lines

Key Points

1. The branch line must **Point Snap** onto the centre of a manhole on the trunk line.
2. All strings must be in the same model.

Trunk drainage lines are created the same way as the branch lines except special care must be used when placing the junction manholes. When placing the junction manhole *on top of* the branch line turn the point snap on and the line snap off (the F3 and F4 keys are convenient for this). Zoom into the branch line junction manhole so that you can snap onto the centre of the manhole.

A manhole contains three points; one at each point where the pipes join (invert level points) and the one you want to snap onto at the centre of the manhole (setout level point). In the figure below, the blue line is being placed to join the magenta line. Note that the diamond indicates that there is a point snap and the information panel indicates that we are snapping to line 2. The information panel also indicates the snap was a point snap.



After snapping onto the branch line manhole click **Prev** on the **plan view title area** to return to the previous view and continue appending manholes.

You can tell that you have created a junction manhole correctly when you profile the trunk line and you can see the branch lines joining at the junction manhole. If the branch lines are not shown then one of three things have gone wrong.

- 1) centre of the manholes did not align, **Use Strings=>Points Edit=>Move** to move the branch string manhole
- 2) the “downstream end” of the branch line must be the junction manhole. With the direction of flow for the string set to “Ascending” the junction manhole must be at the high chainage end of the string. If the direction of flow for the string set to “Descending” the junction manhole must be at the low chainage end of the string. To check the flow direction see **Flow in the Wrong Direction**.
- 3) The branch string and the trunk string have not been created in the same drainage model. From the main menu select **Strings->Inquire (F2)** and select the strings to check their models. If this is the problem, use **Strings=>Edit=>Change** and specify the correct drainage model (enter the model BEFORE picking the string) or **Strings=>Edit=>Duplicate** to duplicate one of the strings into the correct model.

Drainage Section Views and Plots in the Wrong Direction

If the section views and the profile plots are running downhill in the wrong direction, the **reverse** function may be used to change the direction.

To reverse only one string, from the main menu select

Strings =>Strings Edit =>Reverse

and pick the drainage strings to reverse. This will also change the drainage flow direction attribute from **ascending chainage** to **descending chainage**.

To reverse all of the strings in a model select the **Strings Reverse** option,

Design =>Drainage-Sewer =>More=>Reverse all strings

To confirm the direction of flow see **Flow in the Wrong Direction**

Drainage Network Editor

The drainage network editor is used to automatically or manually change the attributes of your drainage network. These abilities include:

General

- s **Setting manhole names**

Hydrology

- s **Catchment Areas**
- s **Checking the Automatic Catchment Linking**
- s **Global and Defaults Tab**
- s **Drainage Templates**

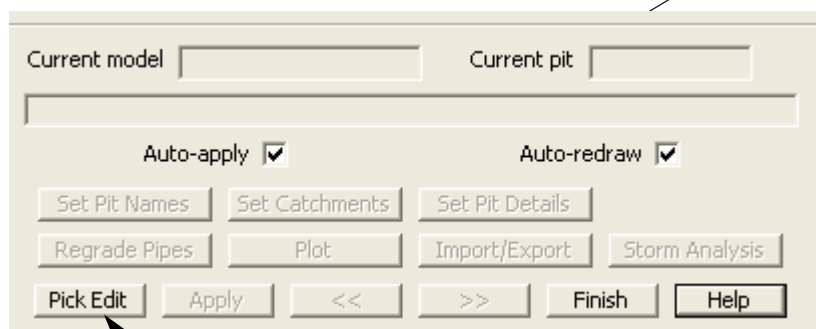
Hydraulics

- s **Outlet and Tailwater Conditions**
- s

The drainage network editor is accessed through the main menu by selecting

Design=>Drainage-Sewer=>Network Editor.

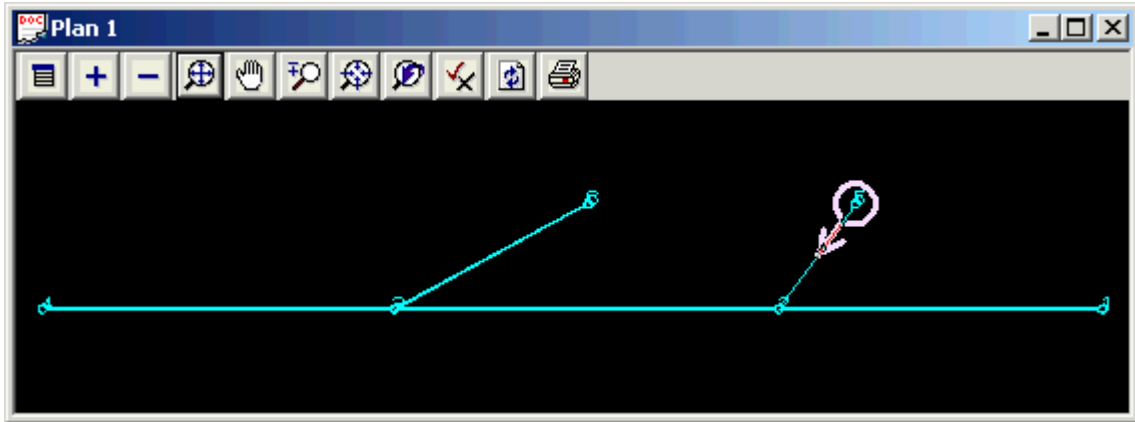
The bottom section of the network editor panel is shown below.



To begin select a 12d drainage manhole that is in your drainage model.

You must pick and accept the manhole and not the pipe! Pipes cannot be used to pick the network!

The manhole that was selected is highlighted with a circle and an arrow shows the direction of flow (see image below).



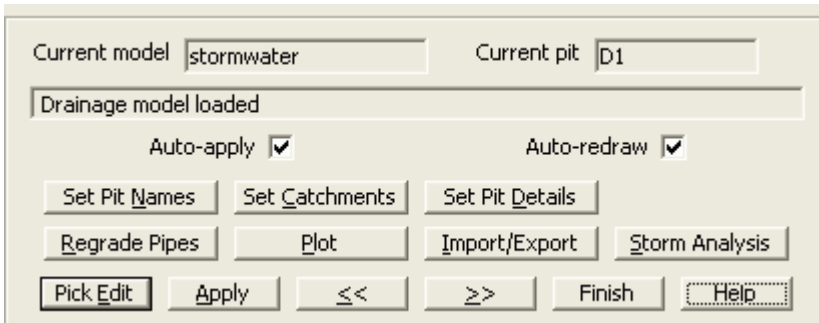
The option buttons on the drainage editor now become active.

Setting manholes names (and pipes)

If your network was created from 2d strings the manholes will be named incrementally using integer numbers. Use the drainage **network editor** to manually change explicit ones or quickly change all the names using a different naming method.

The manhole names are based on the string names so make sure the string names are set. To view string names on the plan view, go to the Plan View tool bar and select **Toggle=>Names**. If they do not appear see Displaying View Text. The string names may be changed using **String->Strings Edit->Change**. When using this function always...

Enter the new name BEFORE selecting the string!



Select **Set Pit Names** and the following panel will appear.

Field descriptions

After selecting the desired naming method and options.

Select Run to change/assign the manhole names. These names should be visible on the plan view with the drainage network model. If they do not appear, see the section below: **Displaying View Text**

To create larger text labels that can be moved see **Labelling the Manholes**

Select Back to Editor to remove the panel.

Displaying View Text

After you have named the manholes in your network, the names should appear beside each manhole in the plan views. If they do not appear check the following.

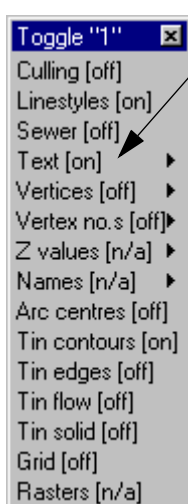
After you have named the pits in your network, the names should appear beside each pit in plan. You can change the text size for each string by selecting **Strings=>Editor** and then pick-accept the drainage string. The text size is set from the selection **Utilities=>Size**.

The offset from the pit is set by selecting **Strings=>Properties=>Strings**, picking the drainage string and setting the values for **Delta x**, and **Delta y**.

Note: Auto pit names are **NOT** shown in the section view.

Trouble shooting auto pit names not being displayed

Problem	Solution
Plan text is toggled off	select Toggle on the plan view title area

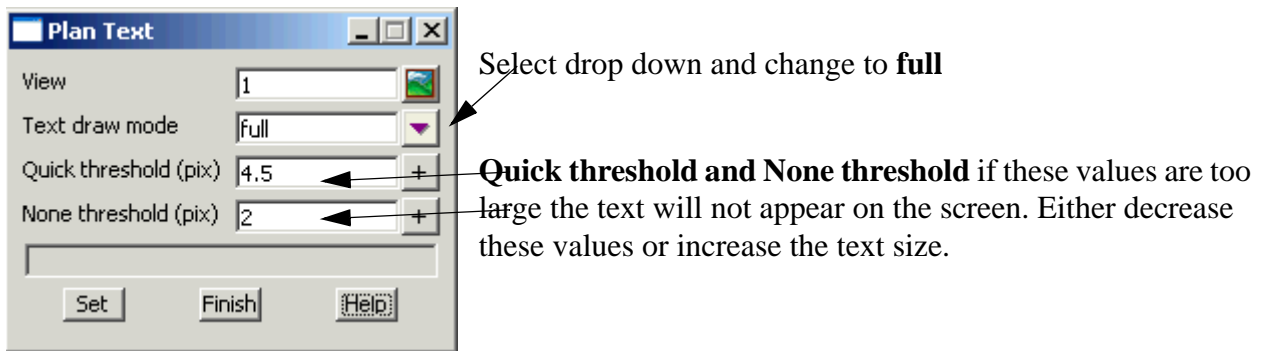


Check that the **Text** is toggles on. If it is on then walk right and ensure the text is turned on or n/a for your drainage network.

Small text is turned off select the **Menu** button on the **plan view title area** and select **Settings =>Text =>Text**

- if these values are too large the text will not appear on the screen. Either decrease these

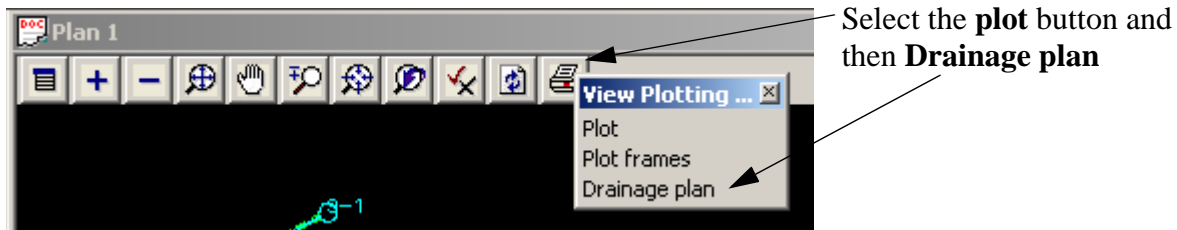
values or increase the text size.



string text size is 0. Each drainage line can have its own size of the text. To change it, select **Strings=>Editor** then pick-accept the drainage string. The text size is set from the selection **Utilities=>Size**. If this is set to zero the labels are not drawn.

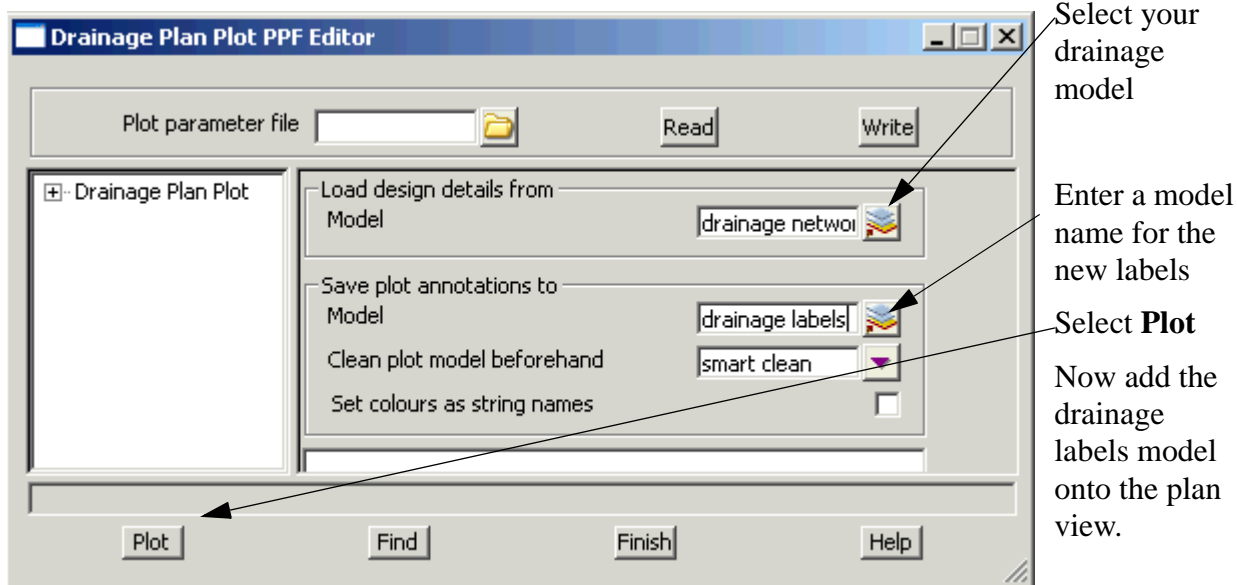
Labelling the Manholes and Pipes

To label the manholes and the pipes use Drainage Plan Annotations. This may be accessed from one of three locations. From the plan toolbar



or **Design->Drainage-Sewer->Plots->Plan annotations**
 or **Plot->Plot and ppf editors->Drainage plans**
 or **from the Drainage Network Editor - Plot Button**

Note (The following panel has been reduced in size).



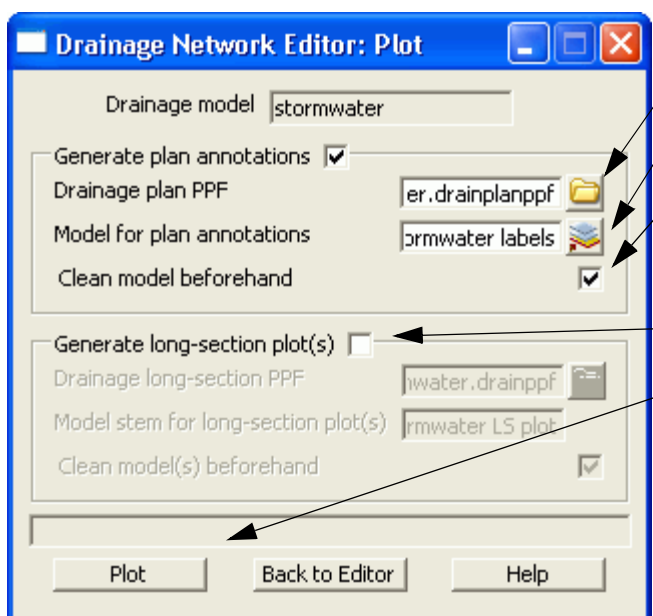
Select your drainage model

Enter a model name for the new labels

Select **Plot**

Now add the drainage labels model onto the plan view.

Option 2 is to select the **Drainage Network Plot Button**, the following panel will be displayed.



This plot will plot both the long section and plan at the same time. Select a ppf file from the library.

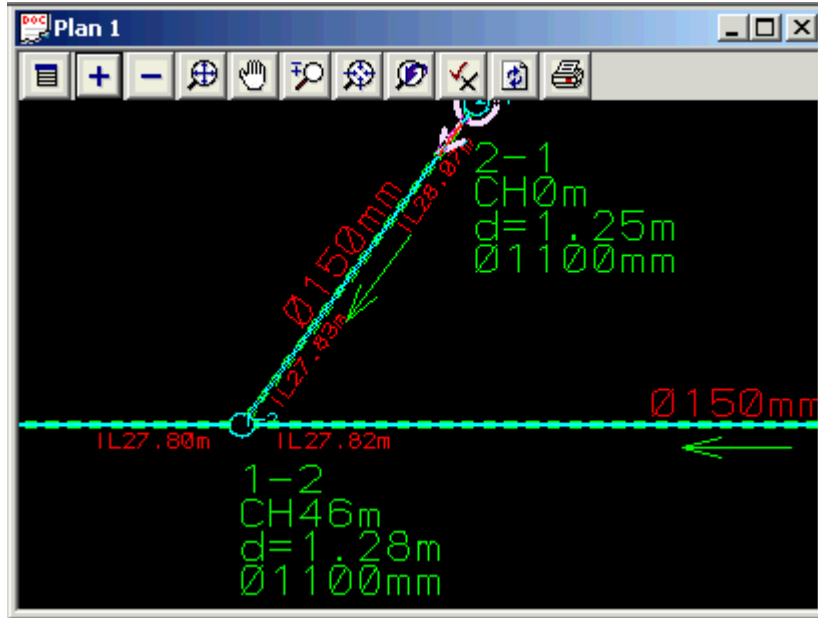
Enter a model for the plan annotations.

Select **Clean model beforehand** if you have not manually moved any of your manhole labels.

Turn off the long section plot for now.

Select **Plot**.

Now add the **Model for plan annotations** onto the plan view.

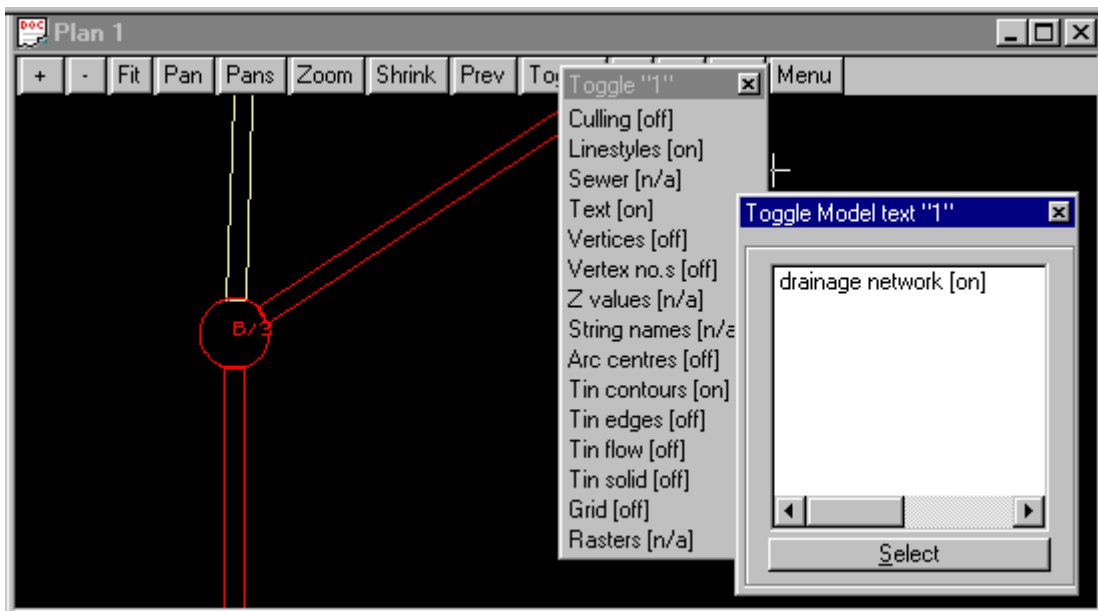


By default, the manholes are labelled with the name, chainage, depth and size. The pipes are labelled with their size in mm, the invert levels and the normal direction of flow. The text properties can all be customised using the plot parameter file but this will be discussed later in the plotting section.

These labels are **not** automatically updated when you change the names or pipe diameters. You must rerun the labelling routine to update the labels.

Turn off View Text Manhole Labels

To turn off the automatic view text manhole labels for this view select Toggle=>Text and then walk right to select the drainage model. Do not click on **Text**, rather walk right. If you click **Text** you will toggle on/off all of your text on the view. Not just the drainage model.



Moving Text

The labels created may be manually moved using the **CAD toolbar** but if the model is relabelled the text

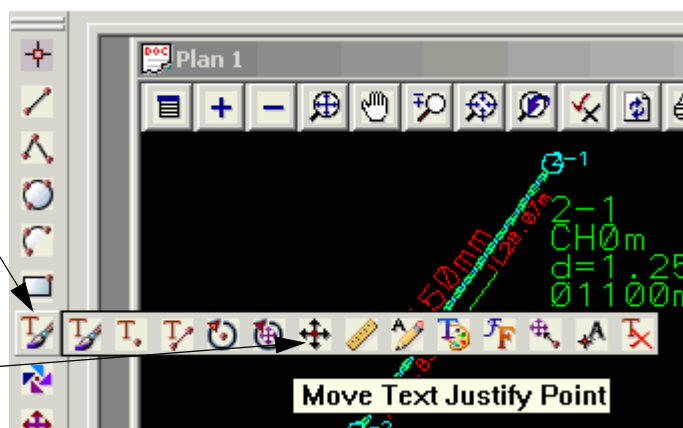
will return to its original location! Text moved via the **Drafting->Multi string translate** will remain in the moved position when **Smart Clean** is selected in the Plan Annotation panel.

Before selecting text turn on your **teXt snap**.

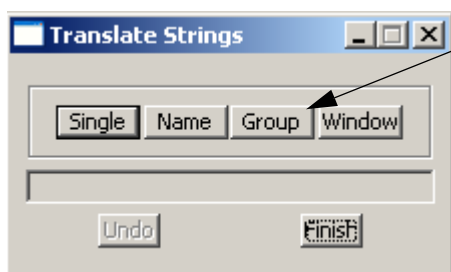


To move a single line a text use the **CAD** toolbar. Select the **Move text justify** button. To use this toolbar you must **DRAG** the **Create text** button to the right

and then release when the pointer is on the **Move Text Justify Point**.



To move a pre-defined **Group** of text select **Drafting->Multi string translate**



Select **Group** and then pick and accept one of the text items in the group. Move it to its new location and accept.

Note: To move another group you must select the **Group** button again.

Catchment Areas

Key Points

1. Start near the manhole for auto linking.
2. Manual linking available via Network Editor->Catchments->Pick button.
Disable the auto selection of a string via Right mouse on pick button then select **Clear**.

Catchment areas for your hydrological model may be defined using a Super, 2d, 3d or polyline string to set the catchment boundaries. Other ways to set the areas are: manual entry in the **network editor**, via a spread sheet program, the **Top 10 Attribute Editor** or the **ILSAX pipe editor**.

Note that if a catchment string is created to define the area for a manhole then all other data entry types will be ignored and the area from the string will be used.

There are 3 sets of catchments and it is up to the user to decide how they are to be used. Often set 1 will be all the impervious areas and set 2 the pervious and set 3 for special areas. Each set of catchments has its own model. Another option is to have only one set of catchments and to use the percent impervious field.

If exporting to external drainage design programs they may not accept all three sets so check the interface notes before defining the catchments.

In each set/model, 12d will automatically link the catchment string to the manhole that is closest to the first point on your catchment string. This is the preferred method. If this is not possible, then a manhole may be manually linked to a catchment string using the **Catchment manual link**.

Also see **Checking the Automatic Catchment Linking**

Drawing Catchment Strings in 12d

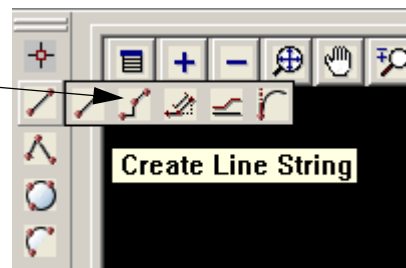
Before creating the catchment string set the **CAD control bar** data.

Type the name of a model for the catchment strings



Now to create the catchment string use the **Create line string** button on the CAD toolbar.

DRAG the **Create line** button and release at the **Create Line String** button.



The first point should always be placed near the manhole. 12d will assume that the catchment will drain to the manhole closest to this first point.

There is no need to go “overboard” with the accuracy of the catchment strings (except maybe with SAG pit catchments near the low points). From experience, it is more important to spend time verifying catchments in the field than spending a lot of time getting them “exactly” placed on the catchment plan. If you want to use the drawing as a catchment plan submission then the extra care in creating the strings may be warranted. Continue selecting and accepting the points on the catchment string.

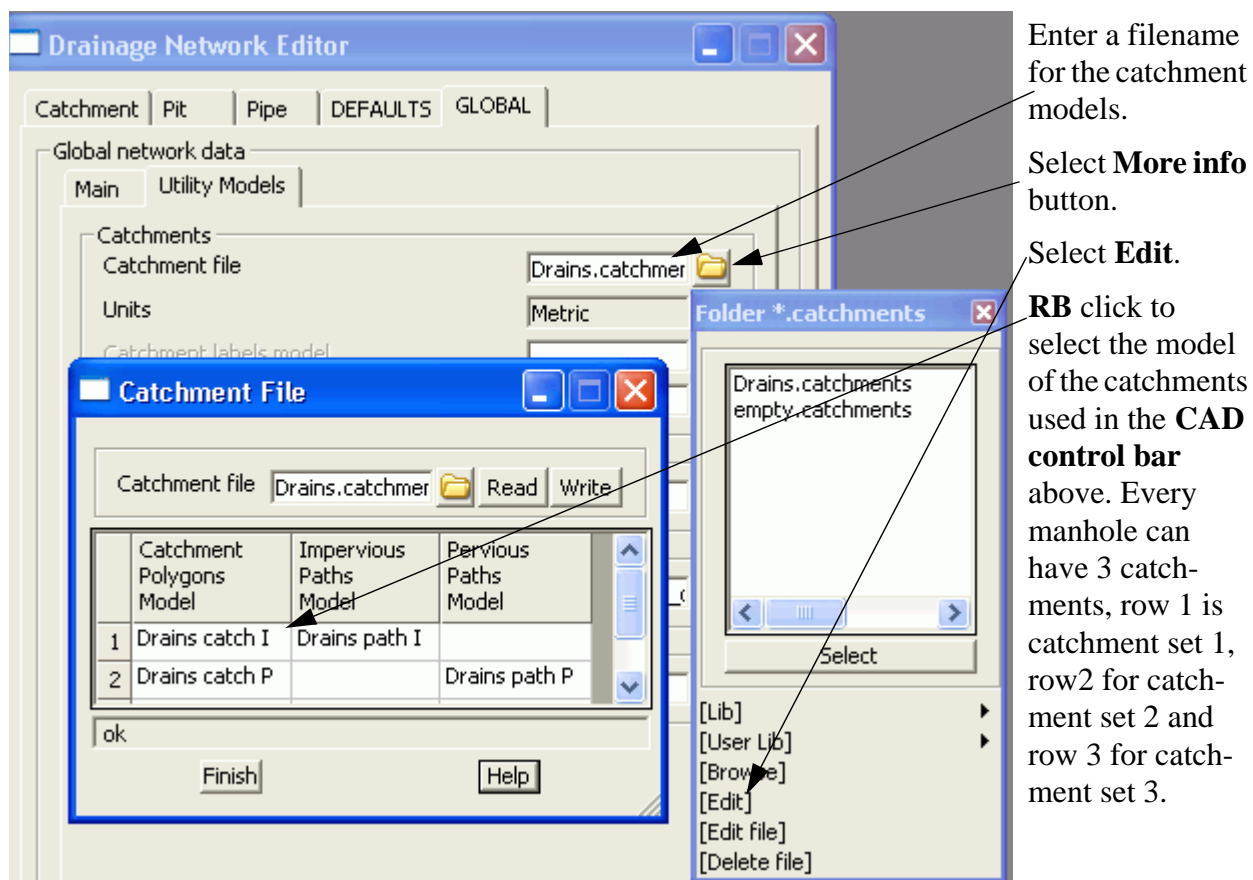
SAG inlet catchments: DO NOT START AT THE INLET, just start nearer to this inlet than any other! If you start at the inlet then move out to the crest of the catchment, the catchment overflow level cannot be determined from the catchment string.

For the last point on your catchment line select **Close** from the **CAD** toolbar. This function places the last point on the string over the first point on the string forming a closed polygon.

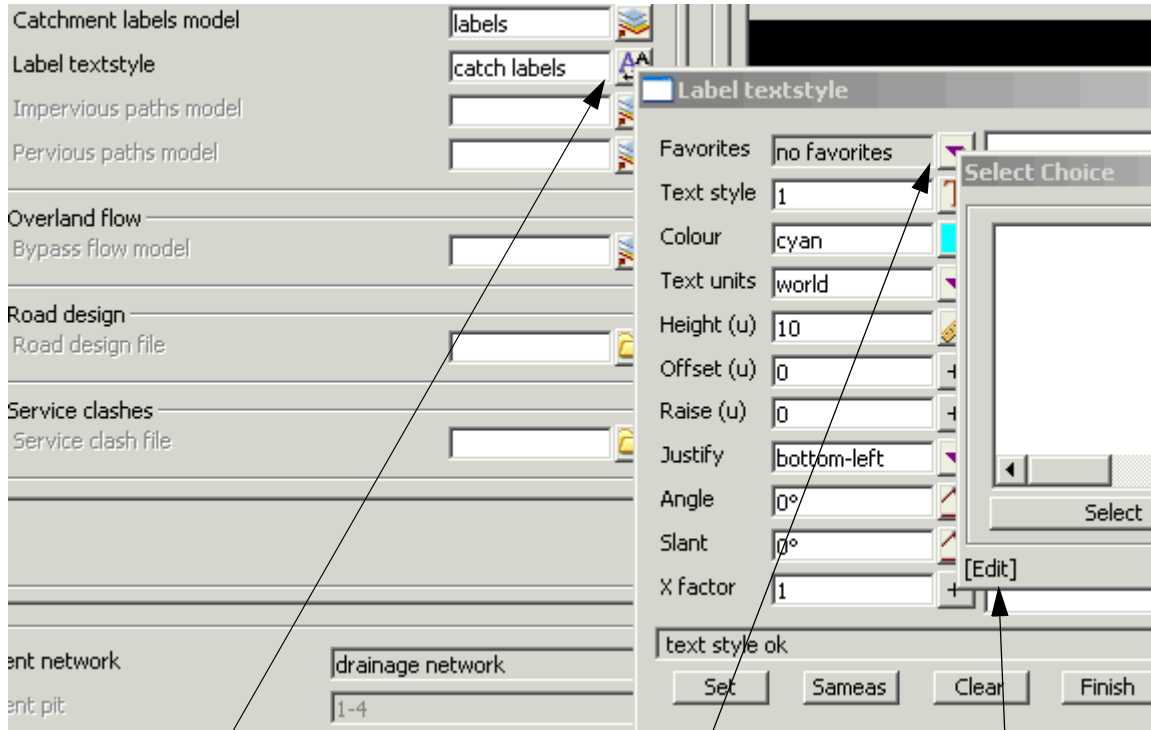
Once the catchments are drawn they become linked to the drainage network in the **Drainage network editor**. We will label the catchment with the manhole name and area at the same time.

Start the **Drainage network editor** and move to the **Global** Tab and then the **Utility Models** sub tab.



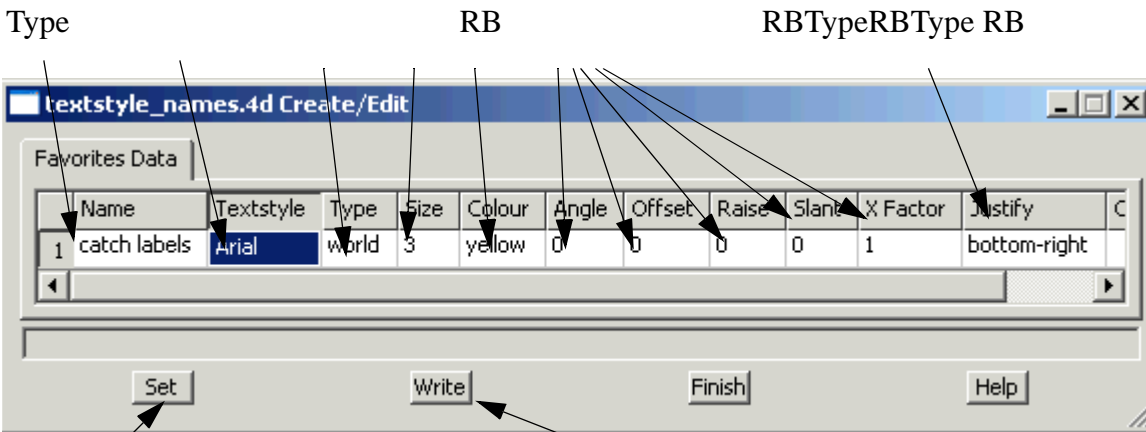


We now need to create a label textstyle if you do not have any favourites defined.

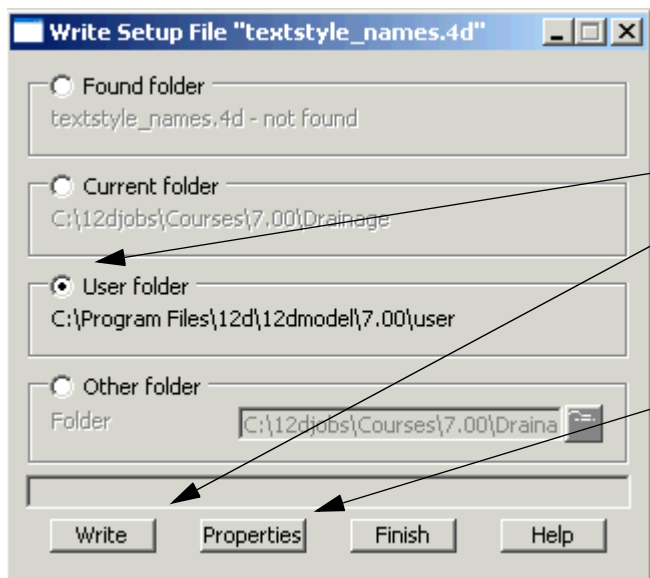


Select the **textstyle** button and then the drop down for **Favourites**. Now select **Edit**.

Enter the data as show. Some data you will have to type on the keyboard (**type**) and other you may use the right mouse button (**RB**) and then select browse.



Select **Set** to store the textstyle favourite for this session only. To permanently save this textstyle favourite and have access to it in all of your projects select **Write** and the following

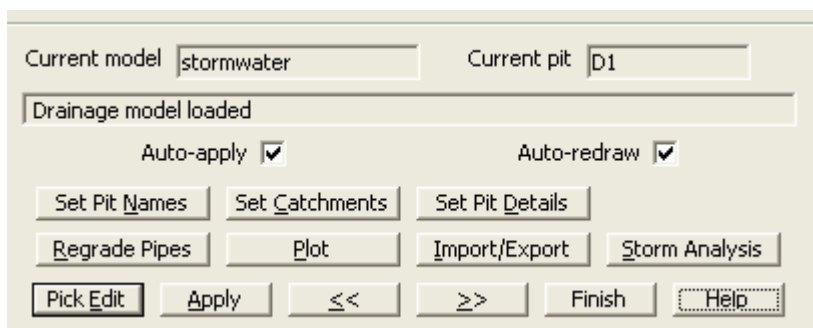


Select the **User folder**.

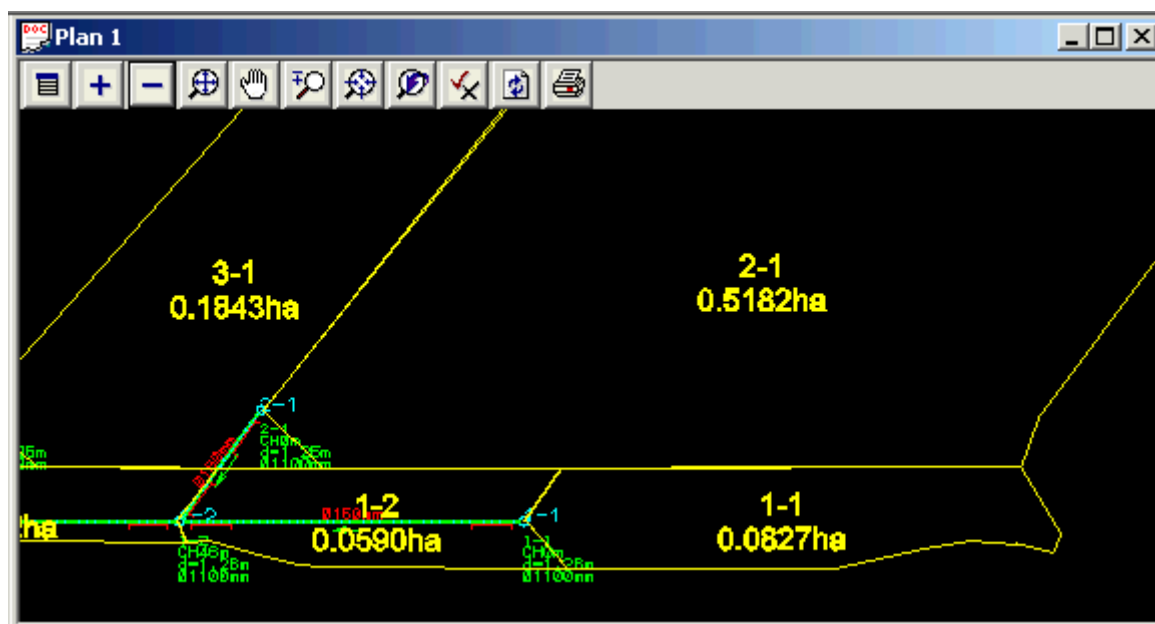
Select **Write** to save the favourite to the **User folder**.

If you are in a network environment and want to see if you have write access to this files select the **Properties** button.

Label Catchments



Finally select **Set catchments**. This will link the catchments to the manholes and label the catchments. Now add the model **labels** onto the plan view.

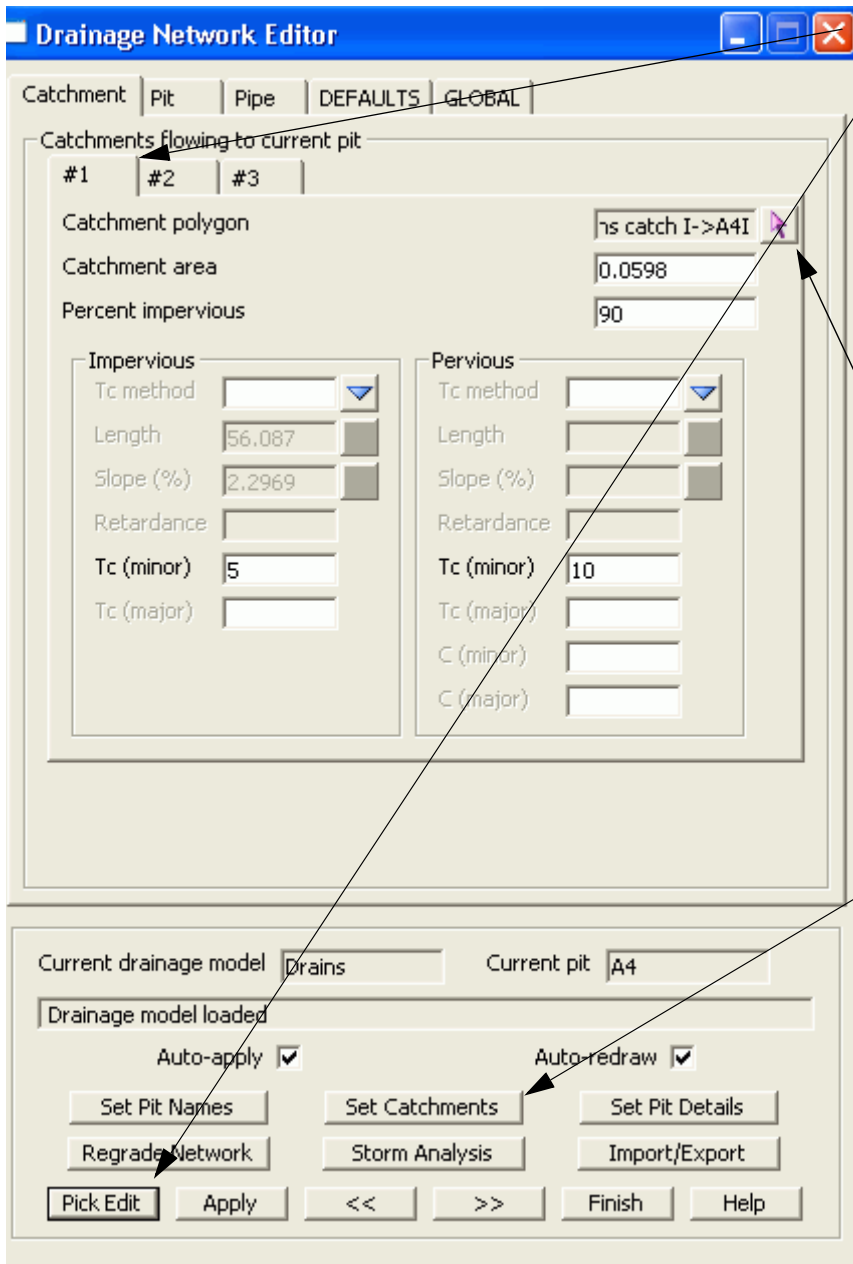


There are some cases where linking the closest manhole to vertex 1 is not feasible. In these cases you may manually link the manhole to a catchment.

Catchment manual link

The manual links are used when the first point on the catchment string is closest to the wring manhole. Note that the following restrictions still apply.

1. The string selected for catchment 1 must be in the model for set 1. To check if you have selected a valid string select the **Set Catchments** button.
2. If the catchment string has already been linked to another manhole (automatic or manual) then the new link will be created and the old link erased.
3. If you change the catchment model for one of the sets on the **Network Editor->Global->Utility Models->catchments** than all of the manual links in that set will be erased.



First change to the **Catchment** tab. Now either use the **Pick Edit** button to select the manhole or use the >> (next) or << (prev) buttons to move to the desired manhole. The manhole will be circled in the plan view and its name shown in the **Current Pit** field.

Now select the **Catchment polygon** button and pick the desired catchment string.

NOTE! If you decide to enter a value and NOT use the selected string **RB** on the button and select **Clear**.

If the **Auto apply** tick box is not selected then you will have to select the **Apply** button for the manual link to become active.

After the **Set Catchment** button is selected the measured catchment area will be shown in the **Catchment area** field using the units specified in the **Global-Utility models-Units** field.

Checking the Automatic Catchment Linking

The automatic manhole-catchment linking is easily checked by specifying a **Catchment labels model** with **Labels textstyle** on the **Global->Utility models** tab and selecting the **Set Catchments** button on the network editor. Also once the **Set Catchments** has been selected, the catchment is indicated when the

manhole is selected using the network editor. Since there may be three catchments per manhole the catchment data last viewed in the editor is the catchment that is highlighted.

The catchment strings may be drawn in a CAD package and then imported into 12d or drawn inside 12d. The strings may be easily drawn in 12d with the tin contours and/or flow arrows displayed in the plan view.

Network Editor - Global, Default Settings and Explicit Settings

Design values for the hydrology and hydraulics calculations are set either globally (one value for the entire network) or via Defaults for the manholes or pipes. Defaults values may be overridden by explicit settings found on the **catchment**, **pits** or **pipes** tab. Explicit manhole/pipe settings need only be specified if the default value is not desired.

Drainage Templates

The default and global settings may be saved as a template for other projects/networks. Set the defaults for a network and then export the model using **File IO->Data output->12da/4da data**. This file may now be imported to another project via **File IO->Data input->12da/4da data**. Since the global and default values are stored as model attributes, they will be imported with the network.

Tip: If you do not want the drainage system imported then delete them from the model before exporting the 12da file.

Network Editor - Hydrology

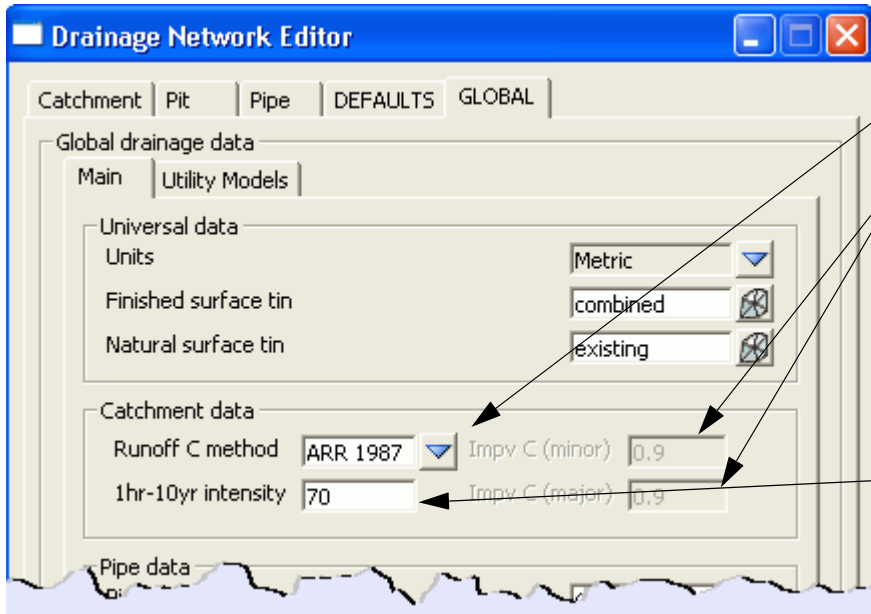
The **network editor** edits both the network and catchment data and it has already been introduced in the previous sections. This section will discuss the Hydrology **Global**, **Defaults** and **explicit setting** for the hydrology parameters. The parameters described on the **defaults** tab will also be found on the **Catchment** or **Pit** tabs.

Catchment Areas

The catchment areas have already been discussed in the previous section. There is no default catchment area to apply to all catchments (as would be expected).

Note! If a catchment string is linked to the manhole and the Set catchments button is selected, this string area will override any manual value that you type into the drainage area field. To ensure manual entry is maintained, RB select the string selection button and select Clear.

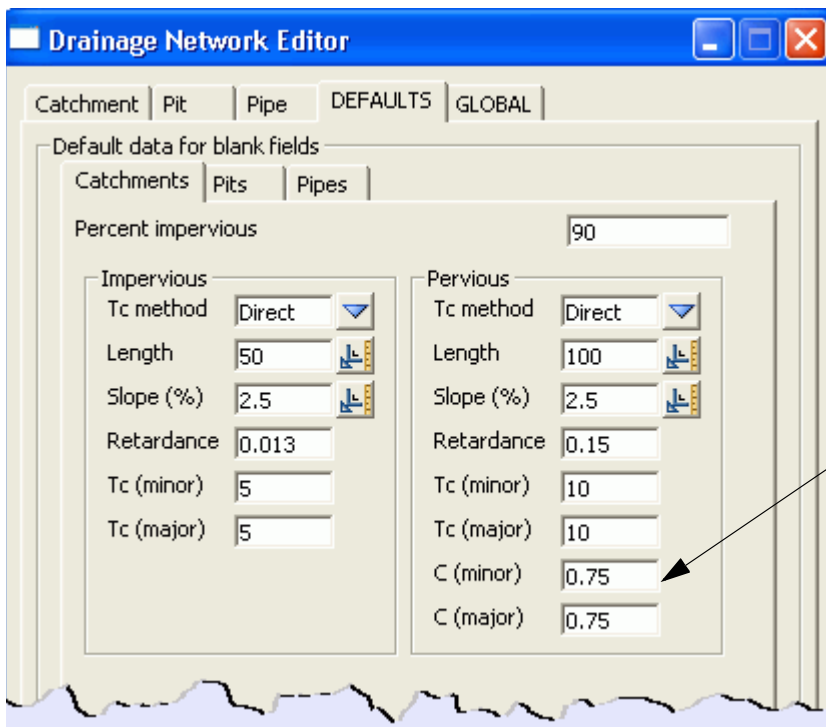
Coefficients of Runoff



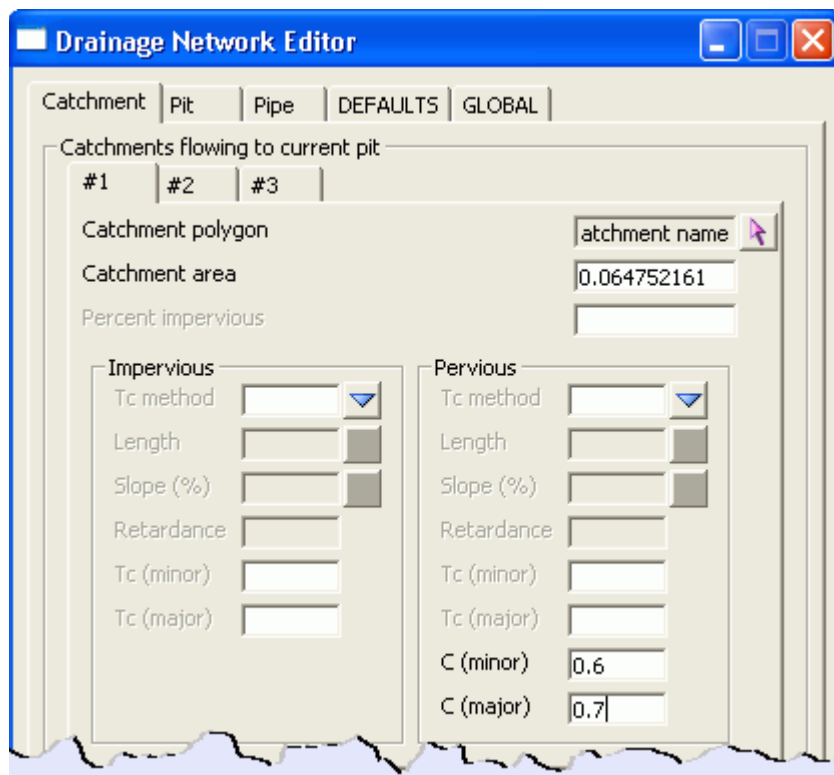
Runoff C methods include **Direct** and **ARR 1987**. For the **ARR 1987**.

Direct: There is a global impervious C value for both the minor and major storms.

ARR 1987: The composite C value is calculated using the **1hr-10yr intensity**, the percent impervious, ARR frequency factors and the return period specified when hydrology runs are made.



The **ARR 1987** has no explicit settings. The **Direct** method has both **defaults** and **explicit settings** on **Catchment** tabs (see below).

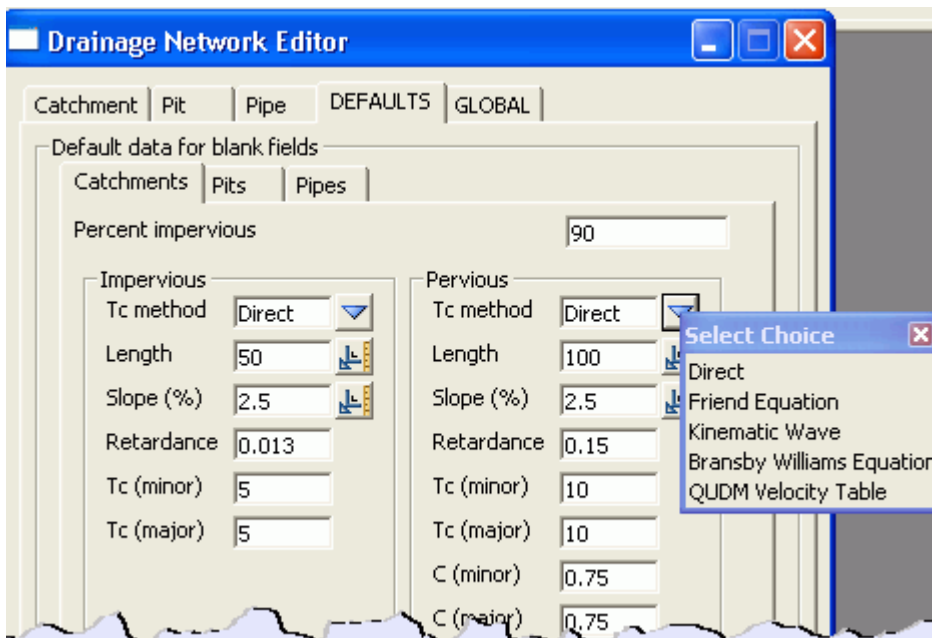


Percent Impervious

The default percent impervious for the network is set on the **Defaults->Catchment Defaults** tab and the **explicit settings** are on the **Catchment** tab (see above). The percent impervious is used to determine the area for the impervious and pervious components and the composite C value if using the **ARR 1987** method for calculating runoff coefficients.

Times of Concentration

There are several methods for entering times of concentration for the catchment areas (see list below). Default and explicit settings (catchment tabs) are entered/calculated for both the methods and values for the pervious and impervious areas. Since each catchment may use a different tc method all of the tc parameter fields on the defaults tab are active. They must be filled in even if you do not plan on using that value.



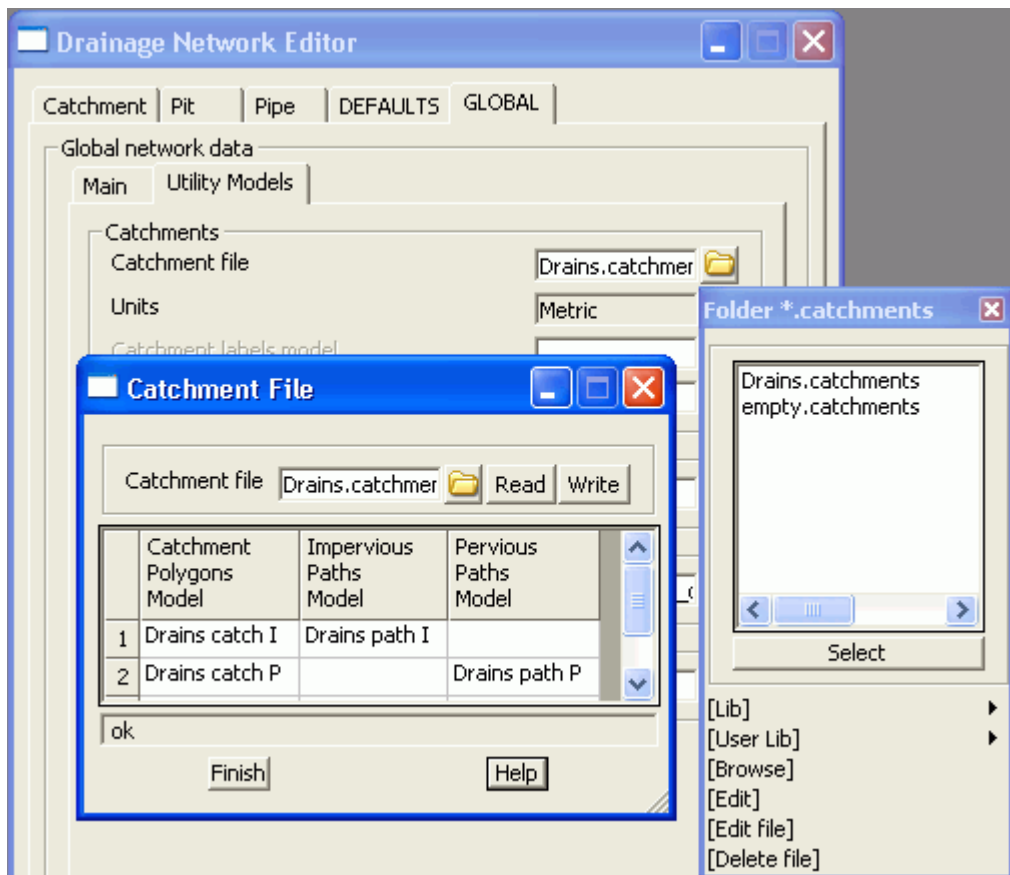
1. **Direct method** requires minor and major tc values.
2. **Friend, Kinematic Wave** and **QDUM** methods require the retardance, length and slope of the catchments to be entered. Default values must be entered but the optional **explicit settings** for slope and length can be entered on the catchment tabs or a catchment characteristic strings may be drawn (see **Catchment Tc path strings**). The length of this string is used for the length parameter and the design tin is used with the string to calculate the slope using the equal area method.
3. Data for the remaining methods is entered in a similar fashion.

Tc Path Strings

These strings are used to calculate the time of concentration for the impervious and pervious areas. They are drawn in two models; one for the impervious paths and one for pervious paths. The models are specified using the **Catchment file** field on the **network editor** (Global->Utility model tab). The 3 rows in the **catchment file** correspond to the 3 catchments available for each manhole. Therefore it is possible to have a maximum of 6 Tc paths models!

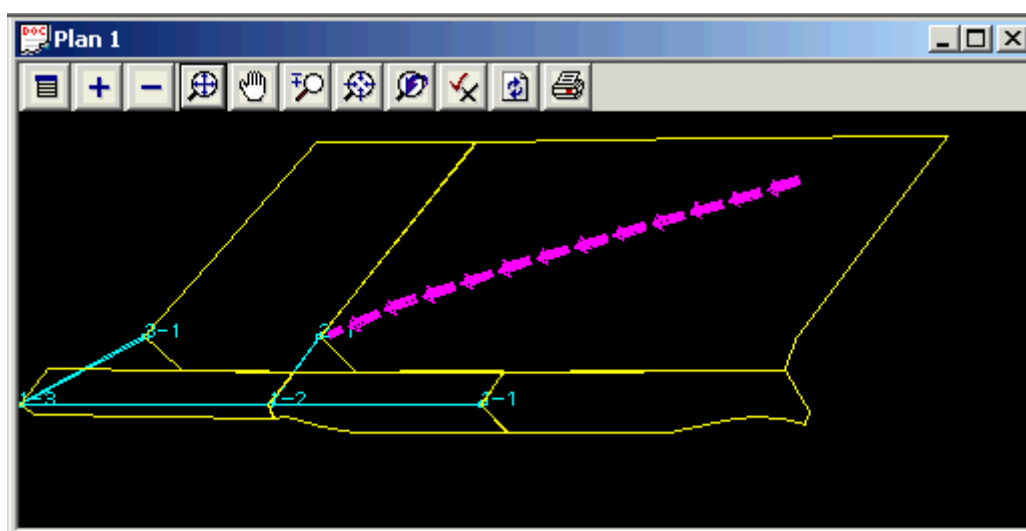
Key Points

1. Each Catchment set may have 2 Tc paths models. Pervious and impervious paths are kept in separate models.
2. End the Tc path string at the manhole that it is to be linked to.
3. Enter the paths models via **Catchment file** field on the **network editor** (Global->Utility model tab)
4. You must select a Tc method (explicit or implicit) via the **Defaults->Catchments tab** or the **Catchments Tabs**. Just specifying the models is NOT enough!

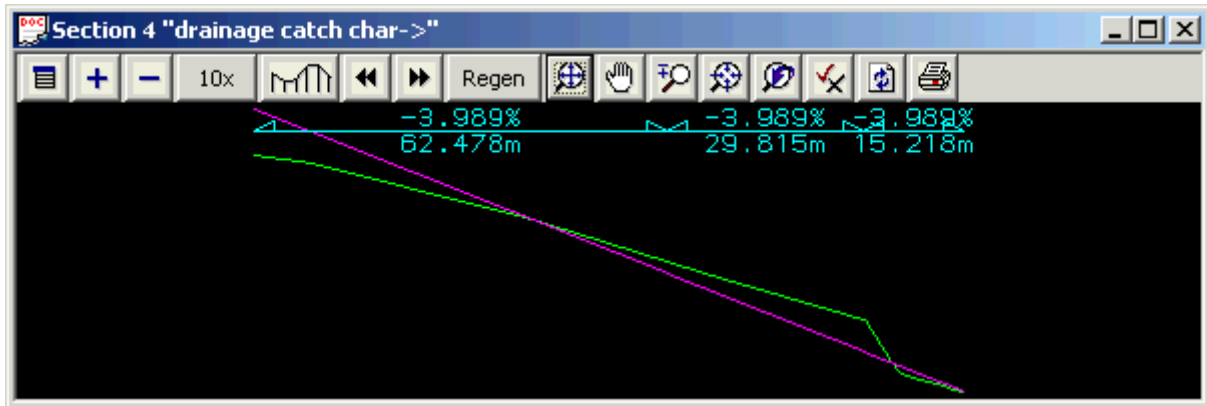


Catchment slope (equal area)

The length of this string is used for the length parameter and the design tin is used with the string to calculate the slope using the equal area method. These strings are drawn from upstream to downstream, finishing nearest to the manhole they are to be linked to. The line style for these strings must be the **flow line** style found under **Drainage 12d** in the linestyle drop down list.



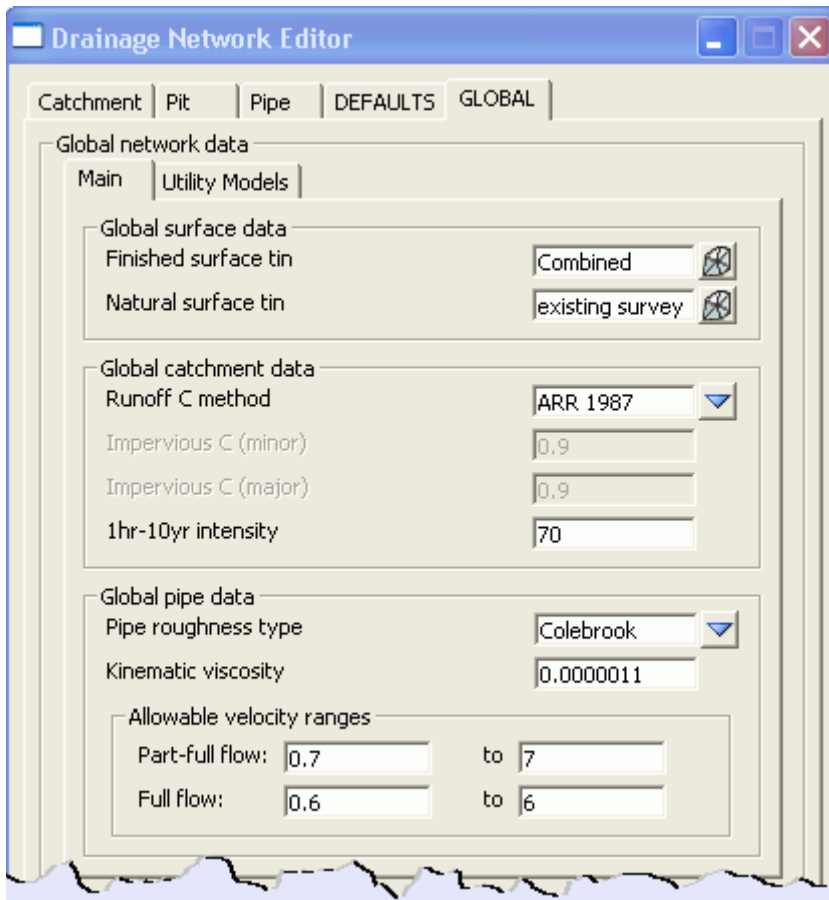
The equal area slope is calculated at export time. After the export the slope string, it may be profiled to see the slope (see below).



Network Editor - Hydraulics

This section will discuss the hydraulic **Global**, **Defaults** and **explicit settings** for the hydraulic parameters. The **explicit settings** for the parameters described on the **defaults** tab will also be found on the **Pit** or **Pipe** tabs.

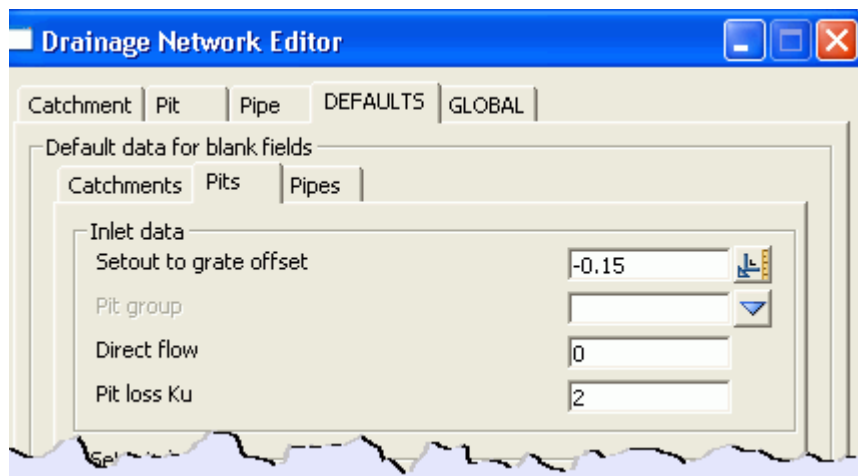
Pipe Friction Method



The **Global** friction loss method for the pipe roughness method is set here (**Colebrook** or **Manning**). The default **pipe friction values** are set on the **Defaults->Pipes** tab.

The ranges for pipe peak velocities are used for checking purposes only. If the velocities are outside this range, warning messages will be given in the output window.

Pit Losses Ku, and Direct Flow

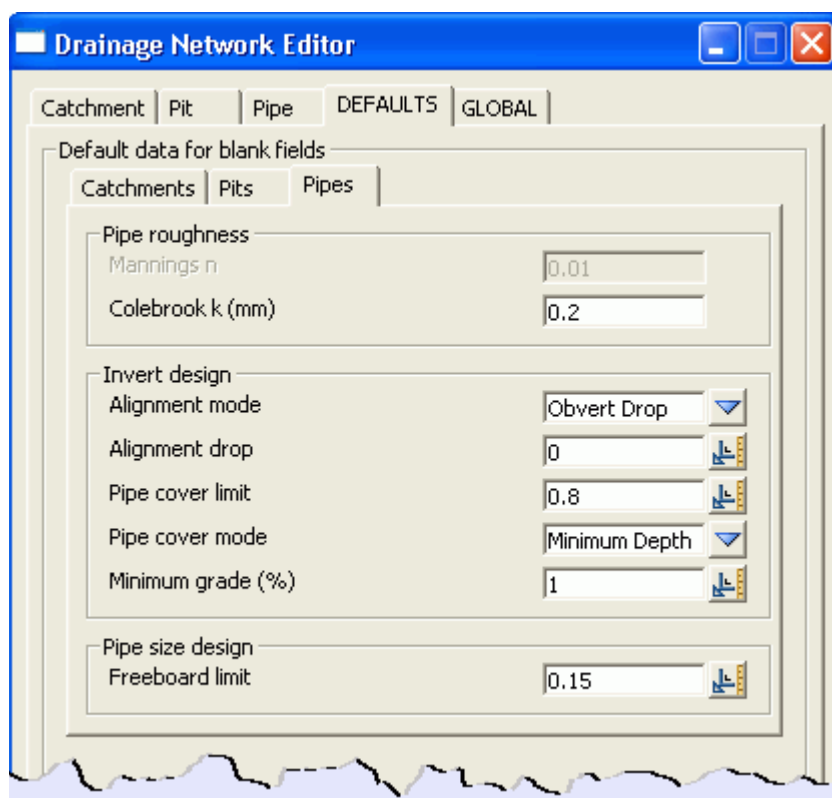


If the setout point was on top of the kerb, enter the **Setout to grate offset** so that the overflow level of the manhole can be determined.

The **Direct flow** (cms/cfs) is water flowing into the manhole. It is not added to the approach flow and therefore is not affected by manhole inlet capacity.

The **Pit loss Ku** is used to model the energy losses through the manholes.

Pipe Friction Values and Freeboard Limit

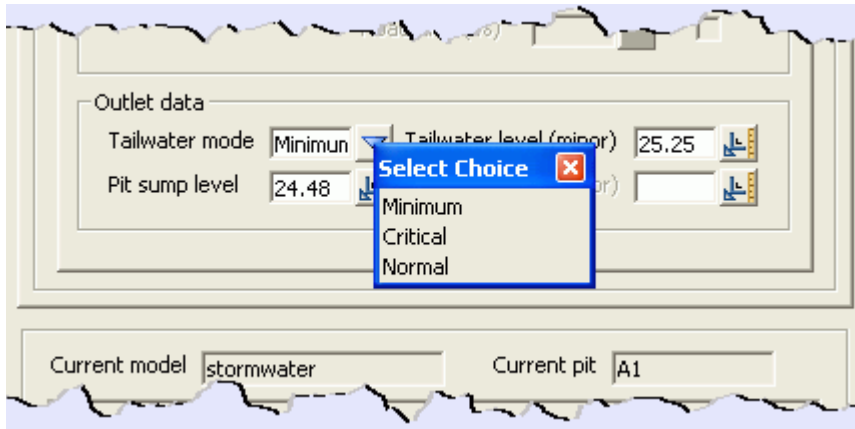


The global **pipe friction method** on the **Global** tab determines which fields are active, **Colebrook k** or **Mannings**. The default value for the selected method is entered here.

The **Freeboard limit** is the limit for the upstream manhole (after the ku has been applied). The freeboard is measured from the grate level (**setout level minus setout to grate offset**).

Outlet and Tailwater Conditions

The most downstream manhole on each network requires tailwater conditions. Often the invert level on the downstream end of the last pipe also needs to have the level locked to either discharge into a waterway or join into an existing drainage system. When the most downstream manhole is selected the following fields will become active on the **Network Editor - Pit - Main** tab. If these field are not active and you think you are at the outlet see **Flow in the Wrong Direction**.

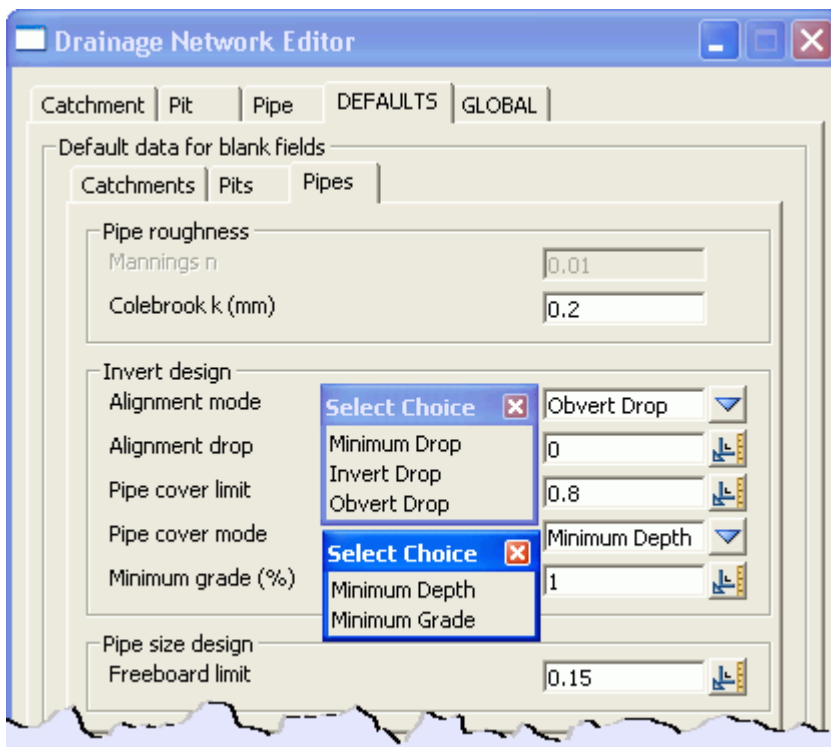


Minimum will use the least of the **Critical** or **Normal** depths. If a fixed level is available for the minor and/or major storms, these value may be entered here. The **Pit sump level** is used to enter the sump level of the network that is being connected to (Optional).

Pipe Design Parameters - Sizes, Invert alignment, Min Cover, Max Height

The invert levels during design are controlled by the **pipe sizes**, **max pipe height**, **min pipe cover** and **invert alignment** mode.

Invert Alignment Modes



12d has 3 design modes for setting the pipe inverts upstream and downstream of the manholes. These work together with the 2 pipe cover modes as follows.

The tin specified in the **Global-Main Finished Surface Tin** field is used for these calculations. The description below assumes that none of the inverts have been manually locked.

NOTE! Invert design parameters are set on the **Pipe-Design** tab not the **Pit** tab. The **Alignment mode** refers to the **DOWNSTREAM INVERT ONLY**.

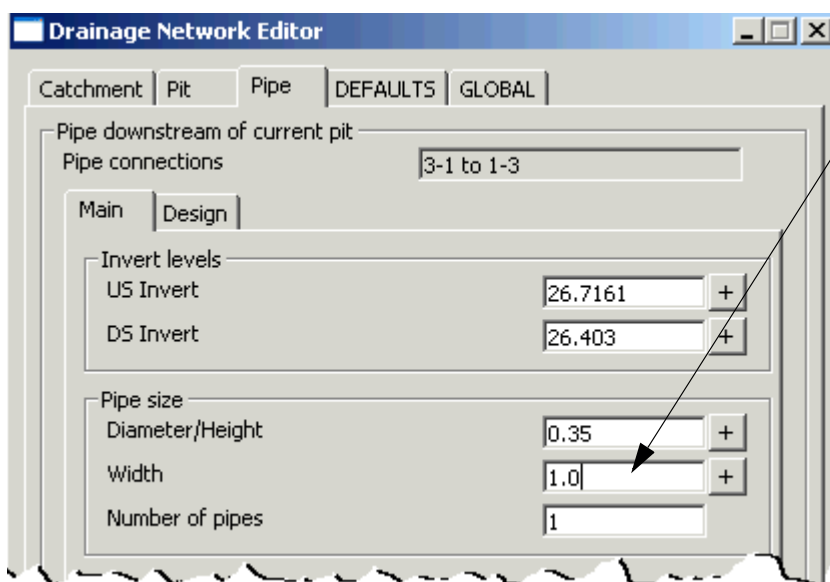
1. The initial pipe grade is set as the **Minimum grade (Minimum Grade mode)** or the grade between the ground levels at the manholes (**Minimum Depth mode**). Even in the **Minimum depth** mode the minimum grade constraint is checked.
2. 12d shifts the pipe down so that there is at least the **Pipe cover limit** along the pipe. The **Pipe cover limit** should include an amount for the pipe thickness.

3. Inverts are moved down if required according to the setting in **Alignment mode**.
 Obverts are aligned using **Obvert Drop** with a zero **Alignment drop** and similarly the inverts are aligned with the **Invert drop** mode. **Minimum drop** ensure that the inverts drop a minimum of the specified drop but the drop may well be more than the **Alignment drop** specified. As the inverts are moved down the minimum pipe grade is maintained.

NOTE! If **Obvert Drop** is selected and the downstream pipe is a smaller pipe then the inverts will be aligned!

Pipe sizes, Max pipe height and Multiple Pipes and Box Culverts

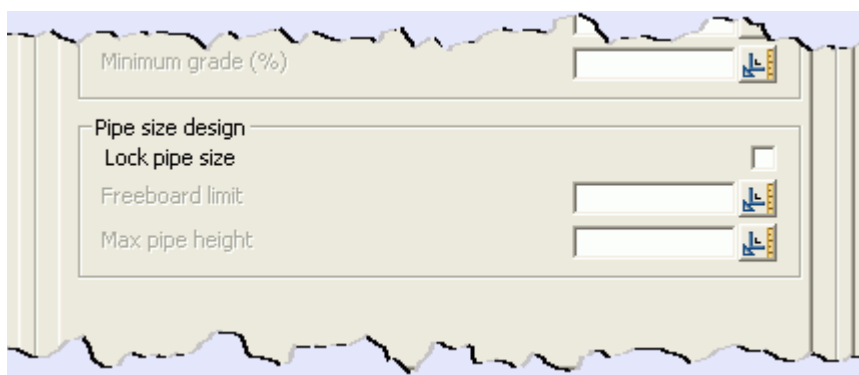
The 12d design engine will select pipe sizes from the file specified on the **Drainage Network Design** panel, **Preferred pipes file** field list. See **selecting pipe sizes**. However, the maximum pipe height allowed before multiple pipes are used and the selection of box culverts is set on the **pipe->main** and **pipe >design** tabs respectively.



To specify a box culvert in your network, select the pipe segment and enter a width for the pipe.

For box culverts, the design engine increases the widths and maintains the height through the available sizes. Once the maximum height has been reached, the next culvert height and minimum width is checked.

On the **Pipe->Design** tab the **max pipe height** can be set for each pipe segment (there is no default for this value). If the 12d design engine requires a larger pipe, then multiple pipes will be selected.



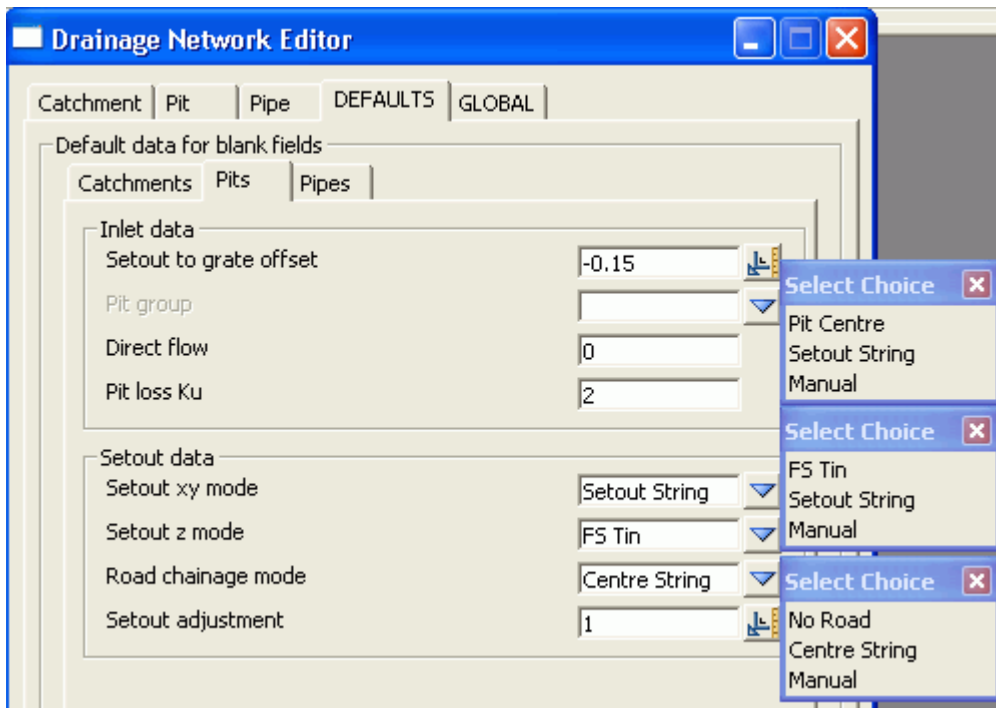
Road Design File for Pit Setout - x,y, level, road chainage and setout offset

The road design file is used to automatically link the manhole to a road setout string and a road centre line

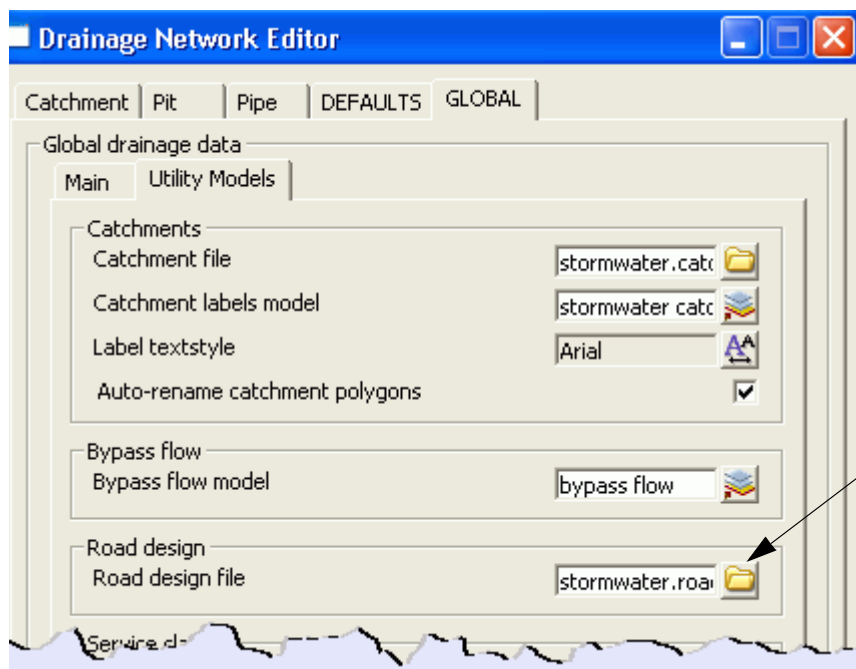
string. Explicit picking of these strings may be found on Pits->Setout->String selection. These strings may be used calculate road grades and crossfalls (bypass model required) and/or construction setout data.

The construction setout point defines the location on the manhole to be printed in the **manhole schedules**, plotted on the **plan annotations** or listed on the **drainage long sections**. The setout point and level can be set to the centre of the manhole or it can be linked to a road design string. The setout level plus the **Setout to grate offset** determines the grate level for surcharging calculations.

The centre of the manhole or setout point can also be dropped perpendicular onto the road centre line to obtain the road chainage and offset distance.

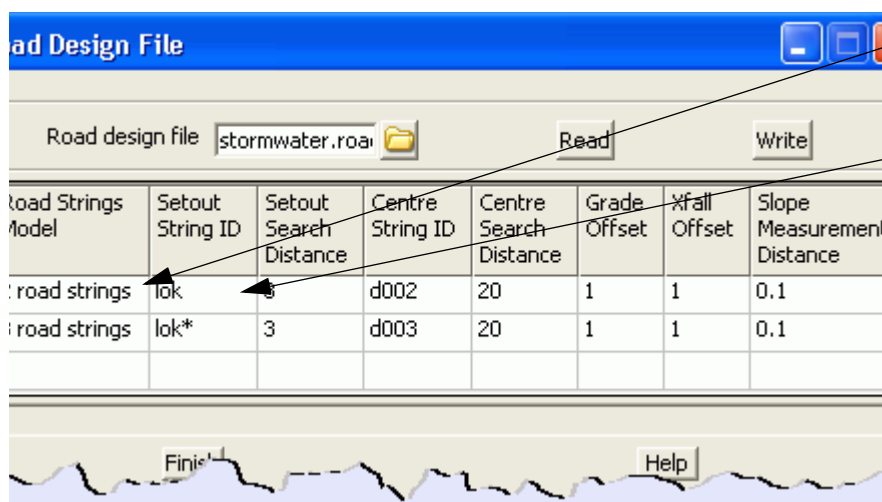


Pit centre is the centre point of the manhole (the intersection of the joining pipes). Often the setout point for a manhole or catch basin is not the centre of the manhole but rather a point on the kerb or back on the foot path. The **setout string** option will drop the centre point of the manhole onto the closest string in the **Road design** model list specified on the **Global->Utility models** tab. The manhole cover level will be set to **level on this string**.



Type a file name, select the folder icon and then select **Edit** from the drop down. **NOT Edit file.**

The following editor will appear.



RB select this box and choose the models containing the setout strings. In the **Setout string ID** box enter the string name prefix (wild card * allowed) to limit the selection for setout string. If no **ID** is entered then this model will NOT be searched!

The **Centre string ID** is used in the same way to find the centre line string. If needed, this string is used for road chainage and to determine which direction to measure the crossfall (between the setout string and the centre string).

The distances and searches are optional. The **setout** and **centre search distances** are the maximum distance that the routine will look when trying to locate the setout and centre line strings respectively.

The **grade offset** is the distance upstream from the setout point that the road grade measurement will start and the **Xfall offset** is the distance from the setout point to the start of the crossfall measurement. The measurements will be taken over a distance of **slope measurement distance** with the actual levels taken from the finished surface tin specified on the Global-Main tab.

Repeat this for each road string model used in the design. **Remember to select Write when finished!**

Select the **Set Pit Details** button on the bottom of the panel the calculate these values.

Explicit settings for the setout strings and the auto calculated values are found on the **Pit-Setout** tab. If the **manual** mode is selected the Easting and Northing locations may be picked in plan view or typed into the input boxes.

The setout level defines the level on the manhole to be printed in the manhole setout tables and in the drainage longsection plots. The **FS Tin** selection obtains the level from the FS tin, specified on the **Global-Main** tab, at the centre point of the manhole. The **Setout String** location obtains the z level from the setout string as described in the section above. **Explicit settings** and the auto calculated value are found on the **Pit-Setout** tab.

If **Road chainage mode** is set to **Centre string**, then the **Centre String ID** in the **Road design file** (shown above) is used to select the road string to measure the chainage and offset from. The values and **explicit settings** for the road chainage and offset are found on the **Pit->Setout** tab.

Setout to Grate Offset

The grate level is used by 12d when determining the freeboard and when calculating depth of flooding at SAG pits. The grate level is often exported to other design packages. The grate level is calculated as

$$\text{Grate Level} = \text{Setout z} + \text{Setout to grate offset}$$

The setout to grate offset is generally zero or negative and implicitly set on **Network Editor->Defaults->Pits->Setout to grate offset** or explicitly on **Pits->Main->Setout to grate offset**.

Calculate Bypass flow routes

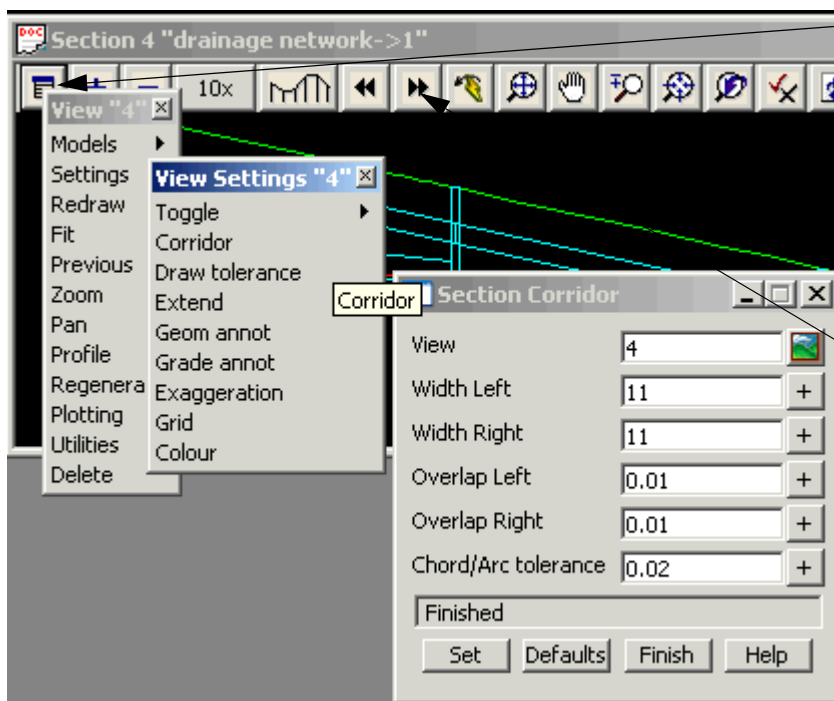
This option is required for manhole inlet capacity calculations and is covered in the advanced drainage training.

As an introduction, the overland flow parameter routine determines the road grade, crossfall, manhole inlet capacity and downstream bypass manhole for each manhole. To achieve accurate measurements for the road grade and crossfall, the manhole is linked to a setout string (see below).

Service and Utility Clashes

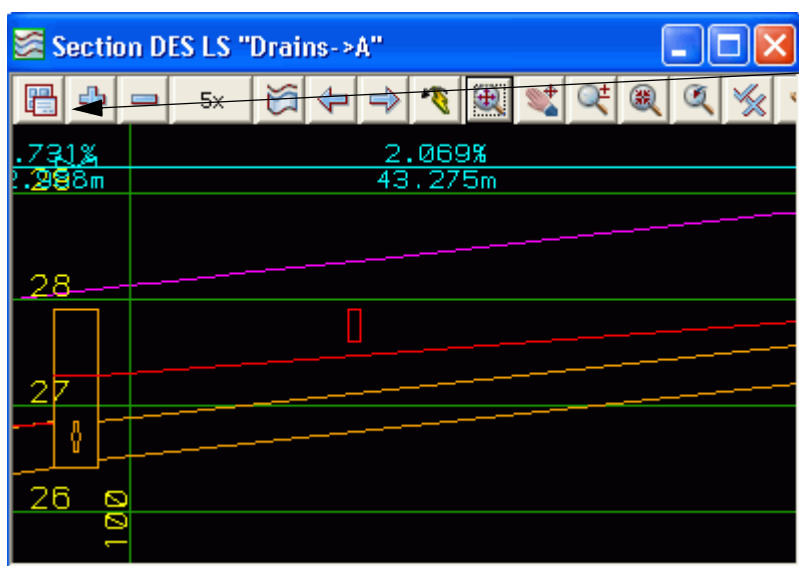
WARNING!

12d service clash routines notify the user of crossing services but not parallel services that are close to each other. To view parallel services, add the services model onto a section view, profile a drainage string and then set the corridor value for the section view.



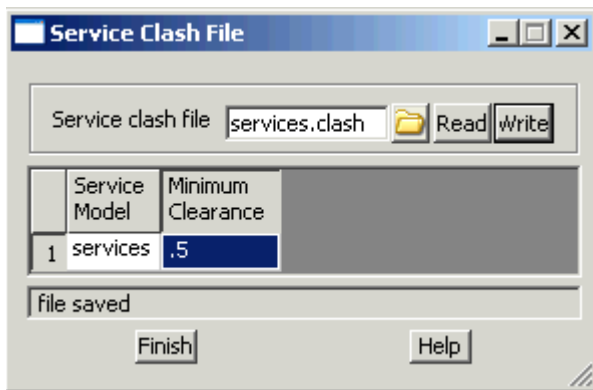
Settings->Corridor and then set the **Width left** and **Width Right** to the desired clearance. If the service can be seen then it is within the tolerance. 11 is used in this example only so that you can see the service on the other side of the road.

Use the **Next** and **Prev** button to switch drainage strings.



To obtain a report of all strings inside or crossing the drainage string profiled, select the **View** menu button then **Utilities->Report**

The service clash model list is entered on the **Global-Utilities Model** field.



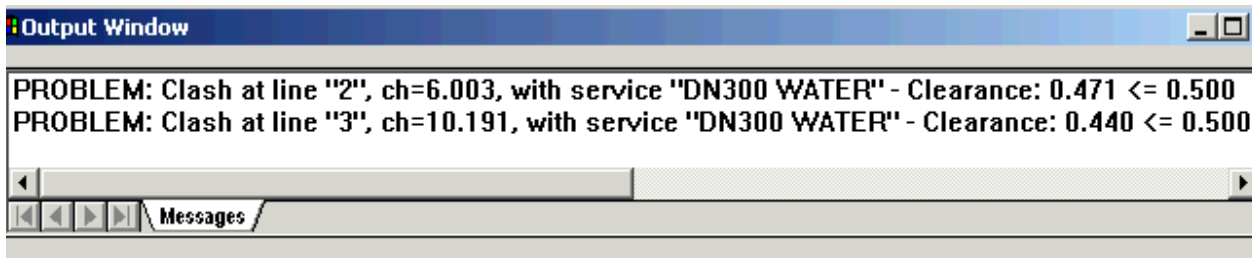
To create a list enter a list name, select the folder icon and then select edit.

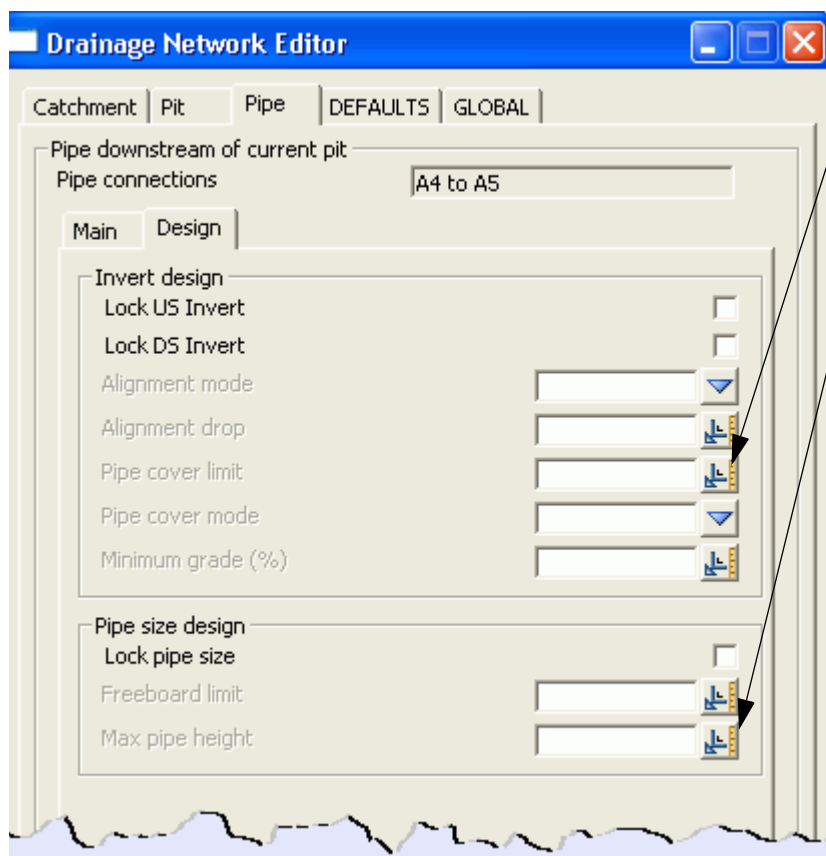
In the **Service model** column **RB** to select the model. Enter **Minimum Clearance** for the services in this model. If different clearances are required for different services then place the services in different model. Warnings will be issued at design time. Cover levels or fixed inverts can be used to avoid the services.

Service clashes are listed in the output when the **Set pipe inverts** is selected on the **Drainage Network Editor**. If the output window is not visible then from the main menu select

Window->Output Window

and make sure it is selected.





The most common method to avoid the clash is to increase the **Pipe cover limit** for this pipe segment so that the pipe is pushed down. If the clash problem is above the pipe then the **Max pipe height** may be used and multiple pipes are selected.

This method is preferred over locking the inverts as this leaves more flexibility for aligning the inverts.

Once the invert levels have been reset the output window will indicate the final clearance.



After a pipe design run details of the service clash data will again be listed in the output window.

Drainage Design in 12d Drainage Design

12d has a sophisticated rational method hydrology and hydraulic grade line pipe design engine. In addition it has the capability to export this data to several other popular drainage packages. Regardless of the design method selected the drainage network in 12d is updated from the design so that drainage plans, long sections and manhole schedules can be quickly produced.

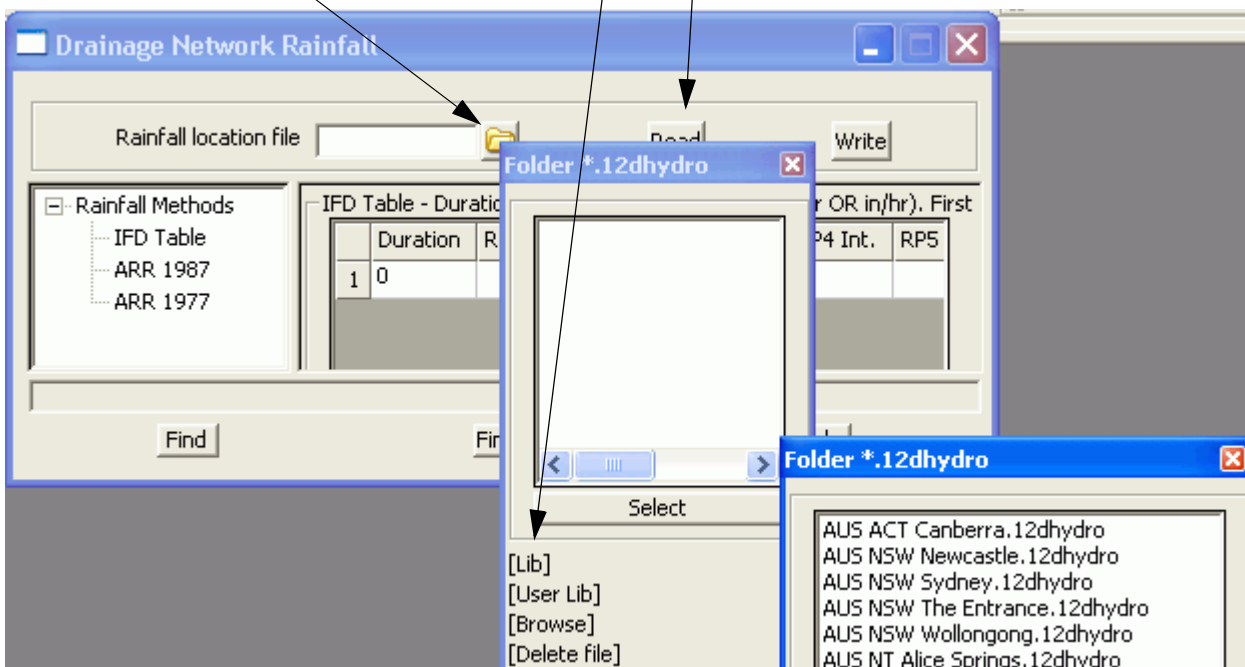
12d Rational Method Hydrology - Drainage Rainfall Editor

The **Drainage Rainfall Editor** is used to input rainfall IFD data using several methods. The data is stored in Meteorology files (each file is for a specific location) that can be shared between 12d projects. The data is edited using an editor similar to those used for the plot parameter files (ppf). Seven methods for entering/calculating the rainfall intensities are shown in the panel below. From the main menu select,

Design->Drainage-Sewer->Rainfall Editor

Data is entered using one (or more if desired) input methods and then saved by entering a **Meteorology file** name and selecting **Write**. The standard 12d system file search paths are used (project folder, user library folder and then library folder).

Select the folder icon and then walk right on the **Lib** item to display a list of sample files. Select a file the select **Read**. **YOU MUST SELECT THE READ BUTTON!**



IFD Tables

IFD tables are often available from meteorological services. The table input format follows. The first row is used to define up to 9 return periods and the following rows list the rainfall intensities for the duration entered in the first column.

Hint: to increase the size of the grid control select another method, ARR 1987 for example, and then select IFD table again.

Drainage Network Rainfall

Rainfall location file:

[-] Rainfall Methods

- IFD Table
- ARR 1987
- ARR 1977

IFD Table - Durations (minutes) & Intensities (mm/hr OR in/hr). First row defines Return Pe

	Duration	RP1 Int.	RP2 Int.	RP3 Int.	RP4 Int.	RP5 Int.	RP6 Int.	RP7 Int.
1	0	1	2	5	10	20	50	100
2	5	55	72.65	98.28	115.06	137.16	168.12	193.23
3	6	51.49	67.95	91.71	107.23	127.7	156.33	179.53
4	7	48.56	64.03	86.25	100.74	119.85	146.57	168.19
5	8	46.06	60.69	81.61	95.22	113.19	138.29	158.58
6	9	43.89	57.8	77.59	90.45	107.43	131.13	150.29
7	10	41.98	55.25	74.06	86.26	102.39	124.87	143.03
8	11	40.29	52.99	70.92	82.55	97.91	119.32	136.61
9	12	38.76	50.96	68.12	79.22	93.91	114.37	130.87

Australian Rainfall and Runoff 1987 Method

The rainfall intensities and other factors from Volume 2 of ARR 1987 are entered in this table.

Drainage Network Rainfall

Rainfall location file:

[-] Rainfall Methods

- IFD Table
- ARR 1987
- ARR 1977

ARR 1987

Intensities (mm/hr)

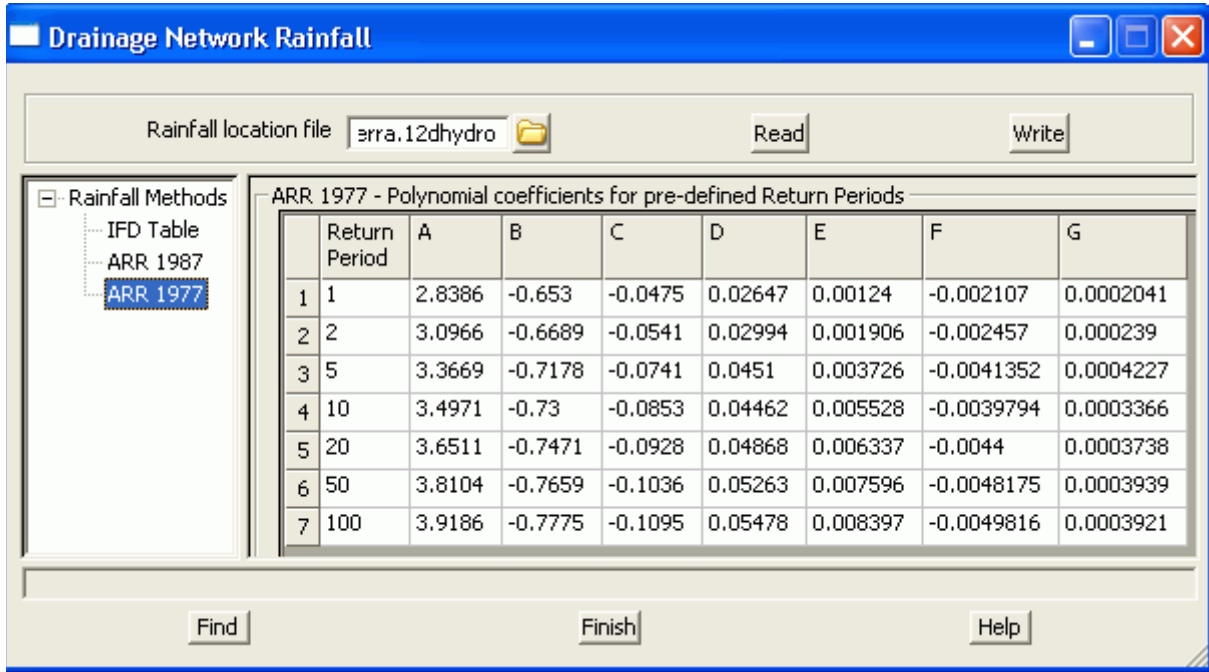
2yr - 1hr [Map 1]	<input type="text" value="22"/>	<input type="button" value="↑"/>	<input type="button" value="↓"/>
2yr - 12hr [Map 2]	<input type="text" value="4.3"/>	<input type="button" value="↑"/>	<input type="button" value="↓"/>
2yr - 72hr [Map 3]	<input type="text" value="1.14"/>	<input type="button" value="↑"/>	<input type="button" value="↓"/>
50yr - 1hr [Map 4]	<input type="text" value="43"/>	<input type="button" value="↑"/>	<input type="button" value="↓"/>
50yr - 12hr [Map 5]	<input type="text" value="8"/>	<input type="button" value="↑"/>	<input type="button" value="↓"/>
50yr - 72hr [Map 6]	<input type="text" value="2.25"/>	<input type="button" value="↑"/>	<input type="button" value="↓"/>

Other factors

Skewness G [Map 7]	<input type="text" value="0.24"/>	<input type="button" value="↑"/>	<input type="button" value="↓"/>
Geographical factor F2 [Map 8]	<input type="text" value="4.28"/>	<input type="button" value="↑"/>	<input type="button" value="↓"/>
Geographical factor F50 [Map 9]	<input type="text" value="15.5"/>	<input type="button" value="↑"/>	<input type="button" value="↓"/>
Lat of location (deg S)	<input type="text" value="35°18'"/>	<input type="button" value="↑"/>	<input type="button" value="↓"/>
Long of location (deg E)	<input type="text" value="149°06'"/>	<input type="button" value="↑"/>	<input type="button" value="↓"/>

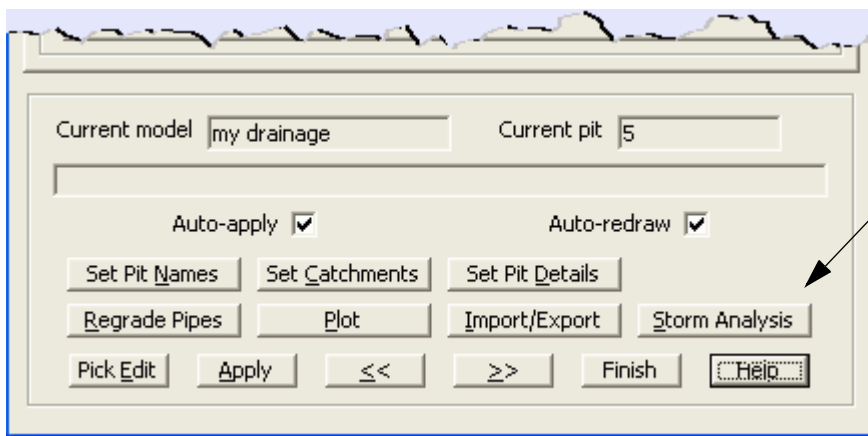
Australian Rainfall and Runoff 1977 Method

The seven coefficients for each return period from ARR 1977 are entered in this table.

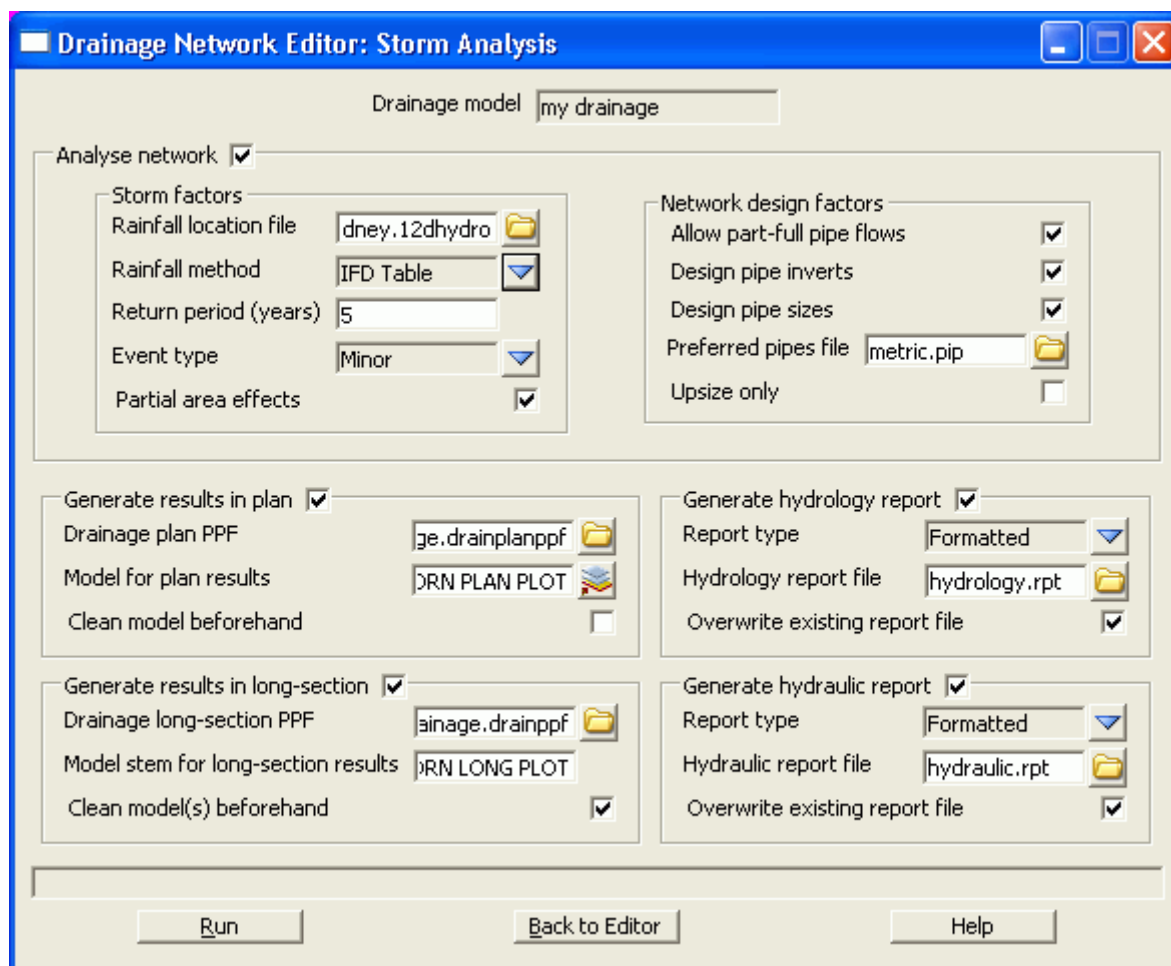


Drainage Network Design

The **Storm Analysis** button on the **Network Editor** executes the 12d drainage design, plots the drainage long section and plan annotation and prepares the hydrology and hydraulic design tables.



From the **Drainage Network Editor** select **Storm Analysis**. The following design panel will appear.



In general the **Analyse network** is always selected. If you only want to plot or create the reports then remove the tick.

Storm Factors

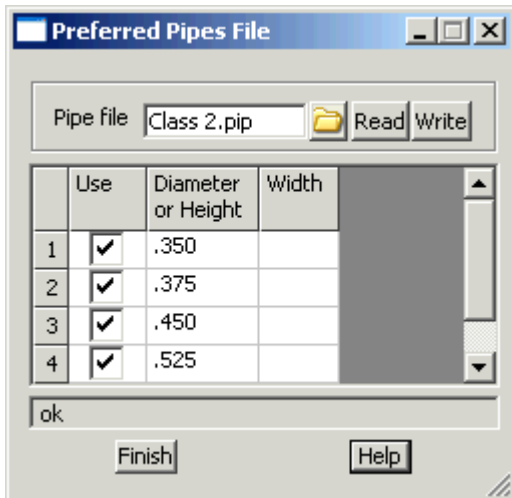
Select the folder icon on the **Rainfall location file** and then walk right on the **Lib** line to select one of the rainfall files in the 12d library. If the file has only one type of rainfall definition then the **Rainfall method** field will be completed. Otherwise select the **Rainfall method** desired. The valid **Return period** will depend of the method selected but you cannot extrapolate beyond your data.

Event type determines which set of design values (**minor or major**) will be used for this run. Enable the 12d rational method engine partial area calculations by selecting the **Partial area effects** box.

Network Design Factors

Selecting Pipe Sizes

These values control the values to be designed in the run. If **Design pipe sizes** is selected then a files containing the available pipe sizes must be supplied. The pipe sizes in this file are in the **Units** specified in the drainage network editor. To create a new file, enter the file name and then select the folder icon followed by the **Edit** line. The following panel will appear.



The diameters/heights are required and the width is optional to specify a box culvert.

YOU MUST SELECT THE WRITE BUTTON!

The **Upsize only** selection will stop pipes in the system from being reduced in the design. Regardless of this selection, the 12d design engine will not allow a smaller pipe to be selected in the downstream direction.

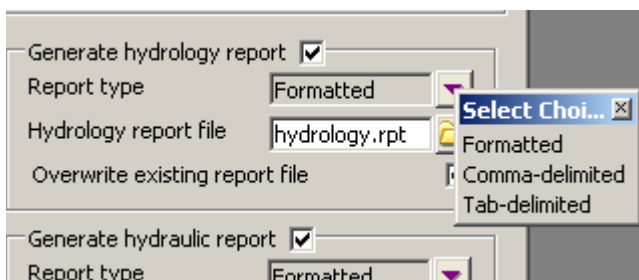
Generate Results in Plan

This selection automatically runs the drainage plot annotation function. A **Drainage plan ppf** must be entered and samples are supplied in the 12d library. A **Model for plan results** is required if this option is selected. The **Clean model before hand** tick box forces the model to be cleaned before the labels are created. When not selected a “Smart clean” is performed.

Generate Results in Long Section

This selection automatically runs the drainage long section plotter. A **Drainage long section ppf** is required and examples are found in the 12d library. A **Model stem for long section results** is required if this option is selected. In almost all cases the **Clean model before hand** tick box should be selected.

Generate hydrology report



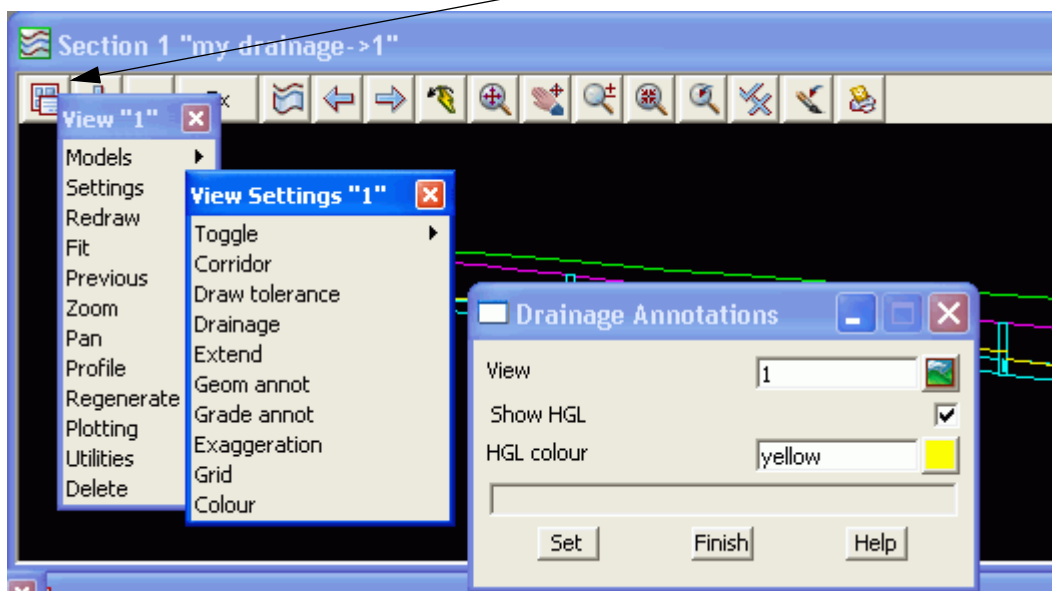
The **hydrology report** may be formatted for inserting into a 12d model/text editor (formatted) or spreadsheet (comma or tab delimited). In almost all cases **Overwrite existing report file** will be selected.

The Run Button and HGL data on the Section View

When the **Run** button is selected the discharges are calculated, the HGL check is performed and the pipes sizes and inverts are designed (if selected). The plan and long section drawings will also be updated with

the new data (if selected).

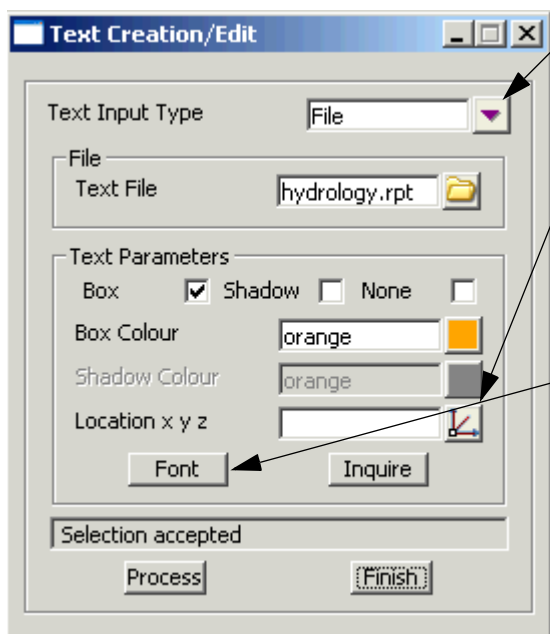
The HGL values will also be available on the 12d section views when profiling the drainage strings. The colour of the HGL line may be changed via the view's menu button then **Settings->Drainage**.



Importing Text into a 12d model

Formatted text may be inserted into a 12d model by selecting

Drafting->Text and Tables->Create edit paragraph text



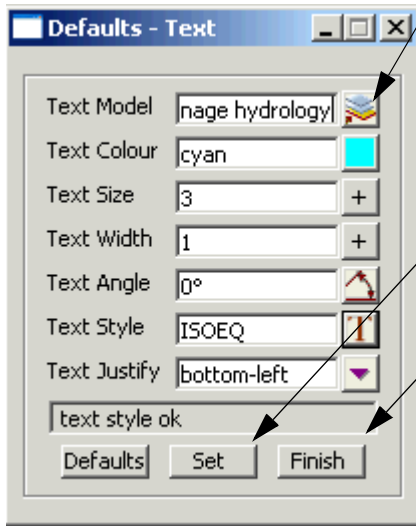
Change to **File**.

Select the folder icon and then pick the formatted text file. It will be displayed then select **Set**.

Next select the location in plan for the text.

The font selected must be a fixed space font or the data will not align properly.

Select the **Font** to display the following panel.



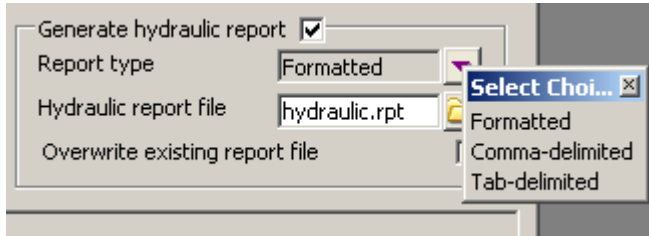
Enter a **Text Model** for the report.

The **Text Style** must be a fixed space font.

Select **Set** then **Finish**.

Now add the **Text Model** onto the

Generate hydraulic report



The **hydraulic report** may be formatted for inserting into a 12d model/text editor (formatted) or spreadsheet (comma or tab delimited). In almost all cases **Overwrite existing report file** will be selected.

If you want both the hydrology and hydraulic report in the same file, enter the same file name in both file fields but turn of the **Overwrite existing report file** for the hydraulic report.

Design Results

Results from the design runs are shown in several forms:

1. Hydrology and hydraulic reports
2. **Drainage plan annotations**
3. **Drainage longsections**
4. Hydraulic Grade line on the Section view
5. Output window data - Service/utility clashes

Samples of the hydrology and hydraulics report are shown below.

Drainage Data Input and Output to Spreadsheets

Spreadsheets are an effective method to manage the numerous variables urban drainage designers create in the modelling process. Spreadsheet data can be transferred to and from 12d in tab delimited files and stored within 12d as “user definable attributes”. These attributes are linked to the pit and pipes within a network. Drainage long section plots can display the pipe attributes in the “arrows” data area and pit attributes in the bubbles area. Drainage plan drawing can also show these pit and pipe attributes.

Drainage strings will be created if they do not exist in the model but manholes cannot be added to existing strings.

See also

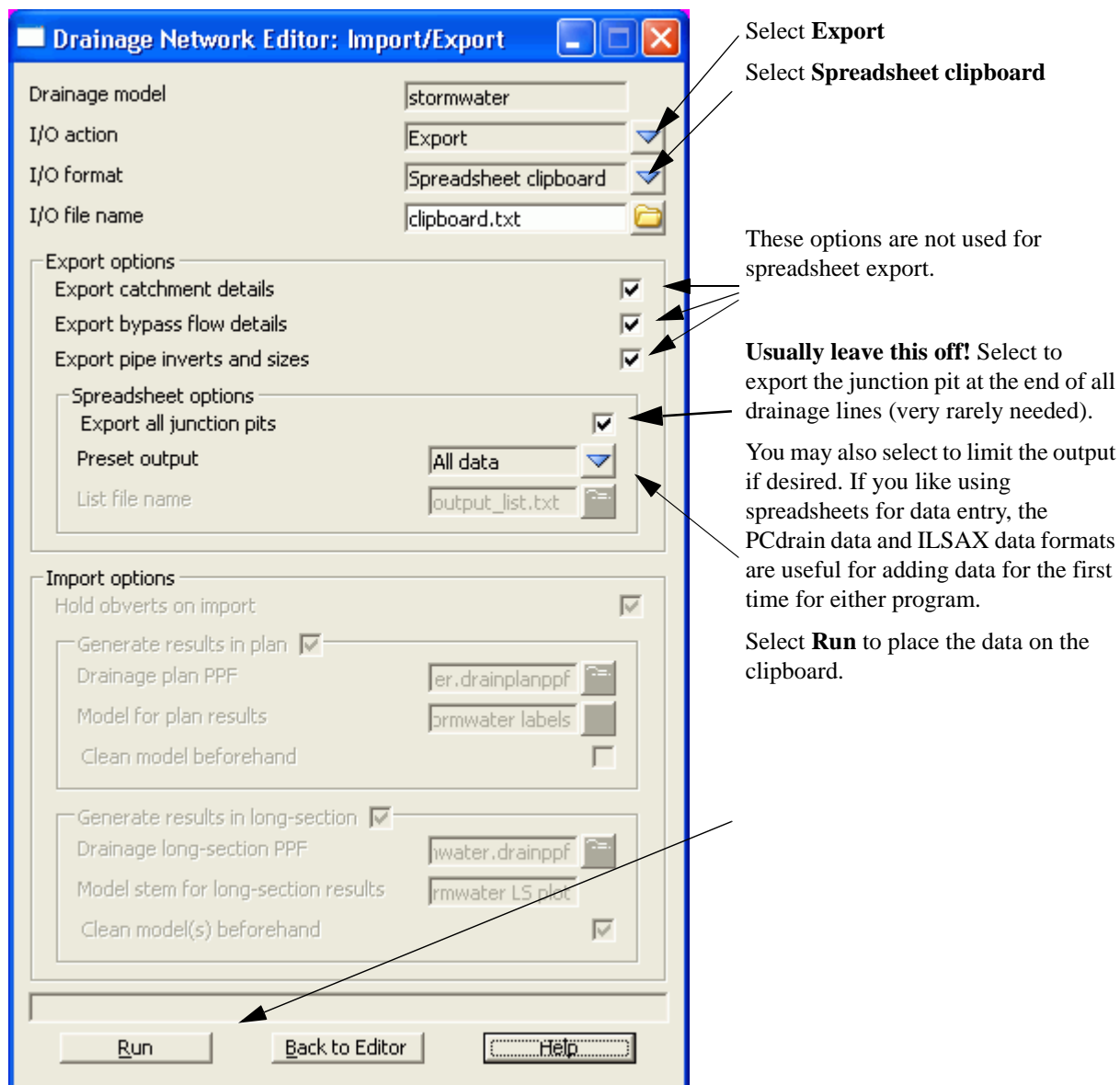
12d to spreadsheet transfers

Spreadsheet to 12d update and create

Spreadsheet options

12d to spreadsheet transfers

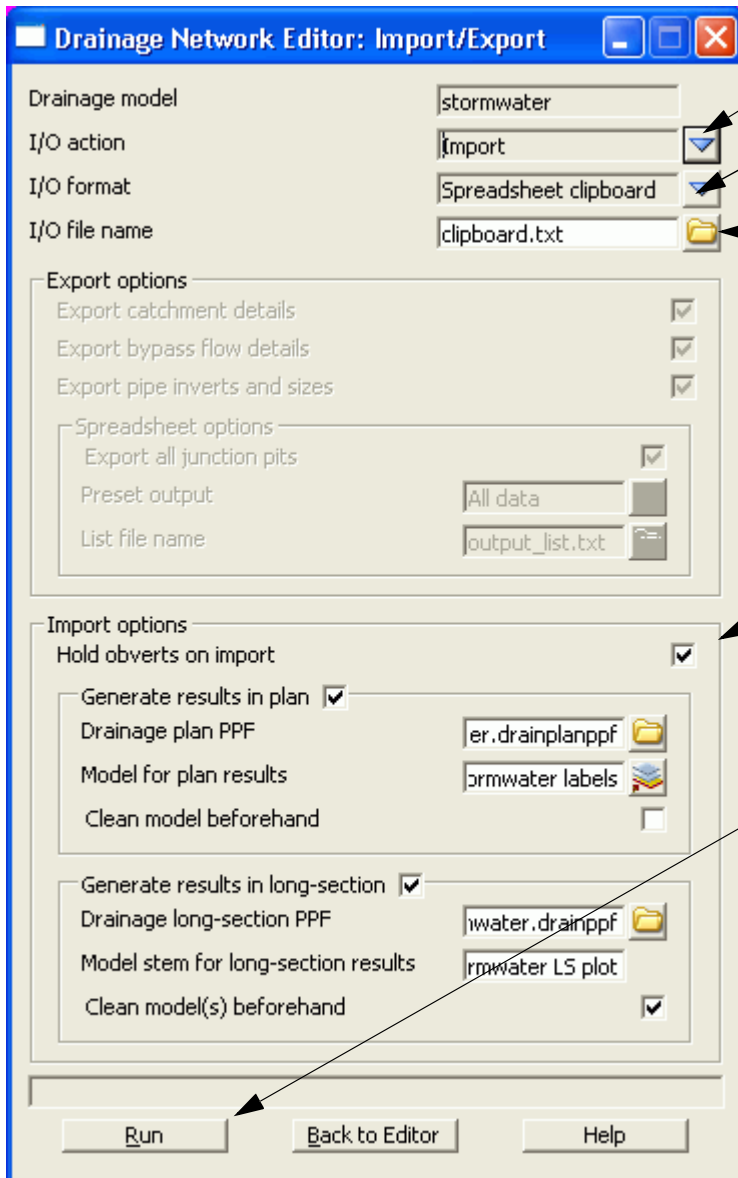
This interface is accessed the **Import/Export** button on the Drainage **Network Editor**.



Spreadsheet to 12d transfers

This item is accessed from the **Import/Export** button on the **Drainage Network Editor**.

The following panel will appear.



Select **Import**

Select the **Spreadsheet clipboard** format.

The file field is ignored.

This is ignored on spreadsheet imports.

Select **Run** to update the drainage model.

Tab delimited, “12d drainage spreadsheet” format or “from to” format data must be on the clipboard in order to update a 12d drainage model or create a new model. These format are described below.

Updating an Existing Model

The data usually is generated by 12d using the **Export** option, pasted into a spreadsheet and then copied back to the clipboard so that 12d can be updated.

When 12d exports the drainage model to a spreadsheet it includes a column for the unique string identifier and a unique manhole identifier (unique to the drainage model not the 12d project). The names of the strings and manholes may be changed via the spreadsheet if these columns are present at import time.

If the manhole id column is not present, 12d will search the drainage model for a matching manhole name. When the manhole is a junction between drainage lines, only the trunk line will be the data updated.

Creating a New Model

It is possible to create a new string or an entire drainage network using this format. However, manholes cannot be added to an existing string. The entire drainage string must be created at once. Two formats are available, the “from-to manhole” format and the “12d drainage spreadsheet” format.

At present the network editor must select a drainage string to become active. Therefore, if you are not

adding strings to a network, you will have to create a drainage network with one “dummy” manhole. Select this one “dummy” manhole to activate the editor. After importing the data and the new drainage lines are created the “dummy” manhole may be deleted.

12d drainage spreadsheet Format

The top left cell in the clipboard data must be the text “12d” to specify this format. The minimum amount of data required to create a new string is the string name, manhole name, x and y coordinates. You can add as much additional data as you have available. This would include pipe diameters inverts etc. The manholes must be listed from upstream to downstream order. If the string is to join a trunk line, the junction manhole must be included for both the tributary and the trunk line.

An example file exists called **new_network.txt** is supplied in the library. Open this file in a spreadsheet or a text editor and copy it to the clipboard. Set the **I/O Action** to **Import** and select **Run**. The new drainage lines will exist in the model currently being edited.

From-to Manhole Format

The top left cell in the clipboard data must be the text “from to” to specify this format. The minimum amount of data required to create a new string is the upstream pit name (*pit name), the downstream pit name (*ds pit name) and the x(x location) and y(y location) coordinates of the upstream pit. If the string is to join a trunk line, the junction manhole must be included for both the tributary and the trunk line.

An optional column for the manhole cover elev (cover elev) may be specified. Once the network has been created additional pipe and manhole data may be added using the “12d drainage spreadsheet” format described above.

An example file exists called **new_from_to_network.txt** is supplied in the library. It is shown below. Open this file in a spreadsheet or a text editor and copy it to the clipboard. Enter a new model name in the **Drainage model** field and select paste. The new drainage model will now exist.

from to	pit	pit	pit	pit
*pit name	*ds pit name	x location	y location	cover elev
text	text	real	real	real
E/1	A/3	5309.458	7336.935993	29.2173
D/1	A/4	5277.189	7336.935989	28.5071
C/1	B/3	5251.238738	7423.99485	31.5257
A/1	A/2	5354.629222	7336.935998	30.2115
A/2	A/3	5340.019987	7322.035996	29.89
A/3	A/4	5293.458002	7322.035991	28.8652
A/4	A/5	5250.182625	7322.035986	27.9127
A/5	A/6	5217.194202	7322.035983	27.1867
A/6	A/7	5183.458002	7322.035979	26.4442
A/7		5152.698693	7322.035975	25.7672
B/1	B/2	5289.42875	7422.289079	32.7197
B/2	B/3	5264.638564	7393.947083	30.7948
B/3	B/4	5249.738564	7384.207593	30.4187
B/4	B/5	5249.738564	7351.201545	29.1444
B/5	A/5	5233.426685	7336.935984	27.544

“12d drainage spreadsheet” Format

Each column of data is used for a 12d drainage variable or a user defined attribute. Each row represents a manhole and the downstream pipe (controlled by the direction of flow variable) within the drainage network. A sample is shown below.

12d	pit	pit	pit	pit	pit	pit
*string Name	*pit name	pit type	pit low ch invert	pit high ch invert	pit id	string id
text	text	text	real	real	integer	integer
E	E/1	SA2	28.108	28.108	1	67389
E	A/3	SA2	27.7559	27.7559	2	67389
D	D/1	SA2	27.3961	27.3961	3	68100
D	A/4	SA2	26.8018	26.8018	4	68100
C	C/1	SA2	30.67	30.67	5	72072
C	B/3	SA2	29.563	29.563	6	72072
A	A/1	SA2	29.1026	29.1026	7	82469
A	A/2	SA2	28.7811	28.7311	8	82469
A	A/3	SA2	27.7652	27.7059	9	82469
A	A/4	SA2	26.8127	26.7518	10	82469
A	A/5	SA2	26.0867	26.0244	11	82469
A	A/6	SA2	25.3442	25.2942	12	82469
A	A/7	SA2	24.6672	24.6672	13	82469
B	B/1	SA2	31.2759	31.2759	14	192066
B	B/2	SA2	29.351	29.301	15	192066
B	B/3	SA2	29.123	29.073	16	192066
B	B/4	SA2	28.0444	27.8951	17	192066
B	B/5	SA2	26.3447	26.2947	18	192066
B	A/5	SA2	26.0744	26.0744	19	192066

Duplicate Definitions

Strings Variables such as “direction” are may be defined for numerous manholes on the same string. Searching in a top down direction through the file, the last definition found for the string will be set.

Invert levels may be set via pipe data or pit data or combined. It is recommended that the user only use one method and not combine them. Both are exported so delete the ones you are not going to use. The variables are processed from left to right, so if duplicate definitions of an invert level or found the right most data will be set.

The format definition

- 1.Row1, column 1 must contain either “12d”, or “from to”. Therefore, the first column must be a 12d drainage variable (cannot be a user defined attribute).
- 2.Row 1. The text <pit> at the top of the column indicates the column contains a user defined pit attribute and similarly <pipe> indicates a user defined pipe attribute.
- 3.Row 2. This row contains the names of the 12d drainage variable names and the pit/pipe attributes. All names are case sensitive so be careful where you use capital letters. A list of 12d drainage variables is found below.

Names beginning with an asterix (*) will not be processed (except pit/string names when unique identifiers are present in the data). 12d drainage variables names beginning with an asterix indicate that this data was calculated at export time and cannot be read back into 12d (for example, pipe length, pipe grade and deflection angle).

Prefixing an user defined attribute name with “DELETE ” (no quotes, note the space after the DELETE) will cause the attribute to be deleted from all pits/pipes within the model.

- 4.Row 3. The text in this row define the type of attribute to be stored within 12d. The only valid choices are;

integer
real
text

If you want to change an attribute type you must delete the attribute and create it again. If you simply change the attribute type in the third row then that attribute will not be updated.

5. Blank lines may be inserted as desired.
6. You are not required to fill in all of the cells in the spreadsheets. Blank cells are ignored (you must use a space to remove all data from text attributes (the space will not be stored).
7. Pipe names are included in the data so that they can be changed but they are **not** used to identify the pipe. Pipe data will always be assigned to the pipe following the pit in the direction of **ascending** chainage. If flow directions is ascending then the pipe data will be for the downstream pipe. If the flow direction is descending then the pipe data will apply to the upstream pipe.

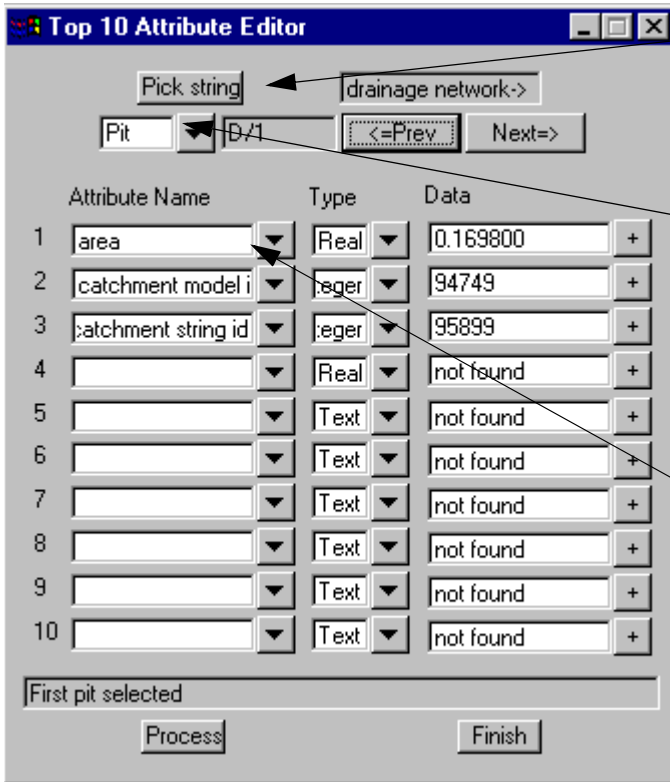
12d Drainage Variable Names

Manhole Variables	Pipe Variables	String Variables
*string Name	pipe name	direction
*pit name	pipe type	fs tin
pit type	low ch invert	ns tin
pit diameter	high ch invert	string id
pit low ch invert	diameter	
pit high ch invert	*length	
pit road chainage	*grade	
pit road name	low hgl	
*pit angle	high hgl	
*pit drop	pit hgl	
*pit depth	flow	
*pit chainage	velocity	
x location		
y location		
cover elev		
*fs elev		
*ns elev		
pit id		

Reviewing, Changing and Creating User Defined Attributes

The catchment data is stored within 12d as user defined attributes. These attributes are automatically created by 12d when required but you are free to change them or add more as desired. The attributes may be exported to a spreadsheet and edited and then imported back into 12d. To work with the user defined attributes within 12d select

Design=>Drainage-Sewer=>More=>Top 10 Attribute Editor.



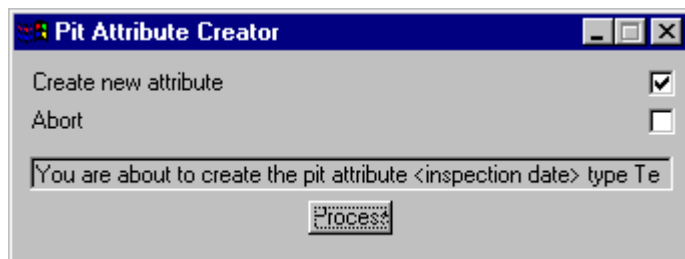
First Select **Pick** to select the string that contains the user attributes (the drainage string). The strings will be highlighted in white when they are selected.

All catchment data is store with the manholes in drainage strings. To access the manhole attributes, select the drop down icon and then select **manhole**. A circle will be drawn around the manhole selected. **Next** and **Prev** will now move you from manhole to manhole.

Select the drop down icon and then select the **Attribute Name** from the list of existing user defined attributes. These attributes include all of the attributes in the model that the string exists in.

They may not be defined for the manhole you are editing. **Not found** will be displayed in the **Data** field if the manhole does not have that attribute defined.

To change the value for the attribute enter the new value in the **data** field. If the attribute does not exist, deleting the **not found** text and adding data will create it. The message on the right will be displayed whenever you are creating a new attribute.

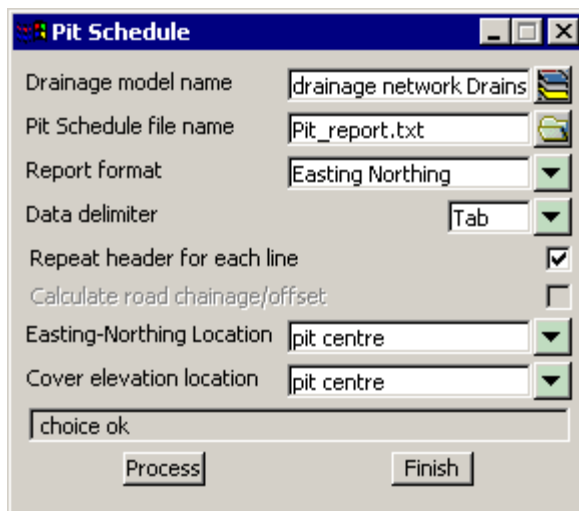


Manhole/Pit Schedules

Manhole/pit schedules or construction tables are generated in tab or space delimited formats.

This panel is accessed from the menu selection

Design => Drainage => More Drainage => Pit schedule



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Drainage model name <i>model containing the drainage strings</i>	input box	drainage network	
Pit schedule file name <i>file to be created</i>	input box	pit report	
Report Format <i>file format</i>	choice box	Road change...,Easting...	
Data delimiter <i>tab delimiters are best for spreadsheets and space for some text editors</i>	choice box	Tab, Space	
Repeat header for each line <i>when selected, the column headings will be printed each drainage line</i>	tick box	selected	
Calculate road chainage/offset <i>only used for road chainage-offset format. When selected, the road chainages and offset calculation panel will be displayed so that the this data can be updated before the report is generated. (see below)</i>	tick box	selected	
Easting Northing Location <i>easting northing data can be from the manhole centre or the x,y location on the road design string that the manhole has been linked to</i>	choice box	pit centre, road design string	
Cover elevation location <i>the cover level elevation can be from the manhole centre or the elevation on the road design string that the manhole has been linked to (if a link has been made then these values should be the same). Note that the road design string data is NOT calculated at this time. These are the vaules calculated from</i>	choice box	pit centre, road design string	

the Drainage Misc Utilities or the last drainage data export.

Process button

Create the pit report

Finish button

remove the panel from the screen

Notes:

The columns of data may be separated by spaces or a tab. (tab is used for spreadsheet transfers). The internal width and length data are retrieved from the **drainage.4d** file for the pit type specified. If you want a longer description for the pit then the type used inside 12d this can also be entered in the drainage.4d file. The remarks for each pit are entered as user defined pit attribute named **remarks** and may be set using the attribute editor (on the drainage menu) or via a spreadsheet.

Easting Northing Sample

```
.PIT SCHEDULE
Pit
No TYPE EASTING NORTHING INTERNAL DIA INLET DIA OUTLET PIT
WD LEN INV LEV DIA INV LEV FIN RL DEPTH
REMARKS
B1 SA2 5302.458 7336.936 450.000 900.000 375 28.210 29.387 1.177
A2 SA2 5264.372 7322.036 450.000 900.000 375 27.470 28.646 1.226
C1 SA2 5224.155 7336.936 450.000 900.000 375 26.690 27.863 1.173
A3 SA2 5187.910 7322.036 450.000 900.000 375 25.930 27.158 3.628
A1 SA2 5309.458 7321.100 450.000 900.000 225 28.550 29.577 1.027
A2 SA2 5264.372 7322.036 450.000 900.000 225 27.470 375 27.420 28.646 1.226
A3 SA2 5187.910 7322.036 450.000 900.000 375 25.930 375 23.530 27.158 3.628
A4 SA2 5157.411 7321.332 450.000 900.000 375 23.090 26.714 3.624
outlet to existing system
NOTE:
1. ALL SETOUT POINTS QUOTED TO CENTRE OF PIT
```

Road Chainage Offset Example

```
DRAINAGE LINE A
PITPIT LOCATION LOCATION OFFSETS
No.EASTING NORTHING STATION CTRL OFFS TYPE REMARKS
A/15354.629 7336.936 231.171 d002 -7.450
A/25340.691 7320.911 217.233 d002 8.575
A/35293.458 7320.886 170.000 d002 8.600
A/45250.131 7320.886 126.673 d002 8.600
A/55217.194 7322.036 93.736 d002 7.450
A/65183.458 7322.036 60.000 d002 7.450
A/75152.699 7322.036 29.241 d002 7.450
```

Notes

The Set pit details must be run at least once to before printing the report. If the pits are moved or the designed strings changed then this option must re rerun.

The Road Chainage and Offset Pit Schedules use two user defined attributes for each pit. The first is **ctrl string** which identifies the string that the pit will be offset from and the second is **ctrl model** which contains the model name for the control string. These may be manually created/modified using a spreadsheet or the attribute editor.

The easting northing data obtained for the **road design string** option is obtained by dropping the manhole centre perpendicular onto the selected road design string. This data is stored as pit attributes **setout x** and **setout y**. It is calculated when the manhole cover levels are recalculated (drainage misc utilities and during drainage export (recalc level option must not be turned off)).

The cover elevation data obtained for the **road design string** option is obtained by dropping the manhole centre perpendicular onto the selected road design string and obtaining the elevation at this point. This data is stored as pit attribute **level z**. It is calculated when the manhole cover levels are recalculated (drainage misc utilities and during drainage export (recalc level option must not be turned off)).

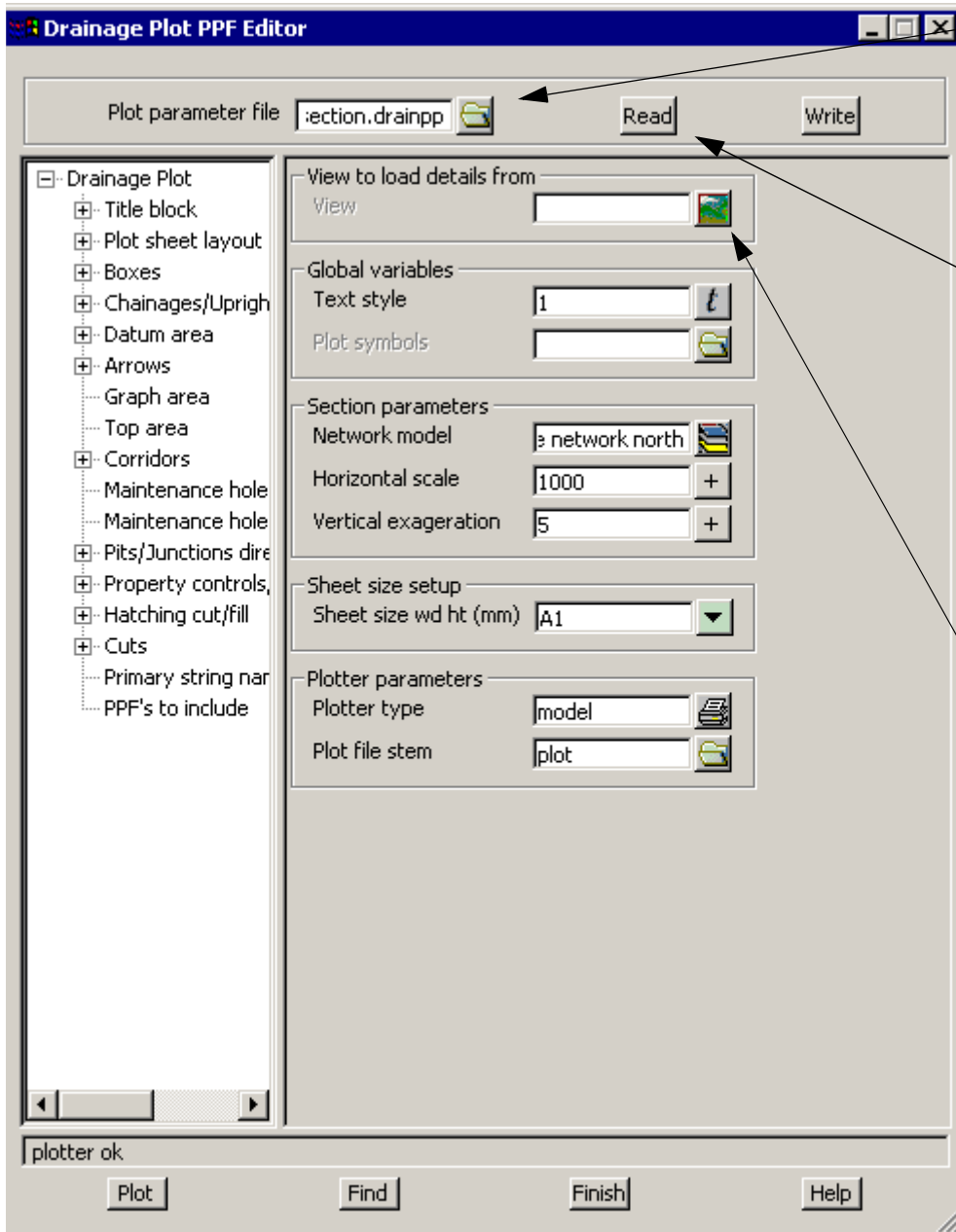
Long Section Plotting

Detailed description of the 12d drainage long section plotting may be found in the 12d Reference manual. The long section plots are customised using the drainage plot parameter files (drainppf). Title blocks, user defined text may be added and then plotted directly or to various file formats (dwg, dgn etc.). From the main menu

Design=>Drainage-Sewer=>Plots=>Longsections

See Also

manhole Schedules to set road chainage and name data



To access the drainppf files supplied select the icon and then walk right on **Lib** to select this drainppf file.

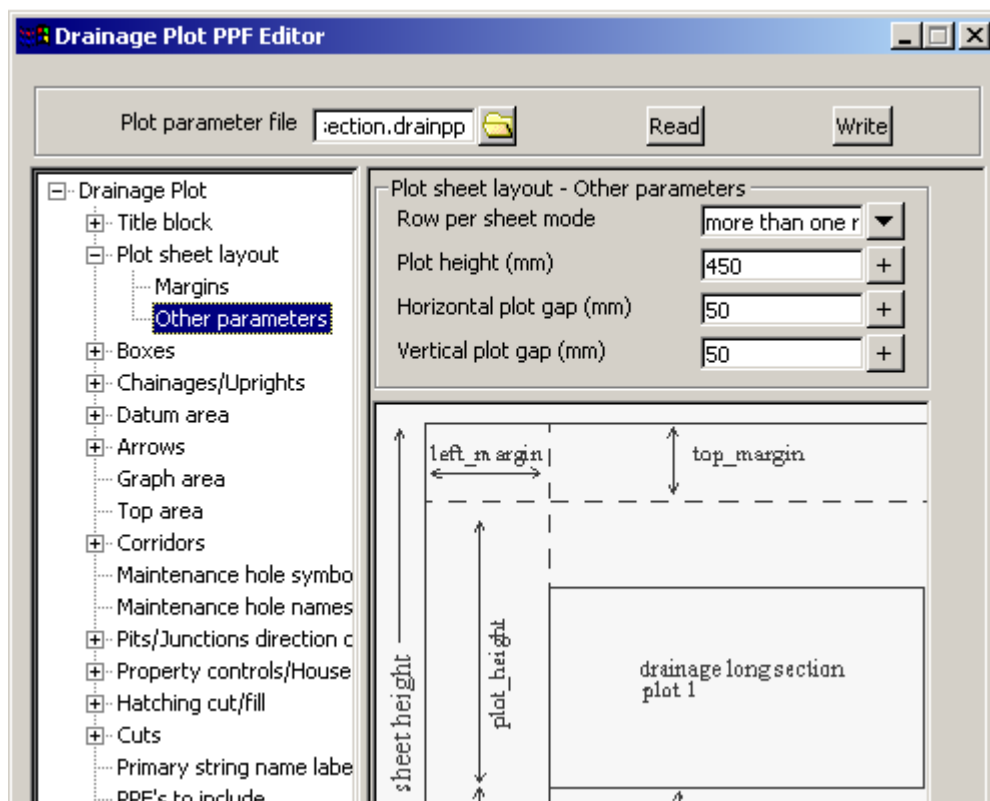
Select **Read**

Enter a new name for this drawing and select **Write**. This will save the setting we are about to make should you want to replot this long section.

This section view determines the additional models (such as services) to show plot. These are referred to as corridor models. The vertical exaggeration is also obtained from this view.

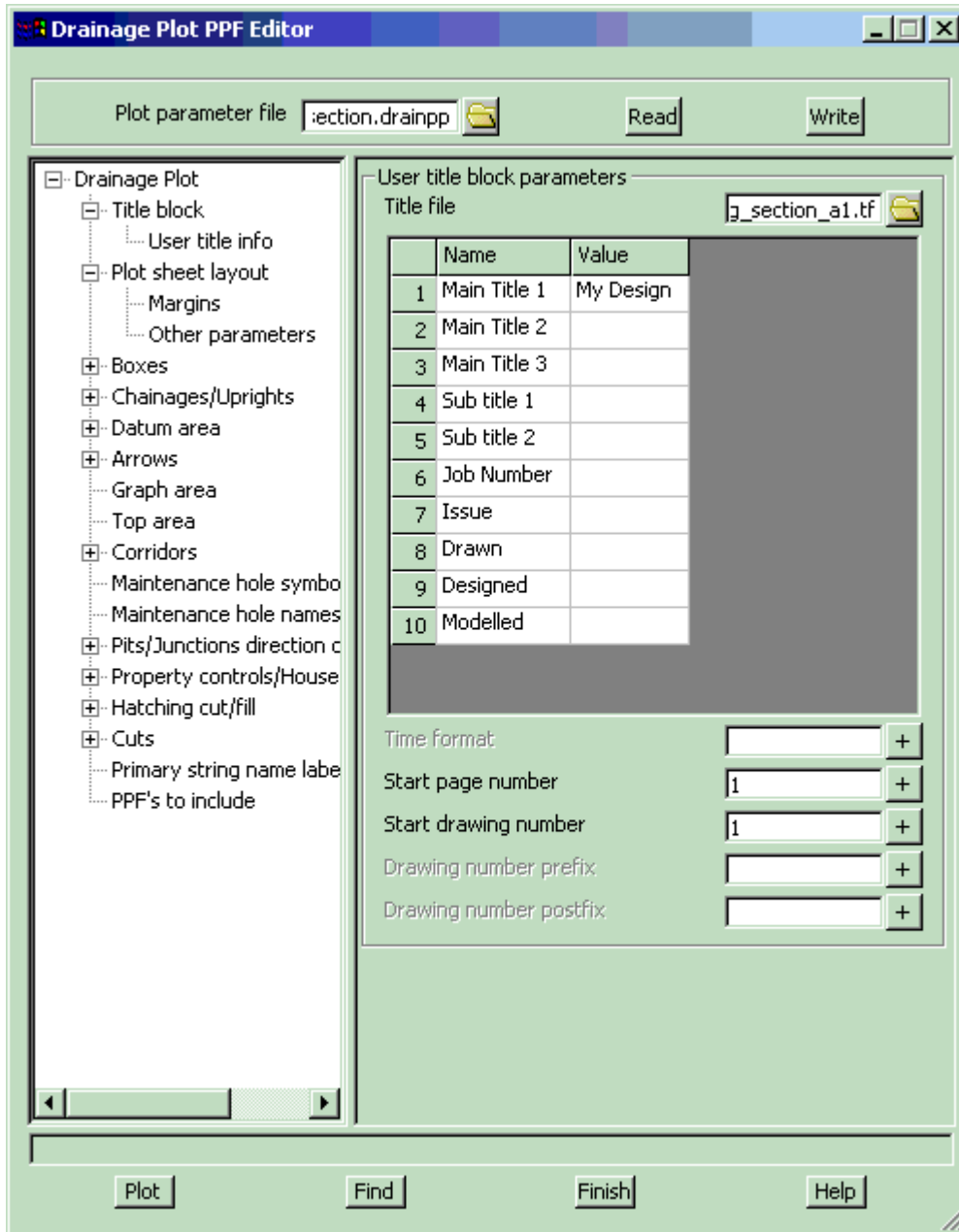
The **network model** field will be completed with the model of the string being profiled. If this is not your drainage network model then select it now.

When **Plotter Type** is set to model then **plot file stem** is the model name prefix for plots that will be created. The first sheet of plots will be in model **plot1**, the second in **plot2** etc.



The **plot height** determines how much room is left vertically for the actual plot. This specifies the total height of the plot. 12d then constructs the box area and arrow area on the bottom and then arrow area on the top. The amount left over is used for the long section itself.

To stop datum breaks from occurring increase this height, increase your plot scale or decrease your vertical exaggeration. If there is too much white space in the graph area then reduce this value.

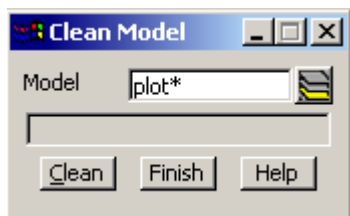


The **+Drainage plot+title block+User title info** allow you to enter the text for the title block. The list displayed is retrieve from the **title file** selected above. Enter the data for the plot and then select **Write** to save the changed to the local drainppf file you entered earlier.

Select **Plot** and the plots will be send to the **plot file stem** entered. These models may be added (one at a time) to a plan view to inspect them before plotting to paper or exporting to other drawing packages.

If changes are to be made and then plotted again you must delete the drawings in the model. These models may be cleaned out using

Models->Clean



The asterisk may follow the plot file stem to clean all of the models at once. You will be shown the model list before they are cleaned.

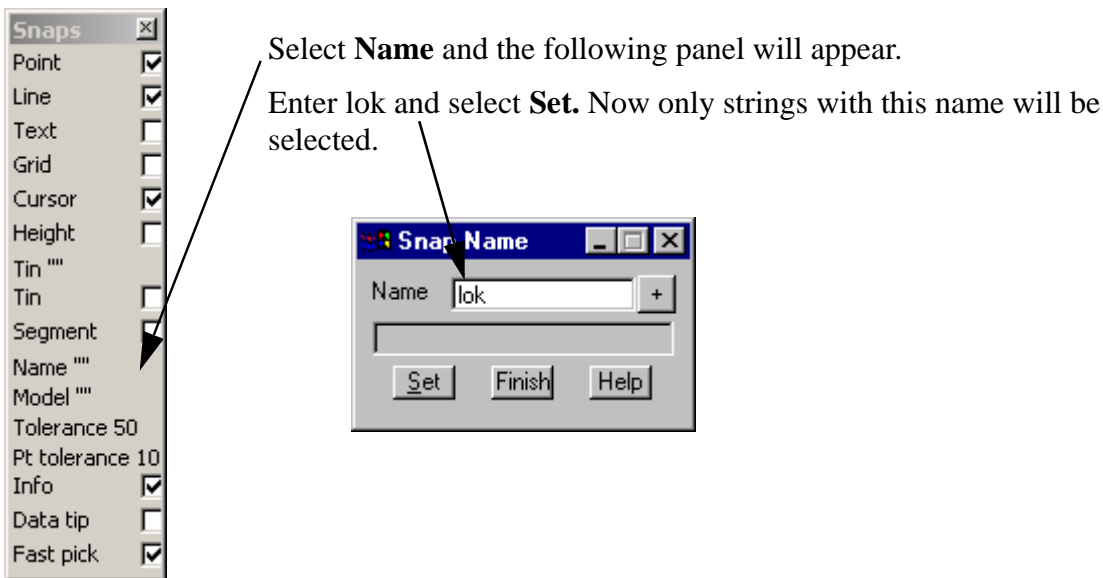
Working with Kerb/Lip Strings

The reference point for kerb inlet manholes is usually on the kerb lip string or a fixed distance off the string. The rest of the strings only complicate the picture so we will take copies of the kerb strings to be placed in another model. Isolating the kerb strings into a separate model and joining them together is the recommended way to work with them. This may take a few minutes but sometimes you have even less time than that. So first lets look at how to pick kerb strings quickly.

Picking kerb strings - name snap

Strings generated by 12d have specific names attached to them. The lip string is often called "lok". Therefore, if we could restrict our string selection to those strings named "lok" it would make placing the manholes very efficient. We are going to do this with the **Name snap**.

There are 3 types off snap tool bars available. Standard, vertical and horizontal. To obtain the standard snaps toolbar select, **Utilities=>Snaps=>Snaps** and the following snap toolbar will appear.

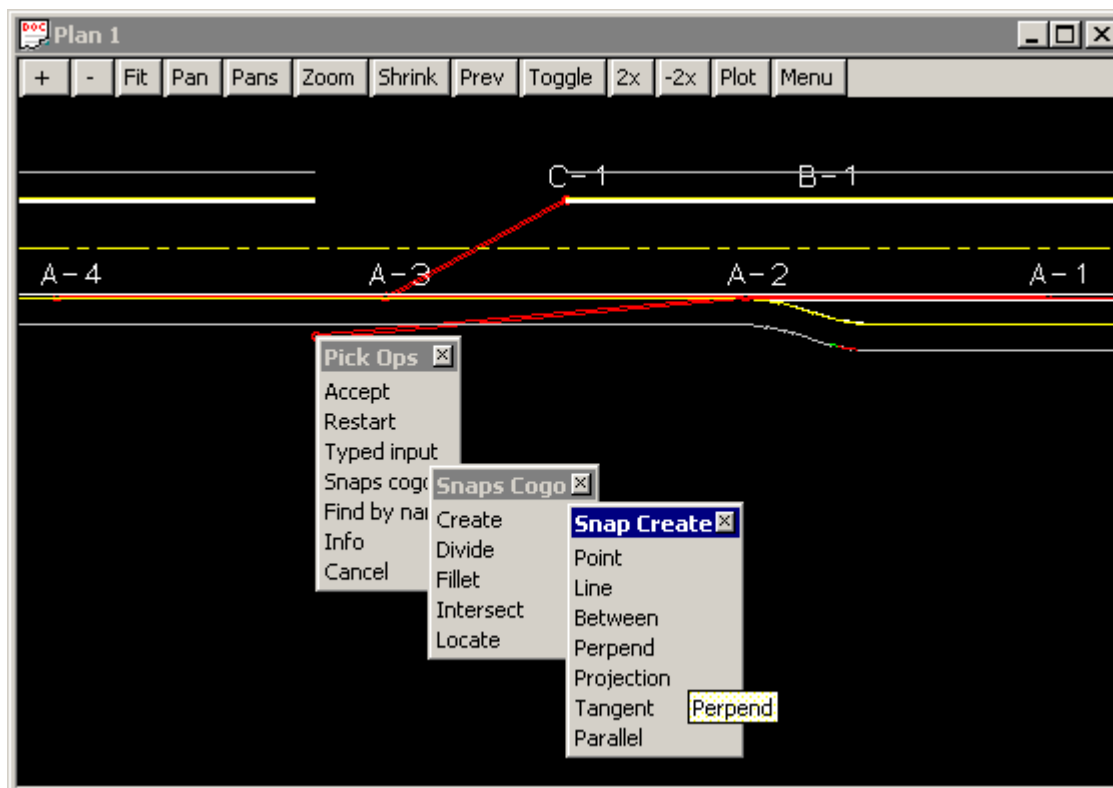


Leave the panel up to remind your erase the lok entry and select **Set** again so that you will once again be able to pick any string.

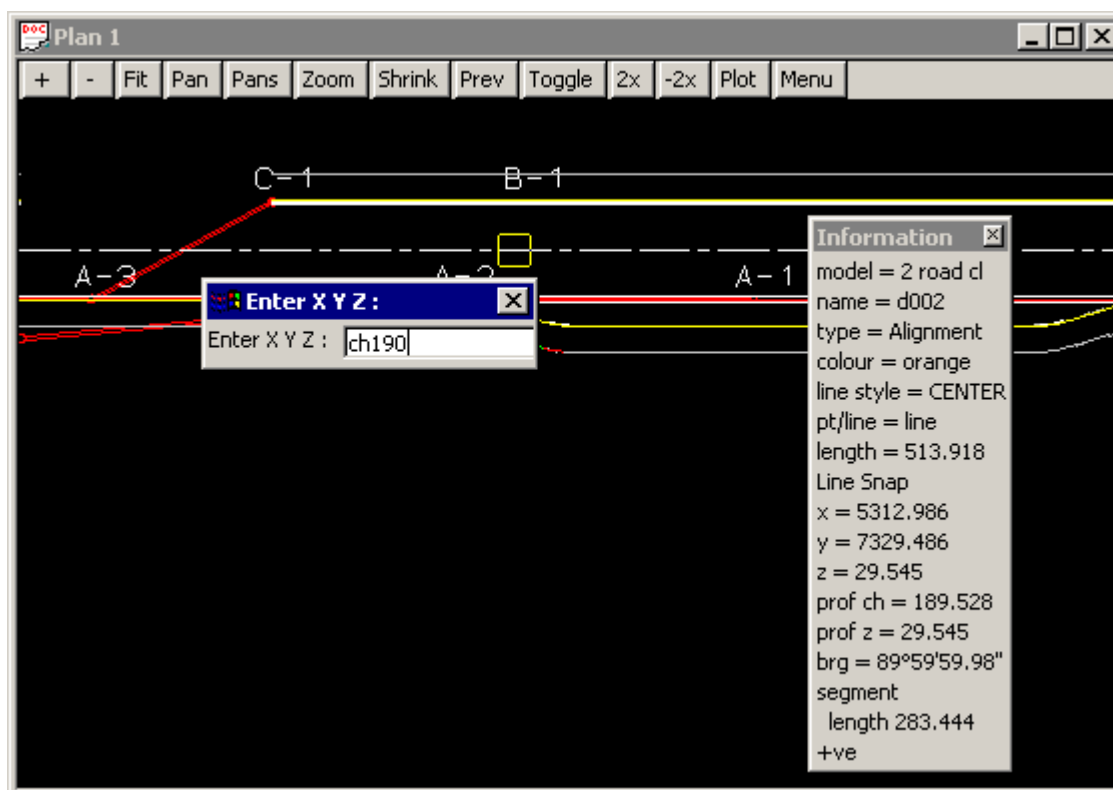
Placing a manhole at a Specific Control String Chainage

When appending or moving drainage manholes, the following steps will place the manhole at a specific chainage along the control string.

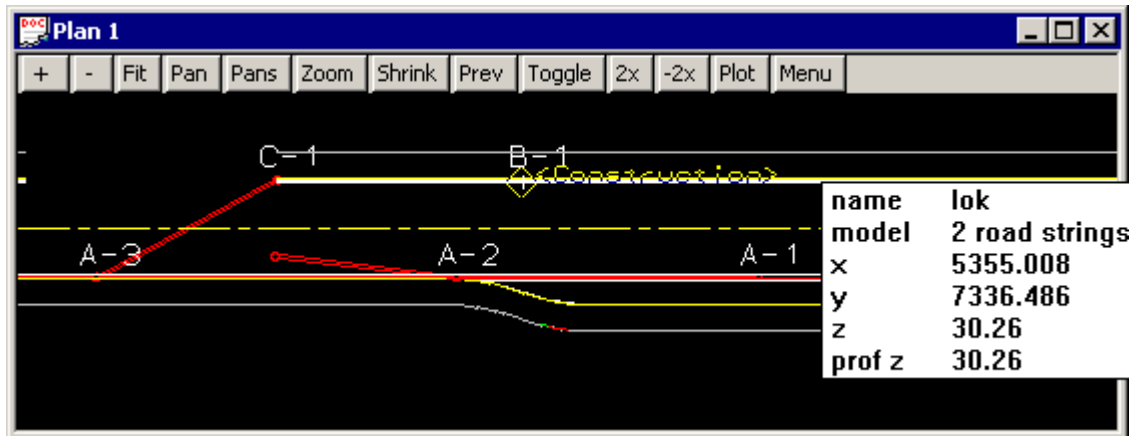
1. **RB** and then select **Snaps cog=>Create=>Perpend** from the menu. Messages indicating what to be done next are given in the bottom left corner of the 12d window.



2. **LB** select but **do not** accept the road centre line (control string).
3. To place the manhole across from chainage 2100 Type ch2100 then press enter.



4. **MB** accept the inserted point. This identifies the point on the control string. Next
5. **LB** select the lip line then **MB** accept. The construction point will be displayed on the lip line



6. **MB** accept the construction point to place the manhole.

Placing a manhole at a Specific Distance/Offset along the kerb string

When appending drainage manholes, the following steps will place the manhole at a specified distance along a string and if desired an offset.

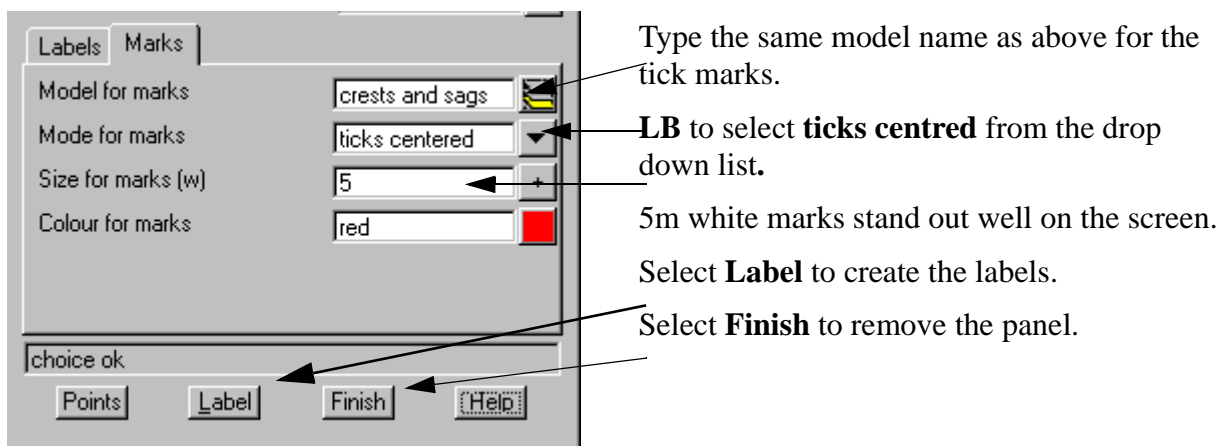
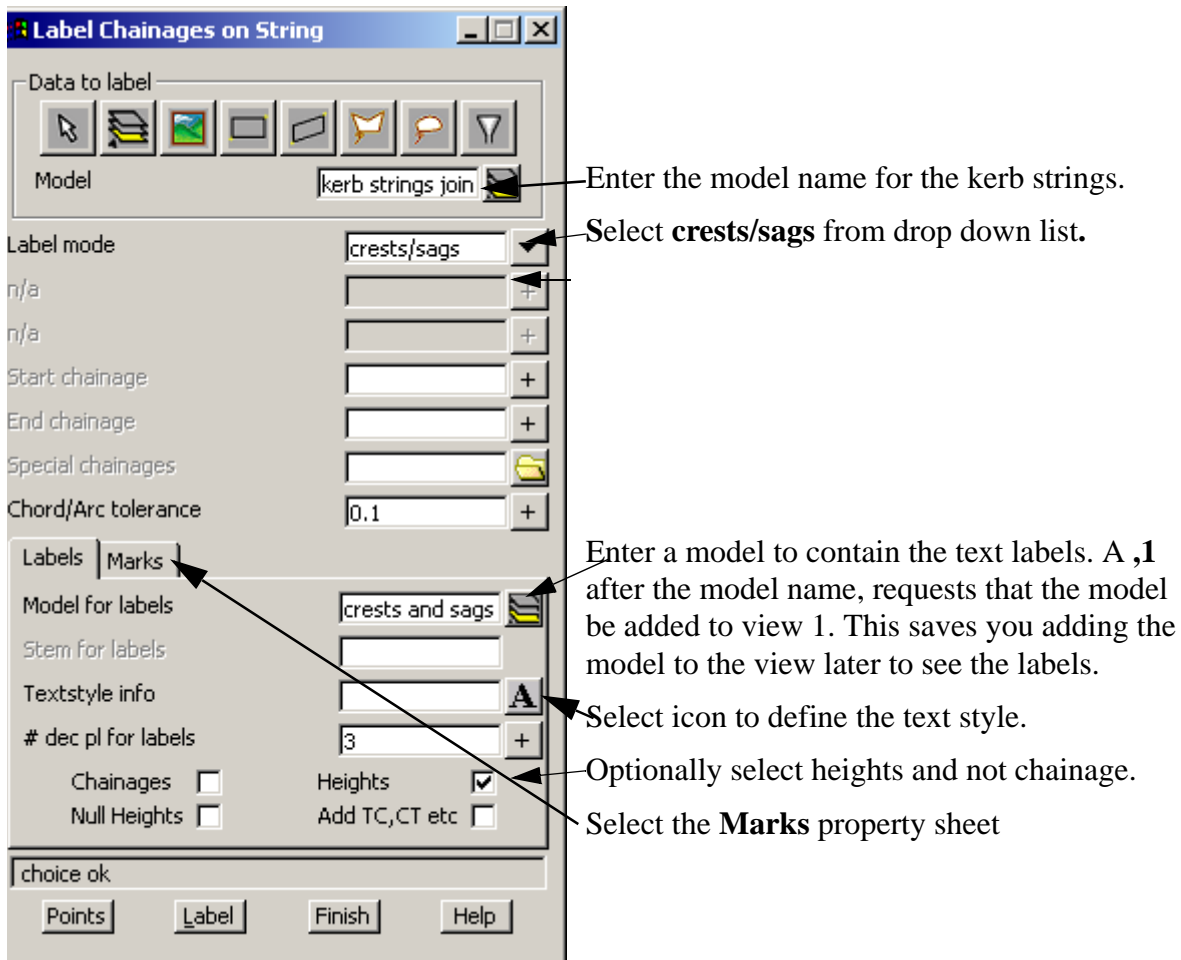
1. **RB** and then select Snaps cogo=>Locate=>Offset from the menu. Messages indicating what to be done next are given in the bottom left corner of the 12d window.
2. When you select the string to measure the distance along, do not click but rather drag in the direction you want to offset. Next **MB** accept
3. **LB** select then **MB** accept the control point to measure the distance from. (If this point is not on the string selected in step 2 the point will be dropped perpendicularly onto that string).
4. Type the distance along the string then press Enter (a negative value would go in the opposite direction to the drag in step 2).
5. Type the offset distance from the string then press Enter (positive is defined using a right hand rule method from the direction in step 2).
6. **MB** accept the construction point to place the manhole.

Locating Crests and Sag Points

This step will place tick marks at the crest and sag points of your kerb strings. It is an optional step but it will help ensure that a drainage manhole is always placed at SAG manhole locations.

If your road designer has given you kerb inverts strings split into numerous sections, use the “head to tail” feature described in section 4.2 above before using this section. The crests and sag locations along the design string can be identified using the selection

Strings =>Label => Chainages



To get a clear picture of what the kerbs look like in profile lets create a section view and profile the kerb string.

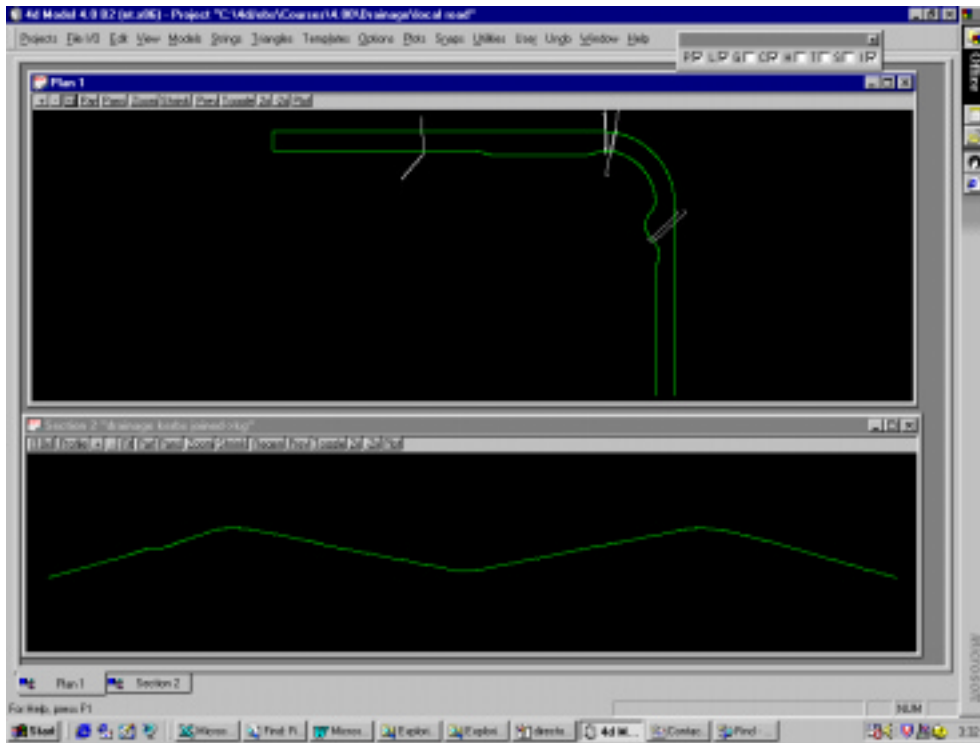
To obtain more working area, hide the **Output Window** (Window=>Output window).

From the main menu select,

View=>New=>Section View

Now Select Profile on the **section view title area** and then pick the kerb string in the plan view. Your screen

should now look like the following.



Place your pointer in the section view and notice how the cross in the plan view indicates your position in plan.

THE END

Advanced Stormwater Design - Introduction

The **Stormwater Design Course Notes** and this manual, the **Advanced Stormwater Design Course**, describe the functions and processes of the 12d drainage module.

The **Stormwater Design Course Notes** contain:

- sset drainage defaults and layout a drainage network,
- suse the powerful 12d drainage network editor to avoid service clashes, grade pipes, align oberts, minimise depth and many other design tools,
- sautomatically assign names to the pit/pipes in the network,
- sdesignate catchment areas and produce catchment plans,
- stransfer data to and from electronic spreadsheets to enable the user to easily review the data and add user defined data to the 12d pipe network. This data may include such data as pipe bedding types and trench width,
- screate pit layout schedules to export to spreadsheets or word processors for final formatting.
- sproduce long section drainage profiles including HGL data, flows, invert levels, service crossings
- screate plan drawings with pipe sizes, flows, manhole symbols, linestyles for pipe sizes, design parameters for manhole and pipes and user defined data
- slocate pits/manholes at exact chainage and offset locations

This manual, the **Advanced Stormwater Design Course**, is intended to describe the more advanced features 12d model drainage and discuss the customisation of the package. This will include

- s drainage trench exvavation volume calculations
- s pipe and manhole quantity calculation
- s customising the drainage.4d file
- sdesign or evaluate the drainage system using 12d Drainage or create input files for the XP SWMM/RAT2000, Micro drainage, Drains and PCdrain drainage design packages,
- sread the output from the drainage design packages (automatic if using 12d Drainage), update the drainage network and store the hydraulic data, such as hgl (hydraulic grade line) levels, peak pipe flows and pipe capacities,
- s pit inlet capacity calculations and over land flow
- s flooded width analysis
- s surcharge volumes at SAG pits
- s and detailed drainage plan labelling

Setup Files and Their Locations

The drainage module consists of the optional 12d Drainage engine, utilities, startup configuration files for RAT2000, XP SWMM and the 12d drainage configuration file (drainage.4d). Demonstration versions of Drains, RAT2000 and PCdrain have been included on the CD along with a copy of the ILSAX hydrology package. Manuals for the ILSAX program may be obtained from the Civil Engineering Department at the University of Technology Sydney.

All setup files have been configured for the training version. However, when you start working on real projects you may want to customise the drainage module. **More - Customising the drainage module**

The **drainage.4d** file contains pipe types (RCP, Class 2 etc.) and example pit inlet capacity tables for RTA (NSW Road and Traffic Authority) standard pits. Detailed pit type descriptions and internal pit dimensions can be included in this file to be inserted into your pit schedules. For PCdrain users there is a routine to read your gully pit file and include these pit types in 12d **More**.

See “The drainage.4d file” on page 2102.

REVIEW THIS DATA CAREFULLY! A detailed description of the pit inlet capacity tables in this file is given in “Pit Inlet Capacities” on page 2102. The **drainage.4d** file may be customised for any additional inlet capacity data you may have.

Starting with a Basic Drainage Network

These course notes assume that you have completed the Stormwater Design Course and that you have experience creating 12d model drainage networks with catchments areas. This course will begin with a completed drainage design found in the directory

\12djobs\courses\7.00\drainage\local road complete

Drainage Volume Calculations

Sample templates are included in the courses section of 12djobs (\12djobs\courses\7.00\drainage\pipe template.tpl). The templates from this template library may be added to your project using

Design=>Templates=>Utilities=>Input.

This routine calculates the excavation volume for all of the drainage strings in a model. Since templates are used for the calculations trench shapes can be customised by depth and over excavation for bedding materials can be included. Net area calculations to exclude pipe area is not supported.

Key points

1. One template for each pipe size (mm)
2. Carefully consider the tin selected.
3. Box culverts should have their own pipe type

A template must exist for each pipe size in the model (pipe size x 1000). For example a 0.3m pipe will require a template to exist named 300. A 0.5ft pipe would require a template named 500. Sample templates are included in the courses section of 12djobs (\12djobs\courses\7.00\drainage). These may be copied to your *.project directory and then added to your project using **Design=>Templates=>Utilities=>Add=>All all to project.**

The templates are run along the strings and the total volumes are reported. Volumes for each strings are given in the report file. An example follows.

```

----- BEGIN APPLY TEMPLATE REPORT -----
apply template to string report -

string      E
tin         design
separation  10.000
left template 375
right template 375
cut volumes and areas are negative
fill volumes and areas are positive

chainage-  -----sectional  information-----  -----intermediate  information----  -----accumulative
information-----
-----cut area --fill area -----cut vol ---fill vol  -cut volume-- -fill volume- -
--balance---

0.000      -1.434    0.000
           -0.771    0.000    0.000    0.000    0.000
0.550      -1.367    0.000
           -14.222   0.000    -0.771    0.000    -0.771
10.000     -1.642    0.000
           -15.293   0.000    -14.992   0.000    -14.992
20.000     -1.416    0.000
           -1.845    0.000    -30.286   0.000    -30.286
21.313     -1.393    0.000
           -0.794    0.000    -32.130   0.000    -32.130
21.863     -1.493    0.000
           -32.924   0.000    -32.924   0.000    -32.924

total cut      -32.924
total fill      0.000
balance        -32.924
ie excess of cut over fill  32.924

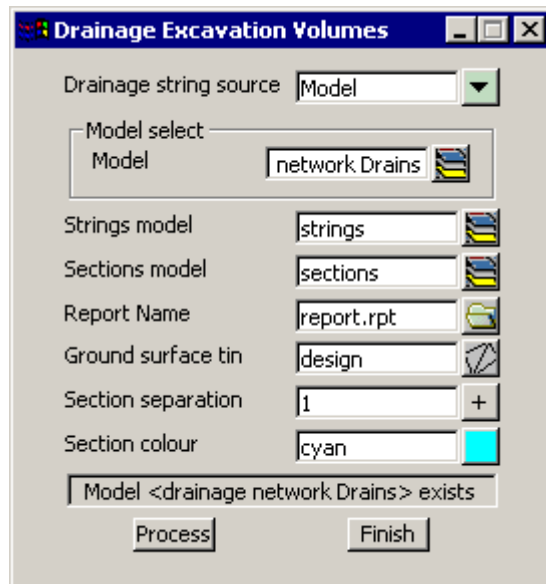
```

If a tin is created from these strings then volumes by depth can be determined using **Design=>Volumes=>Exact=>Tin to tin**

Usage

This panel is accessed from the menu selection

Design => Drainage => Reports => Excavation Quantities



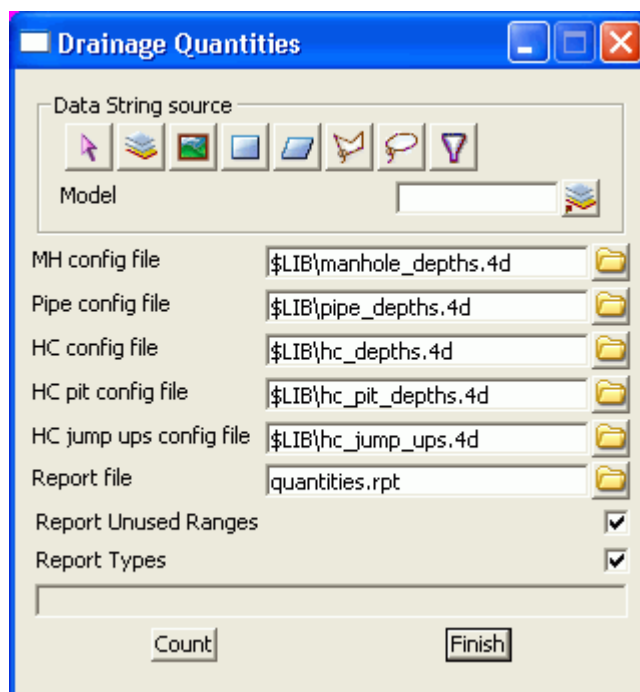
The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
drainage string source <i>drainage string selection</i>	choice box	model	View,model,string
drainage model <i>Model to contain all of the pit and pipe network to be worked on.</i>	input box		
Strings model <i>Strings generated from the templates will be stored in this model</i>	model box		
Sections model <i>Sections generated from the templates will be stored in this model</i>	model box		
Report name <i>cut and fill volumes will ne sent to this report</i>	input box		
Ground Surface Tin <i>tins from which the volumes will be calculated</i>	tin box		
Section separation <i>distance between the sections</i>	real box		
Sections colour <i>Sections generated from the templates will be assigned this colour (strings colours are defined in the templates)</i>	colour box		

Network Quantities Report

This panel is accessed from the menu selection

Design => Drainage Sewer => Reports=> Network Quantities



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Data String Source	Choice		
---------------------------	--------	--	--

usually the entire model is selected but view is also available for combining models

MH config file	file box		
-----------------------	----------	--	--

This file specifies the types and depth ranges for the manholes. Details of this file are contained below.

Pipe config file	file box		
-------------------------	----------	--	--

This file specifies the types and depth ranges for the pipes. Details of this file are contained below.

HC config file	file box		
-----------------------	----------	--	--

This file specifies the types and depth ranges for the house connections. Details of this file are contained below.

HC pit config file	file box		
---------------------------	----------	--	--

This file specifies the types and depth ranges for the HC pits. Details of this file are contained below.

HC jump ups file	file box		
-------------------------	----------	--	--

This file specifies the types and depth ranges for the house connections jump ups. Details of this file are contained below.

Report file	file box		
--------------------	----------	--	--

a sample report file is given below.

Report unused ranges tick box

*the depth ranges for the manhole/pipe/house connections are defined in the *.4d files. Selecting this option will cause the depth ranges in the file to be printed even if there are no manhole/pipe/house connections in these depth ranges (zero quantity values will be shown).*

Report types tick box

*Selecting this option will cause the manhole/pipe/house connection types used in the model types to be listed (even if quantities are not requested in the *.4d files). Since this is a complete of the type used in the model, the list informs the user what types have not been included in the quantity calculation.*

Count button

executes the option.

Finish button

removes the dialogue from the screen

The *.4d files listed above are contained in the 12d **library** directory. Each line is the file performs a count (count lines). No items are counted twice. Therefore, if an item is counted its type and then a count line is found the wild card is used for the type, the type already counted will not be included in the count.

The format for a count line is three or four values (space delimited) per line. Size is optional.

```
<type (from drainage.4d)> <size> <starting depth> <ending depth>
```

Notes:

All **types** with spaces in the name must be enclosed in quotes The wild card * may be used.

The **size** is optional and if omitted the all sizes will be counted in this group (do not use the * for a wild card).

The **starting depth** and **ending depth** are required for all count lines.

Sample count lines for manholes follow.

```
// sum concrete cover manholes is various ranges

"CONC COVER" 0.0 1.6
"CONC COVER" 1.5 3.0
"CONC COVER" 3.0 999.9 // this is expected to be zero
"CONC COVER" -999.0 0.0 // trap errors

// any that are not Concrete cover will be counted here

* 0.0 1.6
* 1.6 3.0
* 3.0 999.9
```

Manhole Quantities

=====

CONC COVER	0.00	1.60	13	16.506
CONC COVER	1.60	3.00	1	1.510
CONC COVER	3.00	999.9	0	0.000
CONC COVER	-999.0	0.0	0	0.000
*	0.00	1.60	0	0.000
*	1.60	3.00	0	0.000
*	3.00	999.9	0	0.000

total length = 18.016

Types Used

CONC COVER

Diameters Used

1.100

Since the **Report unused ranges** tick box was selected, these lines were printed even though there were no manholes in the data ranges.

This data results from selecting the **Report types** tick box.

Sample count lines for pipes follow.

```
// sum class 2 pipes by diameter and for various ranges

// count 375

2 0.375 0.0 2.0
2 0.375 2.0 5.0
2 0.375 5.0 999.

// count 450

2 0.450 0.0 2.0
2 0.450 2.0 5.0
2 0.450 5.0 999.

// count 525

2 0.525 0.0 2.0
2 0.525 2.0 5.0
2 0.525 5.0 999.

// count pipe sizes that were missed

2 * 0.0 2.0
2 * 2.0 5.0
2 * 5.0 999.

// count all other missed pipes

* 0.0 999.
```

Exporting to Drainage Design Software Packages

12d contains most of the data required for your drainage design packages. However, each packages has specific design variables that 12d does not have access too. The design process is intended to export your data from 12d to the design package, design the drainage system and then read the results back into 12d for your long sections.

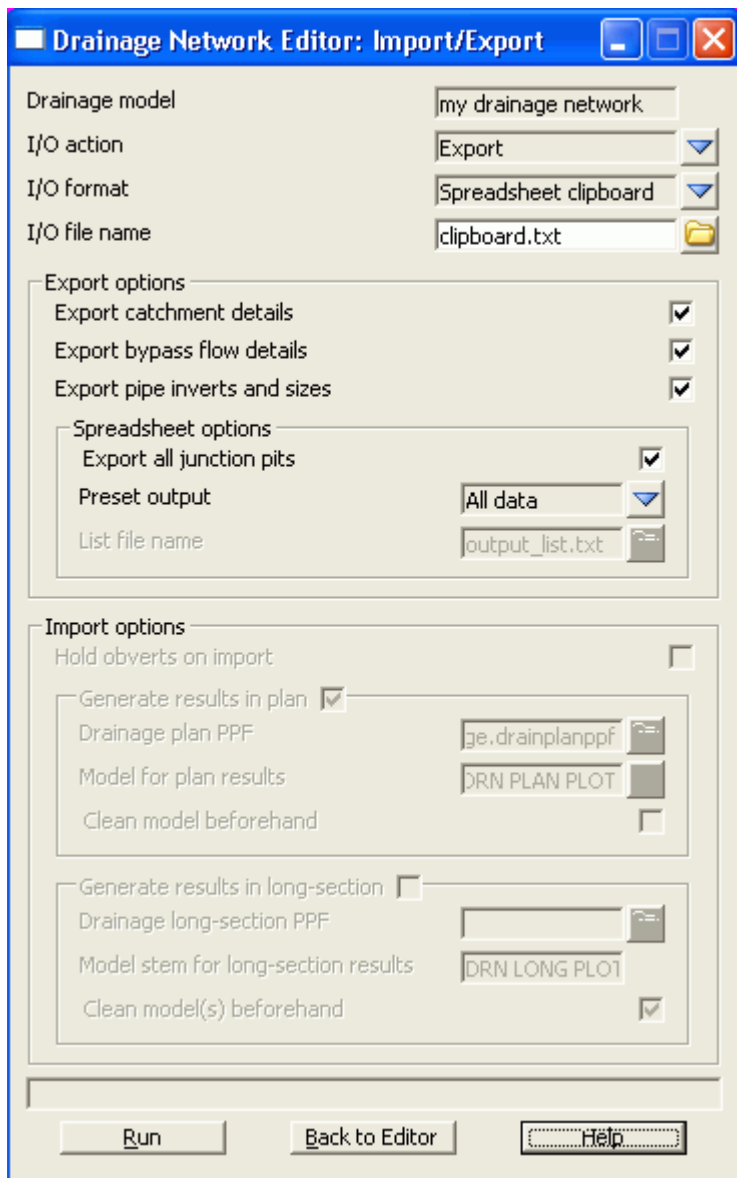
If pits/pipes are to be added/deleted from your network during the design process you are safest to add/delete the pit/pipe to 12d and to your design package separately.

Not recommended and as a poor alternative, you have the option of reading the results back into 12d, adding/deleting the pits/pipes and then exporting the data to a new drainage project in your drainage design software. **As 12d does not have access to all of the data in the design packages this method is not recommended!**

Some of the drainage design programs offer a third option that allows you to import data “on top of” an existing project thereby merging and over writing the existing data. Be sure to contact the drainage software supplier to obtain exact details of how the merging process is performed.

The interface is run by selecting **Import/Export** from the **Drainage Network Editor**

Design->Drainage-Sewer->Network Editor



The **Drainage model** is the model currently being edited. The **I/O action** determines if data is exported or imported and enables/disables many of the fields below.

The **I/O format** selects which external program the 12d is interfacing with. Some programs use the windows clipboard and others use files. If the clipboard is used the data will also be written to a file by 12d in case you need to take the data to another computer.

The **Export options** have slightly different effects depending on the **I/O format** (program) selected above. Therefore they will be discussed later with the various formats.

Export pipe diameters and inverts is generally select for existing systems only. If your design program will set invert levels and pipe sizes then turn this tick box off for new systems. Some design programs will require initial inverts and pipe sizes. In this case this box should be selected on the first export.

Export default catchment/pit parameters is generally selected for the first export. For subsequent exports turn this selection off and then only the catchment areas (if the model is supplied above) will be exported.

Drainage Data Input and Output to Spreadsheets

Spreadsheets are an effective method to manage the numerous variables urban drainage designers create in the modelling process. Spreadsheet data can be transferred to and from 12d in tab delimited files and stored within 12d as “user definable attributes”. These attributes are linked to the pit and pipes within a network. Drainage long section plots can display the pipe attributes in the “arrows” data area and pit attributes in the bubbles area. Drainage plan drawing can also show these pit and pipe attributes.

Drainage strings will be created if they do not exist in the model but manholes cannot be added to existing strings.

See also

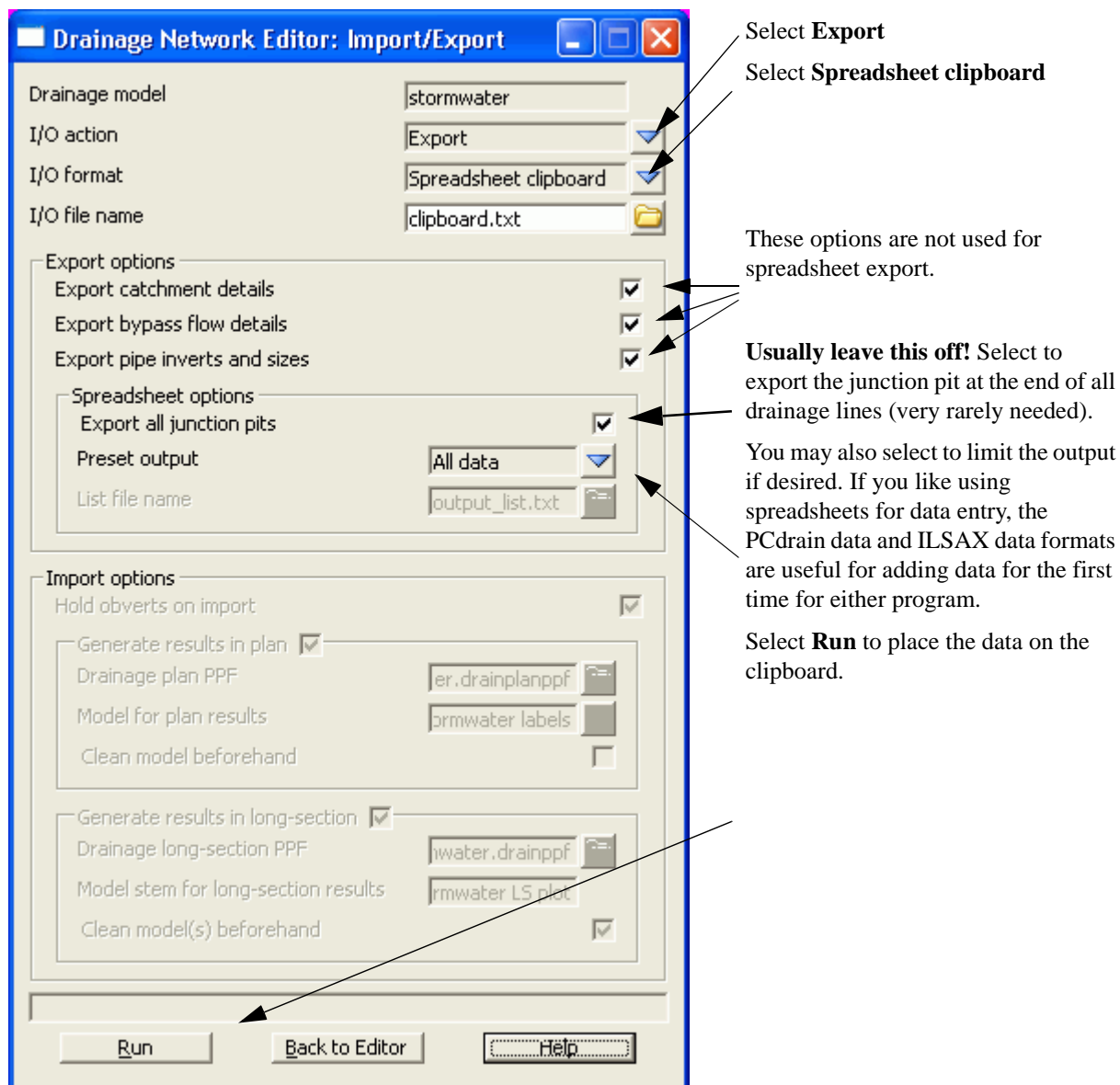
12d to spreadsheet transfers

Spreadsheet to 12d update and create

Spreadsheet options

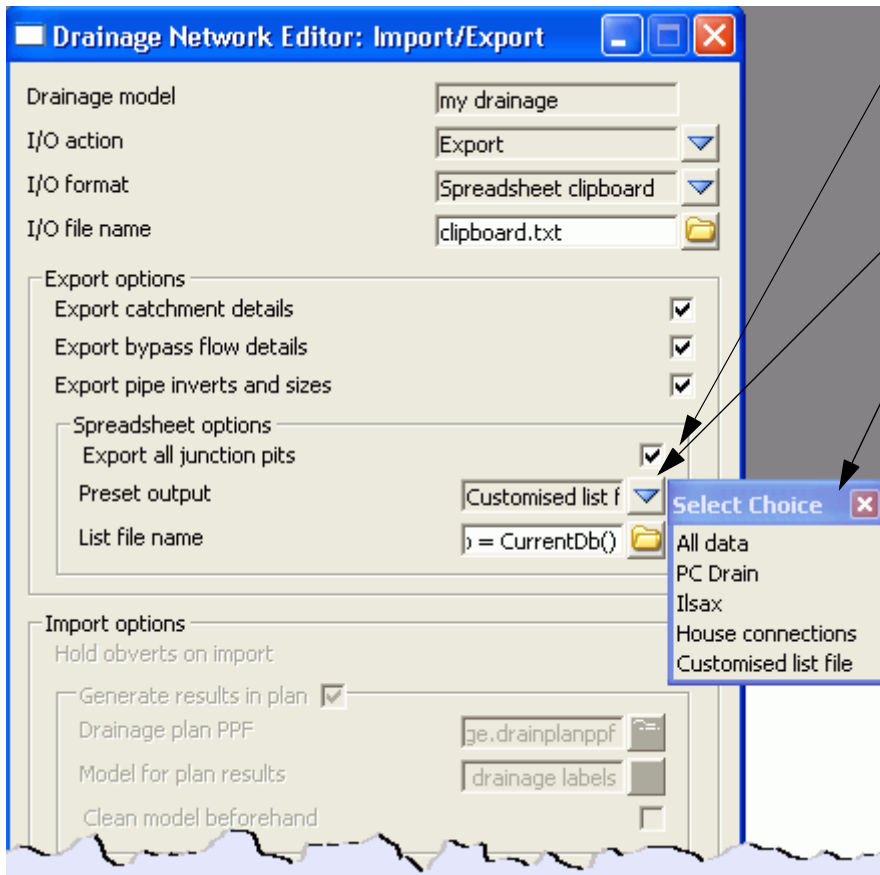
12d to spreadsheet transfers

This interface is accessed the **Import/Export** button on the Drainage **Network Editor**.



Options

The **Spreadsheet Options** section allows the user to define the amount of data exported.



Export all junction pits when selected will repeat the data for the junction pit at the end of each branch line.

Preset Output this choice box offers the following choices:

All Data: All of the 12d drainage string data and the user defined attributes will be exported to the clipboard in a tab delimited format. The 12d data names and the user defined attribute names will appear at the top of the spreadsheets columns.

ILSAX: For the ILSAX program, the spreadsheet column headings will change depending on the pipe and catchment indicators (P2 card) and the inlet type (P3 card). Therefore, use the ILSAX pipe editor macro to set up one pit/catchment for the type of data you wish to enter. Now when you export the pipe network data the column headings will include the names of the relevant parameters.

User defined below: The **Customised list file name** is used to define the drainage values, their order and format you desire.

The **customised list file** is a text file where each line contains a drainage variable or a spreadsheet IO command (blank lines are ignored unless preceded by the header command). The spreadsheet IO commands available are:

header	to define a line of text to be exported
blank	to leave a blank column in the output
pipe data	to specify the following user defined attributes are pipe data
pit data	to specify the following user defined attributes are pit data.
variable name	a 12d drainage variable names
factor	the following variable is multiplied by this factor

The simplest way to create your own customised tab delimited file is to set the **Preset Output** field to **All data** and leave the **customised list file name** field blank. Selecting **Set, Finish** and then **Copy** from the main dialogue. The data will be placed on the clipboard and a **customised list file**, named **output_list.txt** will be created containing the names of all of the drainage variables in the 12d model. Use a text editor to add/or delete the variable names, change their order and/or add spreadsheet IO commands. **Save the file with a new name!** The **output_list.txt** file is overwritten on every export.

A listing of a customised list file follows. Note the words in the header file have a "tab" between them so that they will be spaces across the spreadsheet columns.

```

header
Pipe Details
  header
  Name Length U/S IL D/S IL Slope(%) Class Dia I.D. Rough Pipe Is No. Pipes

  pit data
  *pit name

  pipe data
  *length
  low ch invert
  high ch invert

  factor
  100
  *grade

  pipe type

  factor
  1000
  diameter

```

After creating your customised list file, select **Options** again and change the **Preset Output** field to **User Defined below** and enter the new **customised list file** name that you saved above. Select **Set** then **Finish** and finally **Copy** to put the formatted data onto the clipboard.

The data can be pasted into a spreadsheet program for checking or additional formatting.

CUSTOM FORMATED DATA MIGHT NOT BE PASTED BACK INTO 12d!

The data must be in the “12d drainage spreadsheet” format to be read into 12d.

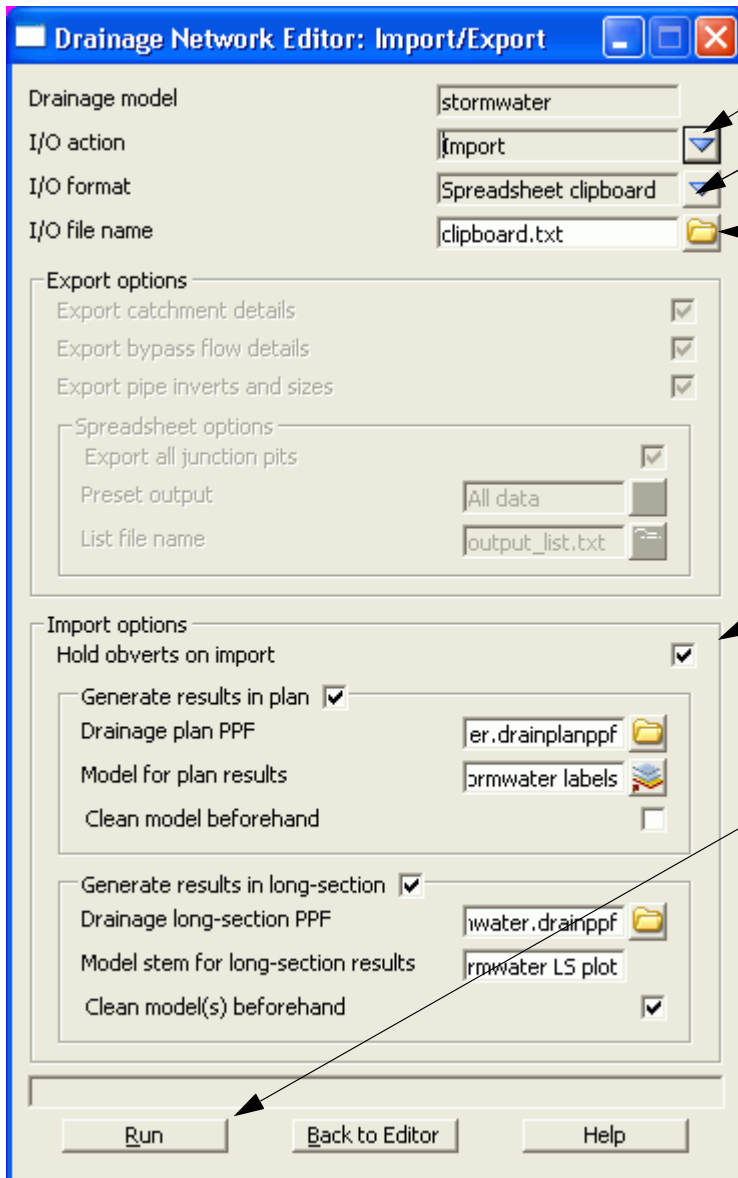
Caution with manhole names in the form 1-1 or 1/1. Some spreadsheets will interpret these values as dates. If you use these formats for your manhole names you will have to paste command them in once, format the columns that contain the manholes names as text data and then paste the information in again.

One final word on using the copy/paste commands in the Microsoft Excel program. The Paste Special command using the “Skip Blanks” option will allow you to copy a large block of 12d data (with blanks in it) on top your data so that your data is preserved where it coincides with the blanks. To use this option paste the data into a blank spreadsheet and then select copy again. The Paste special option with “Skip Blanks” will now be available.

Spreadsheet to 12d transfers

This item is accessed from the **Import/Export** button on the **Drainage Network Editor**.

The following panel will appear.



Select **Import**

Select the **Spreadsheet clipboard** format.

The file field is ignored.

This is ignored on spreadsheet imports.

Select **Run** to update the drainage model.

Tab delimited, “12d drainage spreadsheet” format or “from to” format data must be on the clipboard in order to update a 12d drainage model or create a new model. These format are described below.

Updating an Existing Model

The data usually is generated by 12d using the **Export** option, pasted into a spreadsheet and then copied back to the clipboard so that 12d can be updated.

When 12d exports the drainage model to a spreadsheet it includes a column for the unique string identifier and a unique manhole identifier (unique to the drainage model not the 12d project). The names of the strings and manholes may be changed via the spreadsheet if these columns are present at import time.

If the manhole id column is not present, 12d will search the drainage model for a matching manhole name. When the manhole is a junction between drainage lines, only the trunk line will be the data updated.

Creating a New Model

It is possible to create a new string or an entire drainage network using this format. However, manholes cannot be added to an existing string. The entire drainage string must be created at once. Two formats are available, the “from-to manhole” format and the “12d drainage spreadsheet” format.

At present the network editor must select a drainage string to become active. Therefore, if you are not

adding strings to a network, you will have to create a drainage network with one “dummy” manhole. Select this one “dummy” manhole to activate the editor. After importing the data and the new drainage lines are created the “dummy” manhole may be deleted.

12d drainage spreadsheet Format

The top left cell in the clipboard data must be the text “12d” to specify this format. The minimum amount of data required to create a new string is the string name, manhole name, x and y coordinates. You can add as much additional data as you have available. This would include pipe diameters inverts etc. The manholes must be listed from upstream to downstream order. If the string is to join a trunk line, the junction manhole must be included for both the tributary and the trunk line.

An example file exists called **new_network.txt** is supplied in the library. Open this file in a spreadsheet or a text editor and copy it to the clipboard. Set the **I/O Action** to **Import** and select **Run**. The new drainage lines will exist in the model currently being edited.

From-to Manhole Format

The top left cell in the clipboard data must be the text “from to” to specify this format. The minimum amount of data required to create a new string is the upstream pit name (*pit name), the downstream pit name (*ds pit name) and the x(x location) and y(y location) coordinates of the upstream pit. If the string is to join a trunk line, the junction manhole must be included for both the tributary and the trunk line.

An optional column for the manhole cover elev (cover elev) may be specified. Once the network has been created additional pipe and manhole data may be added using the “12d drainage spreadsheet” format described above.

An example file exists called **new_from_to_network.txt** is supplied in the library. It is shown below. Open this file in a spreadsheet or a text editor and copy it to the clipboard. Enter a new model name in the **Drainage model** field and select paste. The new drainage model will now exist.

from to	pit	pit	pit	pit
*pit name	*ds pit name	x location	y location	cover elev
text	text	real	real	real
E/1	A/3	5309.458	7336.935993	29.2173
D/1	A/4	5277.189	7336.935989	28.5071
C/1	B/3	5251.238738	7423.99485	31.5257
A/1	A/2	5354.629222	7336.935998	30.2115
A/2	A/3	5340.019987	7322.035996	29.89
A/3	A/4	5293.458002	7322.035991	28.8652
A/4	A/5	5250.182625	7322.035986	27.9127
A/5	A/6	5217.194202	7322.035983	27.1867
A/6	A/7	5183.458002	7322.035979	26.4442
A/7		5152.698693	7322.035975	25.7672
B/1	B/2	5289.42875	7422.289079	32.7197
B/2	B/3	5264.638564	7393.947083	30.7948
B/3	B/4	5249.738564	7384.207593	30.4187
B/4	B/5	5249.738564	7351.201545	29.1444
B/5	A/5	5233.426685	7336.935984	27.544

“12d drainage spreadsheet” Format

Each column of data is used for a 12d drainage variable or a user defined attribute. Each row represents a manhole and the downstream pipe (controlled by the direction of flow variable) within the drainage network. A sample is shown below.

12d	pit	pit	pit	pit	pit	pit
*string Name	*pit name	pit type	pit low ch invert	pit high ch invert	pit id	string id
text	text	text	real	real	integer	integer
E	E/1	SA2	28.108	28.108	1	67389
E	A/3	SA2	27.7559	27.7559	2	67389
D	D/1	SA2	27.3961	27.3961	3	68100
D	A/4	SA2	26.8018	26.8018	4	68100
C	C/1	SA2	30.67	30.67	5	72072
C	B/3	SA2	29.563	29.563	6	72072
A	A/1	SA2	29.1026	29.1026	7	82469
A	A/2	SA2	28.7811	28.7311	8	82469
A	A/3	SA2	27.7652	27.7059	9	82469
A	A/4	SA2	26.8127	26.7518	10	82469
A	A/5	SA2	26.0867	26.0244	11	82469
A	A/6	SA2	25.3442	25.2942	12	82469
A	A/7	SA2	24.6672	24.6672	13	82469
B	B/1	SA2	31.2759	31.2759	14	192066
B	B/2	SA2	29.351	29.301	15	192066
B	B/3	SA2	29.123	29.073	16	192066
B	B/4	SA2	28.0444	27.8951	17	192066
B	B/5	SA2	26.3447	26.2947	18	192066
B	A/5	SA2	26.0744	26.0744	19	192066

Duplicate Definitions

Strings Variables such as “direction” are may be defined for numerous manholes on the same string. Searching in a top down direction through the file, the last definition found for the string will be set.

Invert levels may be set via pipe data or pit data or combined. It is recommended that the user only use one method and not combine them. Both are exported so delete the ones you are not going to use. The variables are processed from left to right, so if duplicate definitions of an invert level or found the right most data will be set.

The format definition

1. Row1, column 1 must contain either “12d”, or “from to”. Therefore, the first column must be a 12d drainage variable (cannot be a user defined attribute).
2. Row 1. The text <pit> at the top of the column indicates the column contains a user defined pit attribute and similarly <pipe> indicates a user defined pipe attribute.
3. Row 2. This row contains the names of the 12d drainage variable names and the pit/pipe attributes. All names are case sensitive so be careful where you use capital letters. A list of 12d drainage variables is found below.

Names beginning with an asterix (*) will not be processed (except pit/string names when unique identifiers are present in the data). 12d drainage variables names beginning with an asterix indicate that this data was calculated at export time and cannot be read back into 12d (for example, pipe length, pipe grade and deflection angle).

Prefixing an user defined attribute name with “DELETE ” (no quotes, note the space after the DELETE) will cause the attribute to be deleted from all pits/pipes within the model.

4. Row 3. The text in this row define the type of attribute to be stored within 12d. The only valid choices are;

integer
real
text

If you want to change an attribute type you must delete the attribute and create it again. If you simply change the attribute type in the third row then that attribute will not be updated.

5. Blank lines may be inserted as desired.
6. You are not required to fill in all of the cells in the spreadsheets. Blank cells are ignored (you must use a space to remove all data from text attributes (the space will not be stored).
7. Pipe names are included in the data so that they can be changed but they are **not** used to identify the pipe. Pipe data will always be assigned to the pipe following the pit in the direction of **ascending** chainage. If flow directions is ascending then the pipe data will be for the downstream pipe. If the flow direction is descending then the pipe data will apply to the upstream pipe.

12d Drainage Variable Names

Manhole Variables	Pipe Variables	String Variables
*string Name	pipe name	direction
*pit name	pipe type	fs tin
pit type	low ch invert	ns tin
pit diameter	high ch invert	string id
pit low ch invert	diameter	
pit high ch invert	*length	
pit road chainage	*grade	
pit road name	low hgl	
*pit angle	high hgl	
*pit drop	pit hgl	
*pit depth	flow	
*pit chainage	velocity	
x location		
y location		
cover elev		
*fs elev		
*ns elev		
pit id		

Bypass Flow

Many of the design programs 12d exports to allow for bypass flow. Bypass flow involves the calculation of inlet capacity which is often based on the road grade upstream of the manhole.

The following steps are required to enable the export of bypass flow data and the required data is entered using the drainage **Network Editor**.

1. Set the manhole types to names that signify the inlet type in the program you are exporting to (**Type** on the **Pit->Main** tab).
2. Check that your grate level is correct (Setout z + **Setout to grate offset**)
3. Mark the manhole as a On grade or SAG inlet (**Inlet data** on the **Pit->Main** tab). On grade inlets capture the water as it passes the inlet while SAG inlet trap the water flowing in from both directions.
4. Draw an bypass flow string in the direction of flow so that it passes within 1 manhole diameter of the inlet. If flooded with calculations are to be done later, the bypass flow string should also be in the flow channel. Enter this model name (**Bypass flow model** on the **Global->Utility Models** tab). When bypass flow strings join they must join within 1 manhole diameter of a manhole.
5. Ensure a setout string is linked to the inlet so that the road grade may be calculated in its direction. If road crossfall is needed then the centre string is also required. These strings are specified using the (**Road design file** on the **Global->Utility Models** tab).
6. Press the **Set Pit Details** button. Road grades, crossfalls, ponding depths and bypass pits will now be found in the **Inlet data** section on the **Pit->Main** tab.

Drawing Bypass Flow Strings

The bypass flow string must be within 1. manhole diameter of the drainage pit in be considered on the bypass flow path. If the bypass flow string is to be used for flooded width calculations in the future, the string must also be drawn in the main flow area of the cross section.

Use the **CAD toolbar** to create the bypass flow paths. A unique name is required if you plan to calculated flooded widths after the analysis is done.

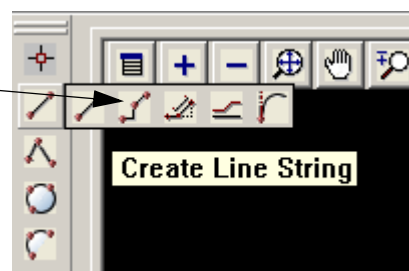
To use the **CAD toolbar** go to the **CAD data bar** and enter a string name and model name.

Select the line style (optional).



DRAG the **Create line** button and release at the **Create Line String** button.

When finished drawing the string press **ESC**.



Starting at the upstream end. LB select an insertion point and MB or press return to accept the selection. Continue this until you reach the end of the flow path. The string will not be shown in the new linestyle until the screen is redrawn. Press **ESC** to finish drawing the string. MB on the plan view title area to redraw the screen. The correct linestyle will now appear.

If you reach a sag pit location you may terminate the string or continue defining the bypass flow path for a surcharging event out of the sag location.

Set Pit Details - Calculate the Bypass Flow Data

Once the first 4 steps above are complete you are ready to calculate the bypass flow data. Select **Set Pit Details** and then select a manhole on a bypass flow string. The downstream pit will now show in the **Bypass pit** field.

If **Pit on grade** is selected and a setout string was found, the **Road grade** will appear in grey. You may override this value by selecting the tick box beside the value and entering your own value. If a road centre string was selected, the **Road xfall** field will also have a value.

If **Sag pit** was selected and a catchment string was selected in catchment set 1, the **Pond depth** would be displayed. The catchment string is draped onto the finish surface tin and the low point located. The **Pond depth** is calculated as

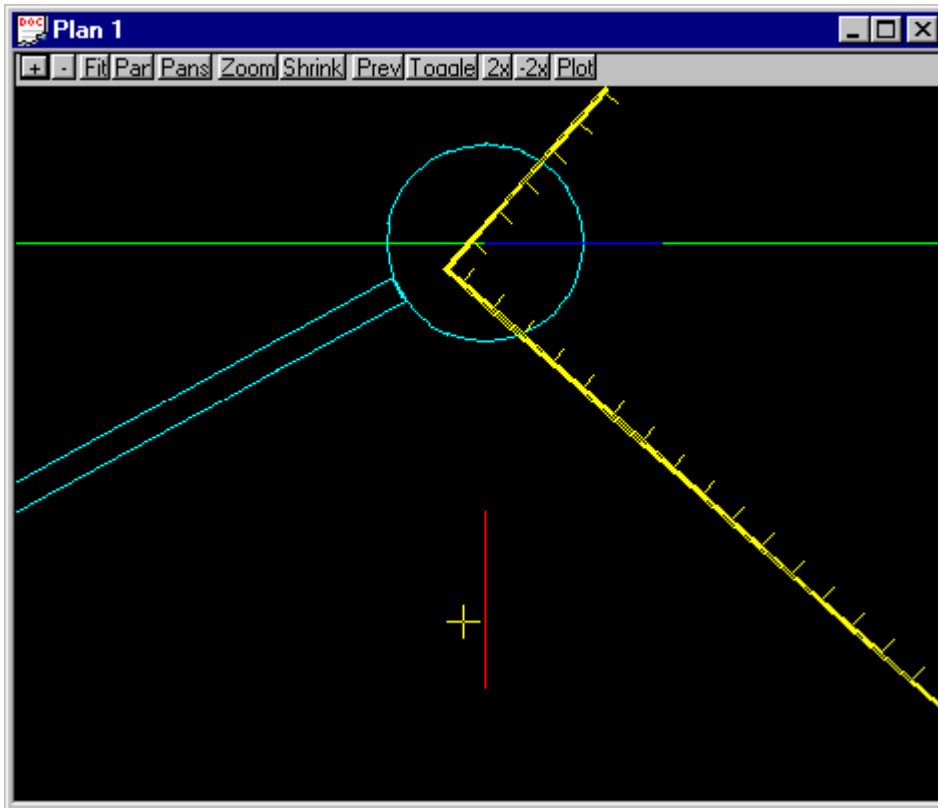
Pond depth = min level - (setout level + setout to grate offset).

Negative Ponding Depths

Negative ponding depths are usually caused by two errors in input. The first may be that the grate level is too high. Often this happens when the setout point is on the top of the kerb and no **Setout to grate offset** has been entered.

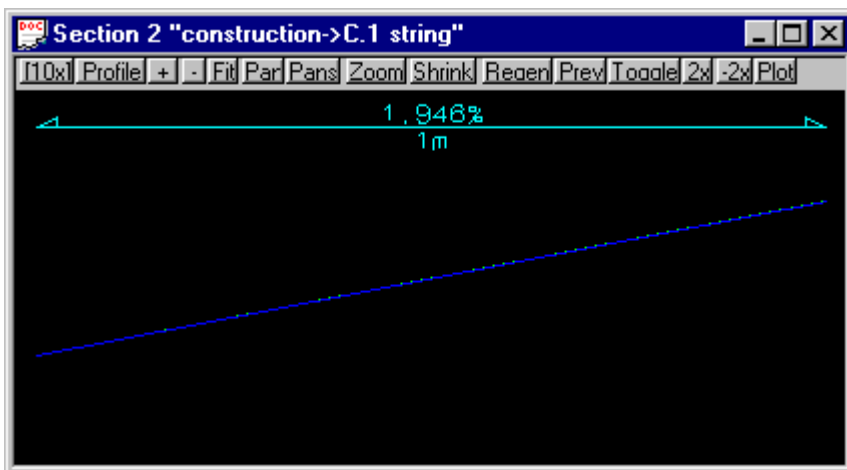
The second is that the catchment string has not been drawn around the crest of the catchment. The lowest section of the catchment string must be drawn carefully because it is the lowest point on the string that determines the overflow elevation. If in doubt, profile the catchment string with the design tin shown in the section view. Double check where the low point is.

12d adds verification strings in the **construction** model to confirm the locations where the road and crossfall have been measured. To check these strings add the **construction** model to the plan view. The following image shows a close up of the verification strings at a pit.



The blue line indicates where the road grade was measured and the red line indicates where the road cross fall was measured.

These are 3d super strings and therefore you may profile them in the section view. With the grades toggled on (check under **Toggle**) you can verify the slopes.



Note in the **Section View Title area** that the string is named “>string”. The work string indicates that it was created from string data and not from the tire

Important Notes

1. Pits with no pit type specified will not be processed by the overflow routine and the inlet capacity will be set to 100%.
2. For pits with road design string specified, the inlet capacity will be set to 100%.
3. If no bypass flow string is supplied for a pit, the inlet capacity is set to 100%.
4. If you have a problem with the inlet capacity factors (Drains Version 1 and ILSAX), check the calcu-

lated crossfall and grade.

Running PCdrain for Windows

Data is exchanged to and from PCdrain via the interchange (*.int) file. Gutter profiles and inlet type must be specified in PCdrain before the interchange file is read into PCdrain.

The data sent to PCdrain includes

- s manhole names and types, easting and northing data with surface levels
- s pipe deflection angles at manholes
- s finished surface profile along the centre line of the pipes
- s optional - crossing services - level, size and location along the pipes
- s optional - bypass manholes, road grades and SAG inlet ponding depths
- s optional - up to 2 catchment areas per manhole
- s optional - default catchment characteristics, k values and overland travel times
- s optional - pipe sizes and invert levels

PCdrain Requirements

Manhole names

The manhole name from 12d is assigned to both the structure and catchment name in PCdrain. These names cannot exceed 7 characters.

Manhole type

The 12d manhole type is transferred to the structure type in PCdrain. These names must match those specified in the PCdrain Inlet charts selected (**Data=>Inlet charts**). Select the desired inlet charts BEFORE importing the interchange file.

12d manhole types with an "S" in the name are treated by 12d and PCdrain as a SAG inlet pit. 12d will strip off all characters after the "S" before adding the ponding depth. If a catchment string in set #1 is available for the SAG pit then the ponding depth will be calculated. The 12d manhole type will remain unchanged. A typical example would be a manhole type "ITC" with the sag tick box on would become "ITC0.100" if a ponding depth of 0.1 was calculated.

Bypass Flow

When a catchment string is specified for the manhole, the maximum depth before bypass flow commences is calculated. The lowest point on the catchment string is determined by draping it onto the drainage strings tin. The maximum depth before bypass is calculated manhole setout level less the setout to grate offset less the lowest point on the catchment string.

PCdrain differentiates between manholes (no surface inflow) and gully pits via the 12d manhole type. The bypass flow strings can only be drawn within 1 manhole diameter of the gully pits. Keep the bypass flow strings away from the PCdrain manholes.

Catchments

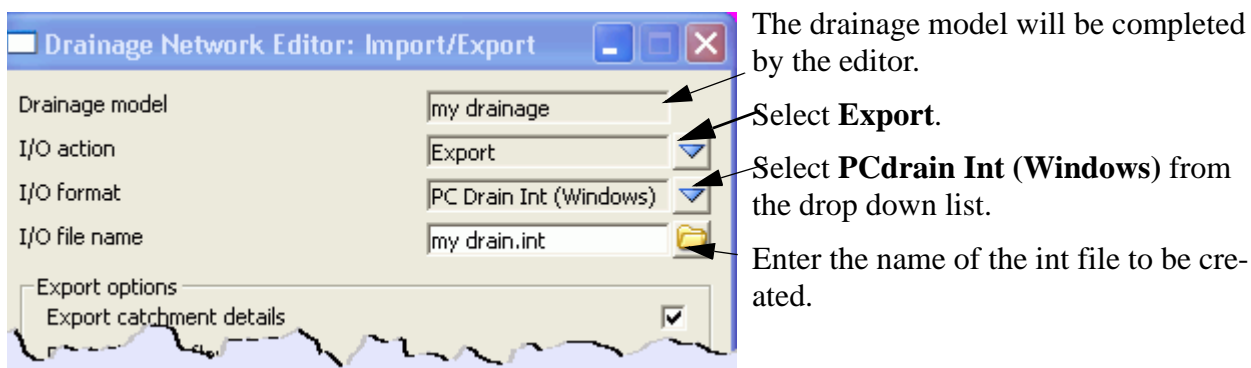
Again, since PCdrain differentiates between inlets and manholes (using the 12d manhole type), ensure that catchments are only drawn for gully inlet and NOT manholes.

12d to PCdrain

1. Export the data to PCdrain selected via the Network editor
Design=>Drainage-Sewer=>Drainage Network Editor

After selecting the drainage network, select the **Import/Export** button and the following dialogue will

appear.



Select the **Run** button and the interface file will be created.

2. Launch the PCdrain for Windows program. If you have a project set up with the design parameters, rainfall data, inlet charts and gutter profiles then open it now and skip to step 8. Otherwise continue with step 5.
3. The Design Parameters can be set as desired with the menu selection **Data=>Design Parameters**.
4. Select the rainfall data using the **Data=>Rainfall** menu selection.
5. Select the inlet charts using the **Data=>Inlet Charts** menu selection. The manhole types specified in 12d must be included in these settings. **More - PCdrain to 12d pit converter**
6. At least one gutter profile in PCdrain needs to be defined. These are set through the menu selection **Data=>Gutter Profiles**. The default gutter section name (**Road ID**) from 12d is **4d** and therefore it is recommended you create a profile with this name and your own description. If you have changed the profile names in 12d (through the spreadsheet interface or the Attribute editor) these new profile names will have to exist in PCdrain.
7. Save this file now so that you can retrieve it later if required. It can be used as a starting template for new jobs.
8. **File=>Import** from the menu. Select the file exported in step 1. The information from 12d may be viewed by selecting **Data=>Network** and then selecting the desired tabs.
9. The HGL level and the pipe elevation at the outlet should be set using the menu selection **Data=>Outlet**.
10. If you have not exported pipe data then the pipe size must be determined. Use the menu selection **Process=>Select Pipe Sizes**.

PCdrain data values

Some PCdrain data values are not available in the 12d network editor. Prior to an import from PCdrain, **initial export values** are used. On the first **import** from PCdrain, 12d attributes are created to hold the PCdrain variables for subsequent exports to PCdrain. These data values are usually changed in the PCdrain menus but may be changed in 12d using the Attribute editor.

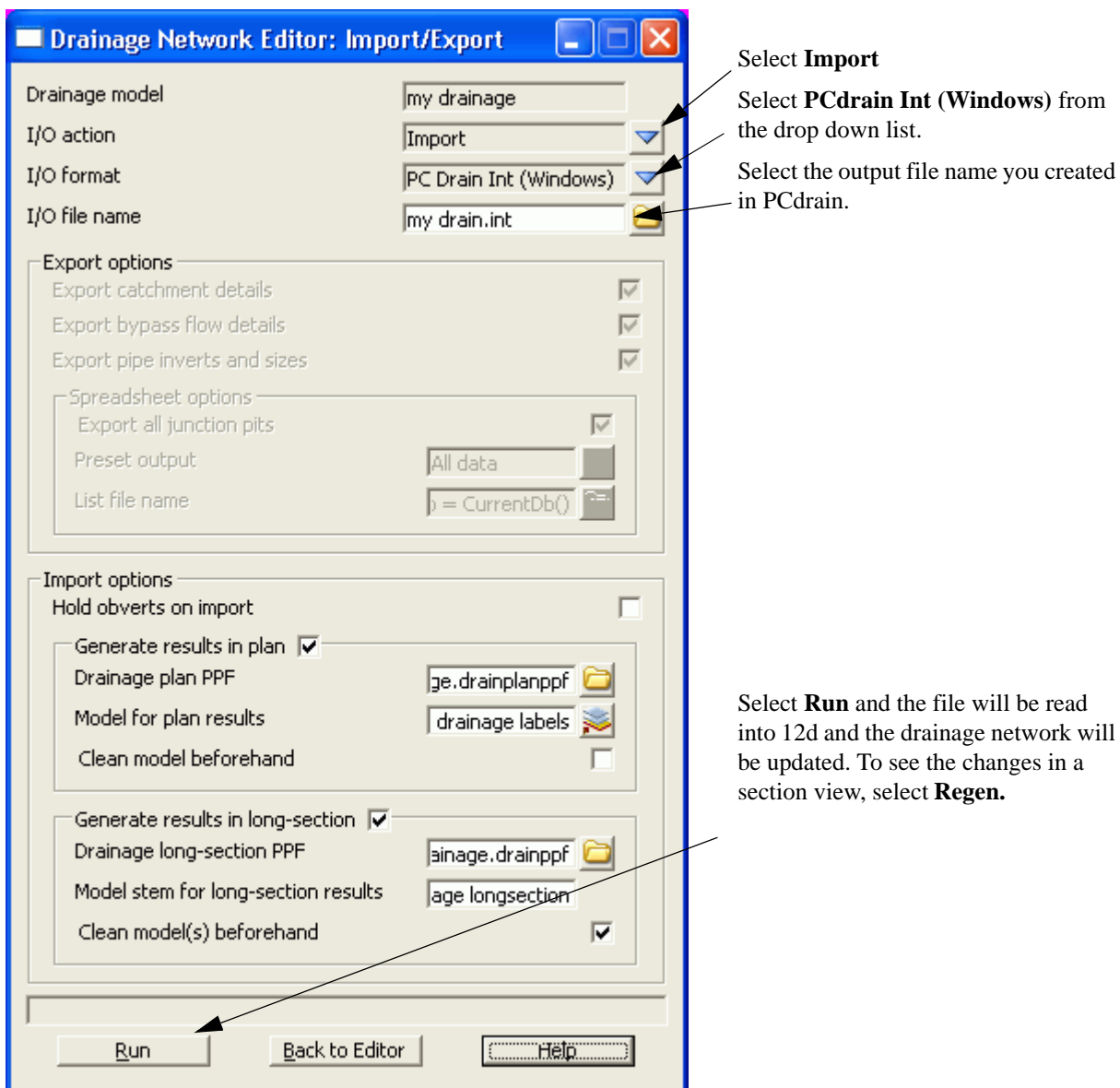
PCdrain	12d editor	12d attribute	initial export value
Kw	not available	kw	12d ku value
Minor Coef	Catch Set 1 - Pervious C (minor)	c minor pervious	default
Major Coef	Catch Set 1 - Pervious C (major)	c major pervious	default
Minor Coef2	Catch Set 2- Pervious C (minor)	c minor pervious2	default

PCdrain	12d editor	12d attribute	initial export value
Major Coef2	Catch Set 2- Pervious C (major)	c major pervious2	default
Tc overrider	Catch Set 1 - Pervious Tc (minor)	tc minor pervious	default
Length of overland flow	Catch Set 1 - Pervious length	catchment length pervious	default
Grade of overland flow	Catch Set 1 - Pervious slope (%)	catchment grade pervious	default
Length of gutter flow	Catch Set 1 - Impervious length	catchment length impervious	default
Grade of gutter flow	Catch Set 1 - Impervious slope (%)	catchment grade impervious	default
Road XSections left	not available	overland profile name	4d
Road XSections right	not available	overland profile name right	4d

PCdrain to 12d

Export the results to 12d using the **File=>Export** menu selection. Note the name of the interchange file you are creating as you will need to enter it inside 12d.

Return to 12d and select **Import/Export** from the network editor and the following dialogue will appear,



A listing of the data imported is stored on the 12d output window.

Manholes that have been specified as SAG inlets will have the ponding depth removed from the end of the PCdrain structure type before the data is stored as the 12d manhole type.

Running Drains - Version 2 & 3

Key Points

1. The Drains database (each project has its own) and the 12d database (drainage.4d) must be synchronised (**More**).
2. For bypass flow, 12d selects pit families for Drains in the following way

The users selects pit group in 12d and at export the pit group is scanned in the drainage.4d file using the road data to select the Drains pit families
3. Data is copied from 12d to the Windows clipboard and then pasted into Drains. 12d can not delete any objects in Drains, it can only add and update.
4. When updating 12d from Drains, always copy the DATA to 12d before the results. 12d will update the network but will not add or delete manholes.

Drains Interface Overview

The Drains program performs the rational and ILSAX hydrology calculations as well as hydraulic grade line calculations that determine pipe sizes and pipe invert levels.

The data sent to Drains includes

- s manhole names and types, easting and northing data with surface levels
- s finished surface profile along the centre line of the pipes
- s optional - bypass manholes, road grades/crossfalls and SAG inlet ponding volumes and depths. Pit family selection using road grade and crossfall data.
- s optional - composite catchment area create from three 12d areas per manhole
- s optional - default catchment characteristics, k values and overland travel times
- s optional - pipe sizes, type and invert levels

Data is copied from 12d to the Windows clipboard and then pasted into Drains (**Edit=>Paste data from spreadsheet**). 12d can not delete any objects in Drains, it can only add and update.

The Drains menu selection **Run=>Design** is used to design the network. Once the drainage network has been designed in Drains the updated design data (**Edit=>Copy data to spreadsheet**) and/or the hydraulic results (**Edit=>Copy results to spreadsheet**) are sent back to 12d via the clipboard.

Always copy the DATA to 12d before the results as the results are deleted inside 12d with every update of the data!

A demonstration version of the Drains program is included on the 12d distribution CD in the directory

Other_Software\Drains

The version is limited in the number of pits allowed.

Synchronising the Drains database and the drainage.4d file.

The Drains database and the 12d drainage.4d file must be synchronised as follows.

All Cases	
Drains database	drainage.4d
Pipe type	Pipe type entries
Only if bypass flow is required	
Drains database	drainage.4d
Pit family	12d manhole group with road data to lookup Drains pit family
Overland route database	One default value set (not in drainage.4d)

Every Drains file begins with a default database and uses that database for the life of the project. This database must be synchronised with the **drainage.4d** file in 12d to ensure the Drains pit families, pit sizes, pipe types and overflow route types.

The following 5 steps will help ensure 12d is synchronised with Drains. More details are given in the sections below.

1)Export the Drains database from your Drains file

Inside Drains select **Project=>Overflow Route database**. Then select **OK** and then **YES**. This will cause Drains to export the database to the file "Drains Connection Data.txt".

2)Create a drainage.4d file from the Drains file

- s From the 12d menu select **Design->Drainage-Sewer->More->Drains to drainage.4d**.
- s Select **Read Drains database**,
- s review the Drains pit families list to identify the character (usually a comma or -) that separates the pit group from the road data and then enter it in the **Pit group separator** field.
- s Check the **12d pit groups** and if they are acceptable
- s select **Create drainage.4d**. The Drains database dump file is copied to the 12d working folder and a drainage.4d file is created in the 12d working folder.
- s **More details below**.

3)Edit the drainage.4d file

From the 12d menu select **Design->Drainage-Sewer->More->Edit drainage.4d**. Select **Find** then edit from the file **more info** button. Set the road grade and crossfalls for the 12d manhole groups.**More details below**.

4)Restart 12d

From the 12d menu select **Project->Restart**.

5)Set the Overflow shape, Update Manhole and Pipe type.

A single global overflow route shape can be specified in 12d via the following routine and then it can be modified in the Drains program. The import operation of the interface will read modified values and store them so that the next export operation will export the modified values.

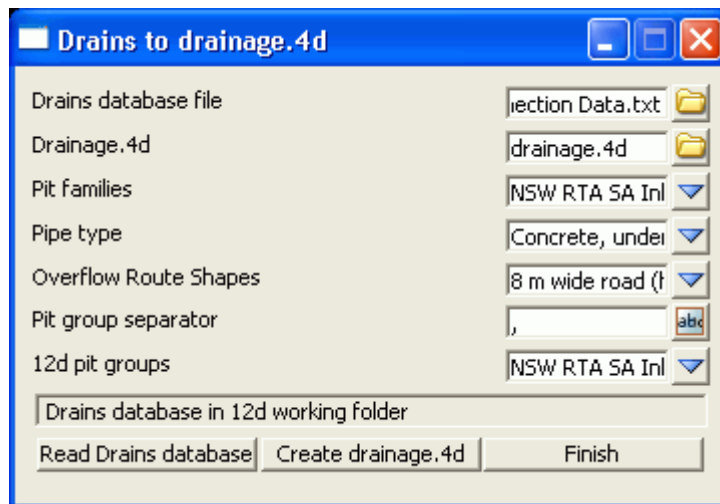
If the network has already been created, using manhole and pipe types that no longer exist in the drainage.4d file, they will have to be updated before the export to Drains can occur. You may update them using the drainage network editor or you may set **all** of the manhole and pipes types to **one value** using this

routine. Later you may change them individually using the **Drainage network editor**.
 From the 12d menu select **Design->Drainage-Sewer->More->Drainage io defaults**.
More details below.

Drains to drainage.4d file

Position of option on menu: Design =>Drainage-Sewer =>More=>Drains to drainage.4d

On selecting the Drains to drainage.4d option, the Drains to drainage.4d panel is displayed.



Key Points

1. Select **Read Drains database (12d will search the usual locations for the Drains database)**
2. Review the Drains pit families list to identify the pit group separator and then enter it in the **Pit group separator** field. **PRESS THE ENTER KEY!**
3. Check the **12d pit groups** and if they are acceptable select **Create drainage.4d**.

The Details

The Drains database dump file **Drains Connection Data.txt** is copied into the 12d working folder and read. The choices for the **Pit families**, **Pipe types** and **Overflow Route Cross Section Shapes** are loaded into the panel. The user must select a **Pit group separator** to separate the road grades and crossfalls from the pit family names. The resulting **12d Pit Groups** will be calculated and displayed in the choice box. **Create drainage.4d** will create a **drainage.4d** file that may then be edited to specify the road grade and crossfall threshold values. Once the file is created you may review/edit it by selecting the **More Info** icon then **Edit** on the **Drainage.4d** field. The **Overland route shapes** are not exported to the drainage.4d file and are presented for your information only.

YOU MUST RESTART 12D FOR THE NEW DRAINAGE.4D FILE TO BECOME ACTIVE!

Field Description	Type	Defaults	Pop-Up
Drains database file	file	Drains Connection Data.txt	

You must update this file from Drains before each use of this panel. Inside Drains select Project=>Overflow Route database. Then select OK and then YES. This will cause Drains to export the database to the file "Drains Connection Data.txt".

*Selecting **Enter** in this field or selecting **Read Drains database** will cause the panel to search for the*

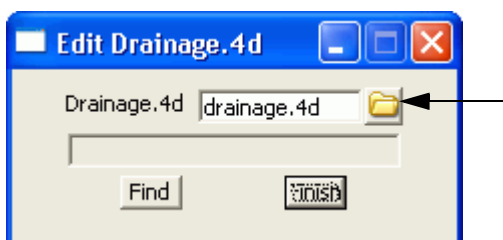
database dump in the folders **C:\Program Files\Drains\Program** and **C:\Program Files\Drains\Demo\Program**. If the Drains program is installed in another folder then you must browse for the file. After reading the file choice boxes below will be populated. Drains Connection Data.txt will be copied into the 12d working folder.

Drainage.4d	file	drainage.4d
<i>The drainage.4d will be created in the 12d working folder unless otherwise specified. It will only be used for 12d projects in this folder.</i>		
Pit families	choice	Drains pit families
<i>These are the Drains pit families that will be exported to the drainage.4d file. The 12d pit groups will be created from this list.</i>		
Pipe type	choice	Drains pipe types
<i>These are the Drains pipe types that will be exported to the drainage.4d file.</i>		
Overflow Route Shapes	choice	Drains Route Shapes
<i>These are the Drains Route Shapes and are for information only.</i>		
Pit group separator	input	
<i>These characters will be used to remove the road grade crossfall data from the Pit families above. The data before this character will become the 12d pit groups. Press Enter or select Read Drains database to create a new list of 12d pit groups.</i>		
12d pit groups	choice	12d pit groups
<i>These are created from the Pit family list above by deleting all text after the Pit group separator. This should delete all of the road grade and crossfall information from the pit group names.</i>		
Read Drains database	button	
<i>Searches for the Drains database (see general description above) and populates the choices fields.</i>		
Create drainage.4d	button	
<i>Create a local copy of the drainage.4d file.</i>		

Editing the Drainage.4d file

Position of option on menu: Design =>Drainage-Sewer =>More=>Edit drainage.4d

On selecting the Edit drainage.4d option, the Edit drainage.4d panel is displayed.



Select the **Find** button to search the 12d path for the current **drainage.4d** file. Select the **More info** button and then **Edit** to edit the file.

The drainage.4d file contains Manhole and Pipe commands. 12d also uses the Manhole commands to specify a manhole group by using the prefix "group". Details follow.

Pit Families and Manhole Groups

Version 2+ of the Drains clipboard interface uses a **pit family** to describe the kerb shape. Optionally, the Drains pit families also have the road crossfall and/or grade attached as a suffix to the name with a special character between them (pit group separator). Therefore there may be many pit families that have the same kerb shape but different road grades and cross falls. All of these pit families with the same prefix are brought together in 12d as a **manhole group**.

An example manhole group is the drainage.4d file is shown below. The 12d group is called **NSW RTA Pits** and 12d uses the road grade to select which pit family should be sent to Drains. In this example the road crossfall would not be used in selecting the pit family.

The **pit group separator** is a "-". This character separates the pit group from the road data.

It is up to the user to decide the grade when the next pit family should be used. In this case the threshold value for the gutter grade is set midway between the published values of the inlet curves. For example at a gutter grade of 2% 12d starts sending the **NSW RTA Pits - 3% slope** pit family.

This pit families listed on the right must match exactly with those in the Drains pit database.

```
Manhole "group NSW RTA Pits" {
//   cross fall, gutter grade, cap1, cap2, cap3, cap4pit family
//4d   0,      1,   0,   0, 0.0, 1.0      NSW RTA Pits - 1% slope
//4d   0,      2,   0,   0, 0.0, 1.0      NSW RTA Pits - 3% slope
//4d   0,      4,   0,   0, 0.0, 1.0      NSW RTA Pits - 5% slope
//4d   0,      6,   0,   0, 0.0, 1.0      NSW RTA Pits - 7% slope
//4d   0,      8,   0,   0, 0.0, 1.0      NSW RTA Pits - 9% slope
}
```

An example with crossfalls follows.

```
Manhole "group NSW RTA Pits" {
//   cross fall, gutter grade, cap1, cap2, cap3, cap4
//4d   1,      1,   0,   0, 0.0, 1.0      NSW RTA Pits - 1% crossfall, 1%
slope
//4d   1,      3,   0,   0, 0.0, 1.0      NSW RTA Pits - 1% crossfall, 3%
slope
//4d   1,      5,   0,   0, 0.0, 1.0      NSW RTA Pits - 1% crossfall, 5%
slope
//4d   1,      7,   0,   0, 0.0, 1.0      NSW RTA Pits - 1% crossfall, 7%
slope
//4d   1,      9,   0,   0, 0.0, 1.0      NSW RTA Pits - 1% crossfall, 9%
slope

//4d   3,      1,   0,   0, 0.0, 1.0      NSW RTA Pits - 3% crossfall, 1%
slope
//4d   3,      3,   0,   0, 0.0, 1.0      NSW RTA Pits - 3% crossfall, 3%
slope
//4d   3,      5,   0,   0, 0.0, 1.0      NSW RTA Pits - 3% crossfall, 5%
slope
//4d   3,      7,   0,   0, 0.0, 1.0      NSW RTA Pits - 3% crossfall, 7%
slope
//4d   3,      9,   0,   0, 0.0, 1.0      NSW RTA Pits - 3% crossfall, 9%
slope
```

}

The Drains pit family names must match the names in the last column EXACTLY!

Manhole Types and Pit Sizes

Each Drains pit family has several pit sizes. The Drains pit sizes link to the 12d manhole types and therefore all Drains pit sizes should exist in the 12d drainage.4d file.

The pit size will be read back from Drains into 12d as the pit type so that it can be placed on the drainage long sections and pit schedules.

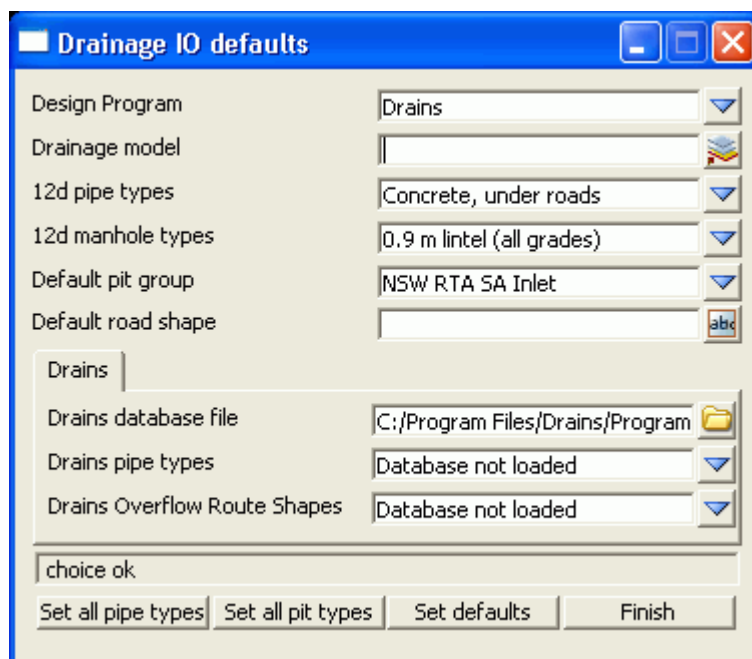
Pipe Types

The pipe type selected in 12d must exist in the pipe database inside Drains. Simple “2” for class 2 or “RCP” do not exist in Drains.

Setting the Overflow Route, the Pit and Pipe types

Position of option on menu: Design =>Drainage-Sewer =>More=>Drainage IO Defaults

On selecting the Drainage IO Defaults option, the Drainage IO Defaults panel is displayed.



The routine changes ALL of your manhole and pipe types in a model to a single value. If you have changed your drainage.4d file after creating your drainage network, the manhole and pipe types you originally selected may no longer be valid (i.e. in the drainage.4d file).

Field Description	Type	Defaults	Pop-Up
Design Program	choice	Drains	Drains,PCdrain
<i>The drainage model to be updated.</i>			
Drainage model	file		
<i>The drainage model to be updated.</i>			
12d pipe types	choice		values from drainage.4d

Set all pipe types will set all pipes in the model to this value

12d manhole types choice values from drainage.4d

Set all pit types will set all manholes in the model to this value

Default pit groups choice values from drainage.4d
*manhole definitions in the drainage.4d file that have **group** as a prefix are included.*

Default road shape choice values from drainage.4d
*type the desired name or if using Drains select the desired shape from the **Drains Overflow route shapes**.*

Drains Tab

Drains database file file

*pressing enter in this field will start a search for the Drains database dump. The search path is the specified folder, C:\Program Files\Drains\Program then C:\Program Files\Drains\Demo\Program. If the file is found the choice fields below are populated. **It is highly recommended that this file be in the 12d working folder.***

Drains pipe types choice 1 values from Drains file

*the pipe types are retrieved from the last Drains database dump. Changing this value will update the **12 pipe types** above.*

Drains Overflow Route Shapes choice values from Drains file

*the overflow route shapes are retrieved from the last Drains database dump. Changing this value will update the **Default road shape** above.*

Set all pipe types button
all pipe types in model are set to this value

Set all pit types button
all pit types in model are set to this value

Set defaults button
*the defaults for the **Drains Overflow Route Shapes** and **12d pit group** are set*

Finish button
removes the panel

Drains Version 2+ Requirements

Manhole Names

The 12d manhole names cannot be more than 9 characters long. 12d uses 2 additional characters to the manhole name at export time create names for the pipes, overflow routes and catchments. For example manhole "A-1" will have a bypass route "F A-1", a catchment "C A-1" and a downstream pipe "P A-1".

Bypass Flow (Overland Flow Routes)

There are 3 requirements for Drains bypass flow.

1. Select **Default pit group** (Network editor->Defaults->Pits->Pit group). The Drains and 12d databases must be in sync.

2. Bypass strings in the **Bypass route model** specified (Network editor->Global->Utility Models->Bypass flow model. For more details see **Bypass Flow**.)
3. Road grade and crossfall calculated (Network editor->Global->Utility Models->Road design file)

The overland flow strings are not allowed to pass through the outlet pit on the network.

SAG Inlet Calculations

SAG inlets are manholes where the water ponds at the surface rather than flowing past. If a SAG inlet has a catchment string the overflow depth and volume are calculated. The catchment string from Set #1 is draped onto the design tin and the lowest point is found on the draped string (stored as a 12d pit attribute **overflow level**). The storage volume inside the string up to this point is measured and stored as a 12d pit attribute **overflow volume from level**. The pit cover level and **Setout to grate offset** are subtracted from the lowest point on the catchment string to determine the Max Ponding Depth.

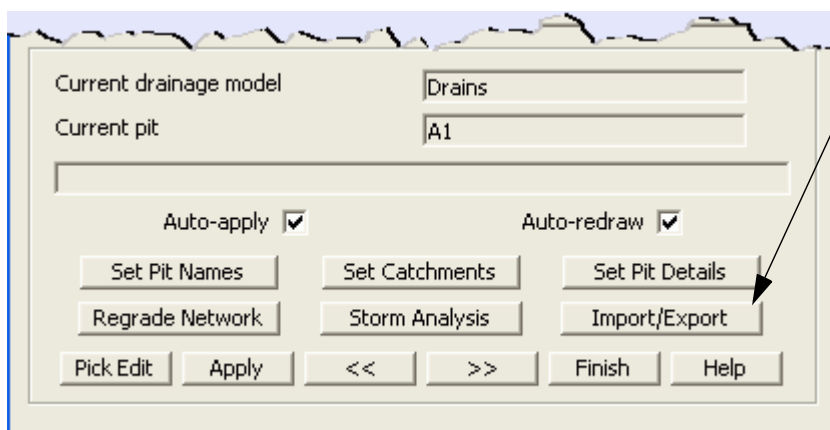
Results

Drains exports the maximum data from all of the rainfall events analysed. Therefore, ensure you analyse only the rainfall events desired before copying the results to the clipboard. To verify the data that is being sent to 12d, copy the data into a spreadsheet so you can view it there first. The pit sizes selected in Drains will be stored in 12d as the manhole type. Therefore the pit sizes in Drains should exist as manhole types in the drainage.4d file. If pit families are changed in Drains the pit group in 12d will be updated by search for the pit family in the drainage.4d file.

12d to Drains

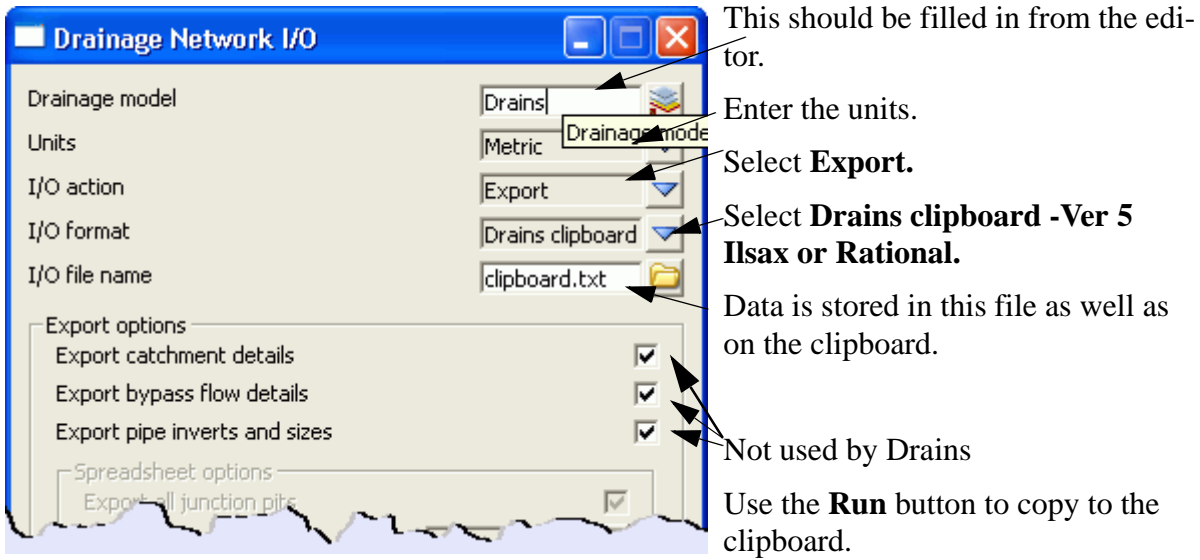
Setup your drainage network models and ensure they have been assigned pit names.

1. Copy the data to the clipboard



From the Drainage network editor select the **Import/Export** button.

The following interfaces dialogues will appear.

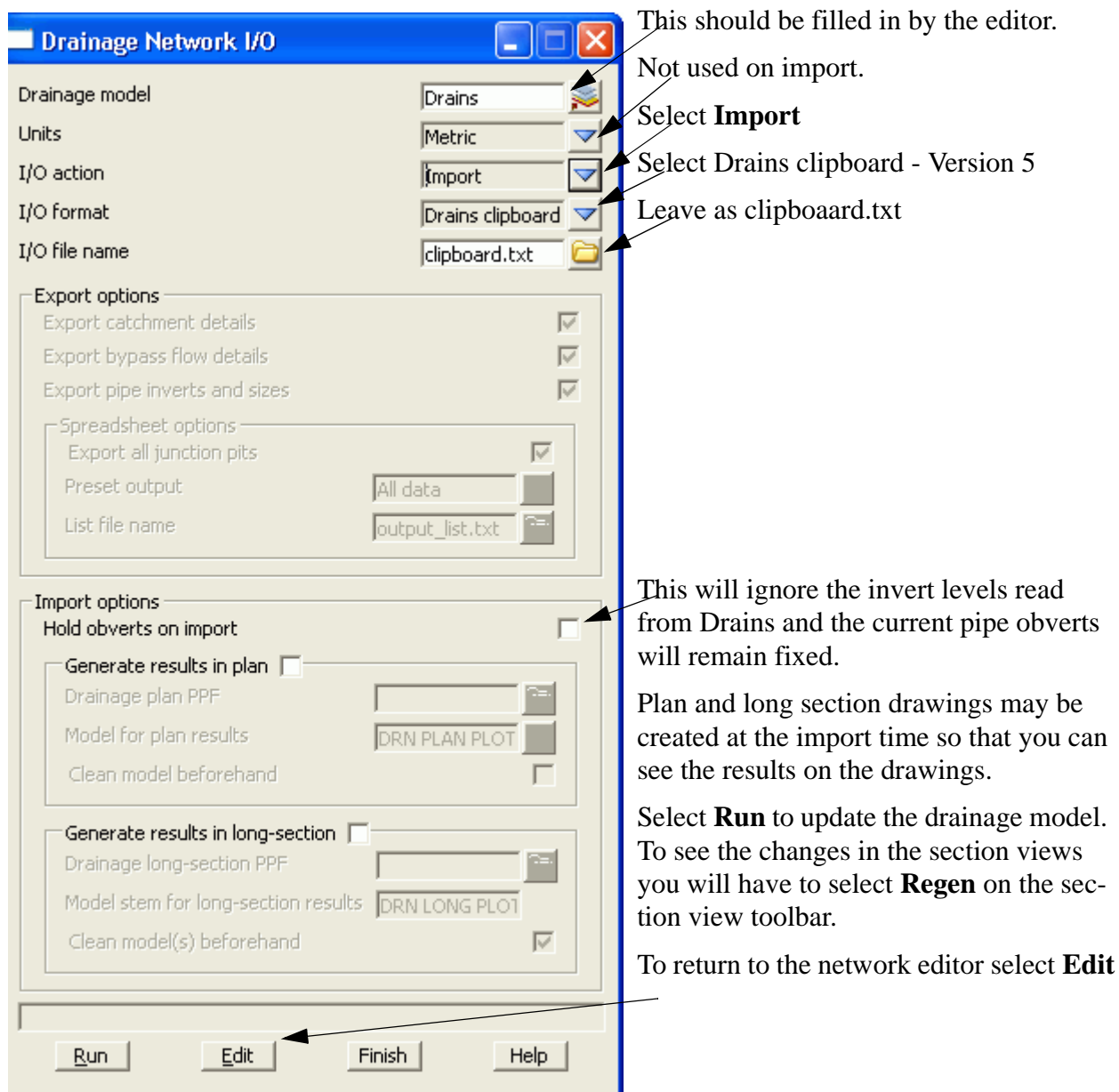


2. From within the Drains program select **Edit =>Paste data from spreadsheet**. If you paste the data into a Drains project that has a hydrological model and rainfall data already defined the project will be ready to run.
3. Use the Drains Run=>Standard design to design your pipe sizes and invert levels. The Run=>Advanced Design will select the size of the manholes as well.

Drains to 12d Update

The following steps are required to update the 12d model with the Drains hydraulic results and changes to the pipe sizes and inverts.

1. To update the pipes and invert levels in 12d, select **Edit->Copy Data to Spreadsheet** from the Drains menu.
2. From within the 12d Drainage network editor select **Import/Export**.



IMPORTANT: THE DATA MUST BE PASTED BEFORE THE RESULTS!

12d erases the hydraulic and hydrology data when the physical data is updated. Therefore, always paste the data before the results.

Running XPSWMM and RAT2000

The drainage design with all three of the XP software programs follows the same methodology. The process is substantially automated with the XP-SWMM program so that the XPX file is automatically read by XP-SWMM and automatically created when leaving XP-SWMM.

Drainage design with XP programs includes the following steps.

1. 12d creates an XPX file that is read by the XP programs.
2. The XP program is then run in the design mode to determine the pipe sizes and invert levels.
3. If bypass and overland flows are to be modelled then the inlet capacities need to be defined and then run the XP program in the Full Analysis Model.
4. The XP program creates an XPX file for 12d to import.

XP Program Requirements

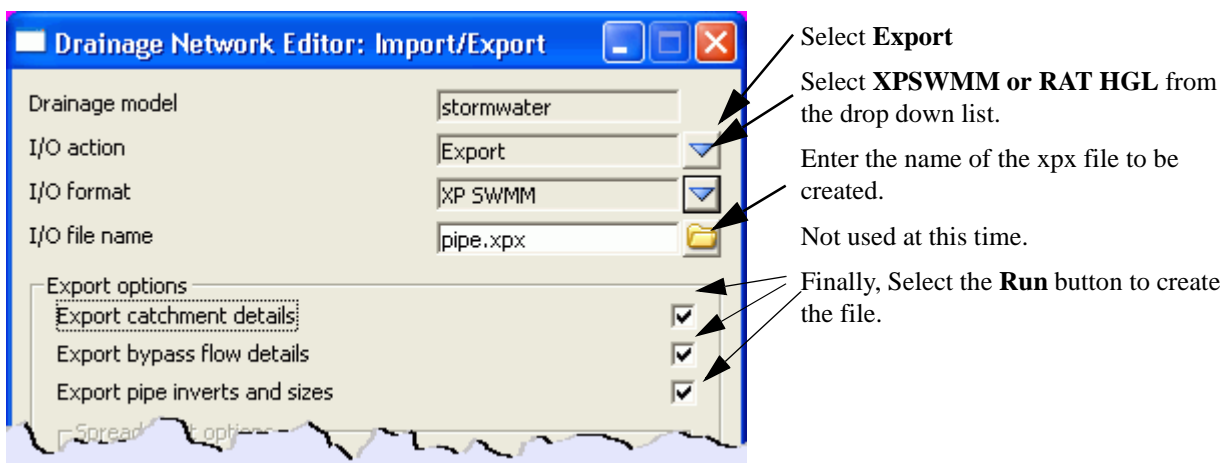
12d to the XP Programs

The x,y pit layouts and the cover/surface levels are obtained from your drainage network while the catchment and overland flow data comes from the models specified in the drainage interface dialogue.

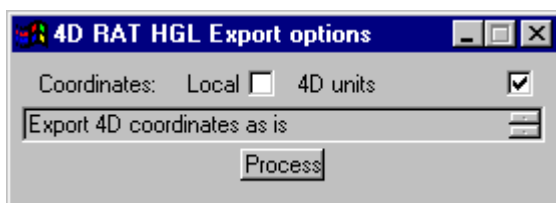
The steps required to transfer the data to the XP programs are as follows.

1. Setup your drainage network models.
2. To create the XPX file for XP programs start the Drainage Network Editor and select **Import/Export**

The following interfaces dialogues will appear.



If exporting to RAT-HGL the following dialogue will appear.



If you are using old versions of RAT-HGL (1996 or earlier) select use **Local** otherwise select **4D units** (eastings and northings).

Select process.

3. The XP SWMM program will automatically startup and load the XPX file.

From within RAT-HGL, either select **File =>New** and follow the input prompt or load a file that contains all of the pit inlet rating curves, hydrological and design data without a pipe network. Many users

have such RAT-HGL files setup so as to streamline the design process.

The xpx file for RAT2000 will have the file startup.xpx added to it so that you may include all the startup global data that you require. The

Fixed inlet capacities and rating curve names indicating road grade and crossfall may be set in the **drainage.4d** file. The format for these names is pit name-crossfall-road grade (ex SA2-3-4). These curves must exist in this file.

4. To read in the pipe file created above, select **Special =>Import Data** and select the xpx data file. Warnings will be given stating that several fields are inactive. This is expected as more data is sent to RAT-HGL than is needed at this time. Select the **Close Square** on the Help title area and the pipe network and catchments should now appear on the screen.
5. If you want RAT-HGL to redesign you network, change the analysis mode to Design mode by selecting **Special=>Job Control** and **Select Design mode**. Do not do this if you want to analyse the network you layed out in 12d (used for existing systems).
6. Select the rainfall events to design/analyse and the **LB** (twice) on **OK** to return to the layout. Now select the outlet and enter the starting tailwater levels.
7. Now you can run RAT-HGL (**Special =>Solve**).

XP Programs to 12d

Once you have your design finished, the following steps are required to update your 12d model. Your design may contain several return periods in the analysis (Rp1 to Rp7) but 12d reads only the results from Rp1. The following table is taken from the RATHGL output file (*.out extension) and the results indicated are read back into 12d via the xpx file.

HGL PIPE NETWORK ANALYSIS SUMMARY RETURN PERIOD 5 YEARS
PROJECT:12d DRAINAGE LAYOUT

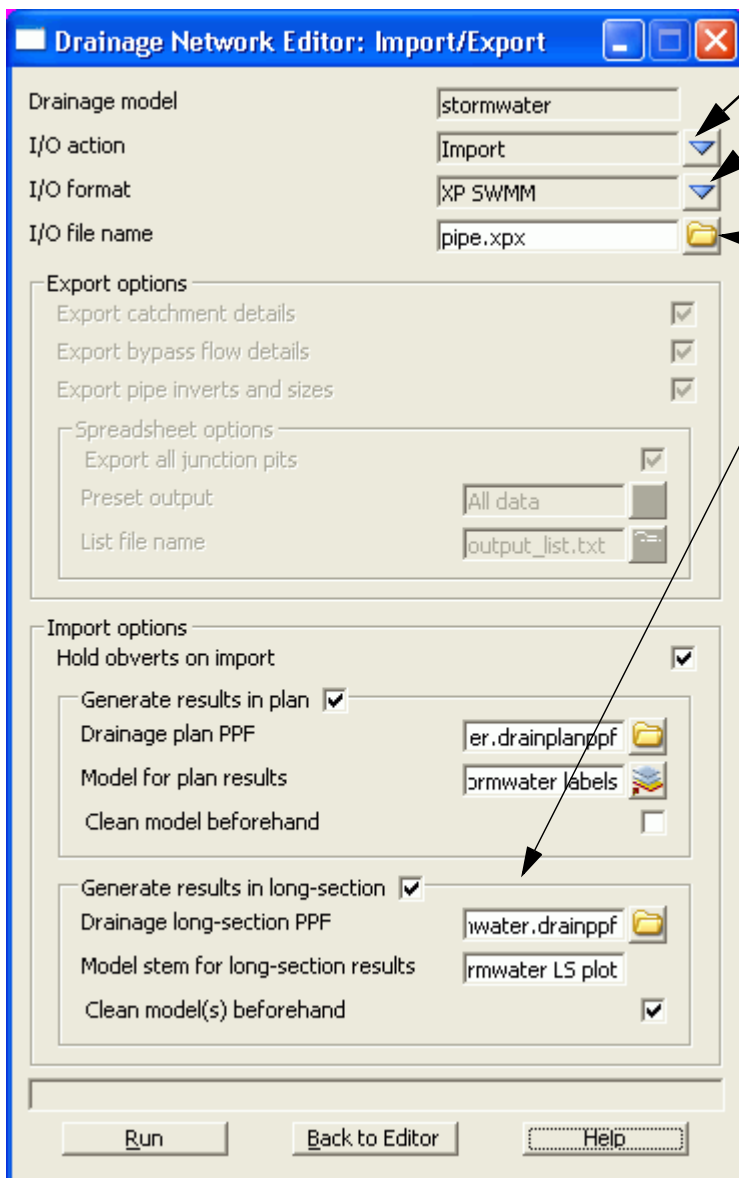
```

-----
|ITEM DIM| RESULT
-----
RN      -   1   2   3   4   5   6
NN      -  1-1 2-1 1-2 3-1 1-3 1-4
DN      -  1-2 1-2 1-3 1-3 1-4 1-4
MT      -   99  99  99  99  99  0
DHGL    M 29.258 29.258 28.139 28.139 27.269 .000 DS HGL
DD      M .225 .375 .375 .300 .450 .000 Diameter
DCTL    HGL HGL HGL HGL HGL
DO      M .225 .375 .375 .300 .450 .450
QO      M3/S .033 .181 .237 .075 .334 .353 Flow
VELD    M/S .826 1.639 2.148 1.065 2.100 .000
NORM    M .106 .264 .271 .153 .289 .000
CRIT    M .152 .314 .345 .215 .396 .000
KP      - .00 .00 .00 .00 .00 .00
SF      M/M .0040 .0082 .0140 .0046 .0107 .0000
LEN     M 45.93 18.44 54.65 31.31 49.91 .00
HGLP    M 29.444 29.409 28.905 28.284 27.802 .000 US HGL
DU      M .225 .375 .375 .300 .450 .000
VELU    M/S .826 1.639 2.148 1.065 2.100 .000 Velocity
UCTL    HGL HGL HGL HGL HGL
KU      - 1.50 1.50 1.50 1.50 1.50 .00 Ku
KL      - 1.50 1.50 1.50 1.50 1.50 .00
KR      - 1.50 1.50 1.50 1.50 1.50 .00
KW      - 1.50 1.50 1.50 1.50 1.50 .00 Kw
UHGL    M 29.496 29.615 29.258 28.370 28.139 27.269
LHGL    M 29.496 29.615 29.258 28.370 28.139 27.269
RHGL    M 29.496 29.615 29.258 28.370 28.139 27.269
UWSL    M 29.496 29.615 29.258 28.370 28.139 27.269 HGL PIT
MWSL    M 30.297 29.615 29.403 28.875 28.340 27.369
AF      M3/S .033 .207 .023 .094 .040 .000
IF      M3/S .033 .181 .023 .076 .023 .023
IC      M3/S .036 .227 .026 .076 .023 .023
BF      M3/S .000 .026 .000 .019 .017 .000
ID      M .000 .000 .000 .000 .000 .000
ITW     M .000 .000 .000 .000 .000 .000
IVEL    M/S .000 .000 .000 .000 .000 .000
IVD     M2/S .000 .000 .000 .000 .000 .000
FC      -      *      #      #      #
-----

```

In addition to the results, the following input data is read back into the 12d model so that it may be exported back to RATHGL in the future (if required). 100% of your RATHGL data is not included in the XPX formats and the contents of the XPX file will depend upon your design mode. Therefore, use caution if you read an XPX file into an existing RATHGL model and check your data once inside RATHGL.

1. From within RAT-HGL, produce an XPX file for 12d to read by selecting **Special=>Export Data** and following the default prompts.
2. From within 12d, select the **Import/Export** button on the Drainage Network Editor. The following panel will appear.



Select **Import**.

Select to select **RATHGL** or **XP-SWMM**.

Select the file name specified in step 1

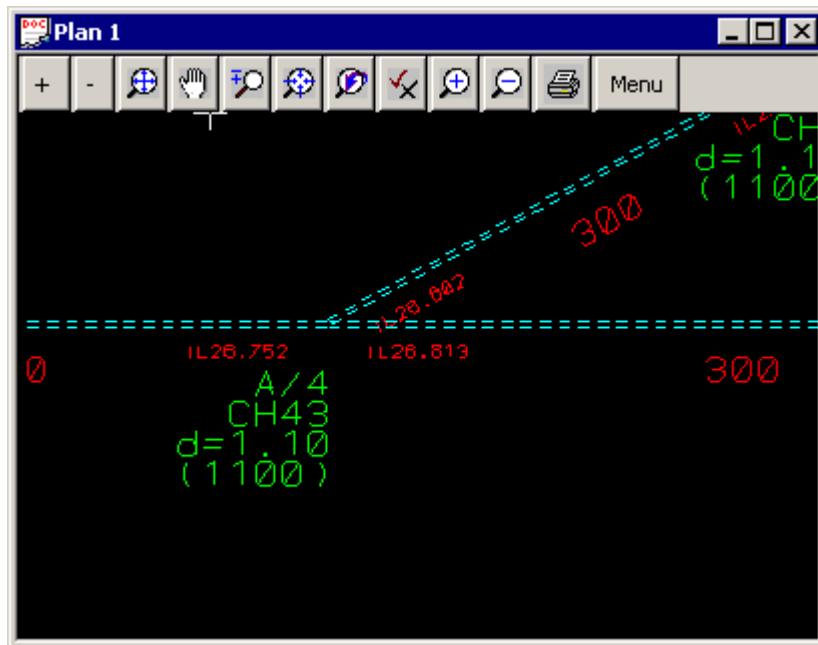
Select **Run** to update the drainage model and import hydraulic/hydrological results.

Detailed Drainage Plan Drawing

12d drainage has the capability to create detailed drainage plan drawings with the following features:

- s create symbols at the manholes and the type of symbol is controlled by the manhole type (given when you create the manhole).
- s draw lines with line styles to represent pipe sizes
- s create text labels for manhole types
- s create text labels for pipe diameters and inverts
- s create text labels for house connection types, invert levels and chainages
- s indicate direction of flow on pipes.

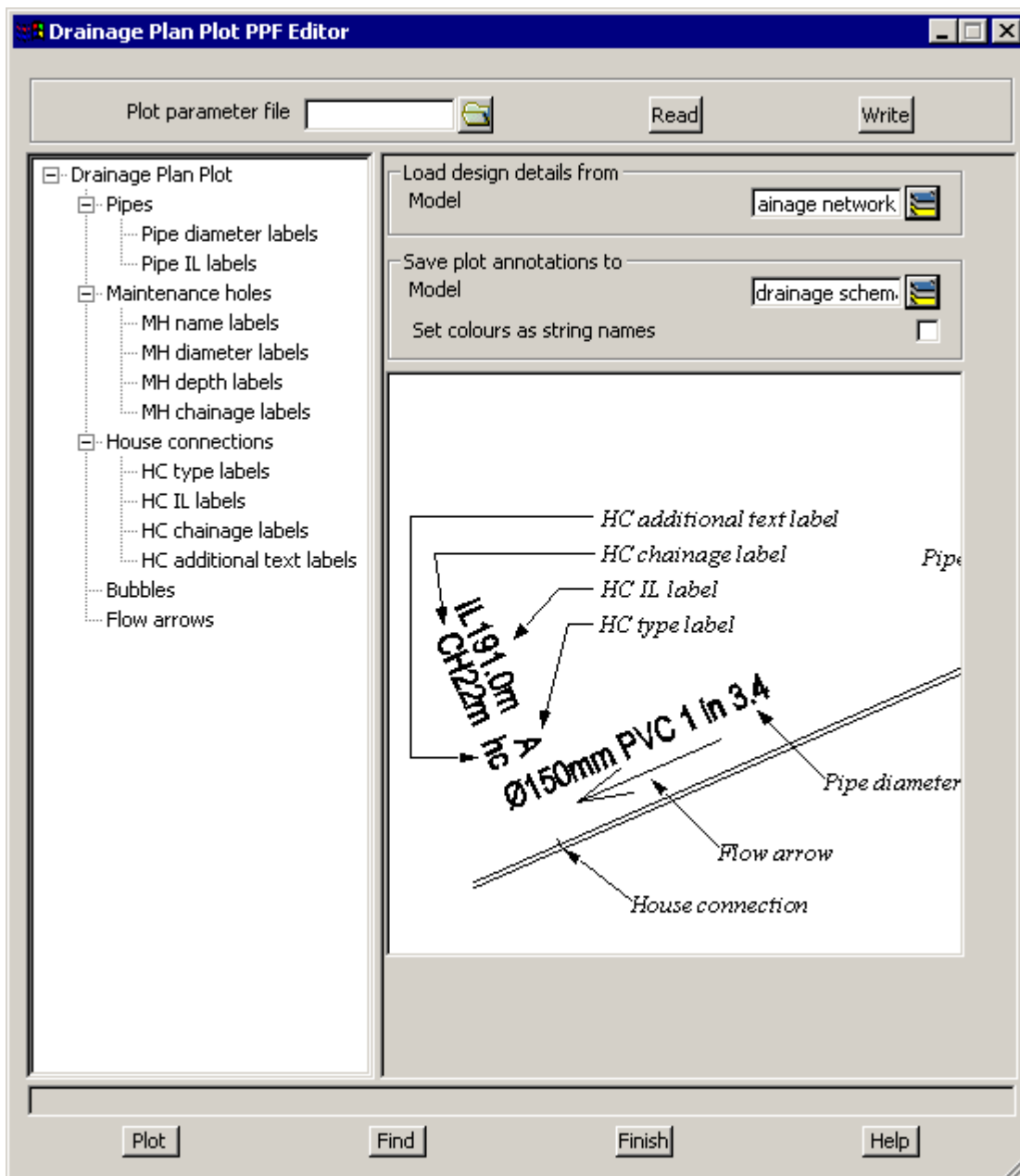
An example is shown below



Usage

This option is accessed from the menu selection

Design => Drainage-Sewer => Plots => Plan Annotations



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Plot parameter file	file box		
----------------------------	----------	--	--

Optional - no dpf is required. The default settings will create a schematic drainage drawing. A custom dpf may be selected if desired.

Load design details from	model box		
---------------------------------	-----------	--	--

data source for drainage strings to be labelled

Save plot annotations to	model box		
---------------------------------	-----------	--	--

labels to be created are stored here, Undo will remove the labels created

set colour as string name? tick box

when selected the string colour will be used for the string name (to be used for DWG/DXF export using map files)

Plot button

Creates the labels in the model specified

Find button

used to locate plot parameter input boxes using Version 5 plot parameter names

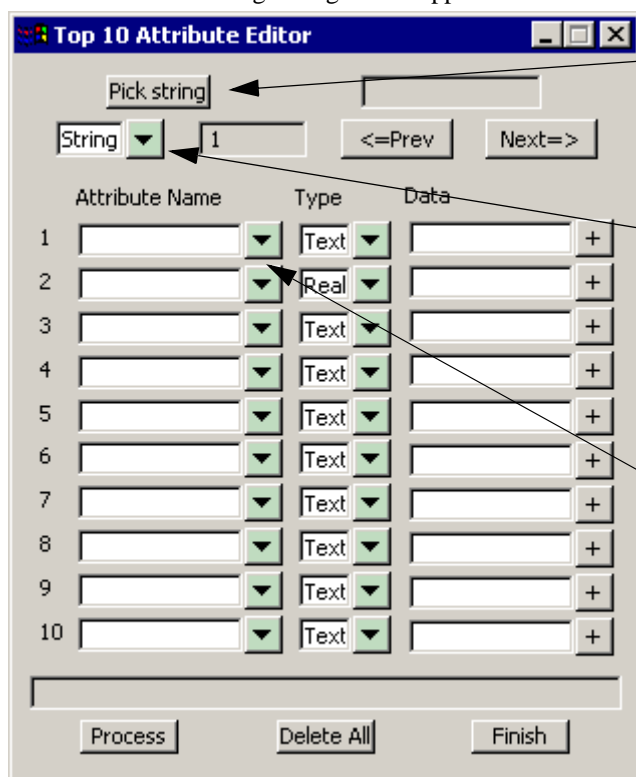
IMPORTANT! to turn off any data change the text height to zero.

Reviewing, Changing and Creating User Defined Attributes

The catchment data is stored within 12d as user defined attributes. These attributes are automatically created by 12d when required but you are free to change them or add more as desired. The attributes may be exported to a spreadsheet and edited and then imported back into 12d. To work with the user defined attributes within 12d select

Design=>Drainage-Sewer=>More=>Top 10 Attribute Editor.

The following dialogue will appear.



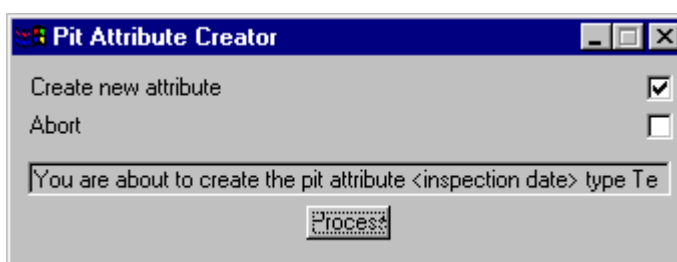
First Select **Pick** to select the string that contains the user attributes (the drainage string). The strings will be highlighted in white when they are selected.

All catchment data is store with the pits in drainage strings. To access the pit attributes, select the drop down icon and then select **Pit**. A circle will be drawn around the pit selected. **Next** and **Prev** will now move you from pit to pit.

Select the drop down icon and then select the **Attribute Name** from the list of existing user defined attributes. These attributes include all of the attributes in the model that the string exists in.

They may not be defined for the pit you are editing. **Not found** will be displayed in the **Data** field if the pit does not have that attribute defined.

To change the value for the attribute enter the new value in the **data** field. If the attribute does not exist, deleting the **not found** text and adding data will create it. The message on the right will be displayed whenever you are creating a new attribute.



The drainage.4d file

The drainage.4d file controls many of the settings for the pit and pipes types inside 12d. This section details the format of the drainage.4d file. Changes to this model take effect only after 12dmodel has been restarted.

The original **drainage.4d** file is found in the “program file\12d\12dmodel\7.00\set_ups” directory. **Do NOT** change this file. Copy it into “program file\12d\12dmodel\7.00\user” directory and edit it there. Files in the user directory are used by preference and they are never over written by a 12d update.

```
Manhole "SA2" { // internal pit size data (width, length)
//SIZE 100, 200
//DESC "2m lintel - grate and side entry"
// pit inlet capacities from Mathematical Description of Pit Entry Capacities Feb 1992
// cross fall, gutter grade, cap1, cap2, cap3, cap4
//4d 1, 1, 0, 0, 0.230, .621
//4d 1, 3, 0, 0, 0.225, .604
//4d 1, 5, 0, 0, 0.215, .577
//4d 1, 7, 0, 0, 0.200, .538
//4d 1, 9, 0, 0, 0.235, .593

//4d 3, 1, 0, 0, 0.495, .819
//4d 3, 3, 0, 0, 0.270, .568
//4d 3, 5, 0, 0, 0.290, .599
//4d 3, 7, 0, 0, 0.400, .727
//4d 3, 9, 0, 0, 0.330, .649

//4d 5, 1, 0, 0, 0.540, .793
//4d 5, 3, 0, 0, 0.480, .747
//4d 5, 5, 0, 0, 0.460, .744
//4d 5, 7, 0, 0, 0.450, .729
//4d 5, 9, 0, 0, 0.420, .704
```

The format of the entries is as follows.

1. All lines are to be blank or begin with //. This is not the normal 12d convention.
2. //SIZE indicates the values to be read and stored in the user defined pit attributes **pit internal width** and **pit internal length** when the pit schedule macro is run. A comma is used to separate the two values.
3. //DESC indicates that the following quoted text will be read and stored in the user defined pit attribute **pit type description** when the pit schedule macro is run.
4. The pit inlet capacity table data must begin //4d and commas are used to separate the data (comma delimited).
5. SAG pit names must begin with the 3 letters SAG.
6. The sample data provided is taken from the paper, “Mathematical Description of Pit Entry Capacities”, Feb 1992, by Geoffrey O’Loughlin *et al.*

Pit Inlet Capacities

The pit inlet capacity tables contained within the **drainage.4d** file are used by the drainage design packages in different ways but with a common philosophy. An example entry may be found in the section

“The drainage.4d file” on page 2102

On grade pits

Crossfall data must never decrease moving down the table while the gutter grade data must increase for a constant crossfall. When the tables are being read, the next set of capacity factors will not be used until the crossfall and grade are equal to or exceed the values in the tables. The factors are not interpolated!

Drains and ILSAX

The cap1, cap2, cap3 and cap4 values are used to describe the inlet capacity of the pit as described in their user manuals.

RAT-HGL

If cap2, cap3 and cap4 are all equal to zero then a fixed inlet capacity equal to cap1 will be exported to RAT-HGL. If the sum of these three values is greater than zero then a pit type will be created in the format of **pit_type-crossfall-roadgrade**. For example SA2-3-2 for a SA2 pit with a road crossfall of 3% and a road grade of 2%. A rating curve with this name will have to exist inside RAT-HGL. 12d has no way of transferring the rating curve itself into RAT-HGL.

PC Drain

Similar to RAT-HGL, PC Drain has its own rating curves defined internally. The road grade is sent as a separate piece of data to PC Drain so that the pit inlet capacity may be determined.

SAG Inlets

Sag inlets always have a manhole type that begins with the three letters SAG or for PCdrain they end in a S. Sag pits contain only one line of data and an example follows.

```
Manhole "SAG3" {
// pit inlet capacities from Mathematical Description of Pit Entry Feb 1992
// if zeros are entered Sc1 and Sc2 then calculated crossfalls (if available) are used for
Drains and ILSAX
// Sc1 and Sc2 and the slope upstream on the overflow path is used for S11 and S12
//      Sc1      ,      Sc2      ,      S11      ,      S12      ,      lintel length,      max depth
//4d      3.0,      3.0,      0.5,      0.5,      3,      .150
}
```

Special conditions exist for each of the following programs.

Drains and ILSAX

RAT-HGL, RAT 2000 and XP SWMM

No direct means of specifying SAG pits has been established. A fixed inlet capacity before bypass begins can be calculated and entered with the format of an on grade pit. Cap1 would represent the inlet capacity with cap2, cap3 and cap4 being set to zero.

PC Drain

PC Drain places a suffix code in the pit type to specify that the pit is a SAG pit. For example an 9S0.03 indicates that pit type 9 is a sag pit and the maximum depth before bypassing is 30mm.

Flooded Width Analysis and HEC RAS

The Calculate Flooded width procedure creates cross sections along the **bypass flow** paths and then calculates the flooded width at each section using Manning’s normal depth calculations. A HEC-RAS project (same name as the bypass flow string) is also created for each line. The flooded width is indicated on each section as a blue line if it is less than a user defined width and a red line if the flooded width exceeds the limit. Details of the calculations such as the velocity, depth, wetted perimeter and slope can be exported to a spreadsheet for further analyse (velocity times depth calculations for example). The discharges imports from the urban stormwater design packages are shown in the following table.

Design Program	Discharge Event
PCdrain Drains	Minor ARI Maximum flow event analysed
ILSAX	Maximum flow event analysed
RAT HGL	First return period analysed

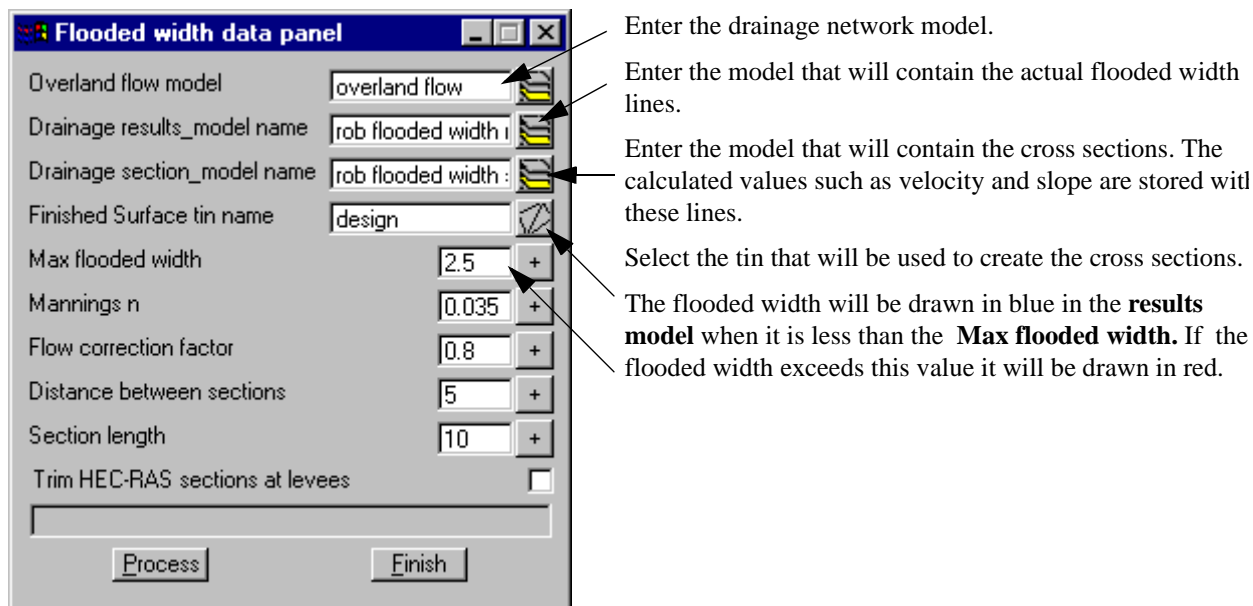
The user defines the length of these sections and the interval at which they are to be spaced. 12d calculates the normal flow depth interpolating the pit approach and bypass flows from the hydrology models (ILSAX, Drains, PC Drains or RAT HGL). The cross sections are taken perpendicular to the flow line and the slope is for the normal depth calculations is determined using the distance along the flow line and the change in elevation between the two lowest points in the primary flow channel. The flow line need not intersect the low points on the section but the flow line does mark the primary flow channel. If the depth of the flow exceeds the banks of the primary channel, then all adjacent flow channels will be considered as active flow area.

Limitations where overland flow lines join

Where overland flow lines converge at a manhole, 12d does not know the flow split between the 2 approaching paths. Therefore, 12d uses the total flow from all lines as the flow at the manhole for each line. This may overestimate the flooded width along the flow lines at these points.

Limitations at SAG pits

The flow width are not shown adjacent the sag inlets. The depth of flow due to ponding and the approach flow coming from several directions may overestimated flooded width in these areas. Therefore not flood depths are caclulated approaching SAG inlets.



Manning's n is the n value to be used in the normal depth calculations.

The **Flow correction factor** is the factor described in ARR 1987 for calculating depths of flow in gutter channels.

Distance between sections specifies the interval at which cross sections and therefore flooded width will be calculated along the flow path.

Section Length defines the length of each cross section. The cross section will be centred on the overland flow path.

Trim HEC-RAS sections at levee is used for super critical flow calculations in HEC-RAS. If you plan to do super critical flow calculations then check this box. A levee point is the crest in the cross section found as you move away from the flow line location. If a levee point is encountered then the section is trimmed here. This is a feature because HEC-RAS has problems with cross sections with levees.

Cross Sections and Discharges

The analyse flooded width will proceed along each flow path and identify every pit on the line. Cross sections will be constructed in the model with the length and interval entered in the input dialogue. These cross sections may be plotted using the main menu selection **Plot=>X plot=>X plot**. The **Sort Sections** must **not** be selected for these sections to be plotted.

Discharges will be determined for each cross section by pro-rating the discharge dependant on the distance between the pits. The bypass discharge will be taken from the upstream pit and the approach discharge of the downstream pit.

12d will give warning messages in the output window when it encounters the following conditions and these messages will be stored as string attributes on the flooded width strings. Descriptions of these messages follow.

Inverts do not go downhill

12d locates the lowest point (adjacent to the flow line without moving over a local crest) on each cross section to calculate the slope between the cross sections. This message indicates that the downstream minimum elevation is higher than the upstream minimum elevation.

Sometimes flow lines will go uphill. If you have specified an overflow from a SAG location then the flow line will go uphill until it crosses the overflow crest.

If the flow line is not supposed to be going uphill at this section, check to see where the flow line intersects the cross section located upstream of the one identified in the warning message. If it is in a local sag point

that is not the lowest point on the section, move the flow line.

The program will use a slope of 0.5% to calculate a width at this location. This results in very wide flooded width sections to draw the user's attention to the problem area.

Vertical Walls Assumed at the Ends of the Cross Sections

If the depth of flow exceeds the ground surface elevation at the ends of the cross section a warning message the warning message shown above is shown. The cross sections causing the warning follows.

The vertical wall is placed at cross section chainage -20. Note that the flow line is always at chainage 0

Drainage Overflow Areas from Volumes

This option is used to graphically display the overflow storage volume at a sag pit. The following pit attributes must exist for the flood extents to be calculated.

overflow volume	value greater than zero required.
sag pit	must be equal to 1.
catchment model id	set by labelling catchments
catchment string id	set by labelling catchments

The maximum storage volume is read from the drainage pit attribute "overflow volume". This may be entered manually using the **Attribute Editor** or it will be created when data is read from the drainage design programs Drains or XP SWMM design programs.

This routine locates the lowest point on the catchment string by draping the string on the tin specified and adds the overflow limit specified to this value. This becomes the **overflow limit**.

The volume at this level is calculated and the compared to the **overflow volume** read from the user defined attribute. If the overflow volume is less than the volume in the catchment then the routine iterates to find the flood level for the overflow volume.

If the overflow volume is greater than the volume in the catchment, the results depend of the **Use overflow limit** tick box.

If the box is selected, the **overflow limit** (calculated above) is reported at the flood level in the catchment.

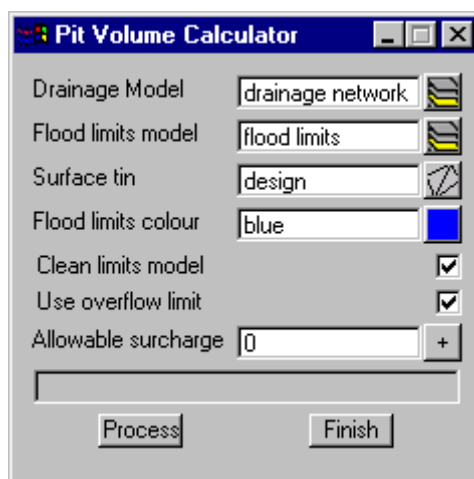
If the tick box is not selected the routine iterates to find the flood level where the storage equals the **overflow volume** read. This option allows the user to see the maximum flood level should the catchment low point become blocked.

See Also

Drainage overview

Usage

This panel is accessed from the menu selection **Design => Drainage Sewer => More=>Calc pit overflow areas**



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Drainage model	model box		

all pits in this model that have a non zero "overflow volume" and "sag pit" set to 1 will be processed

Flood limits model model box
flood limits strings will be created in this model

Surface Tin tin box
ground surface tin used to calculate the volumes and flood limits

Flood limits colour colour box
flood limits strings will be created using this colour

Clean limits model tick box
*if selected all strings in the **Flood limits model** will be deleted before the calculations commence.*

Use overflow limit tick box
*if the elevation calculated from the storage volume is higher than the lowest point on the catchment string then the **allowable surcharge** value below will be added to the lowest point on the catchment string and this elevation will be used to determine the flooding limits*

Allowable surcharge real box
*this value is used only if **Use overflow limit** is ticked. Its purpose is described in the field above.*

Process button
executes the option.

Finish button
removes the dialogue from the screen

Drainage Utility Program

utilities_panel

Position of option on menu: Design => Drainage-Sewer =>More => Misc. utilities

The Drainage utility program contains functions to significantly reduce the time required to perform drainage tasks. These tasks include

Assign Pit names

To use the export routines, every pit in 12d must have a pit name. This selection automatically creates the pit names for the entire model or selected strings. Examples of pit names are 1,2,3... A1,A2,A3....Pit 3-A, Pit 3-B.

Reset pit cover levels

This selection sets the cover levels for the manholes to the design tin or design strings. The user will be prompted for each manhole to select a tin level, a string level (if a design string model is supplied) or keep a manually set level. The tin/string/manual selection will be stored and the levels reset now and whenever the pit/pipe interfaces exports the data (unless this last option has been manually turned off).

Regrade pipe levels

The selection applies the default grading rules (cover level) to reset the pipe invert levels for the entire network. Manhole cover levels are not changed during this function

Label Catchments and Label drainage network

This selection quickly creates labels for a drainage and catchment plan. The pits are labelled with their name, the pipes with their diameters and the catchments with their area and the pit they drain to. These labels must be updated using this selection whenever the catchment or network is changed. To turn off the automatically drawn pit names in the current view select **Menu=>Settings=>Text=>Toggle** and select the drainage model.

Analyse Flooded Width

This is the only hydraulic calculation that takes place in 12d. The normal depth along the bypass flow paths is calculated using discharges imported from hydrology/hydraulic packages including spreadsheets. This flooded width is drawn to scale at intervals along the bypass flow path and colour coded (blue if less than a specified limit and red if greater than the limit).

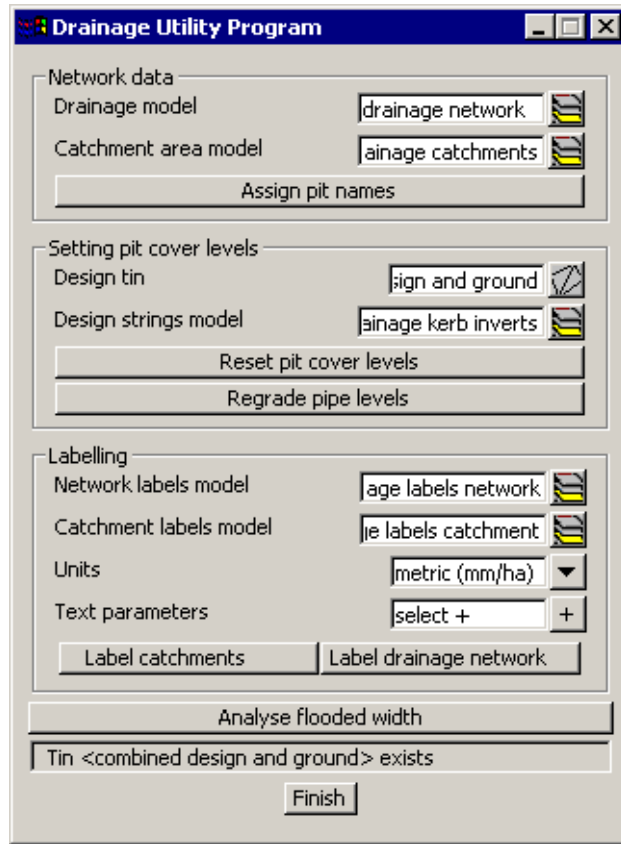
See Also

Drainage overview

Usage

This panel is accessed from the menu selection

Design => Drainage-Sewer => More => Misc. utilities



The fields and buttons used in this panel have the following functions:

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

drainage model	input box		
<i>Model to contain all of the pit and pipe network to be worked on.</i>			

catchment area model	input box		
<i>Model to contain the catchments strings for the Drainage Model above</i>			

Assign pit names	button		
<i>This button launches a dialogue for setting the names for the pit and pipes in the network model.</i>			

design tin	tin box		
<i>This optional field allows the user to specify a new tin for the surface levels of the pits. If you are using road grade and cross fall for pit inlet capacity it is preferable leave this blank and to link the pits to a string using the design model field below. If some or all of the pits are linked to strings in the design model below, they will still use the strings selected. more about design strings</i>			

design model	model box		
<i>This model contains the strings for the pit cover levels (the string directions are also used for road grade and cross fall). If this model is changed you will be prompted to select new strings to link the pits to. more about design strings</i>			

Reset pit cover levels	button		
-------------------------------	--------	--	--

This button will reset the pit levels to the design strings in **design model** or to the tin specified in **design tin** above. The first time this is selected you will be prompted to choose whether to set the pit cover level to the design tin or the a string in the design model. **more about design strings**

Regrade pipe levels button

The selection applies the default grading rules (cover level) to reset the pipe invert levels.

network labels model model box drainage labels network

Model to contain the network labels for the **Drainage Model** above. This model is cleaned out each time **Label drainage network** is selected.

catchment labels model model box drainage labels catchment

Model to contain the catchment labels for the **Catchment Area Model** above. This model is cleaned out each time **Label catchments** is selected

catchment units choice box ha, acres

Conversion factors of 10,000 will be used for ha and 43560 for acres. Not that not all design packages support both units.

text parameters input box

Select the + to access the text parameters (colour, size, alignment etc.) for the text created with **Label Catchment** or **Label drainage network**

label catchments button

This selection creates labels indicating the catchment name and area in the units specified above.

CAUTION: If you change you catchment strings or rename you pits you must run this routine to update the labels.

label drainage network button

This selection creates labels indicating the pipe size and pit name for the network model.

CAUTION: If you change you change the pipe sizes or rename you pits you must run this routine to update the labels.

analyse flooded width button

This selection launches the dialogue for analysing the flood along bypass flow paths. The bypass flows must be imported from your design package/spreadsheet before running this selection.

[drainage_utilities_panel_assign_pit_names](#)

Set Pit Names

The **Set pit name** selection names the pits and pipes for the drainage model (both pits and pipes can be named). Three numbering schemes are available:

drainage strings names are used as the prefix followed by the pit number (ex A-1)

drainage strings names are used as the suffix followed by the pit number (ex 1/A)

the pits are sequentially numbered. (ex 1,2,3....)

The names can have pre-text added to the beginning of the pit name and a separator between the string name and the pit number (/ - etc.) if desired.

Design Program Notes:

PCdrain users: Since catchments contain only 3 characters do not use separators. Using the letters A-Z for strings and numbers 1-99 will give you 26 strings and up to 99 pits on each string. Using the numbered stem works very well in PC Drain.

Micro Drainage users: Pits and pipes are numbered separately in Micro drainage. The pipes must use the numbered sequence with the most upstream pipes numbered with the smallest numbers. Number of digits must be set to 3.

ILSAX users: You must use alphabetic characters for your string names and no more than 3 characters

See Also

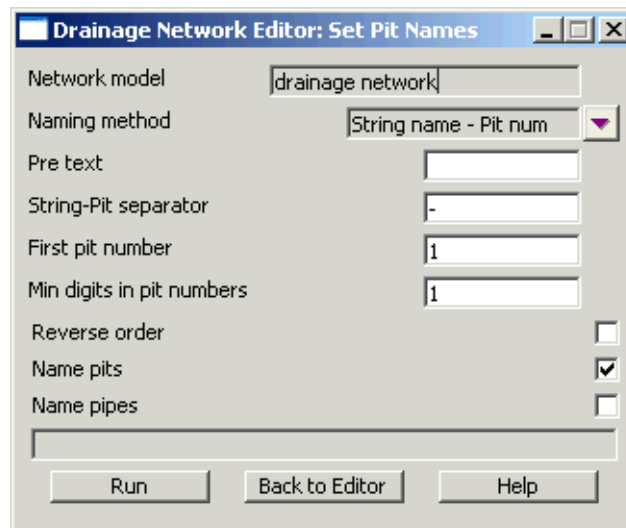
- Labelling a drainage network
- Displaying the Auto Pit Names
- Drainage overview

Usage

The selection is found on the drainage **network editor** and is accessed through the main menu by selecting

Design=>Drainage-Sewer=>Drainage Network=>Drainage=>Network editor

Select the **Set Pit Names button** and the following panel will appear.



The fields and buttons used in this panel have the following functions:

Field Description	Type	Defaults	Pop-Up
Model	Model box		drainage model from main dialogue
Naming Method	Choice box		
		<i>Pit num - String name</i> for string A manhole 1 the name is IA	
		<i>String name - Pit num</i> for string A manhole 1 the name is AI	
		<i>Sequential numbering</i> the strings names are sorted alpha-numerically and the manholes are numbered starting at First pit number	
Pre text	input box		
		<i>this text will precede the pit name (ex Pit A01)</i>	

String/pit separator input box

the character that separates the string name from the pit number. For example if pit names A/01, A/02 etc. where desired a "/" would be entered. You may omit the separator if none is desired.

First Pit Number integer box

the starting pit number on the drainage lines. For drainage strings with the flow direction set as descending chainage the first pit is the junction pit.

Min digits in pit numbers integer box

a non zero value will pad the pit numbers with leading zeros. (ex if 2 is entered, pit 1 is not A/1 but rather A/01)

Reverse numbering order tick box

*Unselected, pit **First pit number** is at the low chainage end of the line. Selected, pit **First pit number** is the second pit from the high chainage end of the line.*

Number pits tick box

the pits are assigned names. This allows the pit and pipes to be names differently.

Number pipes tick box

the pipes are assigned names. This allows the pit and pipes to be names differently.

Run button

name the pits/pipes. The pit at the high chainage of the string is not labelled. The only time you will need to name this pit is when it is the outlet from the system.

Back to Editor button

return to the network editor.

Help button

display this page.

Drainage Input/Output Interface

Drainage_interfaces_panel

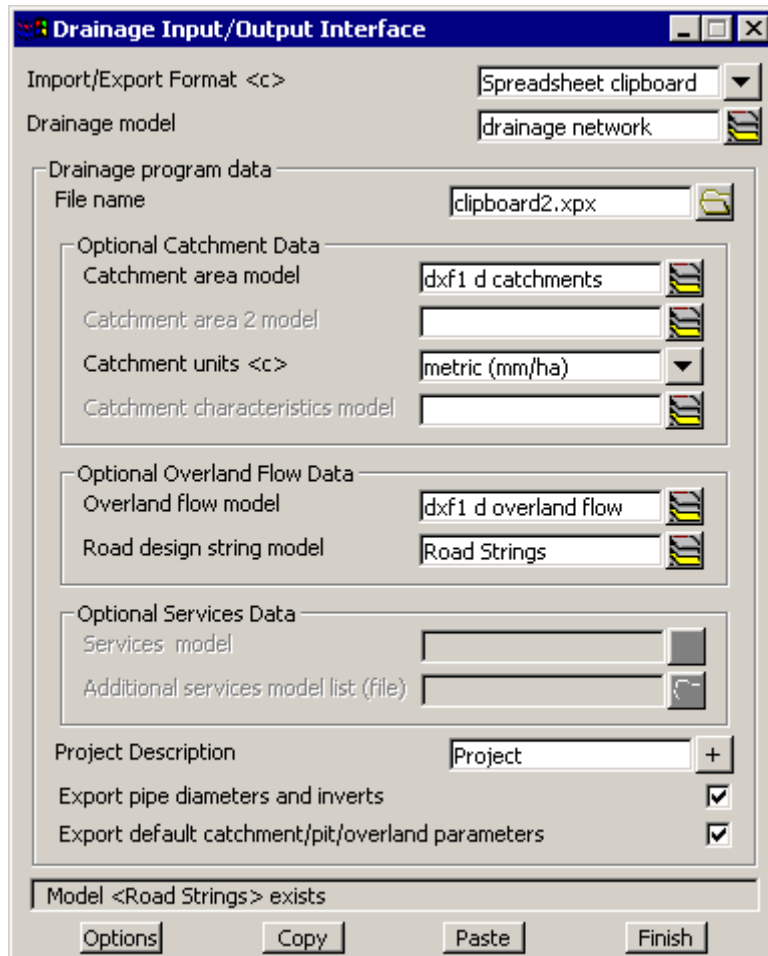
Position of option on menu: Design => Drainage => More=> pit/pipe design interface

See Also

- Drainage overview
- Drainage Misc Utilities
- Spreadsheet clipboard**
- Running Drains
- Running PCdrain (Windows)
- Running Micro Drainage - Win DES
- Running XPSWMM
- Running RAT2000

Usage

This panel is accessed from the menu selection **Design => Drainage => More=> pit/pipe design interface**



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
import/export format <c>	input box	XP SWMM	Spreadsheet clipboard, Drains clipboard

PCdrain Int (windows)
 RAT2000
 XP SWMM
 Micro Drainage
 Drains
 PC Drain (DOS)
 RAT HGL
 ILSAX

select the drainage design program to export/import to.

drainage model input box

*Required Model to contain all of the pit and pipe network to be exported/imported. Also see **Drawing the Drainage Network***

file name input box

*Required file to be read or written to. If a clipboard format is chosen for **import/export format** above then the data will also be written to this file on a **Copy** selection*

catchment area model input box

*Optional model to contain the catchments strings for the **Drainage Model** above. Also see **Designating Catchment Areas***

catchment units <c> input box ha, acres

Conversion factors of 10,000 will be used for ha and 43560 for acres. Not that not all design packages support both units.

catchment characteristics modelinput box

Optional strings in this model will be used to define the catchment slope and width (XP SWMM only)

bypass flow model input box

*Optional model to contain the bypass flow strings for the **Drainage Model** above. Also see **Creating Bypass Flow Strings***

road design string model input box

*Required if **bypass flow model** is specified above. Also see **Pit Inlet Capacity, road grade/crossfall and Bypass routes***

services model input box

Optional if the strings in this model cross the drainage network the crossing data (drainage chainage, invert elevation and thickness) will be sent to the design package

additional services model list (file)input box

Optional if your services lie in more than one model then enter a text file name here and then select edit from the fields file icons. Type the names of all of the service models and then save the file.

project description input box

Optional this description will be sent to the design program

export pipe diameters and invertstick box

*Select this tick box to export the pipe diameters and inverts. see also **Quick Check Lists for Drainage***

Design Software

export default catchment/pit parameter stick box tick

*selected all default catchment parameters are exported
not selected only catchment area is exported if **catchment area model** is specified above. see also
Quick Check Lists for Drainage Design Software*

Options button

several calculations are preformed before all exports. Advanced users may turn some off for large models (100's of pits). The option to re-link your pits to new design strings is also included here.

More options

Write/Copy button

*This will create/over write the file specified above in **file name**. If **Copy** button is present the data will also be placed on the windows clipboard as Tab delimited text.*

Read/Paste button

***Read** will read the file specified above in **file name**. **Paste** read the data from the windows clipboard. Both selections will update the drainage strings in the model specified above in **drainage model**. If the **Spreadsheet clipboard** import is selected and the strings are not present in the model they will be created.*

Options

[Drainage_interfaces_panel](#) Drainage calculation options

Selecting the Options button brings up the dialogue to the left. Additional choices may be present at the bottom of the dialogue depending on the **Import/Export Format** that you selected on the main dialogue.:

Catchment areas when selected the catchment areas are linked to the drainage pits and the areas recalculated. See also **Designating Catchment Areas**

Re-link pits to road strings-tin when selected a dialogue for each pit will be presented asking which design string or tin to link the pit to. See also **Selecting design string or tin**

Calculate bypass flow routes when selected will calculate the downstream bypass pit, road grade and crossfall and inlet capacities. See also **Pit Inlet Capacity, road grade/**

crossfall and Bypass routes

Calculate now will calculate the selected option immediately and return the user to the main dialogue.

Set will set the options but no calculations will be performed until a **Write** or **Copy** is selected from the main dialogue.

Finish removes the panel from the screen.

Drainage_

Position of option on menu: Design =>Drainage-Sewer =>

On selecting the xx option, the xx panel is displayed.

These defaults are used when creating a manhole in a drainage string. The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
<i>comment</i>	input		
Finish <i>removes the panel</i>	button		
Help <i>displays this help page</i>	button		

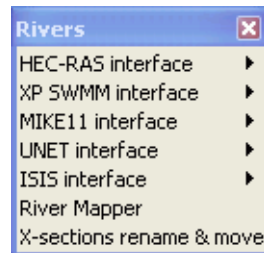
19 Rivers

rivers

Position of menu: **Design=>Rivers**

The **Rivers** option is used to prepare data for analysis packages and examine the results from the analysis.

The **Rivers** walk-right menu is:



See Also

Frequently Asked Questions (Rivers)

River Interface Models

HEC-RAS Interface

XP-SWMM Interface

XP SWMM Culverts

MIKE11 Interface

UNET Interface

ISIS Interface

River Mapper

Presenting Water Level Results

How to for Rivers

Rivers beta menu

River Interface Models

The River interface strings are split into different models depending on the strings function. Also the string names are used to define names of entities such as cross sections and reservoirs when they are exported. Following is a list of the river interface string types:

River strings

Source strings

Reservoir Strings

Spill Strings

River Strings

The river centre line and bank are defined by the strings in the **River strings** model.

The centre line string is used to

- s measure the centre line distance between the sections,
- s mark to zero chainage (or starting chainage) on the cross section, and
- s if automatic source strings are created they will be perpendicular to this string
- s **define culvert locations** and sizes (XP SWMM only)

The left and right bank strings are used to

- s measure the bank distances between the sections and
- s mark the cross section chainage where the conveyance (usually roughness) changes

The names of the strings must be **left bank**, **right bank** and **centre line river name, reach name** (centre may be spelled center).

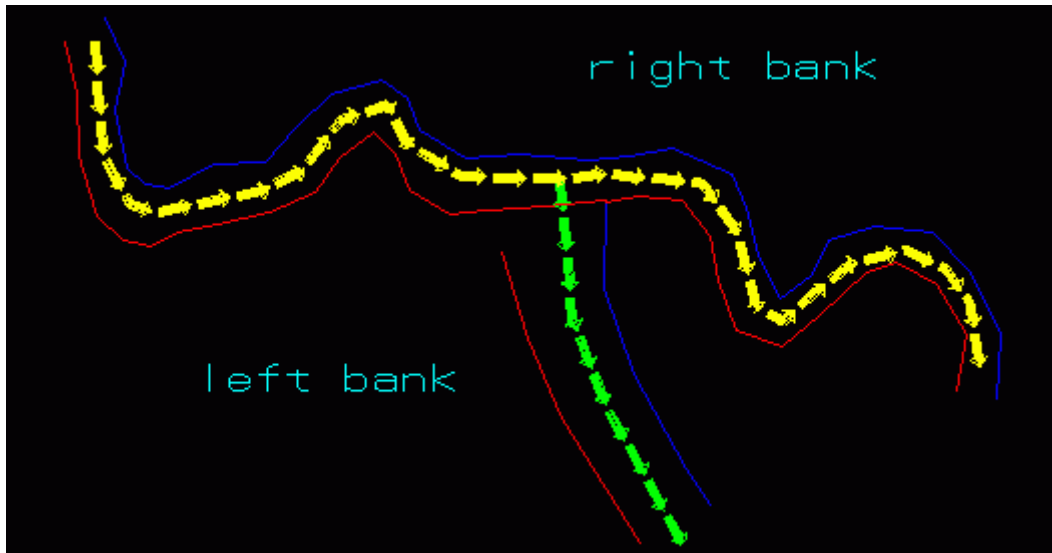
The left bank is on the left side of the river looking downstream and the right bank is on the right (looking down stream). These strings need not touch each other and may extend from one river reach to another.

HEC RAS and UNET

The centre line string must begin at the downstream end of the river. The modelling convention for these programs is to have the low chainage at the downstream end. You may use super, 2D,3D or alignment strings in this model. If you put other strings in this model you will receive warning messages saying that these strings will not be used.

Each reach of the river **MUST** have its own centre line string and they must "touch" each other to create a river confluence.

A sample of a river strings model for **HEC RAS** with one confluence is shown below. The line style for the centre line is not required. It is used only to show the direction of the centre line string.



Notes:

left bank strings are shown in red, right bank in blue and centre line strings in yellow and green. The line style for the centre line strings is *Drainage_4D->Flow line*. This is not required but shows the direction of the string. The string labels were created with Strings->Label->User->Label strings with names.

Centre line string direction is very important!

HEC RAS, UNET, XP SWMM

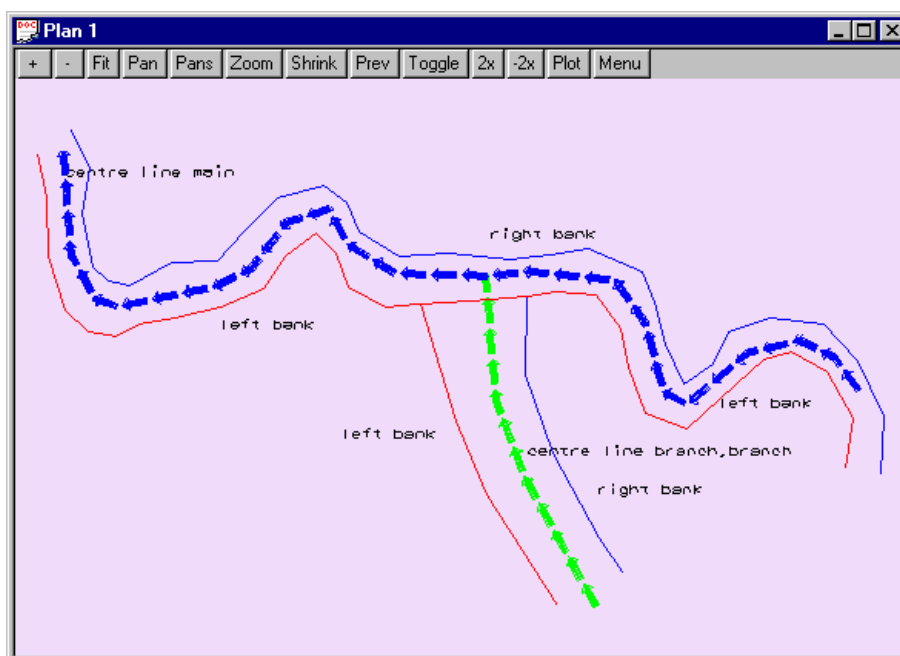
start at the **DOWN**stream end of the river

ISIS and Mike 11

start at the **UP**stream end of the river

ISIS and MIKE11

The centre line strings are drawn starting **upstream** for the ISIS and Mike 11 programs.



Source Strings

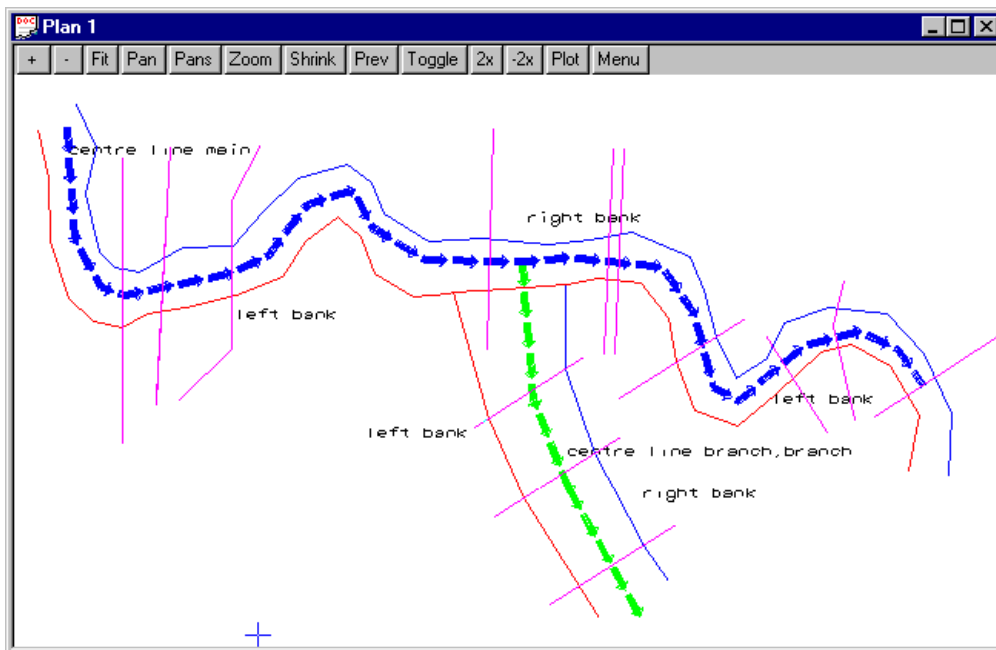
Cross sections are created at the location of the **source strings**. These source strings are initially created at a user defined spacing and section length using any one of the river interfaces writers. The user may alter these sections as desired. These may be shortened if they intersect at sharp bends in the river; they may be extended at extremely wide river sections or extra points may be added so that the section is no longer a straight line.

Source strings can be deleted and additional sections can be added by creating new source strings. The **Create source strings** tick box on the interface panel must **NOT** be selected to use the customised strings.



A quick way to manually create 2 point string is via the CAD tool bar.

A sample of source strings (shown in magenta) is presented below. The source strings may run in any direction except for Mike11. In Mike11, the cross sections will be created in the same direction as the source strings. For all other interfaces the low chainage will be used for the left bank (section viewed looking downstream).



Reservoir Strings

The **reservoir strings** may define inline reservoirs or offline storage. The elevation of the first point on the string sets the maximum level to be used in the stage storage curve. 12d will determine the minimum level inside the reservoir string and then calculate the volumes at a 1m (2 foot for imperial units) increment. The default increment may be changed by creating a string attribute "stage increment" (see **stage increment**).

Inline reservoirs are "touched" by centre line strings both upstream and downstream. Offline storage areas

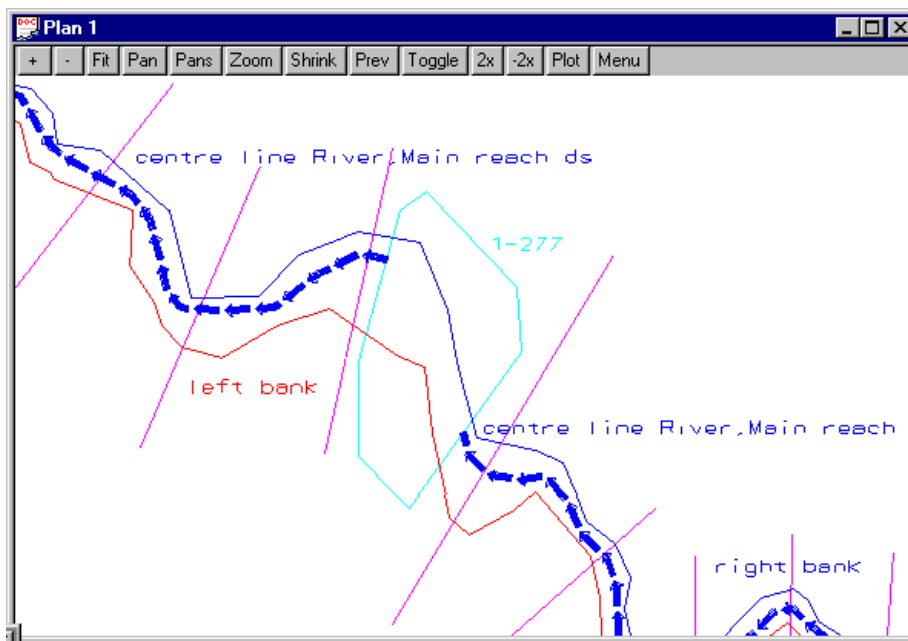
are linked to the cross sections via **Spill strings**.

Other features of the reservoir strings are

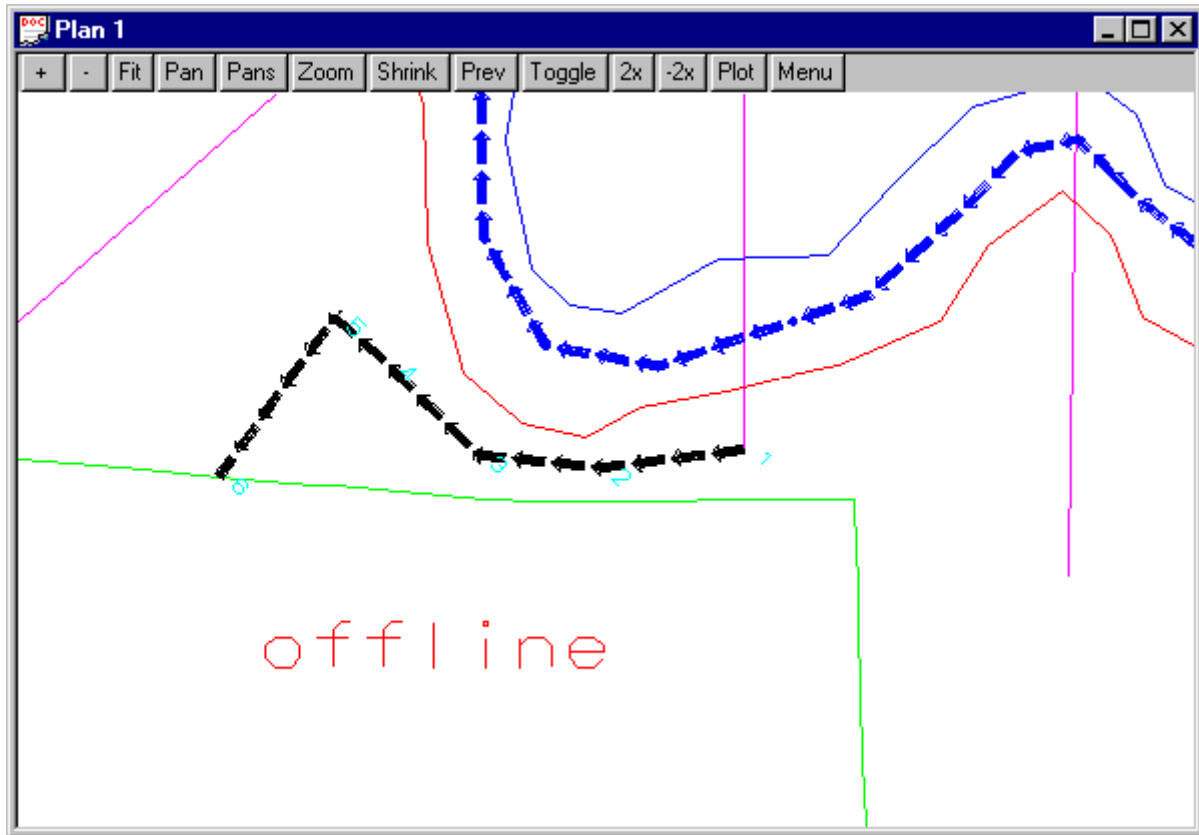
Auto height

XP SWMM catchment parameters

A sample drawing showing an inline reservoir in cyan (1-277) follows. Note that the river centre line touches the reservoir string both upstream and downstream. The left and right bank strings may continue straight through the reservoir.



A sample drawing of an offline reservoir follows (the reservoir string is shown in green). Note that the spill string (black) starts at the source string (point 1), then follows the section line to be cut and exported (points 2 to 5) and ends by touching the off line reservoir string at point 6. The rivers strings do not touch the offline storage strings.



Spill strings

Spill strings are strings that link offline storage areas to a cross section (see drawing above). The string must begin by "touching" the source string and then proceed to the first point on the spill section. During the export the first point will NOT be exported as part of the spill section. After defining the end of the spill section the last point on the string must "touch" the reservoir string. Again this last point will NOT be exported as part of the spill section.

The default roughness for the spill section is the "left n" from the main export panel, the default slope is 0.5% and the default length is 100. See the manual setting table for **manual override settings**.

Define Culvert Locations

12d allows culverts to be included as a segment of a super string. The **XP SWMM** rivers interface allows culverts in 2 models. In the spill string model, a two point superstring may cross a spill string to indicate a culvert through the embankment. In the river string model a segment of the river centre line may be marked as a culvert. If a source string crosses the same segment than a multi-link with both the culvert and the natural section will be exported.

Adding a Culvert to a super string

1. **Super strings only!**
Convert string to a super string (if required)
Strings->Convert
2. **Mark the ends of the culvert.**

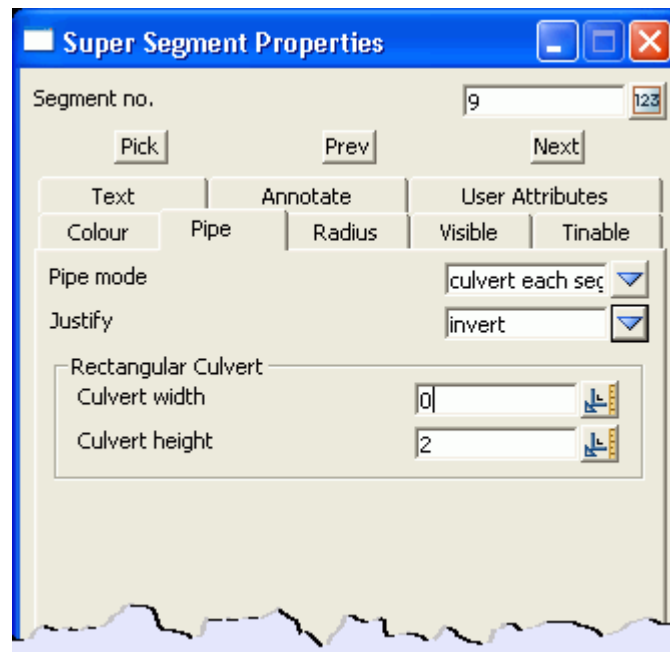
Add a vertex at the upstream and downstream end of the culvert (Toggle vertices on if desired)

String->Points Edit->Insert

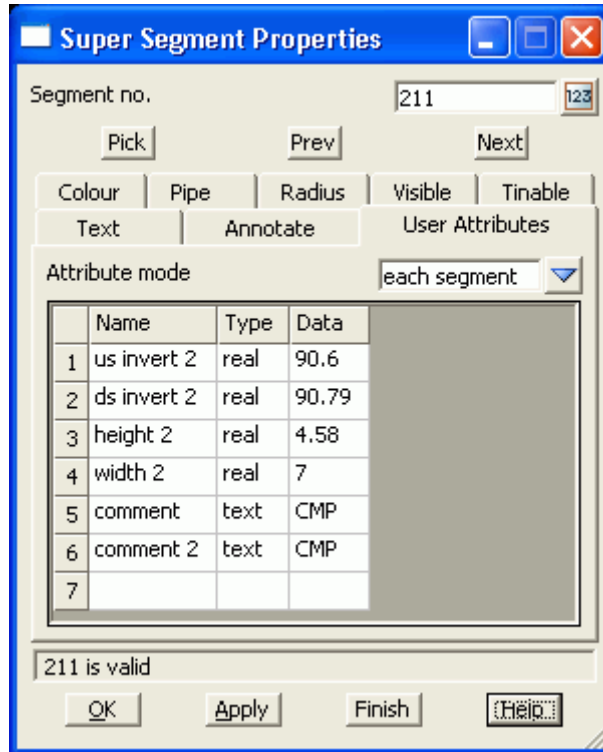
3. **Mark the segment as a culvert or pipe**

Use the super string segment editor to set the culvert data.

Strings->Properties->Segments (all) and change Segment properties to use **culvert each segment** (box) or **pipe each segment** (round). Note that if there is one box culvert on the centre line then all must be box culverts. If you need pipes and box culverts combined, set the width to zero for pipes. Also set the Justify mode to indicate the type culvert levels you wish to specify.

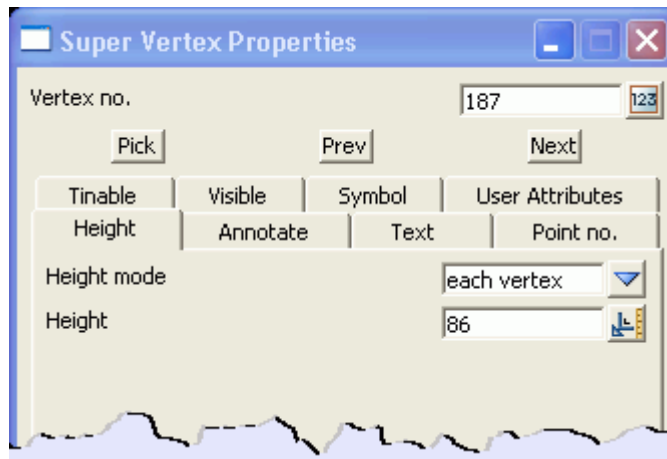


If there are two (max is 7) culverts at this location that have different inverts or sizes add the following user defined attributes to the segment. The comment attributes are printed by the Culvert Table routine and are used to label the culvert as well. If there are a number of identical culverts, the attributes "number of pipes" (integer) can be set to a value greater than 0. Additional attributes to customise the culvert are listed at the end of this section. Default mannings n are 0.024 for pipes (corrugated metal) and 0.012 for box (concrete).



4. **Set the upstream and downstream levels**

Select a vertex at the end of segment, ensure the **height mode** is **each vertex** and set the height. Use the **Next** or **Prev** button to move to the other end of the culvert and set its height as well.



Culvert Segment Attributes

Purpose	Attribute Name	Type	Typical Data Value
Culvert entrance loss	entrance loss	Real	0.5
Culvert exit loss	exit loss	Real	1.0

Purpose	Attribute Name	Type	Typical Data Value
Culvert length	length	Real	8.0
Multiple identical culverts	number of pipes	Integer	2

Culvert Table

Culvert_table_panel

Position of option on menu: Design=>Rivers=>XP SWMM interface=>Culvert table

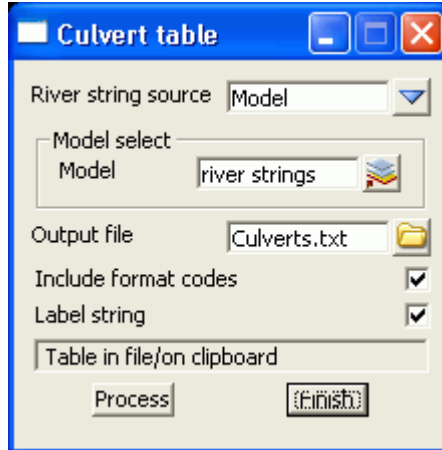
This option is used to create a table of the culverts created along the centre line of the river and to label the invert levels and comment for the first culvert on each segment (some segments may include attributes for more than on culvert). A sample is shown below.

chainage	Number	US Inver	DS Inver	Height	Width	Quantity	X location	Y location	Comment	Segment
Centre line center line 1										
88444	1	125.28	124.95	11	7	1	683236	1389459		705
87269	1	127.58	127.24	6		1	683059	1390605	72/cmp	695
85983	1	123.13	123.72	6		1	682871	1391834	inv-72/cm	682
84317	1	124.15	123.47	6		1	681757	1392779		666
84317	2	124.59	125.15	6	0	1	681757	1392779	6ft cmp	666
83854	1	123.07	123.28	5		1	681319	1392820	60 inch cc	659
83854	2	123.54	123.42	5		1	681319	1392820	60 inch cc	659

See Also

Defining culvert locations

Usage



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
River string source <i>the imported cross section strings will be stored in this model</i>	input	view	string,model,view
String,Model,View <i>centre line string selection</i>	various		
Output file <i>text file to contain the table</i>	File box		

Include format codes tick box

format codes are used to format tables in 12d...not desired for other programs

Label string tick box

The invert labels and the pipe size will be added as vertex and segment text

Process button

executes the option.

Finish button

removes the dialogue from the screen

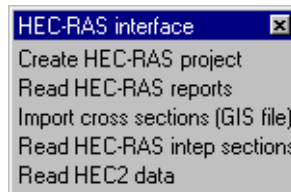
HEC-RAS Interface

HEC_RAS_Interface

Position of menu: Design=>Rivers=>HEC-RAS interface

The HEC-RAS interface creates the HEC-RAS project files ready to open and run. This includes the project, plan, flow and geometry files. Water levels are read back into 12d where they may be viewed in a 3D perspective view to easily identify extents of flooding.

The HEC-RAS walk right menu is,



See also

- River and Source Strings
- Create HEC-RAS files
- Read HEC-RAS results
- Presenting Water Level Results
- Import cross sections (GIS file)
- Read HECRAS Interp sections
- Read HEC2 Data
- How to for Rivers
- Frequently Asked Questions (Rivers)

Exporting to HEC-RAS

The HEC-RAS project is created from a surface tin (representing the river bed and overbanks) and a model containing strings identified by their names “left bank”, “right bank and the name prefix, “centre line”. Any additional strings in the specified model will be ignored (warning messages will be given when you run the macro that any additional strings are being ignored). The low chainage (often zero) of the centre line strings must be at the downstream end of the reaches.

Cross sections are created at the location of the **source strings**. These source strings are initially created using the HEC-RAS option at a user defined spacing and section length. The user may alter these sections as desired. These may be shortened if they intersect at sharp bends in the river; they may be extended at extremely wide river sections or extra points may be added so that the section is no longer a straight line.

Source strings can be deleted and additional sections can be added by creating new source strings. The **Create source strings** tick box on the interface panel must **NOT** be selected to use the customised strings.

Presenting HEC-RAS Results in 12d

After the HEC-RAS analysis is complete the water level results are read back into 12d. Water level strings are created with the plan shape of the cross sections at the elevation retrieved from the HEC-RAS results. These strings are then triangulated to create a water surface tin from which the water level boundaries are determined. These results can then be shown in plan, long section, cross section and in 3D perspectives.

More details

HEC-RAS Write Panel

[Rivers_hecras_panel HEC-RAS Interface Writer](#)

Position of option on menu: Design=> Rivers=>HEC-RAS interface=>Create HEC-RAS project

The HEC-RAS interface creates the HEC-RAS project files ready to open and run. This includes the project, plan, flow and geometry files. Water levels are read back into 12d where they may be viewed in a three dimension perspective view to easily identify extents of flooding.

[Rivers_hecras_panel_beta HEC-RAS Interface Writer](#)

See also

River and Source Strings

HEC-RAS Interface overview

Read HEC-RAS results

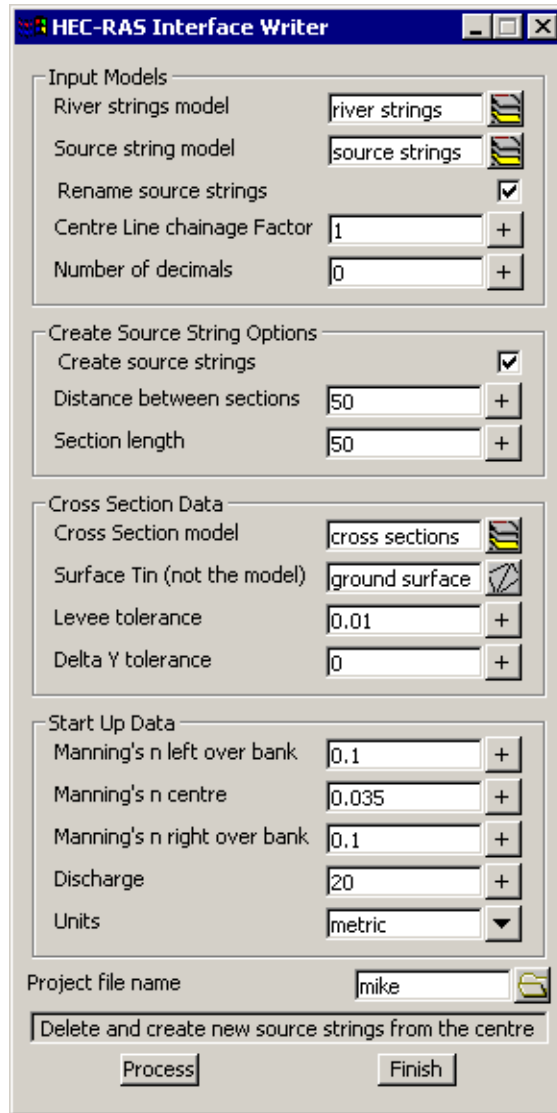
Presenting Water Level Results

How to for Rivers

Frequently Asked Questions (Rivers)

Usage

The HEC-RAS panel for creating the HEC-RAS project follows.



The fields and buttons used in this panel have the following functions:

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

INPUT MODELS

River strings model Model box

*Model containing the centre line, left bank and right bank strings. **The centre line strings must begin downstream and proceed upstream.** The name of the river may follow the words “Centre line “ (note the ending space). For example the centre line string may be named “Centre line Parramatta River, downstream reach”. The comma separates the river name from the reach name. If no comma is included then the river name is repeated for the reach name.*

Confluences are modelled by a using a separate string for all reaches. Thus a system with a branch is modelled with three strings. The branch will be one string and the main reach will have a downstream string and an upstream string. The reaches must touch at the confluence.

The distance from the start of the upstream strings to the first cross section is used to model the confluence length.

The left and right bank strings need not be separate strings (see figure below).

Source string model Model box

New source strings will be created in this model or existing source strings are contained in the model. See **Create source strings** tick box below.

Rename Source Strings Tick box not selected

If selected the source strings will be a name using the chainage along the river centre line. The **number of decimals** and the **Centre line chainage factor** (ft to miles or m to km) are specified below.

Centre Line Chainage Factor Real box

The cross section names are created by dividing the chainage on the centre line by this factor. Typically 1000 is used to convert metres to kilometres and 5280 to convert feet to miles.

Number of decimals Real box

When **Rename source strings** is selected, the source strings name will have the specified number of decimals.

CREATE SOURCE STRNGS OPTIONS

Create Source Strings Tick box not selected

When selected existing source strings are deleted and new ones created perpendicular to the centre line at the specified spacing and length. Once you have created the sources strings they can be easily modified. On the **Strings->Points Edit** menu you will find the selections **Move** (to move the end points), **Insert** (to insert additional points).

Distance between sections Real box

The distance between the cross sections. At present no check is made for overlapping cross sections around river bends.

Section Length Real box

The length of the cross section with zero chainage at the mid point.

CROSS SECTION DATA

Cross section model Model box

The cross sections created and exported are stored in this model.

Surface Tin (not the model) Tin box

Tin or super tin to create the cross sections from (remember a tin is like a string. It is placed in a model.).

Levee Tolerance Real box

If the surface level drops more than this amount while moving away from the channel centre line then the crest is marked as a levee. A value of zero means that no levees are marked.

Delta Y tolerance Real box

This value filters out points on the cross section. Imagine a tube of this diameter passing over the cross section. The tube is elongated until one point lies outside the tube. The tube is shortened to the previous point and then all points inside the tube are deleted from the cross section. The tube then moves on to the next point. The filtered (smoothed) and original sections are kept for comparison. **The final water**

tin is created from the ground tin and therefore the boundary string is located using the unfiltered section.

STARTUP DATA

Manning's n Real box

Manning's n values for the left, right and centre channel sections.

Discharge Real box

This discharge is used at the upstream end of all reaches. If you have multiple river branches, you can set the flow for each branch inside HEC-RAS or inside 12d. This can be changed at each section See manual settings

Units Choice box

This selection will set the default units for the project being created.

Project file name Input box

The HEC-RAS project name. Remember HEC-RAS (2.0 or earlier) is limited to 8 characters only. If the total path name is too long HEC-RAS will not analyse the project.

HEC-RAS Read Panel

Rivers_hecras_panel HEC-RAS Interface Reader

Position of option on menu: Design=>Rivers=>HEC-RAS interface=>Read HEC-RAS reports

After the HEC-RAS analysis is complete the water level results are read back into 12d. Water level strings are created with the plan shape of the cross sections at the elevation retrieved from the HEC-RAS results. These strings are then triangulated to create a water surface tin.

See also

HEC-RAS Interface overview

Create HEC-RAS files

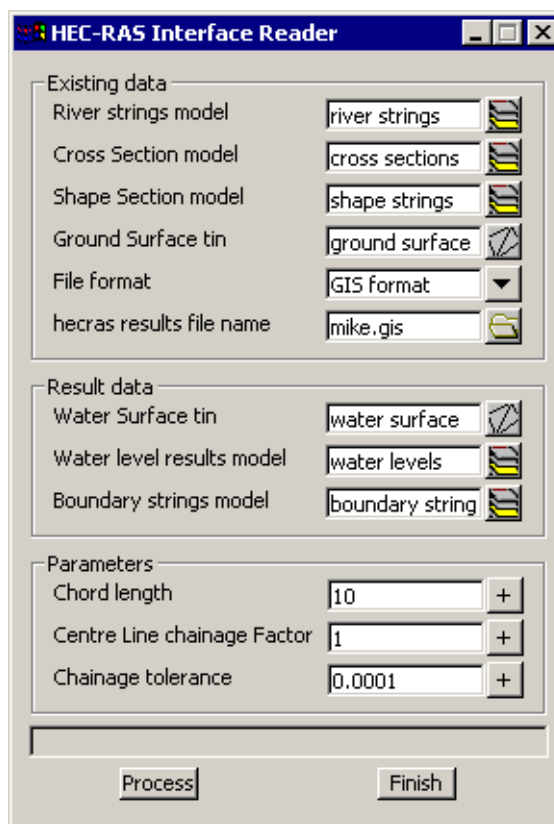
Presenting Water Level Results

How to for Rivers

Frequently Asked Questions (Rivers)

Usage

The HEC-RAS read panel follows.



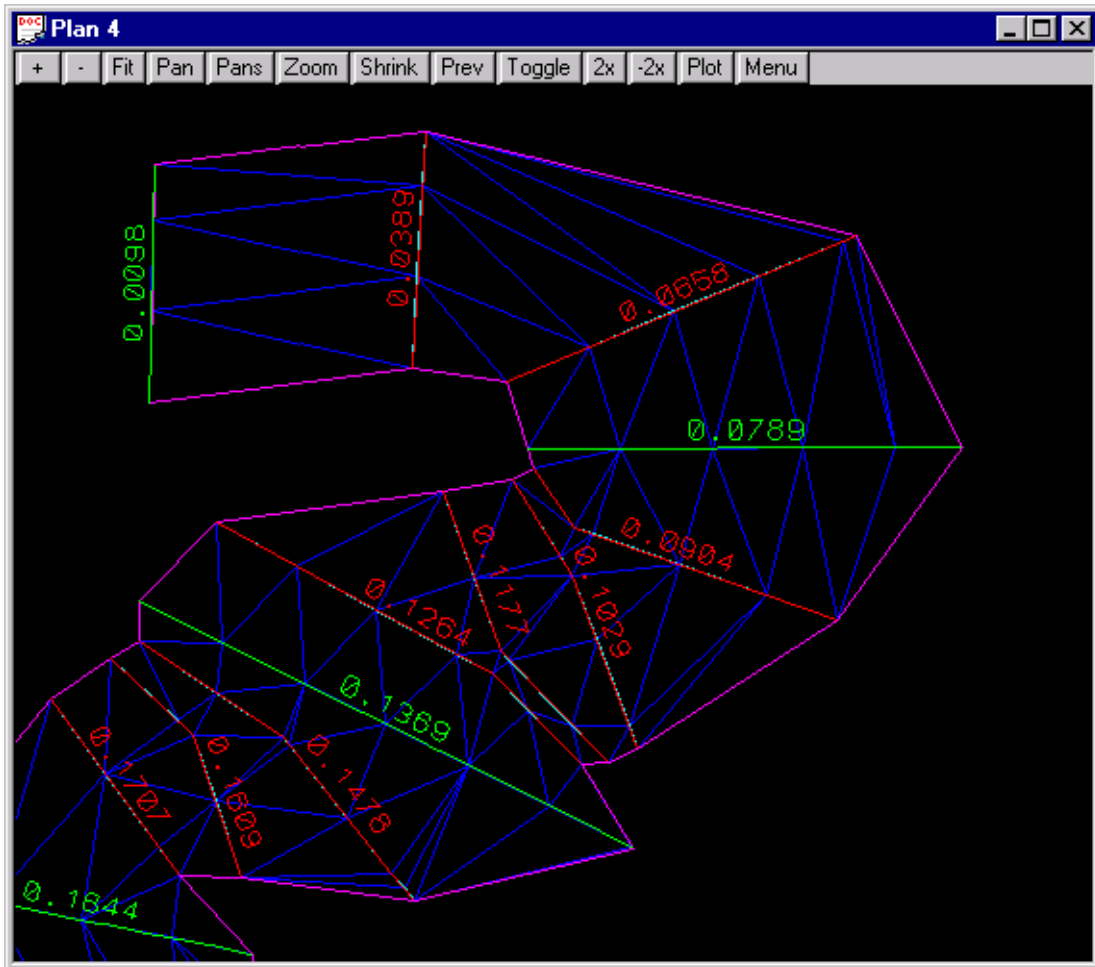
EXISTNG DATA

River strings model Model box

The river strings model specified in the write panel.

Cross Section model Model box

*The cross section model specified in the write panel. This must be specified but is only used when reading the *.rep file types (see **File format** below). The interface will search the string names in this model for the cross sections specified in the HEC-RAS report. A match is successful if the HEC-RAS cross section chainage and the string name are within the tolerance specified below in **Chainage tolerance**.*



Shape string model Model box

For meandering rivers, the cross sections (shown in green above) may not be at a close enough spacing to create a water surface that follows the river. 2D shape strings (shown in red above) can be created to create a water surface (shown in blue above) to follow the river. Note that water levels are extended when the shape strings are in a junction area or past the end of a reach.

Ground surface tin Tin box

*If a **boundary string model** is specified below, the intersection of this ground surface and the water surface will be determined. The strings will be stored in the model from the **boundary string model** field.*

File format Choice box

The GIS format should be used in most cases. The rep format is used for reading the HECRAS report files with the "Standard Table 1" selected in HECRAS.

HEC-RAS report file name File box

The HEC-RAS report file (GIS format) is created using the HEC-RAS menu selection

File=>Export GIS data

The HEC-RAS report file (REP format) created using the HEC-RAS menu selection

File=>Generate Report

The report must include the Standard Table 1.

RESULTS DATA

Water surface tin model Model box

The model to contain the new water surface tin.

Water surface tin Tin box

The name of the water surface tin to be created.

Water level results model Model box

The model where the water surface strings will be created at each cross section and shape string.

Boundary string model Model box

The model to contain the intersection strings between the water and ground surfaces specified above. If left blank no intersection strings will be calculated.

PARAMETERS

Chord Length Model box

This value set the spacing for the points on the water level strings (both cross section and shape strings). It is recommended that you use a length of no more than half of your average cross section and shape string lengths. A large value in this field may result in unexpected water level profiles for meandering rivers.

Centre line chainage factor Model box

*This data is only required if the **Shape string model** is used. The shape string names are created by dividing the chainage on the centre line by this factor. Typically 1000 is used to convert metres to kilometres and 5280 to convert feet to miles.*

Chainage Tolerance Real box

This is the tolerance used when the cross section chainage from the HEC-RAS report is compared with the cross section string names. A value of 0.00001 is excellent if you have not altered the cross section names in 12d or HEC-RAS.

However, if you have altered chainage names then you may have to increase the value of the tolerance. Suppose the tolerance is set to 0.001 and the water level for section 0.056 is read from the HEC-RAS report file. The interface will search for the first string with a name between 0.055 and 0.057. If you chose to great of a tolerance then more than one water level result will match a 12d cross section and a warning message will be given.

If you have one specific cross section that you would like to have a different tolerance set for (maybe only one section is giving you troubles), use the Attribute Editor

(Strings->User->Attribute Editor), select the cross section string and create a real type attribute named tolerance set to the tolerance desired.

Import cross sections (GIS file)

Rivers_hecras_gis_panel

Position of option on menu: **Design=>Rivers=>HEC-RAS interface=>Import cross sections (gis file)**

This option is used to import HEC RAS cross sections are HEC RAS interpolated cross section into 12d model. Note that the imported cross sections will be given the X,Y coordinates used in the HECRAS project.

See Also

River and Source Strings

HEC-RAS Interface

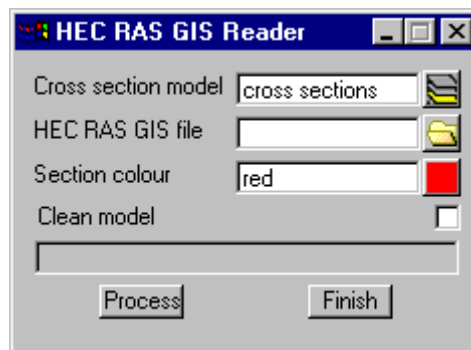
How to for Rivers

Frequently Asked Questions (Rivers)

Usage

This panel is accessed from the menu selection

Design => Rivers => HEC-RAS Interface=>Import cross sections (GIS file)



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Cross section model <i>the imported cross section strings will be stored in this model</i>	model box		
HEC RAS GIS File <i>the GIS file generated from HEC RAS</i>	File box		
Surface Tin <i>ground surface tin used to calculate the volumes and flood limits</i>	tin box		
Section colour <i>Cross sections will be created using this colour</i>	colour box		
Clean model <i>if selected all strings in the Cross section model will be deleted before the cross sections are imported</i>	tick box		
Process <i>executes the option.</i>	button		

Finish button
removes the dialogue from the screen

Read HEC-RAS interp sections

[Drainage_hecras_interp_panel](#)

Position of option on menu: Design=>Rivers=>HEC-RAS interface=>Read HEC-RAS interp section

This option is used to import HEC RAS interpolated cross sections (names begin with *) based on their distance along the left and right bank strings.

The low chainage must be at the downstream end for both the "left bank" and "right bank" strings.

See Also

River and Source Strings

HEC-RAS Interface

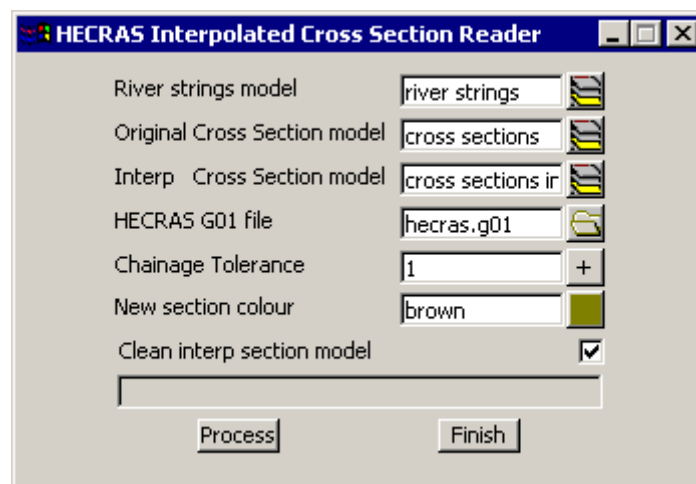
How to for Rivers

Frequently Asked Questions (Rivers)

Usage

This panel is accessed from the menu selection

Design => Rivers => HEC-RAS Interface=>Read HEC RAS Interp sections



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

[hec ras read panel River strings model](#)**River strings model**model box
the centre line, left and right bank strings must exist in this model

[Rivers_hecras_interp_panel](#)**Chainage tolerance**Real box
existing cross sections must be located in 12d model. This value is the tolerance used when the HEC RAS cross section names are compared to the 12d string names.

[hec ras read panel Original Cross Section model](#)**Original cross section model**model box

the HEC RAS cross section names will be compared with the string names in this model

hec ras read panel Interp Cross Section model **Interp cross section model** model box

the imported cross section strings will be stored in this model

hec ras read panel HECRAS G01 file **HEC RAS G01 File** File box

*the G01 (geometry) file used by HEC RAS to store the data in raw format. This is **not** the GIS format.*

Process button

executes the option.

Finish button

removes the dialogue from the screen

Read HEC2 Data

Drainage_hec2_panel

Position of option on menu: Design=>Rivers=>HEC-RAS interface=>Read HEC2 data

This option is used to import HEC2 cross sections into 12d. Since the file does not contain any easting and northing data, the cross sections will be lined up vertically and will have to be placed manually inside 12d.

See Also

River and Source Strings

HEC-RAS Interface

Moving Strings ragg

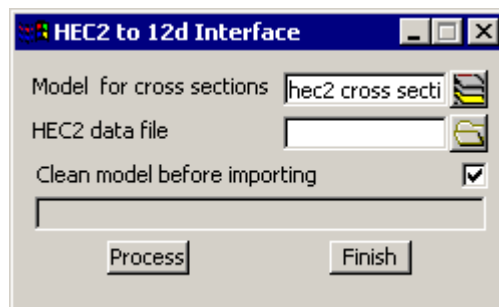
How to for Rivers

Frequently Asked Questions (Rivers)

Usage

This panel is accessed from the menu selection

Design => Rivers => HEC-RAS Interface=>Read HEC2 Data



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Cross section model	model box		
----------------------------	-----------	--	--

the cross section created will be placed in this model

HEC2 cross section File boxbox
the HEC2 cross section data file to be read

Process button
read the data and create the cross sections.

Finish button
removes the dialogue from the screen

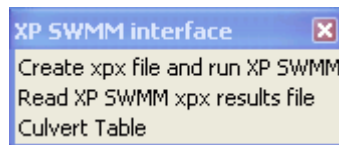
XP-SWMM Interface

XP_SWMM_interface

Position of menu: Design=>Rivers=>XP SWMM interface

The XP-SWMM interface launches your XP-SWMM program and loads either a default xpx file from the set_ups path (master_rivers.xpx) or your existing project. The 12d data is automatically imported in the XP-SWMM project (via a *.xpx file) to either create a new river reach or update an existing reach. Water levels are read back into 12d where they may be viewed in a 3D perspective view to easily identify extents of flooding.

The XP-SWMM walk right menu is,



See also

River and Source Strings

Defining Culvert Locations

Hydrology Data

Create XP-SWMM files

Read XP-SWMM results

Presenting Water Level Results

How to for Rivers

Frequently Asked Questions (Rivers)

Exporting to XP-SWMM

The XP-SWMM project is created from a surface tin (representing the river bed and overbanks) and a model containing strings identified by their names “left bank”, “right bank and the name prefix, “centre line”. Any additional strings in the specified model will be ignored (warning messages will be given when you run the macro that any additional strings are being ignored). The low chainage (often zero) of the centre line strings must be at the downstream end of the reaches.

Cross sections are created at the location of the **source strings**. Source strings can be deleted and additional sections can be added by creating new source strings. The **Create source strings** tick box on the interface panel must **NOT** be selected to use the customised strings.

Presenting XP-SWMM Results in 12d

After the XP-SWMM analysis is complete the water level results are read back into 12d. Water level strings are created with the plan shape of the cross sections at the elevation retrieved from the XP-SWMM results (xpx file). These strings are then triangulated to create a water surface tin from which the water level boundaries are determined. These results can then be shown in plan, long section, cross section and in 3D perspectives.

More details

XP-SWMM Write Panel

Rivers_xpswmm_panel XP SWMM Interface Writer

Position of option on menu: Design=>Rivers=>XP SWMM interface=>Create xpx file

and run XP SWMM

The XP-SWMM interface creates the XP-SWMM project files ready to open and run. This includes the project, plan, flow and geometry files. Water levels are read back into 12d where they may be viewed in a three dimension perspective view to easily identify extents of flooding.

[Rivers_xpswmm_panel_beta XP SWMM Interface Writer](#)

See also

River and Source Strings

Hydrology Data

XP-SWMM Interface overview

Read XP-SWMM results

Presenting Water Level Results

How to for Rivers

Frequently Asked Questions (Rivers)

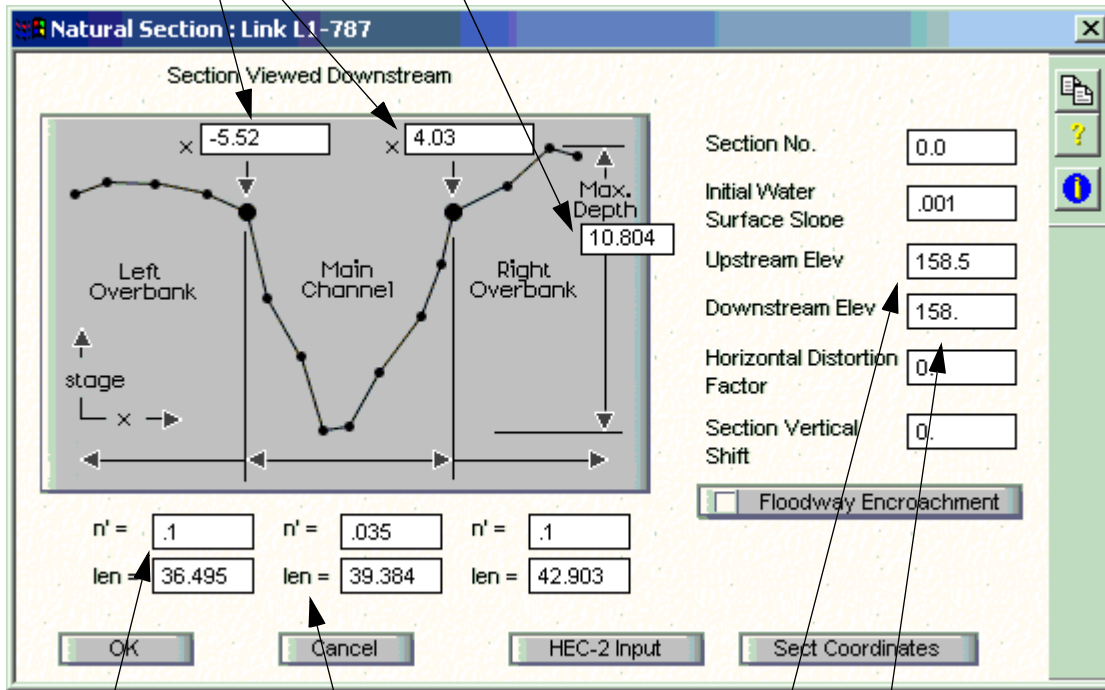
The source strings define the location where cross sections are cut from the ground surface TIN. A node is created in XP-SWMM at this location and the cross section shape is used to the next downstream node (no cross section is created at the most downstream source string).

The centre line and overbank channel lengths are measured in the downstream direction. XP SWMM link and node input panels are displayed below with the relationship to the 12d model described.

XP SWMM Link Data

cross section chainage at intersection of left and right bank strings

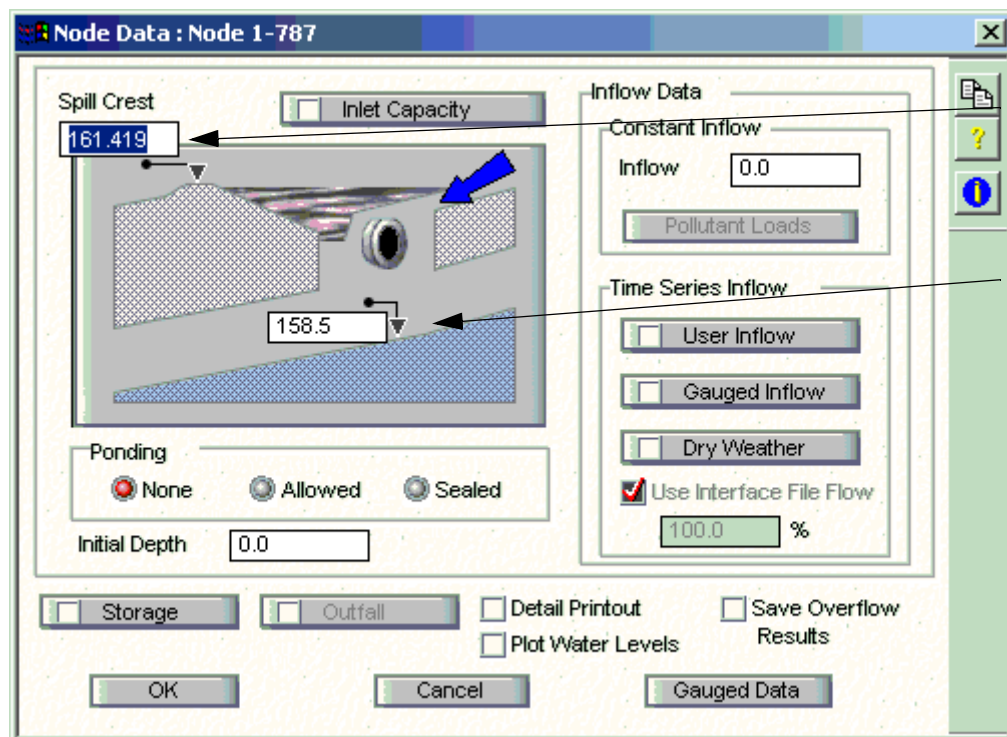
max elev - min elev at upstream cross section



n values from 12d panel
channel lengths measured along
river strings

Minimum cross section elev from
upstream node.
Minimum cross section elev from
downstream node

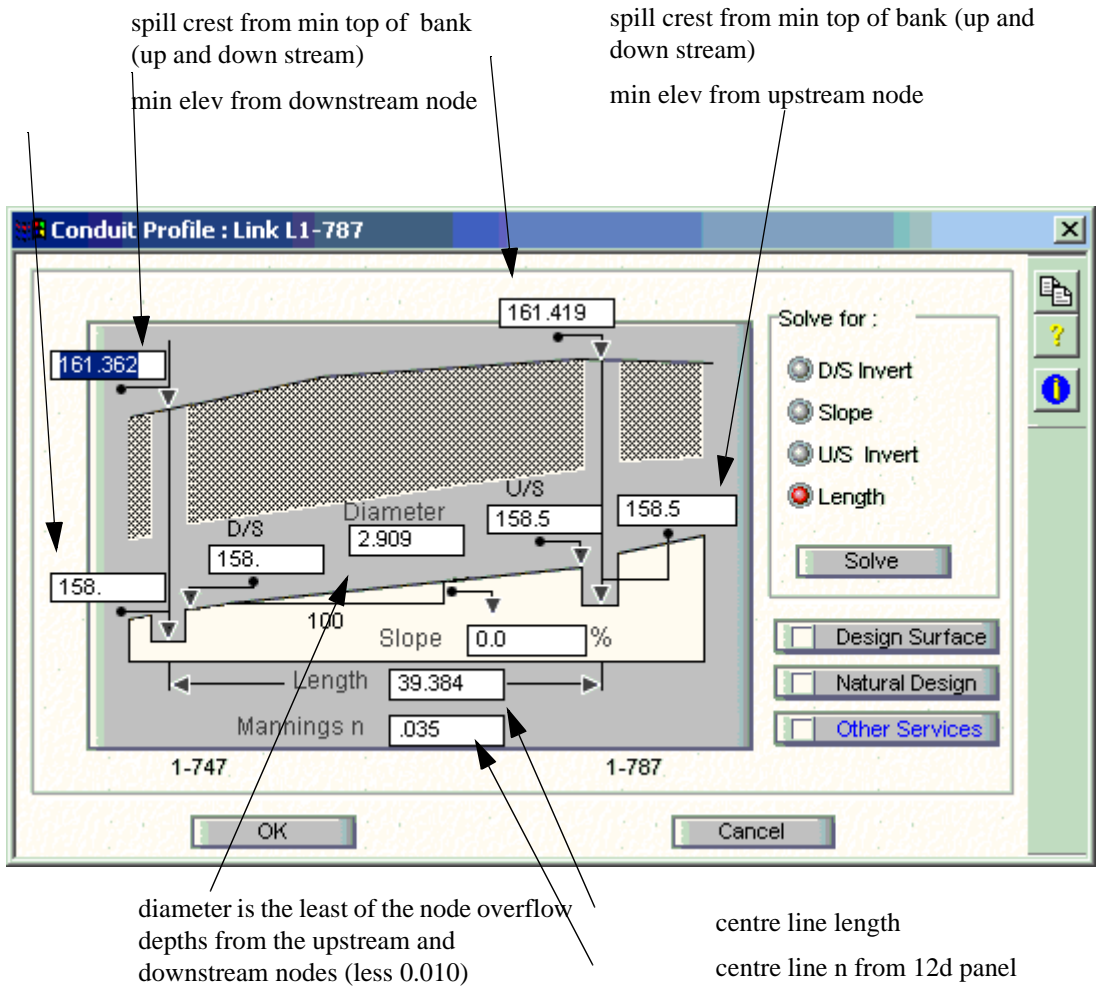
XP SWMM Node Data



max
top
of
bank
from
upstr
eam
and
down
strea
m
links
mini
mum
eleva
tion

XP SWMM Conduit Data

The slope of the conduit/link is calculated by assuming that its invert matches vertically with the invert of the downstream link. The overflow levels at the nodes are calculated by determining the lowest of the bank levels for the upstream and downstream links. The least of the overflow depths at the nodes is then used as the link diameter.



Usage

The XP-SWMM panel for creating the XP-SWMM project follows.

The fields and buttons used in this panel have the following functions:

Field Description	Type	Defaults	Pop-Up
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River strings model	Model box		
----------------------------	-----------	--	--

*Model containing the centre line, left bank and right bank strings. **The centre line strings must begin downstream and proceed upstream.** The name of the river may follow the words "Centre line " (note the ending space). For example the centre line string may be named "Centre line Parramatta River, downstream reach". The comma separates the river name from the reach name. If no comma is included then the river name is repeated for the reach name.*

The left and right bank strings need not be separate strings (see figure below).

Source string model	Model box		
----------------------------	-----------	--	--

*New source strings will be created in this model or existing source strings are contained in the model. See **Create source strings** tick box below.*

Create Source Strings	Tick box	not selected	
------------------------------	----------	--------------	--

When selected existing source strings are deleted and new ones created perpendicular to the centre line at the specified spacing and length. Once you have created the sources strings they can be easily modi-

fed. On the **Strings->Points Edit** menu you will find the selections **Move** (to move the end points), **Insert** (to insert additional points).

- Distance between sections** Real box
The distance between the cross sections. At present no check is made for overlapping cross sections around river bends.
- Section Length** Real box
The length of the cross section with zero chainage at the mid point.
- Cross section model** Model box
The cross sections created and exported are stored in this model.
- Centre Line Chainage Factor** Real box
The cross section names are created by dividing the chainage on the centre line by this factor. Typically 1000 is used to convert metres to kilometres and 5280 to convert feet to miles.
- Number of decimals** Integer box
The cross section names are created with this many decimals. CAUTION XP SWMM only allows 10 characters for the names and each link name begins with "Lx-" That leaves 7 characters for the chainages.
- Surface Tin (not the model)** Tin box
Tin or super tin to create the cross sections from (remember a tin is like a string. It is placed in a model.).
- Levee Tolerance** Real box
Not implemented in XP-SWMM.
- Manning's n** Real box
Manning's n values for the left, right and centre channel sections.
- Delta Y tolerance** Real box
*This value filters out points on the cross section. Imagine a tube of this diameter passing over the cross section. The tube is elongated until one point lies outside the tube. The tube is shortened to the previous point and then all points inside the tube are deleted from the cross section. The tube then moves on to the next point. The filtered (smoothed) and original sections are kept for comparison. **The final water tin is created from the ground tin and therefore the boundary string is located using the unfiltered section.***
- Discharge** Real box
*This discharge is used at the upstream end of all reaches. If you have multiple river branches, you can set the flow for each branch inside XP-SWMM or inside 12d. This can be changed at each section **See manual settings***
- Units** Choice box
This selection will set the default units for the project being created.
- Project file name** Input box
*The XP-SWMM *.xp name to be created or updated. An xpx file will also be created using this name to*

transfer the data.

After selecting the **Process** button the cross section strings will be created and exported to a xpx file (using the project file name as the stem. **Never included ".xpx" in the project file name**) The xpx file will be over written without any warning. This is only used as a temporary transfer file.

12d needs to know where XPSWMM program and the XP SWMM working directory are. The system file that contains these locations is called XPSWMM.4d. (See **System file path** for its location). The file contents are as follows:

Line 1 the XP SWMM working directory
 Line 2 the full path to the XP SWMM program
 Line 3 the destination of the hydro.ini file when it is created

IMPORTANT: include the final "\" on lines 1 and 3.

The **XPSWMM.4d** file as supplied follows;

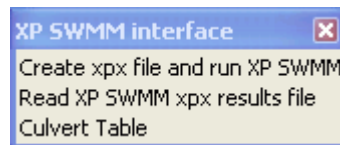
```
c:\xps\xp-swmm\work\  

c:\xps\xp-swmm\xpswmp32.exe  

c:\xps\xp-swmm\  


```

Next 12d will check for an XP project in your XP SWMM work directory (project file name + ".xp"). If it does not exist the file **Master_rivers.xp** will be copied from the **System file path** to your XP SWMM working directory. If a wp file already exists in your working directory you will see the following options dialogue.



The default is to update the wp file. Nodes and links in the file with the same names as in the export will be updated. If they do not exist they will be added. The import will NOT delete any nodes or links inside XP SWMM. This option is often used to merge rivers data with urban drainage data.

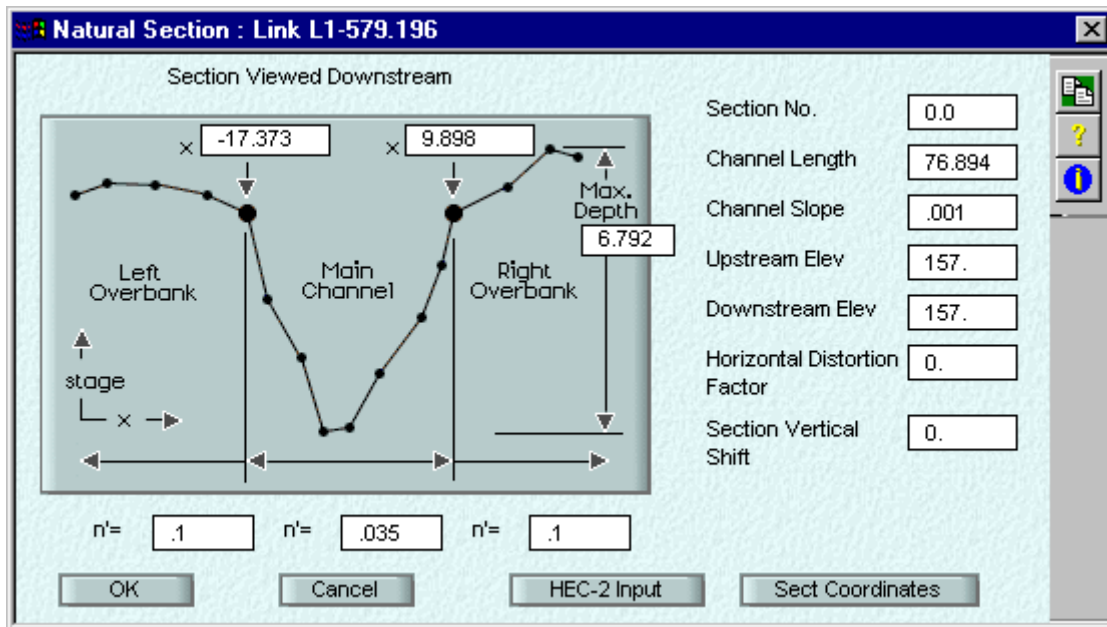
The over write option will copy the Master_river.xp file into the working directory and over write the existing file.

In either of the two cases the xpx file will be imported after XP SWMM has started. When you exit your XP SWMM session regardless of whether or not you save the XP file the XPX file will be exported over writing the original export file from 12d.

Your third option if not to run XP-SWMM at all and work with the XPX file as you see fit.

Export Details

The following diagram displays how the values from 12d are exported to XP-SWMM



At every source string location a node is created in XP-SWMM. The cross section geometry is then used for the downstream reach and is exported looking in the downstream direction.

The node name is **set manually** or calculated inside 12d by obtaining the centre line chainage at the intersection with section string. This value is divided by the **Centre line chainage factor** and rounded to the **Number of decimals** specified in the 12d export dialogue box. This value is then prefixed with the reach index followed by a dash. The downstream link name is set to the node name prefixed with "L". If you are planning to merge the river file with an XP SWMM drainage network then you will want to manually set the node names to the drainage pit names for the most upstream and most downstream source strings.

When selecting the **Number of decimals** in the 12d export dialogue, ensure that the total link name generated does not exceed the XP limit of 10 characters.

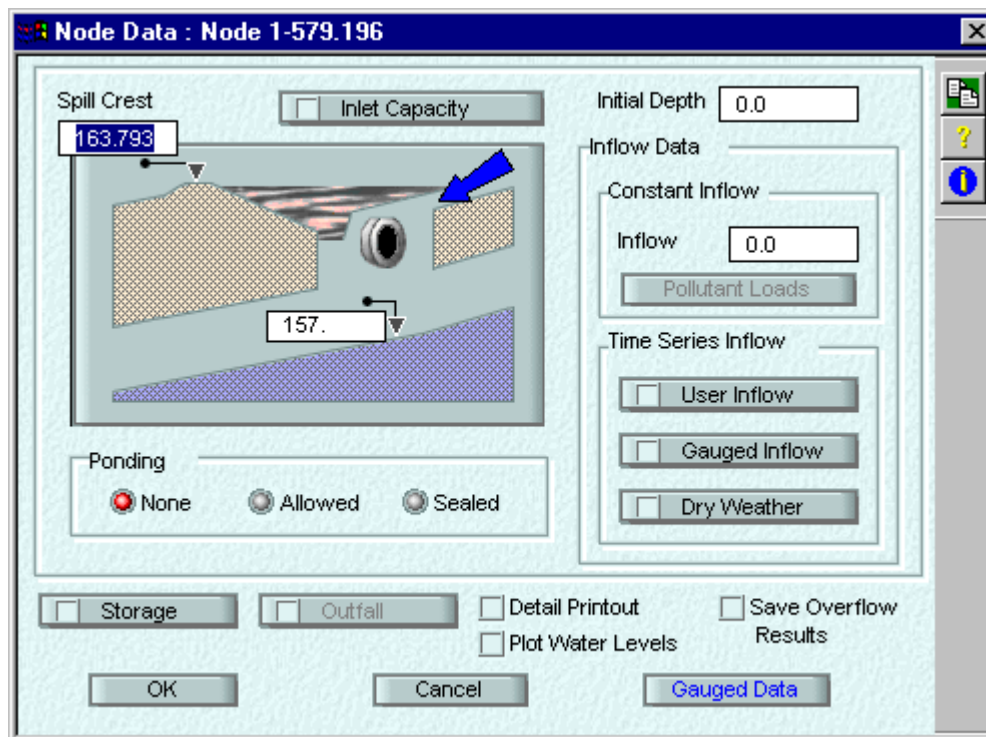
The section number variable is not exported to XP-SWMM.

Where the centre line cross the section in 12d is marked as zero chainage in XP-SWMM. The left overbank (-17.373) and the right overbank (9.898) are determined by the intersection of the left and right bank strings with the section. The n values are the values that are entered in the 12d export dialogue box. The maximum depth is calculated by subtracting the lowest elevation from the greatest elevation for both this cross section and the downstream cross section. The minimum of the two values is used.

The channel length is determined by subtracting the downstream section's centre line chainage from the current section centre line chainage. The **Centre line chainage factor** is **NOT** used in this calculation.

Upstream elevation is obtained by calculating the minimum elevation at the current section and the downstream elevation is the same value for the downstream cross section. The channel slope is calculated using these elevations and the channel length above.

The horizontal distortion factor and section vertical shift are set to zero. A section coordinate point is generated every time the source string crosses a 12d triangle edge, at the centre line and the left/right bank locations.



The spill crest level at the node is set to the maximum level on the cross section. Constant inflow is zero unless the node is the most upstream section on the reach or the flow value for the source string has been set manually see manual settings.

Hydrology Data

Hydrology data may be exported to the runoff layer of XP SWMM for both the reservoir strings and the source strings. There are 2 requirements to enable the hydrology.

Key Points

1. If you plan to use storage areas, you need to draw reservoir strings (all in one model) and each should have a name (to become the XP SWMM node name).
2. You must create a file named "hydrology.txt" and store it in the project working folder. This file will contain the default xpx variable names. These defaults may be overridden using the same xpx variable name as a string attribute on the source/reservoir string (see format below).
3. The reservoir or source string must have an integer string attribute named "xpx r rfcmnt" with a value greater than 0 (max of 5). Use the Strings->Properties->Attributes or Strings->User->Attribute Editor to create/change this attribute.
4. Total area for the reservoir strings is calculated at each export time.

Hydrology.txt file format

The file is tab delimited and each line consists of three pieces of data: the XPSWMM variable name, the default value, and the type of data (integer, real or text).

You enter the xpx variable name

Any of these default values may be specified using a string attribute on the reservoir or source string. The attribute name must be of the same type as defined in the hydrology.txt file. If data for a second XP SWMM catchment is desired add a " 2" to the end of the attribute name. Up to 5 catchments are allowed in XP SWMM.

A sample hydrology.txt file follows:


```
// SCS hydrology screen

R_CN      85      real
R_TC      60      real
R_SHF     256     integer
R_SHAPE   0       integer

R_IADEPTH 0.04    real
R_IAFRACT 0.2     real
R_IA      1       integer
CNTLS     5       integer
R_FSCS    1       integer

// sub catchment screen

R_RAINSEL "SCS Type II FL Mod."text
R_INFILSEL      ""text
R_GWTAG  0      integer

// runoff node screen

R_WAREA  1.      real
R_WIMP   1.      real
R_WIDTH  1.      real
R_WSLOPE 1.      real
```

Attribute name format for string attributes.

The attribute name is the XP variable name prefixed by "xpx " with the underscore character in the xpx variable replaced by a space. For example the xpx variable "R_RAINSEL" would be set using the attribute name "xpx R RAINSEL".

Exporting River Junctions

River junctions are defined by the intersection of the centre line strings in 12d. The cross section immediately downstream of the intersection becomes the junction node. It is used as the downstream cross section for all upstream branches. The channel length for the last link on the tributary is set to the distance the centre line string extends beyond the cross section. The distance downstream along the main branch is **NOT INCLUDED!**

XP-SWMM Read Panel

[Rivers_xpswmm_panel XP-SWMM Interface Reader](#)

Position of option on menu: Design=>Rivers=>XP SWMM interface=>Read XP SWMM xpx results file

After the XP-SWMM analysis is complete and the XP-SWMM program is closed the water level data is written to an xpx file that 12d will read. Water level strings are created with the plan shape of the cross sections at the elevation retrieved from the XP-SWMM results. These strings are then triangulated to create a water surface tin.

[Rivers_xpswmm_panel_beta XP-SWMM Interface Reader](#)

See also

[XP-SWMM Interface overview](#)

Create XP-SWMM files
 Presenting Water Level Results
 How to for Rivers
 Frequently Asked Questions (Rivers)

Usage

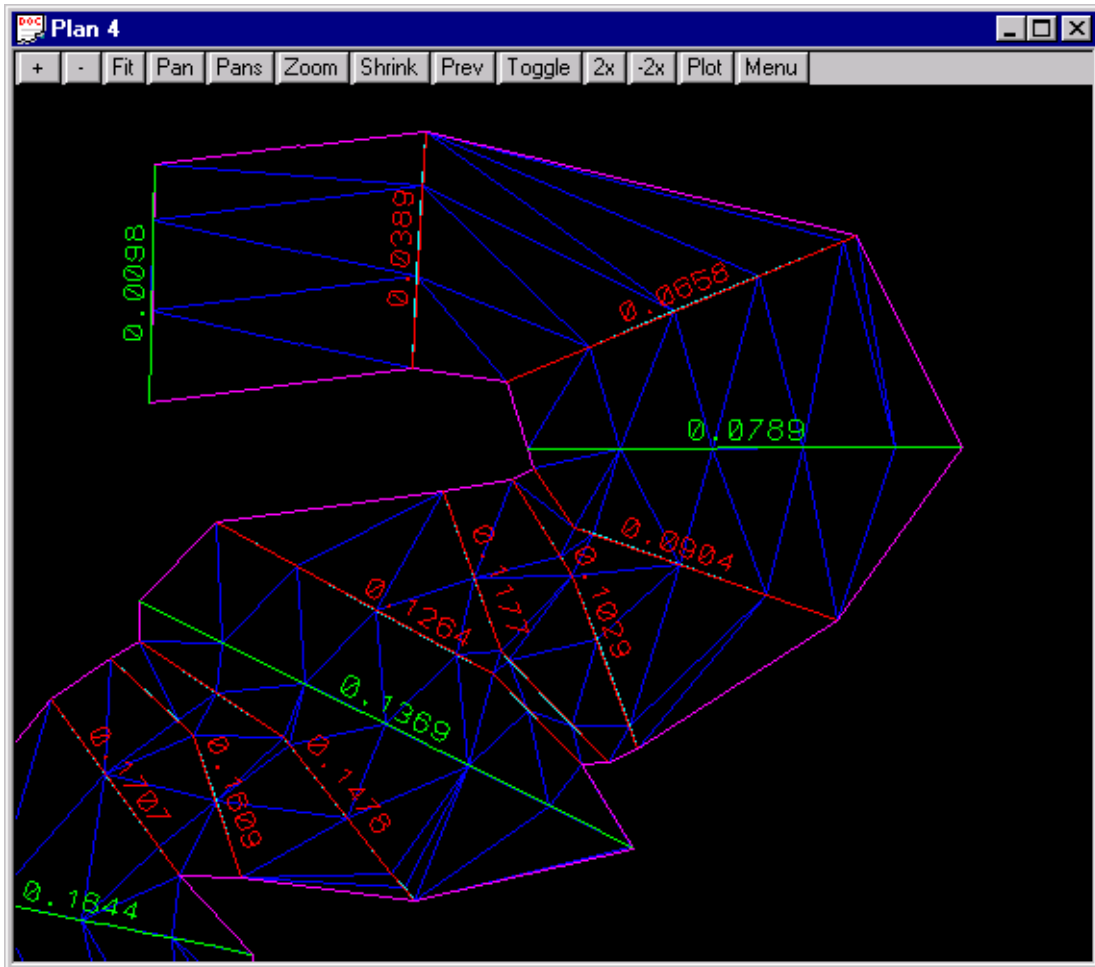
The XP-SWMM read panel follows.

River strings model Model box

The river strings model specified in the write panel.

Cross Section model Model box

*The cross section model specified in the write panel. The interface will search the string names in this model for the cross sections specified in the XP-SWMM report. A match is successful if the XP-SWMM cross section chainage and the string name are within the tolerance specified below in **Chainage tolerance**.*



Shape string model Model box

For meandering rivers, the cross sections (shown in green above) may not be at a close enough spacing to create a water surface that follows the river. 2D shape strings (shown in red above) can be created to create a water surface (shown in blue above) to follow the river. Note that water levels are extended when the shape strings are in a junction area or past the end of a reach.

Centre line chainage factor Model box

*This data is only required if the **Shape string model** is used. The shape string names are created by dividing the chainage on the centre line by this factor. Typically 1000 is used to convert metres to kilometres and 5280 to convert feet to miles.*

Ground surface tin Tin box

*If a **boundary string model** is specified below, the intersection of this ground surface and the water surface will be determined. The strings will be stored in the model from the **boundary string model** field.*

XP-SWMM report file name File box

*The XP-SWMM *xpx* file created automatically created when closing XP-SWMM or via the XP-SWMM menu selection*

File=>Export Data

Water surface tin model Model box

The model to contain the new water surface tin.

Water surface tin Tin box

The name of the water surface tin to be created.

Water level results model Model box

The model where the water surface strings will be created at each cross section and shape string.

Boundary string model Model box

The model to contain the intersection strings between the water and ground surfaces specified above. If left blank no intersection strings will be calculated.

Chord Length Model box

This value set the spacing for the points on the water level strings (both cross section and shape strings). It is recommended that you use a length of no more than half of your average cross section and shape string lengths. A large value in this field may result in unexpected water level profiles for meandering rivers.

Chainage Tolerance Real box

This is the tolerance used when the cross section chainage from the XP-SWMM report is compared with the cross section string names. A value of 0.00001 is excellent if you have not altered the cross section names in 12d or XP-SWMM.

However, if you have altered chainage names then you may have to increase the value of the tolerance. Suppose the tolerance is set to 0.001 and the water level for section 0.056 is read from the XP-SWMM report file. The interface will search for the first string with a name between 0.055 and 0.057. If you chose to great of a tolerance then more than one water level result will match a 12d cross section and a warning message will be given.

If you have one specific cross section that you would like to have a different tolerance set for (maybe only one section is giving you troubles), use the Attribute Editor

(Strings->User->Attribute Editor), select the cross section string and create a real type attribute named tolerance set to the tolerance desired.

MIKE11 Interface

Mike11_interface

Position of menu: **Design=>Rivers=>Mike11 interface**

The MIKE 11 interface creates the MIKE 11 project files including *.bnd11, *.hd11, *.nwk11, sim11 and the cross section data text file (to be imported into *.xns11). Water levels are read back into 12d where they may be viewed in a 3D perspective view, on cross sections and on river profiles. Plan drawings easily identify extents of flooding and all data can be plotted onto engineering drawings.

The Mike11 walk right panel is,



See also

- River and Source Strings
- MIKE11 Interface Overview
- MIKE 11 Write Panel
- MIKE 11 Read Panel
- Presenting Water Level Results
- How to for Rivers
- Frequently Asked Questions (Rivers)

Exporting to MIKE 11

The MIKE 11 project is created from a surface tin (representing the river bed and overbanks) and a model containing river centre line strings (identified by the name prefix, "centre line"). The low chainage (often zero) of the centre line strings must be at the upstream end of the reaches.

Cross sections are created at the location of the **source strings**. These source strings are initially created using the MIKE 11 option at a user defined spacing and section length, imported from drawing packages or manually created in 12d. The user may alter these sections as desired. They may be shortened if they intersect at sharp bends in the river; they may be extended at extremely wide river sections or extra points may be added so that the section is no longer a straight line.

Source strings can be deleted and additional sections can be added by creating new source strings. The Create source strings tick box on the interface panel must NOT be selected to use the customised strings.

Presenting MIKE 11 Results in 12D

After the MIKE 11 analysis is complete the maximum water level results are read back into 12d. Water level strings are created with the plan shape of the cross sections at the elevation retrieved from the MIKE 11 results. These strings are then triangulated to create a water surface tin.

How the water level boundaries are determined

MIKE 11 Write Panel

Rivers_mike11_panel Mike11 Interface Writer

Position of option on menu: **Design=>Rivers=>Mike11 interface=>Create Mike11 files**

The MIKE 11 interface creates the MIKE 11 project files including *.bnd11, *.hd11, *.nwk11, *.sim11 and the cross section data text file (to be imported into *.xns11). Water levels are read back into 12d where they may be viewed in a 3D perspective view to easily identify extents of flooding.

Rivers_mike11_panel_beta Mike11 Interface Writer

See also

River and Source Strings

MIKE 11 Read Panel

Presenting Water Level Results

How to for Rivers

Frequently Asked Questions (Rivers)

Usage

12d creates most of the files necessary to run MIKE11. The exception to these are the time series files (both water level and discharge data). The simulation file created assumes that these files will have the same name as the centre line strings used in 12d. For example, if you name your centre line string *centre line Major River* then your time series files will be named *Major River-H.DFS0* for the tail water conditions and *Major River-q.dfs0* for your discharges.

The *.bnd11, *.hd11, *.nwk11 and *.sim11 files are created by appending 12d data to default data found in the following files.

cross_sections.4d

hd11-end.4d

hd11-header.4d

nwk11-header.4d

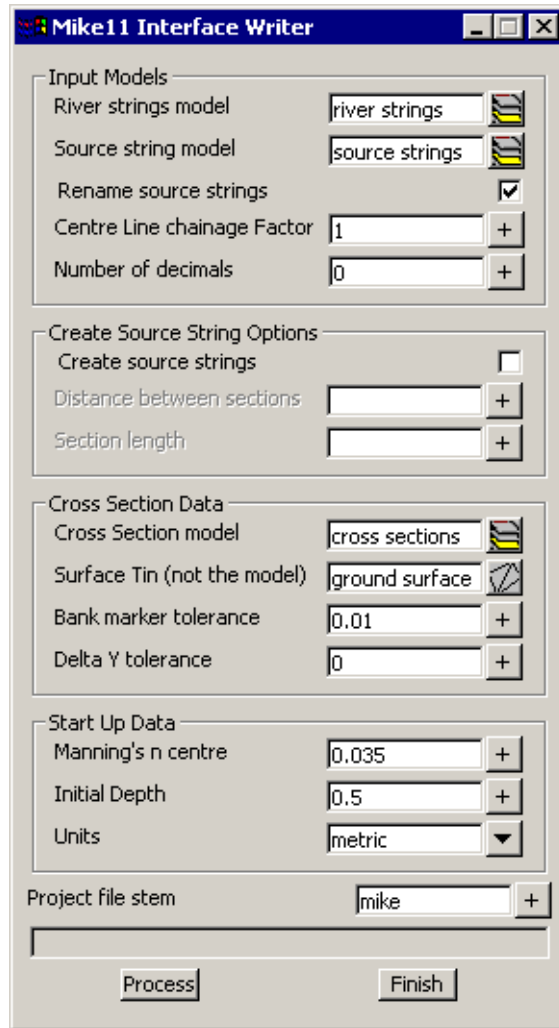
nwk11-options.4d

sim11-header.4d

sim11-period.4d

The user need not modify these files unless they would like to change the default values used when first creating the MIKE11 project. If you plan to modify these files, they are found in the 12d *setups* directory. Before modifying they should be copied to the 12d *user* directory (global defaults) or into the current project directory if they are project specific.

The MIKE 11 panel for creating the MIKE 11 project follows.



The fields and buttons used in this panel have the following functions:

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

River strings model	Model box		
----------------------------	-----------	--	--

*Model containing the river centre line strings. **The centre line strings must begin upstream and proceed downstream.** The name of the river must follow the words “centre line “ (note the ending space). The name of the river may follow the words “Centre line “ (note the ending space). For example the centre line string may be named “Centre line Parramatta River, downstream reach”. The comma separates the river name from the reach name. If no comma is included then the river name is repeated for the reach name.*

Confluences are modelled by a using a separate string for all reaches. Thus a system with a branch is modelled with three strings. The branch will be one string and the main reach will have a downstream string and an upstream string. The reaches must touch at the confluence.

Source string model	Model box		
----------------------------	-----------	--	--

*New source strings will be created in this model or existing source strings are contained in the model. See **Create source strings** tick box below.*

Create Source Strings	Tick box	not selected	
------------------------------	----------	--------------	--

When selected existing source strings are deleted and new ones created perpendicular to the centre line at the specified spacing and length. Once you have created the sources strings they can be easily modified. On the **Strings->Points Edit** menu you will find the selections **Move** (to move the end points), **Insert** (to insert additional points).

Distance between sections Real box

The distance between the cross sections. At present no check is made for overlapping cross sections around river bends.

Section Length Real box

The length of the cross section with zero chainage at the mid point.

Cross section model Model box

The cross sections created and exported are stored in this model.

Centre Line Chainage Factor Real box

The cross section names are created by dividing the chainage on the centre line by this factor. Typically 1000 is used to convert metres to kilometres and 5280 to convert feet to miles.

Surface Tin (not the model) Tin box

Tin or super tin to create the cross sections from (remember a tin is like a string. It is placed in a model.).

Bank Marker Tolerance Real box

If the surface level drops more than this amount while moving away from the channel centre line then the crest is used as a Bank Marker. A value of zero means that no bank marks are created.

Delta Y tolerance Real box

This value filters out points on the cross section. Imagine a tube of this diameter passing over the cross section. The tube is elongated until one point lies outside the tube. The tube is shortened to the previous point and then all points inside the tube are deleted from the cross section. The tube then moves on to the next point. **The final water tin is created from the ground tin and therefore the boundary string is located using the unfiltered section.**

Manning's n Real box

Manning's n values for the channel sections.

Initial depth Real box

This depth is added to the minimum elevation on the cross section and is used as the starting water level for the cross section.

Units Choice box

This selection will set the default units for the project being created.

Project file name Input box

The MIKE11 project name. All of the MIKE11 files will begin with this name and the appropriate extensions added.

Running MIKE11

Three steps are required to run MIKE11 with the files 12d creates.

1. Create you time series files.
2. Inside MIKE11, create a new cross sections file and import the cross sections.
3. Open the simulation file, and load the network file to have the grid points calculated.

Creating Time Series Files

Your time series files must be named with the prefix of the river string name. For example if your centre line string in 12d was named *centre line Major River* your time series files need to named *Major River-H.DFS0* for the tail water conditions and *Major River-q.dfs0* for your discharges.

The standard time series dates are from 12:00 to 12:30 on 01 January 2000 with a one minute time step. If other periods are desired, you can either change the file *sim11-period.4d* in the 12d library before running the interface or change the dates inside MIKE11 after you read in the data. **DO NOT USE THE ORIGINAL FILES! Copy the file you are changing into the 12d user directory and modify it there. 12d will look for the file here first.**

Importing Cross Sections

From the MIKE11 main menu select **File->new** and then under Mike11 select **cross sections** from the dialogue box.

From the main menu select **File->Import->Import Raw data & Recompute**. Select the *.txt file with the **Project file stem** you specified in the 12d-Mike11 Write Panel. Now save this file with the same **Project file stem** (MIKE11 adds the .xns11 extension).

Calculating Grid Points

From the main menu select **File->Open** and select the *.sim11 file with the **Project file stem** you have specified in 12d. On the **Input** tab property sheet select **Edit** beside the **Network** file. Press **Ctrl+T** to take you into the table editing mode and then select the **Grid Points** tab property sheet. On the sheet select **Generate Grid Points** and then save the file.

You should now get the “Green lights” on the **Start** property sheet of the simulation file editor.

MIKE 11 Read Panel

[Rivers_Mike11_panel Mike 11 Interface Reader](#)

Position of option on menu: Design=>Rivers=>Mike11 interface=>Read Mike11 results (max)

After the MIKE 11 analysis is complete the water level results are read back into 12d. Water level strings are created with the plan shape of the cross sections at the elevation retrieved from the MIKE 11 results (maximum water level).

Water levels are interpolated to create water level strings at the shape string locations. Note that water levels are extended when the shape strings are in a junction area or past the end of a reach. These strings are then triangulated to create a water surface tin.

The MIKE11 executable file, *res11read.exe* must be found in the directory *c:/mikezero/bin* so that 12d can read the Mike11 binary data files.

[Rivers_Mike11_panel_beta Mike 11 Interface Reader](#)

See also

MIKE11 Interface Overview
 Presenting Water Level Results
 MIKE 11 Write Panel
 How to for Rivers
 Frequently Asked Questions (Rivers)

Usage

The MIKE 11 read panel follows.

The fields and buttons used in this panel have the following functions:

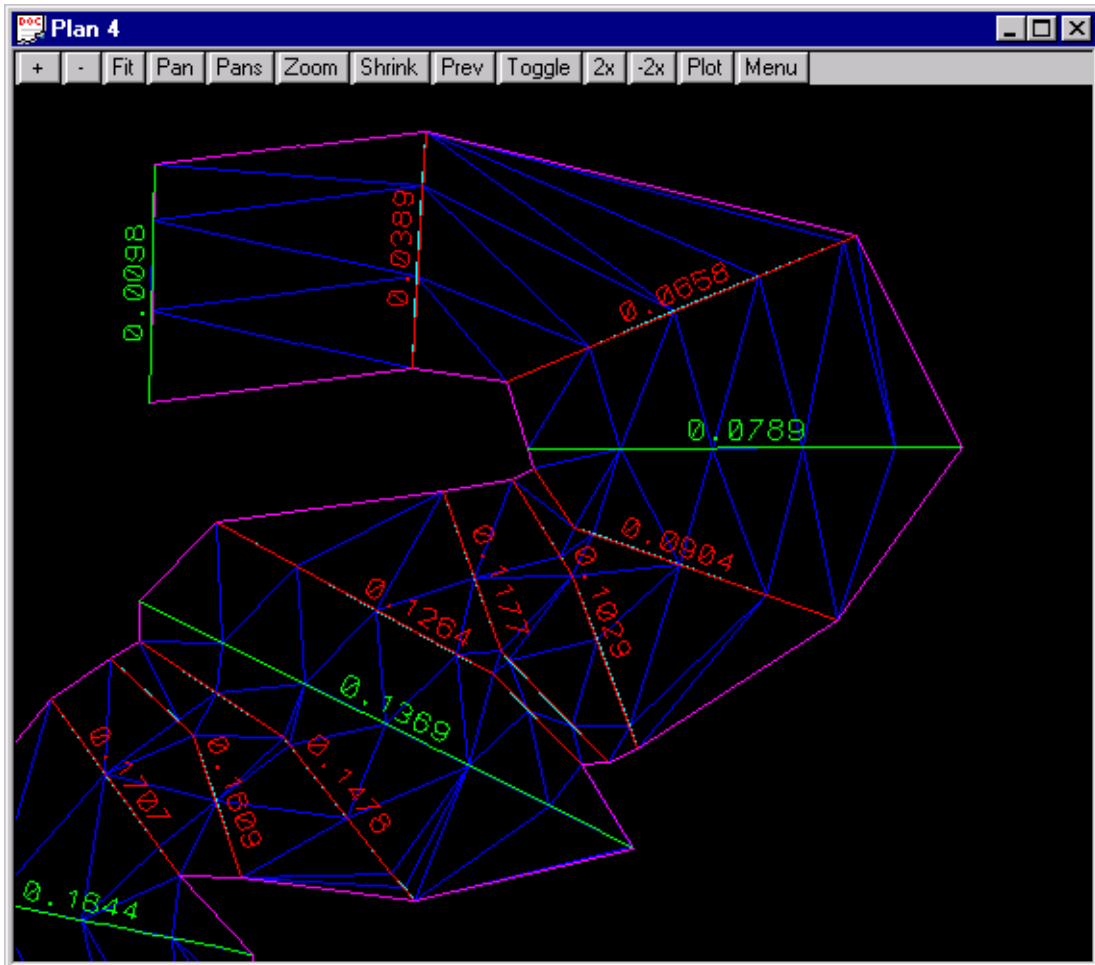
Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

River strings model	Model box		
----------------------------	-----------	--	--

The river strings model specified in the write panel.

Cross Section model	Model box		
----------------------------	-----------	--	--

*The cross section model specified in the write panel. The interface will search the string names in this model for the cross sections specified in the MIKE 11 report. A match is successful if the MIKE 11 cross section chainage and the string name are within the tolerance specified below in **Chainage tolerance**.*



Shape string model Model box

For meandering rivers, the cross sections (shown in green above) may not be at a close enough spacing to create a water surface that follows the river. 2D shape strings (shown in red above) can be created to create a water surface (shown in blue above) to follow the river. Note that water levels are extended when the shape strings are in a junction area or past the end of a reach.

Centre line chainage factor Model box

*This data is only required if the **Shape string model** is used. The shape string names are created by dividing the chainage on the centre line by this factor. Typically 1000 is used to convert metres to kilometres and 5280 to convert feet to miles.*

Ground surface tin Tin box

*If a **boundary string model** is specified below, the intersection of this ground surface and the water surface will be determined. The strings will be stored in the model from the **boundary string model** field. Super tins cannot be used for this function. A composite tin is required for the tin-tin intersect.*

MIKE 11 report file name Input box

This is the binary data file that will be converted to an ASCII text file and read by 12d. The maximum water levels at each cross section will be extracted from the file.

Water surface tin Tin box

The name of the water surface tin to be created.

Water surface tin model Model box

The model to contain the new water surface tin.

Water level results model Model box

The model where the water surface strings will be created at each cross section and shape string.

Boundary string model Model box

The model to contain the intersection strings between the water and ground surfaces specified above. If left blank no intersection strings will be calculated.

Chord Length Model box

This value set the spacing for the points on the water level strings (both cross section and shape strings). It is recommended that you use a length of no more than half of your average cross section and shape string lengths. A large value in this field may result in unexpected water level profiles for meandering rivers.

Centre Line Chainage Factor Real box

The cross section names are created by dividing the chainage on the centre line by this factor. Typically 1000 is used to convert metres to kilometres and 5280 to convert feet to miles.

Chainage Tolerance Real box

*This is the tolerance used when the cross section chainage from the MIKE 11 results file is compared with the cross section string names. If a **Centre line chainage factor** of 1 is used a value of 0.1 is appropriate. If a **Centre line chainage factor** of 1000 or 5280 is used a **Chainage** tolerance of 0.00001 is more appropriate.*

However, if you have altered chainage names then you may have to increase the value of the tolerance. Suppose the tolerance is set to 0.001 and the water level for section 0.056 is read from the MIKE 11 report file. The interface will search for the first string with a name between 0.055 and 0.057. If you chose to great of a tolerance then more than one water level result will match a 12d cross section and a warning message will be given.

If you have one specific cross section that you would like to have a different tolerance set for (maybe only one section is giving you troubles), use the Attribute Editor (Strings->User->Attribute Editor), select the cross section string and create a real type attribute named tolerance set to the tolerance desired.

Presenting River Water Level Results

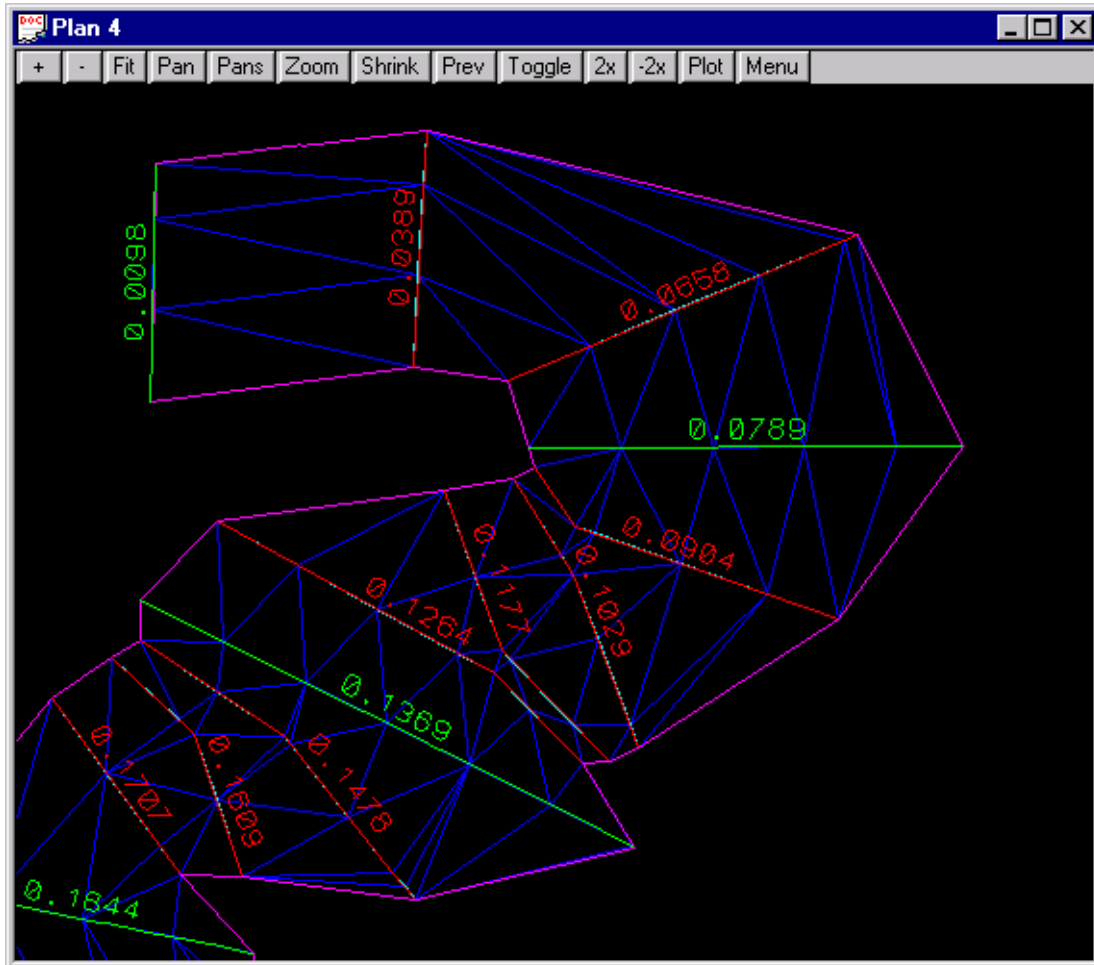
Topics

- How the water level boundaries are determined
- Defining the Water Surface Boundaries
- Trimming the Water Surface Tin and Islands
- Colouring the Ground Surface
- Colour by Depth
- Depth Contours
- Colour the ground surface by elevation

See also

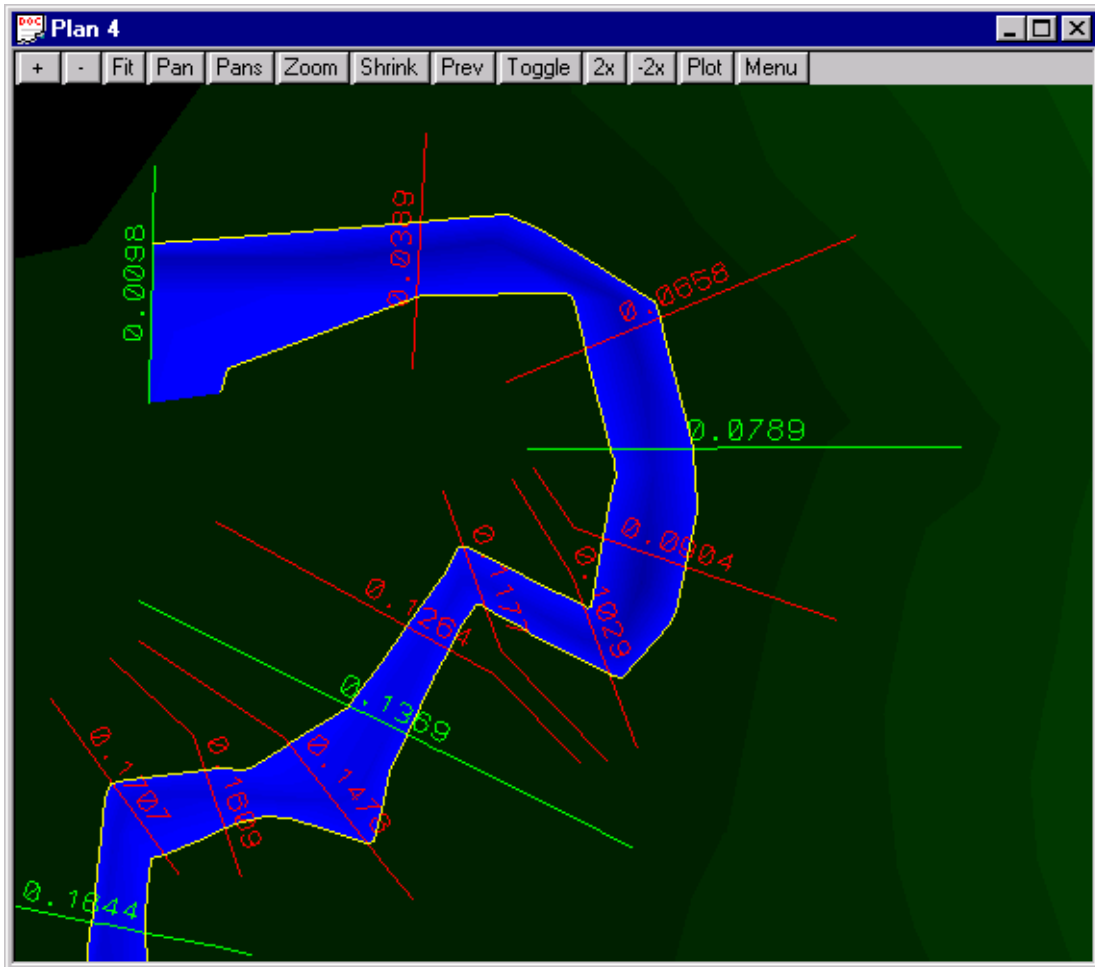
- River and Source Strings
- XP-SWMM Interface
- HEC-RAS Interface
- MIKE11 Interface
- ISIS Interface
- How to for Rivers
- Frequently Asked Questions (Rivers)

How the water level boundaries are determined



For meandering rivers, the cross sections (shown in green above) may not be at a close enough spacing to create a water surface that follows the river. 2D shape strings (shown in red above). Note that water levels are extended when the shape strings are in a junction area or past the end of a reach. can be created to

create a water surface (shown in blue above) to follow the river.



The water surface is draped over the ground surface and the boundary strings (strings defining the edges of the water surface – shown in yellow above) are created. They may be used to trim the water surface or shade your ground surface tin for flood inundation mapping. Boundary strings also include islands! Shading the river bed blue, in a 3D perspective view, is an effective way to show the water level extents and still view the shape of the river bottom (it has the effect of very clean water that you can see through!).

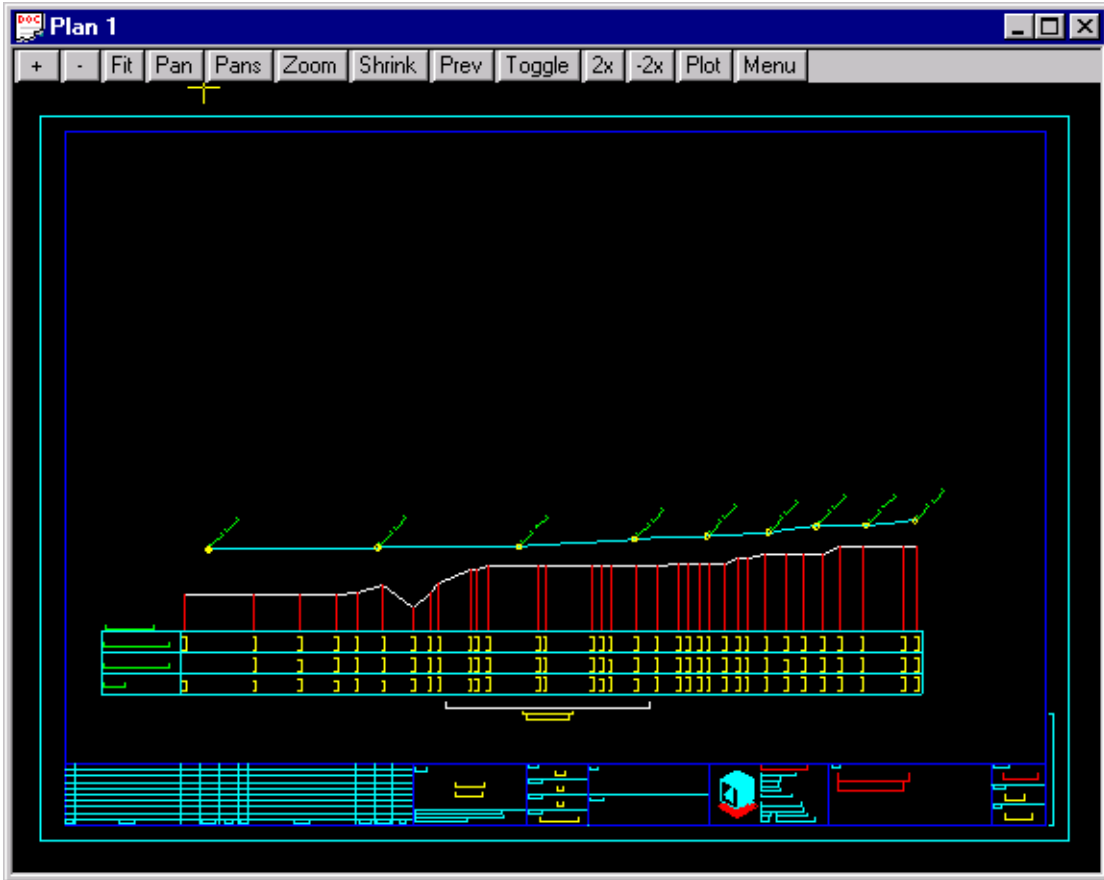
Sample Presentations and Drawings

The water surface may be

- s •contoured (elevation),
- s • depth contours created,
- s • water surface coloured by depth (shown above),
- s • cross sections plotted
- s • and longitudinal profiles drawn (shown below).
- s •All of these results can be plotted complete with your customised drawing sheets.
- s •Finally, you may walk down the water course in the perspective view (and record this to an Windows AVI file).

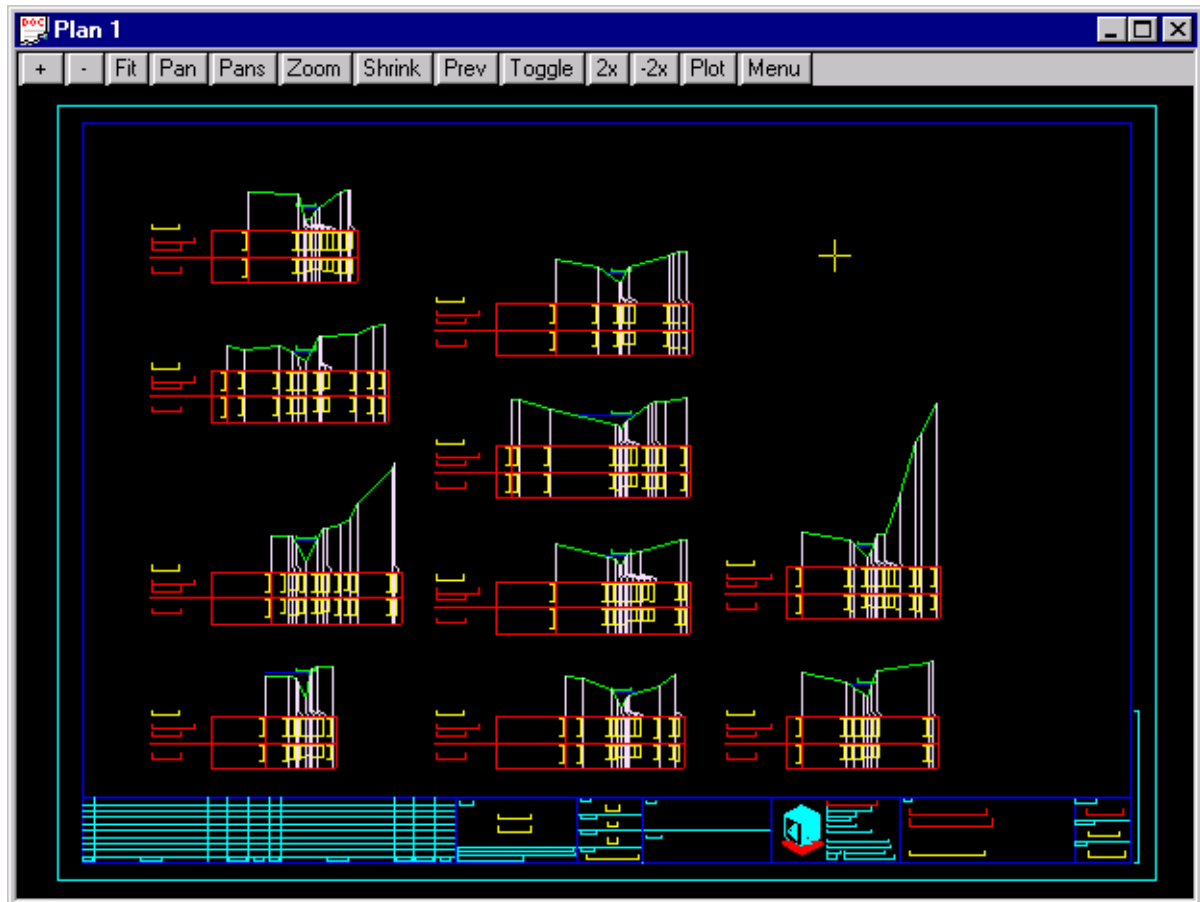


Close up view of cross section labels with water levels

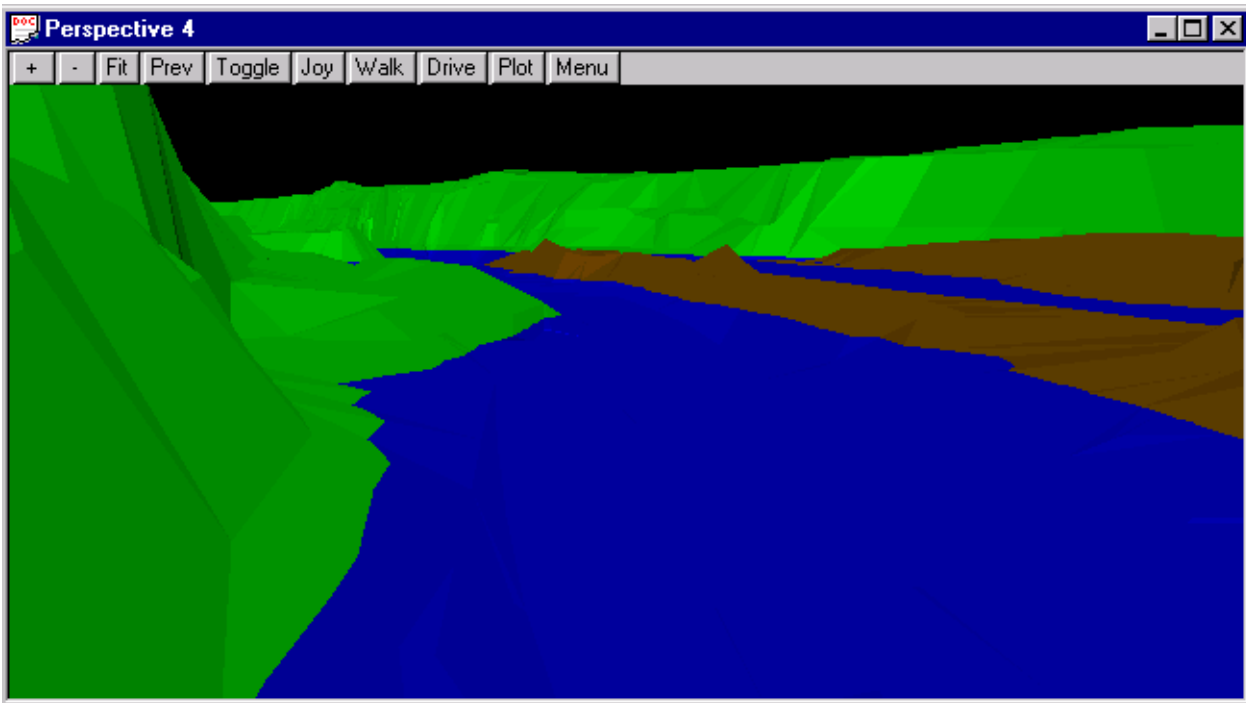


Plan 1	
DATUM RL154.000	
RIVER CENTRELINE LEVEL	155.500
100 YEAR WATER LEVEL	
change	0.000

Close up of text (user chooses wording, size, colour, text style etc.)



The tin created can be viewed in a perspective view and sections taken where desired. A sample perspective view follows.



Example of cross sections long sections and depth colouring see the HEC-RAS Interface topic.

Defining the Water Surface Boundaries

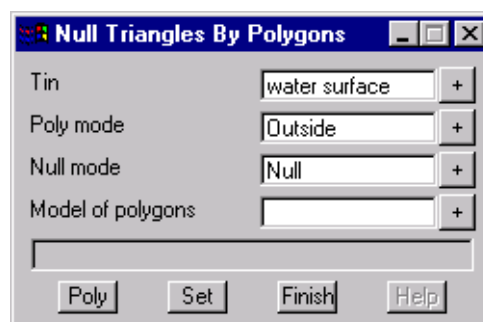
The water surface and its boundary is created by 12d. The first step is to trim the water surface back to the boundary strings. Since the water boundary does not generally form a closed polygon (the left and right river boundaries will need to be joined at one end of the river) use the **Strings=>Strings Edit=>Join** to connected strings.

If the water surface reached the edges of you cross sections then there will be numerous breaks in the boundary string. The best solution is to extend the cross sections and/or add additional shape strings. If it is not a major error in modelling then the break in the boundary can be joined using the **Strings=>Strings Edit=>Join**.

If boundary strings are created outside that water level boundaries they should not be used in this area. Boundary strings should only be used inside the area defined by your water level results.

Trimming the Water Surface Tin and Islands

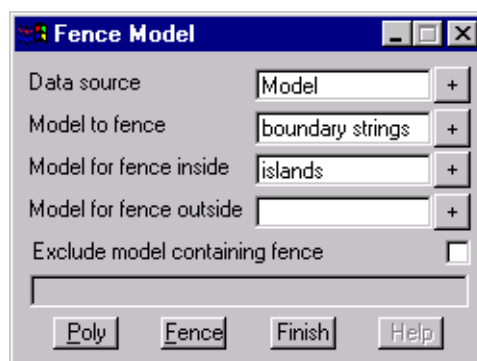
Use the **Triangle=>Null=>by polygons** selection to null triangles inside the polygon you have created above.



Select your water surface tin and change the **Poly mode** to **Outside**. Now select the **Poly** button and pick the boundary string. The triangles outside the polygon will now be nulled.

If you have some islands in the model then change the **Poly mode** to **Inside** and select the islands.

If you have numerous islands, say more than 10 it may be easier to copy all of the islands into one model using the fence command (Utilities->Fence->Fence).

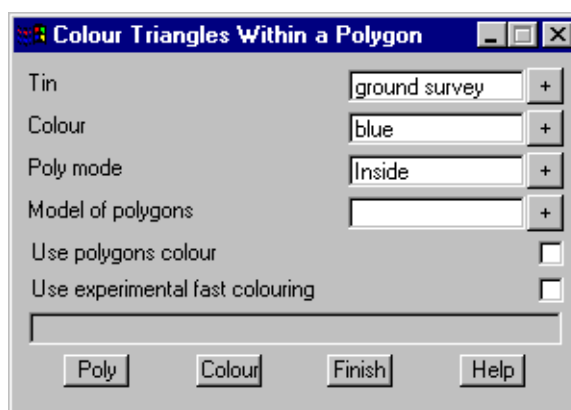


The **Model to fence** is the boundary strings model and the **Model for fence inside** is the new model to contain the islands. The **Exclude model containing fence** should not be ticked. Select **Poly** and then pick the boundary string. All of the islands inside the boundary string will not be copied to the islands model.

Colouring the Ground Surface with Flood Zones

The boundary strings can also be used to colour the ground surface. Colouring the river bed blue is an effective way to show the water level extents and still view the shape of the river bottom (the effect of very clean water that you can see through!).

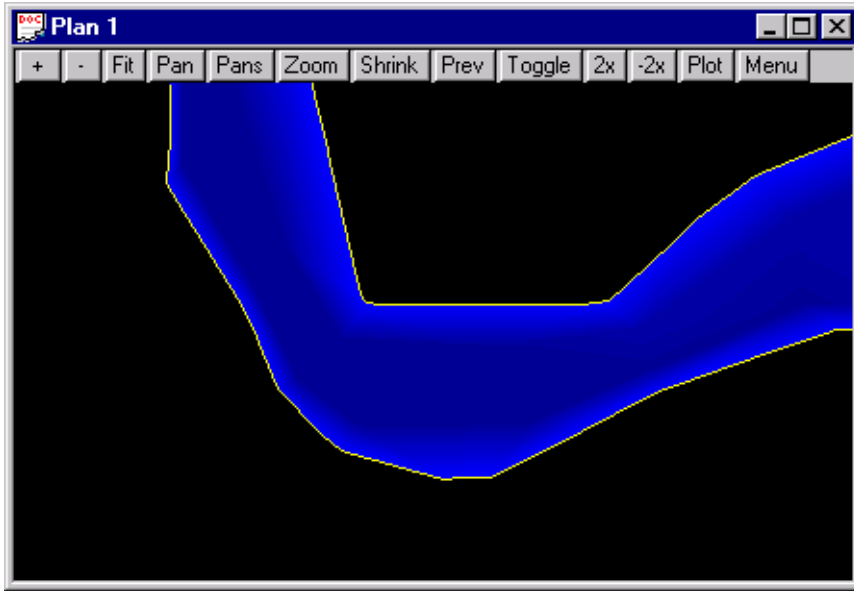
First, define the water surface boundaries (see above). Next re-triangulate the ground tin so that it includes the boundary string model (**Triangles=>Edit=>Tin**). Next select **Triangles=>Colour=>Colour within polygon**. The following panel will appear.



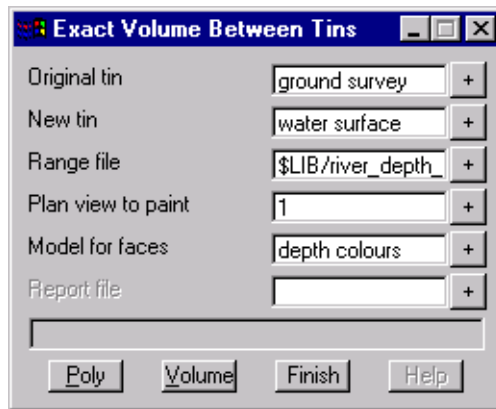
Select your ground tin and the desired colour. Next select the **Poly** button and pick the boundary string to be coloured inside. If islands exist change, change the colour (to a ground colour) and then select the island string.

Colour by Depth

The water surface can be coloured by depth. This function calculates the depth between the water surface and the ground surface and creates "faces" of different colours. The colours to be used are specified in a depth range file. This option requires the purchase of the Volumes Option



From the main menu select Options->Volumes->Exact->Tin to tin.

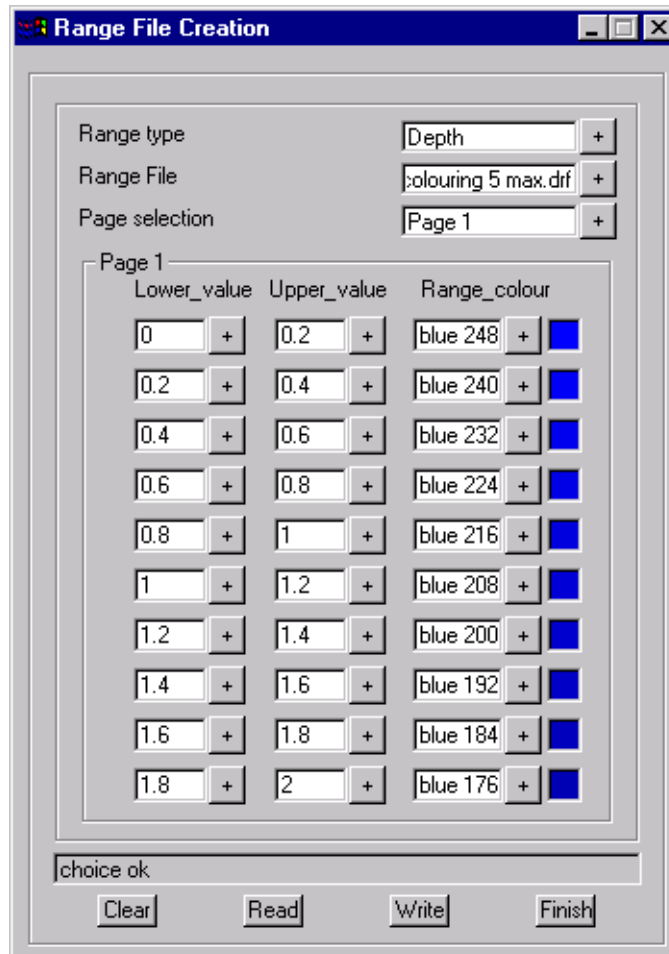


Original tin this is your ground survey tin

New tin this is your water surface tin

Range file two range files are supplied. One with a range from 0 to 5 and another from 0 to 50. The library contains a spreadsheet the can quickly create other range files or you may edit the using the built in range editor.

To use the built in range file editor select + beside you range file then **edit**.



You may change the range value and the colours as desired. Be sure to select **Write** to save the changes before selecting **Finish**.

See also Range File Creation

Plan View to paint you can paint a current view without saving the face data. This is a good option if you wish to take a quick look at the depth colours in one area.

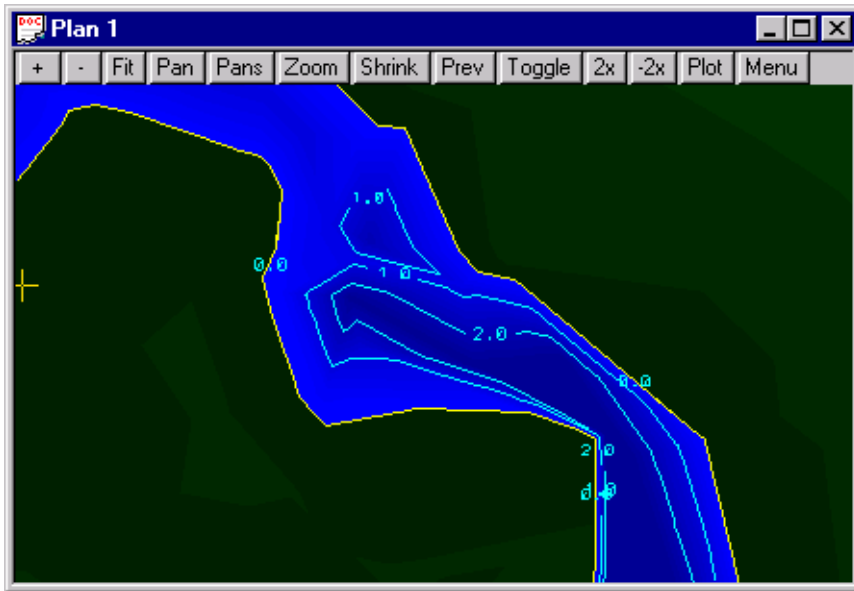
Model for faces the faces can be stored in a model. Note that faces consume a great deal of hard disk space. Therefore you may consider colouring one area at a time using the **Poly** option.

Poly If your water surface tin is very large than you may want to only colour a portion of the tin. You must create a polygon (Strings->Create->2d) and then pick this polygon. When your select **Volume** only the area inside the polygon will be coloured.

Volume select this button to colour the surface.

Depth Contours

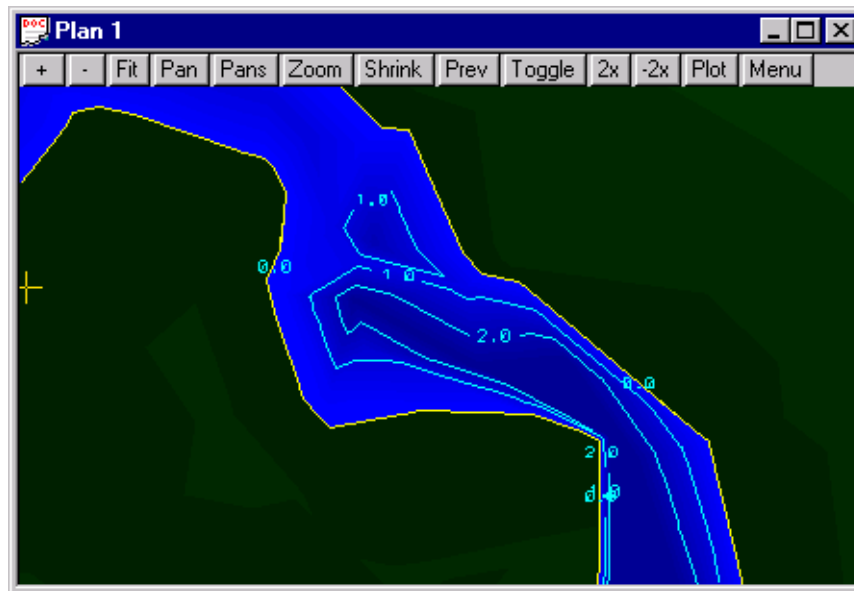
Once you have the tin coloured by depth you might want to add depth contours. From the main menu select **Options->Tin->Analysis->Depth Contours**. This option requires the purchase of the tin Analysis module.



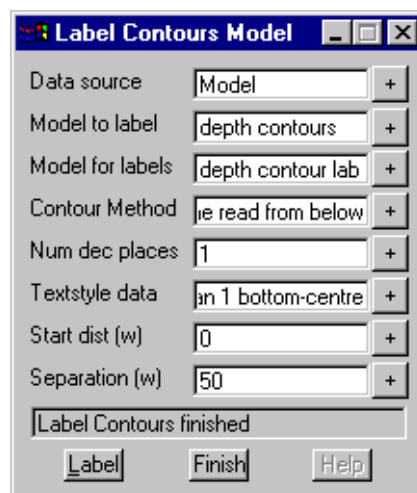
Depth Contours	
Original tin	ground survey +
New tin	water surface +
Model for depth strings	depth contours +
Colour for cut strings	red +
Colour for zero strings	yellow +
Colour for fill strings	cyan +
Start level	0 +
End level	10 +
Interval	1 +
2d/3d strings	2d +
finished	
<input type="button" value="Calculate"/> <input type="button" value="Finish"/> <input type="button" value="Help"/>	

- Original tin** this is your ground survey tin
- New tin** this is your water surface tin
- Model for depth strings** this is the model for your depth contours
- Colour for cut strings** this must be selected but we will not use this colour
- Colour for zero strings** the zero string will be the same as our boundary strings
- Colour for fill strings** this is the colour for the depth contours
- Start level** enter a zero for this value
- End level** enter a level greater than the greatest depth
- Interval** enter the contour interval as desired
- 2d/3d strings** 2d strings
- Calculate** this will create your contour strings

Adding Values to the Contours



Since there are numerous ways to label the contours it is performed as a separate step. From the main menu select **Strings->Label->Contours**.



Contour method the example above uses *Line removal and Centred line read from below*.

This copies the contour lines themselves and inserts a break in the line.

Start distance this is usually left as zero. It changes the start point for the first label on each contour.

Separation this determines the spacing of the contour labels.

Colour the ground surface by elevation

With the water surface coloured by depth, you may want to colour the ground surface by elevation.



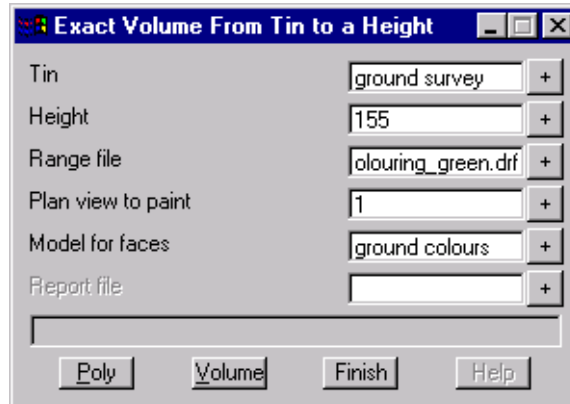
This colouring may be done from either From the main menu select **Options->Volumes->Exact->Tin to height** or **Triangles->Colour->Tin height colour**.

Options->Volumes->Exact->Tin to height

Options->Volumes->Exact->Tin to height requires the purchase of the Volumes module. First select **Triangles->Tin info** from the main menu and then select you ground surface tin. You will want to copy the minimum z level from this pane.

Tin Information			
Tin	ground survey +		
x min	42407.034	x max	43076.368
y min	36815.276	y max	37563.525
z min	155	z max	234.074
Points	2459	Tris	4912
information retrieved			
Info Calc Extent Finish Help			

Now from the main menu select **Options->Volumes->Exact->Tin to height**



Select your ground surface to colour and enter the minimum elevation (from above) into the **Height** field. The **Range file** “*\$LIB/ground_colouring_green.drf*” is found in the library.

Plan View to paint you can paint a current view without saving the face data. This is rarely used in this case

Model for faces the faces can be stored in a model. Note that faces consume a great deal of hard disk space. Therefore you may consider colouring one area at a time using the **Poly** option.

Poly If your ground surface tin is very large than you may want to only colour a portion of the tin. You must create a polygon (Strings->Create->2d) and then pick this polygon. When your select **Volume** only the area inside the polygon will be coloured.

Volume select this button to colour the surface.

UNET Interface

UNET_interface

Position of menu: Design=>Rivers=>UNET interface

The UNET interface creates the *.cs file. Water levels are read back into 12d where they may be viewed in a 3D perspective view to easily identify extents of flooding.

The UNET walk right menu is,



See also

- River and Source Strings
- Reservoir Strings
- Create UNET files
- Read UNET results
- Presenting Water Level Results
- How to for Rivers
- Frequently Asked Questions (Rivers)

UNET Write Panel

Rivers_unet_panel Unet Interface Writer

Position of option on menu: Design=>Rivers=>UNET interface=>Create UNET CSECT file

The UNET interface creates the UNET *.cs file. Water levels are read back into 12d where they may be viewed in a three dimension perspective view to easily identify extents of flooding.

Rivers_unet_panel_beta Unet Interface Writer

See also

- River and Source Strings
- UNET Interface Overview
- Read UNET results
- Presenting Water Level Results
- How to for Rivers
- Frequently Asked Questions (Rivers)

Usage

The UNET panel for creating the UNET project follows.

UNET Interface Writer

Input Models

River strings model: river strings

Source string model: source strings

Create Source String Options

Create source strings:

Distance between sections: 50

Section length: 50

Storage area model: storage strings

Cross Section Data

Cross Section model: cross sections

Centre Line chainage Factor: 1

Surface Tin (not the model):

Levee tolerance: 0

Delta Y tolerance: 0

Start Up Data

Manning's n left over bank: 0.1

Manning's n centre: 0.035

Manning's n right over bank: 0.1

Discharge: 0.01

Units: metric

Project file name:

Process Finish

UNET Read Panel

[Rivers_unet_panel Unet Interface Reader](#)

Position of option on menu: Design=>Rivers=>UNET interface=>Read UNET reports

After the UNET analysis is complete the water level results are read back into 12d. Water level strings are created with the plan shape of the cross sections at the elevation retrieved from the UNET results. These strings are then triangulated to create a water surface tin.

[Rivers_unet_panel_beta Unet Interface Reader](#)

See also

UNET Interface Overview

Create UNET files

Presenting Water Level Results

How to for Rivers

Frequently Asked Questions (Rivers)

Usage

The UNET read panel follows.

The screenshot shows the 'UNET Interface Reader' dialog box. It is organized into three sections:

- Existing data:**
 - River strings model: river strings
 - Cross Section model: cross sections
 - Shape Section model: shape sections
 - Centre Line chainage Factor: 1
 - Ground Surface tin: ground surface
 - UNET results file name: unet.txt
- Result data:**
 - Water Surface tin: water surface
 - Water Surface tin model: tin water surface
 - Water level results model: water levels
 - Boundary strings model: boundary strings
- Parameters:**
 - Chord length: 10
 - Chainage tolerance: 0.0001

At the bottom of the dialog, there is a checkbox labeled 'is valid', a 'Process' button, and a 'Finish' button.

The UNET file format consists of a line number, section name and elevation separated by at least 1 space. An example follows:

```
1 0.25 118.24
2 0.50 118.25
3 0.75 118.30
4 1.00 118.40
```

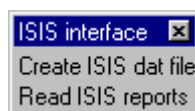
ISIS Interface

ISIS_Interface

Position of menu: Design=>Rivers=>ISIS interface

The ISIS interface creates *.dat input file. Water levels are read back into 12d where they may be viewed in a 3D perspective view to easily identify extents of flooding.

The ISIS walk right menu is,



See also

- River and Source Strings
- Reservoir Strings
- Spill strings
- Create ISIS files
- Read ISIS results
- Presenting Water Level Results
- How to for Rivers
- Frequently Asked Questions (Rivers)

Exporting to ISIS

The ISIS project is created from a surface tin (representing the river bed and overbanks) and a model containing **river strings** identified by their names "left bank", "right bank and the name prefix, "centre line". Any additional strings in the specified model will be ignored (warning messages will be given when you run the macro that any additional strings are being ignored). The low chainage (often zero) of the centre line strings must be at the upstream end of the reaches.

Cross sections are created at the location of the **source strings**. These source strings are initially created using the ISIS option at a user defined spacing and section length. The user may alter these sections as desired. These may be shortened if they intersect at sharp bends in the river; they may be extended at extremely wide river sections or extra points may be added so that the section is no longer a straight line.

Source strings can be deleted and additional sections can be added by creating new source strings. The **Create source strings** tick box on the interface panel must **NOT** be selected to use the customised strings.

Reservoir Strings are 2d strings that define the extents of the reservoir. The volume is calculated in increments of 1 or the value set in the attribute **stage increment** for this string. The volumes start from a level with zero volume to the level set for the 2d reservoir string.

The **reservoir strings** may define inline reservoirs or offside storage. Inline reservoirs are "touched" by centre line strings both upstream and downstream. Offline storage areas are linked to the cross sections via **spill strings**.

Spill strings are 2d strings that link offline storage areas to a cross section. The string must begin by "touching" the source string and then proceed to the first point on the spill section. During the export the first point will NOT be exported as part of the spill section. After defining the end of the spill section the last point on the string must "touch" the reservoir string. Again this last point will NOT be exported as part of the spill section.

Presenting ISIS Results in 12d

After the ISIS analysis is complete the water level results are read back into 12d. Water level strings are created with the plan shape of the cross sections at the elevation retrieved from the ISIS *.zsr file. These

strings are then triangulated to create a water surface tin from which the water level boundaries are determined. These results can then be shown in plan, long section, cross section and in 3D perspectives.

More details

ISIS Write Panel

Rivers_isis_panel ISIS Interface Writer

Position of option on menu: Design=>Rivers=>ISIS interface=>Create ISIS file

The ISIS interface creates the ISIS project files ready to open and run. This includes the project, plan, flow and geometry files. Water levels are read back into 12d where they may be viewed in a three dimension perspective view to easily identify extents of flooding.

Rivers_isis_panel_beta ISIS Interface Writer

See also

River and Source Strings

ISIS Interface overview

Read ISIS results

Presenting Water Level Results

How to for Rivers

Frequently Asked Questions (Rivers)

Usage

The ISIS panel for creating the ISIS project follows.

The fields and buttons used in this panel have the following functions:

Field Description	Type	Defaults	Pop-Up
River strings model	Model box		

*Model containing the centre line, left bank and right bank strings. **The centre line strings must begin downstream and proceed upstream.** The name of the river may follow the words "Centre line " (note the ending space). For example the centre line string may be named "Centre line Parramatta River, downstream reach". The comma separates the river name from the reach name. If no comma is included then the river name is repeated for the reach name.*

Confluences are modelled by a using a separate string for all reaches. Thus a system with a branch is modelled with three strings. The branch will be one string and the main reach will have a downstream string and an upstream string. The reaches must touch at the confluence.

The distance from the start of the upstream strings to the first cross section is used to model the confluence length.

The left and right bank strings need not be separate strings (see figure below).

Source string model Model box

New source strings will be created in this model or existing source strings are contained in the model. See **Create source strings** tick box below.

Create Source Strings Tick box not selected

When selected existing source strings are deleted and new ones created perpendicular to the centre line at the specified spacing and length. Once you have created the sources strings they can be easily modified. On the **Strings->Points Edit** menu you will find the selections **Move** (to move the end points), **Insert** (to insert additional points).

Distance between sections Real box

The distance between the cross sections. At present no check is made for overlapping cross sections around river bends.

Section Length Real box

The length of the cross section with zero chainage at the mid point.

Storage strings Real box

These 2d strings define the extents of the storage area. For more details see **Reservoir strings**.

Spill strings Real box

These 2d strings define the location to cut the spill section and start end points define the cross section and reservoir, respectively. For more details see **Spill strings**

Cross section model Model box

The cross sections created and exported are stored in this model.

Centre Line Chainage Factor Real box

The cross section names are created by dividing the chainage on the centre line by this factor. Typically 1000 is used to convert metres to kilometres and 5280 to convert feet to miles.

Number of decimals Integer box

The cross section names are created with this many decimals. CAUTION XP SWMM only allows 10 characters for the names and each link name begins with "Lx-" That leaves 7 characters for the chainages.

Surface Tin (not the model) Tin box

Tin or super tin to create the cross sections from (remember a tin is like a string. It is placed in a model.).

Bank Marker Real box

Not currently implemented in ISIS

Delta Y tolerance Real box

This value filters out points on the cross section. Imagine a tube of this diameter passing over the cross

section. The tube is elongated until one point lies outside the tube. The tube is shortened to the previous point and then all points inside the tube are deleted from the cross section. The tube then moves on to the next point. The filtered (smoothed) and original sections are kept for comparison. **The final water tin is created from the ground tin and therefore the boundary string is located using the unfiltered section.**

Manning's n Real box
Manning's n values for the left, right and centre channel sections.

Initial depth Real box
Not currently implemented in ISIS.

Discharge Real box
This discharge is used at the upstream end of all reaches. If you have multiple river branches, you can set the flow for each branch inside ISIS or inside 12d. This can be changed at each section **See manual settings**

Units Choice box
This selection will set the default units for the project being created.

Project file name Input box
The ISIS project name. The extension ".dat" will automatically be added for you.

ISIS Read Panel

[Rivers_isis_panel ISIS Interface Reader](#)

Position of option on menu: Design=>Rivers=>ISIS interface=>Read ISIS results

After the ISIS analysis is complete the water level results are read back into 12d. Water level strings are created with the plan shape of the cross sections at the elevation retrieved from the ISIS results. These strings are then triangulated to create a water surface tin.

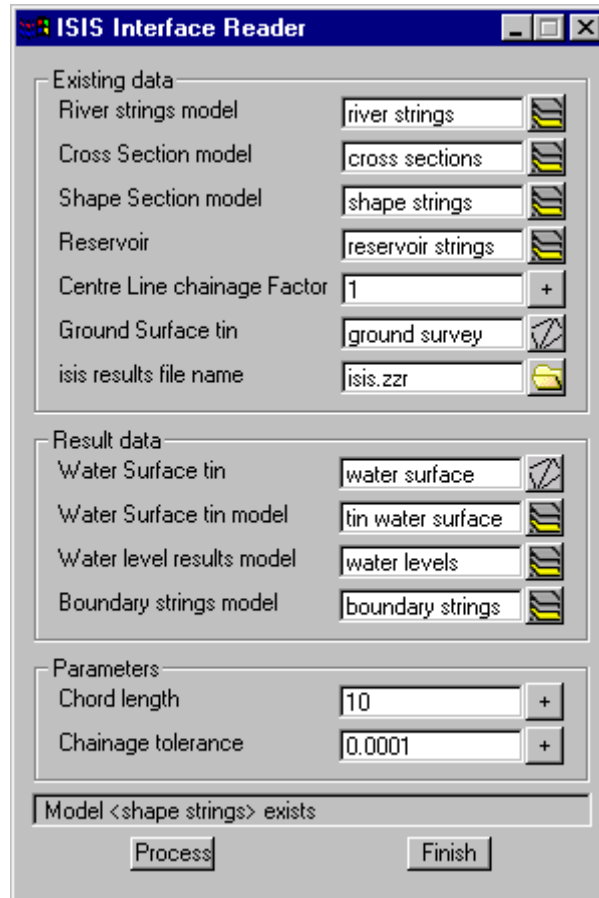
[Rivers_isis_panel_beta ISIS Interface Reader](#)

See also

- ISIS Interface overview
- Create ISIS files
- Presenting Water Level Results
- How to for Rivers
- Frequently Asked Questions (Rivers)

Usage

The ISIS read panel follows.



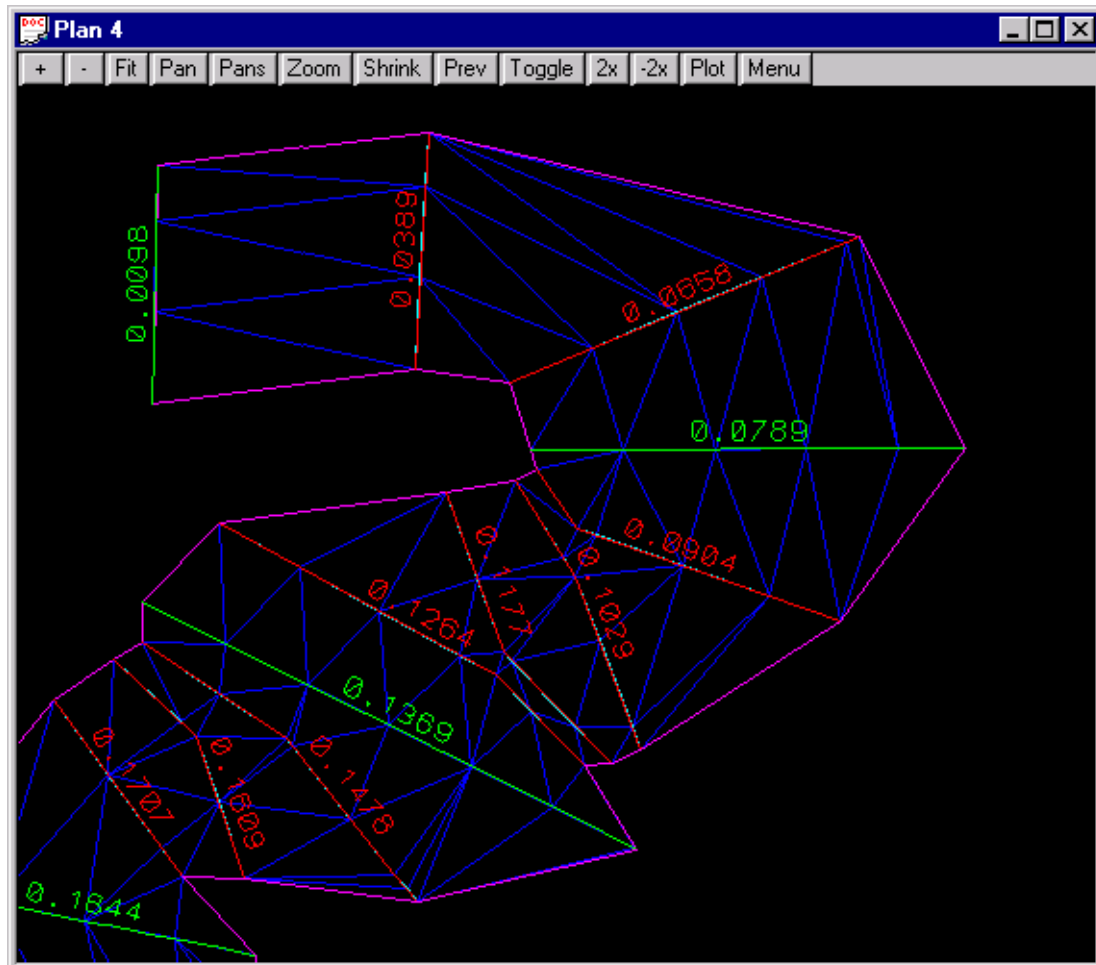
River strings model Model box

The same river strings model specified in the write panel. The river strings are used to sort the cross section and the shape strings. The left and right bank strings are used to check the direction of the strings.

Cross Section model Model box

The same cross section model specified in the write panel. The interface will match the ISIS label and the string name (without the "SECT "). If the ISIS labels were created by 12d then an exact match should result.

*However, if the ISIS file was not created by 12d, the file can still be mapped by manually creating cross section strings (2d or 3d strings). See **Mapping non 12d and historical water level data**.*



Shape string model Model box

For meandering rivers, the cross sections (shown in green above) may not be at a close enough spacing to create a water surface that follows the river. 2D shape strings (shown in red above) can be created to create a water surface (shown in blue above) to follow the river. Note that water levels are extended when the shape strings are in a junction area or past the end of a reach.

Reservoir Model box

*Reservoir strings are assigned elevations from the ISIS zsr file. This model is the same as the **storage area stings** specified in the write panel.*

Centre line chainage factor Model box

*This data is only required if the Cross sections have been manually created and have no names yet. See **Mapping non 12d and historical water level data**.*

ISIS results file name File box

The ISIS zsr file is automatically generated by ISIS.

Ground surface tin Tin box

*If a **boundary string model** is specified below, the intersection of this ground surface and the water surface will be determined. The strings will be stored in the model from the **boundary string model** field.*

Water surface tin model Model box

The model to contain the new water surface tin.

Water surface tin Tin box

The name of the water surface tin to be created.

Water level results model Model box

The model where the water surface strings will be created at each cross section and shape string.

Boundary string model Model box

The model to contain the intersection strings between the water and ground surfaces specified above. If left blank no intersection strings will be calculated.

Chord Length Model box

This value set the spacing for the points on the water level strings (both cross section and shape strings). It is recommended that you use a length of no more than half of your average cross section and shape string lengths. A large value in this field may result in unexpected water level profiles for meandering rivers.

Chainage Tolerance Real box

*This tolerance is not used for the standard 12d cross section names. However, if the cross section names have been created manually and they can be converted to a real number then this is the tolerance used to match the cross section label from the ISIS report to the cross section string names. A value of 1.0 to 10. is common. See **Mapping non 12d and historical water level data** for more details.*

A sample of the *.zsr file that is read by 12d follows.

A sample of the zsr file that is read follows.

Maxima and minima of all variables from
time 0.000 hours to time 30.000 hours

maxima of all variables

Label12	Flow	Stage	Froude no	Velocity	Umode	Ustate	
WY201013	y	0.470	87.305	0.033	0.076	7.916	0.000
WY202013	y	0.470	87.288	0.162	0.297	2.335	0.000
WY203013	y	0.470	87.054	0.682	0.794	4.000	0.800
WY204013	y	0.470	86.804	0.671	1.002	0.562	0.000

How to for Rivers

This section lists specific tasks for the rivers interface. Worked examples are contained in the courses directory of 12jobs and training manuals are found in the documentation directory on the 12d model distribution CD.

Change manual override settings for river strings via attributes

ragg write this Export/import string attributes to a spreadsheet

Manually set a cross section name

Specify a local inflow at a cross section

Change the stage increment for reservoir strings

Boundary Strings are broken. How do I stop this?

Manual Override settings

Many of the automatic settings can be overridden using string attributes via the **String Attribute Editor**. To use the editor

1. Select the river or source string to add/edit the attribute for
2. In the **Attribute Name** column use the selection list to find the attribute to change. If it is not listed then type the attribute name into one of the boxes.
3. Change the attribute **Type** to Integer/Real/Text as required
4. Type the attribute value into the **Data** field (erase the **not found** if required).
5. Select **Process**, **Next**, **Previous** or **Pick string**. Selecting **Finish** will NOT save the attribute.

You will be prompted that you will create a new attribute if you have typed in a new attribute for that string

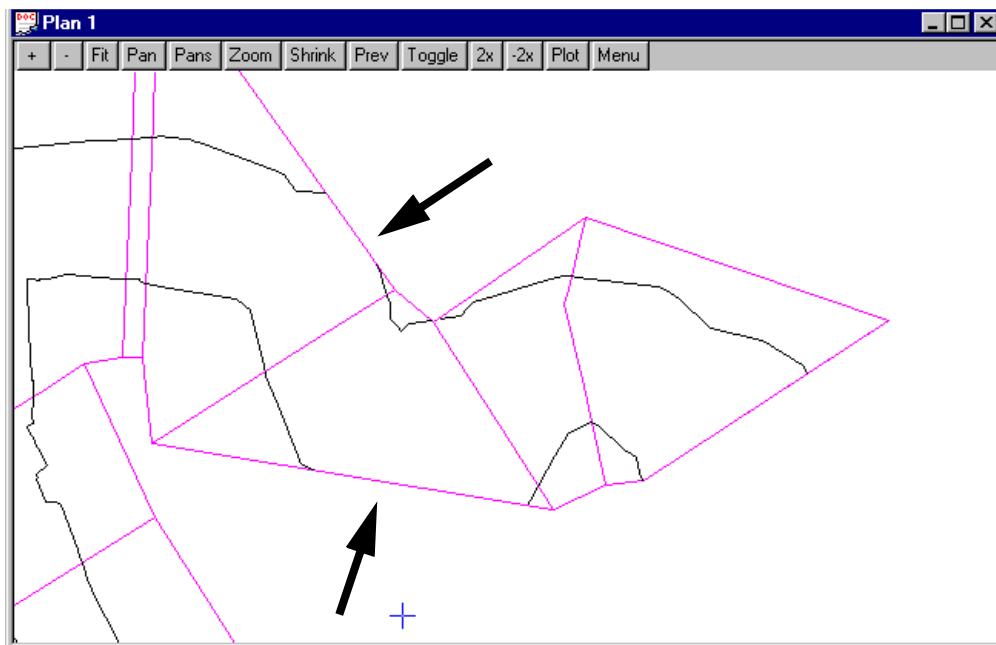
Purpose	String Type	Attribute Name	Type	Typical Data Value
Node/cross section name	source strings	node name	Text	A1
Set a local inflow for this section	source string	flow	Real	10.2
Storage curve increment	storage area strings	stage increment	Real	1.0
Water level string tolerance when comparing numeric string names to data file names	cross sections before importing	tolerance	Real	0.01
Custom n values	source strings	left n, right n, centre n	Real	0.03
Culvert n value	centre line and culverts in spill	roughness	Real	.013
Culvert entrance loss	centre line and culverts in spill	entrance loss	Real	0.5
Culvert exit loss	centre line and culverts in spill	exit loss	Real	1.0

Purpose	String Type	Attribute Name	Type	Typical Data Value
Culvert length	centre line and culverts in spill	length	Real	8.0
Multiple identical culverts	centre line and culverts in spill	number of pipes	Integer	2
Chanel length of a spill string	spill strings	length	Real	30
Channel roughness	spill strings	roughness	Real	0.02
Channel slope %	spill strings	slope	Real	0.5

Export/import string attributes to a spreadsheet

Boundary Strings are broken. How do I stop this?

The boundary strings will be broken into sections when the boundary string goes outside the area defined by the cross sections. See below

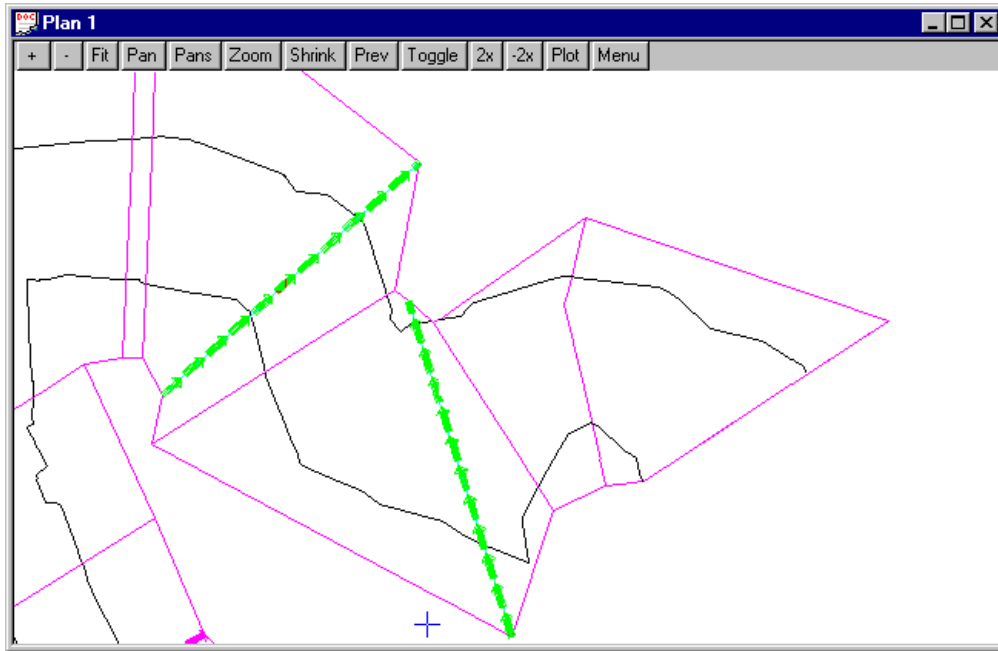


In these two cases the water level has not exceeded the extents of the cross sections but the boundary strings (black) has gone outside the limits of the water level strings (magenta). **Shape strings** are used to expand the area of the water levels between the sections. The water level assigned to the shape string is a linear interpolation between the upstream and downstream cross section water levels. The interpolation is prorated using the distance along the centre line of the river.

Important! water levels are extended when the shape strings are in a junction area or past the end of a reach.

Shape strings are 2d strings. The direction is not important except for Mike11 models. For Mike11 they must be in the same direction as the cross section strings (usually left bank to right bank). The following

drawing shows the boundary string when 2 shape strings have been added (green).



Mapping non 12d and historical water level data

12d can map water levels from river engineering models that were not created by 12d. If the water level results are in the standard HECRAS GIS, HECRAS report, ISIS zsr, UNET, XP SWMM xpx or Mike11 binary file then the standard 12d readers can be used. If the data is historical or not in any of the standard format the **River Mapper** feature can be used.

River Mapper

[Rivers_mapper_panel_beta River Mapper](#)

Position of option on menu: **Design=>Rivers=>River Mapper**

River cross section water level data in a text file may be mapped and displayed using the 12d River Mapper interface. 2d strings are created by the user with the plan shape of the cross sections. 12d assigns water levels from a text file to these strings. These strings are then triangulated to create a water surface tin.

[Rivers_mapper_panel River Mapper](#)

See also

[Presenting Water Level Results](#)

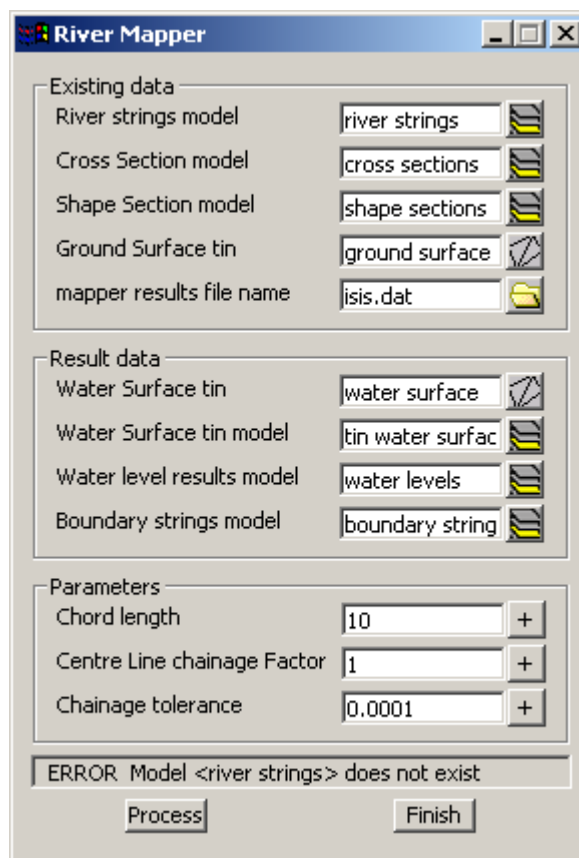
[How to for Rivers](#)

[Frequently Asked Questions \(Rivers\)](#)

Usage

The steps are as follows:

1. Create the **river strings** (centre line, left bank and right bank).
2. Create 2d **source strings**. Use your name for the cross section as the string name. 12d will match the water levels in the file to this string using the name as the key. If you do not assign a name the interface will assign names to strings according to the chainage along the centreline and the value of **.Centre line chainage factor**.
3. From the **Design->Rivers** menu select **River Mapper**.
4. Fill in the fields in the dialogue for the rivers strings (step 1 above) and the cross sections (step 2 above).



River strings model Model box

The river strings model specified in the write panel.

Cross Section model Model box

*The cross section model specified in the write panel. The interface will search the string names in this model for the cross sections specified in the HEC-RAS report. A match is successful if the HEC-RAS cross section chainage and the string name are within the tolerance specified below in **Chainage tolerance**.*

Shape string model Model box

For meandering rivers, the cross sections may not be at a close enough spacing to create a water surface that follows the river. 2D shape strings can be created (automatically or manually) to create a water surface to follow the river. Note that water levels are extended when the shape strings are in a junction area or past the end of a reach.

Centre line chainage factor Model box

If you assigned the source/cross section string a name in Step 2 this field is not used. Otherwise, the centre line chainage and the Centre line chainage factor are used to name your source string/cross sections in 12d. The cross sections will be named in the same units as the 12d data if a Centre line chainage factor of 1 is specified. If your existing data uses cross section names in your data file are in kilometres and your 12d data in meters, you will want to use a Centre line chainage factor of 1000. If your existing data cross section names are in miles and your 12d data is in feet then a Centre line chainage factor of 5280 would be used.

Mapper results file name File box

The report is a tab (or space) delimited text file (usually created by a text editor or spreadsheet). The format is

cross section name <tab> water level elevation

each section name with its water level must be on a separate line. For example.

<i>Section A</i>	<i>2.31</i>
<i>Section B</i>	<i>2.32</i>

If the names contain letters (abc..) then the section name must match the 12d string names exactly (case sensitive). If the names are real numbers than a tolerance for the matching (global and string specific) can be set (see parameters).

12d System Path

When looking for system files 12d first checks your local project directory (the directory that hold the *.project folder), and then the system folders. Unless you have changed these folders in your env.4d file the path is first "program files\12d\12dmodel\5.00\user" and then "program files\12d\12dmodel\5.00\set_ups". In summary:

1. local project directory (the directory that hold the *.project folder)
2. program files\12d\12dmodel\5.00\user
3. program files\12d\12dmodel\5.00\set_ups

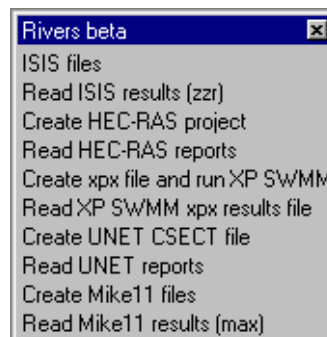
Never modify the files in set_ups. Copy them to the user directory and make your changes there. Here they are safe from being changed during future 12d updates. The only time you will want files in the local project directory is when you have some project specific data. Master_drainage.xp and Master_rivers.xp are good examples of such cases.

More on System files
Attribute Editor

Rivers beta menu

Rivers_beta

The Rivers beta menu contains the latest beta test versions of the Rivers interfaces. These versions will have the newest features in 12d but they will also be under testing. They should not be used unless you have read an signed a 4d Solutions beta test site agreement.



FAQ Rivers

XP SWMM does not start or gives errors when starting from 12d

20 Pipeline

pipeline

Position of menu: Design =>Pipeline

The Pipeline option is used to place large diameter pipelines.

The pipeline is very similar to an alignment string in that it is defined by separate horizontal and vertical geometries.

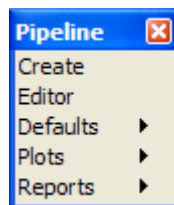
The major differences between a pipeline and an alignment is that a pipeline has a diameter and normally uses circular curves in the vertical geometry rather than the parabolic curves used for alignments.

The pipeline is entered by placing the invert (bottom) of the pipe. Hence in a plan view, the horizontal geometry places the centre of the pipeline. The vertical geometry of the pipeline is for the invert (bottom) of the pipeline.

Note

A **pipeline** string is not the same as a **pipe** string. A **pipe** string is only a 3d string with a diameter.

The Pipeline walk-right menu is



For the option <i>Create</i> , go to the section	"Create" .
<i>Editor</i>	"Editor" .
<i>Defaults</i>	"Defaults" .
<i>Plots</i>	"Plots" .
<i>Reports</i>	"Reports" .

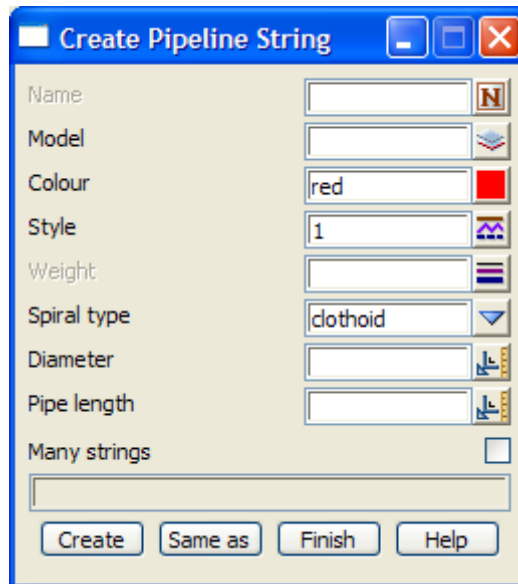
Create

create_pipeline_string

Position of option on menu: Design =>Pipeline =>Create

The Create option is used to produce **new** pipelines. If a pipeline string already exists, the Edit option is used to modify it.

On selecting the Create option, the **Create Pipeline String** panel is displayed.



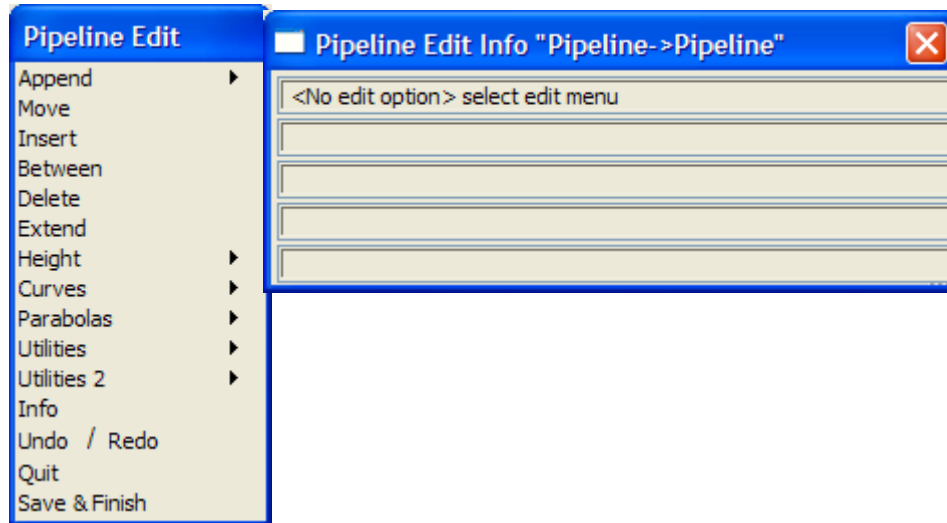
To create a new pipeline string, the pipeline's name, model, colour, style, spiral type and pipe diameter, plus the standard length of pipes used to make up the pipeline are entered into the appropriate fields and the **Create** button selected.

As for a 3d string, to create a new pipeline string with some of the **same** name, colour, model, style etc. **as** an existing string (not necessarily a pipeline), the **same as** button is chosen and the appropriate string selected.

The **Create Pipeline String** panel is then removed and the Pipeline Edit menu and Pipeline Edit Info panel fired up.

The Pipeline Edit menu contains all the options for creating/editing a pipeline string. The **Pipeline Edit Info** panel contains information areas.

The Pipeline Edit menu and **Pipeline Edit Info** panel are



As for an alignment string, to create a new pipeline string the user selects the **Append=>HIP's** option from the Pipeline Edit menu and start placing points in a plan view.

Since the Pipeline Edit menu and **Pipeline Edit Info** panel are the same as those used when editing a pipeline string, the options will be discussed in the following sections under the pipeline Edit option.

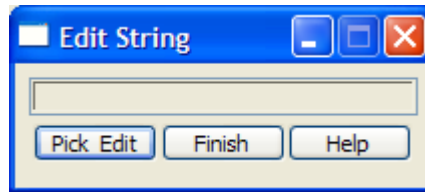
For information on pipeline editing, please continue to the section "Pipeline Editor" .

Editor

Position of option on menu: Design =>Pipeline =>Editor

This is the same option as Editor from the Strings walk-right menu on the 12d Model menu.

The string editor is used to modify any 12d Model strings. After selecting the Editor option, the **Edit String** panel is placed on the screen to record any error messages.



The option is already in the **Pick** mode (the **Pick & Edit** button only needs to be selected if the pick was cancelled) and the user simply picks and accepts the string to be edited.

From the picked string's type, the editor is able to determine the edits that apply to the string and list them in the string's Edit menu.

If a pipeline string is selected, the Pipeline Edit menu and **Pipeline Edit Info** panel (as shown in the previous section) are placed on the screen.

The individual edit operations for a pipeline string will now be discussed in detail.

Please continue to the next section "Pipeline Editor" .

Pipeline Editor

[pipeline_edit_info](#) [pipeline_edit](#)

Position of option on menu: Design =>**Pipeline** =>Editor

A pipeline string is defined by specifying both the horizontal and vertical geometry of the invert (bottom of the pipeline) as separate operations.

The horizontal geometry consists of a series of (x,y) points (called horizontal intersection points) and circular curves applied to the intersection points.

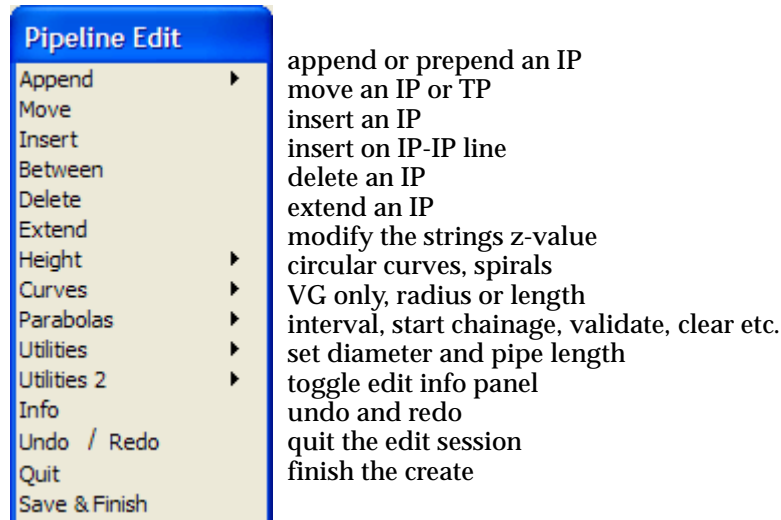
Vertical geometry also consists of a series of points but they are defined with respect to the plan length of the string (chainage) and height. Hence, the vertical geometry is defined by a series of (chainage,height) points (called vertical intersection points) and circular curves applied to the vertical intersection points.

The horizontal geometry is usually defined in a plan view and the vertical geometry in a section view. Hence the pipeline string editor can edit information for the string on both plan and section views.

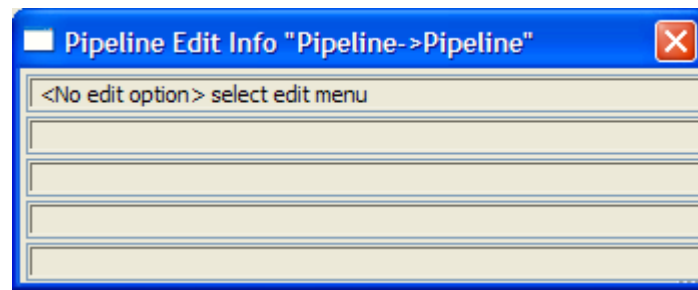
Note: the string can only be edited on a section view if the string is also profiled on the section view.

On selecting a pipeline string the Pipeline Edit menu and Pipeline Edit Info panel are placed on the screen.

The Pipeline Edit menu is



and the **pipeline edit info** panel is



To edit the selected pipeline string, simply select the required edit option from the list of all possible edits in the pipeline edit menu.

The edit is **cancelled** by selecting the cancel option. The edited string is restored to its pre-edit state and the option terminated.

The edit is **finished** and the new string placed in the given model when the finish option is chosen. The edit option then terminates.

When either quit or finish is selected, a **yes-no-cancel** panel is displayed and the user must confirm the selection.

The **pipeline edit info** panel is used to display information and messages during editing of the pipeline string.

The main message area indicates the purpose of the mouse buttons at each step.

Message area 1 displays the current pipeline edit option and message area 5 indicate the next step in the edit option.

Message areas 2 and 3 are used to display information about the string as the cursor is moved near the string and the string points. For example, for the closest IP, the (x,y,z) position and radius of the IP is displayed in area 2, and in area 3 the bearing-in, bearing-out and deflection angle for the adjacent IPs.

Message area 4 displays the cover above the pipeline and the vertical, horizontal and combined joint deflection.

Most of the options are identical to the edit options for an alignment string and will not be discussed in detail again. The options that are only applicable to a pipeline string will be fully described.

Append

HIPs

In a plan view, the `append=>HIPs` option is used to create the first horizontal point in a new pipeline string, to append a new horizontal intersect point to the end of the string or to prepend a new horizontal intersection point to the beginning of the string. The horizontal geometry is for the centre of the pipe in plan.

VIPs

In a section view, the `append=>VIPs` option can be used to create and edit the vertical geometry of the picked string if the string is a primary string on any section view. This can be achieved by using either the `VG edit` or the `profile` option from the section view `View ops` menu. The vertical geometry is for the invert (bottom) of the pipe.

The `append` option is the same as `append` for an alignment string and will not be described further.

Move

The `move` option can be used for moving individual horizontal and vertical intersection and tangent points.

The option acts on the horizontal geometry if the point to move is selected in a plan view, or the vertical geometry if the point to move is selected in a section view.

The `move` option is the same as `move` for an alignment string and will not be described again.

Insert

The `insert` option is designed to place a new intersection point in a string between two adjacent horizontal or vertical intersection points (note that the inserted point does not have to be on the line joining the two intersection points).

The `insert` option is the same as `insert` for an alignment string and will not be described again.

Between

The `between` option is similar to the `insert` option except the inserted point **does** have to be on the line joining the two intersection points. To accomplish this, the cursor position is automatically projected onto the IP-IP line to give the new IP point position.

The `between` option is the same as `between` for an alignment string and will not be described again.

Delete

The `delete` option is used to delete horizontal or vertical intersection points from the string.

The `delete` option is the same as `delete` for an alignment string and will not be described again.

Extend

The `extend` option is used to move an intersection point along the line joining the intersection point to its neighbouring intersection point.

The `extend` option is the same as `extend` for an alignment string and will not be described again.

Height

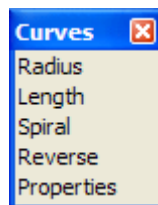
The height option is used to modify the height of a vertical intersection point in the string.

The height option is the same as height for an alignment string and will not be described again.

Curves

curves

The curves option allows the user to add circular curves of a given radius to a either horizontal or vertical intersection points.



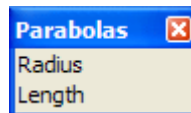
The curve option is the same as curve for an alignment string and will not be described again.

Parabolas

parabolas

The parabolas option is for adding parabolic curves to the **vertical geometry**.

For pipelines, circular curves are normally used on vertical curves.

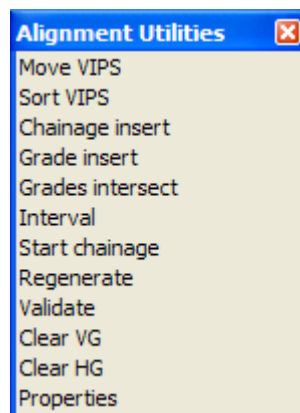


The parabolas option is the same as parabolas for an alignment string and will not be described again.

Utilities

alignment_utilities

The utilities walk-right menu contains a number of useful miscellaneous option for the pipeline string. The menu is



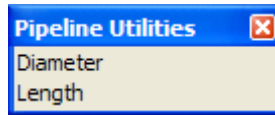
Each of these options is the same as for an alignment string and will not be discussed again.

Utilities 2

pipeline_utilities

The utilities 2 walk-right menu contains options to modify the diameter of the pipeline and to set the standard length of the pipes used to construct the pipeline.

The utilities 2 walk-right brings up the pipeline utilities menu:



Diameter

The diameter option is used to change the diameter of the pipeline string.

After selecting the option, an enter value typed-input box is displayed on the screen containing the pipeline's current diameter.

The new diameter is entered into the typed-input box, terminated with <return>.

The typed-input box then disappears and the option terminates.

Length

The length option is used to change the length of the standard pipe used to construct the pipeline string.

The length of the pipes used in constructing the pipeline string is used for calculating joint deflections along the pipeline.

After selecting the option, an enter value typed-input box is displayed the pipeline's current standard pipe length.

The new length is entered into the typed-input box, terminated with <return>.

The typed-input box then disappears and the option terminates.

Info

The pipeline edit info panel is toggled **on/off** by the info option in the pipeline edit menu.

Quit and Finish

Even after points are created for the new string, the create process can be **aborted** by selecting the quit option from the pipeline edit menu. The option then terminates and **no** string is created.

The create process is completed and the new string created and placed in the given model when the **finish** option is chosen from the pipeline edit menu.

When either the finish or quit option is selected, a **yes-no-cancel** panel is displayed and the user must confirm the selection.

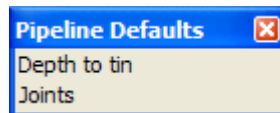
Defaults

pipeline_defaults

Position of menu: Design =>Pipeline =>Defaults

The defaults menu sets default depth to tin and joint deflection angle.

The default walk-right menu is

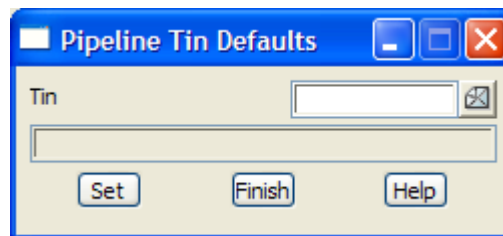


Depth to Tin

pipeline_tin_defaults

Position of option on menu: Design =>Pipeline =>Defaults =>Depth to tin

On selecting the tin option, the **pipeline tin defaults** panel is displayed.



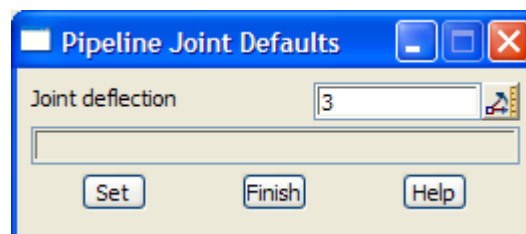
This panel is for setting the default terrain tin which is used to calculate the cover above the pipeline.

Joints

pipeline_joint_defaults

Position of option on menu: Design =>Pipeline =>Defaults =>Joints

On selecting the joints option, the **pipeline joint defaults** panel is displayed.



This panel is for setting the maximum joint deflection for the individual pipes that make up the pipeline.

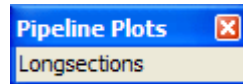
Plots

pipeline_plots

Position of menu: Design =>Pipeline =>Plots

Currently the plots menu contains only one option and it is used for producing longsection plots of major pipelines.

The plots walk-right brings up the pipeline plots menu:



This option will now be described in more detail.

Please continue to the next section "Longsections".

Longsections

plot_pipeline_network plot_pipeline_network_margins plot_pipeline_network_title

Position of option on menu: Design =>Pipeline =>Plots

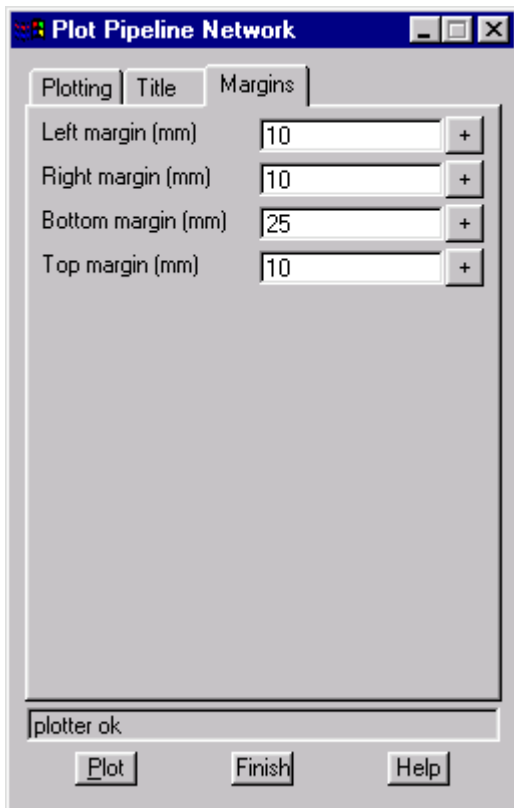
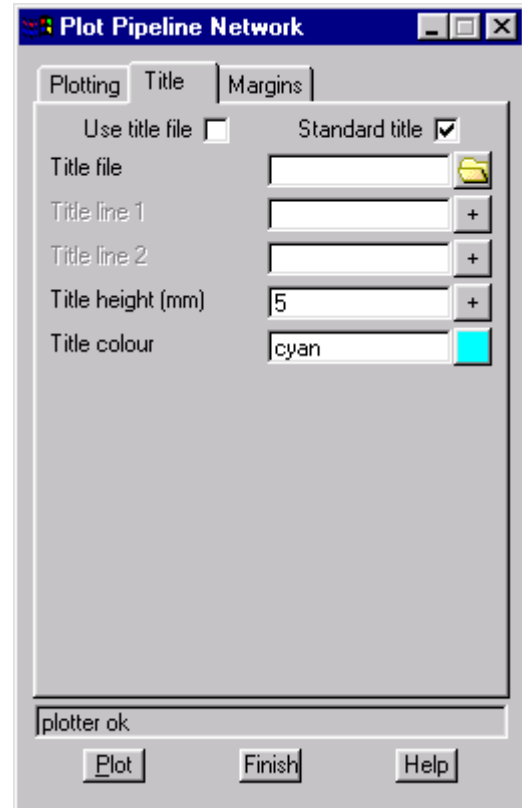
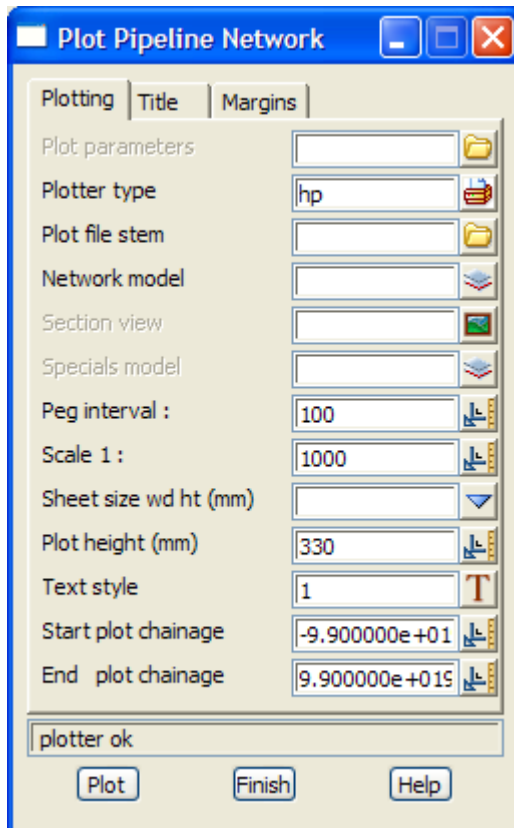
The longsections option is used to generate longsection plots for all the pipeline strings in a given model.

Given the plot sheet size and the horizontal and vertical scales, the longsections for the pipelines are plotted starting at the top of the sheet and moving across the sheet. Once one row is full, if there is room the plot moves down the page and begins a new row. When a plot sheet is full, a new plot sheet is automatically begun.

The pipeline plots include

- ▲ the horizontal and vertical joint deflection at any vertical intersection points which have no curves on them
- ▲ the natural surface height and chainage at any pegs or positions from the specials model, plus the invert level and depth to pipe at the position
- ▲ for any services which cuts the pipeline, the name, diameter, invert level, the distance along the pipeline of the cutpoint plus the invert level and depth of the invert for the pipeline and the cut point.

After selecting the Longsections option, the **Plot Pipeline Network** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Plot parameters <i>file of plot parameters used for extra control of the long section plot.</i>	input		*.ppf
Plotter type <i>format for the plot output.</i>	input	hp	hp, dxf, postscript etc.
Network model <i>the model containing the pipelines to be plotted.</i>	input		
Section view <i>the section view to be used to define the vertical exaggeration, corridor widths, tins to section through, services models to section etc.</i>	input		
Plot file stem <i>since more than one plot page may be produced, the plot file stem plus a plot page sequence number followed by .plt is used as the plot file names.</i>	input		
Specials model <i>model of text strings which are used as extra labels for the plots.</i>	input		
Peg interval <i>if the specials model is blank, the pipelines are labelled with the text peg at the peg interval along the pipeline.</i>	input	50	
Scale 1: <i>horizontal scale for plotting the pipeline long sections. The vertical exaggeration is taken from the section view given in the section view field.</i>	input		
Sheet size wd ht (mm) <i>if non-blank, the width and height values in millimetres (separated by space) or the name of a user defined sheet size. If blank, the sheets size is calculated to fit the long section plot.</i>	input		available sheet sizes
Pipeline line ht (mm) <i>the maximum allowable height for a longsection plot for a pipeline line. Datum breaks are applied to any part of the longsection that will not fit into the pipeline line ht.</i>	input		
Start plot chainage <i>If blank, the start chainage of the pipelines is used; if non blank, the plots start at this chainage for each pipeline.</i>	input		
End plot chainage <i>If blank, the end chainage of the pipelines is used; if non blank, the plots finishes at this chainage for each pipeline.</i>	input		
Plot <i>write out the pipeline longsection plots for the pipelines in the model given in the network model field.</i>	button		

The fields and buttons for *margin* tab:

Left/right margin (mm) 10.0

the left/right hand side margin between the sheet and the plotting area inside the sheet.

Bottom/top margin (mm) 10.0

the bottom/top margin between the sheet and the plotting area inside the sheet.

The fields and buttons for the *title* tab:

Use title file tick-cross

if tick, a user defined title block file is used.

Use Standard title tick-cross tick

if tick, the standard border and two lines of title are placed on the bottom of the plot

Title file input *.tf

*if non-blank and use title file is set to **tick**, then the file given in this field is used to generate a user defined title block for the plot.*

Title line 1/2 input

first/second line of title information

Title height (mm) input 5

height (in millimetres) to draw the characters in the two lines of title information.

Title colour input cyan available colours

colour used for the border and the title information.

For a description of the pipeline plot parameters, please go to the section “Pipeline Plot Parameters” .

Pipeline Plot Parameters

The **pipeline plot** option is used to make special long section plots for a **network** of pipeline strings.

Some of the look of the pipeline long section plot can be controlled from the **plot pipeline network** panel itself, however a wider selection of control parameters is available by using a pipeline long plot, plot parameter file.

The pipeline long section plot parameters are placed in a file with ending **.ppf**.

Each parameter consists of a parameter name followed by one or more spaces and then the parameter value. There is only one parameter per line.

Anything on a line after a double forward slash // is considered to be a comment.

The set of all parameters for the pipeline long section plot is enclosed within a set of curly brackets {} with the header

```
pipeline_long_plot "plot set name"
```

before the curly brackets.

That is,

```
pipeline_long_plot "plot set name" {
    plot parameters
    one per line
}
```

If there is more than one pipeline_long_plot parameter set in the file, only the first set is used.

There may also be parameter sets for other plot types such as section_x_plot in the same file.

The other sets will be ignored when doing a pipeline long section plot.

Plot Sheet Layout

The plot sheet is considered to have only positive co-ordinates with the origin (0,0) in the left hand corner. The units for the plot are millimetres.

The overall size of the plot sheet is given by either a defined sheet size, or by the width and height of the plot given in millimetres and separated by one or more spaces.

```
sheet_size          text          // sheet name, or
                    "mm mm"      // sheet size: width height
```

The sheet size name and width and heights can be specified by the user in a file named sheet_sizes_definitions which is in the normal set up areas, or is pointed to by the environment variable

```
SHEET_SIZES_4D     file          // file of plotter sheets sizes
```

The long plot is then positioned within the plot sheet by giving the margins

```
left_margin        mm
right_margin       mm
top_margin         mm
bottom_margin      mm
```

The (left_margin,bottom_margin) defines the left hand corner position of the long plot on the plot sheet.

The right_margin and top_margin need not be set and if missing, will be calculated from the other plot parameters defining the plot layout.

The pipeline long section plot will break an individual plot up if it doesn't fit across the sheet. There can be one or more rows of plot on the same sheet.

The top row is done first, followed by the second top row, then the third and so on until the bottom row. If there is only one row, it is considered to be the bottom row.

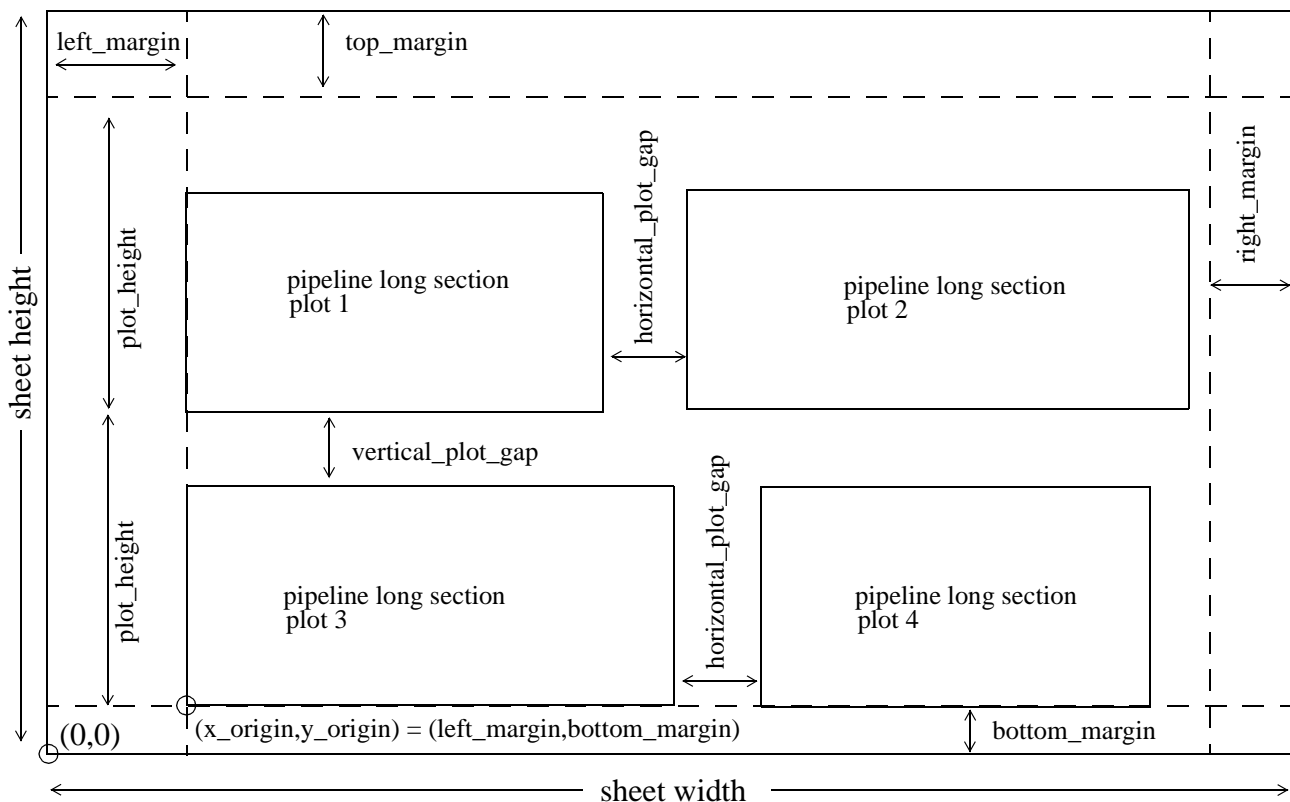
When a sheet is full, a follow on sheet is created.

As soon as one pipeline string is completed, the next pipeline string in the network model is plotted beginning on the same row as the previous pipeline string and with a horizontal gap of size `horizontal_plot_gap` between the plots. If there is not enough room on the row to start the next plot, it will begin on a new row.

The position of the left hand bottom corner of the first plot in the bottom row is given by the parameters, `left_margin` and `bottom_margin`.

If there are two or more rows of plots, the position of the first plot in each row is given by adding multiples of the $(\text{plot_height} + \text{vertical_plot_gap})$ to the `bottom_margin`.

<code>network_model</code>	<i>text</i>	// model of pipeline strings
<code>left_margin</code>	<i>mm</i>	// Position of the left hand bottom
<code>bottom_margin</code>	<i>mm</i>	// corner of first plot in the bottom row.
<code>only_one_line</code>	0	// more than one row on a sheet
	1	// only one row of plot on a sheet
<code>plot_height</code>	<i>mm</i>	// total height of a plot row. It doesn't
		// includes the <code>vertical_plot_gap</code> .
<code>horizontal_plot_gap</code>	<i>mm</i>	// gap between plots on same row
<code>vertical_plot_gap</code>	<i>mm</i>	// gap between rows of plots



The pipeline long plot itself consists of seven areas. From the bottom up, they are boxes, below datum, bottom stagger, graph, top stagger, arrow 4 area and top.

The **boxes area** is where the chainages and various values for the pipeline strings are labelled.

The **below datum area** is a region between the boxes area and the datum line.

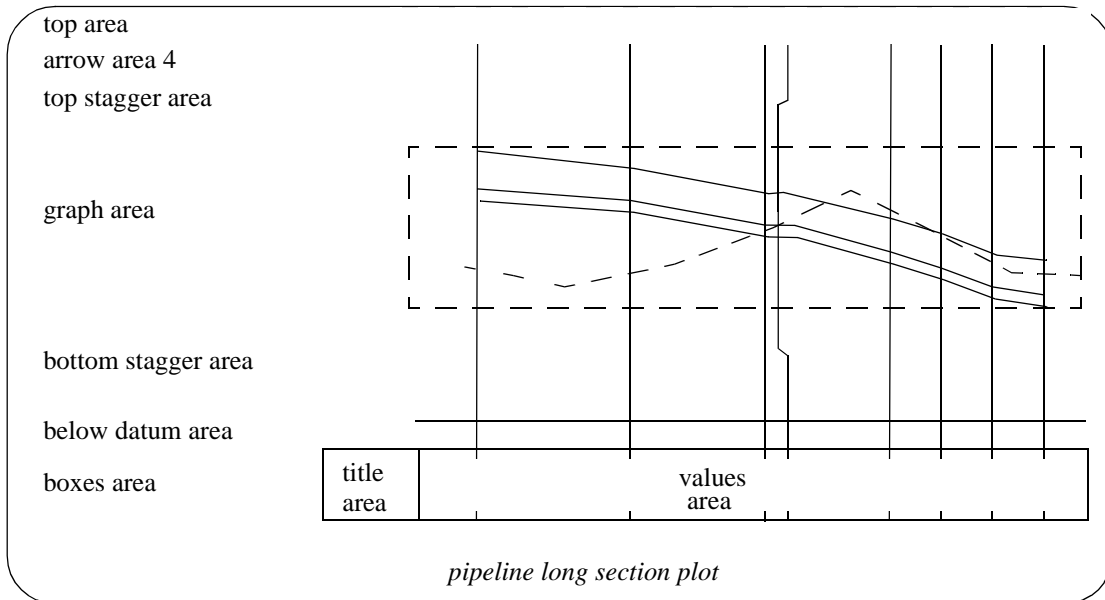
The **bottom stagger area** is where the upright line staggers occur before going up from the boxes area to the graph area.

The **graph area** is the area where the actual plots of the strings are drawn.

The **top stagger area** is where the upright line staggers occur above the graph area.

The **arrow 4 area** is an extension of the uprights above the top stagger area to allow for the drawing of arrows where the arrows go between the staggered uprights above the graph area.

The **top area** is an annotation area above the arrow 4 area (the top of the plot) and is used for pegs and deflection angles.



Apart from information labelled in the boxes and top areas, the pipeline long section plot can place arrows between ips for other information such as

- (a) pipe grade
- (b) vertical geometry
- (c) horizontal geometry

Also the chainages where services cross the pipeline line are automatically labelled.

Chainages, Staggering and Uprights

For the pipeline plot, the labelling of pipe invert levels, pipe invert, depth to invert, pipe grade and natural surface level are done at the chainages:

- (a) pegs given by the `peg_interval`
- (b) horizontal and vertical deflection points
- (c) points in the specials model
- (d) crossing services

The points in the specials model are projected onto the pipeline string and the chainages used for labelling. If the point is a 4d string, then the text at the point is used as a text label at the top of the plot.

The peg interval and specials model are given by the parameters

```
peg_interval      world-units    // distance between pegs
specials_model    text           // model name
```

Uprights, or leader lines, are drawn from the values at the bottom of the plot to the top of the plot for cases (a), (b) and (c), or to the crossing service in the graph area for case (d).

If the text values are placed at the real chainage positions at the bottom of the plot, text overwriting can easily occur if the chainages are very close together.

To prevent such overwriting, the text can be **staggered**.

That is, if the text is going to overwrite a previous text value, the next text value is actually moved along until there is no overwriting.

Since the text is no longer at the correct chainage position, the uprights to the pegs and services start at the text position and then bend back to the correct chainage position on the plot. The region where the bending occurs is called the stagger area.

For the pipeline plot, there is an area below the graph where the uprights bend backwards from the staggered text position to the real chainage position (bottom stagger area).

There is a second area above the graph where the uprights bend forwards from the real chainage position to the staggered text position (top stagger area).

Hence annotation above the top stagger area will line up with the staggered values below the bottom stagger area.

The stagger area below the graph area is defined by

```
stagger_height_1    mm           // distance from the top of datum to the
// start of the staggers
stagger_height_2    mm           // distance over which stagger occurs
stagger_gap_bottom  mm           // distance from end of staggers to the
// bottom of the graph area
```

The stagger area above the graph area is defined

```
stagger_gap_top     mm           // distance from top of the graph area to
// the start of the staggers
stagger_height_3    mm           // distance over which stagger occurs
stagger_height_4    mm           // distance from end of staggers to the
// bottom of above upper staggers area
```

The distance to be left for text to avoid overwriting is:

```
horizontal_text_gap mm           // minimum distance to leave for text
// after peg values
services_text_gap   mm           // minimum distance to leave for text
// after service values
```

When staggering occurs, it is possible for the values area to be longer than the graph area.

For the uprights that are drawn from the text to the pegs, specials and services:

```
line_colour         colour       // colour of uprights to the pegs and
// specials
service_line_colour colour       // colour of upright to the crossing
// services
service_text_colour colour       // colour of the name of the service.
service_text_size   mm           // size of the service text.
```

```
service_il_text_size mm           // size of the service invert level text.
```

service_il_textstyle *text* // textstyle of the service il text
service_il_text_colour *colour* // colour of the service il text

Label vertical geometry:

v_g_text_size *mm* // size of the vertical geometry text
v_g_textstyle *text* // text style of the vertical geometry text
v_g_text_colour *colour* // colour of the vertical geometry text

Label horizontal geometry:

h_g_text_size *mm* // size of the horizontal geometry text
h_g_textstyle *text* // textstyle of the horizontal geometry text
h_g_text_colour *colour* // colour of the horizontal geometry text

Label pegs:

peg_text_size *mm* // size of the peg label
peg_textstyle *text* // text style of the peg label
peg_text_colour *colour* // colour of the peg label

Label special chainage:

chainage_special_text_size *mm* // size of the special chainage text
chainage_special_textstyle *text* //textstyle of the special chainage text
chainage_special_text_colour *colour* // colour of the special chainage text

Boxes Area

The pipeline string values of chainage, invert level, depth to pipe invert or depth to top of pipe, grade and natural surface level can be labelled in the pipeline long section plot with one line of title, and the actual values given at the chainage of each peg in the pipeline string.

The **titles** for the string values, are drawn in the **titles area** of the **boxes area** and the values are drawn in the **values area** of the **boxes area**.

Consequently the boxes area is made up of rows of text consisting of:

title followed by the **values** along the string.

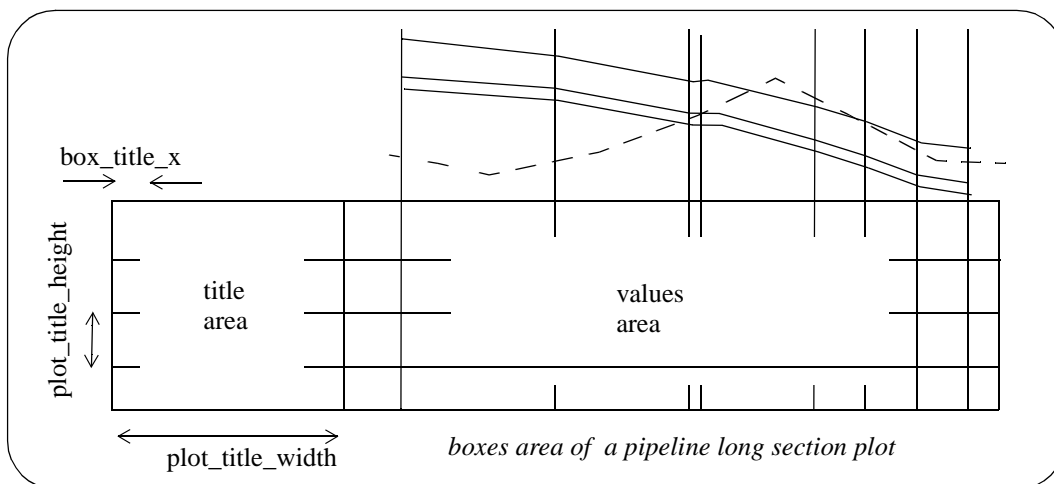
Each row is surrounded by lines to form a box.

The **titles area** for the left plot in the bottom row starts at the co-ordinate (left_margin, bottom_margin) and each row is begun by adding the distance (plot_height + vertical_plot_gap) to the bottom_margin.

The width of the title box is given by the **plot_title_width** parameter and the height of each box is given by **plot_title_height**.

plot_title_width	<i>mm</i>	// width of the label boxes.
plot_title_height	<i>mm</i>	// height of each box
box_titles_x	<i>mm</i>	// the distance between the left of the // title box and the title

The **values area** starts at the end of the label area and the values text is written at right angles to the bottom of the boxes.



The colour of the box line work is given by:

plot_title_line_colour	<i>colour</i>	// colour of the lines in the boxes
------------------------	---------------	-------------------------------------

A default text size and colour can be specified for the title text, and the size and colour of the values. These can be overridden by parameters (given later in this section).

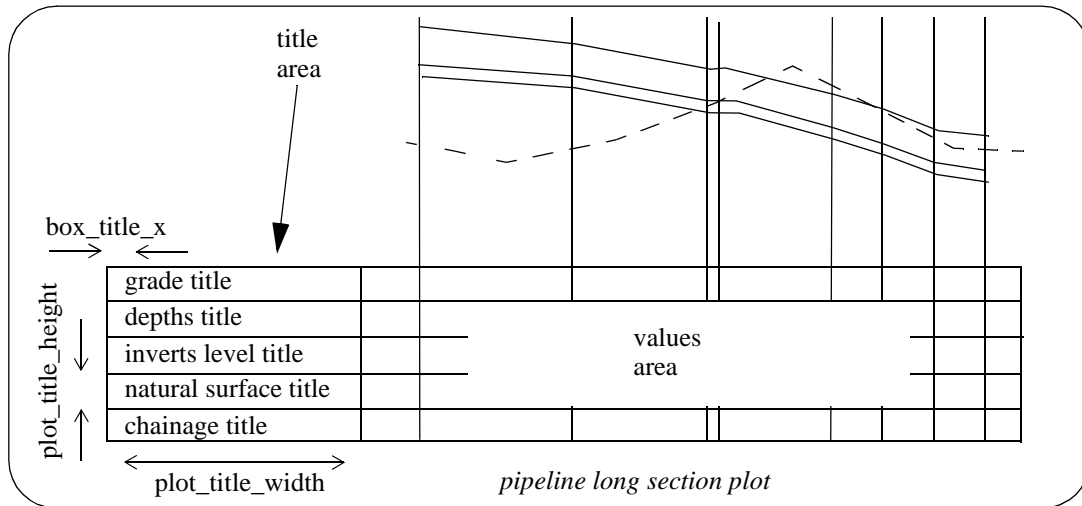
plot_title_text_size	<i>mm</i>	// size of label text in boxes
plot_title_text_colour	<i>colour</i>	// colour of label text in boxes
text_size	<i>mm</i>	// size of value text
text_colour	<i>colour</i>	// colour of values in boxes

The width of the **values** area is determined by the number of chainages to be labelled and whether the values are staggered to prevent over writing.

The total width of the boxes area is the width of the labels area plus the width of the values area which depends on the amount of staggering that occurs.

The order of drawing and labelling the boxes from the bottom up is

- (a) chainage values
- (b) natural surface heights
- (c) pipe invert levels
- (d) depth to invert or depth to top of pipe
- (e) grade of pipeline



The text, size, textstyle and colour for the title text and values text for each box can be set by:

(a) pipeline string chainages

```

plot_title_chainage_name    text           // label for chainages box
chainage_title_text_size   mm             // size of chainage title text in boxes
chainage_title_textstyle   text           // the textstyle of chainage title text in boxes
chainage_title_text_colour colour        // colour of chainage title text in boxes

chainage_text_colour       colour        // colour of chainage text in boxes
chainage_text_size         mm             // size of chainage text in boxes
chainage_textstyle         text           // the textstyle of chainage text in boxes
chainage_decimals         integer        // number of decimal places
// If > 0, trailing zeros are removed after
// the decimal point.
// If < 0, the absolute value is taken as the
// number of decimal places to report
// i.e. no trailing zeros are removed
    
```

(b) natural surface values

```

plot_title_surface_name    text           // label for the pipeline ns value
ns_title_text_size         mm             // size of ns title text in boxes
ns_title_textstyle         text           // the textstyle of ns title text in boxes
ns_title_text_colour       colour        // colour of ns title text in boxes

ns_text_colour             colour        // colour of ns text in boxes
ns_text_size               mm             // size of ns text in boxes
ns_textstyle               text           // the textstyle of ns text in boxes
ns_decimals                integer        // number of decimal places
// If > 0, trailing zeros are removed after
// the decimal point.
// If < 0, the absolute value is taken as the
    
```



```
// number of decimal places to report
// i.e. no trailing zeros are removed
```

(c) pipe invert values

```
plot_title_invert_name  text    // label for the invert level
il_title_text_size     mm      // size of il title text in boxes
il_title_textstyle     text    // the textstyle of il title text in boxes
il_title_text_colour   colour  // colour of il title text in boxes

il_text_colour         colour  // colour of il text in boxes
il_text_size          mm      // size of il text in boxes
il_textstyle          text    // the textstyle of il text in boxes
il_decimals           integer // number of decimal places
                        // If > 0, trailing zeros are removed after
                        // the decimal point.
                        // If < 0, the absolute value is taken as the
                        // number of decimal places to report
                        // i.e. no trailing zeros are removed
```

(c) depth to invert or depth to top of pipe

```
depth_mode            0        // if 0, depth to invert of pipe - default 0
                    1        // if 1, depth to top of pipe (cover)

plot_title_depth_name text    // label for depth of invert
depth_title_text_size mm      // size of depth title text in boxes
depth_title_textstyle text    // the textstyle of depth title text in boxes
depth_title_text_colour colour // colour of depth title text in boxes

depth_text_colour    colour  // colour of depth text in boxes
depth_text_size      mm      // size of depth text in boxes
depth_textstyle      text    // the textstyle of depth text in boxes
depth_decimals       integer // number of decimal places
                        // If > 0, trailing zeros are removed after
                        // the decimal point.
                        // If < 0, the absolute value is taken as the
                        // number of decimal places to report
                        // i.e. no trailing zeros are removed
```

(d) grade of pipeline

```
plot_title_grade_name text    // grade of pipe at the peg
grade_title_text_size mm      // size of grade title text in boxes
grade_title_textstyle text    // the textstyle of grade title text in boxes
grade_title_text_colour colour // colour of grade title text in boxes

grade_text_colour    colour  // colour of grade text in boxes
grade_text_size      mm      // size of grade text in boxes
grade_textstyle      text    // the textstyle of grade text in boxes
grade_decimals       integer // number of decimal places
                        // If > 0, trailing zeros are removed after
                        // the decimal point.
                        // If < 0, the absolute value is taken as the
                        // number of decimal places to report
                        // i.e. no trailing zeros are removed
```

Below Datum Area

The **below datum area** is the region between the boxes area and the arrow_1 area. The datum line is drawn at the top of the below datum area.

datum_title_text_size	<i>mm</i>	// size of datum title text and value
datum_title_textstyle	<i>text</i>	// textstyle of datum title text and value
datum_title_text_colour	<i>colour</i>	// colour of the datum title text and line

The size of the below datum area is

datum_gap	<i>mm</i>	// height of the below datum area
-----------	-----------	-----------------------------------

The datum value is placed above the datum line.

Since the datum value is automatically calculated to try and fit the plot vertically into the graph area, the datum value can change along the plot. When a datum change occurs, the new datum value is written on the datum line at the relevant chainage position.

The datum name, text size and colour are controlled by:

datum_text_size	<i>mm</i>	// size of datum title text and value
datum_textstyle	<i>text</i>	// textstyle of datum title text and value
datum_text_colour	<i>colour</i>	// colour of the datum title text and line

datum_name	<i>text</i>	// text to write before the datum value
datum_text_size	<i>mm</i>	// size of datum text and value
datum_colour	<i>colour</i>	// colour of the datum text and line

Graph Area

The **graph area** is the area where the actual plots of the pipeline strings are drawn.

The length of the graph area is determined by the length of the pipelines string to be plotted (given by the start and end chainages) and the horizontal scale (given by scale) of the plot.

scale	<i>value</i>	// 1:value - horizontal scale // The vertical scale is determined by the // horizontal scale and the vertical // exaggeration for the section view.
start_chainage	<i>value</i>	// “ “ means use start of pipeline strings
end_chainage	<i>value</i>	// “ “ means use end of pipeline strings

The vertical exaggeration is taken from the section view specified for the plot by the parameter:

view_name	<i>text</i>
-----------	-------------

The tins to be sectioned through by the pipeline strings and any service models and corridor settings for the graph area are also taken from the specified section view.

The height of the graph is calculated by subtracting the height of the first five areas (i.e. don't include the top area) from the plot height.

If the plot will not fit horizontally into a row on the sheet, then the plot will be broken at an appropriate peg and the plot continued on another row.

Datum breaks at pegs are used to try and fit the plot vertically into the graph area but if the plot still cannot fit, then it will be truncated at the bottom.

The types of strings that can be drawn in the graph area of the pipeline long section plot are:

- (a) pipeline string the strings from the network model
- (b) tins sections of the pipeline string through any tins on the section view.
- (c) services parts of strings from any models on the section view that cut the

corridor for the section view.

The **colour** of the strings in the plot is the actual string colour for cases (a) and (c), the colour of the tin used for the section in case (b).

Arrow 4 Area

This is just an extension of the stagger lines before the top of the plot. It leaves an area that can be used for extra annotation after the plot is produced.

The height of the area is

```
plot_title_top_height    mm        // height of the arrow 4 area
```

Top Area

The **top area** is an annotation area at the top of the plot (above the arrow 4d area).

It can be used for peg names and horizontal and vertical deflection angles in the pipeline.

The height of the top area is given by

```
vertical_plot_gap        mm        // size of the top area. If it is not large
                           // enough, the text will overwrite the
                           // plot in the row above.
```

Change of Direction At Intersection Points

If there is a horizontal or vertical intersection point without a curve on it, the deflection angle at the intersection point is drawn in the top area.

The text is drawn at the distance **angle_text_offset** above the top of the plot and if there is more than one angle, they are spaced horizontally by the distance **angled_text_gap** to the right.

The size and colour of the deflections is given by `text_size` and `text_colour`.

```
angled_text_offset       mm        // distance of direction text above
                           // top of the plot
angled_text_gap          mm        // distance of direction text to the right
                           // of previous text.
angled_text_angle        value     // angle of direction text
```

Hatching Cut and Fill Areas

This option is used to hatch cut and/or fill areas between sets of tins.

For each set, the name of the two tins, the hatch linestyle, colour and separation and whether cut and/or fill regions are required are all user definable.

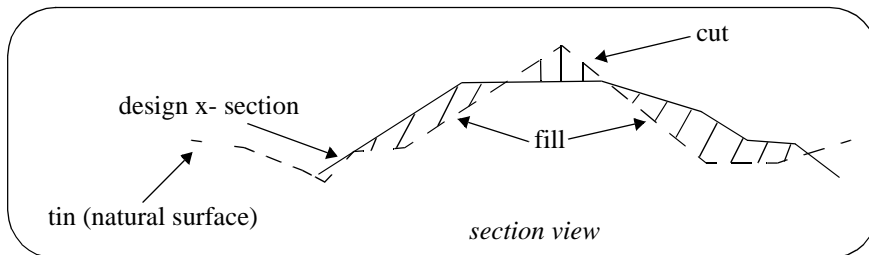
Up to twenty (20) separate sets of tins be hatched.

The parameters for labelling cuts and/or fill regions between tins are given by:

<code>hatch_original_tin_n</code>	<i>tin_name</i>	// tin_name for original surface
<code>hatch_new_tin_n</code>	<i>tin_name</i>	// tin_name for final surface
<code>hatch_cut_separation_n</code>	<i>mm</i>	// distance between cut hatch lines
	<i>0</i>	// don't do cut hatching
<code>hatch_cut_angle_n</code>	<i>degrees</i>	// angle in degrees of cut hatching
<code>hatch_cut_colour_n</code>	<i>colour</i>	// colour of the cut hatching
<code>hatch_cut_linestyle_n</code>	<i>linestyle</i>	// linestyle for cut hatching
<code>hatch_cut_draw_sides_n</code>	<i>1/0</i>	// 1 = draw sides of cut regions
<code>hatch_cut_draw_original_n</code>	<i>1/0</i>	// 1 = draw original tin in cut regions
<code>hatch_cut_draw_new_n</code>	<i>1/0</i>	// 1 = draw new tin in cut regions
<code>hatch_fill_separation_n</code>	<i>mm</i>	// distance between fill hatch line
	<i>0</i>	// don't do fill hatching
<code>hatch_fill_angle_n</code>	<i>degrees</i>	// angle in degrees of fill hatching
<code>hatch_fill_colour_n</code>	<i>colour</i>	// colour of the fill hatching
<code>hatch_fill_linestyle_n</code>	<i>linestyle</i>	// linestyle for fill hatching
<code>hatch_fill_draw_sides_n</code>	<i>1/0</i>	// 1 = draw sides of fill regions
<code>hatch_fill_draw_original_n</code>	<i>1/0</i>	// 1 = draw original tin in fill regions
<code>hatch_fill_draw_new_n</code>	<i>1/0</i>	// 1 = draw new tin in fill regions

Notes

- cut is when the new tin is below the original tin.
fill is when the new tin is above the original tin.
- cut hatching is turned off by setting `hatch_cut_separation_n` to 0.0.
fill hatching is turned off by setting `hatch_fill_separation_n` to 0.0.



Labelling Cuts of Pipeline Through Strings in a Model

The cuts that the pipeline string makes through any strings in user given models can be automatically labelled on the long section plots.

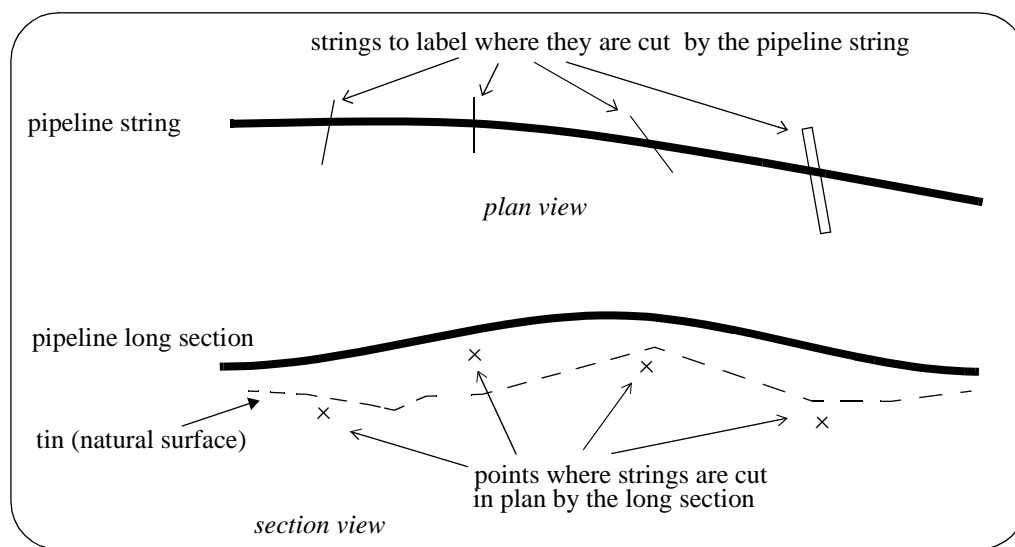
The **height**, **chainage** and **name** of the cut string can be labelled as well as a **symbol** drawn. The height of tins at the same offset value can also be labelled.

The chainage position for the labelling is the chainage of the cut string.

The height position for the labelling can be specified as the

- (a) top of the boxes on the long section
- (b) height value of the cut string
- (c) height of the primary string
- (d) height of a tin.

The actual position of the label is defined relative to the above point.



Note:

Only case (b) involves the actual height of the cut string. For all other cases, only the chainage of the cut string is used. Hence for all cases except (b), the string does need to have a sensible height to be used for cuts through strings.

For example, a boundary string may have null heights but only the chainage is required and the height of the tin at that chainage can be used as the height (case (d)).

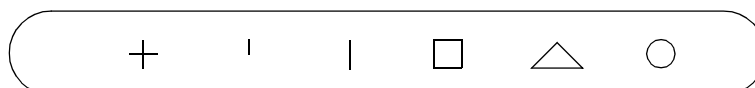
Text justification refers to the actual position and is given by

“top-left”	“top-centre”	“top-right”
“middle-left”	“middle-centre”	“middle-right”
“bottom-left”	“bottom-centre”	“bottom-right”

A choice of six special symbols and/or or any 12d symbols can be drawn at the cut point.

The special 12d Model symbols of size one millimetre are drawn in a square box centred on (0,0) with sides of length two millimetres. That is, the box co-ordinates are (-1,-1), (1,1), (1,-1), (-1,-1).

The six special shapes are



Up to twenty five (25) separate models of strings can be cut and labelled.

Parameters for Labelling Where the Pipeline Cuts Strings in a Model

The method for specifying which strings are to be checked for cuts is by first specifying the **model** which contains the strings, and then a **name mask** which is used to restrict the strings in the model to only those whose name matches the name mask.

Up to twenty five different sets of models and name masks can be used so that different cut sets can be labelled in different ways.

The parameters for selecting and labelling the *n*'th set (where *n* can be from 1 to 25) of cuts of the design string with the strings in the model are given by:

```
cuts_n_model      model_name      // model of strings to be cut
```

The selection of the strings from the model *model_name* whose cut points are to be labelled is all the strings whose name satisfies the name mask *cuts_n_mask*:

```
cuts_n_mask      name_mask      // strings to check for cuts
                                     // and if a cut occurs,
                                     // parameters show how to
                                     // label the cut
```

where *name_mask* is a text string containing the name masks, each separated by one or more spaces, to test the string name against. Each mask can include wild cards and wild characters.

For example

```
or
           cuts_1_mask      "ke*"
cuts_1_mask      "?bank*"
or, if both masks are required,
           cuts_1_mask      "ke* ?bank*"
```

If *cuts_n_mask* is missing, then all strings in the model are used. This is equivalent to *name_mask* being "*".

All strings in the model *cuts_n_model* whose name satisfy the name mask *cuts_n_mask* are then checked for cuts with the design string, and if a cut occurs, the cut point will be labelled according to the rest of the parameters in the *n*'th set.

The parameters for drawing a **symbol** at the cut points are

```
cuts_symbol_n_mode  0      // cross
                   1      // up from centre of box
                   2      // up and down from centre of box
                   3      // square
                   4      // triangle, base at bottom
                   5      // circle
                   6      // use a 12d symbol
```

0 + 1 | 2 | 3 □ 4 △ 5 ○
predefined symbols for cut_symbol_n_modes 0 to 5

If *cuts_symbol_n_mode* is 6, then the 12d symbol is given by

```
cuts_symbol_n_style  plotsymbol // 12d symbol to draw at cut
```

Important Note

The plot symbol of name *plotsymbol* is defined in the file given by:

- (a) the parameter *plot_symbols* in the ppf file

plot_symbols filename

or if *plot_symbols* is not defined, then

(b) in the file pointed to by the environment variable PLOT_SYMBOLS_4D
 PLOT_SYMBOLS_4D filename // default plotsym.4d

or if *PLOT_SYMBOLS_4D* is not defined, then

(c) in the file *plotsym.4d*
 which is searched for in the standard set up file sequence

If none of the above files are defined, or if the symbol does not exist in the above files, then it will be searched for in the standard 12d symbols file which is:

(d) either pointed to by the environment variable SYMBOLS_4D
 SYMBOLS_4D filename // default symbols.4d
 or if the environment variable SYMBOLS_4D does not exist, in the file, *symbols.4d*

The position of the symbol is given by:

cuts_symbol_n_position 1 // above point height value
 3 // above top of boxes
 100 // to primary string
 101-500 // to tin1 or tin2 etc.

The symbol can be adjusted by the parameters:

cuts_symbol_n_x mm // offset adjustment to position
 cuts_symbol_n_y mm // height adjustment to position
 cuts_symbol_n_angle degrees // rotation about point
 cuts_symbol_n_colour colour // colour of symbol

and for all values of *cuts_symbol_n_mode* other than 6:

cuts_symbol_n_size mm // size of symbol, 0 don't draw

The value of the **chainage** of the cut string can be labelled using the parameters

cuts_chainage_n_position1 // above cut strings height value
 3 // above top of boxes
 100 // to primary string
 101-500 // to tin1 or tin2 etc.

cuts_chainage_n_x mm // chainage adjustment to position
 cuts_chainage_n_y mm // height adjustment to position
 cuts_chainage_n_angle degrees // rotation about point
 cuts_chainage_n_size mm // size of text, 0 don't label
 cuts_chainage_n_colour colour // colour of text

cuts_chainage_n_textstyle text // textstyle of text chainage
 cuts_chainage_n_pre_text text // text before the chainage value
 cuts_chainage_n_post_text text // text after the chainage value

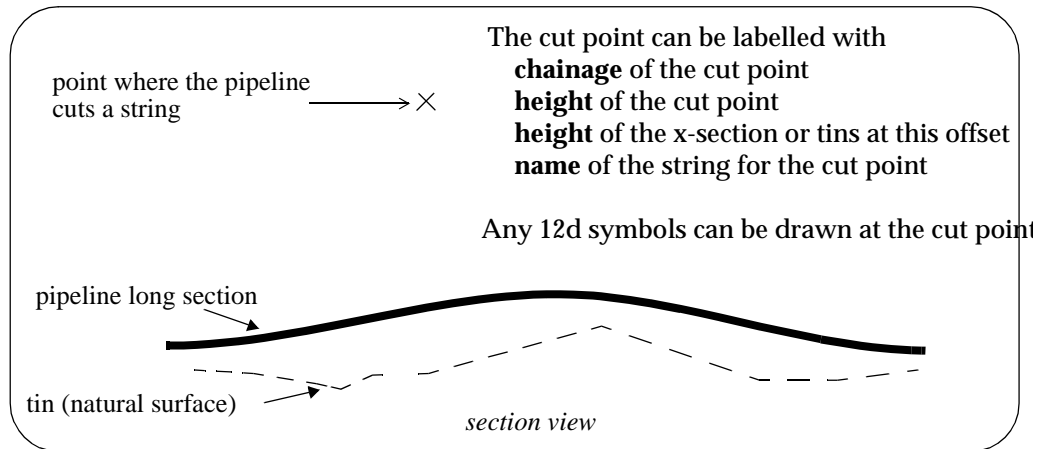
cuts_chainage_n_justification justification // justification of the text
 cuts_chainage_n_no_decimals integer // number of decimals in chainage

The value of a **height** at the chainage of the point can be calculated and labelled using the parameters

cuts_height_n_mode	1	// use height of cut point itself
	3	// use real world height of position // above boxes
	100	// height of primary string
	101-500	// use height of to tin1 or tin2 etc.
cuts_height_n_position	1	// at points position
	3	// above top of boxes
	100	// to primary string
	101-500	// to tin1 or tin2 etc.
cuts_height_n_x	mm	// chainage adjustment to position
cuts_height_n_y	mm	// height adjustment to position
cuts_height_n_angle	degrees	// rotation about point
cuts_height_n_size	mm	// size of text, 0 don't label
cuts_height_n_colour	colour	// colour of text
cuts_height_n_textstyle	text	// textstyle of text height
cuts_height_n_pre_text	text	// text before the height value
cuts_height_n_post_text	text	// text after the height value
cuts_height_n_justification	justification	// justification of the text
cuts_height_n_no_decimals	integer	// number of decimals in height

A **label** which can include the **name** of the cut string is drawn by using the parameters

cuts_label_n_position	1	// above cut strings height value
	3	// above top of boxes
	100	// to primary string
	101-500	// to tin1 or tin2 etc.
cuts_label_n_mode	0	// don't include cut string name
	1	// include cut string name in label
cuts_label_n_x	mm	// chainage adjustment to position
cuts_label_n_y	mm	// height adjustment to position
cuts_label_n_angle	degrees	// rotation about point
cuts_label_n_size	mm	// size of text, 0 don't label
cuts_label_n_colour	colour	// colour of text
cuts_label_n_textstyle	text	// textstyle of text label
cuts_label_n_pre_text	text	// text before the string name
cuts_label_n_post_text	text	// text after the string name
cuts_label_n_justification	justification	// justification of the text



Title Block Information

The plot can have a standard 12d Model title block or a user defined title block.

The standard title block consists of a simple border around the plot and two lines of text in a box underneath the plot. For a user defined title block, all the line work and text is defined by the user.

Standard Title Block

For the standard 12d Model title block, there are extra parameters for two lines of text and text size and colour. The standard title block is turned on or off by the parameter *plot_border*.

<i>plot_border</i>	<i>yes/no</i>	<i>// yes plots a standard title block</i> <i>// default yes</i>
<i>title_1</i>	<i>text</i>	
<i>title_2</i>	<i>text</i>	
<i>title_text_size</i>	<i>value</i>	
<i>title_colour</i>	<i>colour</i>	

User Title Block

For the user defined title block, the title block drawing commands are kept in a file whose name is supplied by the user. The title block drawing commands are almost identical to the linestyle drawing commands and is given at the beginning of chapter Advanced Plotting.

Hence for a user defined title block, there are just two parameters - one to say a title block file is being used and the other to give the name of the title block file. The *plot_border* parameter should also be set to *no* so that the standard title block is not also drawn.

<i>use_title_file</i>	<i>yes/no</i>	<i>// yes draws the title block given in title_file</i> <i>// default no</i>
<i>title_file</i>	<i>filename</i>	
<i>plot_border</i>	<i>no</i>	<i>// turn off standard title block</i>

Some special plot parameters are used to pass information down to variables in a user defined title block

For example, inside the title block file it is possible to have run time user defined text variables. The actual text values for these text variables are passed down to the title block file from the plot parameter file via the parameters *user_text_n* ($n = 1, 2, \dots, 1000$)

<i>user_text_n</i>	<i>text</i>
--------------------	-------------

The special plot parameters are:

<i>time_format</i>	<i>text</i>	<i>// format for \$time</i>
<i>user_text_n</i>	<i>text</i>	<i>// where n = 1, 2, ... 1000</i> <i>// passed down to \$user_text_n</i>
<i>title_1</i>	<i>text</i>	<i>// passed down to \$title_1</i>
<i>title_2</i>	<i>text</i>	<i>// passed down to \$title_2</i>
<i>start_page_number</i>	<i>integer</i>	<i>// used as the starting value for</i> <i>// \$page_number. If missing,</i> <i>// \$page_number starts at 1.</i>
<i>start_drawing_number</i>	<i>integer</i>	<i>// added to \$drawing_number in title</i> <i>// block file. If missing,</i> <i>// \$drawing_number starts at 1.</i>
<i>drawing_number_prefix</i>	<i>text</i>	<i>// passed down to</i> <i>// \$drawing_number_prefix</i>
<i>drawing_number_postfix</i>	<i>text</i>	<i>// passed down to</i> <i>// \$drawing_number_postfix</i>

Parameters that Modify Fields In the Plot Pipeline Network Panel

A number of parameters match those in the **plot pipeline network** panel.

When the plot parameter file is first read, any parameters in the panel will be replaced by the values of any corresponding parameters from the parameter file.

However, if the parameter is subsequently modified in the panel, the panel value will be the value used for the parameter.

The plot parameters that also occur in the **plot pipeline network** panel are:

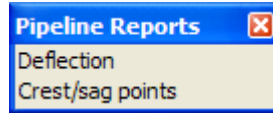
network_model	text	
plotter_type	text	
plot_stem	text	
view_name	text	// name of section view for tins, services, // vertical exaggeration etc.
specials_model	text	
peg_interval	world-units	
scale	value	
sheet_size	text	or "width height"
plot_height	mm	
start_chainage	world-units	
end_chainage	world-units	
left_margin	mm	
right_margin	mm	
top_margin	mm	
bottom_margin	mm	
plot_border	yes/no	
title_1	text	
title_2	text	
title_text_size	value	
title_text_colour	colour	
use_title_file	yes/no	
title_file	filename	

Reports

pipeline_reports

Position of menu: Design =>Pipeline =>Reports

The Reports walk-right menu contains reports for joint deflections along the pipeline and crest and sag points.



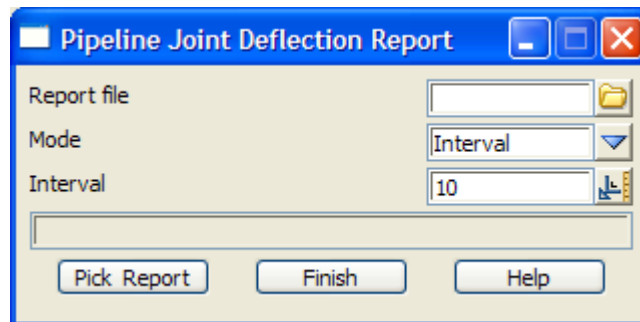
Deflection

pipeline_joint_deflection_report

Position of option on menu: Design =>Pipeline =>Reports=>Deflection

The deflection report gives the horizontal, vertical and combined joint deflections along the pipeline.

After selecting the Deflection option, the **Pipeline Joint Deflection Report** panel is displayed.



The fields and buttons used in this panel have the following functions.

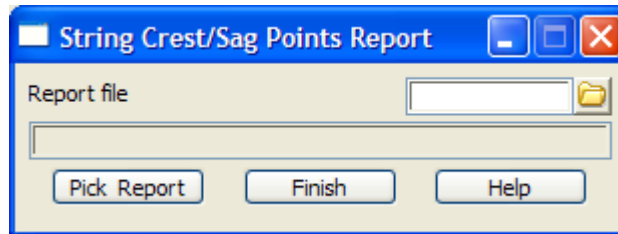
Field Description	Type	Defaults	Pop-Up
Report file <i>name of the file for the report</i>	input		
Mode <i>if interval - reports the joint deflection at the interval given plus any horizontal or vertical intersection points without curves on them</i> <i>If critical - only reports points where the deflection is greater than the value given in the pipeline joint defaults panel.</i> <i>If summary - gives the maximum joint deflections</i>	input	interval	interval, critical, summary
Interval <i>the chainage distance between points along the pipeline where joint deflections are to be reported</i>	input	10	
Pick & Report <i>pick the pipeline string to report on.</i>	button		

Crest/Sag Points

Crest/sag points_reports

Position of option on menu: Design =>Pipeline =>Reports=>Crest/Sag Points

After selecting the Crest/sag points option, the **String Crest/Sag Points Report** panel is displayed.



This is the same option as the Reports=>Strings=>Crest/sag points in the main menu.

For each selected string, the string's crest/sag points are written to the report file given in the report file field of the panel.

21 Volumes

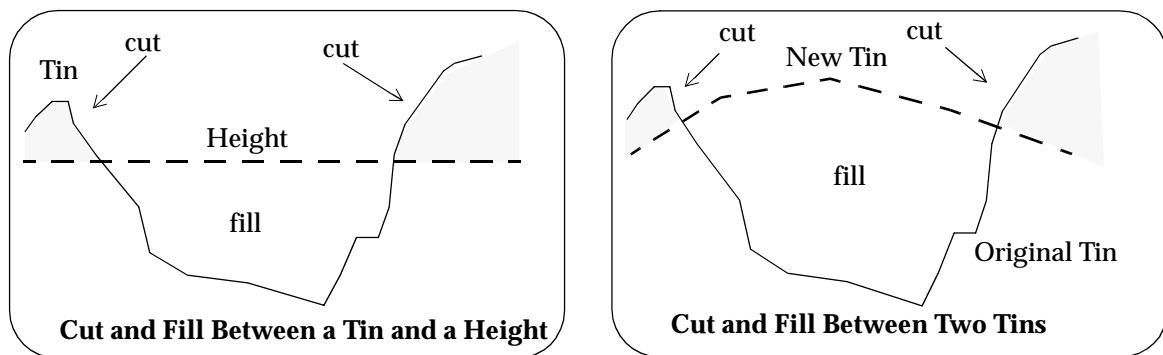
12d Model provides two distinct methodologies for calculating volumes; end area and exact.

In all cases the volumes are broken up into *cut* and *fill* volumes.

Definition of Cut and Fill

Cut is defined to be where ever the new surface or given height is **below** the original surface. That is, you have to **cut** to get from the original surface to the new surface. The sign of cut quantities is set via the **Cut volume sign** field from the **Default settings** tab of the Defaults panel (**Utilities=>Defaults**) and the default for *cut volume sign* is positive.

Fill is defined to be where ever the new surface or given height is **above** the original surface. That is, you have to **fill** to get from the original surface to the new surface. The sign of fill quantities is the opposite to the value for cut and cut is set via the **Cut volumes sign** field from the **Default settings** tab of the Defaults panel (**Utilities=>Defaults**). The default for fill is *negative*.



End Area and Exact Volumes

In the **end area** method, sections are *automatically* created through tins. From the sections, cut and fill areas for the sections and the cut and fill volumes between the sections are calculated. For more information on the end area volume calculations, go to the section “Theory of End Area Volumes”

For **exact** volumes, the volume between a tin and a plane or between two tin is determined by working out the exact geometrical shapes between the tins and summing their volumes. For more information on the exact volume calculations, go to the section “Theory of Exact Volumes”

It is often stated that exact volumes are more accurate than end area volumes. However, when the distance between sections is small in the end area volume calculations, the results are the same to any reasonable degree of accuracy.

The reason for having both methods available in **12d Model** is

- (a) to provide an independent check on the volumes produced
- (b) each method produces a different breakup of the volumes.

In the end area method, cut and fill volumes are produced on a section by section basis. This is needed for applications such as mass-haul calculations.

For the exact method, cut and fill volumes are easily calculated between different **depth** values.

This is useful for applications such as depth (isopach) analysis.

For both the end area and the exact method, 12d Model provides options to calculate the volume

(a) between a surface (tin) and a fixed height (z-value)

and

(b) the volume between two surfaces (tins) - an original surface (tin) and a new surface (tin).

NOTE: For the **end area volumes**, sections are automatically generated and used for the calculations. You do **not** need to generate the sections separately.

For more information on the end area volume calculations, go to the section “Theory of End Area Volumes” . For information on the end area options, please go to the section “End Area” .

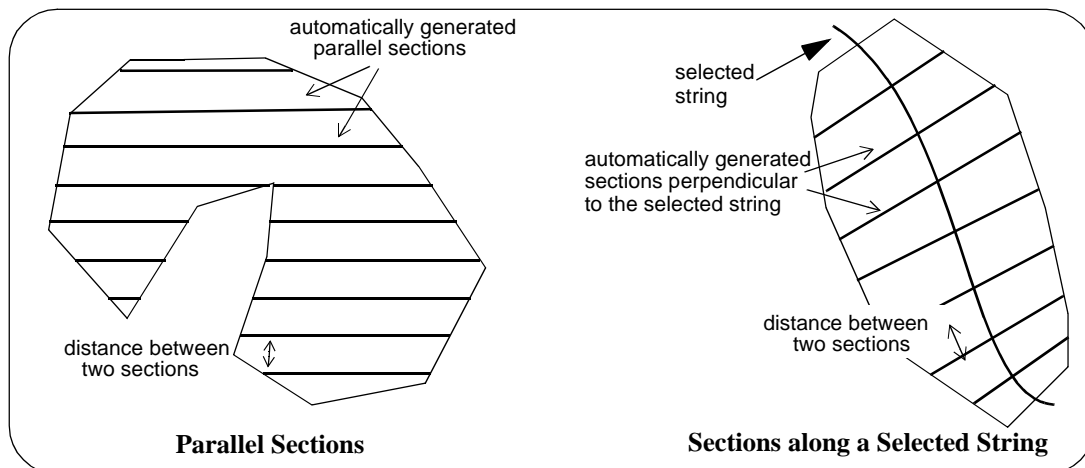
For more information on the exact volume calculations, go to the section “Theory of Exact Volumes” . For information on the exact volume options, please go to the section “Exact” .

Theory of End Area Volumes

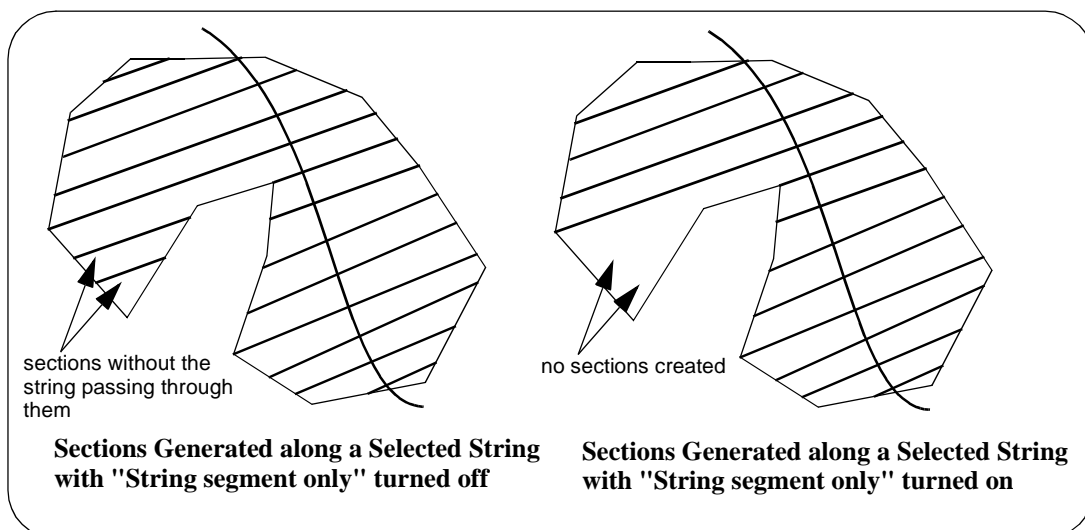
In the **end area** method of calculating volumes, sections are automatically generated through the tins. For each section, cut and fill areas are calculated and then cut and fill volumes are calculated from the cut and fill areas. For the definition of cut and fill, please go to the section “Definition of Cut and Fill” .

For the end area method, **12d** Model provides options to calculate the volume between a surface (tin) and a fixed height (z-value) and the volume between two surfaces (tins).

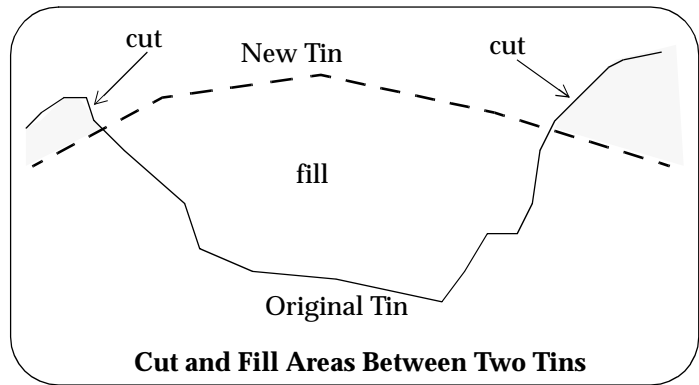
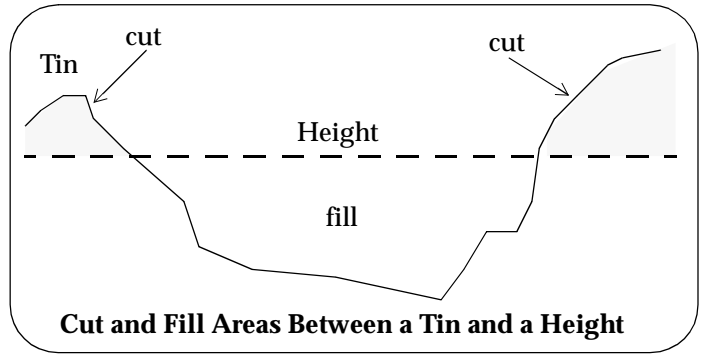
In the **end area** methods of calculating volumes, sections can be generated through a tin or tins at either a *given angle* or at right angles to a **selected** string.



When using the **sections along a string** options, it is possible for a generated section to be broken into more than one part and a parameter exists to only use those sections that contain the selected string.



For each generated section, the *cut* and *fill* areas are calculated and then the volumes between the two sections using either the **average end** (see “Average End Area Formula”) or the **two section prismatic** methods (see “Two Section Prismatic Formula”).



NOTE: For the *end area volumes*, sections are automatically generated and used for the calculations. You do *not* need to generate the sections separately.

Average End Area Formula

Using the *Average End Area* method the *volume* between two *consecutive* sections is calculated by the formula

$$\text{Volume of cut between the two sections} = D \times (C1 + C2) / 2$$

where

D = distance between the two sections

C1 = area of cut for the first section

C2 = area of cut for the second section

The **Total cut volume** is the sum of the cut volumes between each pair of sections.

Similarly

$$\text{Volume of fill between the two sections} = D \times (F1 + F2) / 2$$

where

D = distance between the two sections

F1 = area of fill for the first section

F2 = area of fill for the second section

The **Total fill volume** is the sum of the fill volumes between each pair of sections.

Two Section Prismoidal Formula

The *two section prismoidal* method, as its name suggests, is a modification of the standard prismoidal method but it uses only two sections rather than the three sections required by the standard prismoidal method.

Using the *Two Section Prismoidal* method the *volume* between two *consecutive* sections is calculated by the formula

$$\text{Volume of cut between the two sections} = D \times (C1 + C2 + \text{Sqrt}(C1 \times C2)) / 3$$

where

D = distance between the two sections

C1 = area of cut for the first section

C2 = area of cut for the second section

The **Total cut volume** is the sum of the cut volumes between each pair of sections.

Similarly

$$\text{Volume of fill between the two sections} = D \times (F1 + F2 + \text{Sqrt}(F1 \times F2)) / 3$$

where

D = distance between the two sections

F1 = area of fill for the first section

F2 = area of fill for the second section

The **Total fill volume** is the sum of the fill volumes between each pair of sections.

For the definition of cut and fill, please go to the section "Definition of Cut and Fill" .

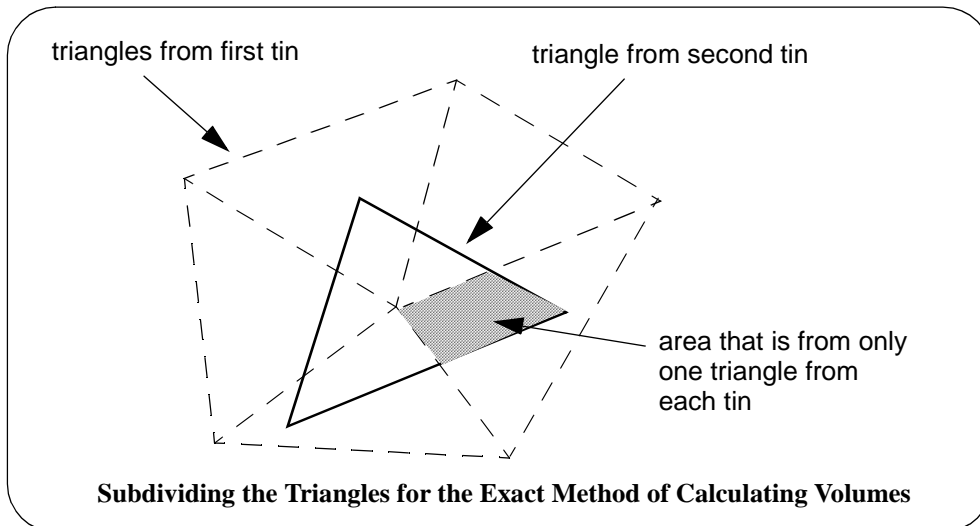
For information on the end area options, please go to the section "End Area" .

For information on the theory for exact volumes, please continue to the section "Theory of Exact Volumes" .

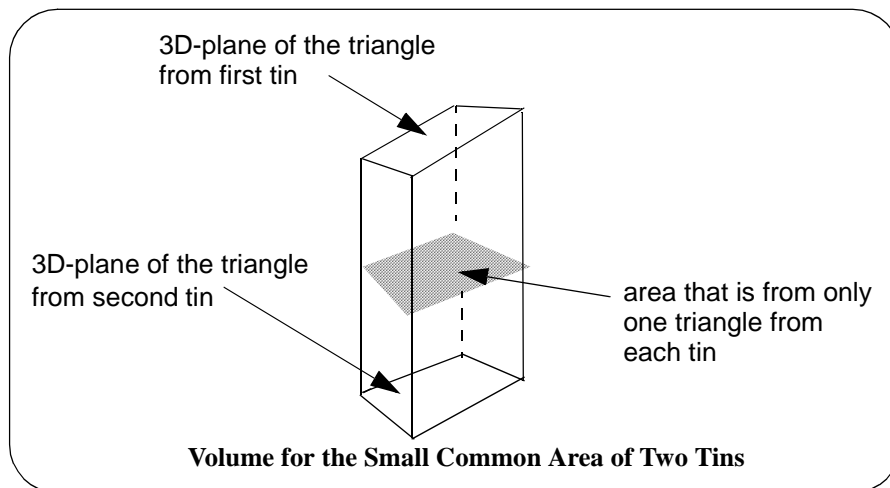
Theory of Exact Volumes

This method calculates the exact volume between two triangulated surfaces (tins), or between one triangulated surface and a plane of constant height.

The volumes are calculated by mathematically subdividing the triangles from both tins into areas that contain only one triangle from each tin.



In three dimensions, these areas represent well defined polygons with the plane of the triangle from one tin as its top and the plane of the triangle from the other tin as its bottom.



For each small area, the cut and fill volume between the two tins can be calculated exactly.

The total *cut* and *fill* volume between the two tin is simply the sum of the cut and fill volumes for each small area.

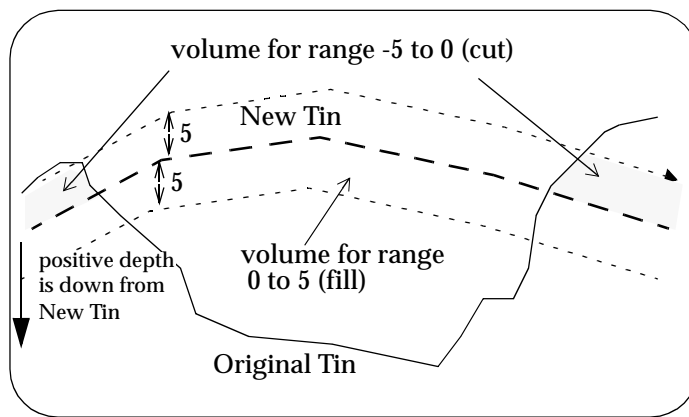
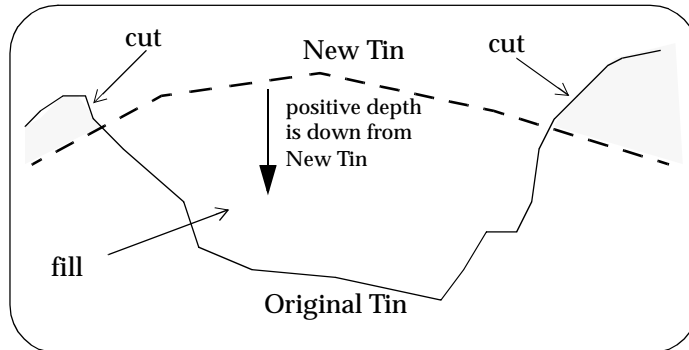
For the definition of cut and fill, please go to the section “Definition of Cut and Fill” .

For information on the exact volume options, please go to the section “Exact” .

The calculated volumes by the exact method can be produced and reported on over *user supplied depth ranges*. Similarly, a view can be coloured on a depth basis using the same **range** file.

IMPORTANT NOTE - the **volume totals** are **only** calculated for the **depths in the range file**. If the depth ranges **does not cover** the entire depth difference between the tins then the totals

which are the sum of the different depth ranges will **not** be the same as the volumes between the two tins.



For information on the theory for end area volumes, please go to the section "Theory of End Area Volumes" .

Volumes Menu

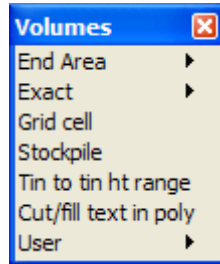
volumes

Position of menu: Design =>Volumes

12d Model provides two distinct methodologies for calculating volumes; end area and exact.

For information and the theory on both these methods go to the section "Volumes"

The Volume walk-right menu is



and each option in this menu will now be discussed.

For the option *End area*, please go to the section "End Area"

<i>Exact</i>	"Exact"
<i>Grid cell</i>	"Grid Cell"
<i>Stockpile</i>	"Stockpile"
<i>Tin to tin ht range</i>	"Tin to Tin by Height Range"
<i>Cut/fill text in poly</i>	"Create Cut/Fill Text Within Polygon"

End Area

end_area_volumes

Position of menu: Design =>Volumes =>End area

These volumes are calculated using the end area method. For more information on the end area volume calculations, go to the section “Theory of End Area Volumes” .

The options tin to height and tin to tin use parallel sections defined at a user supplied angle and separation distance, to calculate the end areas.

The options string tin to height and string tin to tin use sections defined at right angles to a user selected string, for their end area volume calculations. The distance between sections is supplied by the user.

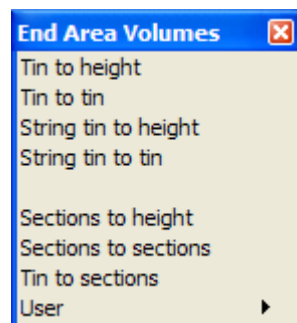
The options sections to height and sections to sections use sections already created to calculate volumes using end areas.

In all the volume options, the sections are restricted to a user defined polygon.

12d Model reports on the cut, fill and balance for each of the sections used in the calculations and also the total cut, fill and balance.

In the report, the sign for cut (negative or positive) is given by the cut volume sign from the **Defaults** panel (fill will have the opposite sign).

The end area walk-right menu is



end area volumes between surface and height
between surfaces
along string between surface and height
along string between surfaces

between a model of sections and height
between two models of sections
between a model of sections and a tin

Each option in this menu will now be described.

For the option *Tin to height*, please go to the section “Tin to Height” .

<i>Tin to tin</i>	“Tin to Tin” .
<i>String tin to height</i>	“String Tin to Height” .
<i>String tin to tin</i>	“String Tin to Tin” .
<i>Section to height</i>	“Sections to Height” .
<i>Section to sections</i>	“Sections to Sections” .
<i>Tin to sections</i>	“Sections to Sections” .

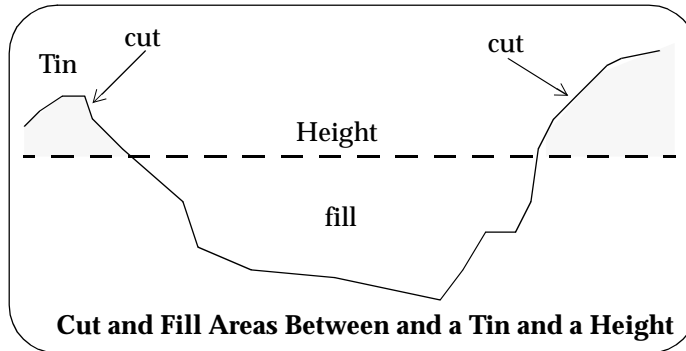
For more information on the end area volume calculations, go to the section “Theory of End Area Volumes” .

Tin to Height

end_area_volume_from_tin_to_a_height

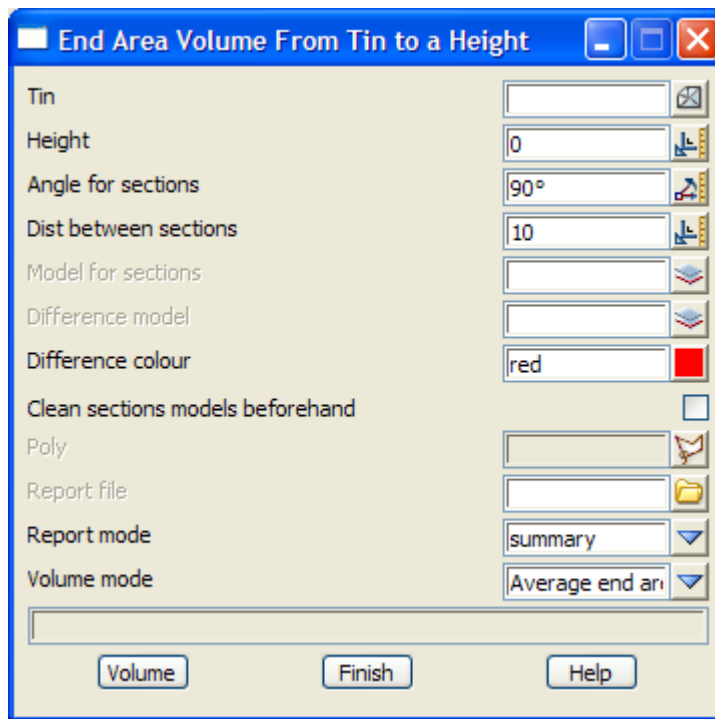
Position of option on menu: Design =>Volumes =>End Area =>Tin to height

The Tin to height option is used to find volumes between an existing surface and a user supplied height. The volumes can only be calculated within a user supplied polygon.



For more information on the end area volume calculations, go to the section “Theory of End Area Volumes” .

On selecting the tin to height option, the **End Area Volume From Tin to a Height** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Tin <i>name of the tin for which the volume between it and a height (z value) will be calculated.</i>	input		available tins
Height <i>the volume is calculated between the tin and the value in this field.</i>	input		
Angle for sections	input	90.0	0,45,90

angle (in degrees) of the lines to section along.

Dist between sections	input	10.0	1,10,100
<i>distance between the lines to section along</i>			
Model for sections	input		available models
<i>if non-blank, the sections though the tin used for the end area calculations are retained and placed in the model given in this field. The sections are given the same colour as the tin. If blank, the sections are not kept.</i>			
Difference model	input		available models
<i>if non-blank, the sections which are the difference between the tin sections and the height are retained and placed in the model given in this field. If blank, the sections are not kept.</i>			
Difference colour	input		available colours
<i>colour for the difference sections strings</i>			
Clean sections models beforehand	tick box		
<i>if tick, the model of sections and difference sections are cleaned out before the option runs.</i>			
Poly	poly string-select		
<i>if selected, the string, rectangle or lasso used as the bounding polygon for the volume calculations.</i>			
Report file	input		*.rpt
<i>name of the file to contain the volume report. If the file already exists, the report will be appended to the file. If no name is given, no report is produced.</i>			
Report mode	input	summary	summary, full
<i>if full, the cut and fill details for every section are included. If summary, just the cut and fill totals are given.</i>			
Volume mode	choice box	Average end area	average end area, prismoidal - 2 sections
<i>the two methods in 12d for calculating volumes using areas of sections. For more information on each method, go to "Average End Area Formula"</i>			
Volume	button		
<i>The volume between the tin and the height (z-value) within the selected bounding polygon is calculated by the end area method. The sections through the polygon will be calculated along straight lines at the angle given by the angle field and at a separation given by the dist field. The sections are made against the tin given in tin field.</i>			

How to Use the Panel and Panel Messages

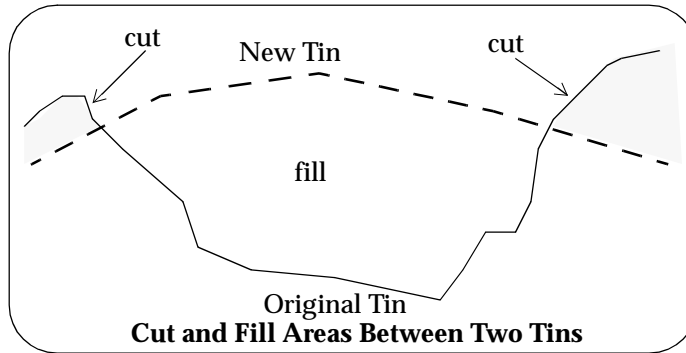
- (a) Select the bounding string by choosing **Poly** and picking the required string.
 - (b) Volume processing begins on selecting the **Volume** button.
 - Progress messages - sent to the panel message area
calculating volumes
 - Completion message - sent to the panel message area
c cut volume f fill volume bal total (balance) volume
- <esc> can be used to terminate the option during volume calculations.

Tin to Tin

end_area_volume_between_tins

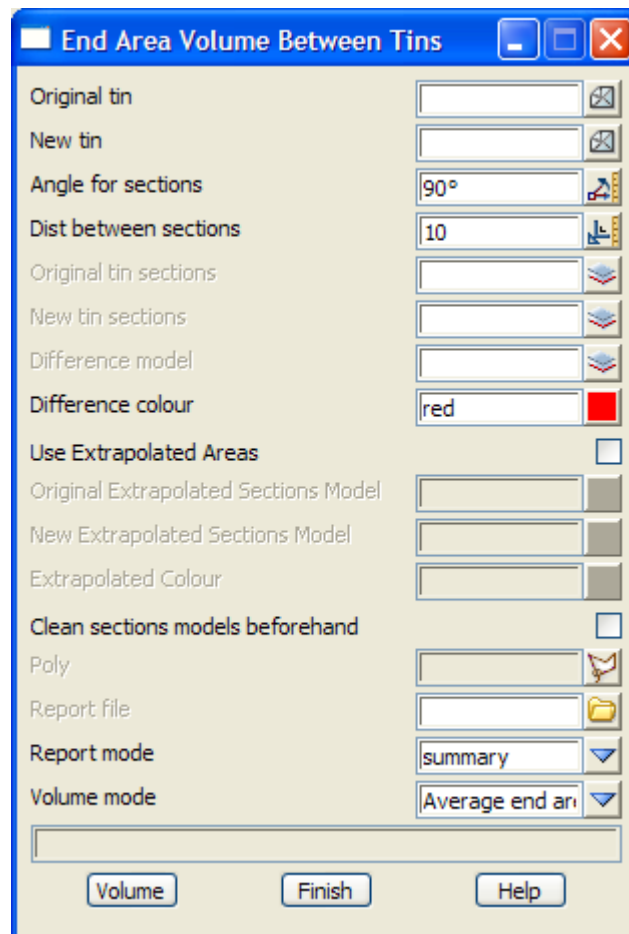
Position of option on menu: Design =>Volumes =>End Area =>Tin to tin

The tin to tin option is used to find volumes between an existing and a new surface. The volumes can only be calculated within a user supplied polygon.



For more information on the end area volume calculations, go to the section "Theory of End Area Volumes".

On selecting the tin to tin option, the end area volume between tins panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Original tin	input		available tins
<i>name of the original tin for determining volumes.</i>			
New tin	input		available tins
<i>name of the new tin for determining volumes.</i>			
Angle for sections	input	90.0	0,45,90
<i>angle (in degrees) of the lines to section along.</i>			
Dist between sections	input	10.0	1,10,100
<i>distance between the lines to section along</i>			
Original tin sections	input		available models
<i>if non-blank, the sections though the original tin used for the end area calculations are retained and placed in the model given in this field. The sections are given the same colour at the original tin. If blank, the sections are not kept.</i>			
New tin sections	input		available models
<i>if non-blank, the sections though the new tin used for the end area calculations are retained and placed in the model given in this field. The sections are given the same colour as the new tin. If blank, the sections are not kept.</i>			
Difference model	input		available models
<i>if non-blank, the sections which are the difference of the original and the new sections are retained and placed in the model given in this field. If blank, the sections are not kept.</i>			
Difference colour	input		available colours
<i>colour for the difference sections strings</i>			
Use extrapolated areas	tick box	not tick	
<i>if not tick, areas (and hence volumes) are only calculated where both sections exist. Hence the sections are limited to where both occur.</i>			
<i>If tick, when the sections are not the same length, the end points of the above and below sections are connected thereby extrapolating the smaller section. This method is not recommended since data does not exist.</i>			
Original extrapolated sections model	model box		available models
<i>if non-blank, the extrapolated sections created from the Original sections are placed in this model. If blank, the extrapolated sections for the original sections are not kept.</i>			
New extrapolated sections model	model box		available models
<i>if non-blank, the extrapolated sections created from the New sections are placed in this model. If blank, the extrapolated sections for the new sections are not kept.</i>			
Extrapolated colour	colour box		available colours
<i>colour for the extrapolated sections</i>			
Clean sections models beforehand	tick box		
<i>if tick, the model of sections and difference sections are cleaned out before the option runs.</i>			
Poly	poly string-select		
<i>if selected, the string, rectangle or lasso used as the bounding polygon for the volume calculations.</i>			
Report file	input		*.rpt

name of the file to contain the volume report. If the file already exists, the report will be appended to the file. If no name is given, no report is produced.

Report mode input summary summary, full

*if **full**, the cut and fill details for every section are included.*

*If **summary**, just the cut and fill totals are given.*

Volume mode choice box Average end area average end area,
prismoidal - 2 sections

the two methods in 12d for calculating volumes using areas of sections. For more information on each method, go to "Average End Area Formula"

Volume button

*The volume between the new and the original tins within the selected polygon string is calculated by the end area method. The sections through the polygon selected by **poly** will be calculated along straight lines at the angle given by the angle field and at a separation given by the dist field. The sections are made against the tins given by the original and the new tin fields.*

How to Use the Panel and Panel Messages

- (a) Select the bounding polygon string by choosing **Poly** and picking the required string.
- (b) Volume processing begins on selecting the **volume** button.

Progress messages - sent to the panel message area
calculating volumes

Completion message - sent to the panel message area
c cut volume f fill volume bal total (balance) volume

<esc> can be used to terminate the option during volume calculations.

String Tin to Height

volume_along_a_string_to_a_height

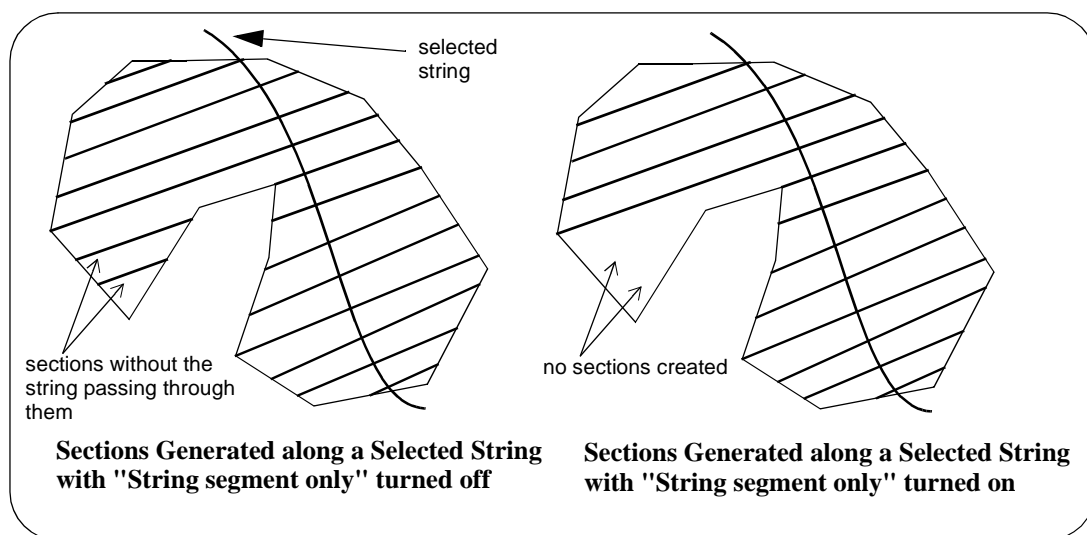
Position of option on menu: Design =>Volumes =>End Area =>String tin to height

The volume options already described calculate the volumes by forming parallel sections through the tin and then using the end area method between adjacent sections.

In many situations, the sections to be used are defined to be at right angles to a user selected string. This method is commonly used in road calculations.

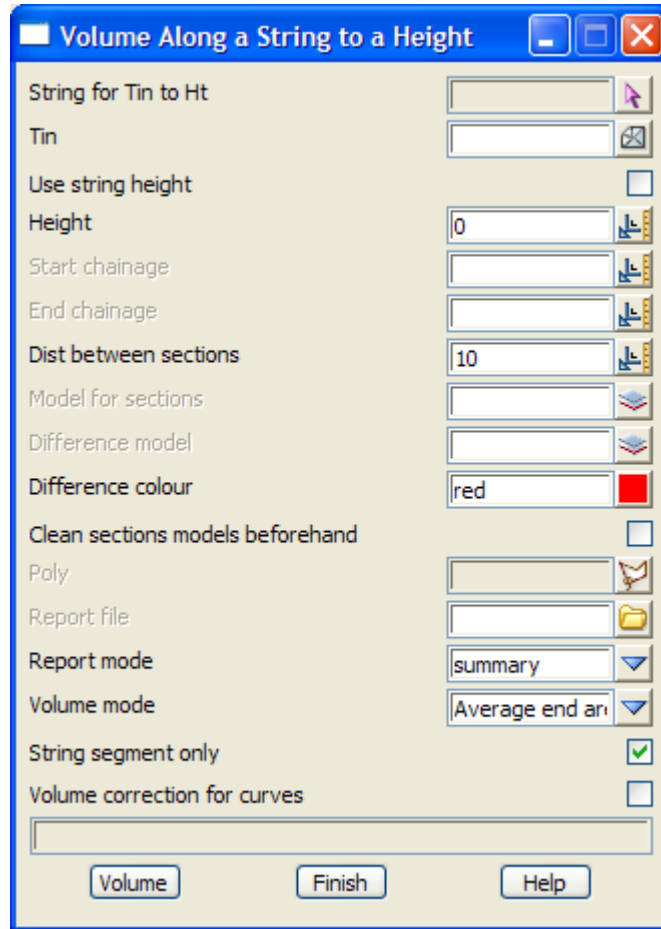
The options string tin to height and string tin to tin both use sections defined at right angles to a user selected string for the end area volume calculations. For both options, the volumes can only be calculated within a user supplied polygon.

It optionally uses the whole section within the polygon or only the part of the section that contains the string.



For more information on the end area volume calculations, go to the section "Theory of End Area Volumes" .

On selecting the string tin to height option, the **volume along a string to a height** panel is displayed.



The fields and buttons in this panel are used as follows.

Field Description	Type	Defaults	Pop-Up
String for Tin to Ht	string select		
<i>a string is selected to be used to define the sections used in the end area calculations. The sections are taken at right angles to this string.</i>			
Tin	input		available tins
<i>name of the tin for which the volume between it and a height (z-value) will be calculated.</i>			
Use string height	tick box		
<i>if tick, the height used for the area calculations is taken at each section from the user selected string. If not tick, the height given in the height panel field is used in the area calculations.</i>			
Height	input	0	
<i>if use string height is set to no tic, the volume is calculated between the tin and the value in this field.</i>			
Start chainage	input		
<i>if non blank, the chainage of the first section to use for volume calculations. If blank, start with the section with the lowest chainage.</i>			
End chainage	input		
<i>if non blank, the chainage of the last section to use for volume calculations. If blank, end with the section with the highest chainage.</i>			
Dist between sections	input	10	1,10,100

distance between the sections taken at right angles down the user selected string.

Model for sections input available models

*if non-blank, the sections though the tin used for the end area calculations are retained and placed in the model given in this field. The sections are given the same colour as the tin.
If blank, the sections are not kept.*

Difference model input available models

*if non-blank, the sections which are the difference between the tin sections and the height are retained and placed in the model given in this field.
If blank, the sections are not kept.*

Difference colour input available colours

colour for the difference sections strings

Clean sections models beforehand tick box

if tick, the model of sections and difference sections are cleaned out before the option runs.

Report file input *.rpt

name of the file to contain the volume report. If the file already exists, the report will be appended to the file. If no name is given, no report is produced.

Report mode input summary summary, full

*if full, the cut and fill details for every section are included.
If summary, just the cut and fill totals are given.*

Volume mode choice box Average end area average end area, prismoidal - 2 sections

the two methods in 12d for calculating volumes using areas of sections. For more information on each method, go to "Average End Area Formula"

String segment only tick-cross tick

*if tick, only the part of the section within the polygon that contains the selected string is used.
If not tick, the whole section within the polygon is used (see "Theory of End Area Volumes").*

Volume correction for curves tick box

if tick, volume corrections are made when going around curves.

Poly poly string-select

if selected, the string, rectangle or lasso used as the bounding polygon for the volume calculations.

Volume button

The volume between the tin and the height (z-value) within the selected polygon is calculated by the end area method. The sections through the tin are calculated at right angles to the selected string at a separation given by the dist field. The section strings are placed in the model given in the model field.

How to Use the Panel and Panel Messages

- Select the bounding polygon string by choosing **Poly** and picking the required string.
- Select a string to define the sections string by choosing **String** button
- Volume processing begins on selecting the **volume** button.

Progress messages - sent to the panel message area

calculating volumes

Completion message - sent to the panel message area

c cut volume f fill volume bal total (balance) volume

<esc> can be used to terminate the option during volume calculations.

String Tin to Tin

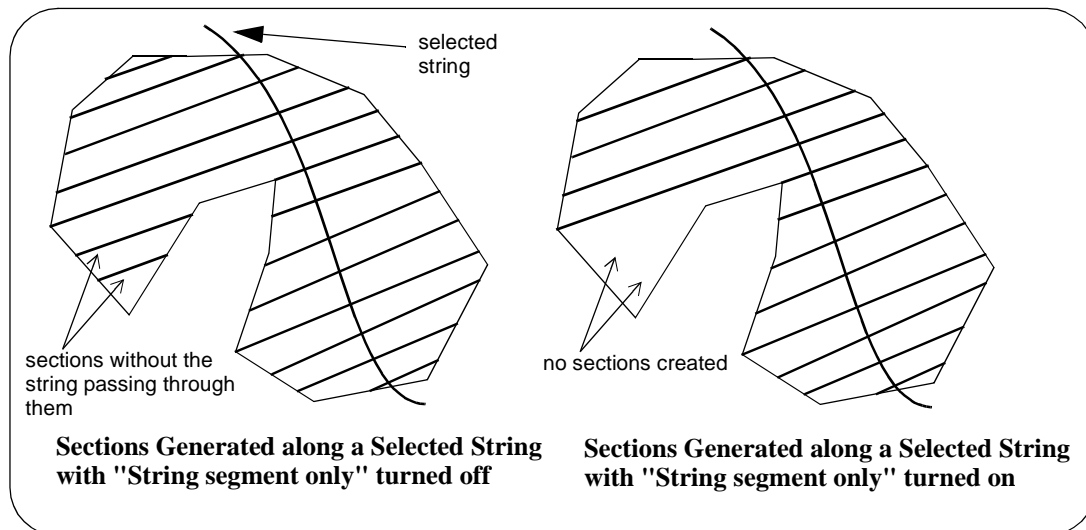
volume_along_a_string_between_tins

Position of option on menu: Design =>Volumes =>End Area =>String tin to tin

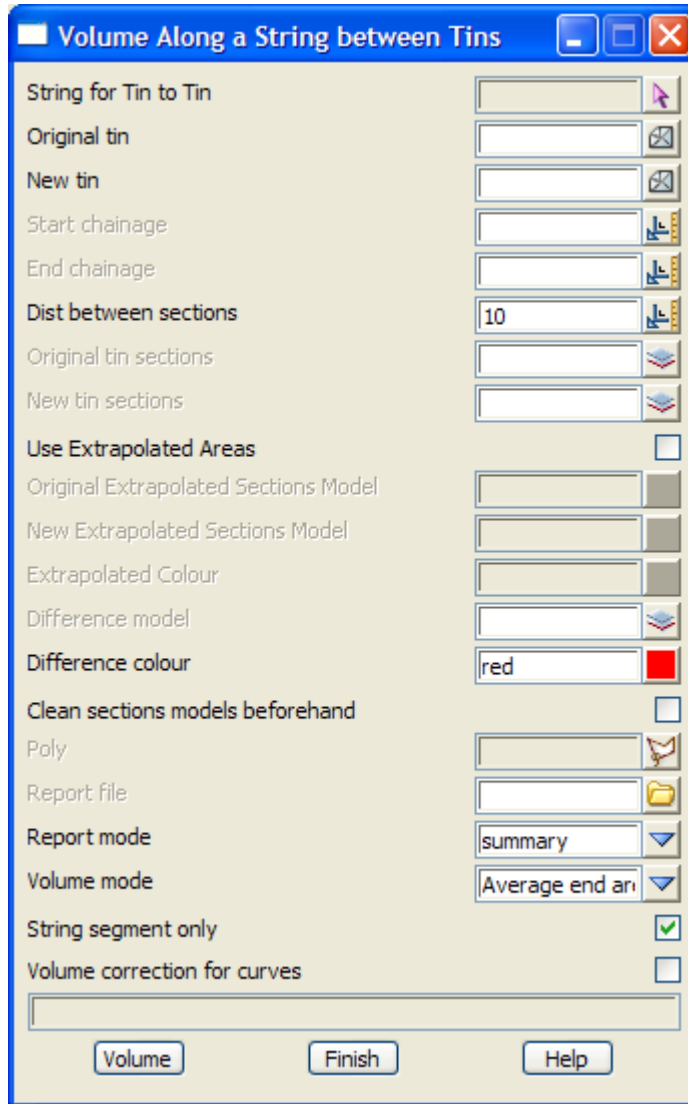
In this option, the sections generated for collating areas and volumes are defined to be at right angles to a *user selected string*. This method is commonly used in road calculations.

It optionally uses the *entire* section within the polygon or only the sections or part of sections that contain the user selected string.

For more information on the end area volume calculations, go to the section "Theory of End Area Volumes" .



On selecting the String Tin to Tin option, the **Volume Along a String Between Tins** panel is displayed.



The fields and buttons in this panel are used as follows.

Field Description	Type	Defaults	Pop-Up
String for tin to tin <i>the string for defining the sections used in the end area calculations. The sections are taken at right angles to this string.</i>	string select		
Original tin <i>name of the original tin for determining volumes.</i>	input		available tins
New tin <i>name of the new tin for determining volumes.</i>	input		available tins
Start chainage <i>if non blank, the chainage of the first section to use for volume calculations. If blank, start with the section with the lowest chainage.</i>	input		
End chainage <i>if non blank, the chainage of the last section to use for volume calculations. If blank, end with the section with the highest chainage.</i>	input		

Dist between sections	input	10.0	1,10,100
<i>distance between the lines to section along</i>			
Original tin sections	input		available models
<i>if non-blank, the sections though the original tin used for the end area calculations are retained and placed in the model given in this field. The sections are given the same colour at the original tin. If blank, the sections are not kept.</i>			
New tin sections	input		available models
<i>if non-blank, the sections though the new tin used for the end area calculations are retained and placed in the model given in this field. The sections are given the same colour as the new tin. If blank, the sections are not kept.</i>			
Use extrapolated areas	tick box	not tick	
<i>if not tick, areas (and hence volumes) are only calculated where both sections exist. Hence the sections are limited to where both occur.</i>			
<i>If tick, when the sections are not the same length, the end points of the above and below sections are connected thereby extrapolating the smaller section. This method is not recommended since data does not exist.</i>			
Original extrapolated sections model	model box		available models
<i>if non-blank, the extrapolated sections created from the Original sections are placed in this model. If blank, the extrapolated sections for the original sections are not kept.</i>			
New extrapolated sections model	model box		available models
<i>if non-blank, the extrapolated sections created from the New sections are placed in this model. If blank, the extrapolated sections for the new sections are not kept.</i>			
Extrapolated colour	colour box		available colours
<i>colour for the extrapolated sections</i>			
Difference model	input		available models
<i>if non-blank, the sections which are the difference of the original and the new sections are retained and placed in the model given in this field. If blank, the sections are not kept.</i>			
Difference colour	input		available colours
<i>colour for the difference sections strings</i>			
Clean sections models beforehand	tick box		
<i>if tick, the model of sections and difference sections are cleaned out before the option runs.</i>			
Report file	input		*.rpt
<i>name of the file to contain the volume report. If the file already exists, the report will be appended to the file. If no name is given, no report is produced.</i>			
Report mode	input	summary	summary, full
<i>if full, the cut and fill details for every section are included. If summary, just the cut and fill totals are given.</i>			
Volume mode	choice box	Average end area	average end area, prismoidal - 2 sections
<i>the two methods in 12d for calculating volumes using areas of sections. For more information on each method, go to "Average End Area Formula"</i>			
String segment only	tick-cross	tick	

if **tick**, only the part of the section within the polygon that contains the selected string is used.
If **not tick**, the whole section within the polygon is used (see "Theory of End Area Volumes").

Volume correction for curves tick box

if tick, volume corrections are made when going around curves.

Poly poly string-select

if selected, the string, rectangle or lasso used as the bounding polygon for the volume calculations.

Volume button

The volume between the original and new tins within the selected bounding polygon is calculated by the end area method. The sections through the tins are calculated at right angles to the selected string at a separation given by the dist field.

How to Use the Panel and Panel Messages

- (a) Select the bounding polygon string by choosing **Poly** and pick the required string.
- (b) Select the string to define the sections string by choosing **String for tin to tin**
- (c) Volume processing begins on selecting the **Volume** button.

Progress messages - sent to the panel message area

calculating volumes

Completion message - sent to the panel message area

c cut volume f fill volume bal total (balance) volume

<esc> can be used to terminate the option during volume calculations.

Sections to Height

end_area_volume_from_sections_to_a_height

Position of option on menu: Design =>Volumes =>End Area =>Sections to height

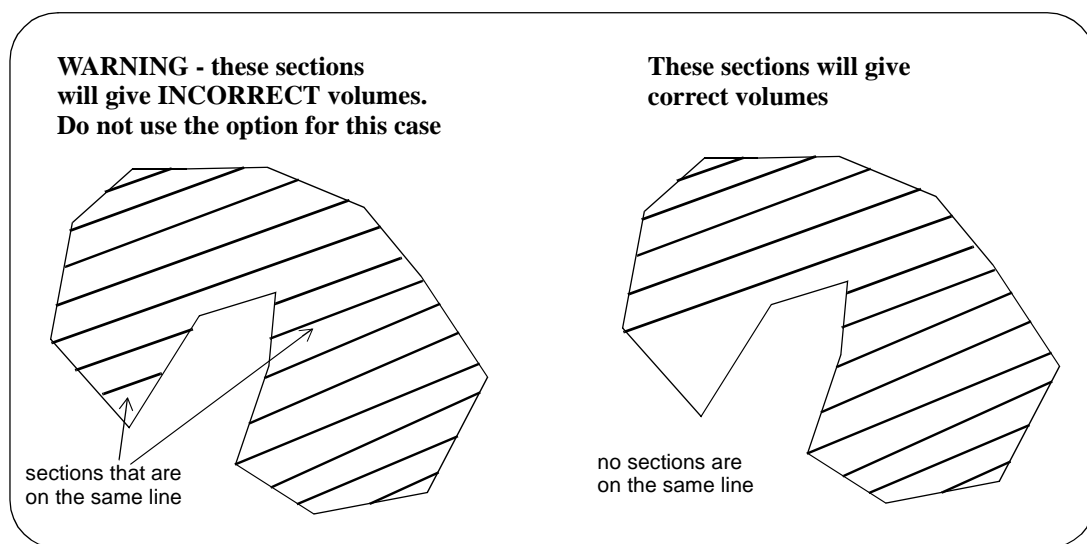
The Sections to height option is used to find volumes between sections that already exist (in a given model) and a user supplied height. The volumes can be restricted to be within a user supplied polygon.

Normally the **Sections to Height** method is not used since if the tin exists, the option

Design =>Volumes =>End Area =>Tin to height

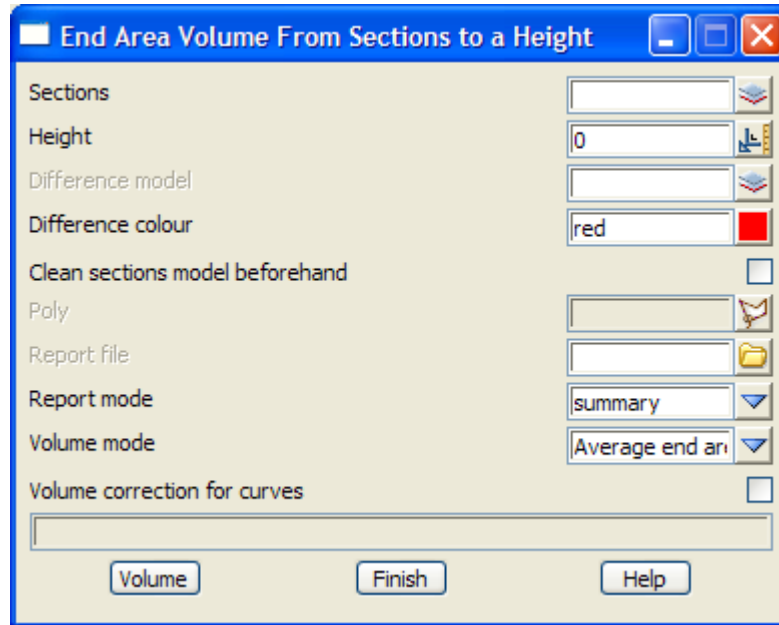
automatically generates sections through the tin at the required interval.

WARNING: The **Sections to Height** method can **not** be used when there are cases of two sections being on the same line.



For more information on the end area volume calculations, go to the section “Theory of End Area Volumes” .

On selecting the Sections to height option, the **End Area Volume from Tin to a Height** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Sections <i>name of the model containing the sections for which the volume between them and a height (z value) will be calculated.</i>	input		available models
Height <i>the volume is calculated between the sections and the value in this field.</i>	input		
Difference model <i>if non-blank, the sections which are the difference between the given sections and the height are retained and placed in the model given in this field. If blank, the sections are not kept.</i>	input		available models
Difference colour <i>colour for the difference sections strings</i>	input		available colours
Clean sections models beforehand <i>if tick, the model of sections and difference sections are cleaned out before the option runs.</i>	tick box		
Poly <i>if selected, the string, rectangle or lasso used as the bounding polygon for the volume calculations.</i>	poly string-select		
Report file <i>name of the file to contain the volume report. If the file already exists, the report will be appended to the file. If no name is given, no report is produced.</i>	input		*.rpt
Report mode <i>if full, the cut and fill details for every section are included. In summary, just the totals are given.</i>	input	summary	summary, full
Volume mode <i>the two methods in 12d for calculating volumes using areas of sections. For more information on each</i>	choice box	Average end area	average end area, prismoidal - 2 sections

method, go to “Average End Area Formula”

Volume correction for curves tick box

if tick, volume corrections are made when going around curves.

Volume button

the volume between the model of sections and the height (z-value) within the selected bounding polygon is calculated by the end area method.

<esc> can be used to terminate the option during volume calculations.

Sections to Sections

end_area_volume_between_sections

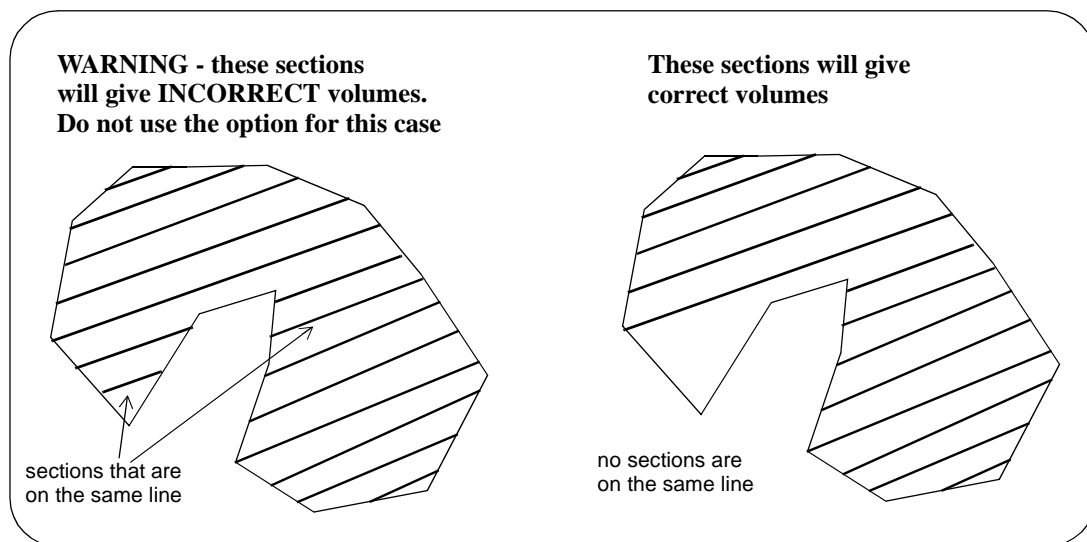
Position of option on menu: Design =>Volumes =>End Area =>Sections to sections

The Sections to sections option is used to find volumes between two models of sections. The volumes can be restricted to be within a user supplied polygon. Note that there needs to be matching sections in the two models of section.

Normally the **Section to Sections** method is not used since if the tin exists, the option

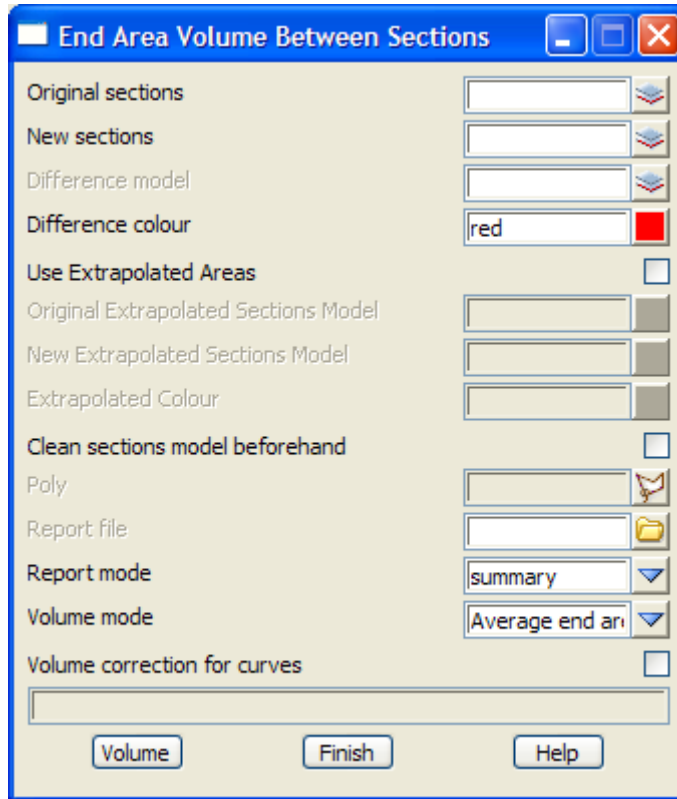
Design =>Volumes =>End Area =>Tin to tin automatically generates sections through the two tins at the required interval.

WARNING: The Section to Sections method can *not* be used when there are cases of two sections being on the same line.



For more information on the end area volume calculations, go to the section “Theory of End Area Volumes” .

On selecting the sections to sections option, the **end area volume between sections** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Original sections <i>name of the original model of sections for determining volumes.</i>	input		available models
New sections <i>name of the new model of sections for determining volumes.</i>	input		available models
Difference model <i>if non-blank, the sections which are the difference of the original and the new sections are retained and placed in the model given in this field. If blank, the sections are not kept.</i>	input		available models
Difference colour <i>colour for the difference sections strings</i>	input		available colours
Use extrapolated areas <i>if not tick, areas (and hence volumes) are only calculated where both sections exist. Hence the sections are limited to where both occur. If tick, when the sections are not the same length, the end points of the above and below sections are connected thereby extrapolating the smaller section. This method is not recommended since data does not exist.</i>	tick box	not tick	
Original extrapolated sections model <i>if non-blank, the extrapolated sections created from the Original sections are placed in this model. If blank, the extrapolated sections for the original sections are not kept.</i>	model box		available models
New extrapolated sections model <i>if non-blank, the extrapolated sections created from the New sections are placed in this model.</i>	model box		available models

Tin to Sections

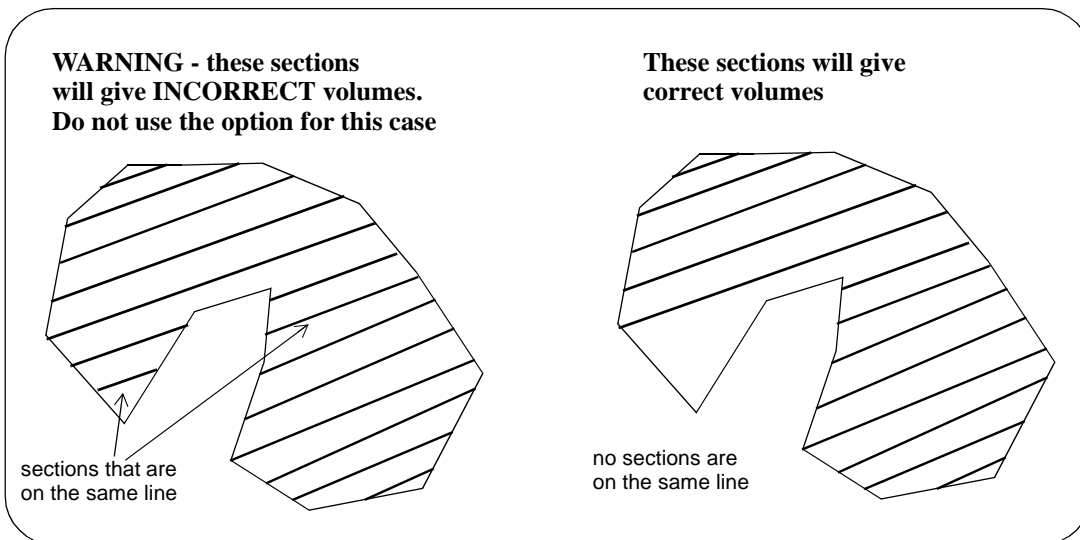
end_area_volume_from_tin_to_sections

Position of option on menu: Design =>Volumes =>End Area =>Tin to sections

The Tin to sections option is used to find volumes between a tin and a model of sections. The volumes can be restricted to be within a user supplied polygon.

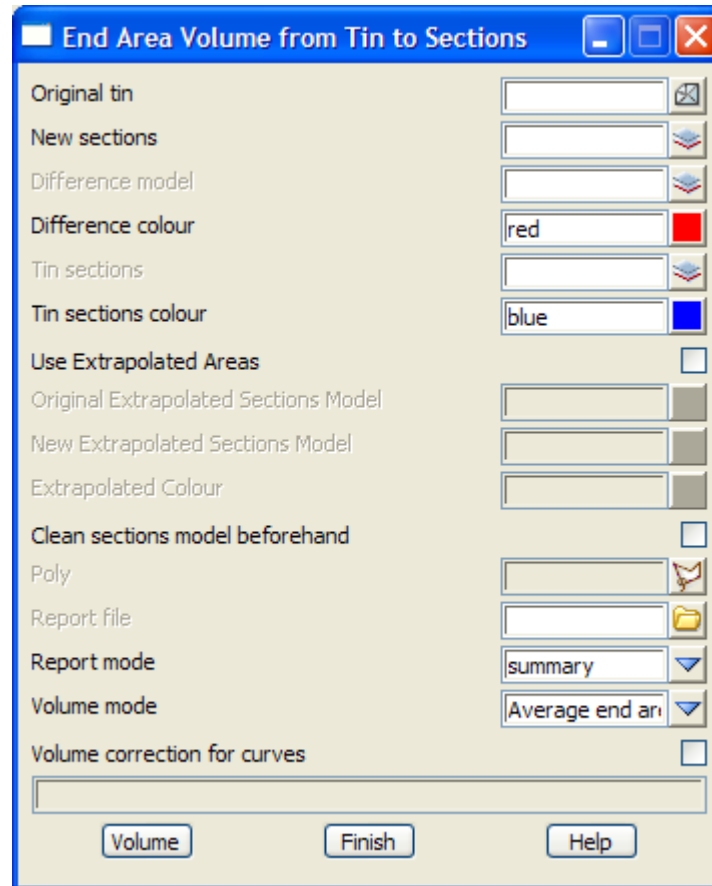
Normally the **Tin to Sections** method is not used since if the tin for the sections exists, the option Design =>Volumes =>End Area =>Tin to tin automatically generates sections through the two tins at the required interval.

WARNING: The Tin to Sections method can *not* be used when there are cases of two sections being on the same line.



For more information on the end area volume calculations, go to the section “Theory of End Area Volumes” .

Selecting Tin to sections brings up the **End Area Volume from Tin to Sections** panel.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Original Tin <i>name of the original tin to use for determining volumes.</i>	tin box		available tins
New sections <i>name of the new model of sections for determining volumes.</i>	model box		available models
Difference model <i>if non-blank, the sections which are the difference of the original and the new sections are retained and placed in the model given in this field. If blank, the sections are not kept.</i>	model box		available models
Difference colour <i>colour for the difference sections strings</i>	colour box		available colours
Tin sections <i>if non-blank, the sections cut through the Original tin are placed in this model. If blank, the sections through the Original tin are not kept.</i>	model box		available models
Tin sections colour <i>colour for the sections cut through the Original tin</i>	colour box		available colours
Use extrapolated areas <i>if not tick, areas (and hence volumes) are only calculated where both sections exist. Hence the sections are limited to where both occur.</i> <i>If tick, when the sections are not the same length, the end points of the above and below sections are</i>	tick box	not tick	

connected thereby extrapolating the smaller section. This method is not recommended since data does not exist.

Original extrapolated sections model model box available models

if non-blank, the extrapolated sections created from the Original sections are placed in this model. If blank, the extrapolated sections for the original sections are not kept.

New extrapolated sections model model box available models

if non-blank, the extrapolated sections created from the New sections are placed in this model. If blank, the extrapolated sections for the new sections are not kept.

Extrapolated colour colour box available colours

colour for the extrapolated sections

Clean sections models beforehand tick box

if tick, the model of sections and difference sections are cleaned out before the option runs.

Poly poly string-select

if selected, the string, rectangle or lasso used as the bounding polygon for the volume calculations.

Report file input

name of the file to contain the volume report. If the file already exists, the report will be appended to the file. If no file name is given, the report is not produced.

Report mode input summary summary, full

if full, the cut and fill details for every section are included. If summary, just the cut and fill totals are given.

Volume mode choice box Average end area average end area,
prismoidal - 2 sections

the two methods in 12d for calculating volumes using areas of sections. For more information on each method, go to "Average End Area Formula"

Volume correction for curves tick box

if tick, volume corrections are made when going around curves.

Volume button

The volume between the original model of sections and the new model of sections within the selected bounding polygon is calculated by the end area method.

<esc> can be used to terminate the option during volume calculations.

Exact

exact_volumes

Position of menu: Design =>Volumes =>Exact

These volumes are calculated by dividing the tins up into small prisms whose volumes can be calculated exactly. For more information on the exact volume calculations, go to the section "Theory of Exact Volumes"

In the exact volume options, the volumes calculations can be restricted to a user defined polygon or if no polygon is provided, the volumes will only be calculated for the regions where both the triangulations exist.

With the exact method, volumes can easily be calculated for depth bands from

(a) the given height to the tin for "tin to height" volumes

or

(b) the new tin to the original tin for "tin to tin" volumes.

Hence for the calculations, a range file can be supplied giving depth pairs and 12d Model will report the cut, fill and balance for each of the depth pairs and also the total of the cut, fill and balance for all the pairs.

In the report, the sign for cut (negative or positive) is given by the cut volume sign from the **default settings** panel (fill will have the opposite sign).

The range file consists of a list of depth ranges and colours, one set per line, in the format

```
lower_depth upper_depth depth_colour
```

This line represents all depths satisfying

```
lower_depth <= depth < upper_depth.
```

For **each range** in the file, the total cut and fill volumes for the depth range will be reported on, and the depth_colour can be used to colour all areas on a plan view satisfying the range.

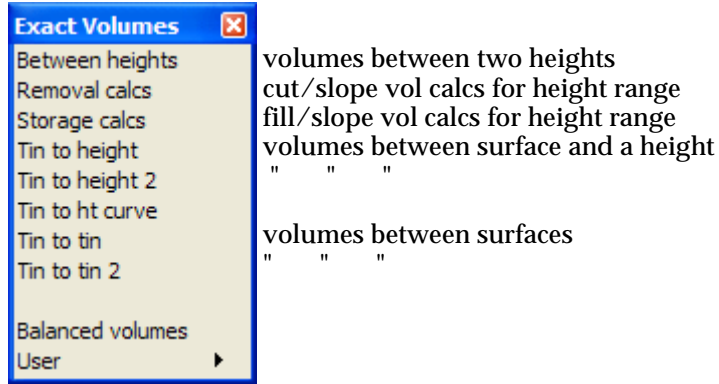
IMPORTANT NOTE - when a depth file is used, the volume totals are only calculated for the depths in the range file. If the depth ranges **does not cover** the entire depth difference between the tins then the totals which are the sum of the different depth ranges will **not** be the same as the volumes between the two tins or the volumes from a tin to a height.

Example of a Depth Range File

```
// depth range file
// format: lower_depth upper_depth colour_for_depth_range
// depth is measured positive down and negative up.

-20 -10 red // colour red where the depth is greater or equal to -20 and less than -10
-10 0 magenta // colour magenta where the depth is greater or equal to -10 and less than 0
0 10 green // colour green where the depth is greater or equal to 0 and less than 10
10 20 "dark green" // colour dark green where depth is >=10 and less than 20
```

The exact walk-right menu is



The options in this menu will now be described.

For the option *Between heights*, please go to the section “Between Heights”

<i>Removal calcs</i>	“Removal Calcs”
<i>Storage calcs</i>	“Storage Calcs”
<i>Tin to height</i>	“Tin to Height”
<i>Tin to height 2</i>	“Tin to Height 2”
<i>Tin to height curve</i>	“Tin to Height Curve”
<i>Tin to tin</i>	“Tin to Tin”
<i>Tin to tin 2</i>	“Tin to Tin 2”
<i>Balanced volumes</i>	“Balanced Volumes”

For more information on the exact volume calculations, go to the section “Theory of Exact Volumes”

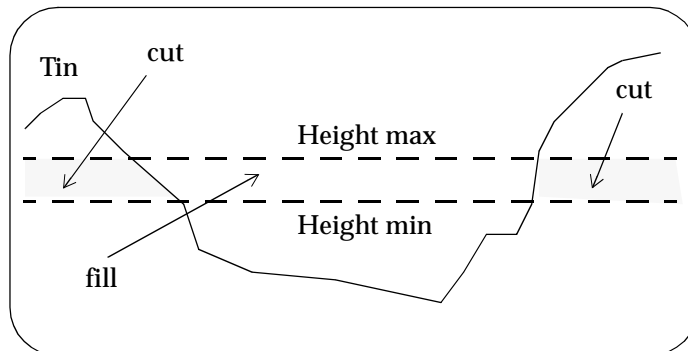
Between Heights

exact_volume_between_heights

Position of option on menu: Design =>Volumes =>Exact =>Between heights

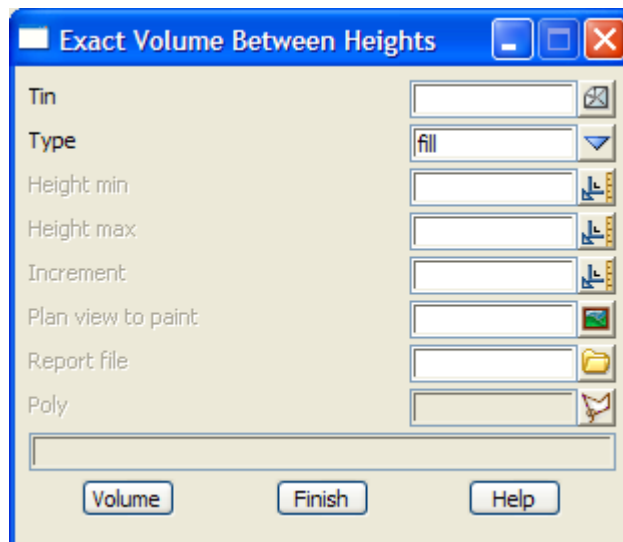
This panel is used to calculate the volume between two heights on a given tin.

The calculations can be restricted to within a polygon, or if no polygon is selected, the entire tin is used.



For more information on the exact volume calculations, go to the section “Theory of Exact Volumes”

On selecting the between heights option, the **exact volume between heights** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Tin <i>name of the tin for which the volume between two heights will be calculated.</i>	input		available tins
Type <i>if fill, the fill volume between the two heights is calculated. If cut, the cut volume between the two heights is calculated.</i>	input	fill	cut, fill
Height min/max <i>volume is calculated between the height min and the height max values.</i>	input		
Increment	input		

the volumes between the height min and height max are reported on and is broken up into intervals given by the increment value.

Plan view to paint input available views

*if non-blank, the region used for calculations will be painted in the given plan view. The colour will be green if type is **fill**, or red if type is **cut**.*

Report file input *.rpt

name of the file to contain the volume report. If the file already exists, the report will be appended to the file. If no name is given, no report is produced.

Poly poly string-select

if selected, this string is used as the bounding polygon for the volume calculations.

Volume button

The volume between the height min and height max for the tin within the selected bounding polygon is calculated by the exact method.

<esc> can be used to terminate the option during volume calculations.

Removal Calcs

removal_calculations

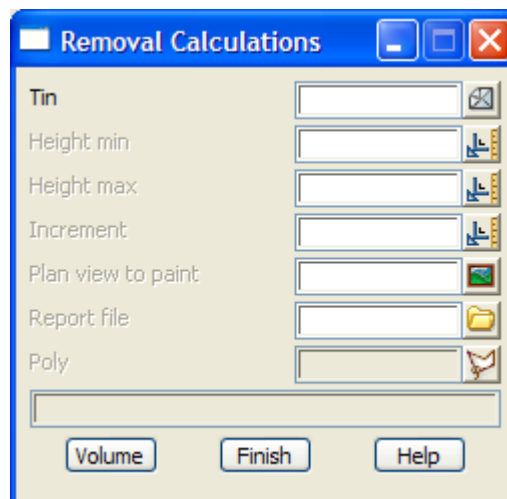
Position of option on menu: Design =>Volumes =>Exact =>Removal calcs

For a user specified range of heights, this option will calculate the cut volume from each height to a given tin, plus the plan and slope areas for the region of the tin exposed by cutting to the height.

The calculations can be restricted to within a polygon, or if no polygon is selected, the entire tin is used.

For more information on the exact volume calculations, go to the section “Theory of Exact Volumes”

On selecting the removal calcs option, the **removal calculations** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Tin <i>name of the tin used in the volume calculations.</i>	input		available tins
Height min/max <i>if non-blank, the minimum/maximum value of the height range to calculate volumes to. if blank, the tin's minimum/maximum z-value is used.</i>	input		
Increment <i>increment between the heights to calculate the volumes to.</i>	input		
Plan view to paint <i>if non-blank, the region used for calculations will be painted red in the given plan view.</i>	input		available views
Report file <i>name of the file to contain the volume report. If the file already exists, the report will be appended to the file. if no name is given, no report is produced.</i>	input		*.rpt
Poly <i>if selected, this string is used as the bounding polygon for the volume calculations.</i>	poly string-select		
Volume <i>calculate the cut volumes from the tin to the height for the required heights in the height min and height</i>	button		

max *range*.

<esc> can be used to terminate the option during volume calculations.

Storage Calcs

storage_calculations

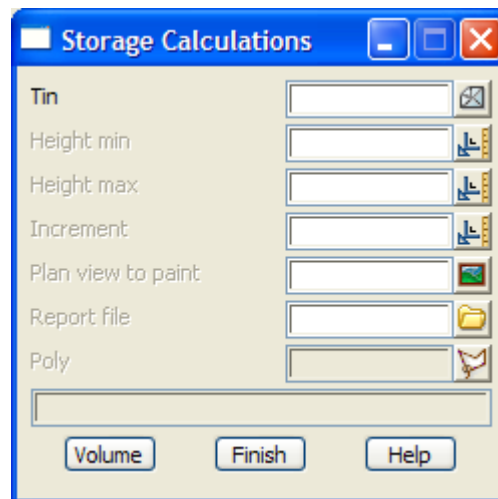
Position of option on menu: Design =>Volumes =>Exact =>Storage calcs

For a user specified range of heights, this option will calculate the fill volume from each height to a given tin, plus the plan and slope areas for the region of the tin covered by filling to the height.

The calculations can be restricted to within a polygon, or if no polygon is selected, the entire tin is used.

For more information on the exact volume calculations, go to the section “Theory of Exact Volumes”

On selecting the storage calcs option, the **storage calculations** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Tin <i>name of the tin used in the volume calculations.</i>	tin box		available tins
Height min/max <i>if non-blank, the minimum/maximum value of the height range to calculate volumes to. if blank, the tin's minimum/maximum z-value is used.</i>	input		
Increment <i>increment between the heights to calculate the volumes to.</i>	input	1	
Plan view to paint <i>if non-blank, the region used for calculations will be painted green in the given plan view.</i>	view box		available views
Report file <i>name of the file to contain the volume report. If the file already exists, the report will be appended to the file. If no name is given, no report is produced.</i>	file box		*.rpt
Poly <i>if selected, this string is used as the bounding polygon for the volume calculations.</i>	poly string-select		
Volume <i>calculate the fill volumes from the tin to the height for the required heights in the height min and height max range.</i>	button		

<esc> can be used to terminate the option during volume calculations.

Tin to Height

`exact_volume_from_tin_to_a_height`

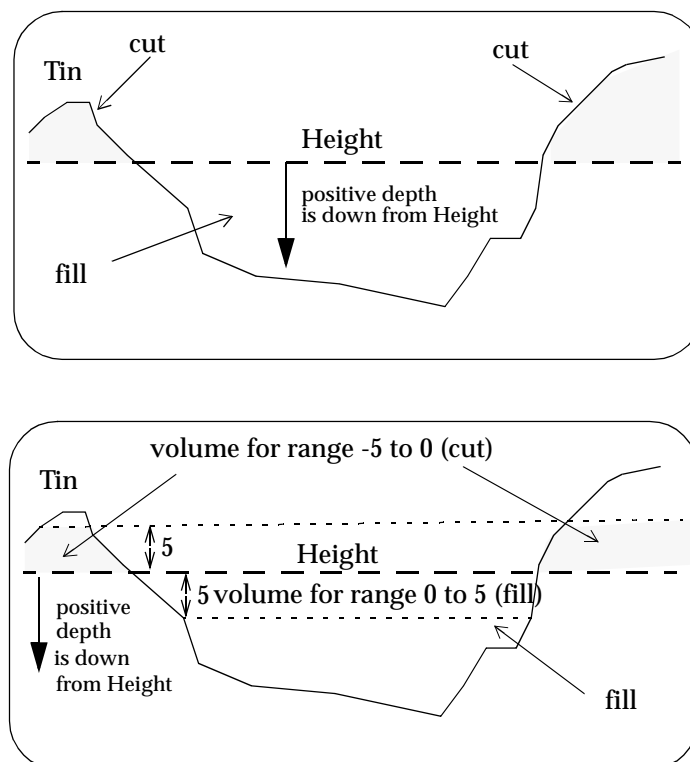
Position of option on menu: Design =>Volumes =>Exact =>Tin to height

This panel is used to calculate the volume between a tin and a given height.

The calculations can be restricted to within a polygon, or if no polygon is selected, the entire tin is used.

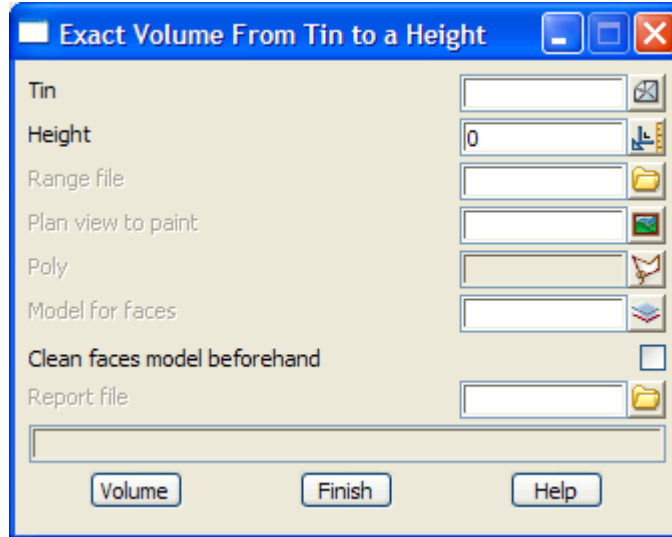
The calculated volumes can be produced and reported over user supplied depth ranges. Similarly, a view can be coloured on a depth basis using the same **range** file.

IMPORTANT NOTE - the **volume totals** are **only** calculated for the **depths in the range file**. If the depth ranges **does not cover** the entire depth difference between the tin and the height then the totals which are the sum of the different depth ranges will **not** be the same as the volume between the tin and the height.



For more information on the exact volume calculations, go to the section “Theory of Exact Volumes”

On selecting the tin to height option, the **Exact Volume From Tin to a Height** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Tin <i>name of the tin for which the volume between it and a height (z value) will be calculated.</i>	input		available tins
Height <i>the volume is calculated between the tin and the value in this field.</i>	input		
Range file <i>if non-blank, the user supplied depth range file is used to split up the volumes report and define the depth colours used for painting a view.</i>	input		*.drf
Plan view to paint <i>if non-blank, the given plan view will be painted according to the depth colours given in the range file.</i>	input		available views
Poly <i>if selected, this string is used as the bounding polygon for the volume calculations.</i>	poly string-select		
Model for faces <i>if non-blank, faces will be created with colours according to the range colours given in the range file.</i>	input		available models
Clean faces models beforehand <i>if tick, the model of faces is cleaned out before the option runs.</i>	tick box		
Report file <i>name of the file to contain the volume report. If the file already exists, the report will be appended to the file. If no name is given, no report is produced.</i>	input		*.rpt
Volume <i>The volume between the tin and the height (z-value) for the given range file within the selected bounding polygon is calculated by the exact method. If a range file does not exist, the volumes between the tin and the height is calculated.</i>	button		

<esc> can be used to terminate the option during volume calculations.

Tin to Height 2

[exact_volumes_to_height_2](#)

Position of option on menu: Design =>Volumes =>Exact =>Tin to height 2

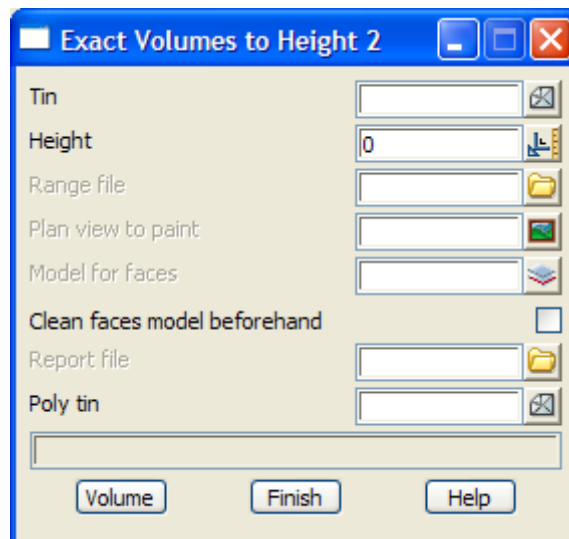
This panel is used to calculate the volume between a tin and a given height but the calculations are restricted to only the regions defined by another tin rather than to a polygon.

The calculated volumes can be produced and reported over user supplied depth ranges. Similarly, a view can be coloured on a depth basis using the same **range** file.

IMPORTANT NOTE - the **volume totals** are **only** calculated for the **depths in the range file**. If the depth ranges **does not cover** the entire depth difference between the tin and the height then the totals which are the sum of the different depth ranges will **not** be the same as the volume between the tin and the height.

For more information on the exact volume calculations, go to the section “Theory of Exact Volumes”

On selecting the tin to height 2 option, the **Exact Volume Height 2** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Tin <i>name of the tin for which the volume between it and a height (z value) will be calculated.</i>	tin box		available tins
Height <i>the volume is calculated between the tin and the value in this field.</i>	input		
Range file <i>if non-blank, the user supplied depth range file is used to split up the volumes report and define the depth colours used for painting a view.</i>	input		*.drf
Plan view to paint <i>if non-blank, the given plan view will be painted according to the depth colours given in the range file.</i>	view box		available views
Model for faces <i>if non-blank, faces will be created with colours according to the range colours given in the range file.</i>	model box		available models

Clean faces models beforehand tick box

if tick, the model of faces is cleaned out before the option runs.

Report file file box *.rpt

name of the file to contain the volume report. If the file already exists, the report will be appended to the file. If no name is given, no report is produced.

Poly tin tin box available tins

name of the tin to define the regions that the volume calculations are restricted to.

Volume button

The volume between the tin and the height (z-value) for the given range file within the selected bounding polygon is calculated by the exact method. If a range file does not exist, the volumes between the tin and the height is calculated.

<esc> can be used to terminate the option during volume calculations.

Tin to Height Curve

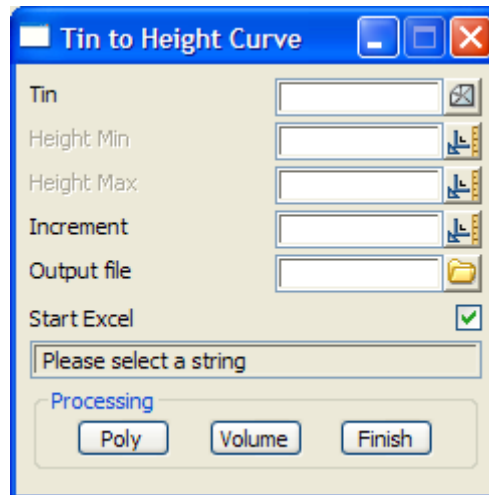
volume_tin_to_ht_curve_panel

Position of option on menu: Design =>Volumes =>Exact =>Tin to ht curve

This panel is used to calculate the volume between a tin between heights and writes out a report on the volumes.

For more information on the exact volume calculations, go to the section “Theory of Exact Volumes”

On selecting the Tin to ht curve option, the **Tin to Height Curve** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Tin <i>name of the tin for which the volume between it and a height (z value) will be calculated.</i>	tin box		available tins
Height min <i>the start height for calculation volumes.</i>	input		
Height max <i>the end height for calculation volumes.</i>	input		
increment <i>the height increment.</i>	input		
Output file <i>the file for the volumes report.</i>	file box		
Start Excel <i>if tick, start Excel up with the report loaded into it.</i>	tick box	tick	
Poly <i>select the polygon which is used in plan only to restrict the area for calculating volumes over.</i>	select		
Volume <i>calculate the volume between heights differing by the given increment, and write out a report.</i>	button		

Tin to Tin

exact_volume_between_tins

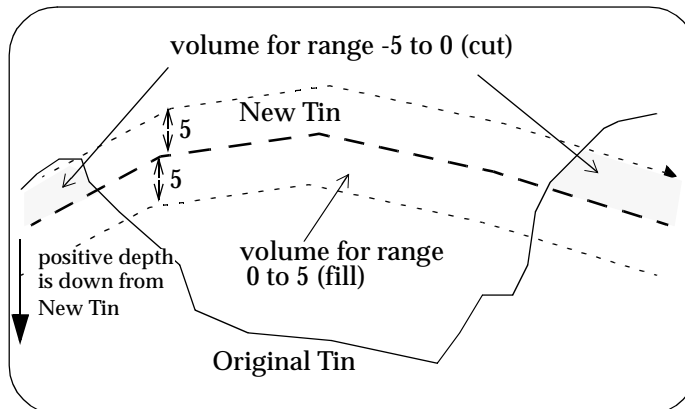
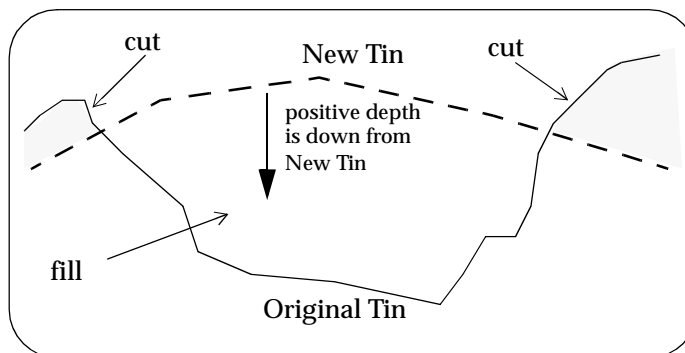
Position of option on menu: Design =>Volumes =>Exact =>Tin to tin

This panel is used to calculate the volume between two tins using the exact method.

The calculations can be restricted to within a polygon, or if no polygon is selected, the overlapping sections of the two tins is used.

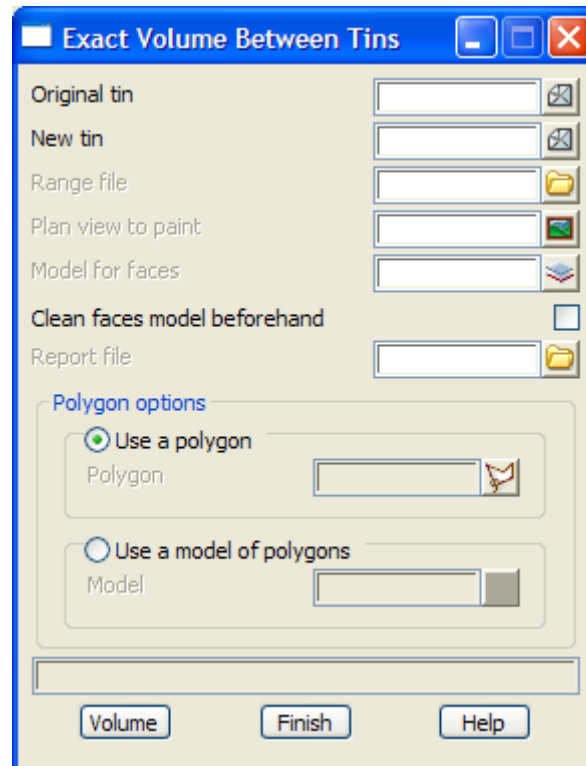
The calculated volumes can be produced and reported on over user supplied depth ranges. Similarly, a view can be coloured on a depth basis using the same **range** file.

IMPORTANT NOTE - the **volume totals** are **only** calculated for the **depths in the range file**. If the depth ranges **does not cover** the entire depth difference between the tins then the totals which are the sum of the different depth ranges will **not** be the same as the volumes between the two tins.



For more information on the exact volume calculations, go to the section “Theory of Exact Volumes”

On selecting the tin to tin option, the **Exact Volume Between Tins** panel is displayed.



Cut is defined to be where ever the new tin is **below** the original tin. Fill is defined to be where ever the new tin is **above** the original tin.

The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Original/New Tin <i>name of the original/new tin for determining volumes.</i>	tin box		available tins
Range file <i>if non-blank, the user supplied range file is used to split up the volumes report and define the depth colours used for painting a view.</i>	input		*.drf
Plan view to paint <i>if non-blank, the given plan view will be painted according to the depth colours given in the range file.</i>	input		available views
Model for faces <i>if non-blank, faces will be created with colours according to the range colours given in the range file.</i>	input		available models
Clean faces model beforehand <i>if tick, the model of faces is cleaned out before the option runs.</i>	tick box		
Report file <i>name of the file to contain the volume report. If the file already exists, the report will be appended to the file. If no name is given, no report is produced.</i>	input		*.rpt

Polygon options

Use a polygon	radio button
Polygon	poly string select
<i>if Use a polygon is selected, then the selected string is used as the bounding polygon for the volume</i>	

calculations.

Use a model of polygons radio button

Model model box available models

if Use a model of polygons is selected, then this model is used and each string in the model is used as a bounding polygon and the volume calculated.

Volume button

The volume between the two tins for the given range file within the selected bounding polygon is calculated by the exact method. If a range file does not exist, the volumes between the two tins is calculated.

<esc> can be used to terminate the option during volume calculations.

Tin to Tin 2

[exact_volume_between_tins_2](#)

Position of option on menu: Design =>Volumes =>Exact =>Tin to tin 2

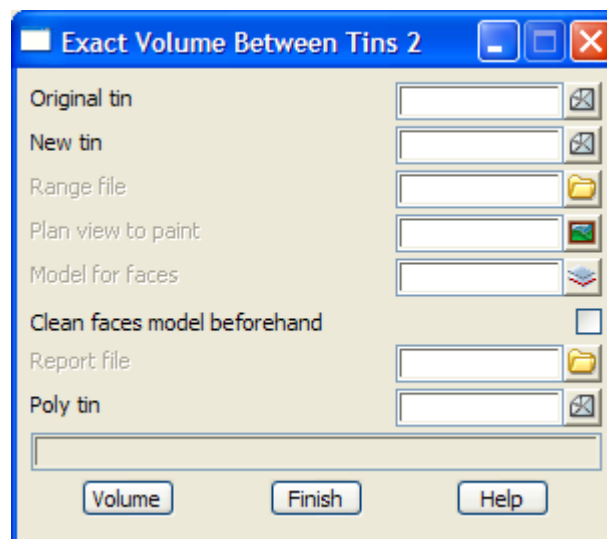
This panel is used to calculate the volume between two tins using the exact method but the calculations are restricted to only the regions defined by another tin rather than to a polygon.

The calculated volumes can be produced and reported on over user supplied depth ranges. Similarly, a view can be coloured on a depth basis using the same **range** file.

IMPORTANT NOTE - the **volume totals** are **only** calculated for the **depths in the range file**. If the depth ranges **does not cover** the entire depth difference between the tins then the totals which are the sum of the different depth ranges will **not** be the same as the volumes between the two tins.

For more information on the exact volume calculations, go to the section “Theory of Exact Volumes”

On selecting the tin to tin option, the **Exact Volume Between Tins 2** panel is displayed.



Cut is defined to be where ever the new tin is **below** the original tin. Fill is defined to be where ever the new tin is **above** the original tin.

The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Original/New Tin <i>name of the original/new tin for determining volumes.</i>	tin box		available tins
Range file <i>if non-blank, the user supplied range file is used to split up the volumes report and define the depth colours used for painting a view.</i>	input		*.drf
Plan view to paint <i>if non-blank, the given plan view will be painted according to the depth colours given in the range file.</i>	input		available views
Model for faces <i>if non-blank, faces will be created with colours according to the range colours given in the range file.</i>	input		available models
Clean faces model beforehand	tick box		

if tick, the model of faces is cleaned out before the option runs.

Report file file box *.rpt
name of the file to contain the volume report. If the file already exists, the report will be appended to the file. If no name is given, no report is produced.

Poly tin tin box available tins
name of the tin to define the regions that the volume calculations are restricted to.

Volume button
The volume between the two tins for the given range file within the selected bounding polygon is calculated by the exact method. If a range file does not exist, the volumes between the two tins is calculated.

<esc> can be used to terminate the option during volume calculations.

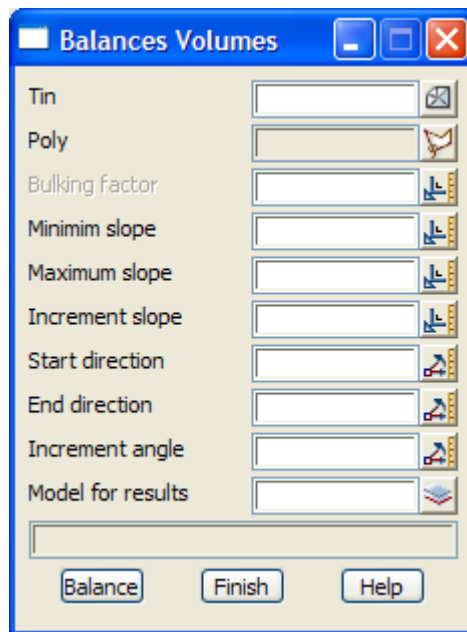
Balanced Volumes

balances_volumes

Position of option on menu: Design =>Volumes =>Exact =>Balanced volumes

This option is currently under development.

On selecting the Balanced volumes option, the **Balances Volumes** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Tin	tin box		available tins
Balance	button		

Grid Cell

grdvol_panel

Position of option on menu: Design =>Volumes =>Grid cell

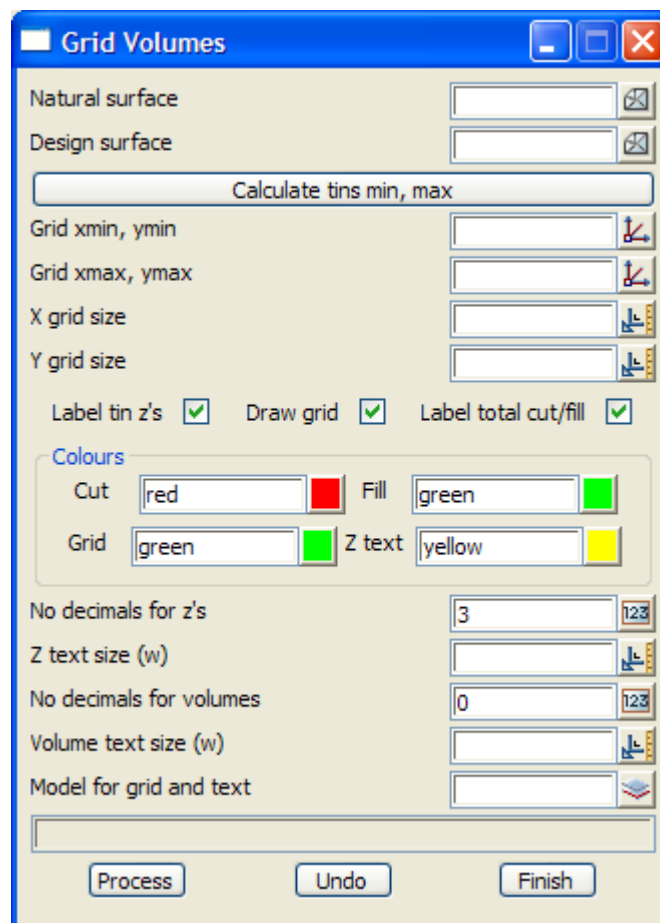
This panel is used to calculate the cut and fill volume between two tins using the exact method and then creating text for each rectangular cells of user defined sides covering the tins.

The rectangular cells (grid) can be drawn and the text of the cut and fill values for each grid cell and z-values at the cell corners. The total cut and fill can also be created at the bottom of the grid.

Cut is defined to be where ever the *design* tin is **below** the *natural surface* tin. **Fill** is defined to be where ever the *design* tin is **above** the *natural surface* tin.

For more information on the exact volume calculations, go to the section “Theory of Exact Volumes”

On selecting the grid cell option, the **grid volumes** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Natural surface/Design surface	tin box		available tins

name of the original/new tin for determining volumes.

Calculate tins min, max	button		
--------------------------------	--------	--	--

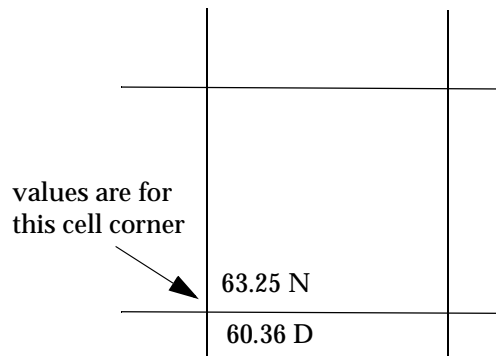
when selected, the minimum and maximum x and y values to define the grid cells are calculated and written to the grid x and y minimum and maximum panel fields.

Grid xmin xmax input
the minimum and maximum x values to define the grid cells. The two values are separated by one or more spaces.

Grid ymin ymax input
the minimum and maximum y values to define the grid cells. The two values are separated by one or more spaces.

X/Y grid size input
the X/Y size of the grid cell.

Label tin z's tick box tick
*if tick, create text values for the z-values from the tins for each of the grid cell corners. The natural surface z value is followed by a **N** and is placed above and to the right of the corner point. The design surface z value is followed by a **D** and is placed below and to the right of the corner point.*



Draw grid tick box tick
if tick, the grid is drawn.

Label total cut/fill tick box tick
if tick, label the total cut, fill and balance at the left hand bottom corner of the grid.

Cut/Fill/Grid/Z text colours colour box
colours to use for the cut, fill and z-values and the grid lines.

Num decimals for z's input 3
number of decimal places in the z values.

Z text size (w) input
size in world units for the text of the z values.

Num decimals for volumes input 0
number of decimal places in the cut and fill volumes.

Volume text size (w) input
size in world units for the text of the volumes.

Model for grid and text model box available models
model to place all the text and grid lines in.

Report file input *.rpt
name of the file to contain the volume report. If the file already exists, the report will be appended to the file. If no name is given, no report is produced.

Process button
calculate the grid volumes and grid lines.

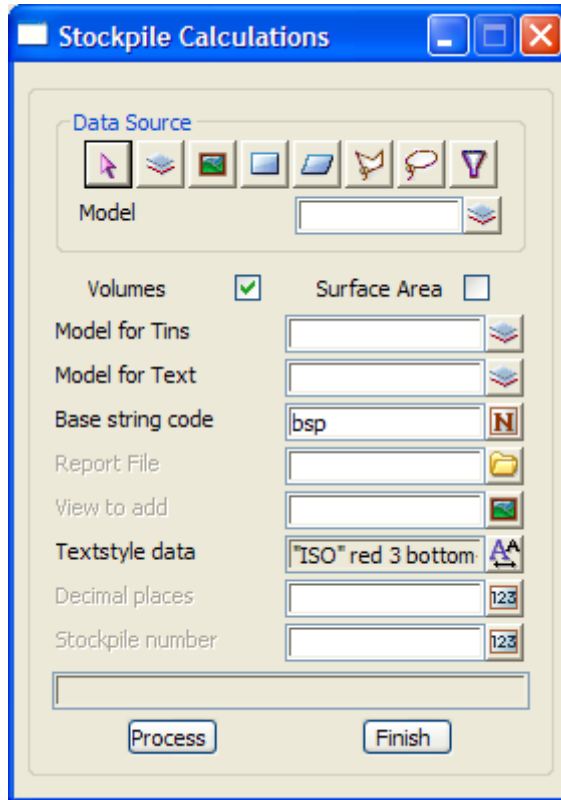
Undo button
undo the last set of text and grid lines created whilst the panel was up.

Stockpile

stockpile_vol_panel

Position of option on menu: Design =>Volumes =>Stockpiles

On selecting the Stockpile option, the **Stockpile Calculations** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Data source type

Model

data selection type - for a full description go to "Data Source" in the chapter "Tools and Concepts"

Data source

data source for strings to create the stockpile.

Volumes

tick box

tick

if tick, calculate and report the volumes of the stockpiles.

Surface area

tick box

if tick, calculate and report the surface area of the stockpiles

Model for tins

model box

available models

name of the model to place the stockpile tins in.

Model for text

model box

available models

name of the model to place the text in.

Base string code

name box

bsp

available names

Code (name) of the string to use as the base of the stockpile.

Report file	file box	*.rpt
	<i>name of the file to contain the volume report.</i>	
View to add	view box	available views
	<i>view to add the model of text to.</i>	
Textstyle data	textstyle data box	text favourites
	<i>text setup - for a full description go to "Textstyle Info and Textstyle Data" in the chapter "Tools and Concepts" .</i>	
Decimal places	number box	
	<i>number of decimal places for the volumes in the report.</i>	
Stockpile number	number box	
	<i>number of stockpile to use in the report.</i>	
Process	button	
	<i>calculate the volume and/or surface area of the stockpile.</i>	

Tin to Tin by Height Range

tin_to_tin_by_height_range

Position of option on menu: Design =>Volumes =>Tin to tin ht range

This option is used to calculate the cut and fill volume between two tins breaking the *cut* and *fill* volumes up by height ranges.

An approximate method is used which uses the z-value of the tin at a point as the representative of the height for a cell of user specified size "delta x" by "delta y" centred on the point. By making delta x and delta y small, the volumes become more accurate but the computation time increases.

Please note that the volume totals are **only** for the heights in the range file. If the height ranges don't cover the entire height difference, then the totals will not be the volumes between the two tins.

Cut is defined to be where ever the new tin is **below** the original tin. **Fill** is defined to be where ever the new tin is **above** the original tin.

In the volumes report, the sign for cut (negative or positive) is given by the cut volume sign from the **default settings** panel (fill will have the opposite sign).

The *height range file* consists of a list of height ranges and colours, one set per line, in the format

```
lower_height upper_height height_colour
```

This line represents all heights satisfying

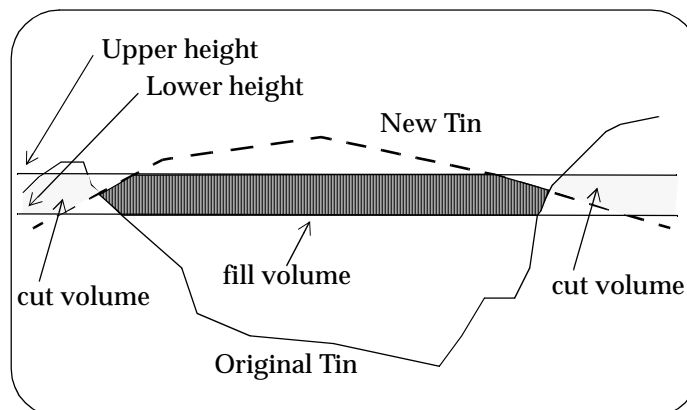
```
lower_height <= height < upper_height.
```

For each range in the file, the total cut and fill volumes for the height range will be reported on. The colour is ignored in this option.

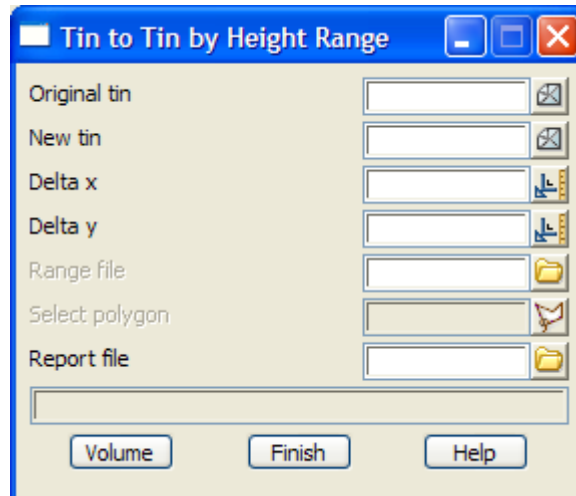
Example of a Height Range File

```
// height range file
// format: lower_height upper_height colour_for_height_range

110 120 green // colour green where the height is greater or equal to 110 and less than 120
120 220 "dark green" // colour dark green where height is >= 120 and less than 220
```



On selecting the tin to tin ht range option, the **tin to tin by height range** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Original/New tin <i>name of the original/new tin for determining volumes.</i>	tin box		available tins
Delta x/Delta y <i>x/y size of the cell to consider to be of the height.</i>	input	1	
Select polygon <i>optional. If selected, the volumes are restricted to being inside this polygon.</i>	string select		
Range file <i>if non-blank, the user supplied height range file is used to split up the volumes report. Note that the volume totals are only for the heights in the range file.</i>	input		*.drf
Report file <i>if non-blank, the name of the file to contain the volume report. Note that the volume totals are only for the heights in the range file</i>	report file		*.rpt
Volume <i>calculate the volumes.</i>	button		

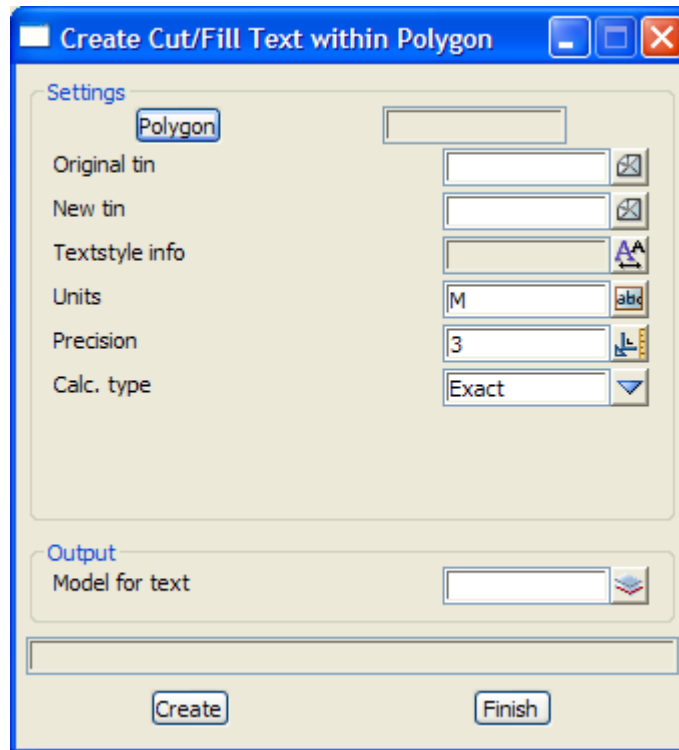
Create Cut/Fill Text Within Polygon

poly_text_volumes_panel

Position of option on menu: Design =>Volumes =>Cut/fill text in poly

This option is used to calculate the cut and fill volume between two tins within a polygon and writing the cut and fill values to a model. The Exact or End Area method can be used for the volume calculations.

Selecting Cut/fill text in poly brings up the **Create Cut/Fill Text within Polygon** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Polygon <i>the volumes are restricted to being inside this polygon.</i>	poly string select		
Original/New tin <i>name of the original/new tin for determining volumes.</i>	tin box		available tins
Textstyle info <i>textstyle info to use for the cut and fill text</i>	textstyle info box		
Units <i>text to place after the cut/fill values</i>	input		
Precision <i>number of decimal places to use for the cut/fill values</i>	input	3	
Calc. type <i>use either Exact or End Area for the volume calculations</i>	choice box	Exact	Exact, End Area

Angle	input	
	<i>angle for sections when End Area is used</i>	
Separation	input	
	<i>distance between sections when End Area is used</i>	
Model for text	model box	available models
	<i>model to place to cut and fill text in.</i>	
Create	button	
	<i>calculate the volumes and text.</i>	

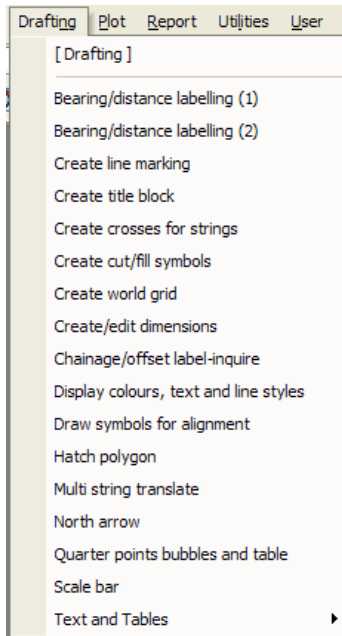
22 Drafting

drafting

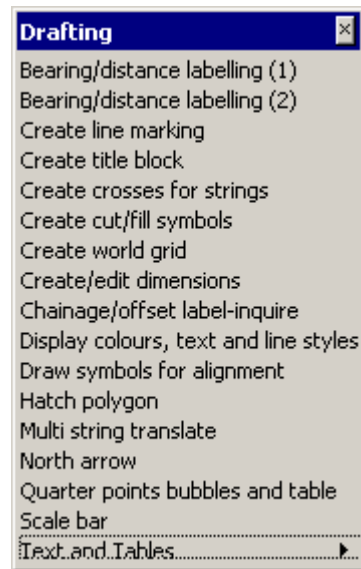
The drafting menu contains options to create data for plots.

The drafting menu is

on Main menu



on 12d Model menu and floating menu



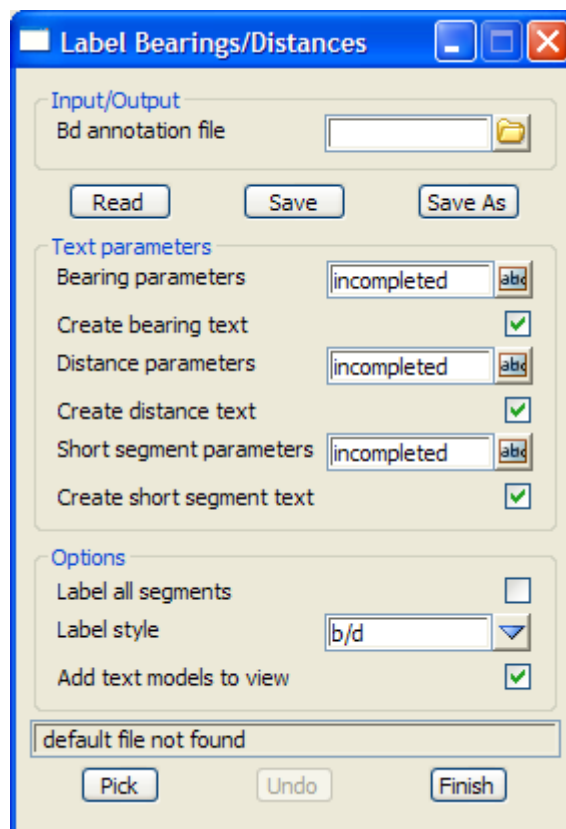
For the option <i>Bearing/distance labelling</i> ,	go to the section “Bearing/Distance Labelling”
<i>Create line marking</i>	“Line Marking” in the chapter “Views”
<i>Create title block</i>	“Create/Edit Title Block File” in the chapter “Plots”
<i>Create crosses for strings</i>	“Create Crosses at String Points”
<i>Create cut/fill symbols</i>	“Create Cut/Fill Symbols”
<i>Create world grid</i>	“Create World Grid”
<i>Create/edit dimensions</i>	“Create/Edit Dimensions”
<i>Chainage/offset label inquire</i>	“Chainage/Offset Label Inquire” .
<i>Display colours, text, linestyles</i>	“Display Colours, Textstyles and Linestyles” .
<i>Draw symbols for alignment</i>	“Draw Symbols for Alignment String”
<i>Hatch polygon</i>	“Polygon Hatching”
<i>Multi string translate</i>	“Text and Tables”
<i>North arrow</i>	“North Point Insertion”
<i>Quarter points bubbles and table</i>	“Setout Lip Line” in chapter “Survey”
<i>Scale bar</i>	“Scalebar”
<i>Text and tables</i>	“Text and Tables”

Bearing/Distance Labelling

bearing_dist_labelling_panel

Position of option on menu: Drafting =>Bearing/distance labelling

This option is used to label a selected line or arc segment with bearing, distance information and arc length information. If the line or arc length is below a given value, the label information is added to a short segment table.



The fields and buttons used in this panel have the following functions:

Field Description	Type	Defaults	Pop-Up
bd annotation file <i>file containing values for the text parameters.</i>	file box		*.bdf files
Read <i>read the file given in the "bd annotation file" field.</i>	button		
Save <i>save the current text parameter settings to the file given in the "bd annotation file" field.</i>	button		
Save as <i>save the current text parameter settings in a file.</i>	button		
Bearing parameters	input box	none/complete	bearing parameters

incomplete

*if none, don't label bearings.**If complete, all the bearing parameters have been set.**If incomplete, not all the bearing parameters have been set so the labels can't be created.***Create bearing text** tick box tick*if tick, bearings are labelled.***Distance parameters** input box none/complete bearing parameters

incomplete

*if none, don't label distances.**If complete, all the distance parameters have been set.**If incomplete, not all the distance parameters have been set so the labels can't be created.***Create distance text** tick box tick*if tick, distances are labelled.***Label all segments** tick box*if tick, all segments of the selected element are labelled.**If not-tic, only the selected segment is labelled.***label style** input box b/d, d/b, /bd b/d
/db, bd, db*defines how to label the bearing and distances. For example, d/b means distance above the line and bearing below the line. Bearing or distance is only labelled if the appropriate flags are set.***Add text models to view** tick box tick*if tick, all models containing text are added to the view containing the selected segment.***Minimum length** input box 0*if non-zero, then if the length of the segment is less than this value, then it is given a short segment number and added to the short segment table.***Next short segment no.** input box 1*the next number to use for short segments.***Pick** button*select the segment to be labelled.***Undo** button*undo the last set of created labels.*

Line Marking

Position of option on menu: Drafting =>Create line marking

This option creates a title block file from a model of data. It has already been documented as

View => Visualisation => Line marking

in the section "Line Marking" in the chapter "Views" .

Create Titleblock

Position of option on menu: Drafting =>Create title block

This option creates a title block file from a model of data. It has already been documented as

Plot => Create title block file

in the section "Create/Edit Title Block File" of the chapter "Plots" .

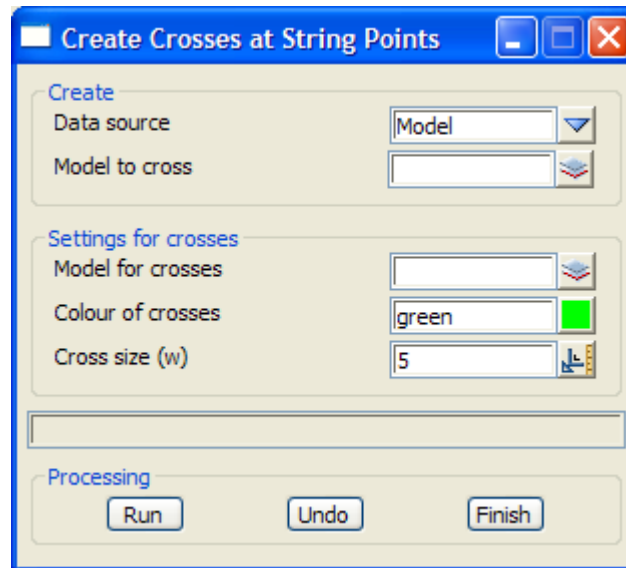
Create Crosses at String Points

create_cross_panel

Position of option on menu: Drafting =>Create crosses for strings

This panel is used to create crosses at the points of strings. The cross is made up of two 2d strings with the intersection of the two strings being the (x,y) position of the point in the string.

The option is mainly used to created crosses to send to packages that don't support a cross at a point.



The fields and buttons used in this panel have the following functions:

Field Description	Type	Defaults	Pop-Up
Data source <i>type of data source.</i>	data source	Model	String, Model, View
Model/View/String <i>data source to create crosses for.</i>	data source		
Model for crosses <i>model for the created crosses</i>	model box		available models
Colour for crosses <i>colour for the crosses</i>	colour box		available colours
Cross size (w) <i>size of the cross in world units.</i>	input box		5
Run <i>run the option</i>	button		

Undo button

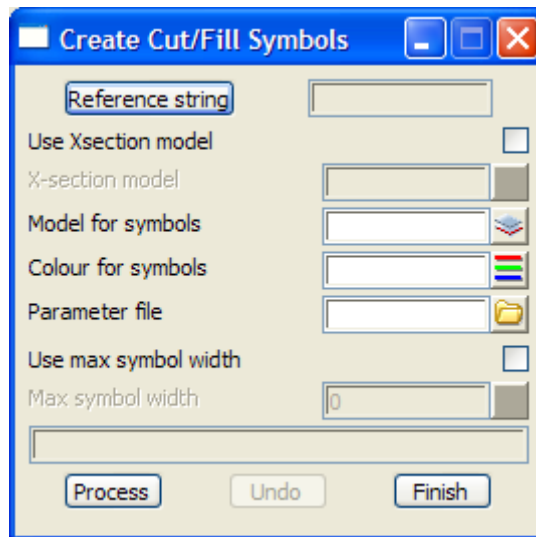
undo the last set of crosses created whilst the panel has been up.

Create Cut/Fill Symbols

tadpole_panel

Position of option on menu: Drafting =>Create cut/fill symbols

This option is used to create cut and fill symbols (tadpoles) between strings or the names of the points across x-sections. The choice of symbols and the points they go between is controlled by a parameter file.



The fields and buttons used in this panel have the following functions:

Field Description	Type	Defaults	Pop-Up
Reference string <i>string used to define chainage and perpendicular</i>	string select		
Use x-section model <i>if tick, the points on the cross-sections in the model are used as the names to create symbols between.</i>	tick box		
X-section model <i>model of cross sections used if "Use X-section model" is ticked.</i>	tick box		available models
Model for symbols <i>model for the created cut-fill symbols</i>	input		available models
Colour for symbols <i>colour for the created cut-fill symbols</i>	Input		available colours
Parameter file <i>file specifying what symbols are drawn between what strings (or points on x-sections).</i>	input		
Use max symbol width <i>if tick, the symbols are only stretched to the maximum size given in the "Max symbol width" field.</i>	tick box		

Max symbol width input

maximum distance in world units to stretch the symbol.

Process button

Run the option.

Undo button

undo the last set of cut-fill symbols created by running the panel. The "Undo" function is lost once the option is finished.

Notes:

```
// Sample file for plotting symbols to denote cut/fill slopes
// All lines starting with // are comments. Blank lines are ignored
//
// The file layout is:

// ch_start ch_end ch_inc side str1  str2 symbol1 %1 symbol2  %2
//
// eg 110 150 10 L "trial1->c1" "trial->c2" tadpole 100 tadpole 50
//
// ch_start defines the start chainage
// ch_end defines the end chainage
// ch_inc defines the chainage increment
// side is one of L, R or LR (left, right, both)
// str1 is the name of the string (or point on x-section) to start tadpole
// str2 is the name of the string (or point on x-section) to end tadpole

// If strings are used, the string model name must be contained in the
// string definition i.e. in the format "model->string_name"
//
// The symbols drawn between the strings (or points) alternate between
// symbol1 and symbol2 and the symbols are drawn as the
// given percentages %1 and %2 respective of the distance
// between the strings (points).

// The symbol can be one of "
// tadpole      - predefined tadpole shape
// line         - predefined batter tick
// "model=xxxxx" - where model "xxxxx" contains 3d strings
//                defining the symbol shape. This is as per
//                user-defined batter symbols in 4D.
//                NB. only 3d strings are supported in the macro

// Example

0 700 10 LR "road str->c2" "road str->c3" tadpole 100 tadpole 50
0 700 10 LR "road str->c4" "road str->c5" line 90 line 50
0 700 10 LR "road str->f2" "road str->f3" "model=symbol" 100 tadpole 50
0 700 10 LR "road str->f4" "road str->f5" line 90 line 50
```

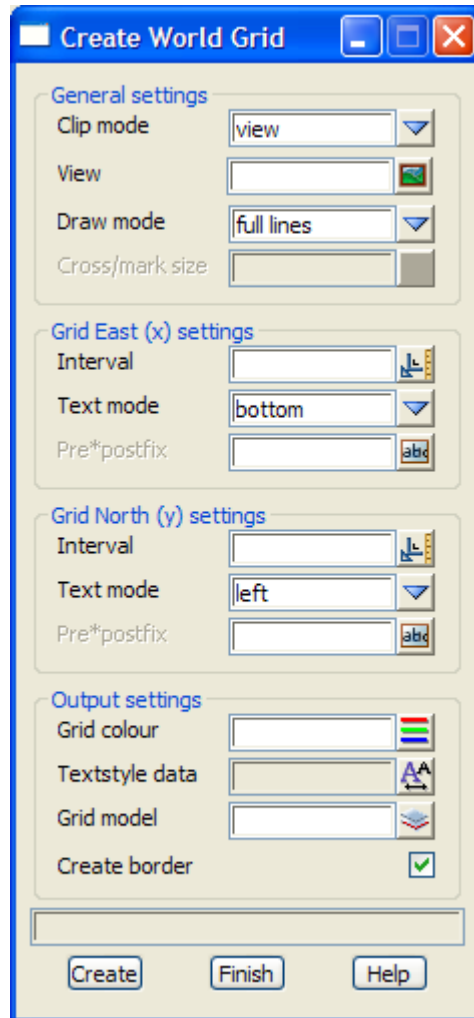
Create World Grid

create_world_grid

Position of option on menu: Drafting =>Create world grid

This option is used to create a grid, identical to the one drawn on a plan view, but in world units. This can then be output to CAD systems that do not allow grids to be easily created.

Selecting the Create world grid option, brings up the **Create World Grid** panel:



The fields and buttons used in this panel have the following functions:

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Clip mode	choice box		rectangle, view
------------------	------------	--	-----------------

if 'rectangle', icons appear for drawing a rectangle, a rotated rectangle or selecting a plot frame. selecting the 'rectangle' and 'rotated rectangle' icons require the user to draw the rectangle to define the area to produce the grid for.

selecting the 'plot frame' icon requires the user to select a plot frame and the view area from the plot frame defines the area to produce the grid for.

If 'view', a View Box appears and a view is selected to define the area to produce the grid for.

Draw mode choice box full lines full lines, crosses, marks

the type of the grid being drawn - full lines, crosses or marks.

If full lines, then solid lines are drawn at the grid x and y spacing.

*If crosses, then crosses of size **cross/mark size** are drawn at the intersection of the grid x and y spacing.*

*If marks, then solid lines size **cross/mark size** are drawn at the beginning/end of the grid at the x and y spacing.*

Cross/mark size input

size in world units of the grid crosses/marks.

Grid East (x)

Interval input

the distance between the East (x) grid lines. If this value is zero, the x grid lines will not be drawn.

Text mode input bottom off,
top,
bottom,
top and bottom

the x (East) grid lines can be labelled with their x value. If the grid lines are labelled, the labels can be drawn on the top, the bottom or both ends of the x-grid lines.

Pre*postfix input

*prefix/postfix (pre*post) to be applied to the value of x (East). If pretext only, just give the text. If post text is required, precede it by a *. For example E*m will place E before the x value and m after the number.*

Grid North (y)

Interval input

the distance between the North (y) grid lines. If this value is zero, the y grid lines will not be drawn.

Text mode input bottom off,
top,
bottom,
top and bottom

the y (North) grid lines can be labelled with their y value. If the grid lines are labelled, the labels can be drawn on the top, the bottom or both ends of the y-grid lines.

Pre*postfix input

*prefix/postfix (pre*post) to be applied to the value of y (North). If pretext only, just give the text. If post text is required, precede it by a *.*

Output settings

Grid colour colour box available colours

colour for the grid lines.

Textstyle data textstyle box

height, angle etc. of the text for the grid labels.

Grid model model box available models

model for the grid lines and text.

Create border tick box

if tick, a rectangle around the area to create the grid for, is created.

Create button

create the grid according to the values given in the panel.

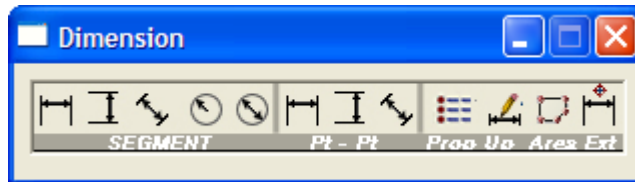
Create/Edit Dimensions

super_dim_panel

Position of option on menu: Drafting =>Create/edit dimensions

This option is used to create and edit dimensions.

This option is currently under development.



The fields and buttons used in this panel have the following functions:

Field Description	Type	Defaults	Pop-Up

read in an existing range file.

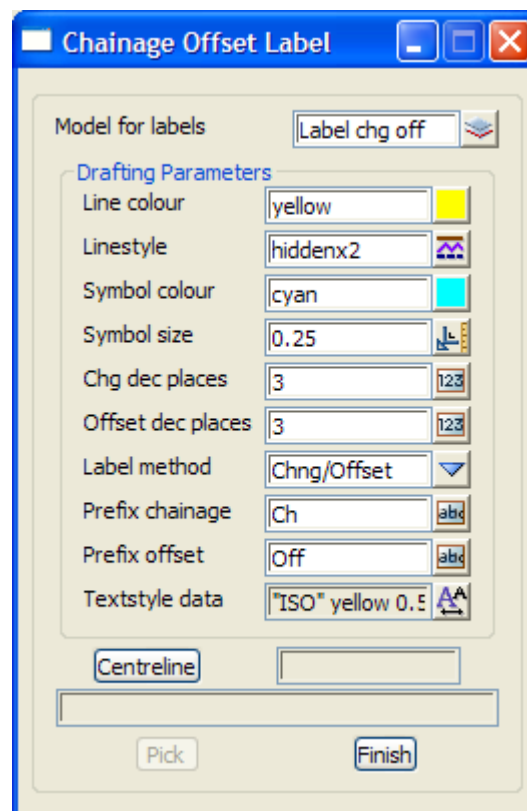
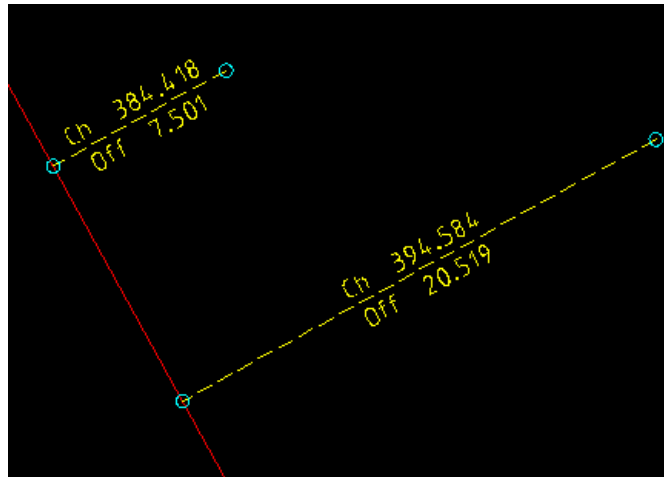
Write button
write out the data in the pages to the given range file.

Chainage/Offset Label Inquire

chainage_offset_panel

Position of option on menu: Drafting =>Chainage/offset label inquire

This option is used to calculate and label the perpendicular distance from a selected point to a selected centreline, and the chainage of the point dropped perpendicularly onto the centreline.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

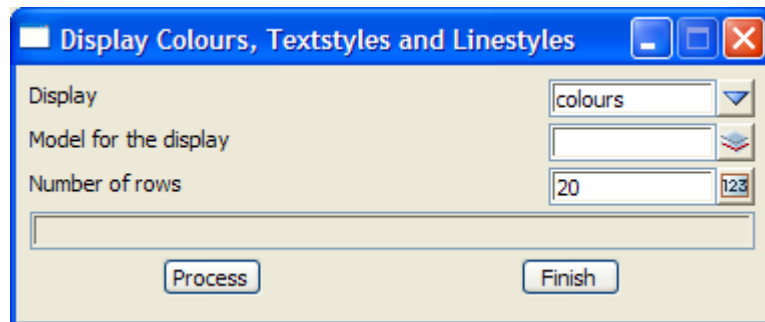
Model for labels	model box	Label chg off	available models
<i>if non-blank, create text for the calculated offset and chainage values and place it in this model.</i>			
Line colour		yellow	available colours
<i>colour of the line drawn.</i>			
Linestyle	linestyle box	hidden2	available linestyles
<i>text style for the text.</i>			
Symbol colour		cyan	available colours
<i>colour of the symbol drawn at the point. text style for the text.</i>			
Symbol size		0.5	
<i>size (in world units) of the symbol drawn at the point.</i>			
Label method	choice box	Chng/Offset	Chng/Offset, Offset/Chng
<i>method of labelling the line from a selected point to the dropped point.</i>			
Prefix chainage		Ch	
<i>prefix for the chainage value.</i>			
Prefix offset		Off	
<i>prefix for the offset value.</i>			
Textstyle data	textstyle data box		available text data
<i>textstyle, size, colour etc. for the text.</i>			
Centreline	string select		
<i>select the string to use for the calculation of chainage and offset.</i>			
Pick	button		
<i>pick a position and the offset from the position to the position dropped perpendicularly onto the selected Centreline is calculated, plus the chainage on the Centreline of the dropped point. The values are reported in the panel's message area and if Model for labels is non-blank, text of the values is created and place in the model.</i>			

Display Colours, Textstyles and Linestyles

display_colour_text_and_line_styles_panel

Position of option on menu: Drafting =>Display colours, text and line styles

This option creates a model to display either all the colours, linestyles or textstyles defined for a project.



The fields and buttons used in this panel have the following functions:

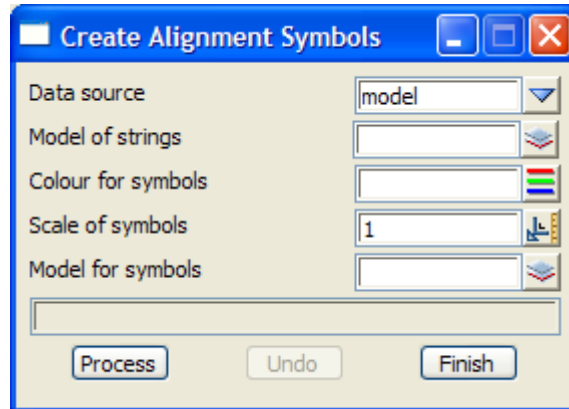
Field Description	Type	Defaults	Pop-Up
Display <i>type of data to display.</i>	choice	colours	colours, textstyles, linestyles
Model for the display <i>model to create the display in.</i>	model box		available modes
Number of rows <i>the display is created by first doing a column of the given "Number of rows" and then moves on to another column until all the data is drawn.</i>	input	20	
Process <i>run the option.</i>	button		

Draw Symbols for Alignment String

alignment_symbols_panel

Position of option on menu: Drafting =>Draw symbols for alignment

This panel is used to create symbols (butterflies and dumbbells) at the spiral-tangent, spiral-curve and curve tangent points.



The fields and buttons used in this panel have the following functions:

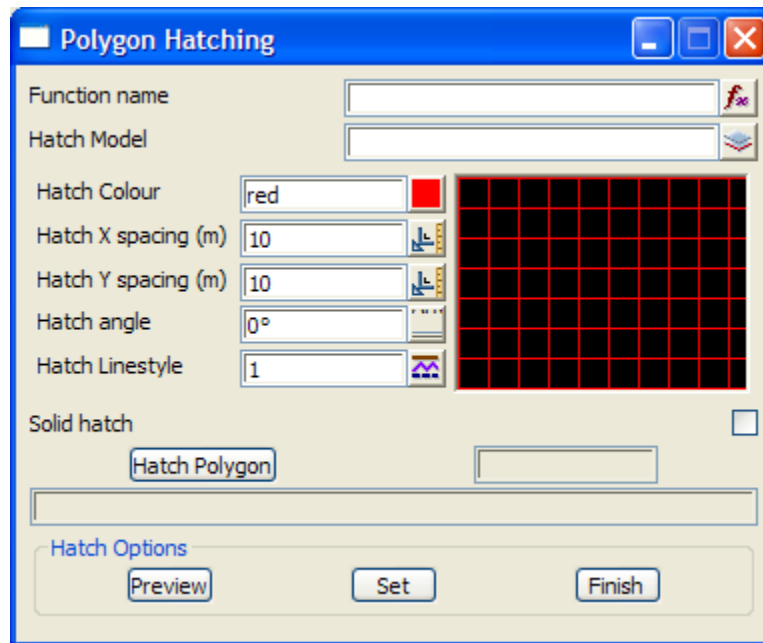
Field Description	Type	Defaults	Pop-Up
Data source <i>type of data to create symbols for.</i>	input box		
Model/View/String <i>data source to create symbols for.</i>	input box		
Colour of symbols <i>colour to use for the created symbols.</i>	input box		
Scale of symbols <i>scale of the created symbols.</i>	input box	1	
Model for symbols <i>model to put the created symbols into.</i>	input box		
Process <i>run the option.</i>	button		
Undo <i>undo the last set of symbols created whilst the panel has been up.</i>	button		

Polygon Hatching

hatch_func_panel

Position of option on menu: Drafting =>Hatch polygon

This option is used to create hatching within a user selected string. A function is created so that the hatching can be recalced if the string is modified.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Function name <i>name of the hatching function.model</i>	input box		
Hatch model <i>model to place the hatching in.</i>	input box		
Hatch colour <i>colour for the hatch lines</i>	colour box	red	
Hatch x/y spacing (m) <i>distance in world units between the x/y hatching lines.</i>	input box	10	
Hatch angle <i>angle of the hatch lines.</i>	input box	0	
Hatch linestyle <i>linestyle for the hatch lines.</i>	input box	1	
Solid hatch	tick box		

if tick, a solid fill of the given hatch colour is used.

Hatch polygon string select

select the string to hatch.

Preview button

draw the hatching to see if it is correct - the hatching function has not been defined.

Set button

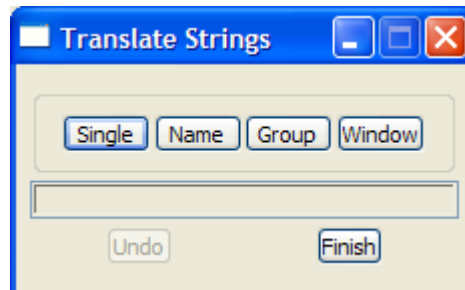
define the hatching function with the values given in the panel fields.

Translate Strings

trans_panel

Position of option on menu: Drafting =>Multi string translate

This panel is used to translate strings selected by name group of a window.



The fields and buttons used in this panel have the following functions:

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Single	button		
---------------	--------	--	--

select a single string to translate.

Name	button		
-------------	--------	--	--

select a string and all strings with the same name on the view will be translated.

Group	button		
--------------	--------	--	--

select a string and all strings with the same group on the view will be translated.

Window	button		
---------------	--------	--	--

click and release to define the first point of the window and then move the cursor and click and release to define the second point of the window. A position is then selected and as the cursor is moved, all strings in the view that are totally inside the window are translated and placed at the next selected position.

Undo	button		
-------------	--------	--	--

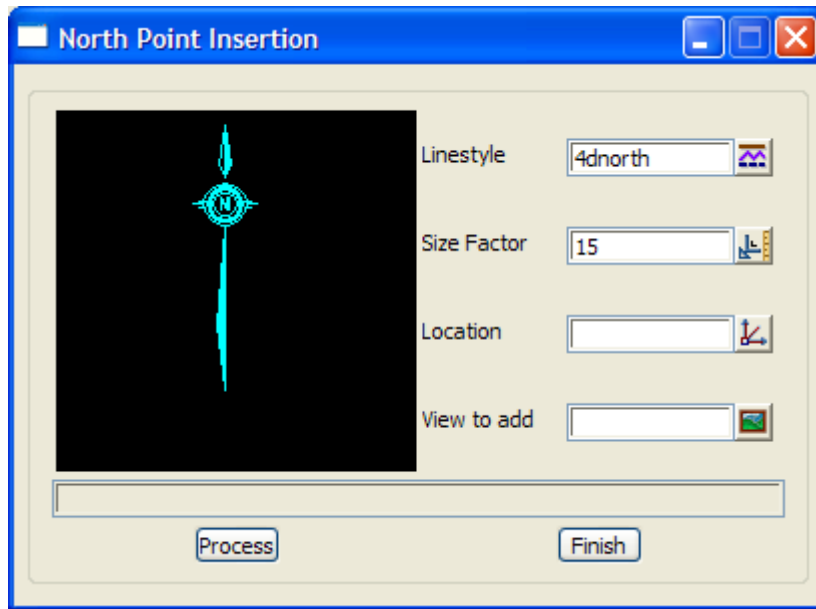
undo the last set of strings translated whilst the panel has been up.

North Point Insertion

4d_north_panel

Position of option on menu: Drafting =>North arrow

This option creates a point with a textstyle of the north point arrow.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Linestyle <i>Linestyle for the north point arrow - leave as 4dnorth.</i>	input box	4dnorth	
Size factor <i>factor the north arrow by this value.</i>	input box	15	
Location <i>either type in an x y position or click on "+" and use Pick xyz to locate the north arrow.</i>	input box		
View to add <i>view to add the arrow to.</i>	input box		
Process <i>create the north point arrow in the model North Point.</i>	button		

Quarter Points

Position of option on menu: Drafting =>Quarter points bubbles and table

This option is used to create bubbles and/or a report for the critical horizontal and vertical points and quarter points (by chord or by chainage) for any arcs in an alignment string.

This option has already been documented as

Survey=>Setout=>Setout lip line

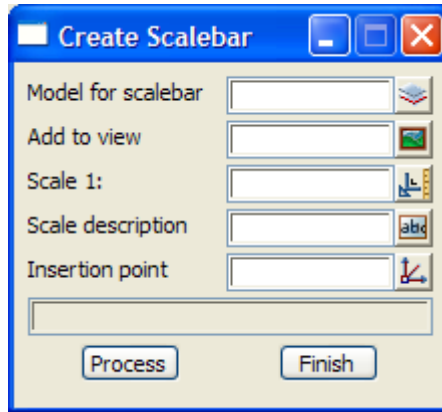
in the section “Setout Lip Line” of the chapter “Survey” .

Scalebar

scalebar_panel

Position of option on menu: Drafting =>Scale bar

This option is used to create a scale bar.



The fields and buttons used in this panel have the following functions:

Field Description	Type	Defaults	Pop-Up
Model for scalebar <i>model to place the scalebar in.</i>	model box		available models
Add to view <i>if non-blank, the model is added to this view.</i>	input box		available views
Scale 1: <i>scale to create the scale bar at.</i>	input box		
Scale description <i>description to write under the scale bar.</i>	input box		
Insertion point <i>position to place the left hand bottom corner of the scale bar at.</i>	pick ops		pick ops
Process <i>run the option.</i>	button		

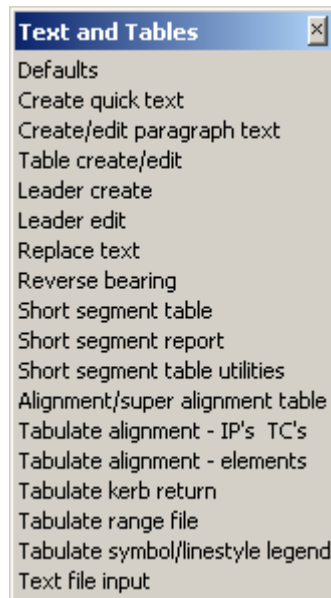
Text and Tables

text_and_tables

Position of menu: Drafting =>Text and Tables

The text and tables menu contains options to create text data and tables for plots.

The text and tables menu is



For the option *Defaults*, go to the section “Defaults - Text” .

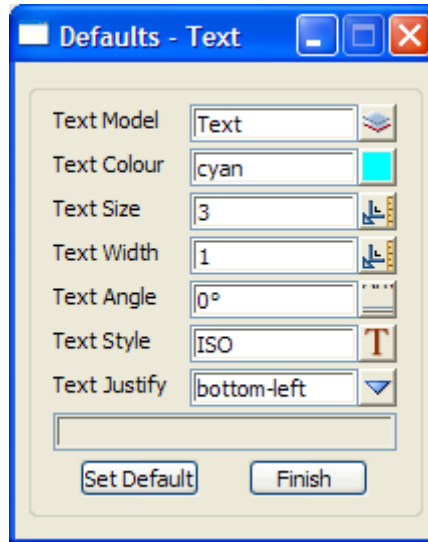
<i>Create quick text</i>	“Quick Text Input” .
<i>Create/edit paragraph text</i>	“Text Creation/Edit” .
<i>Table create/edit</i>	“Table Create/Edit” .
<i>Leader create</i>	“Leader Text Creation” .
<i>Leader edit</i>	“Leader Edit” .
<i>Replace text</i>	“Replace Text” .
<i>Short segment table</i>	“Short Segments Table” .
<i>Short segment report</i>	“Short Segment Report” .
<i>Short segment table utilities</i>	“Short Segments Table Utilities” .
<i>Alignment/super alignment table</i>	“Alignment & Super Alignment Table” .
<i>Tabulate alignment - IP's, TC's</i>	“Tabulate Alignment - IP's and CT's” .
<i>Tabulate alignment - elements</i>	“Tabulate Alignment - Elements” .
<i>Tabulate kerb return</i>	“Tabulate Kerb Return”
<i>Tabulate range file</i>	“Tabulate Range File”
<i>Tabulate symbols/linestyle legend</i>	“Symbol / Linestyle Legend - Tabulation”
<i>Text input file</i>	same option as “Text Creation/Edit”

Defaults - Text

text_defaults_panel

Position of option on menu: Drafting =>Text and Tables =>Defaults

This option is used to project text defaults that are used with the "Fonts" button on many of the text options.



The fields and buttons used in this panel have the following functions:

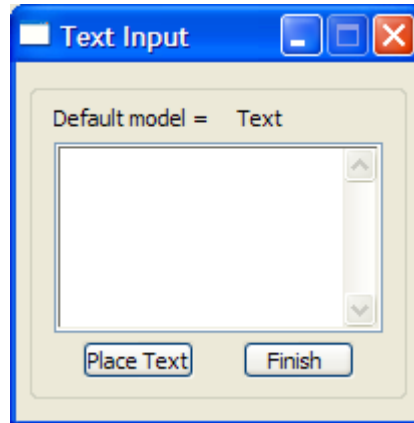
Field Description	Type	Defaults	Pop-Up
Text model <i>default model to place the text in.</i>	model box	Text	available models
Text colour <i>default colour for text.</i>	colour box	cyan	available colours
Text size <i>default size for text.</i>	input box	3	
Text width <i>default x-factor text.</i>	input box	1	
Text angle <i>default angle for text.</i>	input box	0	
Text style <i>default text style.</i>	input box	iso	
Text justify <i>default text justification.</i>	input box	bottom-left	
Set defaults <i>set the project defaults.</i>	button		

Quick Text Input

quick_text_panel

Position of option on menu: Drafting =>Text and Tables =>Create quick text

The quick text option creates lines of text using the text defaults. The text can be edited and modified using the create/edit paragraph text.



The fields and buttons used in this panel have the following functions:

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Text box	button		
<i>type the text to be created into the text box.</i>			

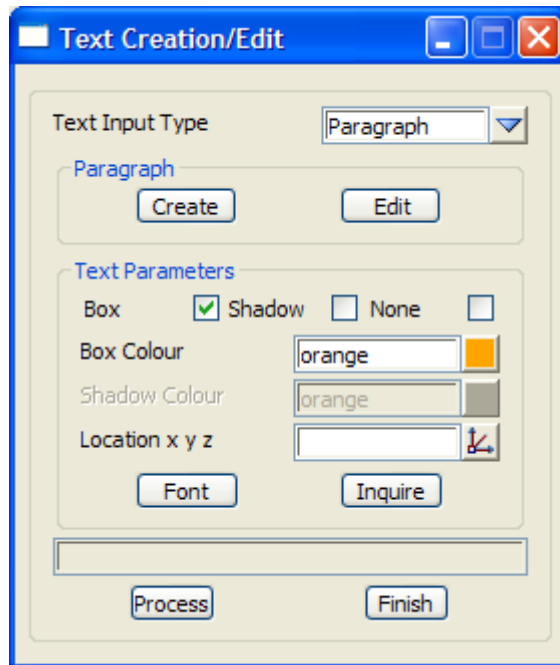
Place text	button		
<i>pick a position to become the justification point for the first line of text.</i>			

Text Creation/Edit

para_panel

Position of option on menu: Drafting =>Text and Tables =>Create/edit paragraph text

The option creates and edits a paragraph of text created with this option or the quick text option.



The fields and buttons used in this panel have the following functions:

Field Description	Type	Defaults	Pop-Up
Text input type	choice box	paragraph	paragraph, file

method of creating text - type in a paragraph or read from a file

if *Paragraph* selected

Create button
select create to bring up the text box to type text into.

Edit button
select edit to pick and edit existing text.

if *File* selected

Text file file box
name of the file to read in.

Text parameters

Box/Shadow/None radio button box
if box is ticked, draw a box around the text.

*if shadow is ticked, draw shadowed box around the text.
if none is ticked, don't draw a box around the text.*

Box colour colour box orange

Colour of the box around the text

Shadow colour colour box orange

Colour of the shadow around the box around the text

Location x y z x,y,z box pick ops menu

pick the position for the text.

Font button

bring up the values for the text - e.g. model, colour, size etc.

Inquire button

xxxxx

Process button

create the text and place it at the given location.

Table Create/Edit

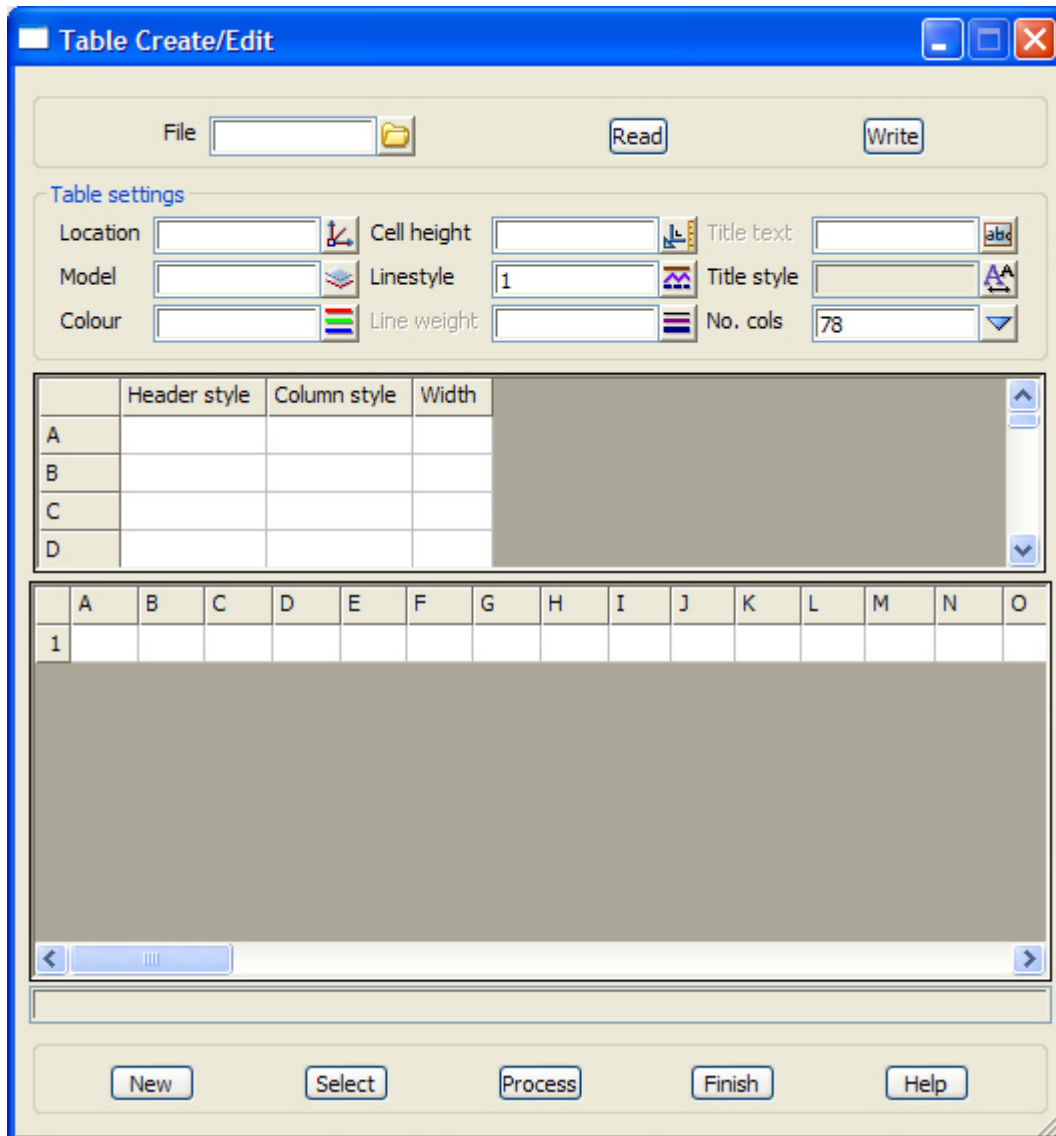
table_create_edit

Position of option on menu: Drafting =>Text and Tables =>Table Create/edit

This option is currently under development

This option reads in a csv file and loads the data into a grid on the panel. The data can be edited in the grid and then a table produced in a model.

An existing table in a model can also be selected and the data read into the grid on the panel. The data can then be edited and the table updated.



The fields and buttons used in this panel have the following functions:

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

File	file		
-------------	------	--	--

file to read in and display in the grid on the panel.

Read button
read the specified file in and display it in the grid on the panel.

Write button
write the data in the grid on the panel to the specified file.

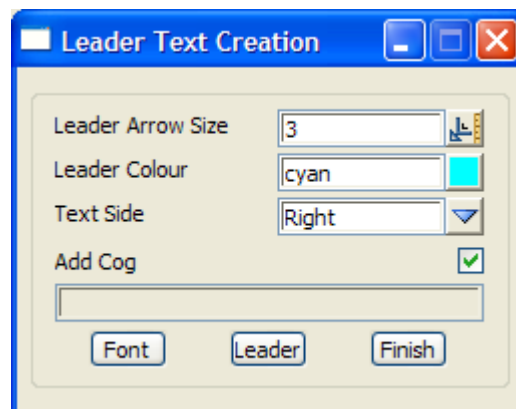
Table settings
create the text and place it at the given location.

Leader Text Creation

leader_text_panel

Position of option on menu: Drafting =>Text and Tables =>Leader create

This option is used to create leader lines and text.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Leader arrow size <i>length (in world units) of the head of the arrow of the leader line.</i>	input box	3	
Leader colour <i>colour of the leader line or arrow</i>	colour box	cyan	
Text side <i>side of the leader line to create the text.</i>	choice box	Right	Right, Left
Add cog <i>if tick, add a cog to the leader line.</i>	tick box	tick	
Font <i>brings up panel for defining information about the text (size, model colour etc.).</i>	button		
Leader <i>create the leader by first picking the point for the arrow end and then the point for the opposite</i>	button		

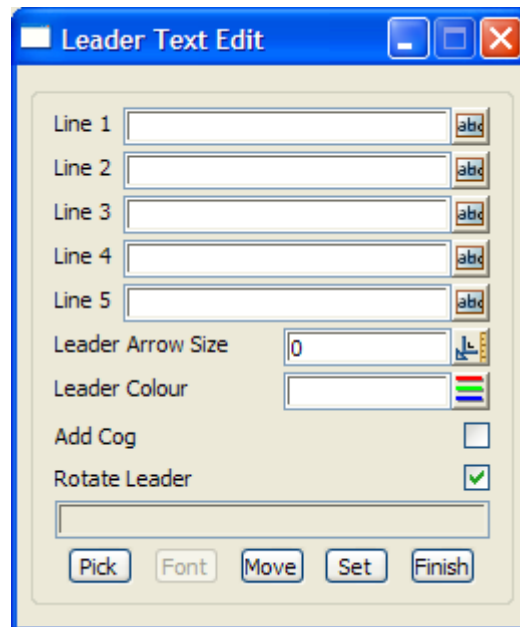
end.where the text goes. Once the second point is place, the "Leader Text Input" panel is displayed for entering five lines of text.

Leader Edit

leader_edit_panel

Position of option on menu: Drafting =>Text and Tables =>Leader edit

This option is used to edit leader lines and text.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Line 1-5 <i>lines of text from the selected leader.</i>	input box		
Leader arrow size <i>length (in world units) of the head of the arrow of the leader line.</i>	input/output box		
Leader colour <i>colour of the leader line or arrow</i>	colour box	cyan	
Text side <i>side of the leader line to create the text.</i>	choice box	Right	Right, Left
Add cog <i>if tick, add a cog to the leader line.</i>	tick box	tick	
Rotate leader <i>if tick, the leader arrow remains fixed when the leader is moved.</i>	tick box	tick	

If not tick, the whole leader line and text is moved.

Pick button

select the leader to be modified.

Font button

brings up panel for defining information about the text (size, model colour etc.).

Move button

move the select leader and its associated text. If "rotate leader" is ticked, then the leader arrow head is left fixed.

Set button

redefine the leader line and text with the current values in the panel fields.

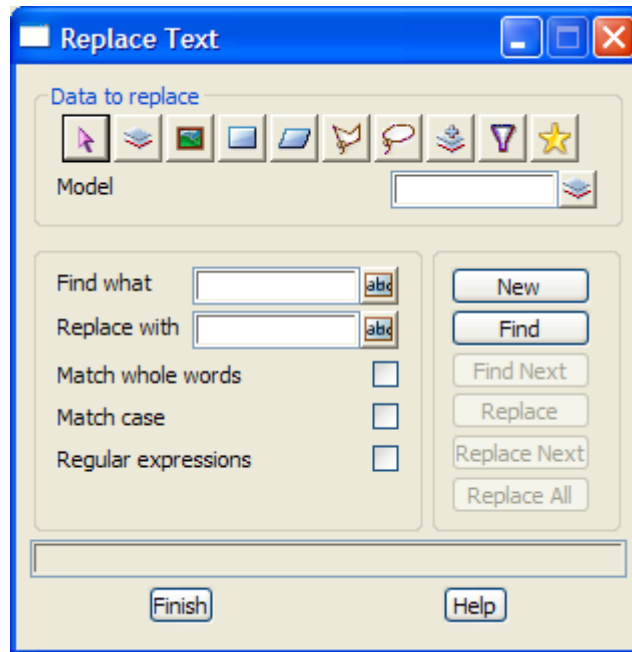
Replace Text

replace_text

Position of option on menu: Drafting =>Text and Tables =>Replace text

Position of option on menu: Utilities =>H-Z =>Find/replace text

This option is used to find and replace text in text strings, 4d string, super strings for vertex and segment text.



The fields and buttons used in this panel have the following functions:

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Data source type

Model

data selection type - for a full description go to "Data Source" in the chapter "Tools and Concepts"

Data source

data source for text to search and change.

Find what	input box
------------------	-----------

text to search for.

Replace with	input box
---------------------	-----------

text to replace the searched text with

Match whole words	tick box
--------------------------	----------

if not tick, text is selected if the "find text" is only part of the text.

If tick, only find the text when the text is exactly the same as the "find text", not just a part of the text.

Match case	tick box
-------------------	----------

if not tick, case is ignored when trying to find a match.

If tick then case is not ignored when trying to find a match.

Regular expressions tick box

if tick then the Find what text can contain regular expressions.

If not tick, the Find what text is not considered to contain regular expressions.

New button

after selecting new the parameters for the find and replace can be changed.

Find button

find the search text. The text is highlighted and centred in the view.

Find Next button

find the next occurrence of the search text.

Replace button

replace the text.

Replace all button

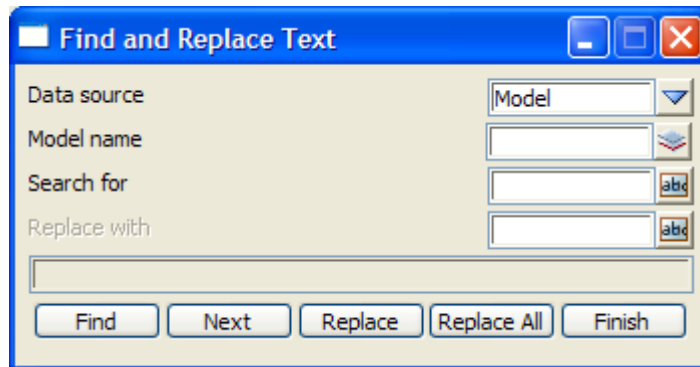
replace all occurrences of the text.

Find and Replace Text

replace_text_panel

Position of option on menu: Drafting =>Text and Tables =>Replace text

This option is used to find and replace text.



The fields and buttons used in this panel have the following functions:

Field Description	Type	Defaults	Pop-Up
Data source type <i>data source type.</i>	input box		string, model, view
Data source <i>source of data to change text.</i>	input box		
Search for <i>text to search for.</i>	input box		
Replace with <i>if non-blank, text to replace the searched text with</i>	input box		
Find <i>find the search text</i>	button		
Next <i>find the next occurrence of the search text.</i>	button		
Replace <i>replace the text.</i>	button		
Replace all <i>replace all occurrences of the text.</i>	button		

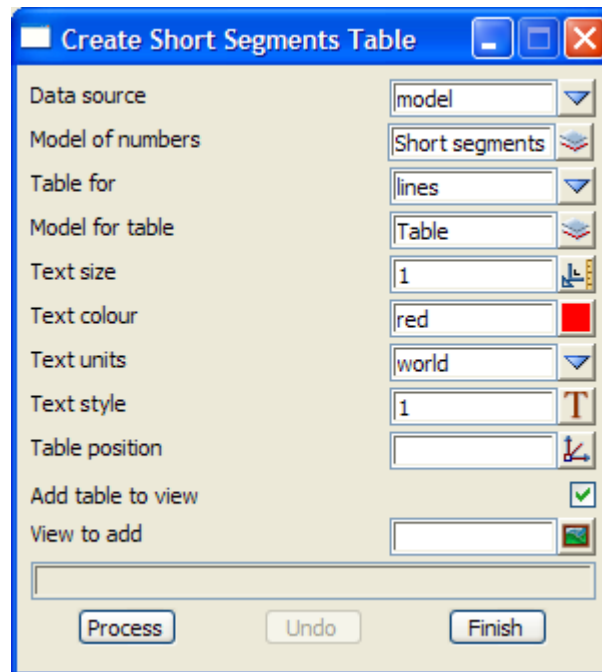
Short Segments Table

short_segment_table_panel

Position of option on menu: Drafting =>Text and Tables =>Short segment table

This panel is used to create a short segment table.

This option is still under development



The fields and buttons used in this panel have the following functions:

Field Description	Type	Defaults	Pop-Up
Data source <i>type of data to process</i>	input box	model	model, string, view
Model/string/View of numbers <i>data to process and build a short segment table for.</i>			
Table for <i>type of short elements to tabulate.</i>	choice box	lines	lines, arcs, lines and arcs
Model for table <i>model to place the short segment table in.</i>	model box	Table	
Text size <i>text size.</i>	input box	1	
Text colour <i>text colour</i>	colour box	red	

- Text units** choice box world world, pixels
units for the text size - default is world units.
- Text style** input box 1
textstyle for the created text.
- Table position** input box
location for the top left hand corner of the table. Either type in an x y position or click on "+" and use "Pick xyz" to locate the table.
- Add table to view** tick box tick
if tick, add the model containing the table to the view.
- View to add** input box
view to add the table to.
- Process** button
create and place the short segment table
- Undo** button
undo the last short segment table created whilst the panel has been up.

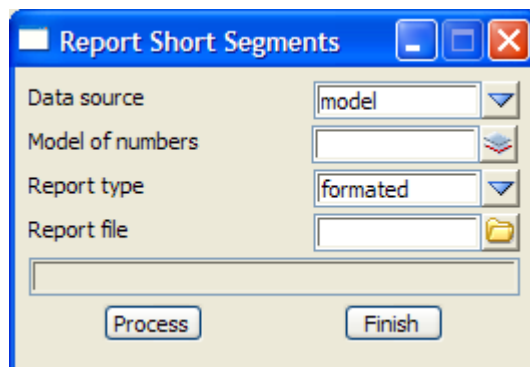
Short Segment Report

[short_segment_report_panel](#)

Position of option on menu: Drafting =>Text and Tables =>Short segment report

This panel is used create a report on the short segments.

This option is still under development



The fields and buttons used in this panel have the following functions:

Field Description	Type	Defaults	Pop-Up
Data source <i>type of data to process</i>	input box	model	model, string, view
Model/string/View of numbers			

data to process and report on the short segments.

Report file report box
name of the report file.

Process button
create the short segment report

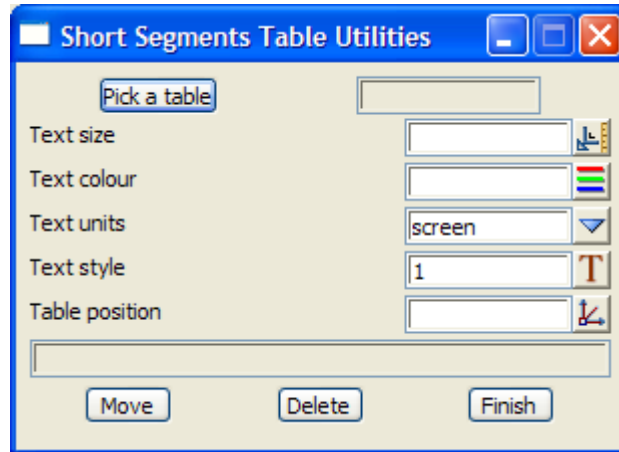
Short Segments Table Utilities

table_utilities_panel

Position of option on menu: Drafting =>Text and Tables =>Short segment table utilities

This panel is used modify an existing short segments table.

This option is still under development



The fields and buttons used in this panel have the following functions:

Field Description	Type	Defaults	Pop-Up
Pick a table <i>select the short segments table to modify.</i>	string select		
Text size <i>text size.</i>	input box	1	
Text colour <i>text colour</i>	colour box	red	
Text units <i>units for the text size - default is world units.</i>	choice box	world	world, pixels
Text style <i>textstyle for the created text.</i>	input box	1	
Table position <i>location for the top left hand corner of the table. Either type in an x y position or click on "+" and use "Pick xyz" to locate the table.</i>	input box		
Move <i>move the selected table to the new location.</i>	button		
Delete <i>delete the selected table.</i>	button		

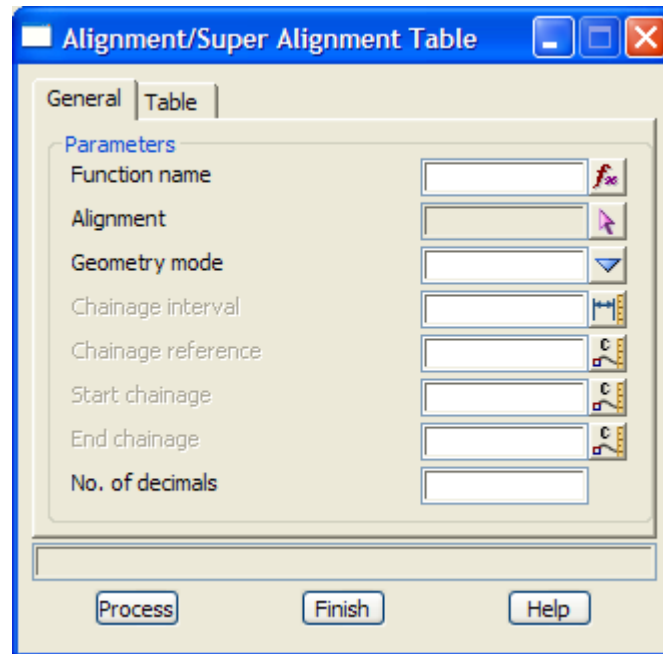
Alignment & Super Alignment Table

alignment_super_alignment_table

Position of option on menu: Drafting =>Text and Tables =>Alignment/Super alignment table

This option is used to create a report and/or a table in a model for an alignment and super alignment string in an IP or element format.

This option is under development.



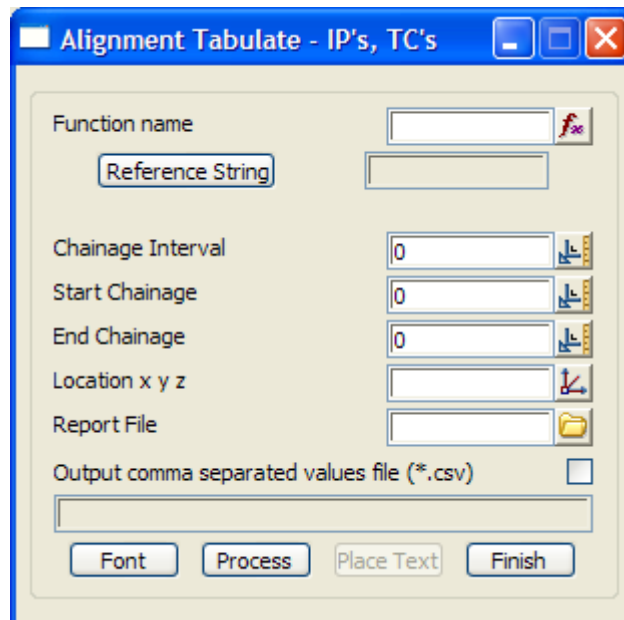
Tabulate Alignment - IP's and CT's

align_ch_tps_func_panel

Position of option on menu: Drafting =>Text and Tables =>Tabulate alignment - IP's TC's

This option is used to create a report and/or a table in a model of an alignment string in an IP and tangent point format.

The table is created by a function so that if the alignment string changes, the table can be easily recalced.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Function name <i>name of the function</i>	input box		
Reference string <i>select the string to create the table and/or report for.</i>	string select		
Chainage interval <i>if zero, only information on the tangent and intersection points is given. If non-zero, the chainage interval to use to report the information about the reference string. The horizontal tangent and intersection points are included.</i>	input box	0	
Start/End chainage <i>start/end chainage to use. If 0, the start/end chainage is used.</i>	input box	0	
Location x y z <i>location for the top left hand corner of the table. Either type in an x y position or click on "+" and use "Pick xyz" to locate the table.</i>	input box		
Report file	file box		

*if non blank, name of the report file.
If blank, don't create the report.*

Font button

brings up panel for defining information about the text (size, model colour etc.).

Process button

process the reference string and create the report. The table is not yet created.

Place text button

create the table and place it at the given location.

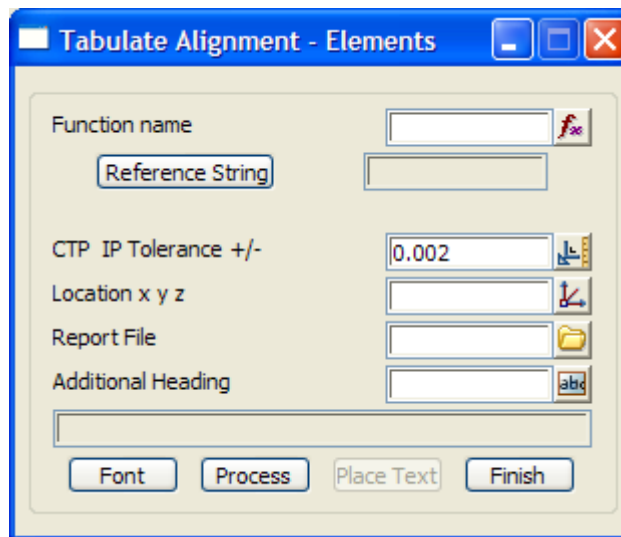
Tabulate Alignment - Elements

moss_ch_tps_func_panel

Position of option on menu: Drafting =>Text and Tables =>Tabulate alignment - elements

This option is used to create a report and/or a table in a model of an alignment string in an horizontal element format.

The table is created by a function so that if the alignment string changes, the table can be easily recalced.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Function name <i>name of the function</i>	input box		
Reference string <i>select the string to create the table and/or report for.</i>	string select		
CTP IP tolerance +/- <i>xxxx.</i>	input box	0.002	
Location x y z <i>location for the top left hand corner of the table. Either type in an x y position or click on "+" and use "Pick xyz" to locate the table.</i>	input box		
Report file <i>if non blank, name of the report file. If blank, don't create the report.</i>	file box		
Additional heading <i>additional information for the heading above the table.</i>	input box		
Font	button		

brings up panel for defining information about the text (size, model colour etc.).

Process button

process the reference string and create the report. The table is not yet created.

Place text button

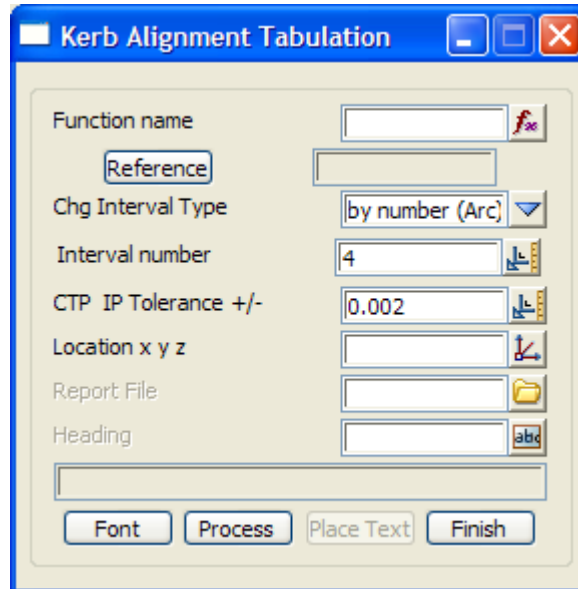
create the table and place it at the given location.

Tabulate Kerb Return

kret_ch_tps_panel

Position of option on menu: Drafting =>Text and Tables =>Tabulate kerb return

This option creates a table for a kerb return.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Function name <i>name of the function</i>	input box		
Reference <i>select the string to create the kerb return table and/or report for.</i>	string select		
Chg interval type	choice box	by number (Arc)	by number (Arc) by distance (Arc) by special chg file by number (Chord)
Interval number <i>number of points to divide the alignment into.</i>	input box	4	
CTP IP tolerance +/- <i>xxxx.</i>	input box	0.002	
Interval number <i>xxxx.</i>	input box	4	

Location x y z input box

location for the top left hand corner of the table. Either type in an x y position or click on "+" and use "Pick xyz" to locate the table.

Report file file box

*if non blank, name of the report file.
If blank, don't create the report.*

Heading input box

heading above the table.

Font button

brings up panel for defining information about the text (size, model colour etc.).

Process button

process the reference string and create the report. The table is not yet created.

Place text button

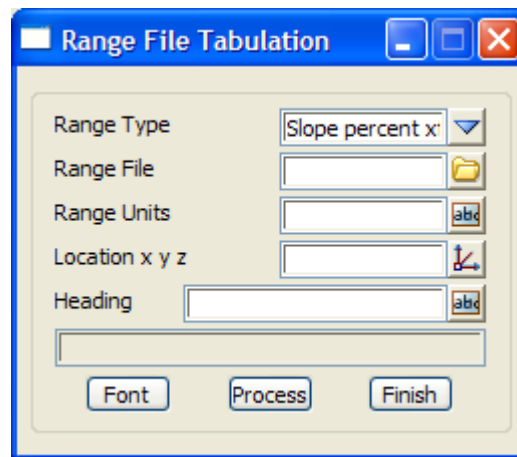
create the table and place it at the given location.

Tabulate Range File

range_table_panel

Position of option on menu: Drafting =>Text and Tables =>Tabulate range file

This option creates a table for a range file.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Range type <i>type of range file to be created.</i>	choice box	slope percent xfall	slope percent xfall slope 1 v in, slope degrees depth, aspect, height
Range file <i>name of the range file.</i>	file box		
Range units <i>text to place beside each line of upper and lower values.</i>	input box		
Heading <i>heading to place at the top of the table.</i>	input box		
Location x y z <i>location for the top left hand corner of the table. Either type in an x y position or click on "+" and use "Pick xyz" to locate the table.</i>	input box		
Font <i>brings up panel for defining information about the text (size, model colour etc.).</i>	button		
Process <i>create and place the range table.</i>	button		

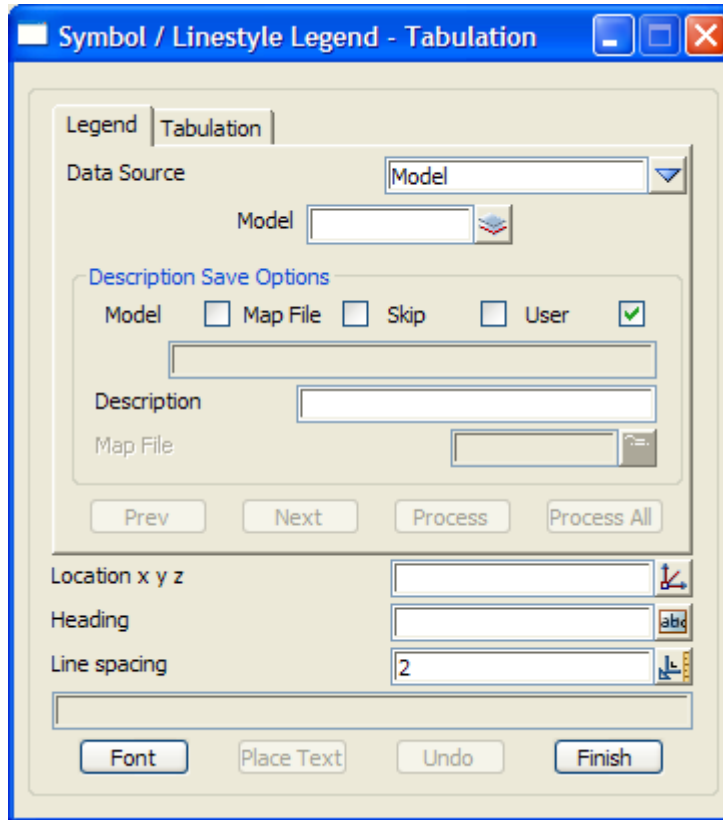
Symbol / Linestyle Legend - Tabulation

sym_tab_panel

Position of option on menu: Drafting =>Text and Tables =>Tabulate symbol/linestyle legend

This panel is used to tabulate symbols and linestyles used in a model.

This option is still under development



The fields and buttons used in this panel have the following functions:

Field Description	Type	Defaults	Pop-Up
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Text File Input

Position of option on menu: Drafting =>Text and Tables =>Text file input

This option has already been documented as "Text Creation/Edit"

Drafting =>Text and Tables =>Create/edit paragraph text

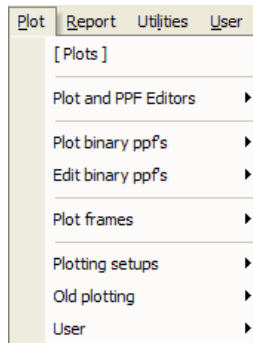
23 Plots

plots

Position of menu: It is on the main menu as Plot

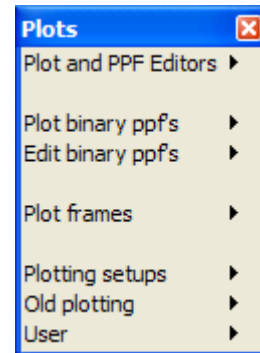
The plots walk-right menu is

on Main menu



create floating Plots menu
plotting and ppf editors
plot an existing ppf
edit an existing ppf
create/edit/plot plot frames
plotting set ups
old plotting options

on 12d Model
Plots floating menu



The options **Plot binary ppf's** and **Edit binary ppf's** are both walk-right menus which list all the binary ppf's in the project and the when the ppf is double clicked, it is Plotted/Edited.

For the options *Plot and PPF Editors*, go to the section "Plot and PPF Editors"

Plot frames

Plotting setups

Old plotting

"Plot Frames"

"Plotting Setups"

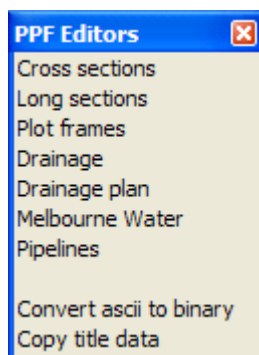
"Old Plotting"

Plot and PPF Editors

ppf_editors

Position of menu: Plot =>Plot and PPF editors

The Plot and PPF editor walk-right menu is



cross section ppf editor
long section ppf editor
creating/editing plot frames
drainage long section ppf editor
drainage plan plot ppf editor
Melb water sewer long section ppf editor
pipeline long section ppf editor

convert old ppf files to new ppf files
copy title data

For the option <i>Cross sections</i> , go to	"X Plot PPF Editor"
<i>Long sections</i>	"Long Plot PPF Editor"
<i>Plot frames</i>	"Plot Frame and PPF Editor"
<i>Drainage</i>	"Drainage Plot PPF Editor"
<i>Drainage plan</i>	"Drainage Plan Plot PPF Editor"
<i>Melbourne Water</i>	"Melbourne Water Plot PPF Editor"
<i>Pipeline</i>	"Pipeline Plot PPF Editor"
<i>Convert ascii to binary</i>	"Convert Ascii PPF to Binary"
<i>Copy title data</i>	"Copy Title Data"

Plot Frames

plot_frames

Position of menu: Plot =>Plot frames

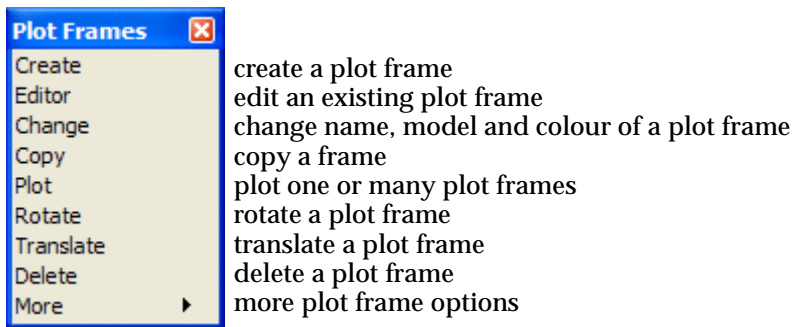
Although plan view plots can be generated in 12d Model by plotting the contents of the plan view with the **Plot** option, the plot will only have a simple title block.

To create plan plots of an arbitrary size, rotation and scale and with complex title blocks, 12d Model uses **plot frames**.

Basically a plot frame consists of a sheet size (in mm), margins within the sheet and a scale for the plot. This will define a plotting area in world co-ordinates (the plot frame).

The plot frame can be arbitrarily positioned and rotated on a plan view.

The plot frames walk-right menu is



For the option *Create*, go to the section "Create"

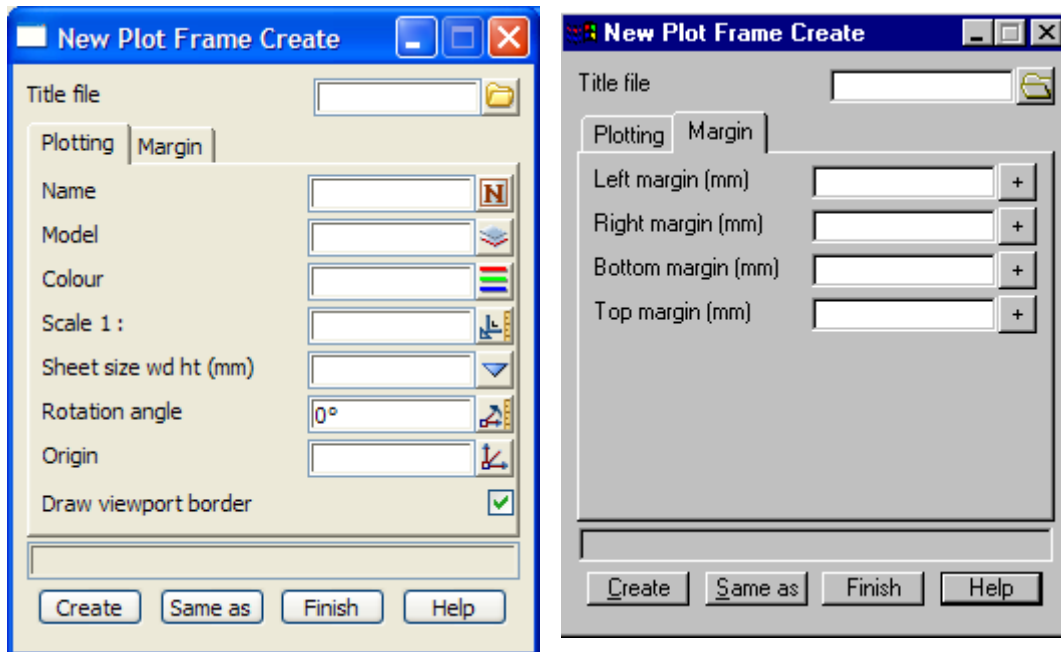
<i>Editor</i>	"Editor"
<i>Change</i>	"Change"
<i>Copy</i>	"Change"
<i>Plot</i>	"Plot Frame and PPF Editor"
<i>Rotate</i>	"Rotate"
<i>Translate</i>	"Translate"
<i>Delete</i>	"Delete"
<i>More</i>	"More Plot Frames"

Create

new_plot_frame_create

Position of option on menu: Plot =>Plot frames =>Create

On selecting the Create option, the **New Plot Frame Create** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Title file <i>name for the title file to use when plotting the plot frame. The title block file can contain default information for the rest of the panel fields. See "Values Used for Defaults when Creating Plot Frames" in the Chapter "PPF Editors"</i>	title file box		all title files
Name <i>name for the plot frame.</i>	input		
Model <i>the model for the plot frame.</i>	input		available model
Colour <i>the colour for the plot frame.</i>	input		available colours
Scale 1: <i>scale for the plot.</i>	input		
Sheet size wd ht (mm) <i>the width and height values (separated by spaces) or the name of a user defined sheet size.</i>	input		
Rotation angle <i>angle of rotation for the plot frame.</i>	input	0	
Origin <i>x_origin y_origin z_origin origin (in world units) for the corner of the plot frame - given as three values separated by spaces. The</i>	input		xyz ops menu

values can either be typed in, or selected by clicking LB in the origin panel view and getting up the xyz ops menu and selecting the pick xyz option.

Draw viewport border tick-cross tick

if **tick**, plot the box around the plotting area (viewport).

Create button

create the plot frame and then put up the plot frame edit panel for the created plot frame.

Same as button

after picking the **same as** button, an existing plot frame is selected and its information is used to fill in the above panel fields.

Margins tab

Left/right margin (mm) 10.0

the left/right hand side margin between the sheet and the plotting area inside the sheet.

Bottom/top margin (mm) 10.0

the bottom/top margin between the sheet and the plotting area inside the sheet.

How To Use the Option

The plot frame contains all the information required to define the physical area in real world units to be plotted, the position on the sheet of the area being plotted, the plotter type and the plot file name.

Once the frame is created, the **New Plot Frame Edit** panel for the created plot frame is automatically placed on the screen so that the frame's position can be adjusted using the **Translate** and **Rotate** buttons.

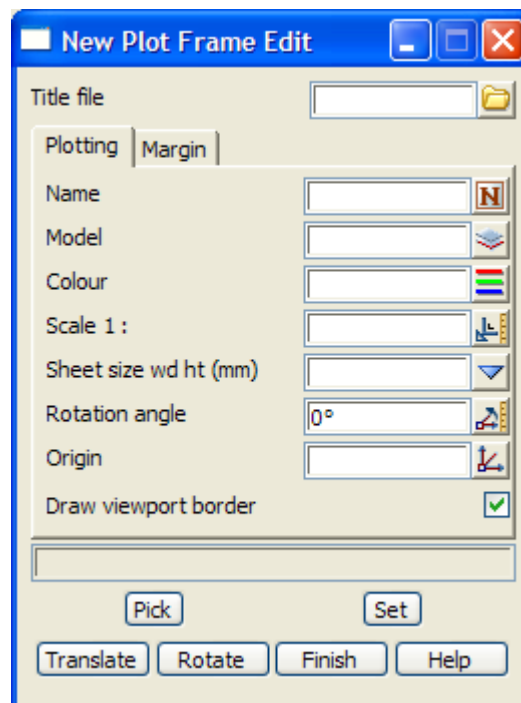
Editor

new_plot_frame_edit

Position of option on menu: Plot =>Plot frames =>Editor

The plot frame editor is used to edit existing plot frames. It is automatically placed on the screen when a plot frame is created so that the frame's position can be adjusted using the **Translate** and **Rotate** buttons.

On selecting the Editor option, the **New Plot Frame Edit** panel is displayed.



Most of the fields and buttons used in this panel are the same as the **New Plot Frame Create** panel.

The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Title file <i>name for the title file to use when plotting the plot frame. The title block file can contain default information for the rest of the panel fields. See "Values Used for Defaults when Creating Plot Frames" in the Chapter "PPF Editors"</i>	title file box		all title files
Name <i>name for the plot frame.</i>	input		
Model <i>the model for the plot frame.</i>	input		available model
Colour <i>the colour for the plot frame.</i>	input		available colours
Scale 1: <i>scale for the plot.</i>	input		
Sheet size wd ht (mm) <i>the width and height values (separated by spaces) or the name of a user defined sheet size.</i>	input		

Rotation angle input 0

angle of rotation for the plot frame.

Origin input xyz ops menu

x_origin y_origin z_origin

origin (in world units) for the corner of the plot frame - given as three values separated by spaces. The values can either be typed in, or selected by clicking LB in the origin panel view and getting up the xyz ops menu and selecting the pick xyz option.

Draw viewport border tick-cross tick

if tick, plot the box around the plotting area (viewport).

Pick button

select the plot frame to be edited.

Set button

update the plot frame with the information in the above panel fields.

Translate button

*after picking the **Translate** button, the plot frame will move with the cursor until a point is selected to give the final position of the plot frame.*

Rotate button

*after picking the **Rotate** button, the plot frame is further rotated around the left hand corner of the sheet, by the angle made between the rotation point and the current cursor position. The plot frame will continue to rotate until a point is selected to fix the rotation angle.*

Margin tab

Left/right margin (mm) 10.0

the left/right hand side margin between the sheet and the plotting area inside the sheet.

Bottom/top margin (mm) 10.0

the bottom/top margin between the sheet and the plotting area inside the sheet.

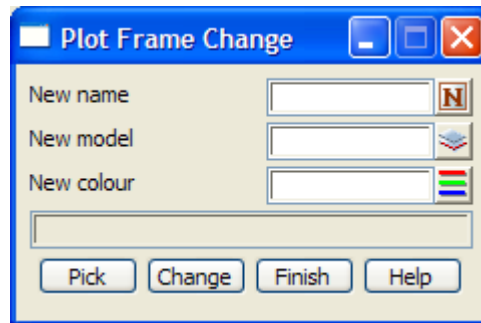
Change

plot_frame_change

Position of option on menu: Plot =>Plot frames =>Change

The change option is used to modify a plot frame's name, model or colour.

On selecting the change option, the **plot frame change** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
New name <i>if non-blank, then the name of the selected plot frame will be changed to the name given in the new name field.</i>	input		
New model <i>if non-blank, then the selected plot frame will be moved to the model given in the new model field.</i>	input		available model
New colour <i>if non-blank, then the colour of the selected plot frame will be changed to the colour given in the new colour field.</i>	input		available colours
Pick <i>select the plot frame to be changed.</i>	button		
Change <i>update the plot frame with the information in the above panel fields.</i>	button		

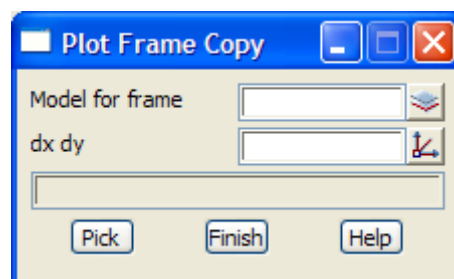
Copy

plot_frame_copy

Position of option on menu: Plot =>Plot frames =>Copy

The copy option is used to make a copy of a plot frame.

On selecting the copy option, the **plot frame copy** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Model for frame	input		available models
<i>if blank, then the model of the copied plot frame will be the same as that of the picked frame.</i>			
<i>if non-blank, then the copied plot frame will be placed in the model given in the model for frame field.</i>			
dx dy	input		xyz ops menu
<i>dx_val dy_val</i>			
<i>translation in world units to apply to the copied plot frame - given as two values separated by spaces.</i>			
Pick	button		
<i>select the plot frame to be copied - the copy will be made as soon as the selected plot frame is accepted.</i>			

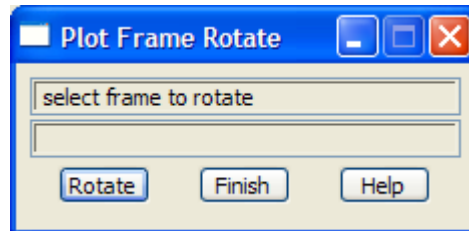
Rotate

plot_frame_rotate

Position of option on menu: Plot =>Plot frames =>Rotate

The rotate option is used to rotate a plot frame about a selected point.

On selecting the rotate option, the **plot frame rotate** panel is displayed.



The buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Rotate	button		

*after picking the **rotate** button, the user is first asked to select a plot frame to rotate, and then to selected a point to rotate about. Once the rotation point has been selected, the plot frame is further rotated by the angle made between the rotation point and the current cursor position. The plot frame will continue to rotate until a point is selected to fix the rotation angle. The option then repeats.*

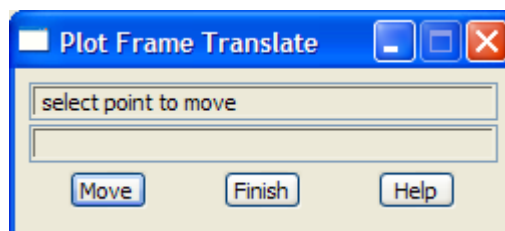
Translate

plot_frame_translate

Position of option on menu: Plot =>Plot frames =>Translate

The translate option is used to translate a plot frame.

On selecting the translate option, the **plot frame translate** panel is displayed.



The button used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Move	button		

*after picking the **move** button, the user is first asked to select a plot frame to translate. Once the plot frame has been selected, the plot frame will move with the cursor until a point is selected to give the final position of the plot frame.*

The option then repeats.

Delete

Position of option on menu: Plot =>Plot frames =>Delete

The delete option just gets up the standard **string delete** panel which can be used to delete plot frames as well as strings.

See “Delete” in the chapter “Strings”

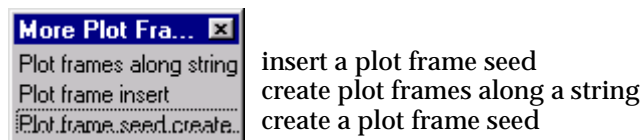
More Plot Frames

more_plot_frames

Position of menu: Plot =>Plot frames =>More

This menu contains options to create plot frame seeds, insert plot frame seeds into a view and create plot frames along a string.

The more plot frames walk-right menu is



Each option in this menu will now be described.

For the option *Plot frames along string*, go to the section “Create Plot Frames along String”

Plot frame insert “Insert Plot Frame Seed”

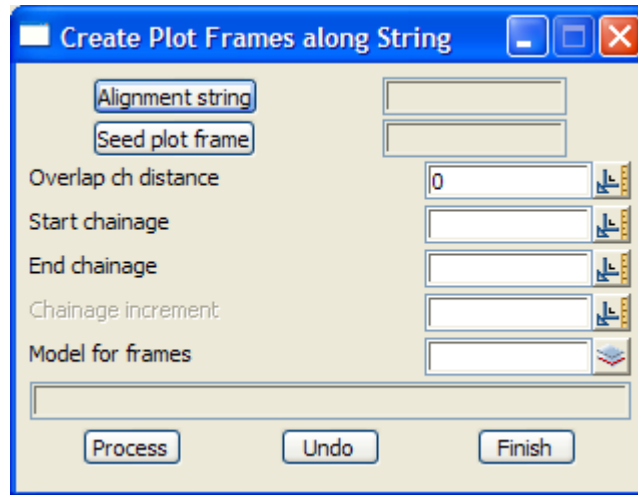
Plot frame seed create “Create Plot Frame Seed”

Create Plot Frames along String

plot_frames_panel

Position of option on menu: Plot =>Plot frames =>More =>Plot frames along string

On selecting the plot frames along string option, the **create plot frames along string** panel is displayed.



The fields and buttons used in this panel have the following functions.

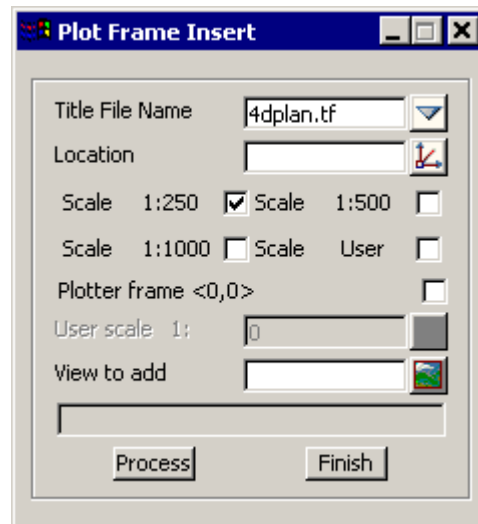
Field Description	Type	Defaults	Pop-Up
String <i>string to create plot frame along.</i>	string select		
Seed plot frame <i>plot frame to create along the selected string.</i>	plot frame select		
Overlap chainage distance <i>if non-zero, the next plot frame is started so that it includes this chainage distance of the selected string from previous plot frame.</i>	input	0	
Start/End chainage <i>start/end chainage to restrict the amount of the selected string to place plot frames along.</i>	input	0	
Chainage increment <i>if non-blank, the start of the next plot frame is placed this chainage distance along the string from the start of the previous plot frame. Used when you want to match the plot frames with the chainage interval on a long section plot. If blank, the next plot frame is placed at the chainage point at the end of the previous plot frame (minus the overlap chainage distance).</i>	input		
Model for frames <i>model to place the created plot frames in.</i>	model box		available models
Process <i>create the plots frames along the selected string.</i>	button		
Undo <i>undo the last set of plot frames created whilst this panel is up.</i>	button		

Insert Plot Frame Seed

4d_pframe_panel

Position of option on menu: Plot =>Plot frames =>More =>Plot frame insert

On selecting the insert plot frame seed option, the **plot frame insert** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Plot frame to insert <i>plot frame from the seed library to insert.</i>			plot frame seeds
Location <i>the bottom left hand corner of the plot frame in inserted at this location.</i>	xyz box		xyz ops menu
Scale <i>scale to use for the inserted plot frame.</i>	radio buttons	1: 250	1: 250, 1: 500, 1:1000, User
User scale 1: <i>if User is selected for Scale, then the required scale is entered here.</i>	tick box		
Plotter frame <0,0> <i>if tick, the bottom left hand corner of the plot frame is placed at (0,0).</i>	tick box		
View to add <i>if non-blank, add to plot frame to this view.</i>	view box		available views
Process <i>insert the selected seed plot frame at the given location at the given scale.</i>	button		

How To Use the Option

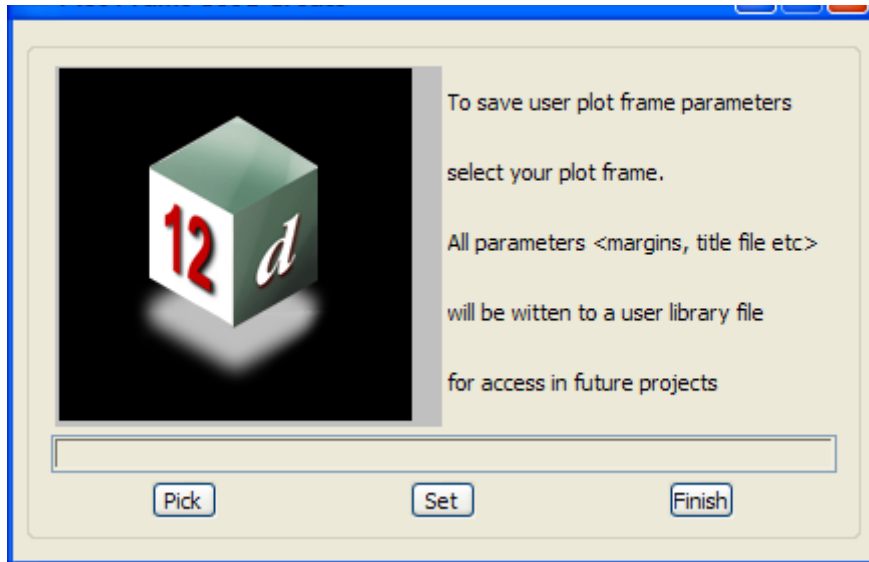
The selected plot frame is inserted at the given location with the given scale.

Create Plot Frame Seed

pframe_seed_panel

Position of option on menu: Plot =>Plot frames =>More =>Plot frame seed create

On selecting the plot frame seed create option, the **plot frame seed create** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Pick <i>pick the plot frame to add to the plot frame seed library.</i>	string select		
Add <i>add the selected plot frame to the plot frame seed library.</i>	button		available model

How To Use the Option

The plot frame contains all the information required to define the physical area in real world units to be plotted, the position on the sheet of the area being plotted, the plotter type and the plot file name.

The **create plot frame seed** panel adds selected plot frames to a library of plot frame seeds.

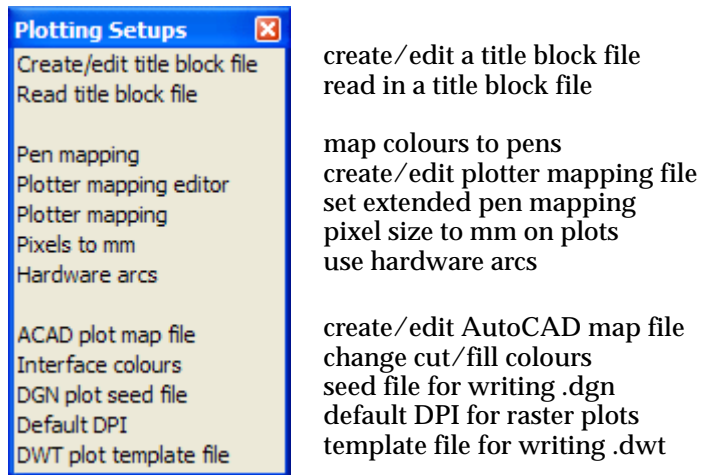
The seeds from the library can be inserted in a plan view using the insert plot frame seed option.

Plotting Setups

ppf_editors

Position of menu: Plot =>Plot and PPF editors

The Plot and PPF editor walk-right menu is



For the option *Create/edit title block file*, go to “Create/Edit Title Block File”

<i>Read title block file</i>	“Create/Edit Title Block File”
<i>Pen mapping</i>	“Pen Mapping”
<i>Plotter mapping editor</i>	“Plotter Mapping Editor”
<i>Plotter mapping</i>	“Plotter Mapping”
<i>Pixels to mm</i>	“Pixels to mm”
<i>Hardware arcs</i>	“Hardware Arcs”
<i>ACAD plot map file</i>	“ACAD Plot Map File”
<i>Interface colours</i>	“Interface Colours”
<i>DGN plot seed file</i>	“DGN Plot Seed File”
<i>DWT plot template file</i>	“DWT Plot Template File”

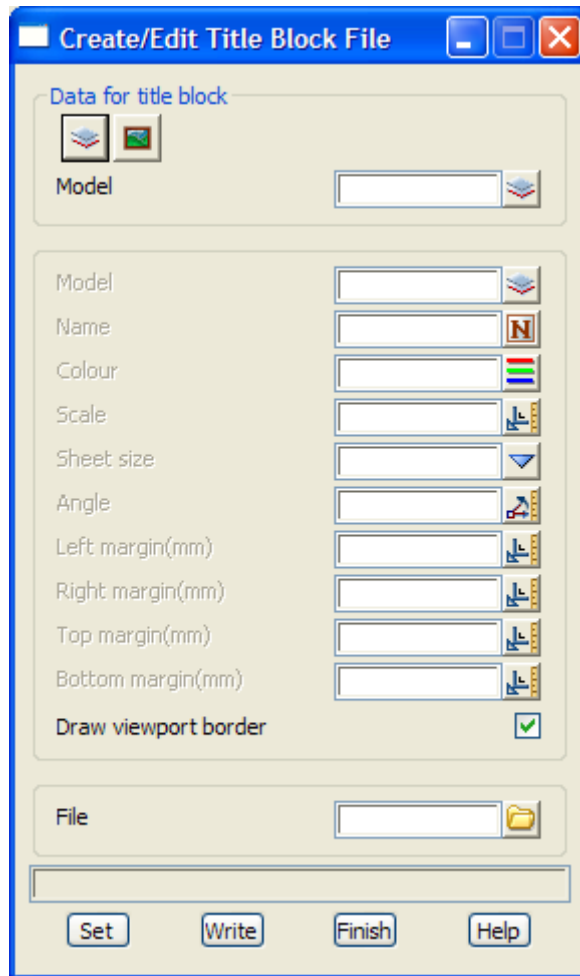
Create/Edit Title Block File

create_edit_title_block_file

Position of option on menu: Plot =>Plotting setups =>Create/edit title block file

This option is used to create a title block file from string data in a model.

The data in the model should be set up with (0,0) representing the left hand bottom of the plotting sheet and the units in model represent *millimetres* on the paper.



The fields and buttons used in this panel have the following functions:

Field Description	Type	Defaults	Pop-Up
Data Model <i>model used to create a title block file.</i>	model box		available models

Plot frame parameters

these parameters are written as attributes in the Data Model and are used as defaults for fields in the option Plots=>Plot frames=>Create

Name

name to use for the plot frame.

Model

model for the plot frame.

model box

available models

Colour <i>colour for the plot frame.</i>	colour box	available colours
Scale 1: <i>scale for the plot frame</i>	input	
Sheet size <i>sheet size for the plot frame</i>	input	available sheet sizes
Angle <i>angle of the plot frame - measured anticlockwise from the positive x-axis</i>	angle box	
Left margin, Right margin, Top margin, Bottom margin <i>margins for the plot frame</i>		
Draw viewport border <i>if tick, a border is drawn around the view port in the colour of the plot frame.</i>	tick box	tick
Title block file <i>name of the file to be created which defines a title block.</i>	file box	*.tbf files
Set <i>save the plot frame parameters as attributes in the data model.</i>	button	
Write <i>run the option – create the title block file.</i>	button	

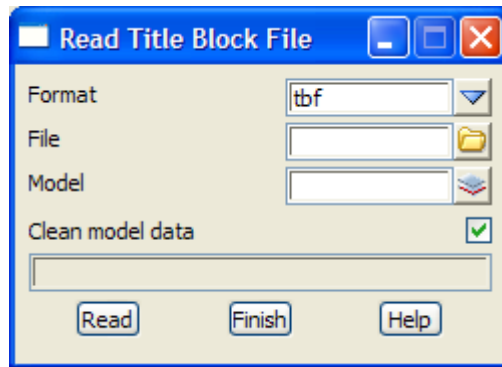
Read Title Block

read_title_block_file

Position of option on menu: Plot =>Plotting setups =>Read title block file

The **read title block file** option is for reading in a title block file and placing the lines, arcs and text defined in the title block file into a given model.

On selecting the Read title block file option, the **Read Title Block File** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Format	choice box		tbf, tf <i>specify if the format of the file is the V7 title block file (.tbf) or the older format (.tf).</i>
Title block file name	file box		<i>name of title block file to read in.</i>
Model for title block	model box		available models <i>model to place the title block in when it is read. The plot frame parameters are set as attributes for the model.</i>
Read	button		<i>read in the title block file and place the information in the given model.</i>

Pen Mapping

This option brings up the **Edit Colours** panel.

For more information on this option, go to the section “Colours” in the Chapter “Tools and Concepts”

Plotter Mapping Editor

create_plotter_mapping_file

Position of option on menu: Plot =>Plotter mapping editor

The **plotter mapping editor** is used to create a plotter mapping file which is used when making a plot from 12d Model. The plotter mapping file defines:

- the mapping from 12d Model colours to the plotter pens and weights of the plotter pen
- the colours for the plotter pens

Different *plotter mapping files* are used for different plotter configurations.

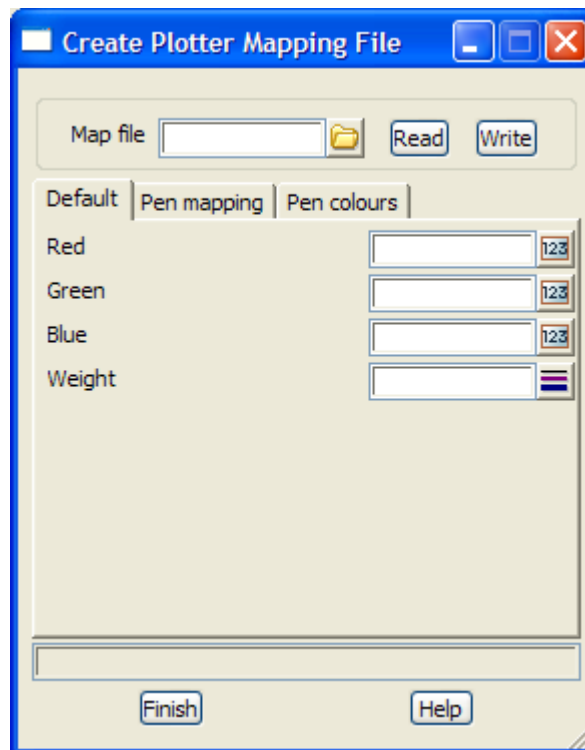
For example, different plotter mapping files would be used when plotting the same plot in 12d Model to a mono-colour plotter or to a colour plotter.

For plotting to a mono-colour plotter, 12d Model colours would be mapped to the one black pen but with possible different weights for different colours. So only one pen colour would be needed and its colour would be set to black (Red 0, Green 0 and Blue 0).

For plotting to a colour plotter, 12d Model colours could be mapped to different colours and weights on the plotter.

The text definition of the plotter mapping file is given in the next section "Plotter Mapping".

On selecting the plotter mapping editor option, the **create plotter mapping file** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Map file <i>the plotter mapping file to be created/edited.</i>	file box		*.pmf file
Read	button		

read in the plotter mapping file given in Map file

Write button

write out to plotter mapping information in the panel to the file given in Map file.

Default tab

Red/Green/Blue input

the value between 0 and 255 of red/green/blue to be used for the default pen colour.

Weight input

the default pen weight.

12d Colour mapping tab

12d Colour colour box

the 12d colour to define the pen mapping for.

Use Pen Number integer box

the number of the pen on the plotter for the 12d colour to be mapped to.

Weight real number box

the weight to use for the plotter pen for the given 12d colour.

Define Pen Colours tab

Pen Number integer box

the number of the plotter pen to define the colour for.

Red/Green/Blue input

the value between 0 and 255 of red/green/blue to be used for the colour of the plotter pen.

Plotter Mapping

plotter_mapping_table

Position of option on menu: Plot =>Plotter mapping

The **plotter mapping file** can be used use with pen plotters but is more specifically designed for electostatic and inject plotters and allows the user to

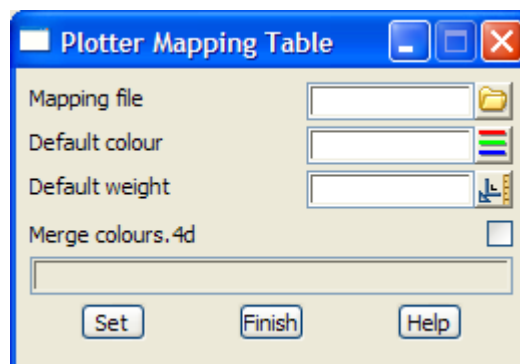
- (a) map the full 10,240 12d Model colours to particular plotter pens and also specify a width (or weight) to be used forPCL5, HPGL2 and postscript plotters.
- (b) specify the red, green and blue mix for pens on HPGL2 and colour postscript plotters

There are also two special formats of the plotter mapping file which are used for plotting to Autocad dxf/dwg and Intergraph dgn. The special mapping files use the 12d Model colour as a key to tables which control how the information is passed to DXF/DWG and DGN.

- (c) .tbl file used with plotting to Intergraph dgn
- (d) .amf used with plotting to Autocad dxf and dwg

The .tbl and .amf files are documented in the “Definition and Example of a .tbl File” and “Definition and Example of a .amf File” sections in the Appendix “Plotters and Plotting” .

On selecting the plotter mapping option, the **plotter mapping table** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Mapping file <i>the plotter mapping file to be used when plotting. If no plotter mapping file is given, the pen mapping table is used.</i>	input		*.pmf file
Default colour <i>the rgb of this colour is used as the rgb for the default pen colour.</i>	input		available colours
Default weight <i>if not blank, the default pen weight.</i>	input		
Merge colour_map.def <i>If tick, the rgb columns from the colour_map.def file are used to define the pen_colours (first row is pen 0, second row is pen 1 etc.), and the pen mapping number is used to construct the pen_mapping table.</i>	tick-cross	tick	
Set <i>set the information in the panel</i>	button		

Plotter Mapping File

The plotter mapping file (.pmf) consists of two sections and two default values:

- (a) the **pen_mapping** table which defines the plotter pens that the **12d** Model colours are mapped to, and the weights for each "12d Model colour to plotter pen" mapping.

The `pen_mapping` table consists of the key word `pen_mapping` followed by the mapping for each **12d** Model colour to the appropriate plotter pen number and pen weight (one per line), all enclosed in curly braces (`{ }`).

```
pen_mapping {                               // pen mapping and weight table

//12d Model colour number      plotter pen number      pen weight

          0                      1                      0.15
          1                      2                      0.25
          3                      1                      0.5
//          etc.
}
```

- (b) the **pen_colours** table which defines the red, green and blue values to be used for the pens on the plotter.

The `pen_colours` table consists of the key word `pen_colours` followed by the red, green and blue values for the plotter pens (one per line), all enclosed in curly braces (`{ }`).

```
pen_colours {                               // pen colours table
//pen      red      green      blue      values 0-255
  0        0        0        0        // pen 0 is black
  1       255        0        0        // pen 1 is red
//          etc.
}
```

- (c) the **default_weight** command that goes at the top of the file (not inside the `pen_mapping` or `pen_colours` table) which is used as the weight for any **12d** Model colour used in the plot but not mapped and given a weight in the `pen_mapping` table.

```
default_weight      weight
```

- (d) the **default_colour** command that also goes at the top of the file (not inside the `pen_mapping` or `pen_colours` table) which defines the default red, green and blue for any pens used but not set in the `pen_colours` table.

```
default_colour      red      green      blue
```

Initialization of the plotter mapping file

When using the plotter mapping table panel:

When used with the **plotter mapping table** panel, the `pen_mapping` and `pen_colours` tables are initialised before the plotter mapping file is used. This is to ensure that any colours and/or pens not mentioned in the file but used in a plot, do have valid definitions.

Hence the initialisation sequence for the plotter mapping file used with the **plotter mapping table** panel is:

Before the plotter mapping file is used, a default `pen_mapping` table for colours 0 to 255 is set up by:

colour `n` goes to pen `n` with the default weight from the **plotter mapping table** panel.

Before the plotter mapping file is used, a default `pen_colours` table for pens 0 to 255 is set up by:

pen `n` is given the red, green and blue of the default colour from the **plotter mapping table** panel.

If the **merge colours.4d** flag is set in the **plotter mapping table** panel, the **rgb** columns from the **colours.4d** file are used to define the **pen_colours** (first row is pen 0, second row is pen 1 etc.), and the pen mapping number is used to construct the **pen_mapping** table.

The **plotter mapping file** is then processed and over writes any of the above initial mapping values.

When using user defined plotters:

A plotter mapping file can be set for a user defined plotter in the file *plotters.4d*.

In this case, the **plotter mapping table** panel is **not** used and hence the initialisation sequence is slightly different.

When used with the **plotter mapping table** panel, the **pen_mapping** and **pen_colours** tables are initialised before the plotter mapping file is used. This is to ensure that any colours and/or pens not mentioned in the file but used in a plot, do have valid definitions.

For a **user defined plotter**, the initialisation sequence for the plotter mapping file is:

Before the plotter mapping file is used, a default **pen_mapping** table for colours 0 to 255 is set up by:

colour *n* goes to pen *n* with the **default weight** *default_weight* from the specified plotter mapping file, or zero if the *default_weight* does not exist.

Before the plotter mapping file is used, a default **pen_colours** table for pens 0 to 255 is set up by:

pen *n* is given the red, green and blue of the **default colour** *default_colour* from the specified plotter mapping file, or **rgb 0 0 0** if the *default_colour* does not exist

The **plotter mapping file** is then processed and over writes any of the above initial mapping values.

An Example of a Plotter Mapping File

An example of a plotter mapping file (.pmf) is:

```

default_colour      100      0      100
default_weight      0.1

pen_mapping {
// pen mapping and weight table
//      colour      pen      weight
      0      1      0.15      // map colour 0 to pen 1 with weight 0.15
      1      2      0.25      // map colour 1 to pen 2 with weight 0.25
      3      1      0.5       // map colour 3 to pen 1 with weight 0.5
}
pen_colours {
// pen colours table
//pen      red      green      blue      values 0-255
      0      0      0      0      // pen 0 is black
      1      255     0      0      // pen 1 is red
      3      0      255     0      // pen 3 is green
}

```

Pixels to mm

[pixels_to_millimetres_plot_factor](#)

Position of option on menu: Plot =>Pixels to mm

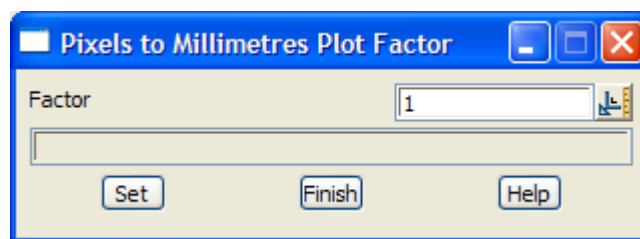
To plot an object, it must be possible to calculate the size in millimetres that the object will have in the plot.

However, in **12d Model** it is possible for text and linestyles to be defined in the screen unit pixels, and since the size of a pixel varies between screens, there is no direct millimetre equivalent for a pixel.

To allow text and linestyles with only a pixel size to be plotted, a factor to convert pixels to millimetres is used.

When plotting, all text and linestyles defined only in pixel units is **multiplied** by the pixels-to-millimetre factor to determine its size in the plot.

On selecting the pixel to mm option, the **pixels to millimetres plot factor** panel is displayed.



To define a new factor, simply type the value into the factor field and select **set**.

The pixel-to-millimetres value is stored for the project.

For a new project, the initial value is loaded from the **defaults** file and is defined in the file by

```
PIXELS TO MM PLOT FACTOR    value
```

Hardware Arcs

[draw_hardware_arcs](#)

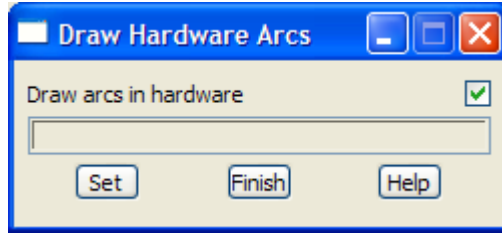
Position of option on menu: Plot =>Hardware arcs

When plotting arcs, the arc can either be broken into a series of straight lines within **12d Model**, or plotted using the arc command (if it exists) for the relevant plotter.

This option allows the user to choose whether

- (a) the plotter arc command is used (hardware arcs)
- or
- (b) before plotting, the arc is broken into a series of lines.

On selecting the hardware arcs option, the **draw hardware arcs** panel is displayed.



To use hardware arcs in plots, simply change the draw arcs in hardware tick-cross box to tick and select **set**.

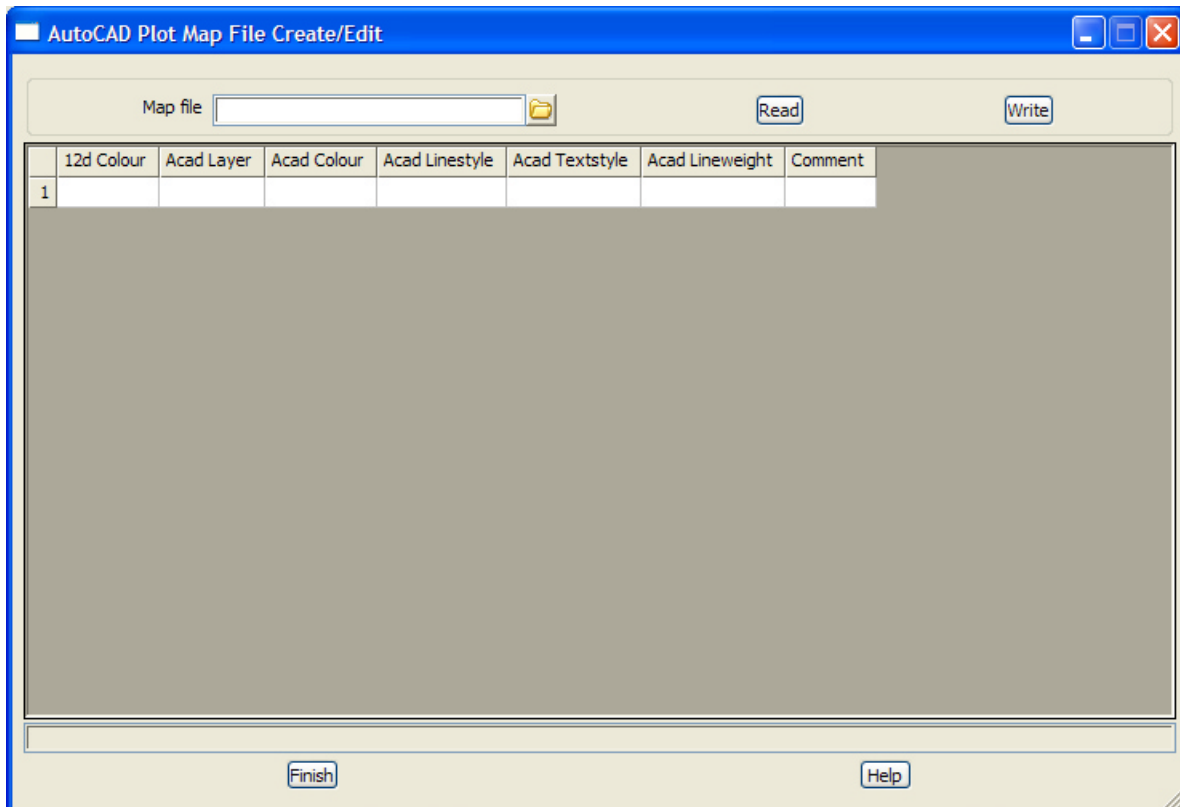
ACAD Plot Map File

[autocad_plot_map_file_create_edit](#)

Position of option on menu: Plot =>Plotting setups =>ACAD plot map file

When plotting to AutoCAD, an Autocad map file can be used which uses the 12d Model colour of an entity in the plot as a key to mapping the entity into AutoCAD.

On selecting the ACAD plot map file option, the AutoCAD Map File Create/Edit panel is displayed.



Interface Colours

plotting_colours_for_interface_strings

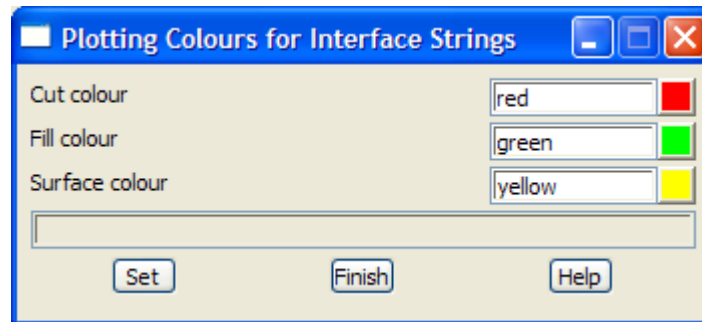
Position of option on menu: Plot =>Interface colours

When drawing interface strings in 12d Model, cut areas are denoted in red, fill areas in green and sections on the surface in yellow.

However, when plotting it is convenient to be able to map the interface colours to other colours.

This panel is used to define new colours for the interface colours, and the new colours are then mapped to pens using the pen mapping table or plotter mapping file.

On selecting the interface colours option, the **plotting colours for interface string** panel is displayed.



To define new colours, simply type the values into the appropriate panel fields and select **set**.

Note - the new interface colours are not used for displaying interface strings in 12d Model, only for plotting.

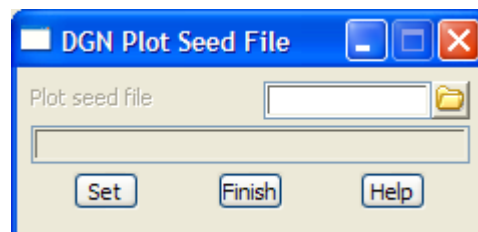
DGN Plot Seed File

dgn_plot_seed_file

Position of option on menu: Plot =>DGN plot seed file

When creating plot files in Intergraph DGN format, an Intergraph DGN seed file can be used.

On selecting the DGN plot seed file option, the **DGN plot seed file** panel is displayed.



To define an Intergraph IGDS plot seed file to use for Intergraph plotting, simply type the file name into the plot seed file panel field and select **set**.

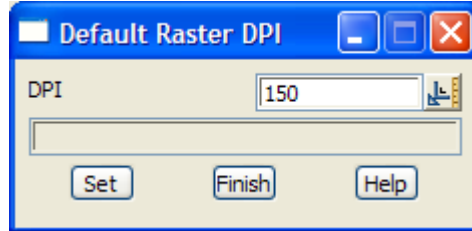
Default DPI

default_raster_dpi

Position of option on menu: Plot =>Default DPI

This defines the default DPI (dots per inch) when plotting rasters.

On selecting Default DPI, the **Default Raster DPI** panel is displayed.



The *DPI* value give the default dots per inch that is used for plotting rasters.

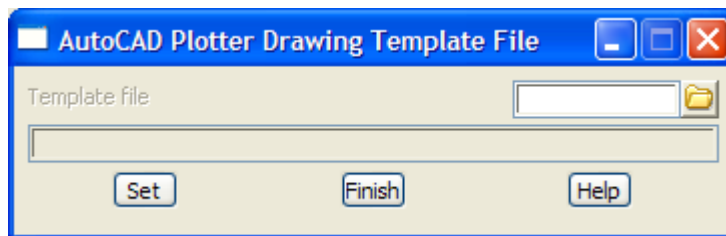
DWT Plot Template File

autocad_plotter_drawing_template_file

Position of option on menu: Plot =>DWG plot template file

When creating plot files in AutoCAD format, an AutoCAD template file can be used.

On selecting the DWT plot template file option, the AutoCAD Plotter Drawing Template File panel is displayed.



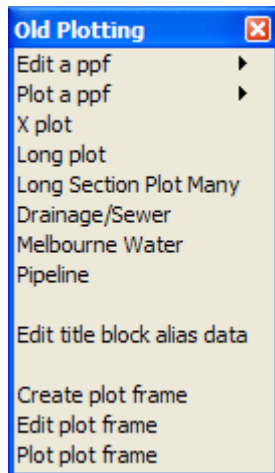
To define an AutoCAD plot seed file to use for AutoCAD plotting, simply select either *DWG* or *DXF* for the File format, type the file name into the plot seed file panel field and select **set**.

Old Plotting

old_plotting

Position of menu: Plot =>Plot =>Old plotting

The Old plotting walk-right menu is



edit a V5ascii ppf
 plot a V5 ascii ppf
 V5 x-section plotting
 V5 long section plotting
 V5 plotting many long section plotting
 V5 drainage long section plot
 V5 Melb water sewer long section plot
 V5 pipeline long section plot

Edit title block alias data for V5 ppfs

create a V5 plot frame
 edit a V5 plot frame
 plot a V5 plot frame

For the option *Edit a ppf*, go to

Plot a ppf

X plot

Long plot

Long section plot many

Drainage/sewer

Melbourne Water

Pipeline

Edit title block alias data

Create plot frame

Edit plot frame

Plot plot frames

“Edit a ppf”

“Plot a ppf”

“X Plot”

“Long Plot”

“Plot Many Long Sections”

“Drainage Longsections” in chapter “Drainage and Sewer”

“Melbourne Water” in chapter “Drainage and Sewer” .

“Plots” in chapter “Pipeline” .

“Title Block Data Editor”

“Create Old Plot Frame”

“Editor Old Pot Frame”

“Plotting Old Plot Frames”

Edit a ppf

directory__ppf

edit_a_file__ppf

Position of option on menu: Plot =>Old plotting =>Edit a ppf

The edit a ppf option is used to edit V5 ascii plot parameter files (*.ppf) with the editor pointed to by the EDITOR_4D environment variable.

The edit a ppf walk-right menu provides a list all the plot parameter files (files ending in .ppf) in the current folder.

When a file is selected from the list, it is loaded into the editor pointer to by the environment variable EDITOR_4D.

Plot a ppf

directory__ppf

Position of option on menu: Plot =>Old plotting =>Plot a ppf

The V5 ascii ppf's for long section, cross section and plot frames can have enough information in them to totally generate the plot from the ppf. The plot a ppf option is used to plot such a plot parameter file (*.ppf).

The plot a ppf walk-right menu provides a list all the plot parameter files (files ending in .ppf) in the current folder.

When a file is selected from the list, it is then used to generate a plot.

Note - the plot parameter file is defined in the chapter **Advanced Plotting**.

X Plot

cross_section_plot section_x_plot_title

Position of option on menu: Plot =>Old plotting =>X plot

The x plot option is used to make the traditional pages of cross-section plots, that is, stacked x-sections, with offsets and elevations labelled for each cross section string, and elevations displayed for each of the tins on the section view.

For 12d Model V5, each string to be plotted is assumed to be on a straight line in plan. Hence the cross section is taken as a straight line from the first point of the string to the last point of the string. The chainage of the first point of the string is used as the offset.

For 12d Model V6 and above, sections do not have to be a straight line in plan. The chainage of the first point of the string is used as the offset.

The format of the x-section plot is partially controlled by fields in the **Section X Plot** panel but more extensive control is possible using a **plot parameter file** (*.ppf). The plot parameter file is fully documented in the "Cross Section Plot Parameter File" section of the Appendix, "Plot Parameters".

The cross section plot is tailored by using the plot parameter file (.ppf file) given in the plot parameters field. A default .ppf file is set by pointing to it with the environment variable

X_SECTION_PPF_4D pathname of default .ppf file

In the pathname to the default .ppf file, \$LIB is used to stand for the library folder set by LIB_4D. For example, "\$LIB/cross.ppf" is the file cross.ppf in the library area.

Which x-sections are to be plotted is specified by giving the model containing the appropriate cross sections. Sections are also drawn through any triangulations and service items on the section view. Vertical exaggeration, services and corridor settings are taken from a plot parameter file or from the settings for the section view.

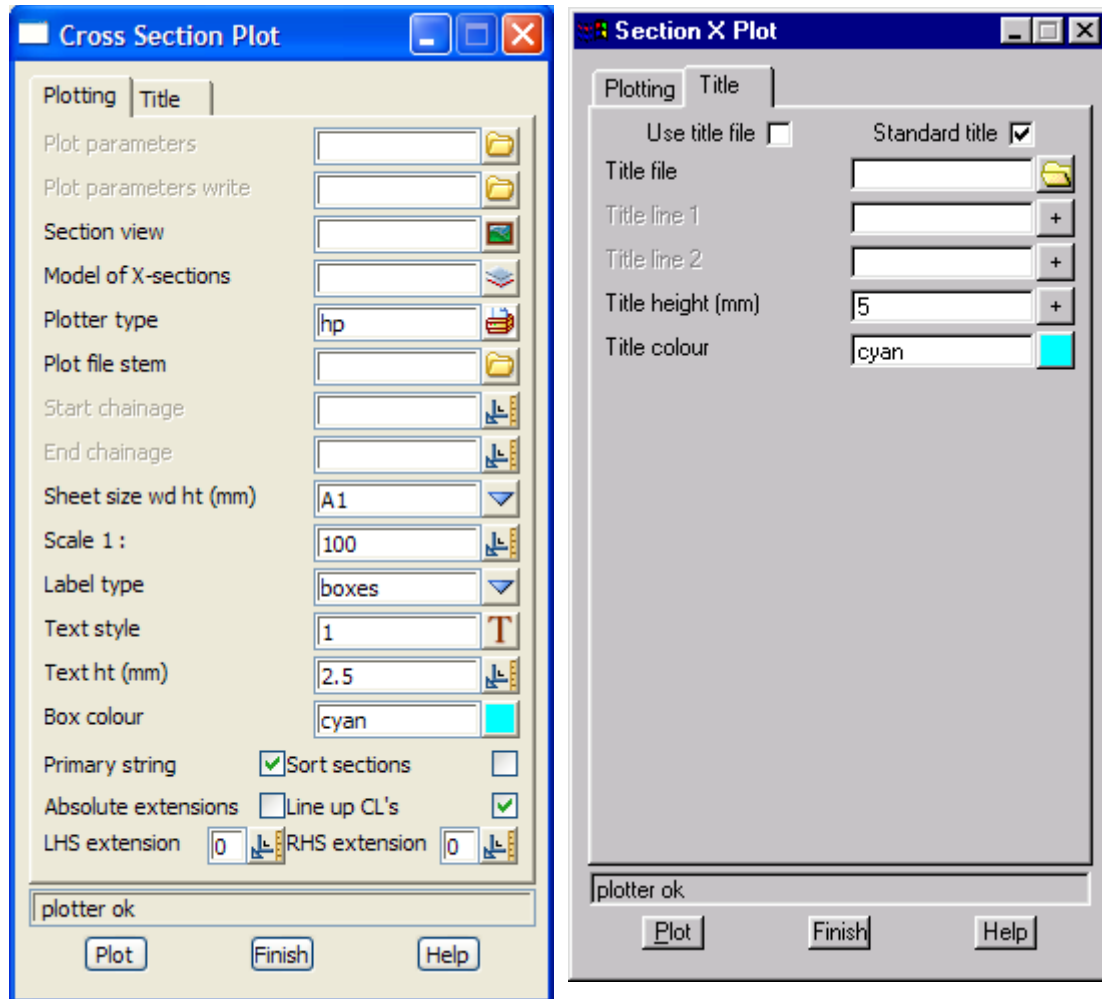
X-sections can be labelled with either the offset from the centreline and heights for each of the x-section points, or simply the position of the centre-line.

The required page size is given, plus the scale (the vertical exaggeration is taken from the view settings) and the sections are then plotted in columns on the plotter page. Once a page is full, a new plot page is automatically begun.

The stacked x-section plots in each column can be lined up by their centre-lines.

After selecting the x plot option, the **section x plot** panel is displayed.

The **title** button on the bottom of this panel controls the use of a title block file and the plotting of a border and two lines of title. If the **title** button is selected, the **section x plot title** panel is displayed.



The fields and buttons used in the first panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Plot parameters	input	X_SECTION_PPF.4D*.ppf	

file of plot parameters used for extra control of the x section plot. The default .ppf file is pointed to by the environment variable X_SECTION_PPF_4D.

For more information on the x section plot parameters, please go to the section “Cross Section Plot Parameter File” in the Appendix “Plot Parameters”

Plot parameters write	input		*.ppf
------------------------------	-------	--	-------

file to write a copy of the plot parameters necessary to regenerate the plot.

Section view	input/output	current view	available views
---------------------	--------------	--------------	-----------------

section view to use for plot definitions such as the tins to profile, the models of services, corridor width and vertical exaggeration.

Model of X-sections	input		available models
----------------------------	-------	--	------------------

the model containing all the x-sections to be plotted. The x-sections are plotted in the same order as they are in the model.

Each string to be plotted is assumed to be on a straight line in plan. Hence the cross section is taken as a straight line from the first point of the string to the last point of the string. The chainage of the first point of the string is used as the offset.

Plotter type	input	hp	hp, dxf, postscript etc.
---------------------	-------	----	--------------------------

file format for the plot output.

- Plot file stem** input
since more than one plot page may be produced, the plot file stem plus a plot page sequence number followed by the ending for the plotter type is used as the plot file names.
- Start/end chainage** input
the plots cover the chainage range for the cross sections given by the start and end chainage fields. If the start/end chainage is blank, the start/end chainage of the x-section strings are used.
- Sheet size wd ht (mm)** input available sheet sizes
must contain the width and height values (separated by space) or the name of a user defined sheet size.
- Scale 1:** input
horizontal scale for plotting the x-sections.
- Label type** input boxes boxes, centreline
if boxes, the offset from the centreline and heights for each point in the x-section will be plotted in the traditional offset/height boxes.
if centre line, only the position of the centre-line and the height of the section at that point will be drawn.
- Text style (mm)** input 1
text style to be used in the x section plot boxes or centreline labelling.
- Text ht (mm)** input 3
height (in millimetres) to plot the offset and heights in the boxes in the plots of the x-sections
- Offset colour** input red available colours
colour used for the offset text and the boxes.
- Primary string** tick-cross tick
if tick, the string from the model of x-sections (the primary string) is plotted.
- Sort sections** tick-cross tick
if tick, the strings from the model of x-sections are sorted by chainage along the design string.
- Absolute extensions** tick-cross
If tick, the sections are only drawn from the centreline out to the left and right extension distances. if no tick, the left and right extension values are added to the section left and right widths, and the section is taken between the extended values
- Line up CL's** tick-cross tick
if tick, the centre-lines are lined up under each other for each plot in a column.
- LHS extension** input 0
distance to extend the x-section to the left.
- RHS extension** input 0
distance to extend the x-section to the right.
- Title** button
bring up the panel for defining information in the title block.
- Plot** button
write out the plots for the x-sections given in the model of x-sections field.
- The fields and buttons in *title* tab are:
- Use title file** tick-cross
if tick, a user defined title block file is used.

Standard Title	tick-cross	tick	
	<i>if tick, the standard 4D Solutions border and two lines of title are placed on the bottom of the plot</i>		
Title file	input		*.tf
	<i>if non-blank and use title file is set to tick, then the file given in this field is used to generate a user defined title block for the plot.</i>		
Title line 1/2	input		
	<i>first/second line of title information</i>		
Title height (mm)	input	5	
	<i>height (in millimetres) to draw the characters in the two lines of title information.</i>		
Title colour	input	cyan	available colours
	<i>colour used for the border and the title information.</i>		

Long Plot

[long_section_plot](#)

[section_long_plot_title](#)

[section_long_plot_title](#)

[section_long_plot_pagination](#)

Position of option on menu: Plot =>Old plotting =>Long plot

The long plot option is used to make traditional long section plots with string chainages and elevations labelled for the primary string and elevations and depths displayed for each of the tins on the section view.

The format of the long section plot is partially controlled by fields in the section long plot panel but more extensive control is possible using a **plot parameter file** (*.ppf). The plot parameter file is fully documented in the “Long Section Plot Parameter File” section of the chapter, “Plot Parameters” .

After selecting the long plot, the **section long plot** panels respectively, is displayed.

The long section plot is tailored by using the plot parameter file (.ppf file) given in the plot parameters field. A default .ppf file is set by pointing to it with the environment variable

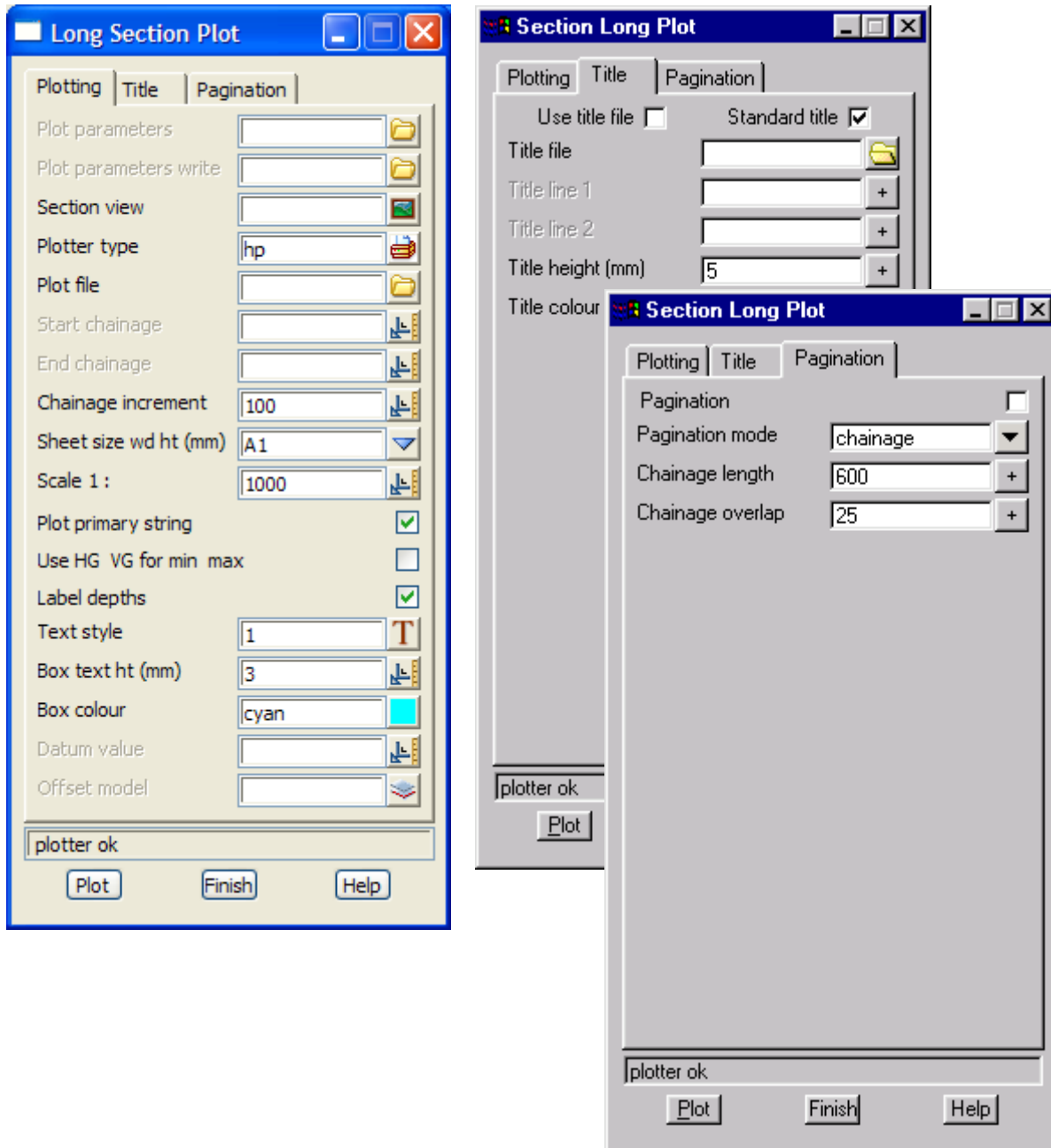
LONG_SECTION_PPF_4D pathname of default .ppf file

In the pathname to the default .ppf file, \$LIB is used to stand for the library folder set by LIB_4D. For example, "\$LIB/long.ppf" is the file long.ppf in the library area.

The **title** button on the bottom of this panel controls the use of a title block file and the plotting of a border and two lines of title. If the **title** button is selected, the **section long plot title** panel is displayed.

The **pagination** button on the bottom of this panel controls whether the long section plot is broken into pages, by a chainage length or millimetres of plot.

If the **pagination** button is selected, the **section long plot pagination** panel is displayed.



The fields and buttons used in the two panels have the following functions.

Field Description	Type	Defaults	Pop-Up
Plot parameters	input	LONG_SECTION_PPF_4D*.ppf	
<i>file of plot parameters used for extra control of the long section plot. The default .ppf file is pointed to by the environment variable LONG_SECTION_PPF_4D.</i>			
<i>For more information on the long section plot parameters, please go to the section “Long Section Plot Parameter File” in the Appendix “Plot Parameters”</i>			
Plot parameters write	input		*.ppf
<i>file to write a copy of the plot parameters necessary to regenerate the plot.</i>			
Section view	input/output	current view	available section views
<i>section view to use for plot definitions such as the tins to profile, the models of services, corridor width and vertical exaggeration.</i>			

Plotter type	input	hp	hp, dxf, postscript etc.
	<i>file format for the plot information.</i>		
Plot file	input		*.hp etc.
	<i>name of the file to write out the long section plot to.</i>		
Start/end chainage	input		
	<i>the plot covers the chainage range given by the start and end chainage fields. If the start/end chainage is blank, the start/end chainage of the primary string is used.</i>		
Chainage increment	input	100	
	<i>chainage increment to label the long plot with chainage and height values.</i>		
Sheet size wd ht (mm)	input		available sheet sizes
	<i>The width and height values (separated by space) or the name of a user defined sheet size.</i>		
Scale 1:	input		
	<i>horizontal scale for the plot. The vertical scale is taken from the ppf or the section view.</i>		
Plot primary string	tick box	tick	
	<i>if tick, the primary string is plotted along with any horizontal geometry displayed in the section view.</i>		
Use HG VG for min, max	tick box	tick	
	<i>if tick, the chainage range available for plotting is from the minimum of the horizontal geometry (HG) and the vertical geometry (VG) to the maximum of the HG and VG. Useful for kerb returns. If no tick, the chainage range available for plotting is from the minimum of the horizontal geometry (HG) to the maximum of the HG.</i>		
Label depths	tick box	tick	
	<i>if tick, label in boxes at the bottom of the plot, the distance between the primary string and the tins.</i>		
Text style	input	1	
	<i>text style to be used in the long section plot boxes.</i>		
Box text ht (mm)	input	3	
	<i>height (in millimetres) to plot the chainage and elevations in the boxes in the long section plot.</i>		
Box colour	input	cyan	available colours
	<i>colour used for the chainage text and the boxes.</i>		
Datum value	input		
	<i>if non-blank, the value to be used as a datum. If blank, then a suitable datum value will be calculated.</i>		
Offset model	input		available models
	<i>if non-blank, then all the strings in the offset model will be projected onto the primary string and drawn and labelled on the long section plot.</i>		
Pagination	button		
	<i>button to bring up the section long plot pagination panel.</i>		
Title	button		
	<i>button to bring up the section long plot title panel.</i>		
Plot	button		
	<i>write out the plot for the long section plot between the chainages given in the start and end chainage fields. The format of the file is given by the plotter type</i>		

The fields and buttons in *title* tab are:

Use title file	tick-cross		
	<i>if tick, a use supplied title block file is used.</i>		
Standard Title	tick-cross	tick	
	<i>if tick, the standard 4D Solutions border and two lines of title are placed on the bottom of the plot</i>		
Title file	input		*.tf
	<i>if non-blank and use title file is set to tick, then the file given in this field is used to generate a user defined title block for the plot.</i>		
Title line 1/2	input		
	<i>first/second line of title information</i>		
Title height (mm)	input	5	
	<i>height (in millimetres) to draw the characters in the two lines of title information.</i>		
Title colour	input	cyan	available colours
	<i>colour used for the border and the title information.</i>		

The fields and buttons in *pagination* tab are

Pagination	tick-cross	tick	
	<i>if tick, the long section plot is broken into separate plots of length given in the length field, from the start chainage to the end chainage. If the overlap field is non-zero, then each page of the long section plot also includes the overlap value of the end of the previous page of plot.</i>		
	<i>The units for length and overlap can be either chainage distance or millimetres on the plot page.</i>		
	<i>Hence apart from the first page and possibly the last page, the plot will have a total length given by the sum of the length and the overlap panel fields.</i>		
Pagination mode	input	chainage	chainage, millimetres
	<i>the units for length and overlap can be either chainage distance or millimetres on the plot page.</i>		
	<i>If pagination mode is set to chainage, the units are chainage distance.</i>		
	<i>If pagination mode is set to millimetres, the units are millimetres on the plot.</i>		
Length	input	600	
	<i>if pagination is set to tick, the length of new plot to be included in the current plot.</i>		
Overlap	input	25	
	<i>if pagination is set to tick, the length of the previous plot page to be included in the current plot.</i>		

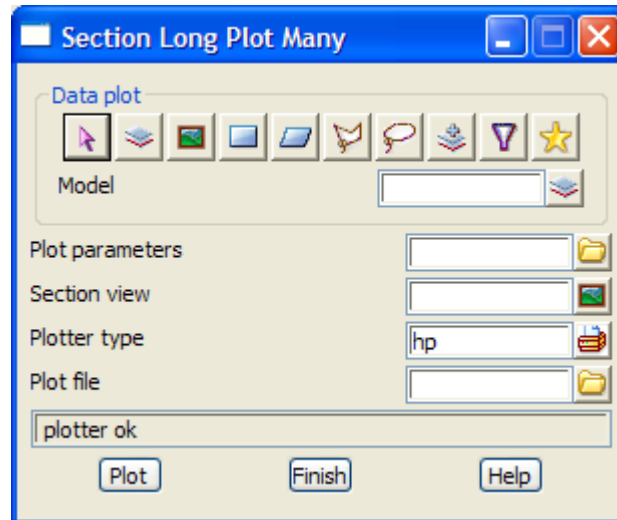
Plot Many Long Sections

[section_long_plot_many](#)

Position of option on menu: Plot =>Old plotting =>Longsection plot many

The Long section plot many option is used to plot individual long section plots for each string selected by the Data source.

On selecting the Long section plot many option, the **Section Long Plot Many** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Data to plot - Data source type

data source type.

Data source

*when the **plot** button is selected, long section plots are created for all the strings selected by the data source.*

Plot parameters	input		*.ppf files
------------------------	-------	--	-------------

file of plot parameters to be used for the long section plots.

Section view	input		available views
---------------------	-------	--	-----------------

name of the section view for defining information for the long section plots. For example, tins to plot.

Plotter type	input	hp	available plotters
---------------------	-------	----	--------------------

type of plotter to plot to.

Plotter file	input		
---------------------	-------	--	--

stem of the name to use for the long section plots.

Plot	button		
-------------	--------	--	--

*when the **Plot** buttons is selected, individual long section plots will be created for all the strings selected in the data source field.*

Drainage/Sewer Plot

Position of option on menu: Plot =>Old plotting =>Drainage/Sewer

The Drainage/sewer plot option is for creating drainage and/or sewer long-section plots.

The option has already been described under **Design=>Drainage-sewer =>Plots**.

See "Drainage Longsections" in chapter "Drainage and Sewer"

Melbourne Water Sewer Plot

Position of option on menu: Plot =>Old plotting =>Melbourne Water

The Melbourne Water sewer plot option is for creating sewer long-section plots to Melbourne Water specifications.

The option has already been described under **Design =>Drainage-sewer =>Plots**.

See “Melbourne Water” in chapter “Drainage and Sewer”

Pipeline Plot

Position of option on menu: Plot =>Old plotting =>Pipeline

The Pipeline plot option is for creating pipeline long-section plots.

The option has already been described under **Design =>Pipeline =>Plots**.

See “Plots” in chapter “Pipeline”

Title Block Data Editor

title_file_alias_panel

Position of option on menu: Plot =>Old Plotting =>Edit title block data

NO LONGER USED IN V7

This panel is used to easily change to data in your drawing title blocks (set values for the user_text_n field in a title file).

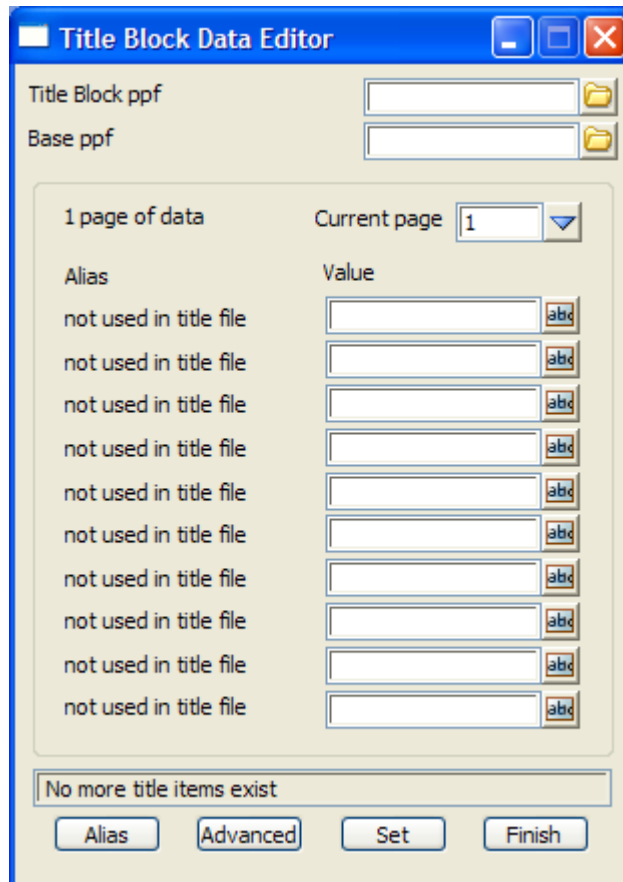
The **Title block ppf** is the ppf that is created by the panel. You may want to create a title block ppf for every drawing you create. This way you can easily re-plot a drawing with the same title block data. This is the ppf name that you will use in the future plot panels when you are ready to plot using the title block.

The **Base ppf** field is an existing ppf that includes all of your default plot parameters for creating your drawing. It must reference a title file.

12d marks the location of your title block data using the variables *user_text_1*, *user_text_2* etc. Since it is difficult to remember what *user_text_1* represents in the title block, 12d allows you to use a meaningful name reference (Main title for example) instead of *user_text_1*. The Alias button allows you to set these alias names for the title file referenced in your base ppf.

The Advanced button is only used if the same text data is to be used in another Title Block ppf (share the data between drawing).

The Set button creates/updates the title block ppf and the title file values that you entered.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Title block ppf

this is the ppf that is created by the panel. This is the ppf name that you will use in the future plot panels when you are ready to plot using the title block. The Title Block ppf is usually stored locally (in the current folder).

Base ppf

this ppf must exist (often in library or your user library). It will contain all of your default plot parameters for creating your drawing. It must reference a title file (see notes below). When you press enter, the ppf file is read to find the name of the title file you reference. Once the title file is found, the alias names are read from the title alias file if available.

To convert an existing ppf file into a Base ppf file use a text editor to delete all references to *user_text_n* variables in the file.

Current page	choice box	available pages
--------------	------------	-----------------

if more than one page of data (10 fields) are required additional pages will be listed here.

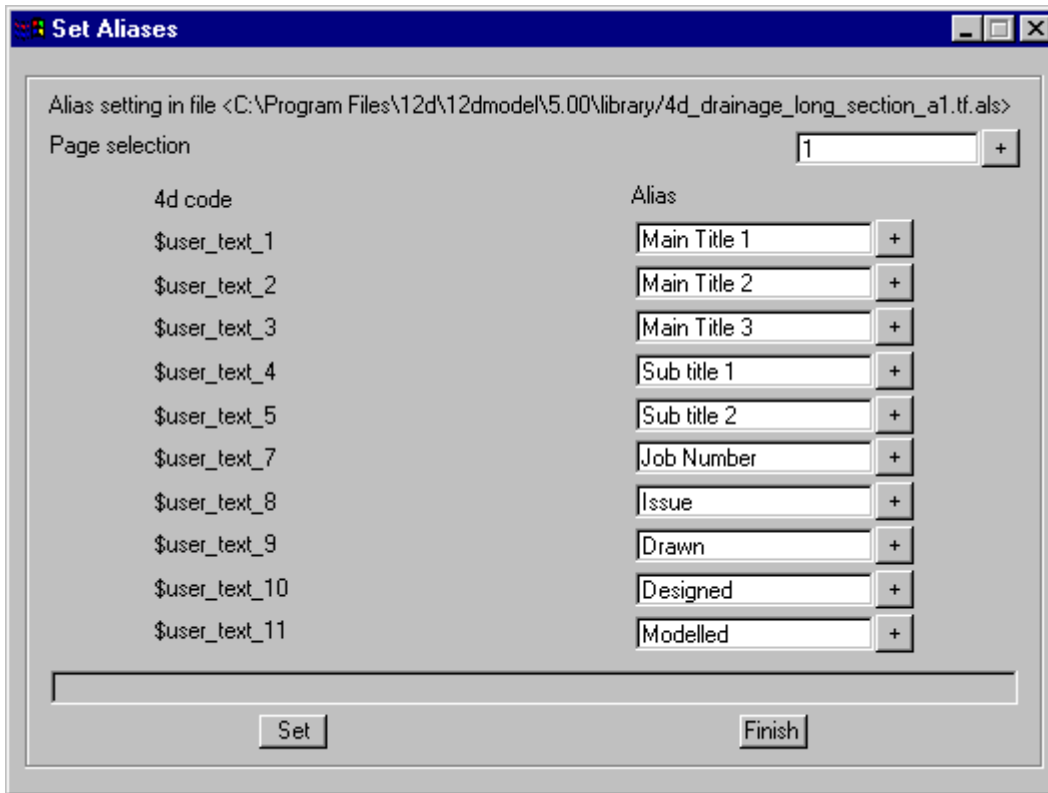
Value	input box
-------	-----------

the data to be shown into your drawing title block is entered here. The description to the left is either *\$user_text_n* (Note that there may be gaps in the numbering sequence) or an alias that has been set up using the alias button below.

Alias	button
-------	--------

if the fields have the names *\$user_text_1*, *\$user_text_2* etc. use the button to change the names

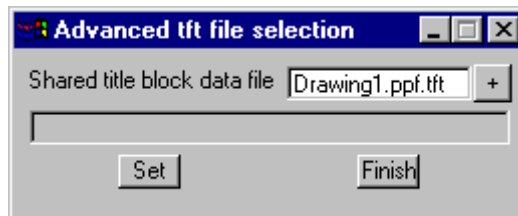
to a more meaningful description. These new names will be stored in the same folder as the with the title file specified in your base ppf file (the extension *als* will be added). The following panel will be displayed.



Note that there may be gap in the *\$user_text_n* sequence. Only the variable used in the title file will be listed.

Advanced button

this feature allows you to share text data between different *title block ppf* files. The actual text data is stored in a title file txt (*.tft) file. Selecting the button will bring up the following panel and allow you to change the *.tft file to be used. Generally you will select a *.tft file previously set up for another title block file.



Select the **Set** button to set your select. The text data will be read and the main panel updated when you select the **Finish** button.

Set button
creates/updates the Title block ppf file and *.tft file.

Notes:

Short-cuts:

*.als and *.tft files can be copied, renamed and then edited using the Title Block Edit Panel or your own text editor.

Alias files (*.als) are kept in the same folder as the your title files. Once you have one alias file set up copy the alias file and rename the copy the same name as the title file but add the additional extension .als. For example:

```
title file    4d_drainage_long_section_a1.tf
alias file    4d_drainage_long_section_a1.tf.als
```

CAUTION: The *user_text_n* variables should represent the same data in both title files. For example *user_text_1* should be the main title in both files.

Title file text files (*.tft see advanced) files are kept in the same folder as the your Title block ppf. If you choose not to share a tft between Title block ppf files you can simply copy and rename them. Once you have saved one *.tft file, copy the file and rename the copy the same name as the title block pp file but add the additional extension .tft

```
Title Block ppf file    drawing 1.ppf
title file text file drawing 1.ppf.tft
```

Title Block ppf

The title block ppf file does not contain any data itself. Rather it references a *.tft file containing the text data and your base ppf file (file containing all of your default plot parameters). An example ppf file follows:

The Title Block ppf file is a ppf file with the Base ppf and user text values (in the tft file) referenced by #include statements.

```
#define ALIAS 1
section_long_plot "plot 2" {
// TITLE BLOCK PPF FILE
#include "Base_ljg.ppf"
#include "Title_block.ppf.tft"
}
```

Base ppf

The Base ppf can be anywhere including local, Library and User Library. It must contain a reference to a title file in the *use_title_file* parameter. The *user_title_file* parameter must be in the file and can't be in an #include file.

The following is an example title file reference.

```
use_title_file    yes
title_file        "your title file.tf "
```

Note: If you already have user_text variables defined in your Base ppf these values will not be used and a warning message will be issued at plot time. It is best to remove all user_text variables from your existing ppfs before attempting to use them with this new 4d facility.

The panel scans the title file reference and records all of the *user_text_n* entries that are used. **Only those used are displayed in the panel.** Next a file with the (is located. If found the alias values are used in the panel instead of *\$user_text_1*, *\$user_text_2* etc.

If an alias file (same name as the title file PLUS the extension .als) has been previously created using the Alias button, the aliases for the user_text's are used on the left hand side of the panel. If an alias file has not been found, they can be created by simply selecting the Alias button.

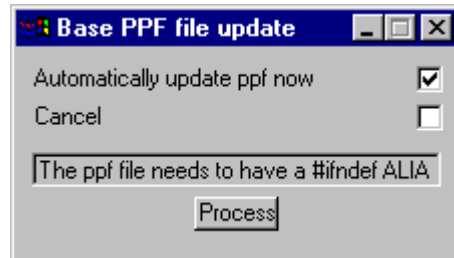
The Base ppf is also checked to see if a

```
#ifndef ALIAS
```

```
and
```

```
#endif
```

exist around the opening "xxxxxxx {" and closing "}" braces. If not, a Base PPF file update panel is displayed.



Select *Automatically update ppf now* and select the Process button. The extra lines then are added to the Base ppf.

For example, the beginning and end of the updated file will look like:

BEGINNING

```
#ifndef ALIAS
```

```
section_long_plot "plot 2" {
```

```
#endif
```

END

```
#ifndef ALIAS
```

```
}
```

```
#endif
```

Clicking on the Alias button brings up the Set Aliases panel. Simply fill in the names to use instead of the words \$user_texts_n in the Title Block - User Text Data Editor panel. Selecting Set writes out an aliases file which has the same names as the title file but with the appended ending .als.

Set

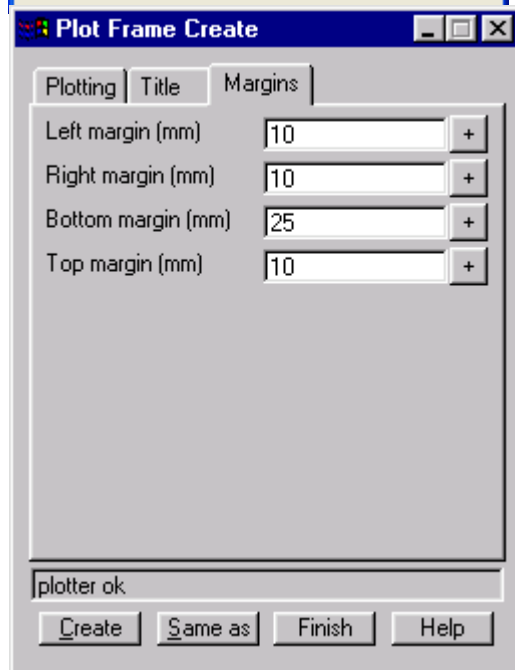
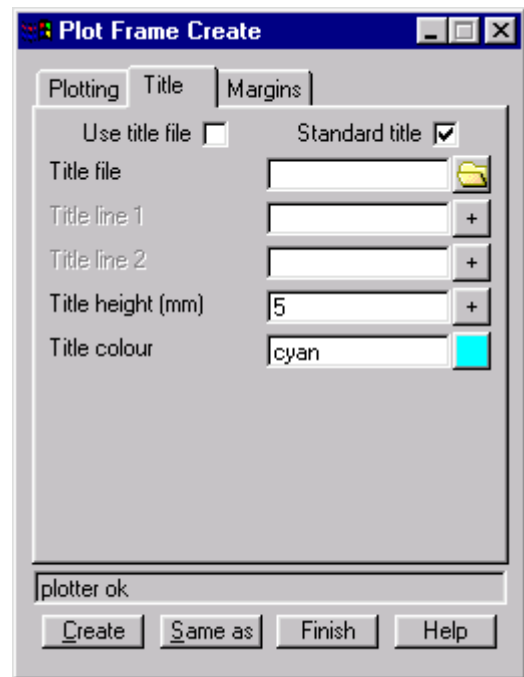
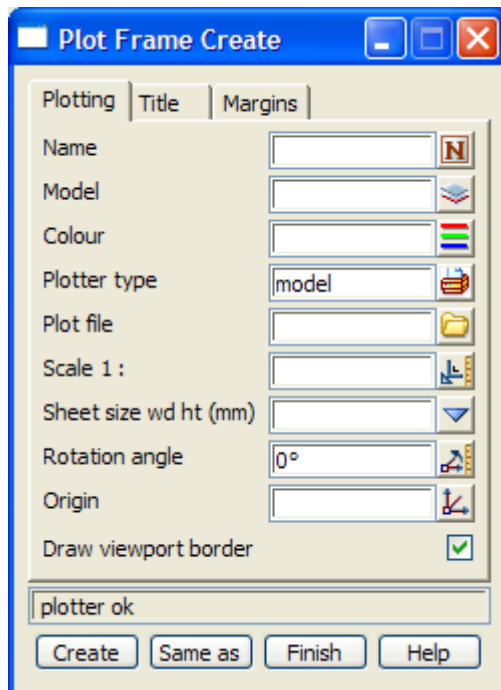
After selecting Set, the values for the user_texts are written to a file specified under **Advanced** (if used) or of the same name as the Title block ppf but with .tft appended.

Create Old Plot Frame

[plot_frame_create](#) [plot_frame_title](#) [plot_frame_margins](#)

Position of option on menu: Plot =>Old plotting =>Create plot frame

On selecting the Create old option, the **plot frame create** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Name <i>name for the plot frame.</i>	input		
Model	input		available model

the model for the plot frame.

Colour	input		available colours
	<i>the colour for the plot frame.</i>		
Plotter type	input	hp	hp, dxf, dwg, postscript etc.
	<i>format for the plot file.</i>		
Plot file	input		*.hp etc.
	<i>name of the file to write the plot of the plot frame to.</i>		
Scale 1:	input		
	<i>scale for the plot.</i>		
Sheet size wd ht (mm)	input		
	<i>the width and height values (separated by spaces) or the name of a user defined sheet size.</i>		
Rotation angle	input	0	
	<i>angle of rotation for the plot frame.</i>		
Origin	input		xyz ops menu
	<i>x_origin y_origin z_origin</i>		
	<i>origin (in world units) for the corner of the plot frame - given as three values separated by spaces. The values can either be typed in, or selected by clicking LB in the origin panel view and getting up the xyz ops menu and selecting the pick xyz option.</i>		
Draw viewport border	tick-cross	tick	
	<i>if tick, plot the box around the plotting area (viewport).</i>		
Create	button		
	<i>create the plot frame and then put up the plot frame edit panel for the created plot frame.</i>		
Same as	button		
	<i>after picking the same as button, an existing plot frame is selected and its information is used to fill in the above panel fields.</i>		

Title tab

Use title file	tick-cross		
	<i>if tick, use the file given in the title file field to generate a title block.</i>		
Standard Title	tick-cross	tick	
	<i>if tick, plot the standard 12d Model title block with the text, height and colour given in the following panel fields.</i>		
Title line 1/2	input		
	<i>first/second line of title information in the 12d titleblock or for the user defined title block.</i>		
Title height (mm)	input	10	
	<i>height (in millimetres) to draw the two lines of title information in the 12d titleblock.</i>		
Title colour	input	cyan	available colours
	<i>colour used for the border and the title information in the 12d titleblock.</i>		

Title tab

Left/right margin (mm)	10.0		
	<i>the left/right hand side margin between the sheet and the plotting area inside the sheet.</i>		
Bottom/top margin (mm)	10.0		

the bottom/top margin between the sheet and the plotting area inside the sheet.

How To Use the Option

The plot frame contains all the information required to define the physical area in real world units to be plotted, the position on the sheet of the area being plotted, the plotter type and the plot file name.

Once the frame is created, the **plot frame edit** panel for the created plot frame is automatically placed on the screen so that the frame's position can be adjusted using the **Translate** and **Rotate** buttons.

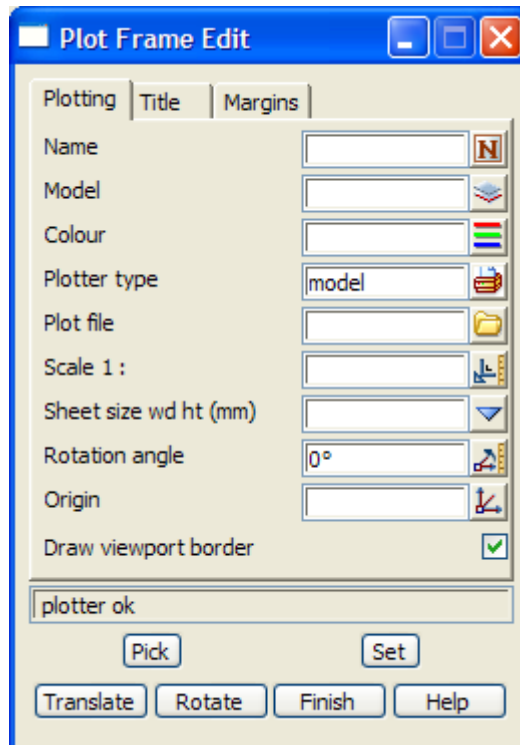
Editor Old Pot Frame

plot_frame_edit

Position of option on menu: Plot =>Old plotting =>Editor plot frame

The plot frame editor is used to edit existing plot frames. It is automatically placed on the screen when a plot frame is created so that the frame's position can be adjusted using the **Translate** and **Rotate** buttons.

On selecting the Editor old option, the **plot frame edit** panel is displayed.



Most of the fields and buttons used in this panel are the same as the **plot frame create** panel - see the previous section "Create Old Plot Frame". The different ones are

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Pick	button		
-------------	--------	--	--

select the plot frame to be edited.

Set	button		
------------	--------	--	--

update the plot frame with the information in the above panel fields.

Translate	button		
------------------	--------	--	--

*after picking the **translate** button, the plot frame will move with the cursor until a point is selected to give the final position of the plot frame.*

Rotate	button		
---------------	--------	--	--

*after picking the **rotate** button, the plot frame is further rotated around the left hand corner of the sheet, by the angle made between the rotation point and the current cursor position. The plot frame will continue to rotate until a point is selected to fix the rotation angle.*

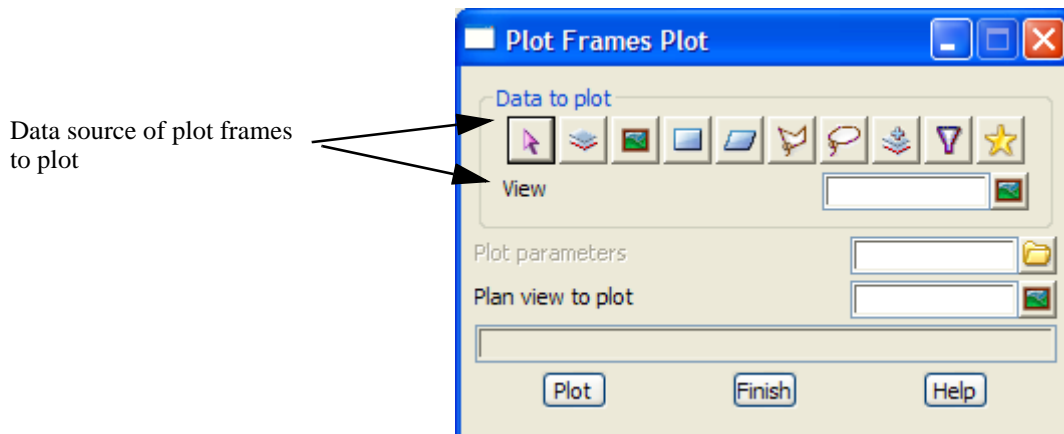
Plotting Old Plot Frames

plot_frames_plot

Position of option on menu: Plot =>Old plotting =>Plot plot frame

The plot old option is used to make a plot of the data on a given plan view for all the selected plot frames (selected by the data source). Note that the plots are of a given plan view and the plot frames do not have to be on the plan view.

On selecting the plot old option, the **plot frames plot** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field	Description	Type	Defaults	Pop-Up
Data to plot	Data source type			
Plot parameters	input			*.ppf files
Plan view to plot	input			available views
Plot	button			

Data to plot - Data source type

data source type.

Data source

when the plot button is selected, all the plot frames in the data source will be plotted.

Plot parameters

input

*.ppf files

file of plot parameters to be used for the plot frames.

For more information on the plot frame plot parameters, please go to the section "Plot Frame Plot Parameter File" in the Appendix "Plot Parameters"

Plan view to plot

input

available views

*the name of the view that is plotted when the plot frames are selected for plotting. Note that the plot frames **do not** have to be on the view.*

Plot

button

when the plot buttons is selected, all the plot frames in the data source field will be plotted.

Pen Mapping Old

colours_to_pens

Position of option on menu:

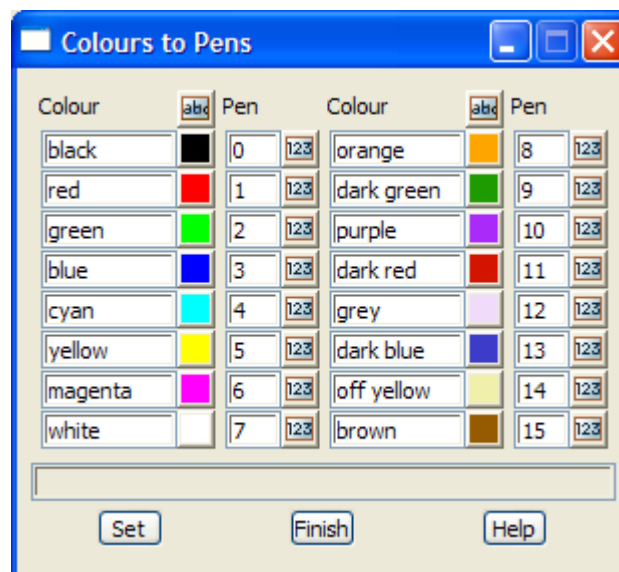
NO LONGER USED

Although 12d Model uses up to 10,240 different colours, most plotters have a smaller number of pens. Consequently for any plot, it is necessary to define what pen number corresponds to each 12d Model colour.

For all plotters types except Eagle, the pen mapping option can be used to define the correspondence between 12d Model colours and plotter pens for the first sixteen colours. The other colours are given in the colour_map.def file. For Eagle plots, the **eagleplt.pmf** file is used to map colours to pens.

The pen mapping option is only used if a plotter mapping is not being used (see next section).

On selecting the pen mapping option, the current pen mapping table is displayed in the **colours to pens** panel.



When starting a new project or entering an existing project, the default pen mapping table is defined by the **colours.4d** file.

Once inside the project, any pen number in the table can be modified by changing the appropriate pen field and then selecting the **set** button. The modified table is stored until 12d Model is quit or the user changes to another project.

The pen mappings for colours above sixteen are given in the **colours.4d** file but can not be displayed or modified by the **colour to pens** panel.

Whenever a plot is created using non-eagle plotter types, the colours are mapped to the pen numbers given in the **colours to pen** table before writing out the plot file.

For Eagle plots, the **eagleplt.pmf** file is used to map colours to pens.

Note - when 12d Model is started up again or the user changes to a new project, the table reverts to its default settings as given in the **colours.4d** file.

24 PPF Editors

Title Blocks

Title blocks used for plots generated by plot frames, long sections, cross sections, pipe line and drainage can be defined by the user.

A user defined title block is build up from lines, circles, arcs and text. The format of the commands to draw these objects is the same as the draw_commands for user defined linestyles given in the Appendix.

For the purpose of defining a title block, all plots are considered to have the **origin** (0,0) in the bottom left hand corner (i.e. the plot is in the positive quadrant only) and the *units* used in the title block drawing commands are **millimetres**.

The title block drawing commands are placed in a file with ending **.tf**

Inside the file, the set of all title block drawing commands is enclosed within a set of curly brackets { } with the header

```
linestyle title_block
```

before the curly brackets.

That is,

```
linestyle title_block {
    title block drawing commands
    one command per line
}
```

Title Block Variables

For title blocks, the text drawing command has been extended so that special information such as the current date and time, plotting scales etc. can be automatically inserted into the title block.

To achieve this, special **title block variables** have been defined and wherever these variables appear in a title block text command, they are expanded to their defined value.

Hence the title block variables are simply place markers which have text values substituted for them when the title block file is used.

The title block variables all begin with a \$ and are followed by either another title block variable or a single space. For example

```
text "text $variable more text" angle height justification textstyle
```

or

```
text "text $variable_1$variable_2 more text" angle height justification textstyle
```

Note - xfactor, slant, offset_width and offset_height can also be given by using:

```
text text angle height "justification" textstyle xfactor slant offset_width offset_height
```

The title block variables which don't involve plot parameters are:

```
$project // the current project
$plot_file // the current plot file
$scale // for plot frames, the current scale
$horizontal_scale // for section plots, the current horizontal scale
$vertical_scale // for section plots, the current vertical scale
$start_chainage // for section plots, the start chainage for the plot
// sheet
$end_chainage // for section plots, the end chainage of the plot sheet
```

The following title block variables take values which are passed down from the **plot parameter file** for the plot (plot parameter files are described in more detail in the rest of this manual):

\$time

The current date and time. The format for the date and time is given by the plot parameter `time_format`. See the next section for the description of the format.

\$title_1, \$title_2

`$title_1` takes the value from the panel field title line 1 from the **section x plot title**, **section long plot title** or **plot frame title** panels, or from the parameter `title_1` in the plot parameter file. If `title_1` doesn't exist, then `$title_1` is blank.

Similarly for `$title_2`.

\$user_text_n where n=1,2,... 1000

`$user_text_n` takes the value of the parameter `user_text_n` in the plot parameter file. If `user_text_n` doesn't exist, then `$user_text_n` is blank.

Aliases can also be defined for the `$user_text_n` which are used in the PPF editors. See the next section on aliases.

\$page_number

`$page_number` has the starting value one, or the value given by the parameter **start_page_number** from the plot parameter file, and is incremented by one, for each plot produced by the plot option (for example, for each page of a long section plot, for each page of x-section plots or each plot generated from a model of plot frames).

\$drawing_number_prefix, \$drawing_number, \$drawing_number_postfix

The values for `$drawing_number_prefix` and `$drawing_number_postfix` are passed down from the plot parameter file by the parameters **drawing_number_prefix** and **drawing_number_postfix** respectively.

`$drawing_number` has the starting value one, or the value given by the parameter **start_drawing_number** from the plot parameter file, and is incremented by one for each plot produced by the plot option (for example, for each page of a long section plot, for each page of x-section plots or each plot generated from a model of plot frames).

Notes

1. For plot frames, the `horizontal_scale` and `vertical_scale` are given the current scale, and `$start_chainage` and `$end_chainage` are ignored.
2. For section plots, `$scale` is ignored.

Aliases for \$User Text

12d Model user defined title blocks can include up to 1,000 markers for placing *user defined text* (`$user_text_n` where n can be from 1 to 1000) which is only substituted for actual text at plotting time. Because of the difficulty of knowing exactly what *\$user_text_n* stood for when the title block is being plotted, the concept of aliases has been introduced.

For example, instead of referring to `$user_text_4`, an alias can be defined to use the text "Engineers name:" instead.

The definition of `$user_text_n` in a title block file has been **extended** so that it also includes any **alias** for the `$user_text_n`.

To define an alias for the `$user_text_n` in the title block file, simply replace the

`"_n"` by `"<n,text for the alias>"`

For example, if `$user_text_1` is to have the alias "Engineers name", the title block file would now

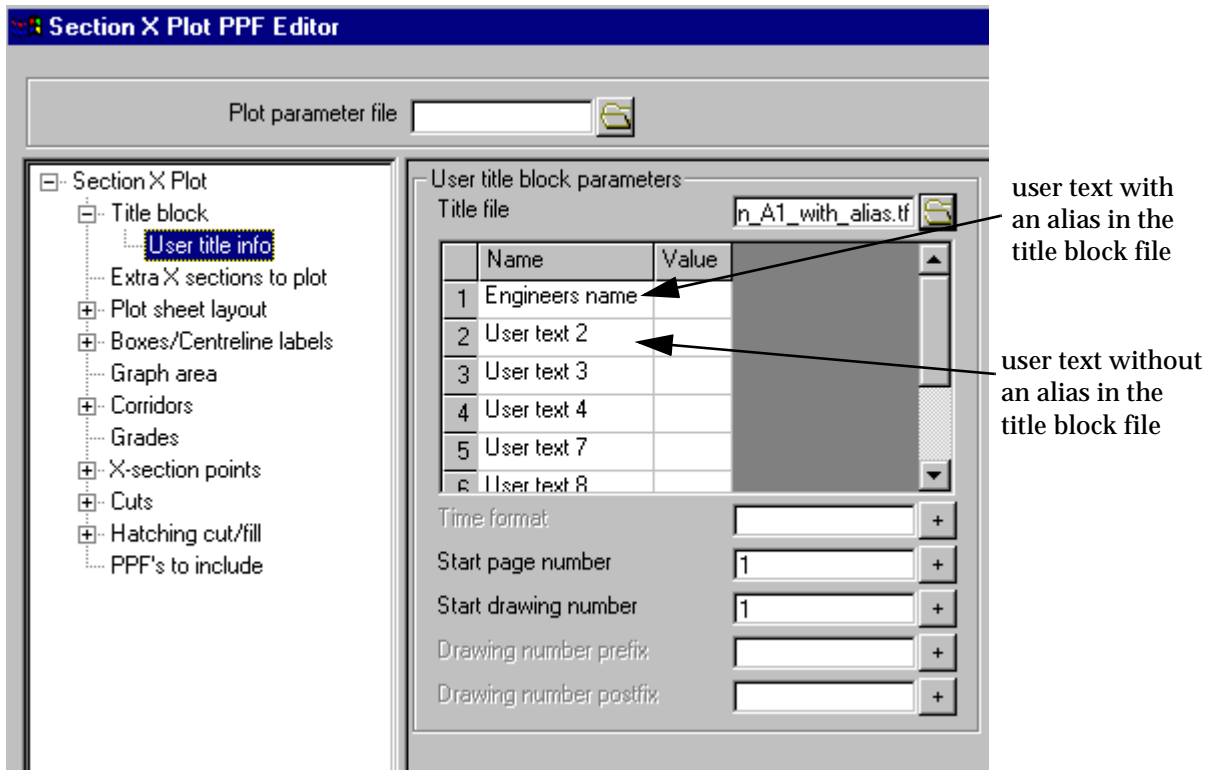
contain:

```
text "$user_text<1,Engineers name:>" 0.000000 2.500 "bottom-left" "1" 1.000 0.000000 0.0 0.0
```

The title file and aliases work seamlessly with the interactive PPF editors and Plotters (which are described in their own sections). In the *Title block* section of the interactive PPF editors and Plotters, the user defined title block file is *scanned* for any *\$user_text* in it and it is presented as a grid containing all the *\$user_text*'s in the title block with a column to fill in the values that the user wants to be plotted.

If the format *\$user_text_n* is in the title block file, it is displayed as "User text n" in the PPF editor. If an *alias* exists, then the *alias* is displayed instead of "User text n".

For example, using the *\$user_text<1,Engineers name>* in a title block file will give:



Values Used for Defaults when Creating Plot Frames

There are special parameters that are written as comments at the top of title block file that are used as defaults for fields in the option *Plots=>Plot frames=>Create new*. They are

```
// plot_frame_name          text
// plot_frame_model        text
// plot_frame_colour       text
// plot_frame_scale        real_number
// plot_frame_sheet_size   text
// plot_frame_angle        real_number
// plot_frame_left_margin  real_number
// plot_frame_right_margin real_number
// plot_frame_top_margin   real_number
// plot_frame_bottom_margin real_number
// plot_frame_viewport     logical (yes or no)
```

Specifying the Format for \$time

The format for \$time is passed down by the plot parameter **time_format**.

```
time_format          format          // format for $time
```

The format consists of one or more codes and the formatting codes are preceded by a percent sign (%). Characters that do not begin with a % are copied unchanged.

%a	abbreviated weekday name
%A	full weekday name
%b	abbreviated month name
%B	full month name
%c	date and time representation for locale
%d	day of month as decimal number (01 - 31)
%H	hour in 24-hour format (00 - 23)
%I	hour in 12-hour format (01 - 12)
%j	day of year as decimal number (001 - 366)
%m	month as decimal number (01 - 12)
%M	minute as decimal number (00 - 59)
%p	current locale's A.M./P.M. indicator for 12-hour clock
%S	second as decimal number (00 - 59)
%U	week of year as decimal number, with Sunday as first day of week (00 - 51)
%w	weekday as decimal number (0 - 6; Sunday is 0)
%W	week of year as decimal number, with Monday as first day of week (00 - 51)
%x	date representation for current locale
%X	time representation for current locale
%y	year without century, as decimal number (00 - 99)
%Y	year with century, as decimal number
%z, %Z	time-zone name or abbreviation; no characters if time zone is unknown
%%	percent sign

The # flag may prefix any formatting code and the meaning of the format code is changed as follows

Format Code	Meaning
%%#c	long date and time representation, appropriate for current locale. For example, "Tuesday, March 16, 1993,12:41:29"
%%#x	long date, appropriate for current locale. For example, "Tuesday, March 16"
%%#d, %%#H, %%#I, %%#, %%#m, %%#M, %%#S, %%#U, %%#W, %%#y, %%#Y	Remove leading zeros (if any).
%%#a, %%#A, %%#b, %%#B, %%#p, %%#X, %%#z, %%#Z, %%#%	# flag is ignored

Examples

The format to give the date in the form dd/mm/yy (06/09/97) is

“%d/%m/%y”

If you want to remove leading zeros from the day and month (6/9/97)

“%#d/%#m/%y”

Example of a Title Block File

```
// Information used for creating plot frames
// plot_frame_name "plot 17"
// plot_frame_model "plot frames"
// plot_frame_colour "green"
// plot_frame_scale 500.000
// plot_frame_sheet_size "A1"
// plot_frame_angle 0.000
// plot_frame_left_margin 10.000
// plot_frame_right_margin 20.000
// plot_frame_top_margin 50.000
// plot_frame_bottom_margin 100.000
// plot_frame_viewport yes
//
// Drawing the title block
//
linestyle title_block {
    colour yellow
    move 0.0 100.0
    text "Page No. $page_number ..." 45.0 45.0 "bottom-left"

    move 100.0 100.0
    text "Scale 1:$scale ..." 45.0 45.0 "bottom-left"

    move 200.0 100.0
    text "Horizontal Scale 1:$horizontal_scale ..." 45.0 45.0 "bottom-left"

    move 300.0 100.0
    text "Vertical Scale 1:$vertical_scale ..." 45.0 45.0 "bottom-left"

    move 400.0 100.0
    text "Time is $time ..." 45.0 45.0 "bottom-left"

    move 500.0 100.0
    text "Plot file:$plot_file Project:$project Time:$time ..." 45.0 45.0 "bottom-left"

    move 600.0 100.0
    text "Engineer: $user_text<1,Engineers name:> ..." 45.0 45.0 "bottom-left"

    move 700.0 100.0
    text "User 2: $user_text_3 ..." 45.0 45.0 "bottom-left"

    move 800.0 100.0
    text "Drawing No:$drawing_number_prefix$drawing_number$drawing_number_postfix ..."
        45.0 45.0 "bottom-left"

    move 900.0 100.0
    text "Chainage min:$start_chainage Chainage max:$end_chainage ..." 45.0 45.0 "bottom-left"

    colour green
    move 0.0 0.0
    draw 1200.0 0.0
    draw 1200.0 1000.0
    draw 0.0 1000.0
    draw 0.0 0.0
    move 10.0 10.0
    draw 1190.0 10.0
    draw 1190.0 990.0
    draw 10.0 990.0
    draw 10.0 10.0
}
```

X Plot PPF Editor

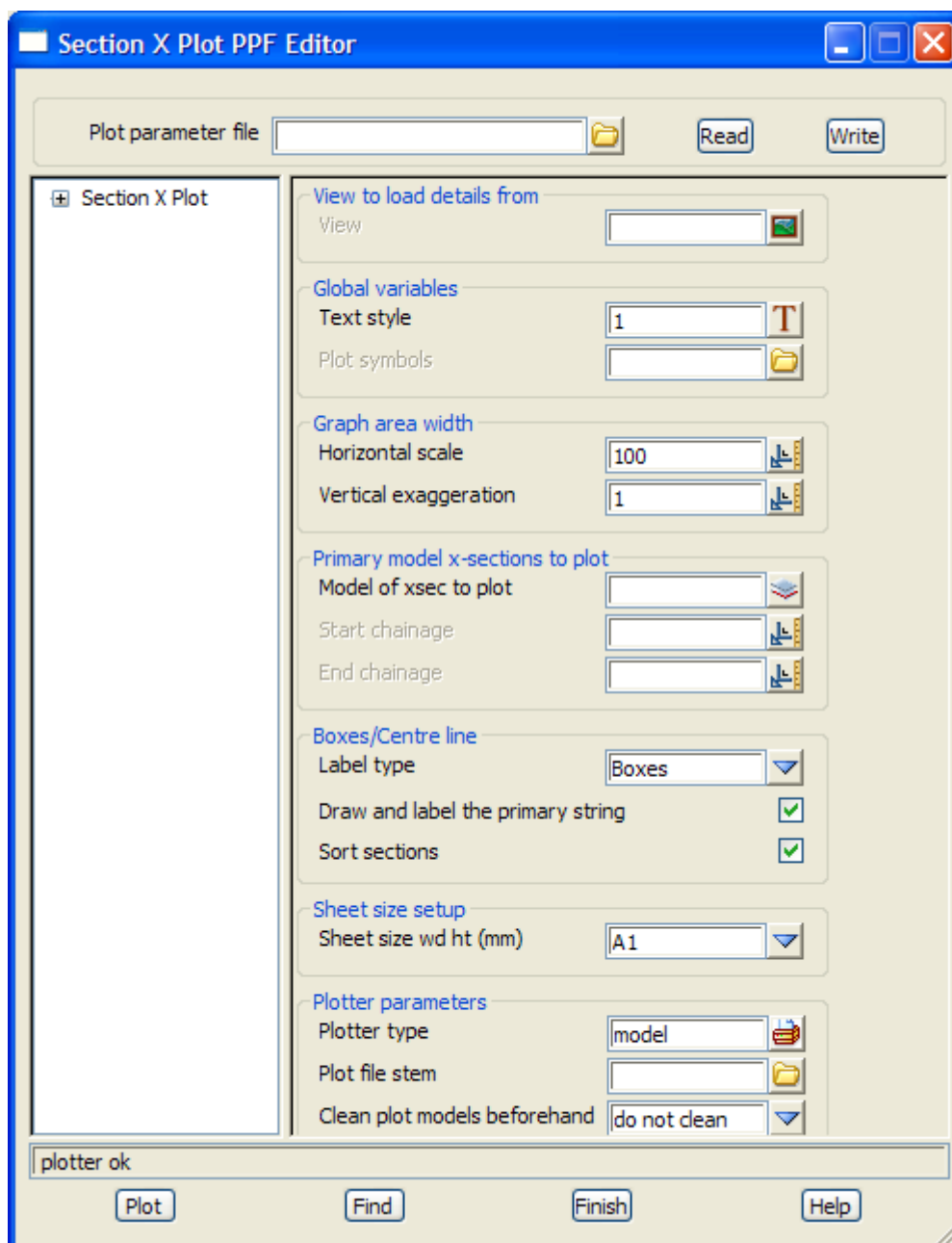
section_x_plot_ppf_editor

Position of option on menu: Plot =>X Plot PPF Editor

The **x section ppf editor** is for creating and/or editing a (binary) x-section ppf file and for creating a cross section plot.

Note: binary ppf's are stored *within* the project (not in the folder containing the project as the ascii ppf's were).

On selecting the X plot ppf editor option, the **Section X Plot PPF Editor** panel is displayed.



Panel field

Type

Plot parameter file

file box

name for the binary plot parameter file to read in or write out.

Read button

read the given plot parameter file in.

Write button

write out the plot parameters to the given plot parameter file. An ascii ppf file is also written out.

Plot button

use the plot parameters from the panel to create the plot.

Find button

brings up a search box. If a valid parameter name is keyed in followed by the enter key, the cursor will be placed in the appropriate field on the appropriate page.

Section X Plot

Section_X_Plot

Section X Plot

Section: View to load details from

The fields and buttons used in this section have the following functions.

Field Description	Parameter name	Type	Pop-Up
-------------------	----------------	------	--------

View		section view box	
-------------	--	------------------	--

on selection of an existing section view, the vertical exaggeration, model of x-sections to plot, corridor model and corridor settings from the section view are loaded into the ppf editor.

Section: Global Variables

The fields and buttons used in this section have the following functions.

Field Description	Parameter name	Type	Pop-Up
-------------------	----------------	------	--------

Text style	global_textstyle	text box	
-------------------	------------------	----------	--

default text style

Plot Symbols	plot_symbols	file box	
---------------------	--------------	----------	--

specify a plot symbol file if it exists.

Section: Global Area Width

The fields and buttons used in this section have the following functions.

Field Description	Parameter name	Type	Pop-Up
-------------------	----------------	------	--------

Horizontal Scale	scale	input	
-------------------------	-------	-------	--

horizontal scale to be used for X section plots

Vertical exaggeration	vertical_exaggeration	input	
------------------------------	-----------------------	-------	--

vertical scale to be used for X section plots

Section: Primary Model X-Sections To Plot

The fields and buttons used in this section have the following functions.

Field Description	Parameter name	Type	Pop-Up
Model of xsec to plot <i>model of X sections to plot</i>	model_to_plot	model box	
Start chainage <i>start chainage of X sections to plot</i>	start_chainage	input	
End chainage <i>start chainage of X sections to plot</i>	end_chainage	input	

Section: Boxes/Centre lines

The fields and buttons used in this section have the following functions.

Field Description	Parameter name	Type	Pop-Up
Label type <i>the label type to be used for plotting.</i>	label_type	choice box	centre line boxes

Draw and label the primary string

	primary_string	tick box	
<i>if ticked, the primary string will be labelled and drawn.</i>			

Sort sections <i>if ticked, the X sections will be sorted in increasing chainage. This is important if individual cross sections are added after an apply function for example.</i>	sort_sections	tick box	
---	---------------	----------	--

Section: Sheet Size Setup

The fields and buttons used in this section have the following functions.

Field Description	Parameter name	Type	Pop-Up
Sheet size wd ht (mm) <i>a valid sheet size is selected.</i>	sheet_size	sheet size box	

Section: Plotter parameters

The fields and buttons used in this section have the following functions.

Field Description	Parameter name	Type	Pop-Up
Plotter type <i>a valid plotting option is selected.</i>	plotter_type	plotter box	
Plot file stem <i>plot file name. The appropriate extension is added dependant on the plotter type selected.</i>	plot_stem	plotter box	
Clean plot models beforehand	plot_model_clean	choice box	do not clean prompt for clean

always clean

whether to clean (delete the elements in) any resultant plot models that may already exist, before generating the plot(s). This parameter is only applicable if plotting to a model or models. Note that if the models are cleaned using this parameter, any non-plot or locked elements found in the models will not be cleaned from the models, and the plot job will be cancelled.

Title Block

Section_X_Plot_Title_block

Common title block parameters

Panel field	Parameter name	Type
Standard title	plot_border	tick box
		<i>if ticked, a standard 12d title block will be used.</i>
Use title file	use_title_file	tick box
		<i>if ticked, a user defined title file is used.</i>
Title line 1	title_1	input
		<i>if Standard title is ticked, Title line 1 is the first line of title text. If Use title file is ticked, Title line 1 is substituted for the title block variable \$title_1.</i>
Title line 2	title_2	input
		<i>if Standard title is ticked, Title line 2 is the second line of title text. If Use title file is ticked, Title line 2 is substituted for the title block variable \$title_2.</i>

12d default title block parameters

Panel field	Parameter name	Type	Pop-Up
Text size	title_text_size	input	
		<i>text size of title text.</i>	
Text colour	title_colour	colour	available colours
		<i>colour of title text.</i>	

Section_X_Plot_Title_block_User_title_info

User title info

The parameters shown below are subject to the appropriate title block variables existing in the title file. For more information on these variables see the section "Title Block Variables".

Panel field	Parameter name	Type	Pop-Up
Title file	title_file	file box	available title files
		<i>specifies the name of the title file to use. If a valid title file exists, the specified Name values will be filled out in the grid using the title block variable \$user_text_n.</i>	
Name		output	
		<i>the alias for the nth user text specified in the title file.</i>	
Value	user_text_n	input	
		<i>the alias text to be substituted in for the user text specified.</i>	
Time format	time_format	input	
		<i>the time format relates to the \$time title block variable. For more information on the time formats see the section "Specifying the Format for \$time".</i>	

Start page number	start_page_number	input
<i>used as the starting value for the title block variable \$page_number. If missing, \$page_number starts at 1.</i>		
Start drawing number	start_drawing_number	input
<i>used as the starting value for the title block variable \$drawing_number. If missing, \$drawing_number starts at 1.</i>		
Drawing number prefix	drawing_number_prefix	input
<i>the value entered is used for the title block variable \$drawing_number_prefix.</i>		
Drawing number postfix	drawing_number_postfix	input
<i>the value entered is used for the title block variable \$drawing_number_postfix.</i>		

Extra X Sections To Plot

Section_X_Plot_Extra_X_sections_to_plot

Extra X Sections To plot

Section: Extra Models of X-Sections To Plot

The order and centreline chainages of the x-section subplots for the x-section plot are defined by the sections from the primary model of cross sections.

The sections through any specified triangulations and service models, and offsets for labelling are fully defined by these primary x-sections.

However it is also possible to plot extra x-sections on each of the sub-plots by supplying extra models of x-sections which are at the same plan positions as the primary x-section strings.

Only those x-sections from the extra models that are within a user specified tolerance of a primary x-section are plotted.

The extra models of x-sections and the plan tolerance for checking that the extra cross-sections are the same position as the primary x-sections are

The fields and buttons used in this section have the following functions.

Field Description	Parameter name	Type	Pop-Up
Model tolerance	extra_model_tolerance_1	input	
<i>user defined distance</i>			
Model name	extra_model_n	input	
<i>extra models of x-sections to plot.</i>			

Plot Sheet Layout

Section_X_Plot_Plot_sheet_layout

X-sections are normally generated at chainages along a given centreline. This centreline chainage is stored with each x-section string.

The chainages of the actual x-sections are referred to as **offsets** from the centreline position rather than x-section chainages. The offsets of the x-section are set up so that the zero offset occurs where the x-section crossed the centreline string.

The x-sections along the centreline are stored in the one model (the primary model) which is then used to generate the cross section plot.

The x-sections are plotted in the order they occur in the x-section model and start being plotted at the bottom left hand corner of the sheet (left_margin,bottom_margin).

The individual x-section plots are then drawn going up the column, and when the column is full, start from the bottom of the next column.

When a sheet is full, a follow on sheet is created.

Each x-section from the primary model of x-sections generates its own sub-plot for which the x-section is the primary string. Hence the cross section plot consists of many individual plots drawn on one or more plot sheets.

Each plot sheet is considered to have only positive co-ordinates with the origin (0,0) in the left hand corner. The units for the plot are millimetres.

Plot Sheet Layout

Section: Plot Width Parameters

The width of the plot can be a fixed distance left or right of the centre line (zero offset) or for the full section plus an extra left and right distance:

The fields and buttons used in this section have the following functions.

Field Description	Parameter name	Type	Pop-Up
Absolute extensions	absolute_extensions	tick box	

if ticked, the section goes from the left_extension offset on the left to the right_extension offset on the right. If unticked the section goes for the entire section length plus the left and right extension distances.

Left extension	left_extension	input	
-----------------------	----------------	-------	--

The left_extension value in world units.

Right extension	right_extension	input	
------------------------	-----------------	-------	--

The right_extension value in world units

Section: Align Section Parameters

If required, all the sub-plots in a column can be automatically positioned so that the zero offsets (the centrelines) of each x-section line up.

The fields and buttons used in this section have the following functions.

Field Description	Parameter name	Type	Pop-Up
Line up centrelines	line_up_cl	tick box	

if ticked, each sub plot will be aligned on the plot using the centreline of each x section.

Section_X_Plot_Plot_sheet_layout_Margins

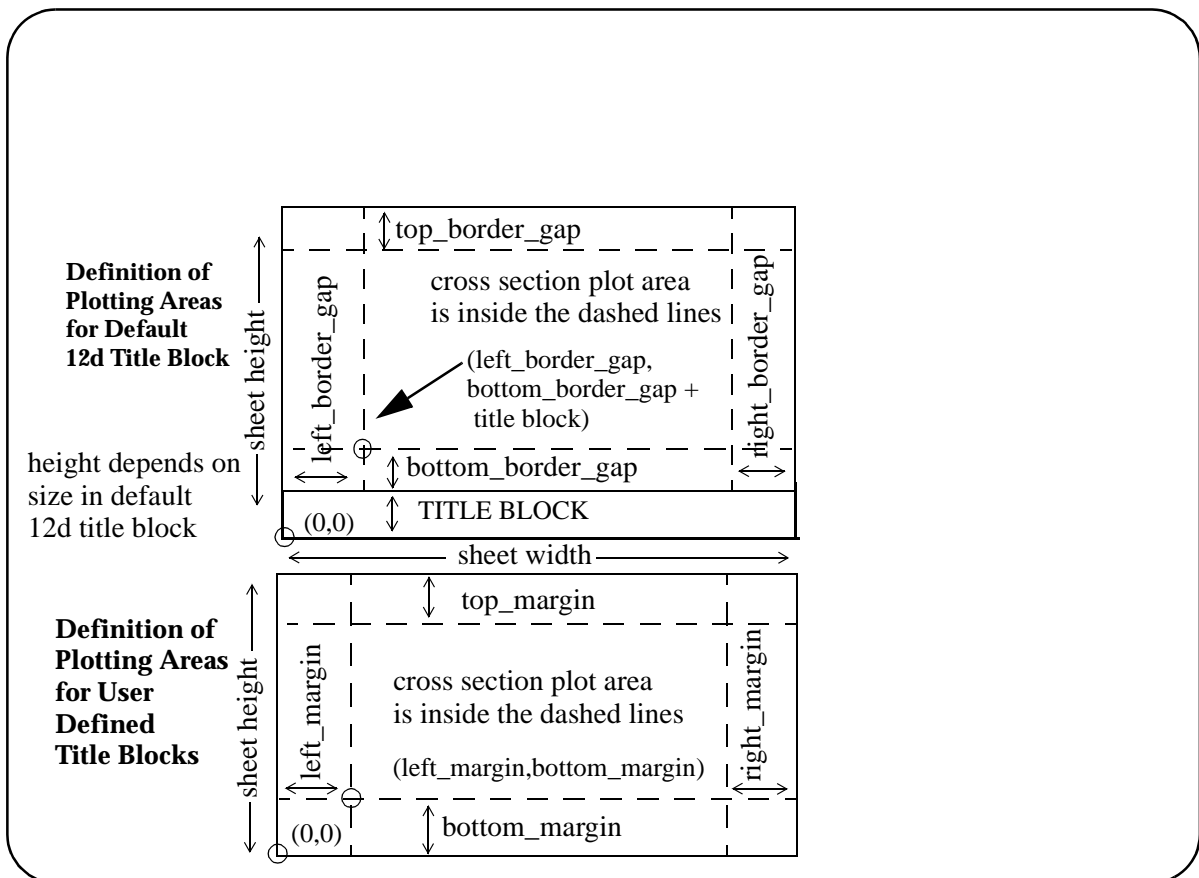
Margins

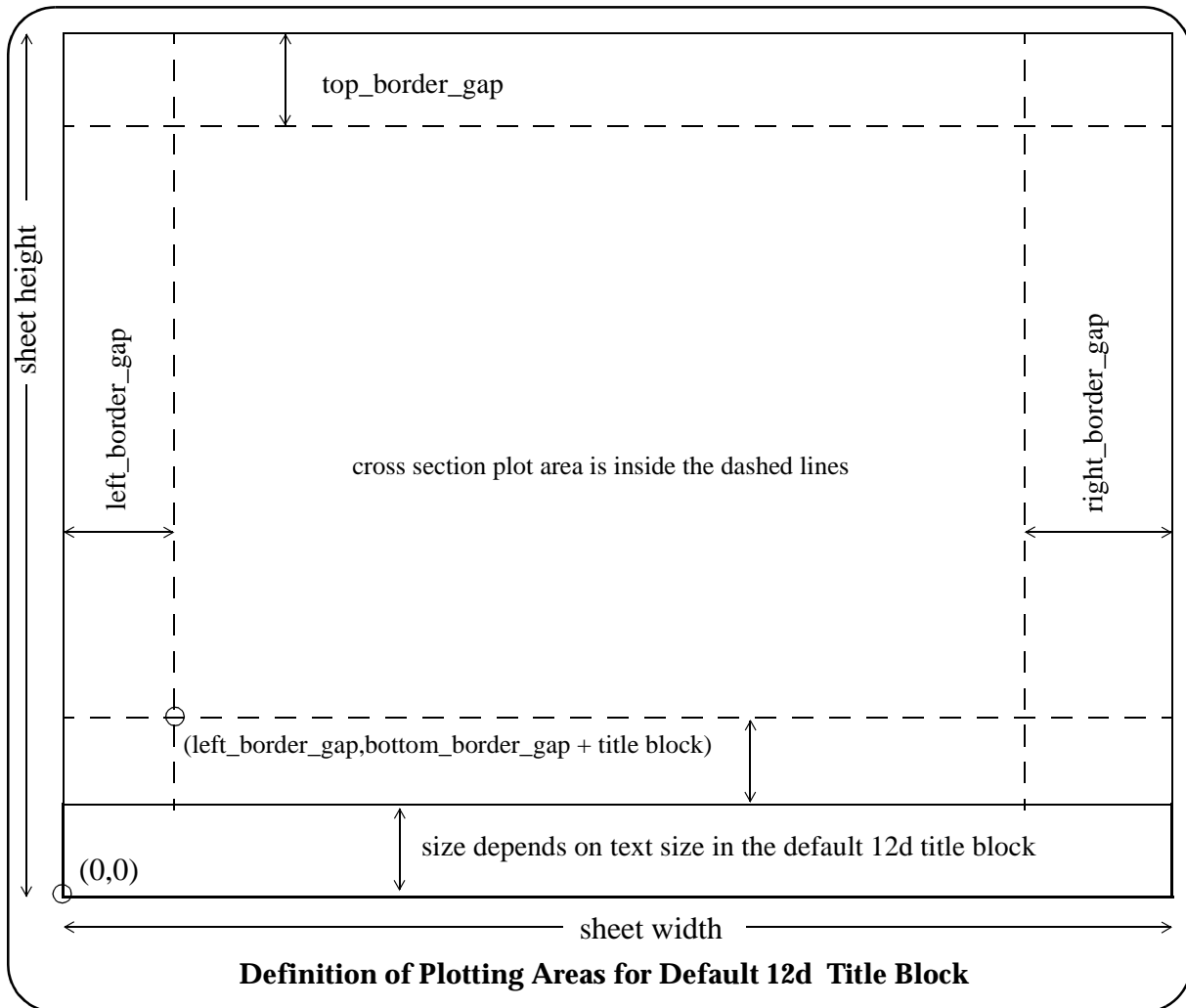
Section: Margins For Standard 12d Title File - Border gaps

If the *default 12d title block* is used, then the size of the bottom of title block depends on the text size. The following parameters are used in the default title block case and the *bottom_border_gap* is added to the calculated height of the bottom of the title block.

The fields and buttons used in this section have the following functions.

Field Description	Parameter name	Type	Pop-Up
Left (mm) <i>left border gap (in millimetres).</i>	left_border_gap	input	
Right (mm) <i>right border gap (in millimetres).</i>	right_border_gap	input	
Top (mm) <i>top border gap (in millimetres).</i>	top_border_gap	input	
Bottom (mm) <i>bottom border gap (in millimetres).</i>	bottom_border_gap	input	

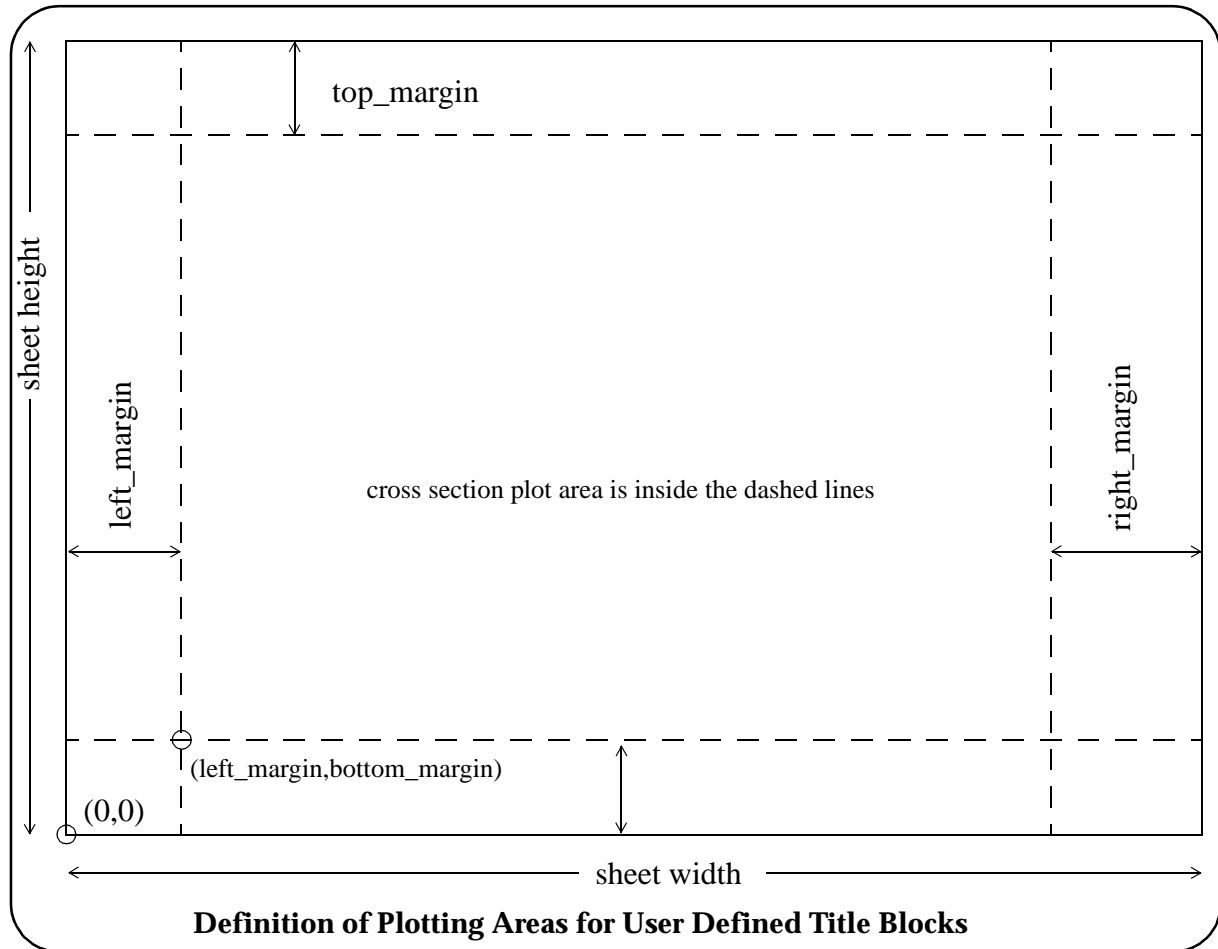




Section: Margins For User Title File

The fields and buttons used in this section have the following functions.

Field Description	Parameter name	Type	Pop-Up
Left (mm) <i>left margin (in millimetres).</i>	left_margin	input	
Right (mm) <i>right margin (in millimetres).</i>	right_margin	input	
Top (mm) <i>top margin (in millimetres).</i>	top_margin	input	
Bottom (mm) <i>bottom margin (in millimetres).</i>	bottom_margin	input	



Because the user can easily select from the plotting panel whether a User Defined Title Block or the default 12d title block is used, both sets of margin and gap parameters can exist in the one plot parameter file.

The x-sections are plotted in the order they occur in the x-section model and start being plotted at the bottom left hand corner of the cross section plotting area.

The individual x-section plots are then drawn going up the column, and when the column is full, start from the bottom of the next column.

When a sheet is full, a follow on sheet is created.

Section_X_Plot_Plot_sheet_layout_Sub_plot_gaps

Sub Plot Gaps

Section: Sub Plot Gaps Parameters

The gaps between the sub plots is restricted to those specified below.

The fields and buttons used in this section have the following functions.

Field Description	Parameter name	Type	Pop-Up
Left (mm) <i>left margin (in millimetres).</i>	left_sub_plot_gap	input	
Right (mm)	right_sub_plot_gap	input	

right margin (in millimetres).

Top (mm) top_sub_plot_gap input

top margin (in millimetres).

Bottom (mm) bottom_sub_plot_gap input

bottom margin (in millimetres).

The x-section sub-plot itself consists of the three regions - boxes, datum and graph.

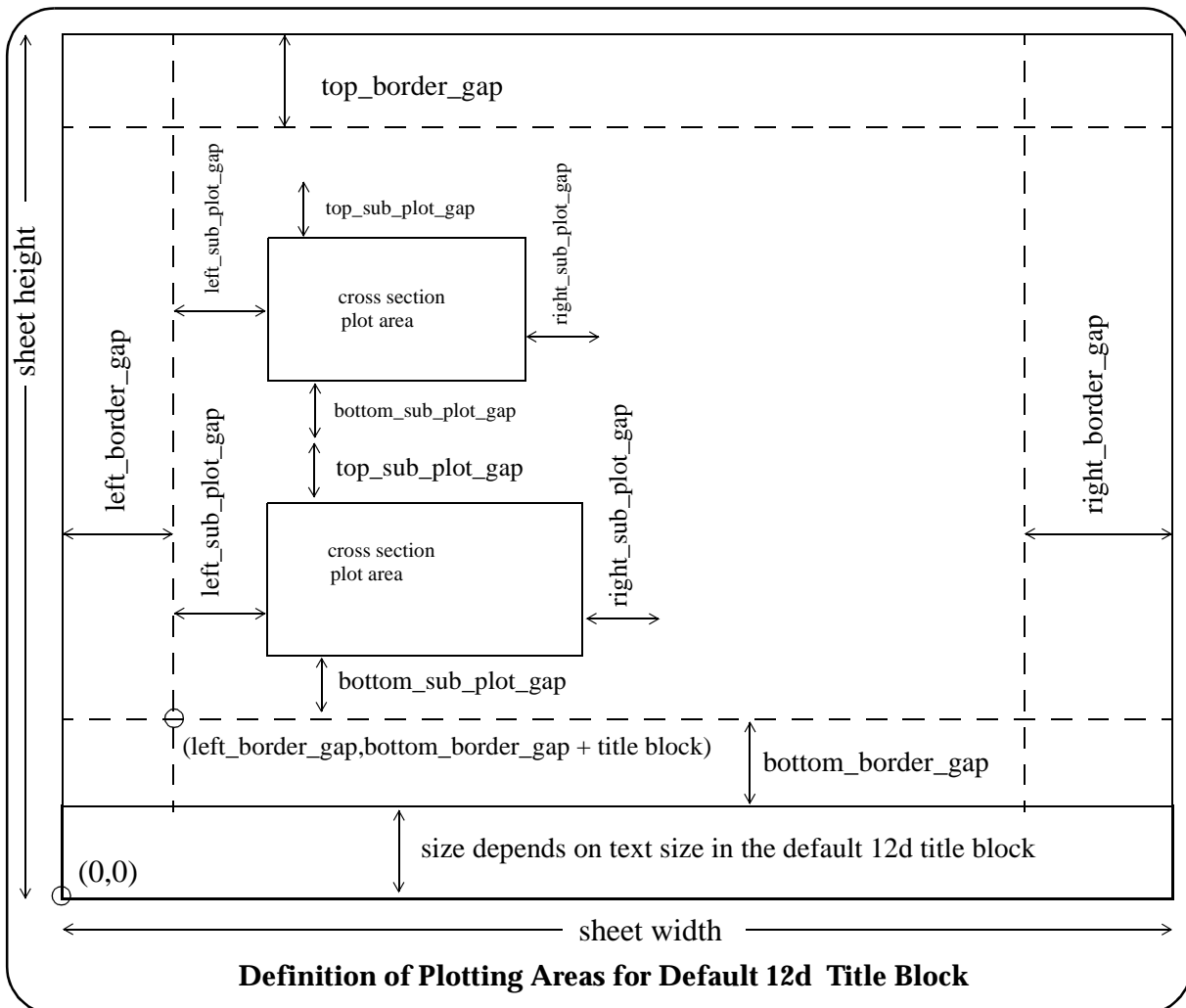
The **boxes area** is where the offset values and the heights for the strings drawn on the x-section plot are labelled.

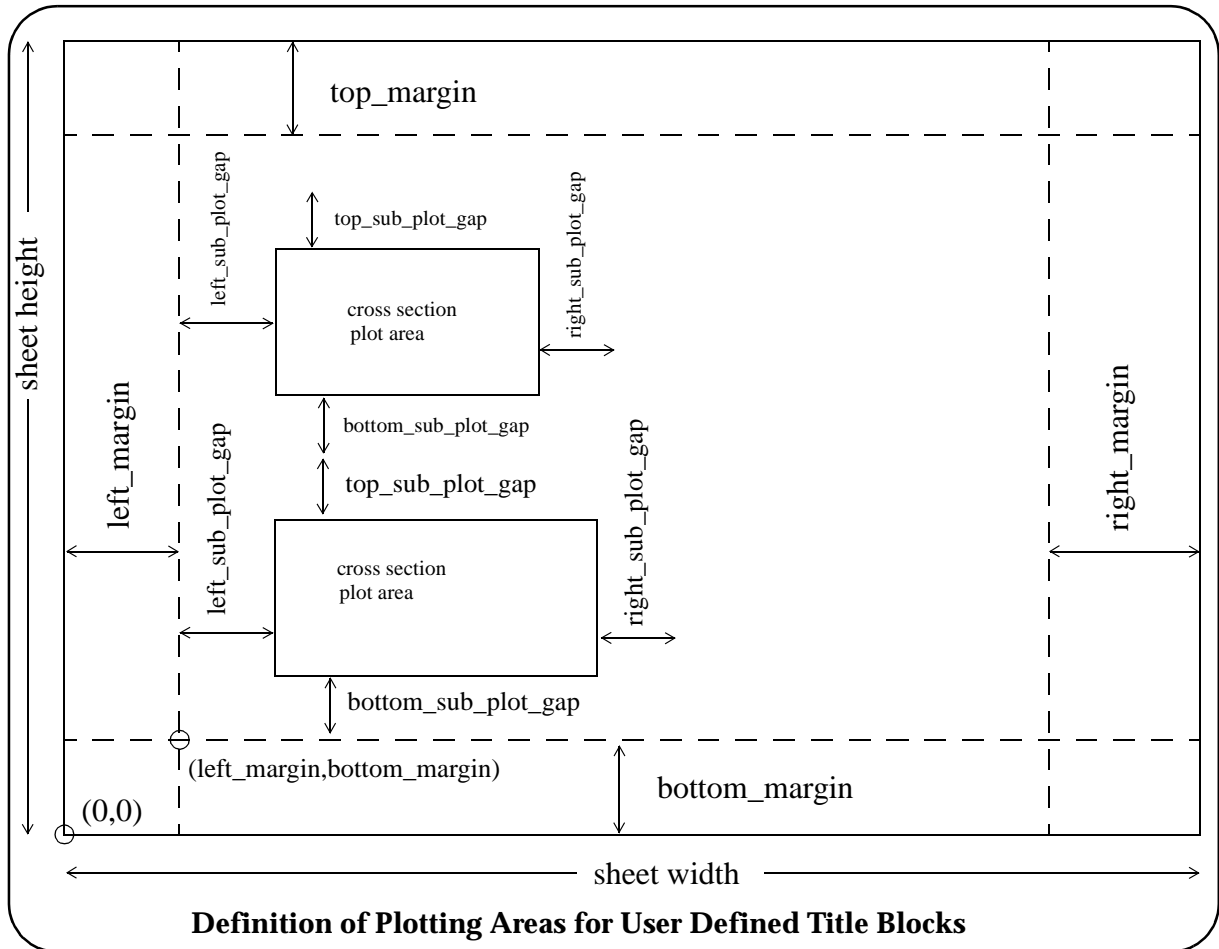
The **datum area** is the region between the boxes area and the graph area.

The **graph area** is the area where the actual plots of the strings are drawn.

Apart from information labelled in the boxes area, the x-section sub-plot can label other information such as

- (a) grades across the x-section
- (b) points across the x- section
- (c) cuts the x-section makes through strings
- (d) cut and fill areas





Please continue to the next section “Boxes/ Centreline Labels” .

Boxes/ Centreline Labels

Section_X_Plot_Boxes_Centreline_labels

Boxes/ Centreline Labels

Section: Boxes or Centreline Labels

The x-section can be labelled with either

- an upright, and the offset and height value at the zero offset (normally the centre line position) - Centre line
- the heights of the x-section and the tins at all the x-section points. - Boxes

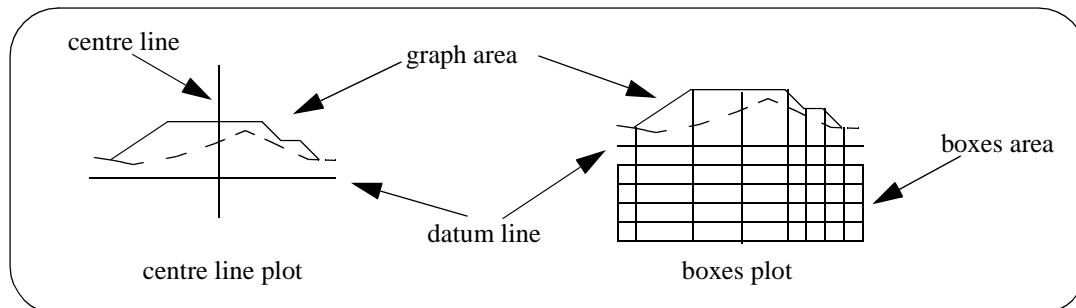
The choice is given by the parameter *label_type* defined in the section “Section: Boxes/Centre lines” .

A datum line exists for both cases.

For the boxes case, a box area for the offset and heights is created below the datum line. The available parameters for tailoring the box area will be given after describing the datum line parameters.

For the centre line case, the centre line and offset and height of the centre line are shown.

In both cases, the actual cross section plot is drawn above the datum line in the graph area.



Common Parameters

Section_X_Plot_Boxes_Centreline_labels_Common_parameters

The parameters defined below, are common to both label types

Common Parameters

Section: Common Datum Line Label Parameters

The fields and buttons used in this section have the following functions.

Field Description	Parameter name	Type	Pop-Up
Datum roundoff	datum_roundoff	input	

value to roundoff the datum value to e.g. 0.5, 0.2, 1.0 (default 1.0)

The roundoff for the datum value is specified by the user (default 1.0) and the datum is automatically calculated for each sub-plot, and labelled.

Datum places for datum	datum_decimals	input	
-------------------------------	----------------	-------	--

number of decimal places to display the datum value (default 1). If > 0, trailing zeros are removed after the decimal point. If < 0, the absolute value is taken as the number of decimal places to report i.e. no trailing zeros are removed

Datum linestyle	datum_linestyle	linestyle box	
------------------------	-----------------	---------------	--

datum line linestyle (default solid)

Datum name	datum_name	input
	<i>text to write before the datum value</i>	
Datum textstyle	datum_textstyle	text box
	<i>textstyle for datum information</i>	
Datum text size (mm)	datum_text_size	input
	<i>size of datum text and value (mm)</i>	
Datum colour	datum_colour	colour box
	<i>colour of the datum text</i>	
Datum line colour	datum_line_colour	colour box
	<i>colour of the datum line</i>	

Section_X_Plot_Boxes_Centreline_labels_Common_parameters_Tins_to_label

Tins To Label

Section: Common Parameters for Tins To Label

The fields and buttons used in this section have the following functions.

Field Description	Parameter name	Type	Pop-Up
Define tin set #		input	
	<i>where n = 1 to.... The set enables the specification of a number of parameters for a number of specified tin names.</i>		
Tin name	tin_n_name	tin box	available tins
	<i>the name of the nth tin to be used for labelling.</i>		

If a tin of the name given by *tin_n_name* does not exist, then the plot is not produced and an error message is given.

Section_X_Plot_Boxes_Centreline_labels_Common_parameters_Centreline_chainage

Centreline Chainage

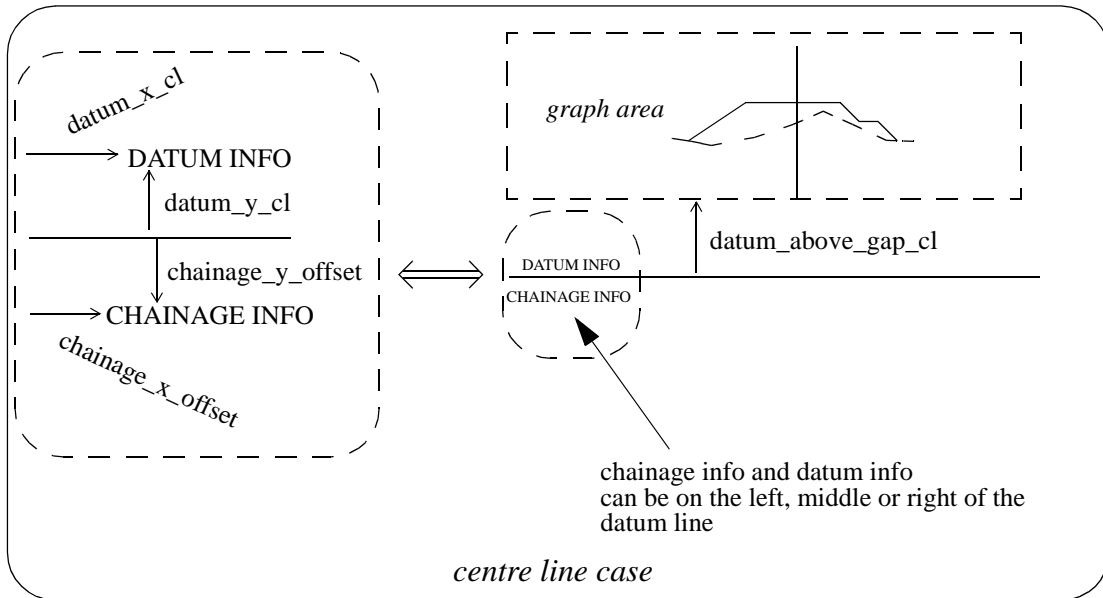
Section: Common Centreline Chainage Label Parameters

Each x-section sub-plot can be labelled with the centreline chainage of the x-section string.

This CHAINAGE INFO label is made up of the text strings:

"chainage_title" followed by the *chainage-value*

and is drawn under the datum line.



The fields and buttons used in this section have the following functions.

Field Description	Parameter name	Type	Pop-Up
-------------------	----------------	------	--------

Label subplot with centreline chainage

	chainage_label	tick box	
--	----------------	----------	--

if ticked, label sub-plot with centreline

Chainage title	chainage_title	input	
-----------------------	----------------	-------	--

text before the chainage value

Chainage Decimal places	chainage_decimals	input	
--------------------------------	-------------------	-------	--

number of decimals in the chainage value. If <0, the absolute value is taken as the number of decimal places i.e. no trailing zeros are removed for the values in the chainage values.

Chainage colour	chainage_colour	colour box	
------------------------	-----------------	------------	--

colour of the text

Chainage text size (mm)	chainage_size	input	
--------------------------------	---------------	-------	--

size of the text

Chainage textstyle	chainage_textstyle	text box	
---------------------------	--------------------	----------	--

textstyle for the chainage label

Chainage text x position (mm)

	chainage_x_offset	input	
--	-------------------	-------	--

x position of text (mm)

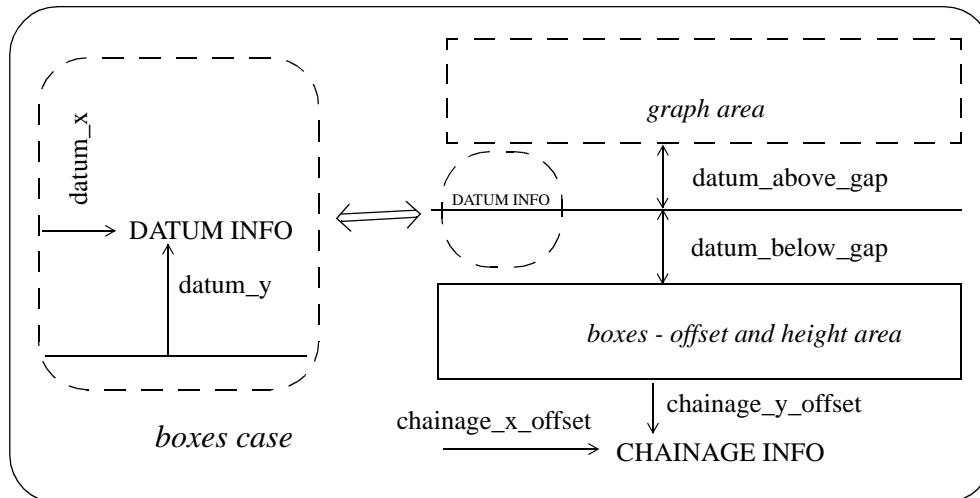
Chainage text y position (mm)

	chainage_y_offset	input	
--	-------------------	-------	--

y position of text (mm)

The *chainage_x_offset* is measured from the beginning of the datum line.

The *chainage_y_offset* is measured from the bottom of the datum line with positive being **down**.



The values of the height and X and Y co-ordinates of the **primary string** (usually the design cross section) at the zero offset can be labelled. Note that zero offset is normally where the alignment string cuts the cross section.

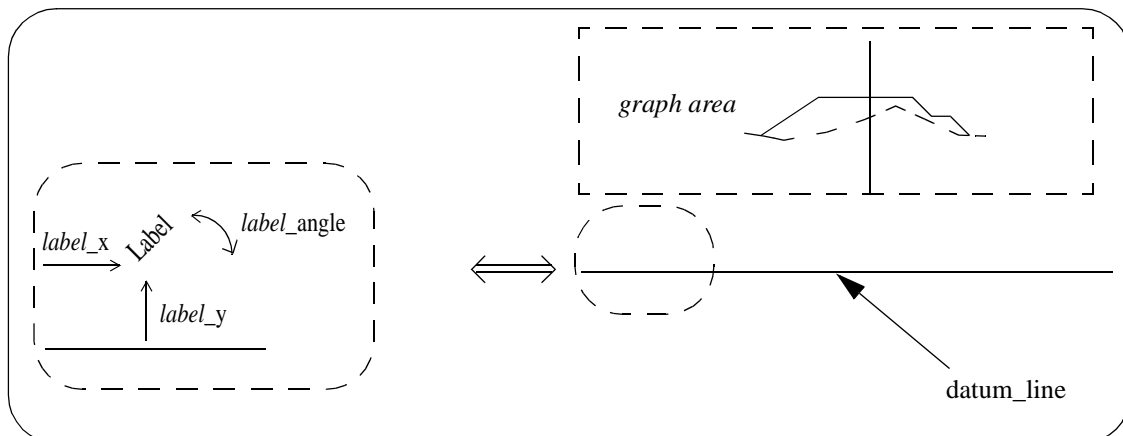
The heights of any tins (such as the natural surface) at the zero offset can also be labelled.

The labels are made up of:

pre_text value post_text

where *value* is either a height or a co-ordinate.

The label is positioned at either the left, right or middle of the datum line, with an x and y adjustment and a rotation.



Section_X_Plot_Boxes_Centreline_labels_Common_parameters_X_coordinate_at_0_offset

X Coordinate At 0 Offset

Section: Common Labelling For X Coord At 0 Offset

The fields and buttons used in this section have the following functions.

Field Description	Parameter name	Type	Pop-Up
-------------------	----------------	------	--------

Draw Label	primary_x0_draw_mode	tick box
<i>if ticked draw the label -default</i>		
Pre text	primary_x0_pre_text	input
<i>pre-text for label - def " "</i>		
Post text	primary_x0_post_text	input
<i>post-text for label - def " "</i>		
Decimal places	primary_x0_decimals	input
<i>number of decimal places to display - def 1. If > 0, trailing zeros are removed after the decimal point If < 0, the absolute value is taken as the number of decimal places to report i.e. no trailing zeros are removed</i>		
X adjustment (mm)	primary_x0_x	input
<i>x adjustment to position of label - def 0</i>		
Y adjustment (mm)	primary_x0_y	input
<i>y adjustment to position of label - def 0</i>		
Angle (dms)	primary_x0_angle	angle box
<i>angle of label - def 0</i>		
Colour	primary_x0_colour	colour box
<i>colour of the label</i>		
Size (mm)	primary_x0_size	input
<i>size (in mm) of the label</i>		
Textstyle	primary_x0_textstyle	text box
<i>textstyle of the label</i>		
Justification	primary_x0_justify	justification box
<i>justification of the label</i>		

Section_X_Plot_Boxes_Centreline_labels_Common_parameters_Y_coordinate_at_0_offset

Y Coordinate At 0 Offset

Section: Common Labelling For Y Coord At 0 Offset

The fields and buttons used in this section have the following functions.

Field Description	Parameter name	Type	Pop-Up
Draw Label	primary_y0_draw_mode	tick box	
<i>if ticked draw the label -default</i>			
Pre text	primary_y0_pre_text	input	
<i>pre-text for label - def " "</i>			
Post text	primary_y0_post_text	input	
<i>post-text for label - def " "</i>			
Decimal places	primary_y0_decimals	input	
<i>number of decimal places to display - def 1. If > 0, trailing zeros are removed after the decimal point If < 0, the absolute value is taken as the number of decimal places to report i.e. no trailing zeros are removed</i>			

removed

X adjustment (mm)	primary_y0_x	input
	<i>x adjustment to position of label - def 0</i>	
Y adjustment (mm)	primary_y0_y	input
	<i>y adjustment to position of label - def 0</i>	
Angle (dms)	primary_y0_angle	angle box
	<i>angle of label - def 0</i>	
Colour	primary_y0_colour	colour box
	<i>colour of the label</i>	
Size (mm)	primary_y0_size	input
	<i>size (in mm) of the label</i>	
Textstyle	primary_y0_textstyle	text box
	<i>textstyle of the label</i>	
Justification	primary_y0_justify	justification box
	<i>justification of the label</i>	

[Section_X_Plot_Boxes_Centreline_labels_Common_parameters_Height_of_primary_string_at_0_offset](#)

Height Of Primary String At 0 Offset

Section: Common Labelling For Height Of Primary String At 0 Offset

The fields and buttons used in this section have the following functions.

Field Description	Parameter name	Type	Pop-Up
Draw Label	primary_height_draw_mode	tick box	
	<i>if ticked draw the label -default</i>		
Pre text	primary_height_pre_text	input	
	<i>pre-text for label - def " "</i>		
Post text	primary_height_post_text	input	
	<i>post-text for label - def " "</i>		
Decimal places	primary_height_decimals	input	
	<i>number of decimal places to display - def 1. If > 0, trailing zeros are removed after the decimal point If < 0, the absolute value is taken as the number of decimal places to report i.e. no trailing zeros are removed</i>		
X adjustment (mm)	primary_height_x	input	
	<i>x adjustment to position of label - def 0</i>		
Y adjustment (mm)	primary_height_y	input	
	<i>y adjustment to position of label - def 0</i>		
Angle (dms)	primary_height_angle	angle box	
	<i>angle of label - def 0</i>		
Colour	primary_height_colour	colour box	

	<i>colour of the label</i>	
Size (mm)	primary_height_size	input
	<i>size (in mm) of the label</i>	
Textstyle	primary_height_textstyle	text box
	<i>textstyle of the label</i>	
Justification	primary_height_justify	justification box
	<i>justification of the label</i>	

Section_X_Plot_Boxes_Centreline_labels_Common_parameters_Text_placement

Text Placement

Section: Common Parameters For Text Labelling

The fields and buttons used in this section have the following functions.

Field Description	Parameter name	Type	Pop-Up
Draw Label	extra_text_draw_mode	tick box	
	<i>if ticked draw the label -default</i>		
Text	extra_text	input	
	<i>text for label - def " "</i>		
X adjustment (mm)	extra_text_x	input	
	<i>x adjustment to position of label - def 0</i>		
Y adjustment (mm)	extra_text_y	input	
	<i>y adjustment to position of label - def 0</i>		
Angle (dms)	extra_text_angle	angle box	
	<i>angle of label - def 0</i>		
Colour	extra_text_colour	colour box	
	<i>colour of the label</i>		
Size (mm)	extra_text_size	input	
	<i>size (in mm) of the label</i>		
Textstyle	extra_text_textstyle	text box	
	<i>textstyle of the label</i>		
Justification	extra_text_justify	justification box	
	<i>justification of the label</i>		

Boxes

When **boxes** is selected for *label_type*, the primary string (usually the design cross section) and each tin in the x-section sub-plot can be labelled with one or two lines of title, and the height at the offset position for each point in the primary string.

The **title** for the strings, is drawn in the **title area** of the **boxes area**.

The offsets/heights are drawn in the **heights area** of the **boxes area**.

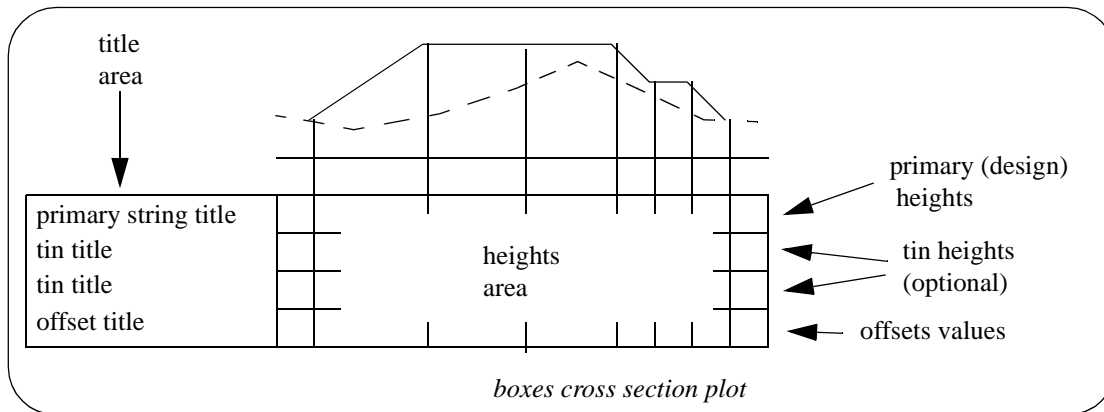
Consequently the boxes area is made up of rows of text consisting of:

string/tin titles followed by the **offset/height values** across the string/tin.

Each row is surrounded by lines to form a box.

The default order of the boxes from the bottom up is

- (a) offset title and values
- (b) tin title and heights - natural surface etc. (optional)
- (c) primary string title and heights - design x-section (optional)



The **title area** starts at the relative position (left_sub_plot_gap,bottom_sub_plot_gap).

Section_X_Plot_Boxes_Centreline_labels_Boxes

Boxes

Section: Default Box Parameters

The fields and buttons used in this section have the following functions.

Field Description	Parameter name	Type	Pop-Up
Colour <i>the default box colour</i>	box_colour	colour box	
Insert 0 offset <i>if ticked, a zero offset will be calculated if not already defined on the x section.</i>	offset_insert_zero	tick box	
Draw box mode	draw_box_mode	choice box	Do not draw any box lines Draw box lines around height area only Draw box lines around title and height area only Use parameters defined in boxes - heights

mode for drawing the boxes for the x section plot.

Section_X_Plot_Boxes_Centreline_labels_Boxes_Datum_lines

Datum Lines

Section: Boxes - Datum Line Parameters

For the boxes case, the **datum line** is positioned the distance *datum_below_gap* above the top of the boxes area and the graph area is then positioned the distance *datum_above_gap* above the datum line.
Hence the graph area is distance (*datum_below_gap* + *datum_above_gap*) above the top of the boxes area.

The fields and buttons used in this section have the following functions.

Field Description	Parameter name	Type	Pop-Up
Graph area to datum line gap (mm) <i>dist from datum line to bottom of the</i>	<i>datum_above_gap</i>	input	
Datum line gap to top of boxes (mm) <i>dist from datum line to the top of the boxes</i>	<i>datum_below_gap</i>	input	
X adjustment (mm) <i>distance to move the datum text along the datum line</i>	<i>datum_x</i>	input	
Y adjustment (mm) <i>distance to raise the datum text above the datum line (used to be called datum_offset) The datum_x and datum_y can be positive, zero or negative.</i>	<i>datum_y</i>	input	

Section_X_Plot_Boxes_Centreline_labels_Boxes_Centreline_chainage

Centreline Chainage

Section: Boxes - Centre Line Parameters

The fields and buttons used in this section have the following functions.

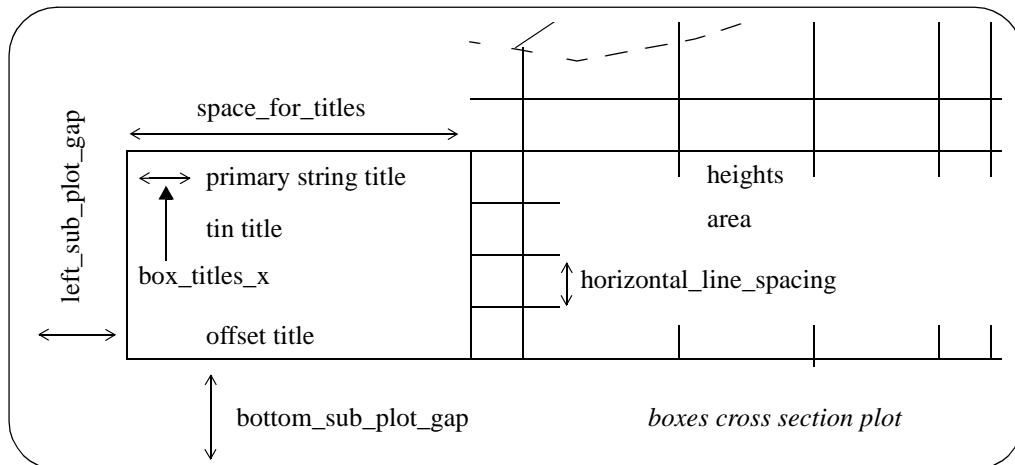
Field Description	Parameter name	Type	Pop-Up
Justification of chainage text	<i>chainage_text_justification</i>	justification box	bottom-left bottom-centre bottom-right bottom-decimal middle-left middle-centre middle-right middle-decimal top-left top-centre top-right top-decimal decimal-left decimal-centre decimal-right decimal-point

justification of the chainage text.

Section_X_Plot_Boxes_Centreline_labels_Boxes_Title_area

Title Area

Many distance definitions in the plot parameter file are given in terms of distance above the **top** of the boxes area.

**Section: Boxes - Title Area Parameters**

The size of the title text is given by the *title_box_text_size* parameter.

The width of the title area is either given by the *space_for_titles* parameter, or if omitted, the required width is automatically calculated.

The fields and buttons used in this section have the following functions.

Field Description	Parameter name	Type	Pop-Up
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Size of titles (mm)	<i>title_box_text_size</i>	input	
----------------------------	----------------------------	-------	--

size of offset, height label and values

Space for titles (mm)	<i>space_for_titles</i>	input	
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size of title area.

There can be two lines of title text and the title text, textstyle and colour can be set independently for the primary string and each tin.

The x position of the title text is the same for all the lines of title text and can be set to be a fixed distance from the left hand side of the boxes.

X adjustment (mm)	<i>box_titles_x</i>	input	
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distance to move the title text from the left hand side of the boxes

The text in the title area is the same for each cross section plot on the sheet so it is possible to restrict the title area to be only on the first cross section on the sheet or the first column of cross sections.

Title area mode	<i>label_first_only</i>	choice box	on all sections on first x-sec of page only on x-sec's in first column
------------------------	-------------------------	------------	--

it is possible to restrict the title area to be only on the first cross section on the sheet or the first column of cross sections

Section_X_Plot_Boxes_Centreline_labels_Boxes_Heights_area

Heights Area

The **heights area** starts at the end of the title area.

The height text is written at right angles to the bottom of the boxes. It can be either top or bottom justified with respect to the box (*box_text_justification*).

The number of decimal places and the size of the heights text can also be specified.

The height of each individual box area is either given by the *horizontal_line_spacing* parameter, or if omitted, the required height is automatically calculated.

Section: Boxes - Height Area Parameters

The fields and buttons used in this section have the following functions.

Field Description	Parameter name	Type	Pop-Up
Number of decimals	number_of_decimals	input	

number of decimal places in the offset height boxes. If <0, the absolute value is taken as the number of decimal places i.e. no trailing zeros are removed for the values in the offset, heights area.

Text size (mm)	text_size	input	
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size of the height values

Justification	box_text_justification	choice box	bottom of individual boxes top of individual boxes
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justification of box text.

Horizontal line spacing (mm)	horizontal_line_spacing	input	
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height of each individual box area of title area. Calculated if omitted

The total height of the boxes area is simply given by number of boxes drawn multiplied by the height of one box (they all have the same height).

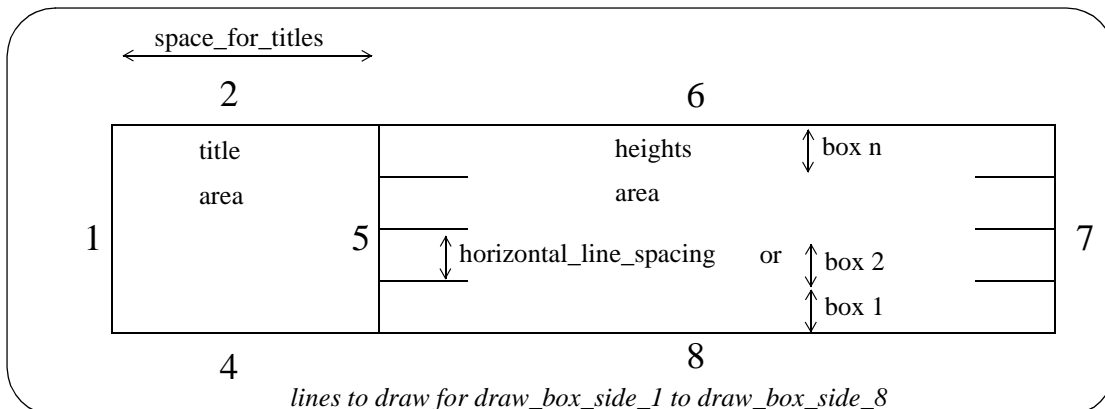
The **width** of the heights area is determined by the number of chainages to be labelled and whether the values are staggered to prevent over writing.

Hence the total width of the boxes area is the width of the labels area plus the width of the heights area.

Section_X_Plot_Boxes_Centreline_labels_Boxes_Outside_linework

Outside Linework

Section: Boxes - Outside Linework Parameters



The fields and buttons used in this section have the following functions.

Field Description	Parameter name	Type	Pop-Up
Draw the left side of title area(1)	draw_box_side_1	tick box	
<i>if ticked, draw the left side of the title area (def).</i>			
Draw the top line of title area(2)	draw_box_side_2	tick box	
<i>if ticked, draw the top line of the title area (def).</i>			
Draw the bottom line of title area(4)	draw_box_side_4	tick box	
<i>if ticked, draw the bottom line of the title area (def).</i>			
Draw the left side of heights area(5)	draw_box_side_5	tick box	
<i>if ticked, draw the left side of the heights area (def).</i>			
Draw the top line of heights area(6)	draw_box_side_6	tick box	
<i>if ticked, draw the top line of the heights area (def).</i>			
Draw right side of heights area(7)	draw_box_side_7	tick box	
<i>if ticked, draw right side of the heights area (def).</i>			
Draw bottom side of heights area(8)	draw_box_side_8	tick box	
<i>if ticked, draw bottom side of the heights area (def).</i>			
Colour (1)	box_side_colour_1	colour box	
<i>colour to draw left side of title area</i>			
Colour (2)	box_side_colour_2	colour box	
<i>colour to draw top of title area</i>			
Colour (4)	box_side_colour_4	colour box	
<i>colour to draw bottom of title area</i>			
Colour (5)	box_side_colour_5	colour box	
<i>colour to draw left side of heights area</i>			
Colour (6)	box_side_colour_6	colour box	
<i>colour to draw top of heights area</i>			
Colour (7)	box_side_colour_7	colour box	
<i>colour for right side of heights area</i>			
Colour (8)	box_side_colour_8	colour box	
<i>colour for bottom of heights area</i>			

Section_X_Plot_Boxes_Centreline_labels_Boxes_Inside_linework

Inside Linework

Section: Boxes - Inside Linework Parameters

The lines at the top of the individual boxes inside the title area and heights area (separation lines) are controlled by the parameters *box_line_draw_mode* and *box_line_mode_n*.

The separation lines can be drawn just in the title area, just in the heights area or in both areas.

The parameter *box_line_draw_mode* can be set to control all the separation lines but there are additional parameters, *box_line_mode_n*, which override *box_line_draw_mode* for each of the individual boxes where n = 1, ... number of boxes -1.

The top of the top box is not controlled by *box_line_mode_n* but is controlled by the parameters *draw_box_side_2* and *draw_box_side_6*.

The fields and buttons used in this section have the following functions.

Field Description	Parameter name	Type	Pop-Up
Separation line mode	<i>box_line_draw_mode</i>	choice box	Do not draw any separation lines Draw the separation lines in both areas Draw the separation lines in the title area only Draw the separation lines in the heights area only

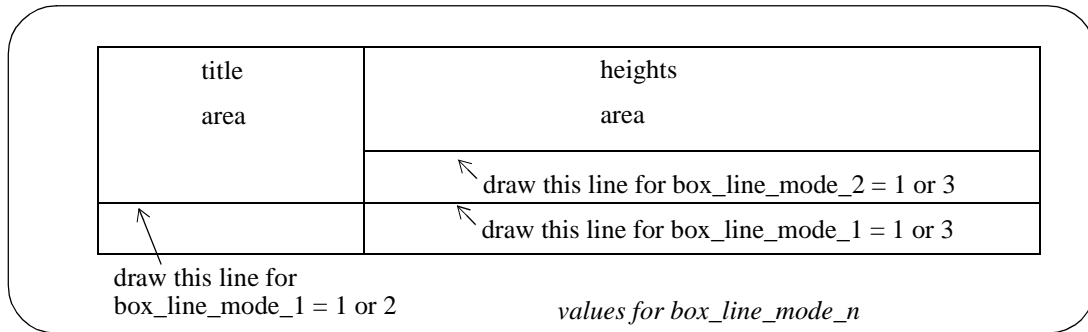
the separation line draw mode.

Box # input

Where box # = 1 to number of boxes(n). Box 1 is the bottom box, increasing upwards.

Line mode	<i>box_line_mode_n</i>	choice box	No top line for title or height area (mode=0) Draw top line for title or height area (mode=1) Draw top line for title area only (mode=2) Draw top line for height area only (mode=3)
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line mode for top of title and height areas for box number specified.

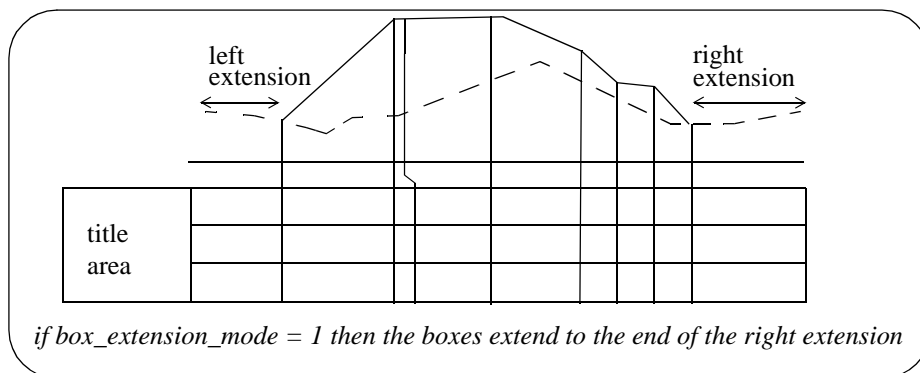


Section_X_Plot_Boxes_Centreline_labels_Boxes_Extension_mode

Extension Mode

Section: Boxes - Extension Mode Parameters

The right hand end of the boxes can stop at the end of the design x-section or extend to the end of the right_extension distance.



The fields and buttons used in this section have the following functions.

Field Description	Parameter name	Type	Pop-Up
Extension mode	box_extension_mode	choice box	extend boxes to end of design x-section (mode=0) extend boxes to end of right extension distance

(mode=1)

Section_X_Plot_Boxes_Centreline_labels_Boxes_Offset_titles_values

Offset Titles/Values

Section: Boxes - Offset Title/Value Parameters

The fields and buttons used in this section have the following functions.

Field Description	Parameter name	Type	Pop-Up
First line of offset title	offset_title	input	

first line of offset title

Second line of offset title <i>second line of offset title</i>	offset_title_2	input
Offset title textstyle <i>offset title textstyle</i>	offset_title_textstyle	text box
Offset title colour <i>offset title colour</i>	offset_title_colour	colour box
Offset title size (mm) <i>offset title size</i>	offset_title_size	input
Offset value colour <i>offset value colour</i>	offset_colour	colour box
Offset value textstyle <i>offset value textstyle</i>	offset_textstyle	text box
Offset value size (mm) <i>offset value size</i>	offset_size	input

Section_X_Plot_Boxes_Centreline_labels_Boxes_Primary_string_titles_values

Primary String Titles/Values

Section: Boxes - Primary String Title Parameters

The fields and buttons used in this section have the following functions.

Field Description	Parameter name	Type	Pop-Up
First line <i>first line of primary string title</i>	primary_title	input	
Second line <i>second line of primary string title</i>	primary_title_2	input	
Textstyle <i>primary string title textstyle</i>	primary_title_textstyle	text box	
Colour <i>primary string title colour</i>	primary_title_colour	colour box	
Size (mm) <i>primary string title size</i>	primary_title_size	input	
Y position (mm) <i>if set, the height in mm above the bottom of all the boxes that the primary string title text is drawn. If not set, then the text is placed at a height that puts it inside the default box for the primary string title.</i>	primary_title_y_pos	input	

Section: Boxes - Primary String Value Parameters

The fields and buttons used in this section have the following functions.

Field Description	Parameter name	Type	Pop-Up
Colour <i>primary string value colour</i>	primary_colour	colour box	

Textstyle	primary_textstyle	text box
	<i>primary string value textstyle</i>	
Size (mm)	primary_size	input
	<i>primary string value size</i>	
Y position (mm)	primary_y_pos	input
	<i>if set, the height in mm above the bottom of all the boxes that the primary string value text is drawn. If not set, then the text is placed at a height that puts it inside the default box for the primary string values.</i>	
Decimals	primary_decimals	input
	<i>number of dec places in primary string height. < 0 to keep all trailing zeros</i>	

Section_X_Plot_Boxes_Centreline_labels_Boxes_Tin_titles_values

Tin Titles/Values

Section: Tin Titles/Values - Tin Parameters

The fields and buttons used in this section have the following functions.

Field Description	Parameter name	Type	Pop-Up
Use tin set #		input	
	<i>set number to be used to define sets of tin parameters i.e. n value</i>		
Tin draw mode	tin_n_draw_mode	choice box	Draw the tin Do not draw the tin
	<i>draw tin mode for the nth tin specified by set #.</i>		
Tin colour	tin_n_draw_colour	colour box	
	<i>tin colour mode for the nth tin specified by set #.</i>		
Tin label mode	tin_n_label	choice box	Label the tin Do not label the tin
	<i>tin label mode for the nth tin specified by set #.</i>		

Section_X_Plot_Boxes_Centreline_labels_Boxes_Tin_titles_values_Tin_Titles

Tin Titles

Section: Tin Title Parameters

The fields and buttons used in this section have the following functions.

Field Description	Parameter name	Type	Pop-Up
Use tin set #		input	
	<i>set number to be used to define sets of tin parameters i.e. n value</i>		
First line of tin title	tin_n_title	input	
	<i>first line of nth tin title</i>		
Second line of tin title	tin_n_title_2	input	
	<i>second line of nth tin title</i>		
Tin title textstyle	tin_n_title_textstyle	text box	

nth tin title textstyle

Tin title colour tin_n_title_colour colour box

nth tin title colour

Tin title size (mm) tin_n_title_size input

nth tin title size

Title Y position (mm) tin_n_title_y_pos input

if set, the height in mm above the bottom of all the boxes that the nth tin title text is drawn. If not set, then the text is placed at a height that puts it inside the default box for the tin heights.

Section_X_Plot_Boxes_Centreline_labels_Boxes_Tin_labels_values_Tin_heights

Tin Heights

Section: Tin Height Parameters

The fields and buttons used in this section have the following functions.

Field Description	Parameter name	Type	Pop-Up
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Use tin set #		input	
----------------------	--	-------	--

set number to be used to define sets of tin parameters i.e. n value

Decimals	tin_n_decimals	input	
-----------------	----------------	-------	--

number of dec places in nth tin height. < 0 to keep all trailing zeros

Textstyle	tin_n_textstyle	text box	
------------------	-----------------	----------	--

textstyle of nth tin height

Colour	tin_n_colour	colour box	
---------------	--------------	------------	--

nth tin height and depth colour

Size (mm)	tin_n_size	input	
------------------	------------	-------	--

nth tin height size

Y pos (mm)	tin_n_y_pos	input	
-------------------	-------------	-------	--

if set, the height in mm above the bottom of all the boxes that the tin height text is drawn. If not set, then the text is placed at a height that puts it inside the default box for the tin heights.

Section_X_Plot_Boxes_Centreline_labels_Boxes_Tin_labels_values_Tin_depths

Tin Depths

Section: Tin Depth Parameters

The fields and buttons used in this section have the following functions.

Field Description	Parameter name	Type	Pop-Up
-------------------	----------------	------	--------

Use tin set #		input	
----------------------	--	-------	--

set number to be used to define sets of tin parameters i.e. n value

Depth label mode	tin_n_depth_label	choice box	Label depths Do not label depths
-------------------------	-------------------	------------	-------------------------------------

depth label mode for the nth tin specified by set #.

First line of tin depth title	tin_n_depth_title	input	
--------------------------------------	-------------------	-------	--

first line of nth tin depth title

Second line of tin depth title

tin_n_depth_title_2 input

second line of nth tin depth title

Depth title textstyle tin_n_depth_title_textstyle text box

nth tin depth title textstyle

Depth title colour tin_n_depth_title_colour colour box

nth tin depth title colour

Depth title size (mm) tin_n_depth_title_size input

nth tin depth title size

Depth title Y position (mm) tin_n_depth_title_y_pos input

if set, the height in mm above the bottom of all the boxes that the tin depth title text is drawn. If not set, then the text is placed at a height that puts it inside the default box for the tin heights.

Decimals in depth value tin_n_depth_decimals input

number of dec places in tin height. < 0 to keep all trailing zeros

Depth value textstyle tin_n_depth_textstyle text box

nth tin depth textstyle

Depth value colour tin_n_depth_colour colour box

nth tin depth colour

Depth value size (mm) tin_n_depth_size input

nth tin depth size

Depth value Y position (mm) tin_n_depth_y_pos input

if set, the height in mm above the bottom of all the boxes that the tin depth text is drawn. If not set, then the text is placed at a height that puts it inside the default box for the tin heights.

Multiplier for positive depths depth_positive_factor input

if set, this value will be used to multiply positive depth values.

Multiplier for negative depths depth_negative_factor input

if set, this value will be used to multiply negative depth values.

The depth from the primary string to a tin, at a particular offset is defined as

$$\mathbf{depth} = \text{tin height value} - \text{height of the primary string}$$

That is, the depth that the primary string is **below** the tin.

Before plotting, the value of depth is multiplied by either the *depth_positive_factor* or *depth_negative_factor*.

if (depth >= 0) plotted_depth_value = depth * depth_positive_factor

if (depth < 0) plotted_depth_value = depth * depth_negative_factor

Hence the definition of depth can be modified by the parameters:

depth_positive_factor *value* // multiplier for positive depths

depth_negative_factor *value* // multiplier for negative depths

For example, if the opposite sign is required for depth, that is,

$$\mathbf{depth} = \text{height of the primary string} - \text{tin height value}$$

simply set

depth_positive_factor -1

Section_X_Plot_Boxes_Centreline_labels_Boxes_Upright_offset_staggering_parameters

Upright Offset/Staggering Parameters

Section: Upright Offset/Staggering Parameters

For each sub-plot, the offsets of the points across the x-section string (primary string) are used for positioning uprights (leader lines), and the offset and height labels for the uprights.

By default, there is an upright at each point across the primary string.

However, if the primary string is a 4d string, then the text at the points on the 4d string can be used as a key to **suppress** the labelling and upright at that point. See “Section: Exclude Uprights At Nominated X-Sec Points”

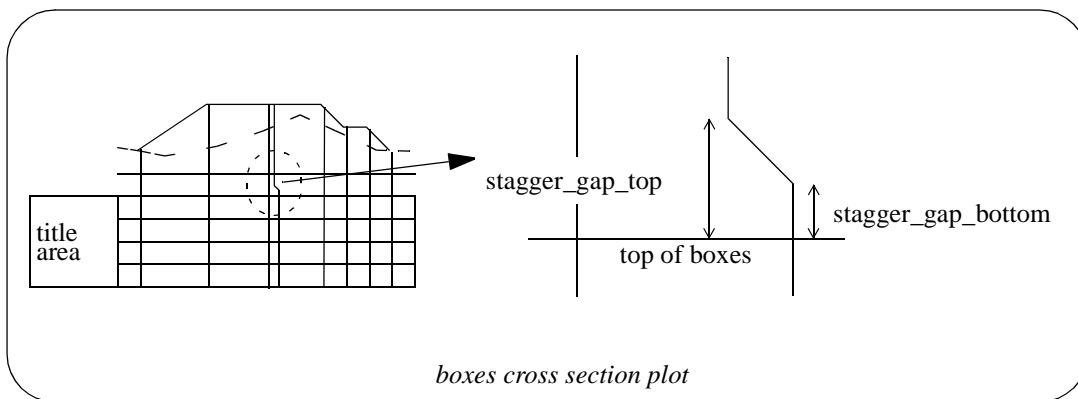
If the real offset position is used for the horizontal position of the offset/height text, text over writing can easily occur. To prevent over writing, the text is automatically **staggered**.

When staggering occurs, the real offset position is then indicated by the offset markers which are drawn at the top of the text boxes from the staggered text position back to the actual offset position of the text.

The size and position of the staggers are given by:

The fields and buttons used in this section have the following functions.

Field Description	Parameter name	TypePop-Up
Offset label tolerance <i>weed out offset values closer together (in offset units) than this value.</i>	offset_label_tolerance	input
Top of stagger to boxes distance (mm) <i>distance from boxes to top of stagger.</i>	stagger_gap_top	input
Bottom of stagger to boxes distance (mm) <i>distance from boxes to bottom of stagger.</i>	stagger_gap_bottom	input
Stagger gap factor <i>distance between staggers is box_text_size * stagger_gap_factor</i>	stagger_gap_factor	input



Section_X_Plot_Boxes_Centreline_labels_Boxes_Upright_offset_staggering_parameters_Uprights_to_exclude

Uprights To Exclude

Section: Exclude Uprights At Nominated X-Sec Points

For each sub-plot, the offsets of the points across the x-section string (primary string) are used for positioning uprights (leader lines), and the offset and height labels for the uprights.

By default, there is an upright at each point across the primary string.

However, if the primary string is a 4d string, then the text at the points on the 4d string can be used as a key to **suppress** the labelling and upright at that point.

The parameters to **stop** labelling and uprights are:

mask_name_n 4d_string_point_text where n=1,100

After any *name masks* have been applied, it is often desirable to weed out offset values that are too close together before doing any labelling.

The fields and buttons used in this section have the following functions.

Field Description	Parameter name	Type	Pop-Up
Set #		input	
<i>set number to be used to define a number of uprights to suppress</i>			
X-sec points to exclude	mask_name_n	input	
<i>the string name to be excluded. Note -the name can include wild cards (*) and characters (?). n is the value from the Set # provided.</i>			

Section_X_Plot_Boxes_Centreline_labels_Boxes_Uprights

Uprights

Section: Uprights

The fields and buttons used in this section have the following functions.

Field Description	Parameter name	Type	Pop-Up
Uprights draw mode	uprights_draw_mode	choice box	<i>none</i>
<i>ticks to stagger height</i>			
<i>to uprights_y above boxes</i>			
<i>to primary string</i>			
<i>to tin 1</i>			
<i>to tin 2</i>			
<i>to tin 3</i>			
<i>to tin 4</i>			
<i>to tin 5</i>			
<i>to tin 6</i>			
<i>to tin 7</i>			
<i>to tin 8</i>			
<i>to tin 9</i>			
<i>to tin 10</i>			

Upright draw mode above boxes.

Uprights Y distance (mm) uprights_y input
 distance to draw the uprights for uprights_draw_mode = "to uprights_y above boxes"

Uprights colour uprights_colour colour box
uprights colour. Default is box_colour

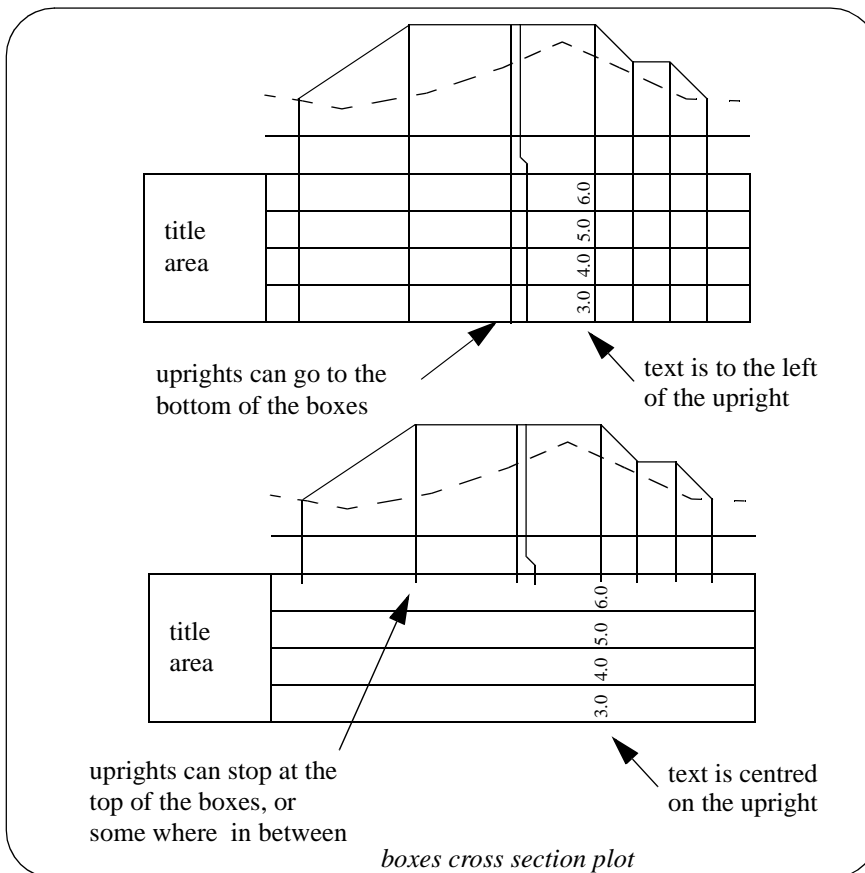
Uprights bottom mode uprights_bottom_mode choice box stop at top of boxes
draw to bottom of boxes
draw to uprights_bottom_y
below top of boxes
draw to uprights_bottom_y
above bottom of boxes
ticks at chainage

Upright draw mode below top of boxes.

Uprights bottom Y distance (mm) uprights_bottom_y input
distance in mm.

Uprights text offset factor uprights_text_offset_factor input
move the text by this factor**size*.

When uprights go below the top of the boxes, the height and offset text is moved to the left so that the upright does not go through the text. The left hand side of the heights boxes also moves to the left to leave room for the height text.



Centreline

Section_X_Plot_Boxes_Centreline_labels_Centreline

Centreline

Section: Centreline Linestyle

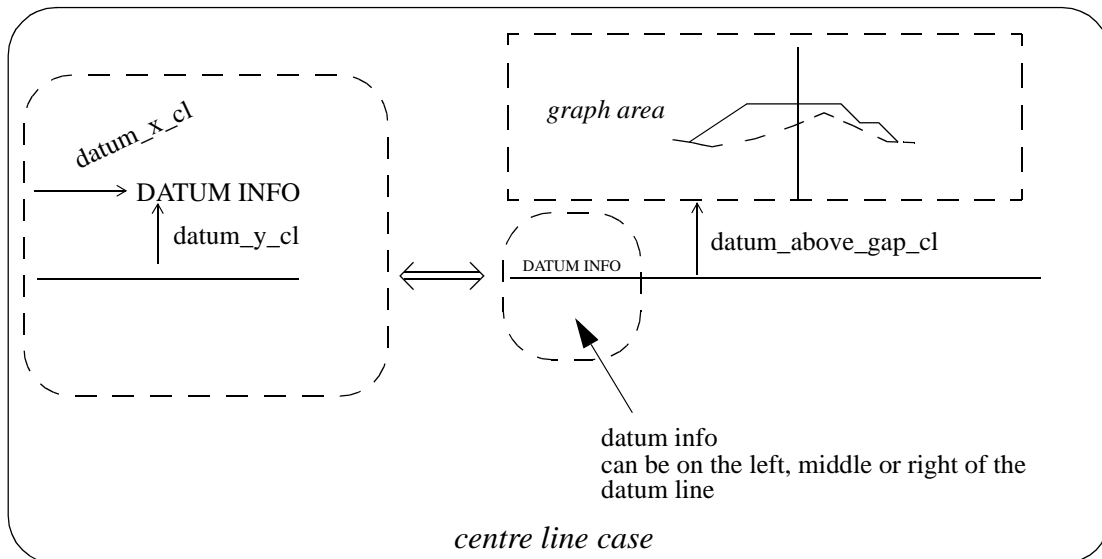
The fields and buttons used in this section have the following functions.

Field Description	Parameter name	Type	Pop-Up
Linestyle of centreline	cl_linestyle	linetype box	
<i>linestyle to be used for drawing centreline</i>			

Section_X_Plot_Boxes_Centreline_labels_Centreline_Datum_lines

Datum Lines

Section: Centreline - Datum Line Parameters



For the centreline case, the graph area is positioned the distance *datum_above_gap_cl* above the datum line.

The fields and buttons used in this section have the following functions.

Field Description	Parameter name	Type	Pop-Up
Graph area - datum line gap (mm)	datum_above_gap_cl	input	
<i>dist from datum line to bottom of the graph area</i>			
Position of text	datum_side_cl	choice box	Middle of datum line Left of datum line Right of datum line

side of centreline to position text.

Text justification	datum_text_justification_cl	just. box	bottom-left bottom-centre bottom-right bottom-decimal middle-left middle-centre middle-right middle-decimal
---------------------------	-----------------------------	-----------	--

- top-left
- top-centre
- top-right
- top-decimal
- decimal-left
- decimal-centre
- decimal-right
- decimal-point

justification of the datum text. **NOTE** : - this is not normally required since by default the text justification is set to match datum_side_cl.

Text justification datum_text_justification_cl just. box bottom-left

Datum text position along datum line (mm)

datum_x_cl input

distance to move the datum text along the datum line

Datum text position above datum line (mm)

datum_y_cl input

distance to move the datum text above the datum line

The datum_x_cl and datum_y_cl can be positive, zero or negative.

Section_X_Plot_Boxes_Centreline_Labels_Centreline_Position_of_ch_x_y_ht_text

Position Of Ch, X, Y, Ht, Text

Section: Centreline - Chainage Text Position

The fields and buttons used in this section have the following functions.

Field Description	Parameter name	Type	Pop-Up
Position of chainage value	chainage_side_cl	choice box	Middle of datum line Left of datum line Right of datum line

side of centreline to position chainage text.

Justification of chainage text

chainage_text_justification_cl just. boxbottom-left

- bottom-centre
- bottom-right
- bottom-decimal
- middle-left
- middle-centre
- middle-right
- middle-decimal
- top-left

top-centre
top-right
top-decimal
decimal-left
decimal-centre
decimal-right
decimal-point

justification of the chainage text.

Section: Labelling for X Coord At 0 Offset

The fields and buttons used in this section have the following functions.

Field Description	Parameter name	Type	Pop-Up
Position of text	primary_x0_position	choice box	Middle of datum line Left of datum line Right of datum line

side of centreline to position x coord text.

Section: Labelling for Y Coord At 0 Offset

The fields and buttons used in this section have the following functions.

Field Description	Parameter name	Type	Pop-Up
Position of text	primary_y0_position	choice box	Middle of datum line Left of datum line Right of datum line

side of centreline to position y coord text.

Section: Labelling for height of primary string at 0 offset

The fields and buttons used in this section have the following functions.

Field Description	Parameter name	Type	Pop-Up
Position of text	primary_height_position	choice box	Middle of datum line Left of datum line Right of datum line

side of centreline to position height text.

Section: Parameters for text labelling

The fields and buttons used in this section have the following functions.

Field Description	Parameter name	Type	Pop-Up
Position of text	primary_height_position	choice box	Middle of datum line Left of datum line

Right of datum line

side of centreline to position text.

Section_X_Plot_Boxes_Centreline_labels_Centreline_Height_of_tin_at_0_offset

Height Of Tin At 0 Offset

Section: Parameters For Labelling The Height Of Tin At 0 Offset

The fields and buttons used in this section have the following functions.

Field Description	Parameter name	Type	Pop-Up
Use tin set # <i>set number to be used to define sets of tin parameters i.e. n value</i>		input	
Depth label mode <i>label mode for the nth tin specified by set #.</i>	tin_n_height_draw_mode	choice box	Do not draw the label Draw the label
Position of text <i>side of datum line to position text.</i>	tin_n_height_position	choice box	Middle of datum line Left of datum line Right of datum line
Pre text <i>pre text for label</i>	tin_n_height_pre_text	input	
Post text <i>post text for label</i>	tin_n_height_post_text	input	
Decimals <i>number of decimal places to display - def 1. If > 0, trailing zeros are removed after the decimal point. If < 0, the absolute value is taken as the number of decimal places to report i.e. no trailing zeros are removed</i>	tin_n_height_decimals	input	
X adjustment (mm) <i>x adjustment to position of label</i>	tin_n_height_x	input	
Y adjustment (mm) <i>y adjustment to position of label</i>	tin_n_height_y	input	
Y adjustment (mm) <i>angle of label</i>	tin_n_height_angle	angle box	
Colour <i>colour of label</i>	tin_n_height_colour	colour box	
Size (mm) <i>size of label</i>	tin_n_height_size	input	
Textstyle <i>textstyle of label of label</i>	tin_n_height_textstyle	text box	

Section_X_Plot_Boxes_Centreline_labels_Centreline_Labelling_offset_height_Superseded_

Labelling Offset/Height (Superseded)

Section: Centreline - Labelling Offset/Height Parameters

In the centre line case, the value of the height of the **primary string** (usually the design cross section) at the zero offset can be labelled. This is normally where the alignment string cuts the cross section.

The label is made up of the texts:

primary_title offset_title offset_value height_text height_value

NOTE: These parameters have now been superseded. The parameters for labelling the height of the primary string at zero offset covers this case. To use the zero offset parameters instead, the *primary_height_pre_text* would include all text required for the Primary_title, offset_title, offset_value and height_text (offset_value is always 0.0).

The fields and buttons used in this section have the following functions.

Field Description	Parameter name	Type	Pop-Up
-------------------	----------------	------	--------

Include primary title in label

	primary_mode_cl	Tick box	
--	-----------------	----------	--

*The parameter primary_mode_cl controls whether the **primary_title** is included in the label.*

Include height in label

	height_mode_cl	Tick box	
--	----------------	----------	--

*The parameter height_mode_cl controls whether the **height_title** and **height_value** are included in the label.*

Include offset in label

	offset_mode_cl	Tick box	
--	----------------	----------	--

*The parameter offset_mode_cl controls whether the **offset_title** and **offset_value** are included in the label.*

Position of text	offset_height_side_cl	Choice	0
		Choice	1
		Choice	2

The label can be placed on the left, centre of right side of the datum line.

Justification of text	offset_height_text_justification_cl		
-----------------------	-------------------------------------	--	--

*justification of the text.justification of the offset height text. **NOTE** : - this is not normally required since by default the text justification is set to match offset_height_side_cl*

Height text label	height_text	Input	
-------------------	-------------	-------	--

height text.

Distance to move text position along datum line (mm)

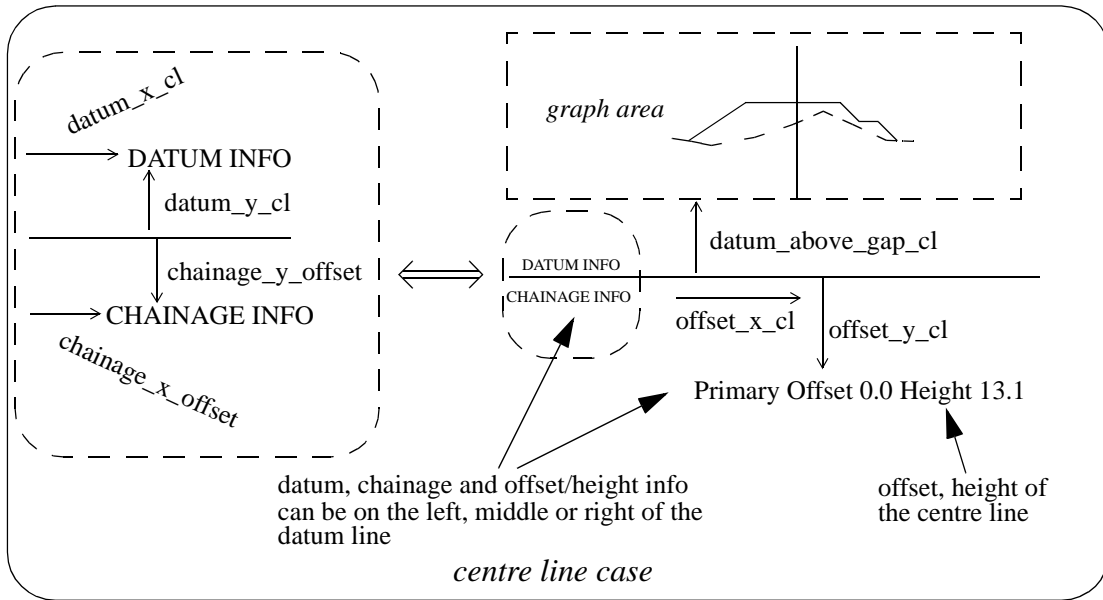
	offset_x_cl	Input	
--	-------------	-------	--

distance to move the text along the datum line.

Distance to move text position below datum line (mm)

	offset_y_cl	Input	
--	-------------	-------	--

distance to move the text below the datum line.



Graph Area

Section_X_Plot_Graph_area

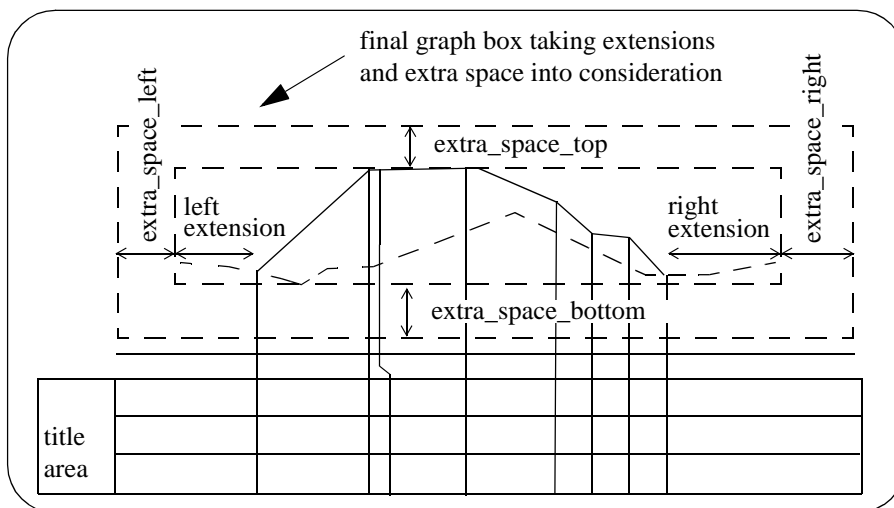
Graph area

The **graph area** for each section sub-plot is the area where the actual plot of the x-section string is drawn.

The **width** of the graph area is determined by the width of the x-section string being plotted, the left and right extensions and horizontal scale (scale) given by the parameters.

Section: Graph Area - Extra Space Parameters

The size of the graph area can be extended to allow for symbols by the following parameters:



The types of strings that are drawn in the graph area of a cross section plot are:

- (a) primary string the x-section string from the x-section model that is being drawn.
Called the primary string and is usually the design x-section.
- (b) tins sections of the primary string through any tins in models in the

- corridor models.
- (c) services parts of strings (from models in corridor models) that cut the defined corridor.

The **colour** of the strings in the plot is the actual string colour for cases (a) and (c), and the colour of the tin used for the section in case (b).

Although all the strings are plotted, the plot parameter file can be used to select which ones are labelled with heights.

The fields and buttons used in this section have the following functions.

Field Description	Parameter name	Type	Pop-Up
Extra space units	extra_space_units	choice box	world units millimetres

units for specifying extra space.

Extra space left (units)	extra_space_left	input
---------------------------------	------------------	-------

distance to subtract from left of plot area

Extra space right (units)	extra_space_right	input
----------------------------------	-------------------	-------

distance to add to right of plot area

Extra space top (units)	extra_space_top	input
--------------------------------	-----------------	-------

distance to add to top of plot area

Extra space bottom (units)	extra_space_bottom	input
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distance to subtract from bottom of plot area

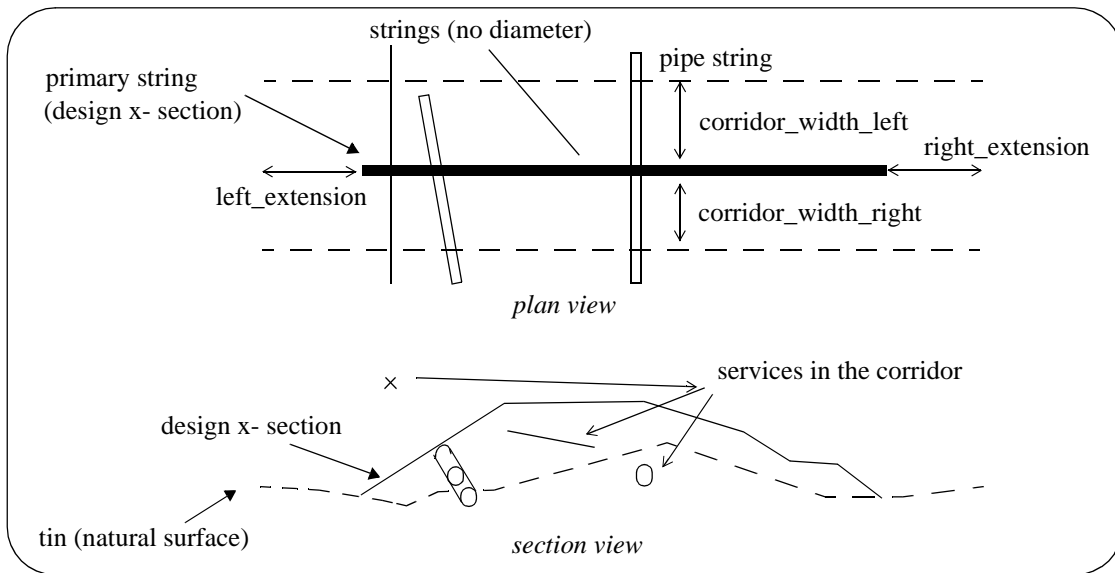
Corridors

Section_X_Plot_Corridors

A corridor around the primary string is defined by giving a left and right corridor width.

Any string in a model added to the section view is checked to see if it appears in the corridor, and if it does, it is drawn on the cross-section plot.

To be drawn, strings do not have to cross the primary string, but just be in the corridor.



Panel field	Parameter name	Type
Left corridor width (world units)		
	<code>corridor_width_left</code>	input
<i>left corridor width</i>		
Right corridor width (world units)		
	<code>corridor_width_right</code>	input
<i>right corridor width</i>		
Left corridor overlap (world units)		
	<code>corridor_overlap_left</code>	input
<i>left corridor overlap</i>		
Right corridor overlap (world units)		
	<code>corridor_overlap_right</code>	input
<i>right corridor overlap</i>		
Chord-arc tolerance (world units)		
	<code>corridor_chord_arc</code>	input
<i>chord-arc tolerance used near any bends in the corridor.</i>		

Model selection

Panel field	Parameter name	Type
Corridor model	<code>corridor_model_n</code>	model box

models containing tins and service strings to be drawn on the section. Where n = 1, 2, ... ,100 given by line number on grid.

Grades

Section_X_Plot_Grades

Grades

Section: Corridor - Grade Parameters

The plot of the x-section string is made up of straight lines joining the individual points of the x-section.

The fields and buttons used in this section have the following functions.

Field Description	Parameter name	Type	Pop-Up
Label grades	grade_label	tick box	

if ticked, label grades.

Either the individual lines can be used as the segments to be labelled for grade, or adjacent lines of the same grade can be considered to be just one segment and labelled only once.

Hence the segments to be labelled for grade can be the individual lines of the x-section, or the segments defined by changes of grade.

Label change of grade segments

grade_change_only	tick box
-------------------	----------

if ticked, label change of grade segments. If not, label individual lines.

It is also possible to ignore segments smaller than a given minimum width on the plot.

Minimum segment width	grade_minimum_width	input
------------------------------	---------------------	-------

segments smaller than specified value (in mm) are not labelled

The grade labels are drawn parallel to the segment, centred about the segments end points, and a distance *grade_offset* above the segment. The size, colour and number of decimal places can all be set.

Decimal places for grades	grade_decimals	input
----------------------------------	----------------	-------

number of decimal places in grade

Size for grade text (mm)	grade_size	input
---------------------------------	------------	-------

size of the grade label

Textstyle for grades	grade_textstyle	text box
-----------------------------	-----------------	----------

textstyle of the grade label

Colour for grades	grade_colour	colour box
--------------------------	--------------	------------

number of decimal places in grade

Grade offset (mm)	grade_offset	input
--------------------------	--------------	-------

distance above the segment for label

Show grade sign	grade_offset	tick box
------------------------	--------------	----------

if ticked, the sign of the grade is labelled.

The grade can be labelled as percent cross-fall, 1 in slope, m/m or VicRoads x:1.

Also a threshold value can be set and any grades whose absolute value are below the threshold can be labelled in one way, and those above the threshold labelled a different way.

Hence, if the absolute value of the grade is less than or equal to the absolute value of *grade_threshold*, then *grade_mode* is used, otherwise *grade_upper_mode* is used.

Grade mode	grade_mode	choice box	% grade 1 in m/m VicRoads x:1
-------------------	------------	------------	--

type of grade value

Grade threshold	grade_threshold	input
------------------------	-----------------	-------

grade threshold for type of grade labelling

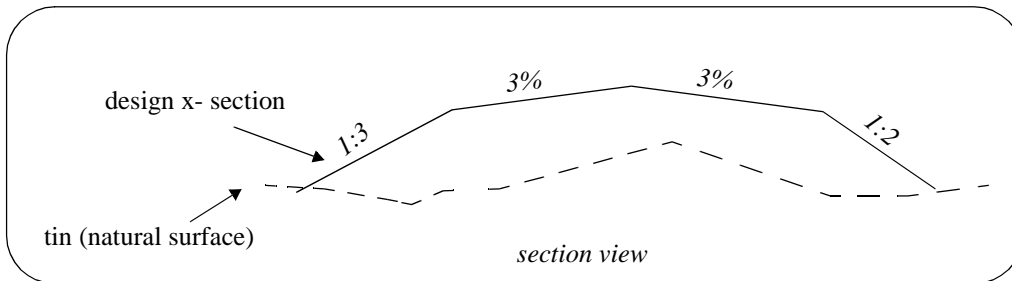
Grade threshold mode grade_threshold_mode choice box % grade
1 in
m/m
VicRoads x:1

type of grade value

Grade upper mode grade_upper_mode choice box % grade
1 in
m/m
VicRoads x:1

type of grade value

Decimal places for grades above threshold value
grade_upper_decimals input
number dec places in grades above threshold value



X-Section Points

[Section_X_Plot_X_section_points](#)

X-Section Points

The points across each x-section can be automatically labelled on the x-section plots.

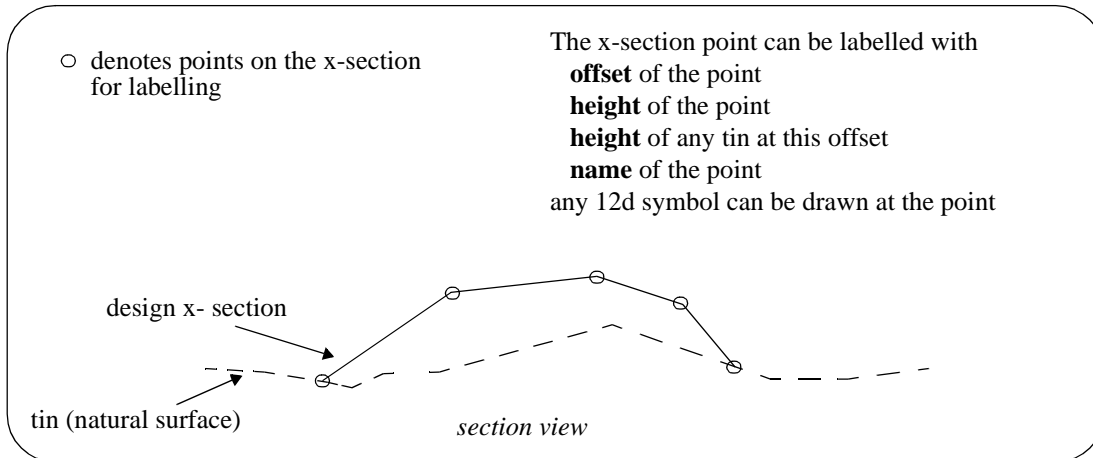
The **offset**, **height** and **name** of the point can be labelled as well as a **symbol** drawn. The height of tins at the same offset value can also be labelled.

The offset position for the labelling is the offset of the point.

The height position for the labelling can be specified as the

- (a) top of the boxes for the x-section
- (b) above the maximum height of the strings on the plot
- (c) height of the point on the x-section string (primary string)
- (d) height of a tin.

The actual position of the label is defined relative to the above point.

**Note:**

Only case (b) involves the actual height of the point on the cross section string. For all other cases, only the offset of the cut string is used.

Other heights, for example, the height of the tin at that offset can be used as the height (case (d)).

Section: X-Section Point Mask Parameters

The fields and buttons used in this section have the following functions.

Field Description	Parameter name	Type	Pop-Up
Define Set #		input	

set number to be used to define a number of points to include

Point mask	points_n_mask	input	
-------------------	---------------	-------	--

The points of the x-section to be labelled for the nth set of parameters is restricted to all the points whose name satisfying the points_n_mask. For example

points_1_mask = "ke"*

or *points_1_mask = "?bank*"*

or, if both masks are required,

points_1_mask = "ke ?bank*"*

Section_X_Plot_X_section_points_Offsets**Offsets****Section: X-Section - Offset Parameters**

The fields and buttons used in this section have the following functions.

Field Description	Parameter name	Type	Pop-Up
Use Set #		input	

set number as specified in the Define set#

Position	points_offset_n_position	choice box	above point value above top of boxes above top of graph area
-----------------	--------------------------	------------	--

to primary string
to tin 1
to tin 2
to tin 3
to tin 4
to tin 5
to tin 6
to tin 7
to tin 8
to tin 9
to tin 10

above point value.

X (mm)	points_offset_n_x	input	
	<i>horizontal adjustment to position of offset text.</i>		
Y (mm)	points_offset_n_y	input	
	<i>height adjustment to position of offset text.</i>		
Angle (dms)	points_offset_n_angle	input	
	<i>rotation of offset text about point.</i>		
Colour	points_offset_n_colour	colour box	
	<i>colour of offset text</i>		
Size (mm)	points_offset_n_size	input	
	<i>size of offset text. A value of 0 = no label</i>		
Textstyle	points_offset_n_textstyle	text box	
	<i>textstyle of offset text</i>		
Pre-text	points_offset_n_pre_text	input	
	<i>text before offset text</i>		
Post-text	points_offset_n_post_text	input	
	<i>text after offset text</i>		
Justification	points_offset_n_justification		justification box
			bottom-left
			bottom-centre
			bottom-right
			bottom-decimal
			middle-left
			middle-centre
			middle-right
			middle-decimal
			top-left
			top-centre

top-right
top-decimal
decimal-left
decimal-centre
decimal-right
decimal-point

justification of the offset text.

Decimals points_offset_n_no_decimals input
number of decimals in offset

Section X_Plot_X_section_points_Heights

Heights

Section: X-Section - Height Parameters

The fields and buttons used in this section have the following functions.

Field Description	Parameter name	Type	Pop-Up
Use Set #		input	
<i>set number as specified in the Define set#</i>			
Mode	points_height_n_mode	choice box	use height of cut point use real height above boxes height of primary string use height of tin 1 use height of tin 2 use height of tin 3 use height of tin 4 use height of tin 5 use height of tin 6 use height of tin 7 use height of tin 8 use height of tin 9 use height of tin 10
<i>height mode above point value.</i>			
Position	points_height_n_position	choice box	above point value above top of boxes above top of graph area to primary string to tin 1 to tin 2 to tin 3 to tin 4

to tin 5
to tin 6
to tin 7
to tin 8
to tin 9
to tin 10

above point position.

X (mm) points_height_n_x input

horizontal adjustment to position of height text.

Y (mm) points_height_n_y input

height adjustment to position of height text.

Angle (dms) points_height_n_angle input

rotation of height text about point.

Colour points_height_n_colour colour box

colour of height text

Size (mm) points_height_n_size input

size of height text. A value of 0 = no label

Textstyle points_height_n_textstyle text box

textstyle of height text

Pre-text points_height_n_pre_text input

text before height text

Post-text points_height_n_post_text input

text after height text

Justification points_height_n_justification just. box

bottom-left
bottom-centre
bottom-right
bottom-decimal
middle-left
middle-centre
middle-right
middle-decimal
top-left
top-centre
top-right
top-decimal
decimal-left
decimal-centre
decimal-right

decimal-point

justification of the height text.

Decimals points_height_n_no_decimals input
number of decimals in height

Section_X_Plot_X_section_points_Labels

Labels

Section: X-Section - Label Parameters

The fields and buttons used in this section have the following functions.

Field Description	Parameter name	Type	Pop-Up
Use Set # <i>set number as specified in the Define set#</i>		input	
Position	points_label_n_position	choice box	above point value above top of boxes above top of graph area to primary string to tin 1 to tin 2 to tin 3 to tin 4 to tin 5 to tin 6 to tin 7 to tin 8 to tin 9 to tin 10
Mode <i>above point position.</i>	points_label_n_mode	choice box	don't include point name include point name in label
X (mm) <i>label mode.</i> <i>horizontal adjustment to position of label.</i>	points_label_n_x	input	
Y (mm) <i>height adjustment to position of label.</i>	points_label_n_y	input	
Angle (dms) <i>rotation of label about point.</i>	points_label_n_angle	input	
Colour <i>colour of label</i>	points_label_n_colour	colour box	
Size (mm) <i>size of label. A value of 0 = no label</i>	points_label_n_size	input	

Textstyle	points_label_n_textstyle	text box	
	<i>textstyle of label</i>		
Pre-text	points_label_n_pre_text	input	
	<i>text before label</i>		
Post-text	points_label_n_post_text	input	
	<i>text after label</i>		
Justification	points_label_n_justification	just. box	bottom-left bottom-centre bottom-right bottom-decimal middle-left middle-centre middle-right middle-decimal top-left top-centre top-right top-decimal decimal-left decimal-centre decimal-right decimal-point
	<i>justification of the label.</i>		

Section_X_Plot_X_section_points_Symbols

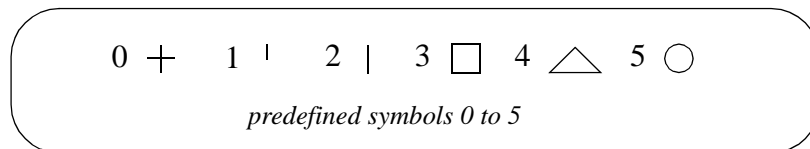
Symbols

Section: X-Section - Symbol Parameters

The fields and buttons used in this section have the following functions.

Field Description	Parameter name	Type	Pop-Up
Use Set #		input	
	<i>set number as specified in the Define set#</i>		
Mode	points_symbol_n_mode	choice box	cross (0) up from centre of box (1) up and down from centre of box (2) square (3) triangle, base at bottom (4) circle (5) use a plot symbol

symbol mode.



if a plot symbol is to be used, the `points_symbol_n_style` parameter must be specified.

Symbol `points_symbol_n_style` plot symbols

a valid plot symbol can be selected.

Position `points_symbol_n_position` choice box

- above point value
- above top of boxes
- above top of graph area
- to primary string
- to tin 1
- to tin 2
- to tin 3
- to tin 4
- to tin 5
- to tin 6
- to tin 7
- to tin 8
- to tin 9
- to tin 10

above point position.

X (mm) `points_symbol_n_x` input

horizontal adjustment to position of symbol.

Y (mm) `points_symbol_n_y` input

height adjustment to position of symbol.

Angle (dms) `points_symbol_n_angle` input

rotation of symbol about point.

Colour `points_symbol_n_colour` colour box

colour of symbol

Size (mm) `points_symbol_n_size` input

size of symbol. A value of 0 = no symbol

Hatching Cut/Fill

Section_X_Plot_Hatching_cut_fill

This option is used to hatch cut and/or fill areas between sets of tins.

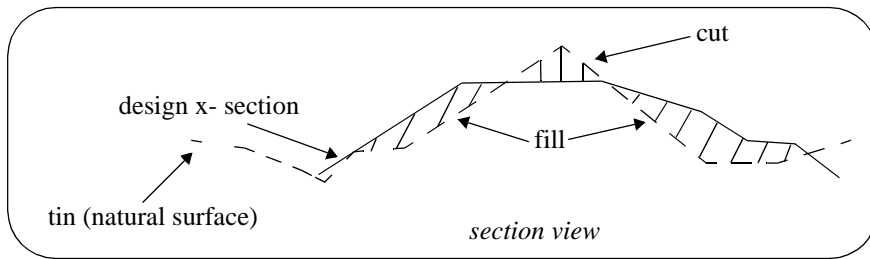
For each set, the name of the two tins, the hatch linestyle, colour and separation and whether cut and/or fill regions are required are all user definable.

Up to twenty (20) separate sets of tins may be hatched.

Panel Field	Parameter name	Type
Define Set #		input
<i>set number to be used to define different original/new tin sets.</i>		
Original tin	hatch_original_tin_n	tin box
<i>tin_name for original surface</i>		
New tin	hatch_new_tin_n	tin box
<i>tin_name for final surface</i>		

Notes

- (a) cut is when the new tin is below the original tin.
fill is when the new tin is above the original tin.
- (b) cut hatching is turned off by setting *hatch_cut_separation_n* to 0.0.
fill hatching is turned off by setting *hatch_fill_separation_n* to 0.0.



Section_X_Plot_Hatching_cut_fill_Cut

Cut

Panel Field	Parameter name	Type
Use Set #		input
<i>set number as specified in the Define set#.</i>		
Cut separation (mm)	hatch_cut_separation_n	input
<i>distance between cut hatch lines. If 0, no hatching.</i>		
Cut hatch angle (dms)	hatch_cut_angle_n	input
<i>angle of hatching.</i>		
Cut colour	hatch_cut_colour_n	colour box
<i>colour of the hatching.</i>		
Cut linestyle	hatch_cut_linestyle_n	linestyle box
<i>linestyle of the hatching.</i>		
Draw sides of cuts	hatch_cut_draw_sides_n	choice box
<i>draw mode for sides of cut regions.</i>		
Draw original tin	hatch_cut_draw_original_n	choice box
<i>draw mode for sides of original tin in cut.</i>		
Draw new tin	hatch_cut_draw_new_n	choice box
<i>draw mode for sides of new tin in cut.</i>		

Section_X_Plot_Hatching_cut_fill_Fill

Fill

Panel Field	Parameter name	Type
Use Set # <i>set number as specified in the Define set#.</i>		input
Fill separation (mm) <i>distance between fill hatch lines. If 0, no hatching.</i>	hatch_fill_separation_n	input
Fill hatch angle (dms) <i>angle of hatching.</i>	hatch_fill_angle_n	input
Fill colour <i>colour of the hatching.</i>	hatch_fill_colour_n	colour box
Fill linestyle <i>linestyle of the hatching.</i>	hatch_fill_linestyle_n	linestyle box
Draw sides of fills <i>draw mode for sides of fill regions.</i>	hatch_fill_draw_sides_n	choice box
Draw original tin <i>draw mode for sides of original tin in fill.</i>	hatch_fill_draw_original_n	choice box
Draw new tin <i>draw mode for sides of new tin in fill.</i>	hatch_fill_draw_new_n	choice box

Cuts

Section_X_Plot_Cuts

The cuts that each x-section string makes though strings in any user-specified model, can be automatically labelled on the x-section plots.

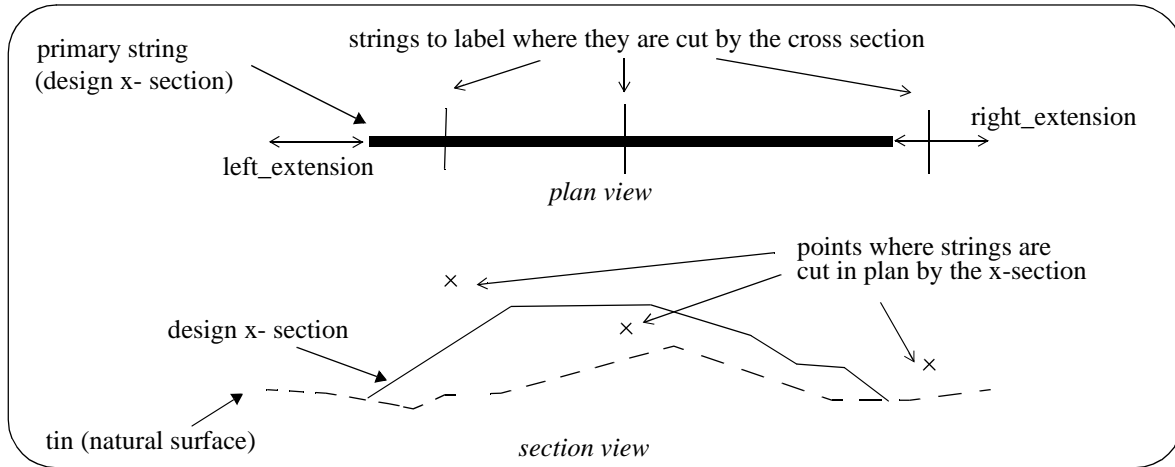
The **height**, **offset** and **name** of the cut string can be labelled as well as a **symbol** drawn. The height of tins at the same offset value can also be labelled.

The offset position for the labelling is the offset of the cut string.

The height position for the labelling can be specified as the:

- (a) top of the boxes on the x-section,
- (b) above the maximum height of the strings on the plot,
- (c) height value of the cut string,
- (d) height of the x-section string (the primary string),
- (e) height of a tin.

The actual position of the label is defined relative to the above point.



Note: Only case (c) involves the actual height of the cut string. For all other cases, only the offset of the cut string is used. Hence, for all cases except (c), the string does not need to have a sensible height to be used for cuts through strings. For example, a boundary string may have null heights but only the offset is required and the height of the tin at that offset can be used as the height (case (e)).

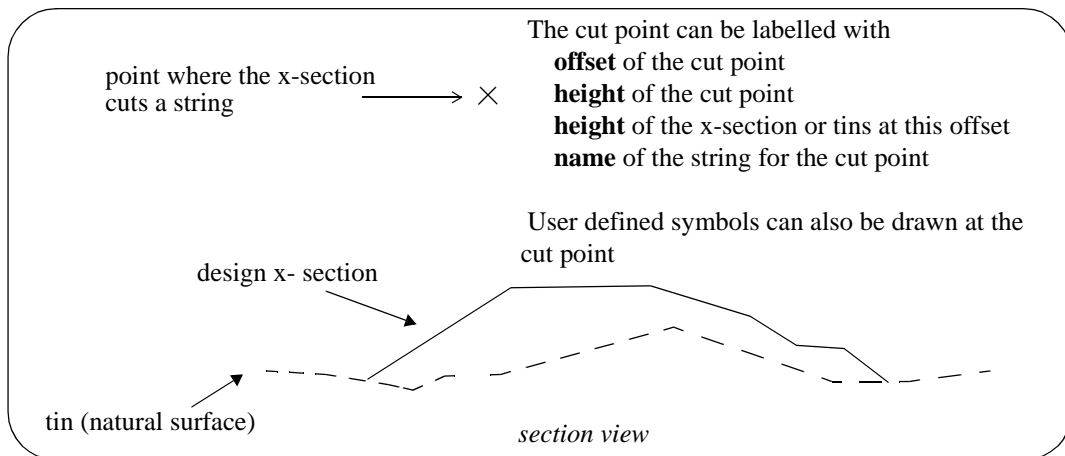
The method for specifying which strings are to be checked for cuts is by first specifying the **model** which contains the strings, and then a **name mask** which is used to restrict the strings in the model to only those whose names match the name mask.

Up to twenty five different sets of models and name masks can be used so that different cut sets can be labelled in different ways.

Panel Field	Parameter name	Type
Define Set #		input
	<i>set number to be used to define different model/mask sets.</i>	
Model	cuts_n_model	model box
	<i>model from which cut masks are derived</i>	
Name mask	cuts_n_mask	input
	<i>text string containing the name masks, each separated by one or more spaces, to test the string name against. Each mask can include wild cards and wild characters.</i>	
	<i>For example: "ke*" or,</i>	
	<i>"?bank*" or, if both masks are required,</i>	
	<i>"ke* ?bank*" or,</i>	
	<i>If cuts_n_mask is blank, then all strings in the model are used. This is equivalent to name mask being set to "*".</i>	

All strings in the model *cuts_n_model* whose name satisfy the name mask *cuts_n_mask* are then checked for cuts with the x-sections, and if a cut occurs, the cut point will be labelled according to the rest of the

parameters in the nth set.



Section_X_Plot_Cuts_Offsets

Offsets

Panel Field	Parameter name	Type	Pop-Up
Use Set #		input	
	<i>set number as specified in the Define set#.</i>		
Position	cuts_offset_n_position	choice box	at cut string height above top of boxes above top of graph area to primary string to tin 1 to tin 2 to tin 3 to tin 4 to tin 5 to tin 6 to tin 7 to tin 8 to tin 9 to tin 10
	<i>position of offset label.</i>		
X (mm)	cuts_offset_n_x	input	
	<i>horizontal adjustment to position of offset text.</i>		
Y (mm)	cuts_offset_n_y	input	
	<i>vertical adjustment to position of offset text.</i>		
Angle (dms)	cuts_offset_n_angle	input	
	<i>rotation of offset text about position.</i>		
Colour	cuts_offset_n_colour	colour box	
	<i>colour of offset text.</i>		
Size (mm)	cuts_offset_n_size	input	
	<i>size of offset text. A value of 0 means no label.</i>		
Textstyle	cuts_offset_n_textstyle	text box	
	<i>textstyle of offset text.</i>		

Pre-text	cuts_offset_n_pre_text	input	
	<i>text before offset text.</i>		
Post-text	cuts_offset_n_post_text	input	
	<i>text after offset text.</i>		
Justification	cuts_offset_n_justification		justification box
			bottom-left
			bottom-centre
			bottom-right
			bottom-decimal
			middle-left
			middle-centre
			middle-right
			middle-decimal
			top-left
			top-centre
			top-right
			top-decimal
			decimal-left
			decimal-centre
			decimal-right
			decimal-point
	<i>justification of the offset text.</i>		

Decimals	cuts_offset_n_no_decimals	input	
	<i>number of decimals in offset.</i>		

Section_X_Plot_Cuts_Heights

Heights

Panel Field	Parameter name	Type	Pop-Up
Use Set #		input	
	<i>set number as specified in the Define set#.</i>		
Mode	cuts_height_n_mode	choice box	use height of cut point use real height above boxes height of primary string use height of tin 1 use height of tin 2 use height of tin 3 use height of tin 4 use height of tin 5 use height of tin 6 use height of tin 7 use height of tin 8 use height of tin 9 use height of tin 10
	<i>determines which height value is labelled.</i>		
Position	cuts_height_n_position	choice box	at cut string above top of boxes above top of graph area to primary string to tin 1 to tin 2

to tin 3
to tin 4
to tin 5
to tin 6
to tin 7
to tin 8
to tin 9
to tin 10

position of height label.

X (mm) cuts_height_n_x input

horizontal adjustment to position of height text.

Y (mm) cuts_height_n_y input

vertical adjustment to position of height text.

Angle (dms) cuts_height_n_angle input

rotation of height text about position.

Colour cuts_height_n_colour colour box

colour of height text.

Size (mm) cuts_height_n_size input

size of height text. A value of 0 means no label.

Textstyle cuts_height_n_textstyle text box

textstyle of height text.

Pre-text cuts_height_n_pre_text input

text before height text.

Post-text cuts_height_n_post_text input

text after height text.

Justification points_height_n_justification
justification box

bottom-left
bottom-centre
bottom-right
bottom-decimal
middle-left
middle-centre
middle-right
middle-decimal
top-left
top-centre
top-right
top-decimal
decimal-left
decimal-centre
decimal-right
decimal-point

justification of the height text.

Decimals cuts_height_n_no_decimals
input

number of decimals in height.

Section_X_Plot_Cuts_Labels

Labels

Panel Field	Parameter name	Type	Pop-Up
Use Set #		input	
	<i>set number as specified in the Define set#.</i>		
Position	cuts_label_n_position	choice box	at cut string height above top of boxes above top of graph area to primary string to tin 1 to tin 2 to tin 3 to tin 4 to tin 5 to tin 6 to tin 7 to tin 8 to tin 9 to tin 10
	<i>position of label text.</i>		
Mode	cuts_label_n_mode	choice box	don't include string name include cut string name
	<i>determines whether the label includes the cut string name.</i>		
X (mm)	cuts_label_n_x	input	
	<i>horizontal adjustment to position of label.</i>		
Y (mm)	cuts_label_n_y	input	
	<i>vertical adjustment to position of label.</i>		
Angle (dms)	cuts_label_n_angle	input	
	<i>rotation of label about position.</i>		
Colour	cuts_label_n_colour	colour box	
	<i>colour of label.</i>		
Size (mm)	cuts_label_n_size	input	
	<i>size of label. A value of 0 means no label.</i>		
Textstyle	cuts_label_n_textstyle	text box	
	<i>textstyle of label.</i>		
Pre-text	cuts_label_n_pre_text	input	
	<i>text before label.</i>		
Post-text	cuts_label_n_post_text	input	
	<i>text after label.</i>		
Justification	cuts_label_n_justification	justification box	bottom-left bottom-centre bottom-right bottom-decimal middle-left

middle-centre
middle-right
middle-decimal
top-left
top-centre
top-right
top-decimal
decimal-left
decimal-centre
decimal-right
decimal-point

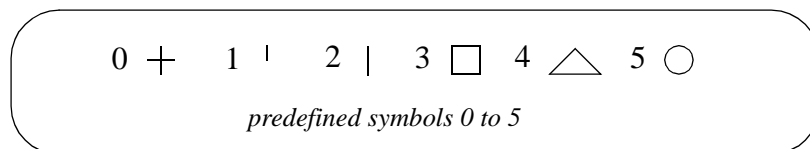
justification of the label.

Section_X_Plot_Cuts_Symbols

Symbols

Panel Field	Parameter name	Type	Pop-Up
Use Set #		input	
	<i>set number as specified in the Define set#.</i>		
Mode	cuts_symbol_n_mode	choice box	cross (0) up from centre of box (1) up&down from box centre(2) square (3) triangle, base at bottom (4) circle (5) use a plot symbol

symbol mode.



Note: *If a plot symbol is to be used, the cuts_symbol_n_style parameter must be specified.*

Symbol	cuts_symbol_n_style	plot symbols	
	<i>a valid plot symbol can be selected.</i>		
Position	cuts_symbol_n_position	choice box	at cut string height above top of boxes above top of graph area to primary string to tin 1 to tin 2 to tin 3 to tin 4 to tin 5 to tin 6 to tin 7 to tin 8 to tin 9 to tin 10

position of symbol.

X (mm)	cuts_symbol_n_x	input	
	<i>horizontal adjustment to position of symbol.</i>		

Y (mm)	cuts_symbol_n_y	input
<i>vertical adjustment to position of symbol.</i>		
Angle (dms)	cuts_symbol_n_angle	input
<i>rotation of symbol about point.</i>		
Colour	cuts_symbol_n_colour	colour box
<i>colour of symbol.</i>		
Size (mm)	cuts_symbol_n_size	input
<i>size of symbol. A value of 0 means no symbol.</i>		

PPF's To Include

Section_X_Plot_PPF_s_to_include

Panel Field	Parameter name	Type	Pop-Up
PPF files		input	

by including pre existing PPF files, the user can build up a modified version without having to set all the parameters.

Long Plot PPF Editor

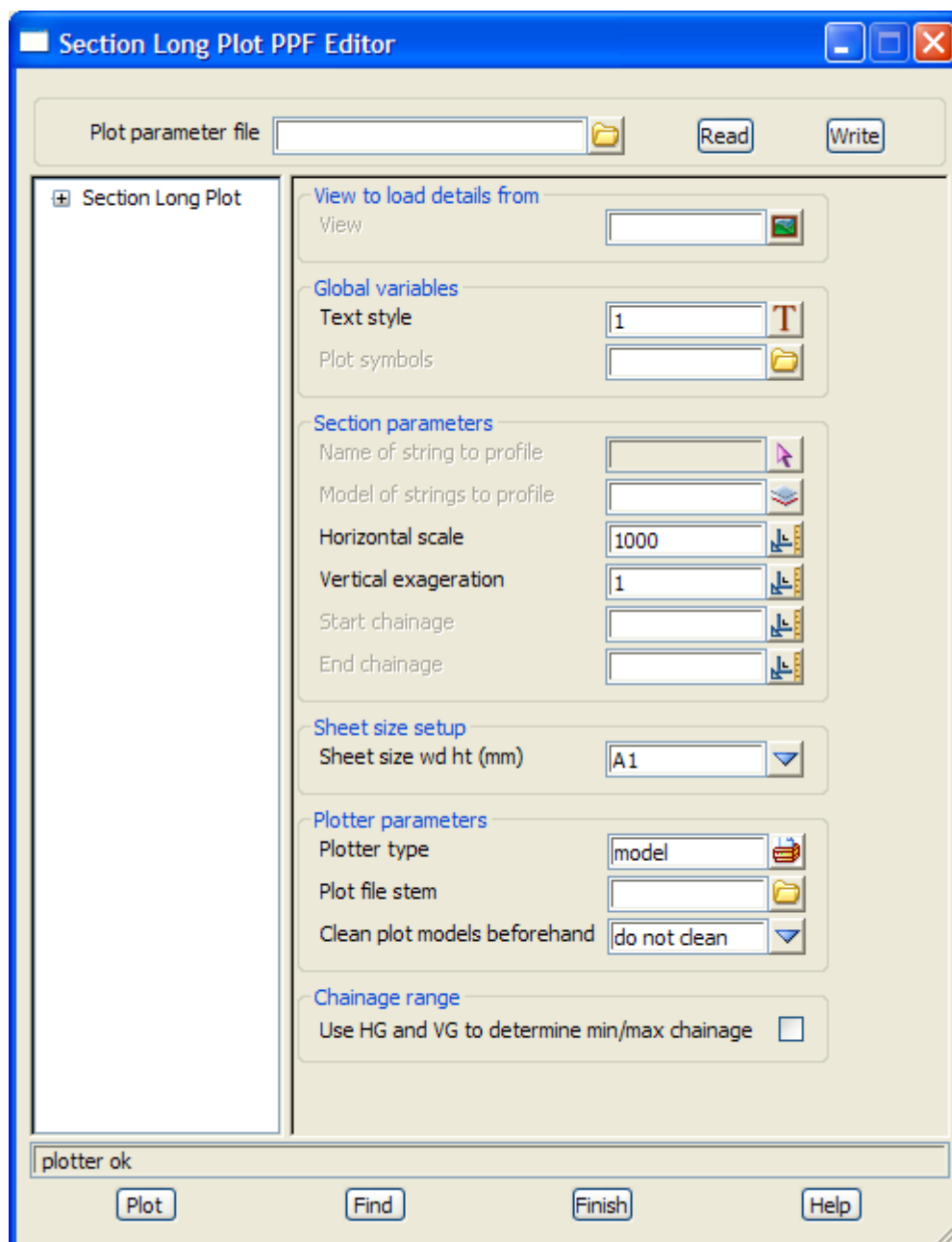
section_long_plot_ppf_editor

Position of option on menu: Plot =>Long Plot PPF Editor

The **long section ppf editor** is for creating and/or editing a (binary) long-section ppf file and for creating a long section plot.

Note: binary ppf's are stored *within* the project (not in the folder containing the project as the ascii ppf's were).

On selecting the Long plot ppf editor option, the **Section Long Plot PPF Editor** panel is displayed.



Panel field	Type
Plot parameter file	file box

name for the binary plot parameter file to read in or write out.

Read button

read the given plot parameter file in.

Write button

write out the plot parameters to the given plot parameter file. An ascii ppf file is also written out.

Plot button

use the plot parameters from the panel to create the plot.

Find button

brings up a search box. If a valid parameter name is keyed in followed by the enter key, the cursor will be placed in the appropriate field on the appropriate page.

Section Long Plot

Section_Long_Plot

Section Long Plot

The long plot itself consists of the three regions - boxes, datum and graph areas.

The **boxes area** is where the titles and the chainage values and the heights/depths for the strings drawn on the long plot are labelled.

The **datum area** is the region between the boxes area and the graph area.

The **graph area** is the area where the actual plots of the strings are drawn.

Apart from information labelled in the boxes area, the long section plot can label other information such as

- (a) horizontal geometry
- (b) vertical geometry
- (c) chainage, heights at special points
- (d) symbols at special points
- (e) bubbles at special chainages
- (f) cuts the design string makes through strings
- (g) cut and fill areas

Section: View to load details from

The fields and buttons used in this section have the following functions.

Field Description	Parameter name	Type	Pop-Up
View		section view box	

on selection of an existing section view, the vertical exaggeration, string to profile, corridor model and corridor settings from the section view are loaded into the ppf editor.

Section: Global Variables

The fields and buttons used in this section have the following functions.

Field Description	Parameter name	Type	Pop-Up
Text style	global_textstyle	text box	

default text style

Plot Symbols	plot_symbols	file box
---------------------	--------------	----------

specify a plot symbol file if it exists.

Section: Section Parameters

The fields and buttons used in this section have the following functions.

Field Description	Parameter name	Type	Pop-Up
Name of string to profile	string_to_plot		string box
<i>model of long sections to plot</i>			
Horizontal Scale	scale	input	
<i>horizontal scale to be used for long section plots</i>			
Vertical exaggeration	vertical_exaggeration	input	
<i>vertical scale to be used for long section plots</i>			
Start chainage	start_chainage	input	
<i>start chainage of long sections to plot</i>			
End chainage	end_chainage	input	
<i>start chainage of long sections to plot</i>			

Section: Sheet Size Setup

The plot **page** or **sheet** is considered to have only positive co-ordinates with the origin (0,0) in the left hand corner. The units for the plot are millimetres.

The fields and buttons used in this section have the following functions.

Field Description	Parameter name	Type	Pop-Up
Sheet size wd ht (mm)	sheet_size	sheet size box	
<i>a valid sheet size is selected.</i>			

Section: Plotter Parameters

The fields and buttons used in this section have the following functions.

Field Description	Parameter name	Type	Pop-Up
Plotter type	plotter_type	plotter box	
<i>a valid plotting option is selected.</i>			
Plot file stem	plot_stem	file box	
<i>plot file name. The appropriate extension is added dependant on the plotter type selected.</i>			

Clean plot models beforehand

plot_model_clean	choice box	do not clean prompt for clean always clean
------------------	------------	--

whether to clean (delete the elements in) any resultant plot models that may already exist, before generating the plot(s). This parameter is only applicable if plotting to a model or models. Note that if the models are cleaned using this parameter, any non-plot or locked elements found in the models will not be cleaned from the models, and the plot job will be cancelled.

Section: Chainage Range

Use **HG VG for min, max** determines whether the horizontal geometry (HG) and the vertical geometry (VG) are both used to determine the minimum and maximum chainages for drawing. This allows the vertical geometry to be plotted when it is outside the horizontal geometry (e.g. kerb returns).

The fields and buttons used in this section have the following functions.

Field Description	Parameter name	Type	Pop-Up
Use HG and VG to determine min/max chainage	use_hg_vg_for_min_max	tick box	

if ticked, the min/max chainage will be determined by the Horizontal and Vertical geometry.

Title Block

Section_Long_Plot_Title_block

Common title block parameters

Panel field	Parameter name	Type
Standard title	plot_border	tick box

if ticked, a standard 12d title block will be used.

Use title file	use_title_file	tick box
-----------------------	----------------	----------

if ticked, a user defined title file is used.

Title line 1	title_1	input
---------------------	---------	-------

*if **Standard title** is ticked, **Title line 1** is the first line of title text. If **Use title file** is ticked, **Title line 1** is substituted for the title block variable \$title_1.*

Title line 2	title_2	input
---------------------	---------	-------

*if **Standard title** is ticked, **Title line 2** is the second line of title text. If **Use title file** is ticked, **Title line 2** is substituted for the title block variable \$title_2.*

12d default title block parameters

Panel field	Parameter name	Type	Pop-Up
Text size	title_text_size	input	
Text colour	title_colour	colour	available colours

text size of title text.

colour of title text.

Section_Long_Plot_Title_block_User_title_info

User title info

The parameters shown below are subject to the appropriate title block variables existing in the title file. For more information on these variables see the section "Title Block Variables" .

Panel field	Parameter name	Type	Pop-Up
Title file	title_file	file box	available title files

*specifies the name of the title file to use. If a valid title file exists, the specified **Name** values will be filled out in the grid using the title block variable \$user_text_n.*

Name		output	
-------------	--	--------	--

the alias for the nth user text specified in the title file.

Value user_text_n input

the alias text to be substituted in for the user text specified.

Time format time_format input

the time format relates to the \$time title block variable. For more information on the time formats see the section “Specifying the Format for \$time” .

Start page number start_page_number input

used as the starting value for the title block variable \$page_number. If missing, \$page_number starts at 1.

Start drawing number start_drawing_number input

used as the starting value for the title block variable \$drawing_number. If missing, \$drawing_number starts at 1.

Drawing number prefix drawing_number_prefix input

the value entered is used for the title block variable \$drawing_number_prefix.

Drawing number postfix drawing_number_postfix input

the value entered is used for the title block variable \$drawing_number_postfix.

Plot Sheet Layout

[Section_Long_Plot_Plot_sheet_layout](#)

[Section_long_Plot_Plot_sheet_layout_Margins](#)

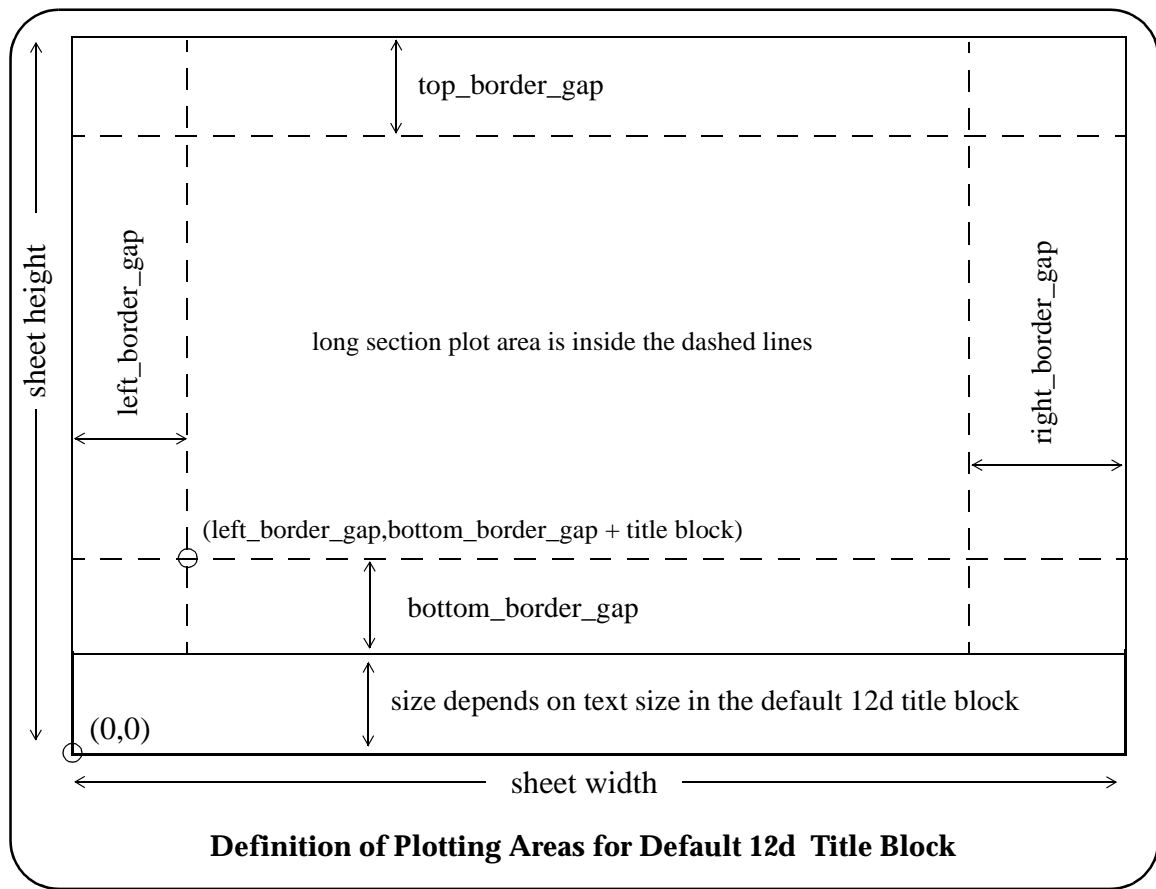
Margins

Section: Margins For Standard 12d Title File - Border gaps

If the *default 12d title block* is used, then the size of the bottom of title block depends on the text size. The following parameters are used in the default title block case and the *bottom_border_gap* is added to the calculated height of the bottom of the title block.

The fields and buttons used in this section have the following functions.

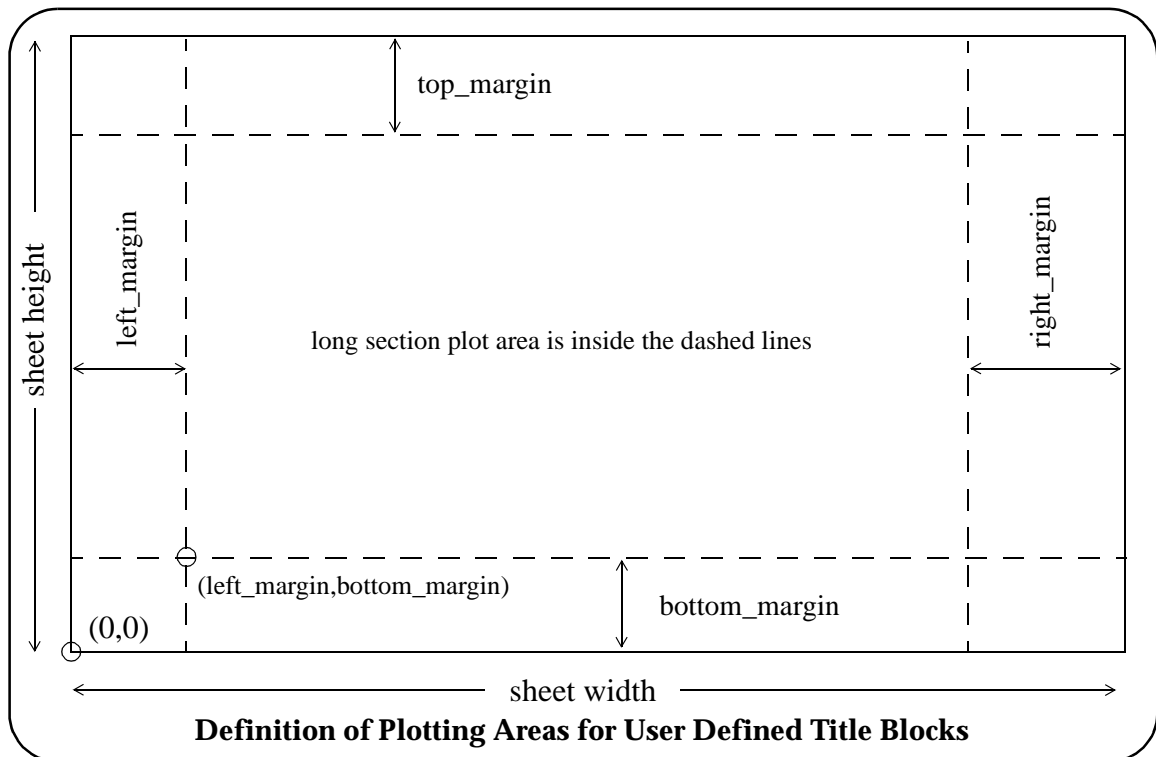
Field Description	Parameter name	Type	Pop-Up
Left (mm)	left_border_gap	input	
	<i>left border gap (in millimetres).</i>		
Right (mm)	right_border_gap	input	
	<i>right border gap (in millimetres).</i>		
Top (mm)	top_border_gap	input	
	<i>top border gap (in millimetres).</i>		
Bottom (mm)	bottom_border_gap	input	
	<i>bottom border gap (in millimetres).</i>		



Section: Margins For User Title File

The fields and buttons used in this section have the following functions.

Field Description	Parameter name	Type	Pop-Up
Left (mm) <i>left margin (in millimetres).</i>	left_margin	input	
Right (mm) <i>right margin (in millimetres).</i>	right_margin	input	
Top (mm) <i>top margin (in millimetres).</i>	top_margin	input	
Bottom (mm) <i>bottom margin (in millimetres).</i>	bottom_margin	input	



Because the user can easily select from the plotting panel whether a User Defined Title Block or the default 12d title block is used, both sets of margin and gap parameters can exist in the one plot parameter file.

The `(left_margin, bottom_margin)` defines the left hand corner position of the long plot on the plot sheet.

The `right_margin` and `top_margin` need not be set and if missing, will be calculated from the other plot parameters defining the plot layout.

If the sheet sizes are missing, they will also be automatically calculated.

Pagination

Section_Long_Plot_Pagination

Pagination

If the long section plot is too long to fit on one page, it can be broken into a number of pages (sheets).

The parameter, `pagination_length`, controls the amount of new chainage length on each plot page. Each page of the long section plot can also included a set chainage amount from the end of the **previous** plot.

Hence apart from the first page and possibly the last page, the plot will have a chainage length given by the sum of the `pagination_length` and `pagination_overlap`.

Section: Pagination Parameters

The fields and buttons used in this section have the following functions.

Field Description	Parameter name	Type	Pop-Up
Use pagination	<code>pagination</code>	tick box	
<i>if ticked, then break the plot into pages.</i>			
Pagination mode	<code>pagination_mode</code>	choice	chainage

millimetres

length and overlap units.

Chainage length pagination_length input

new chainage range on each page.

Chainage overlap pagination_overlap input

overlap between pages.

Note

The *pagination_length* and *pagination_overlap* are given in chainage units **or** millimetres. The user must choose values which will fit on the selected sheet size or the end of each plot will be truncated by the sheet.

Boxes

Section_Long_Plot_Boxes

Boxes

Each string in the long section plot can be labelled with one or two lines of title, and the chainages/heights/depths at the user specified chainages for the strings.

The **title** for the strings, is drawn in the **title area** of the **boxes area**.

The **chainages/heights/depths** are drawn in the **heights area** of the **boxes area**.

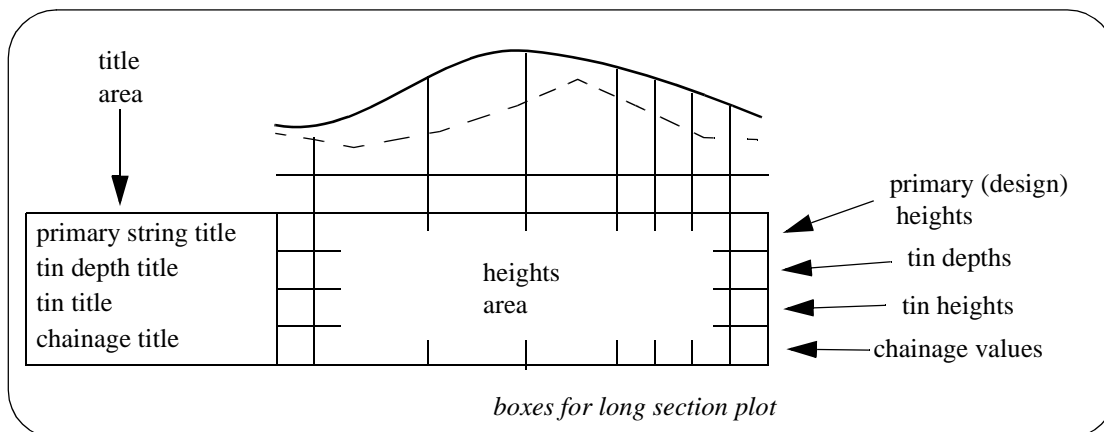
Consequently the boxes area is made up of rows of text consisting of:

string/tin titles followed by the **chainage/height/depth** values along the string.

Each row is surrounded by lines to form a box.

The default order of the boxes from the bottom up is

- (a) optional super-elevation diagram
- (b) chainage values
- (c) can be primary string heights - user choice
- (d) tin heights and depths
- (e) offset heights and depths
- (f) optional volumes or earth works
- (g) can be primary string heights - user choice
- (h) zero or more blank boxes



Section: Linework Parameters

Field Description	Parameter name	Type	Pop-Up
Draw box mode	draw_box_mode	choice box	Do not draw any box lines Draw box lines around height area only Draw box lines around title and height area only Use parameters defined in boxes - heights

mode for drawing the boxes for the long section plot.

Default box colour	box_colour	colour box
---------------------------	------------	------------

default box colour

Number of blank boxes `number_of_blank_boxes` input

number of boxes to be left blank

The blank boxes are used to place other information in (such as horizontal or vertical geometry) or for other user supplied information.

Section: Primary String Parameters

The primary string (the design string) is used to define

- (a) the design long section
- (b) the chainage positions for labelling heights and drawing uprights
- (c) the section line used for sectioning through tins
- (d) the section line for defining the corridor for services

Although the primary string is used to set up most of the information for the long section plot, it doesn't have to be drawn on the long section.

The drawing or not drawing of the primary string on each cross section plot is controlled by the parameter *primary_string*.

The **colour** of the primary string in the plot is the actual primary string colour.

Sometimes the primary string is only required to define chainages or the horizontal path for tin sections. In this case, the primary string would not be drawn on the long section plot.

If the primary string is drawn, it is automatically labelled.

Also the drawing of crosses at the vertical intersection points can be controlled from the ppf file.

Draw and label the primary string `primary_string` tick box

if ticked, the primary string will be drawn and labelled.

Draw crosses at VIP's `primary_draw_vips` tick box

if ticked, crosses will be draw at the vertical intersection points.

The position of the primary string label box can be either straight after the chainage box, or after the tin and offset boxes but before the blank boxes.

Placing the primary string label before the bank boxes or just after the chainage box in controlled by the parameter *primary_label_mode*.

Primary string location `primary_label_mode` choice box in last box before blank
boxes

in first box above chainages

position of the primary string label.

Although the order of the boxes may appear to be fixed, in practice they can be in any order. This is possible because for each box, there is a parameter to set the height in millimetres from the bottom of all the boxes that the text in the box is drawn at (the *_y_pos* parameters).

The roundoff for the datum value is specified by the user (default 1.0) and the datum is automatically calculated for each sub-plot, and labelled.

Section_Long_Plot_Boxes_Title_area

Title Area

Section: Boxes - Title Area Parameters

The **title area** starts at the co-ordinate (left_margin,bottom_margin).

The size of the title text is given by the *title_box_text_size* parameter.

The **width** of the title area is either given by the *space_for_titles* parameter, or if omitted, the required width is automatically calculated.

Field Description	Parameter name	Type	Pop-Up
Size of titles (mm) <i>size of offset, height label and values</i>	title_box_text_size	input	
Space for titles (mm) <i>size of title area.</i>	space_for_titles	input	

The x position of the title text is the same for all the lines of title text and can be set to be a fixed distance from the left hand side of the boxes.

X adjustment (mm) <i>distance to move the title text from the left hand side of the boxes</i>	box_titles_x	input	
---	--------------	-------	--

The y position of the title text can be set separately for each type of title. The parameters are given later under each of the title types (e.g. chainages, primary string, tins, depths etc.).

After the title area there can be a user defined gap, followed by the heights area

Distance between title and heights area (mm) <i>distance between title and heights area in mm.</i>	box_gap	input	
--	---------	-------	--

The height text is written at right angles to the bottom of the boxes. It can be either top or bottom justified with respect to the box (*box_text_justification*).

Section_Long_Plot_Boxes_Heights_area

Heights Area

Section: Boxes - Height Parameters

The **heights area** starts at the end of the title area.

The height text is written at right angles to the bottom of the boxes. It can be either top or bottom justified with respect to the box (*box_text_justification*).

The number of decimal places (*number_of_decimals*), and the size of the heights text (*box_text_size*) can be specified globally but there is a parameter for each box which overrides these defaults for each box of heights.

Field Description	Parameter name	Type	Pop-Up
Justification <i>justification of height text.</i>	box_text_justification	choice box	bottom of individual boxes top of individual boxes

Number of decimals <i>number of decimal places in the height boxes. If <0, the absolute value is taken as the number of decimal places i.e. no trailing zeros are removed for the values in the heights area.</i>	number_of_decimals	input	
--	--------------------	-------	--

Text size (mm) <i>distance to move the title text from the left hand side of the boxes</i>	box_text_size	input	
--	---------------	-------	--

Horizontal line spacing (mm)	horizontal_line_spacing	input	
------------------------------	-------------------------	-------	--

height of the individual height boxes.

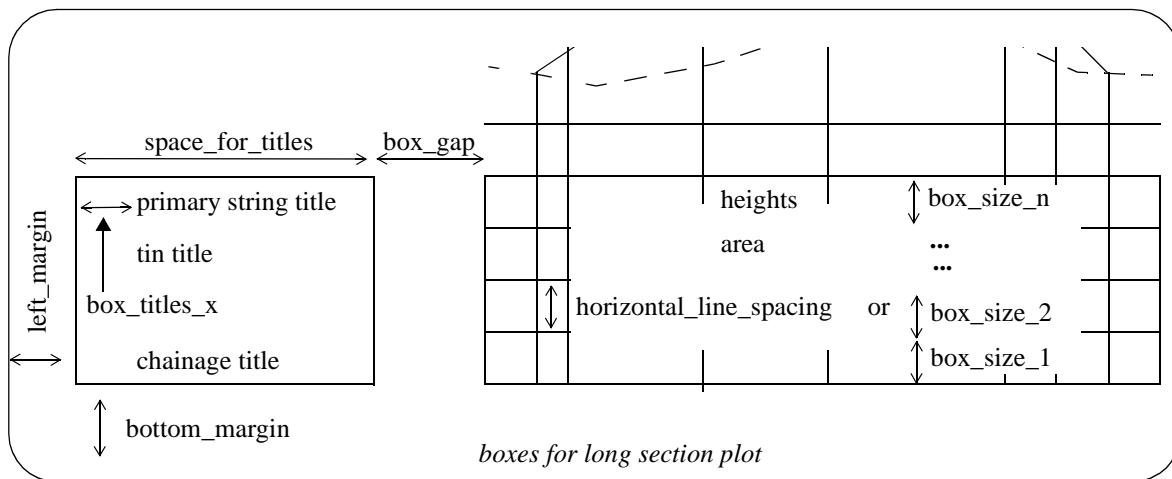
A global height for the individual boxes is either given by the *horizontal_line_spacing* parameter, or if omitted, a height to fit the largest height or depth value is calculated and used as the default box height.

However, the height of each box can be individually set by parameters *box_size_n* where the boxing numbering, n, starts from the bottom box. The value of *horizontal_line_spacing* is used for any of the *box_size_n* parameters not specified.

Box # input
specifying the nth value

Size (mm) box_size_n input
height of the nth box, numbered from bottom up.

The total height of the boxes area is simply given by the sum of the heights of each box.



The **width** of the **heights area** is determined by the number of chainages to be labelled and whether the values are staggered to prevent over writing.

Hence the total width of the boxes area is the width of the **title area** plus *box_gap*, plus the width of the **heights area**.

Many distance definitions in the plot parameter file are given in terms of distance above the **top** of the boxes area so that the distances are independent of the number of boxes and box sizes.

Section_Long_Plot_Boxes_Outside_linework

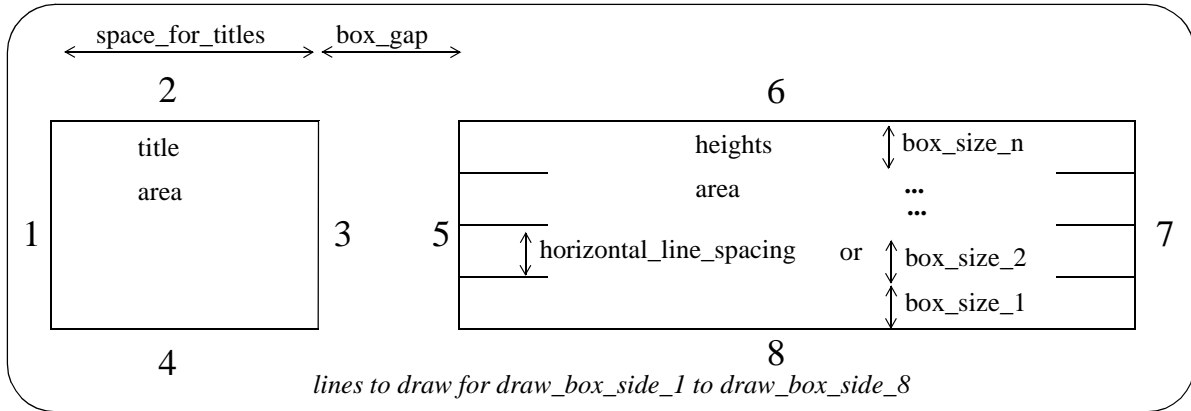
Outside Linework

The drawing of the box line work, the box colour, the position of the primary string labels and the number of blank boxes are all set by parameters.

Section: Boxes - Outside Linework Parameters

Field Description	Parameter name	Type	Pop-Up
Draw the left side of title area(1)	<i>draw_box_side_1</i>	tick box	
<i>if ticked, draw the left side of the title area (def).</i>			
Draw the top line of title area(2)	<i>draw_box_side_2</i>	tick box	

<i>if ticked, draw the top line of the title area (def).</i>		
Draw the top line of title area(3)	draw_box_side_3	tick box
<i>if ticked, draw right side of the title area (def).</i>		
Draw the bottom line of title area(4)	draw_box_side_4	tick box
<i>if ticked, draw the bottom line of the title area (def).</i>		
Draw the left side of heights area(5)	draw_box_side_5	tick box
<i>if ticked, draw the left side of the heights area (def).</i>		
Draw the top line of heights area(6)	draw_box_side_6	tick box
<i>if ticked, draw the top line of the heights area (def).</i>		
Draw right side of heights area(7)	draw_box_side_7	tick box
<i>if ticked, draw right side of the heights area (def).</i>		
Draw bottom side of heights area(8)	draw_box_side_8	tick box
<i>if ticked, draw bottom side of the heights area (def).</i>		
Colour (1)	box_side_colour_1	colour box
<i>colour to draw left side of title area</i>		
Colour (2)	box_side_colour_2	colour box
<i>colour to draw top of title area</i>		
Colour (3)	box_side_colour_3	colour box
<i>colour to draw right side of title area</i>		
Colour (4)	box_side_colour_4	colour box
<i>colour to draw bottom of title area</i>		
Colour (5)	box_side_colour_5	colour box
<i>colour to draw left side of heights area</i>		
Colour (6)	box_side_colour_6	colour box
<i>colour to draw top of heights area</i>		
Colour (7)	box_side_colour_7	colour box
<i>colour for right side of heights area</i>		
Colour (8)	box_side_colour_8	colour box
<i>colour for bottom of heights area</i>		



Section_Long_Plot_Boxes_Inside_linework

Inside Linework

Section: Boxes - Inside Linework Parameters

The lines at the top of the individual boxes inside the title area and heights area (separation lines) are controlled by the parameters *box_line_draw_mode* and *box_line_mode_n*.

The separation lines can be drawn just in the title area, just in the heights area or in both areas.

The parameter *box_line_draw_mode* can be set to control all the separation lines but there are additional parameters, *box_line_mode_n*, which override *box_line_draw_mode* for each of the individual boxes where n = 1, ... number of boxes -1.

The top of the top box is not controlled by *box_line_mode_n* but is controlled by the parameters *draw_box_side_2* and *draw_box_side_6*.

The fields and buttons used in this section have the following functions.

Field Description	Parameter name	Type	Pop-Up
Separation line mode	<i>box_line_draw_mode</i>	choice box	Do not draw any separation lines Draw the separation lines in both areas Draw the separation lines in the title area only Draw the separation lines in the heights area only

the separation line draw mode.

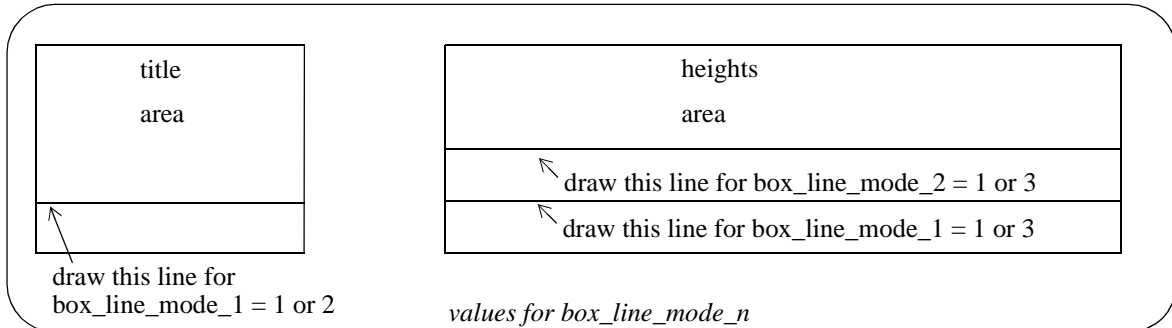
Box # input

Where box # = 1 to number of boxes(n). Box 1 is the bottom box, increasing upwards.

Line mode	<i>box_line_mode_n</i>	choice box	No top line for title or height area (mode=0) Draw top line for title or height area (mode=1) Draw top line for title area
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only (mode=2)
 Draw top line for height area
 only (mode=3)

line mode for top of title and height areas for box number specified.



Section_Long_Plot_Boxes_Chainage_titles_values

Chainage Titles/Values

Section: Chainage Title Parameters

The fields and buttons used in this section have the following functions.

Field Description	Parameter name	Type	Pop-Up
Title line 1 <i>1st line of chainage title.</i>	chainage_title	input	
Title line 2 <i>second line of chainage title.</i>	chainage_title_2	input	
Textstyle <i>textstyle for the chainage title</i>	chainage_title_textstyle	text box	
Colour <i>colour of the chainage title</i>	chainage_title_colour	colour box	
Text size (mm) <i>size of the chainage title</i>	chainage_title_size	input	
Text y position (mm) <i>if set, the height in mm above the bottom of all the boxes that the chainage title text is drawn. If not set, then the text is placed at a height that puts it inside the default box for the chainage.</i>	chainage_title_y_pos	input	

Section: Chainage Value Parameters

The fields and buttons used in this section have the following functions.

Field Description	Parameter name	Type	Pop-Up
Decimal places <i>number of decimal places for chainages</i>	chainage_decimals	input	

Textstyle	chainage_textstyle	text box
	<i>textstyle for the chainage values</i>	
Colour	chainage_colour	colour box
	<i>colour of the chainage values</i>	
Text size (mm)	chainage_size	input
	<i>size of the chainage values</i>	
Text y position (mm)	chainage_y_pos	input
	<i>if set, the height in mm above the bottom of all the boxes that the chainage values are drawn. If not set, then the text is placed at a height that puts it inside the default box for the chainage.</i>	

Section_Long_Plot_Boxes_Primary_string_titles_heights

Primary String Titles/Heights

Sometimes the primary string is only required to define chainages or the horizontal path for tin sections. In this case, the primary string would not be drawn on the long section plot.

If the primary string is drawn, it is automatically labelled.

Also the drawing of crosses at the vertical intersection points can be controlled from the ppf file.

Section: Primary String Title Parameters

The fields and buttons used in this section have the following functions.

Field Description	Parameter name	Type	Pop-Up
Title line	primary_title	input	
	<i>1st line of string title.</i>		
Title line 2	primary_title_2	input	
	<i>second line of string title. Default is primary string name.</i>		
Textstyle	primary_title_textstyle	text box	
	<i>textstyle for the primary string title</i>		
Colour	primary_title_colour	colour box	
	<i>colour of the primary string title</i>		
Text size (mm)	primary_title_size	input	
	<i>size of the string title</i>		
Text y position (mm)	primary_title_y_pos	input	
	<i>if set, the height in mm above the bottom of all the boxes that the primary string title text is drawn. If not set, then the text is placed at a height that puts it inside the default box for the primary string.</i>		

Section: Primary String Height Parameters

The fields and buttons used in this section have the following functions.

Field Description	Parameter name	Type	Pop-Up
Decimal places	primary_decimals	input	
	<i>number of decimal places for height values.</i>		
Textstyle	primary_textstyle	text box	
	<i>textstyle for the height values</i>		

Colour	primary_colour	colour box
<i>colour of the height values</i>		
Text size (mm)	primary_size	input
<i>size of the height values</i>		
Text y position (mm)	primary_y_pos	input
<i>if set, the height in mm above the bottom of all the boxes that the primary string height values are drawn. If not set, then the text is placed at a height that puts it inside the default box for the primary string.</i>		
Search dist when no z (m)	primary_ch_tolerance	input
<i>for a given chainage, if no z value exists, this distance is added to/subtracted from the chainage to search for a valid z value.</i>		

Tin Titles/Heights/Depths

Section_Long_Plot_Boxes_Tin_titles_heights_depths

Tin Titles/Heights/Depths

Section: Tin Titles/Heights/Depths Parameters

The fields and buttons used in this section have the following functions.

Field Description	Parameter name	Type	Pop-Up
Label depth default	label_depths	tick box	

if ticked, the depths are labelled.

Define tin set #		input	
-------------------------	--	-------	--

where n = 1 to.... The set enables the specification of a number of parameters for a number of specified tin names.

Tin name	tin_n_name	tin box	available tins
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the name of the nth tin to be used for labelling.

If a tin of the name given by **tin_n_name** does not exist, then the plot is not produced and an error message is given.

Tin draw mode	tin_n_draw_mode	choice box	Draw the tin Do not draw the tin
----------------------	-----------------	------------	-------------------------------------

draw tin mode for the nth tin specified by tin set #.

Tin colour	tin_n_draw_colour	colour box	
-------------------	-------------------	------------	--

tin colour mode for the nth tin specified by tin set #.

Tin label mode	tin_n_label	choice box	Label the tin Do not label the tin
-----------------------	-------------	------------	---------------------------------------

tin label mode for the nth tin specified by tin set #.

Section_Long_Plot_Boxes_Tin_titles_heights_depths_Titles

Titles

Section: Tin - Title Parameters

The fields and buttons used in this section have the following functions.

Field Description	Parameter name	Type	Pop-Up
Use tin set #		input	

set number to be used to define sets of tin parameters i.e. n value

First line of tin title	tin_n_title	input	
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first line of nth tin title

Second line of tin title	tin_n_title_2	input	
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second line of nth tin title

Tin title textstyle	tin_n_title_textstyle	text box	
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nth tin title textstyle

Tin title colour	tin_n_title_colour	colour box	
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nth tin title colour

Tin title size (mm)	tin_n_title_size	input
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nth tin title size

Title Y position (mm)	tin_n_title_y_pos	input
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if set, the height in mm above the bottom of all the boxes that the nth tin title text is drawn. If not set, then the text is placed at a height that puts it inside the default box for the tin heights.

Section_Long_Plot_Boxes_Tin_titles_heights_depths_Heights

Heights

Section: Tin - Height Parameters

The fields and buttons used in this section have the following functions.

Field Description	Parameter name	Type	Pop-Up
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Use tin set #		input	
----------------------	--	-------	--

set number to be used to define sets of tin parameters i.e. n value

Decimals	tin_n_decimals	input	
-----------------	----------------	-------	--

number of dec places in nth tin height. < 0 to keep all trailing zeros

Textstyle	tin_n_textstyle	text box	
------------------	-----------------	----------	--

textstyle of nth tin height

Colour	tin_n_colour	colour box	
---------------	--------------	------------	--

nth tin height and depth colour

Size (mm)	tin_n_size	input	
------------------	------------	-------	--

nth tin height size

Y pos (mm)	tin_n_y_pos	input	
-------------------	-------------	-------	--

if set, the height in mm above the bottom of all the boxes that the tin height text is drawn. If not set, then the text is placed at a height that puts it inside the default box for the tin heights.

Section_Long_Plot_Boxes_Tin_titles_heights_depths_Depths

Tin Depths

Section: Tin Depth Parameters

The fields and buttons used in this section have the following functions.

Field Description	Parameter name	Type	Pop-Up
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Use tin set #		input	
----------------------	--	-------	--

set number to be used to define sets of tin parameters i.e. n value

Depth label mode	tin_n_depth_label	choice box	Label depths Do not label depths
-------------------------	-------------------	------------	-------------------------------------

depth label mode for the nth tin specified by set #.

First line of tin depth title	tin_n_depth_title	input	
--------------------------------------	-------------------	-------	--

first line of nth tin depth title

Second line of tin depth title	tin_n_depth_title_2	input	
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second line of nth tin depth title

Depth title textstyle	tin_n_depth_title_textstyle	text box	
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nth tin depth title textstyle

Depth title colour tin_n_depth_title_colour colour box

nth tin depth title colour

Depth title size (mm) tin_n_depth_title_size input

nth tin depth title size

Depth title Y position (mm) tin_n_depth_title_y_pos input

if set, the height in mm above the bottom of all the boxes that the tin depth title text is drawn. If not set, then the text is placed at a height that puts it inside the default box for the tin heights.

Decimals in depth value tin_n_depth_decimals input

number of dec places in tin height. < 0 to keep all trailing zeros

Depth value textstyle tin_n_depth_textstyle text box

nth tin depth textstyle

Depth value colour tin_n_depth_colour colour box

nth tin depth colour

Depth value size (mm) tin_n_depth_size input

nth tin depth size

Depth value Y position (mm) tin_n_depth_y_pos input

if set, the height in mm above the bottom of all the boxes that the tin depth text is drawn. If not set, then the text is placed at a height that puts it inside the default box for the tin heights.

Multiplier for positive depths depth_positive_factor input

if set, this value will be used to multiply positive depth values.

Multiplier for negative depths depth_negative_factor input

if set, this value will be used to multiply negative depth values.

The depth from the primary string to a tin, at a particular offset is defined as

$$\text{depth} = \text{tin height value} - \text{height of the primary string}$$

That is, the depth that the primary string is **below** the tin.

Before plotting, the value of depth is multiplied by either the *depth_positive_factor* or *depth_negative_factor*.

if (depth >= 0) plotted_depth_value = depth * depth_positive_factor

if (depth < 0) plotted_depth_value = depth * depth_negative_factor

Hence the definition of depth can be modified by the parameters:

depth_positive_factor value // multiplier for positive depths

depth_negative_factor value // multiplier for negative depths

For example, if the opposite sign is required for depth, that is,

$$\text{depth} = \text{height of the primary string} - \text{tin height value}$$

simply set

depth_positive_factor -1

depth_negative_factor 1

Offset String Titles/Heights/Depths

Section_Long_Plot_Boxes_Offset_string_titles_heights_depths

Offset String Titles/Heights/Depths

Section: Offset Titles/Heights/Depths Parameters

Each string in the offset model given can be automatically projected onto the primary string and drawn on the long section plot.

The offset model has been modified to allow strings to be projected onto the primary string to be specified by model and name, rather than just projecting all the strings in a given model. The string can also be labelled with either the string name, its model name or both.

The string is specified by

offset_n_mask "model_name->string_name"

For each n, a set of plot parameters determine if the string's heights and/or depths from the primary string are labelled in the boxes area.

If only the *string_name* is given, then the model given in the Offset model field of the **Section Long Plot** panel.

If there is **more than one string** with the given model and name, then it will be considered to be one string and at any primary string chainage, the closest of the strings will be the part used for projecting. For example, strings of the same name on either side of a road intersection will be considered to be the one string for projecting.

If any *offset_n_mask* is used, then the Offset option expects all the strings to be specified by an *offset_n_mask*. Then if no mask exists for any value of n, then that parameter set is ignored and no string projected.

If no offset masks are used (that is, no *offset_n_mask*'s are used), then the plot parameters determine whether each string in the offset model is drawn, and if the string's heights and depths from the primary string are labelled in the boxes area. The order that the strings are then plotted and labelled is the same as the order of the strings in the Offset model.

For the following sets of parameters, n takes the value 1 to 100 and specifies that the parameter set applies to the nth string given by *offset_n_mask* or, if no offset masks are given, the nth string in the *Offset model*.

The fields and buttons used in this section have the following functions.

Field Description	Parameter name	Type	Pop-Up
Default offset model <i>default offset model.</i>	offset_model	model	box
Define set # <i>where n = 1 to.... The set enables the specification of a number of parameters for a number of specified tin names.</i>		input	
Offset mask <i>the value specified by model_name->string_name.</i>	offset_n_mask	input	
Offset draw mode <i>draw mode for offset string.</i>	offset_n_draw_mode	choice box	Draw the offset string Do not draw the offset string
Left search distance <i>default 1000. Distance to search to the left of the primary string for the offset string. If 0, don't search to the left.</i>	offset_n_lw	input	

Right search distance	offset_n_rw	input	
	<i>default 1000. Distance to search to the right of the primary string for the offset string. If 0, don't search to the right.</i>		
Offset colour	offset_n_draw_colour	colour box	
	<i>default offset string colour.</i>		
Offset label mode	offset_n_label	choice box	Label the strings heights Do not label the strings heights
	<i>offset string label mode.</i>		

Section_Long_Plot_Boxes_Offset_string_titles_heights_depths_Titles

Titles

Section: Offset String - Title Parameters

The fields and buttons used in this section have the following functions.

Field Description	Parameter name	Type	Pop-Up
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The default title for each set each parameter set, is the string name but this can be changed to just the model name or the model and string name:

Offset string mode	offset_title_mode	choice box	Label with string name Label with model name Label with model->string as name
---------------------------	-------------------	------------	---

offset string title mode.

Use set #		input	
------------------	--	-------	--

set number to be used to define sets of offset parameters i.e. n value

or, for any set, the *offset_title_mode* can be replaced by two lines of user defined title:

First line of offset title	offset_n_title	input	
-----------------------------------	----------------	-------	--

first line of nth offset title

Second line of offset title	offset_n_title_2	input	
------------------------------------	------------------	-------	--

second line of nth offset title

title textstyle	offset_n_title_textstyle	text box	
------------------------	--------------------------	----------	--

nth offset title textstyle

Title colour	offset_n_title_colour	colour box	
---------------------	-----------------------	------------	--

nth offset title colour

Title size (mm)	offset_n_title_size	input	
------------------------	---------------------	-------	--

nth offset title size

Title Y position (mm)	offset_n_title_y_pos	input	
------------------------------	----------------------	-------	--

if set, the height in mm above the bottom of all the boxes that the offset title text is drawn. If not set, then the text is placed at a height that puts it inside the default box for the offset heights.

Section_Long_Plot_Boxes_Offset_string_titles_heights_depths_Heights

Heights

Section: Offset String - Height Parameters

The fields and buttons used in this section have the following functions.

Field Description	Parameter name	Type	Pop-Up
Use set #		input	
<i>set number to be used to define sets of offset parameters i.e. n value</i>			
Decimals	offset_n_decimals	input	
<i>number of dec places in nth offset height. < 0 to keep all trailing zeros</i>			
Textstyle	offset_n_textstyle	text box	
<i>textstyle of nth offset height</i>			
Colour	offset_n_colour	colour box	
<i>nth offset height and depth colour</i>			
Size (mm)	offset_n_size	input	
<i>nth offset height size</i>			
Y pos (mm)	offset_n_y_pos	input	
<i>if set, the height in mm above the bottom of all the boxes that the offset height text is drawn. If not set, then the text is placed at a height that puts it inside the default box for the offset heights.</i>			

Section_Long_Plot_Boxes_Offset_string_titles_heights_depths_Depths

Depths

Section: Offset String - Depth Parameters

The fields and buttons used in this section have the following functions.

Field Description	Parameter name	Type	Pop-Up
Use set #		input	
<i>set number to be used to define sets of offset parameters i.e. n value</i>			
Depth label mode	offset_n_depth_label	choice box	Label depths Do not label depths
<i>depth label mode for the nth offset specified by set #.</i>			
First line of depth title	offset_n_depth_title	input	
<i>first line of nth offset depth title</i>			
Second line of depth title	offset_n_depth_title_2	input	
<i>second line of nth offset depth title</i>			
Depth title textstyle	offset_n_depth_title_textstyle	text box	
<i>nth offset depth title textstyle</i>			
Depth title colour	offset_n_depth_title_colour	colour box	
<i>nth offset depth title colour</i>			
Depth title size (mm)	offset_n_depth_title_size	input	
<i>nth offset depth title size</i>			
Depth title Y position (mm)	offset_n_depth_title_y_pos	input	

if set, the height in mm above the bottom of all the boxes that the offset depth title text is drawn. If not set, then the text is placed at a height that puts it inside the default box for the offset heights.

Decimals in depth value offset_n_depth_decimals input
number of dec places in offset height. < 0 to keep all trailing zeros

Depth value textstyle offset_n_depth_textstyle text box
nth offset depth textstyle

Depth value colour offset_n_depth_colour colour box
nth offset depth colour

Depth value size (mm) offset_n_size input
nth offset depth size

Depth value Y position (mm) offset_n_depth_y_pos input
if set, the height in mm above the bottom of all the boxes that the offset depth text is drawn. If not set, then the text is placed at a height that puts it inside the default box for the offset heights.

Offset String chainages

Section_Long_Plot_Boxes_Offset_string_chainages

Offset String Chainages

Section: Offset String - Chainage Parameters

The fields and buttons used in this section have the following functions for the nth defined offset string.

Field Description	Parameter name	Type	Pop-Up
Use String <i>if ticked, use offset string.</i>	chainage_n_offset_mode	tick box	
Offset String <i>the value specified by model_name->string_name.</i>	chainage_n_offset_string	select box	
Title line 1 <i>1st line of offset chainage title.</i>	chainage_n_title	input	
Title line 2 <i>second line of offset chainage title.</i>	chainage_n_title_2	input	
Textstyle <i>textstyle for the offset chainage title</i>	chainage_n_title_textstyle	text box	
Colour <i>colour of the offset chainage title</i>	chainage_n_title_colour	colour box	
Text size (mm) <i>size of the offset chainage title</i>	chainage_n_title_size	input	
Text y position (mm) <i>if set, the height in mm above the bottom of all the boxes that the offset chainage title text is drawn. If not set, then the text is placed at a height that puts it inside the default box for the chainage.</i>	chainage_n_title_y_pos	input	
Decimal places <i>number of decimal places for offset chainages</i>	chainage_n_decimals	input	
Textstyle <i>textstyle for the offset chainage values</i>	chainage_n_textstyle	text box	
Colour <i>colour of the offset chainage values</i>	chainage_n_colour	colour box	
Text size (mm) <i>size of the offset chainage values</i>	chainage_n_size	input	
Text y position (mm) <i>if set, the height in mm above the bottom of all the boxes that the offset chainage values are drawn. If not set, then the text is placed at a height that puts it inside the default box for the chainage.</i>	chainage_n_y_pos	input	

Super Elevation Diagram

Section_Long_Plot_Boxes_Super_elevation_diagram

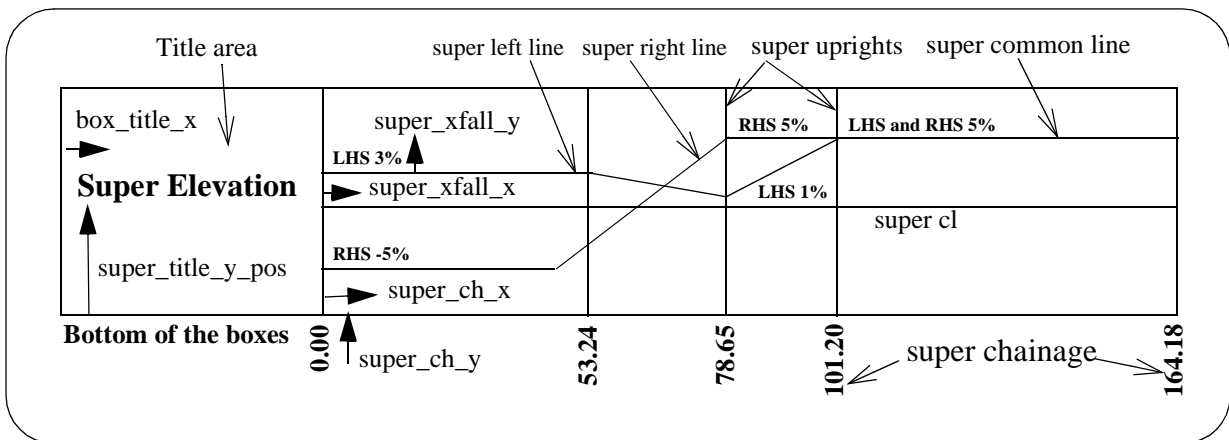
Super Elevation Diagram

Section: Super Elevation Diagram Parameters

The optional *super-elevation diagram* draws the values of the cross-fall (x-fall) between two strings using the primary string as the reference string. The cross-fall at a given chainage on the primary string is calculated by sectioning perpendicular to the reference string at that chainage and cutting the two strings. The cross-fall is defined as the cross-fall between the two cuts points on the strings.

The diagram has levels for the cross fall for a pair of strings on the left of the primary string, and a pair of strings on the right of the primary string. The diagram also has uprights in the super-elevation box with chainage values at the change of super values.

For the left hand side, the cross-fall is calculated at right angles to the primary string between the user given left hinge string and the left edge string.



The fields and buttons used in this section have the following functions.

Field Description	Parameter name	Type	Pop-Up
Super elevation diagram draw mode	super_draw_mode	choice box	don't draw diagram
		mode = 1	draw diagram using super sample interval
		mode = 2	sample super using chainages of x-sec's
		mode = 3	sample super using chainages from a string

super elevation diagram draw mode.

Super sample interval super_sample_interval input
if mode = 1, Chainage distance to sample x-fall. (default 20)

Super sample name super_sample_name input
name to be used in sampling. If mode = 2, name = model_name.

If mode = 3, name = model_name->string_name

Super tolerance super_tolerance input

If super_draw_mode is 1, the change of super is greater than super_tolerance, draw uprights

Section_Long_Plot_Boxes_Super_elevation_diagram_Titles

Titles

Section: Super Elevation Diagram - Title Parameters

The fields and buttons used in this section have the following functions.

Field Description	Parameter name	Type	Pop-Up
-------------------	----------------	------	--------

First line of super title	super_title	input	
----------------------------------	-------------	-------	--

1st line of the super title

Super title textstyle	super_title_textstyle	text box	
------------------------------	-----------------------	----------	--

textstyle of super title

Super title colour	super_title_colour	colour box	
---------------------------	--------------------	------------	--

colour of super title

Super title size (mm)	super_title_size	input	
------------------------------	------------------	-------	--

size of super title

Super title Y position (mm)	super_title_y_pos	input	
------------------------------------	-------------------	-------	--

if set, the height in mm above the bottom of all the boxes that the super title text is drawn. If not set, then the text is placed at a height that puts it inside the default box for the super.

Section_Long_Plot_Boxes_Super_elevation_diagram_X_fall

X-Fall

Section: Super Elevation Diagram - X-Fall Parameters

The fields and buttons used in this section have the following functions.

Field Description	Parameter name	Type	Pop-Up
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X-fall textstyle	super_xfall_textstyle	text box	
-------------------------	-----------------------	----------	--

textstyle of super title

X-fall colour	super_xfall_colour	colour box	
----------------------	--------------------	------------	--

colour of super title

X-fall size (mm)	super_xfall_size	input	
-------------------------	------------------	-------	--

size of super title

X-fall X position (mm)	super_xfall_x	input	
-------------------------------	---------------	-------	--

the distance to the right from the super chainage uprights to the start of the x-fall text.

X-fall Y position (mm)	super_xfall_y	input	
-------------------------------	---------------	-------	--

if set, the height in mm above the bottom of all the boxes that the super x-fall text is drawn. If not set, then the text is placed at a height that puts it inside the default box for the super.

Section_Long_Plot_Boxes_Super_elevation_diagram_Chainage

Chainage

Section: Super Elevation Diagram - Chainage Parameters

The fields and buttons used in this section have the following functions.

Field Description	Parameter name	Type	Pop-Up
Chainage textstyle <i>textstyle of super chainage title</i>	super_ch_textstyle	text box	
Chainage colour <i>colour of super chainage title</i>	super_ch_colour	colour box	
Chainage size (mm) <i>size of super chainage title</i>	super_ch_size	input	
Chainage X position (mm) <i>the distance to the right from the super chainage uprights to the start of the super chainage text.</i>	super_ch_x	input	
Chainage Y position (mm) <i>if set, the height in mm below the bottom of all the boxes that the super chainage is finished.</i>	super_ch_y	input	
Chainage decimal places <i>number of dec places in super chainage</i>	super_ch_decimals	input	

Section_Long_Plot_Boxes_Super_elevation_diagram_Left_side

Left Side

Section: Super Elevation Diagram - Left Side Parameters

The fields and buttons used in this section have the following functions.

Field Description	Parameter name	Type	Pop-Up
Left hinge string <i>left hinge string. (model_name->string_name)</i>	super_hinge_name_left	select box	
Left edge string <i>left edge string. (model_name->string_name)</i>	super_edge_name_left	select box	
Super left linestyle <i>linestyle of super left line.</i>	super_left_linestyle	linestyle box	
Super left line colour <i>colour of super left line.</i>	super_left_line_colour	colour box	
Super left decimal places <i>number of dec places in super left x-fall value</i>	super_left_decimals	input	
Text before left X-fall value <i>text before super left x-fall value.</i>	super_left_pre	input	
Text after left X-fall value <i>text after super left x-fall value.</i>	super_left_post	input	

Section_Long_Plot_Boxes_Super_elevation_diagram_Right_side

Right Side

Section: Super Elevation Diagram - Right Side Parameters

The fields and buttons used in this section have the following functions.

Field Description	Parameter name	Type	Pop-Up
Right hinge string <i>right hinge string. (model_name->string_name)</i>	super_hinge_name_right	select box	
Right edge string <i>right edge string. (model_name->string_name)</i>	super_edge_name_right	select box	
Super right linestyle <i>linestyle of super right line.</i>	super_right_linestyle	linestyle box	
Super right line colour <i>colour of super right line.</i>	super_right_line_colour	colour box	
Super right decimal places <i>number of dec places in super right x-fall value</i>	super_right_decimals	input	
Text before right X-fall value <i>text before super right x-fall value.</i>	super_right_pre	input	
Text after right X-fall value <i>text after super right x-fall value.</i>	super_right_post	input	

Section_Long_Plot_Boxes_Super_elevation_diagram_Centre_line

Centre Line

Section: Super Elevation Diagram - Centre line Parameters

The fields and buttons used in this section have the following functions.

Field Description	Parameter name	Type	Pop-Up
Super centre linestyle <i>super centre line linestyle.</i>	super_cl_linestyle	linestyle box	
Super centre line colour <i>super centre line colour.</i>	super_cl_line_colour	colour box	

Section_Long_Plot_Boxes_Super_elevation_diagram_Common_X_fall

Common X-Fall

Section: Super Elevation Diagram - Common X-Fall Parameters

The fields and buttons used in this section have the following functions.

Field Description	Parameter name	Type	Pop-Up
Text before common X-fall value	super_common_pre	input	
<i>text before super common x-fall value.</i>			
Text after common X-fall value			

super_common_post input

text after super common x-fall value.

Super common linestyle super_common_linestyle linestyle box

super common linestyle.

Super common line colour

super_common_line_colour colour box

super common colour.

Super common decimal places

super_common_decimals input

number of decimal places in super common x-fall value

Section_Long_Plot_Boxes_Super_elevation_diagram_Uprights

Uprights

Section: Super Elevation Diagram - Upright Parameters

The fields and buttons used in this section have the following functions.

Field Description	Parameter name	Type	Pop-Up
Upright mode	super_upright_mode	choice box	for left string only for right string only for both strings

upright mode for super elevation diagram.

Super uprights colour super_upright_colour colour box

super upright colour.

Volume Cut/Fill

Section_Long_Plot_Boxes_Volume_cut_fill

Volume Cut/Fill

Section: Volume Cut/Fill Parameters

The values of calculated cut and fill volumes (cut and fill earth works) can be read from a file and then interpolated to produce cut and fill volumes for a given interval along the primary string.

The fields and buttons used in this section have the following functions.

Field Description	Parameter name	Type	Pop-Up
Draw a volume diagram	volume_draw_mode	tick box	
<i>if ticked, draw a volume diagram.</i>			
Cut and fill text position	volume_text_centre_modechoice	choice box	along the uprights between the uprights
<i>position of cut and fill text relative to the uprights.</i>			
Sample interval	volume_sample_interval	input	
<i>interval to display volumes.</i>			
Report file	volume_file_name	report box	
<i>name of volumes report file.</i>			
Box Y position (mm)	volume_y_pos	input	
<i>if set, the volume box is positioned at this height from the bottom of the first box</i>			
Box size (mm)	volume_box_size	input	
<i>if set, upright, volumes and titles box height.</i>			
Horizontal cut/fill dividing line	volume_cl_linestyle	linestyle box	
<i>linestyle of the cut/fill dividing line.</i>			
Horizontal cut/fill dividing line colour	volume_cl_line_colour	colour box	
<i>colour of the cut/fill dividing line.</i>			

Section_Long_Plot_Boxes_Volume_cut_fill_Titles

Titles

Section: Volumes Cut/Fill - Title Parameters

The fields and buttons used in this section have the following functions.

Field Description	Parameter name	Type	Pop-Up
First line of volume title	volume_title	input	
<i>1st line of the volume title</i>			
Volume title textstyle	volume_title_textstyle	text box	
<i>textstyle of volume title</i>			
Volume title colour	volume_title_colour	colour box	
<i>colour of volume title</i>			

Volume title size (mm) volume_title_size input

size of volume title

Volume title Y position (mm) volume_title_y_pos input

if set, the height in mm above the bottom of all the boxes that the volume title text is drawn. If not set, then the text is placed at a height that puts it inside the default box for the volumes.

Section_Long_Plot_Boxes_Volume_cut_fill_Titles_Cut

Cut

Section: Volumes Cut/Fill - Title Cut Parameters

The fields and buttons used in this section have the following functions.

Field Description	Parameter name	Type	Pop-Up
-------------------	----------------	------	--------

First line of volume cut title	volume_cut_title	input	
---------------------------------------	------------------	-------	--

1st line of the cut volume title

Volume cut title textstyle	volume_cut_title_textstyle	text box	
-----------------------------------	----------------------------	----------	--

textstyle of cut volume title

Volume cut title colour	volume_cut_title_colour	colour box	
--------------------------------	-------------------------	------------	--

colour of cut volume title

Volume cut title size (mm)	volume_cut_title_size	input	
-----------------------------------	-----------------------	-------	--

size of cut volume title

Volume cut title Y position (mm)	volume_cut_title_y	input	
---	--------------------	-------	--

if set, the height in mm above the default position. If not set, then the text is placed at a height that puts it inside the default box for the cut volumes.

Section_Long_Plot_Boxes_Volume_cut_fill_Titles_Fill

Fill

Section: Volumes Cut/Fill - Title Fill Parameters

The fields and buttons used in this section have the following functions.

Field Description	Parameter name	Type	Pop-Up
-------------------	----------------	------	--------

First line of volume fill title	volume_fill_title	input	
--	-------------------	-------	--

1st line of the fill volume title

Volume fill title textstyle	volume_fill_title_textstyle	text box	
------------------------------------	-----------------------------	----------	--

textstyle of fill volume title

Volume fill title colour	volume_fill_title_colour	colour box	
---------------------------------	--------------------------	------------	--

colour of fill volume title

Volume fill title size (mm)	volume_fill_title_size	input	
------------------------------------	------------------------	-------	--

size of fill volume title

Volume fill title Y position (mm)	volume_fill_title_y	input	
--	---------------------	-------	--

if set, the height in mm above the default position. If not set, then the text is placed at a height that puts it inside the default box for the fill volumes.

Section_Long_Plot_Boxes_Volume_cut_fill_Values

Values

Section: Volumes Cut/Fill - Cut Value Parameters

The fields and buttons used in this section have the following functions.

Field Description	Parameter name	Type	Pop-Up
Textstyle <i>textstyle of the cut values.</i>	volume_cut_textstyle	text box	
Colour <i>colour of cut values</i>	volume_cut_text_colour	colour box	
Size (mm) <i>size of cut values</i>	volume_cut_text_size	input	
X position (mm) <i>the x distance to move the cut text from the default cut text position, def 0, it is not used if volume_text_centre_mode= between the uprights</i>	volume_cut_text_x	input	
Y position (mm) <i>the y distance to move the cut text from the default cut text position</i>	volume_cut_text_y	input	
Decimal places <i>number of dec places in cut values.</i>	volume_cut_decimals	input	

Section: Volumes Cut/Fill - Fill Value Parameters

The fields and buttons used in this section have the following functions.

Field Description	Parameter name	Type	Pop-Up
Textstyle <i>textstyle of the fill values.</i>	volume_fill_textstyle	text box	
Colour <i>colour of fill values</i>	volume_fill_text_colour	colour box	
Size (mm) <i>size of fill values</i>	volume_fill_text_size	input	
X position (mm) <i>the x distance to move the fill text from the default fill text position, def 0, it is not used if volume_text_centre_mode= between the uprights</i>	volume_fill_text_x	input	
Y position (mm) <i>the y distance to move the fill text from the default fill text position</i>	volume_fill_text_y	input	
Decimal places <i>number of dec places in fill values.</i>	volume_fill_decimals	input	

Section_Long_Plot_Boxes_Volume_cut_fill_Uprights_Sub_uprights

Uprights/Sub Uprights

Section: Volumes Cut/Fill - Upright Parameters

The fields and buttons used in this section have the following functions.

Field Description	Parameter name	Type	Pop-Up
Draw cut/fill uprights	volume_uprights_draw_mode	choice box	don't draw cut/fill uprights draw cut/fill uprights

upright draw mode.

Colour of uprights	volume_uprights_line_colour	colour box	
---------------------------	-----------------------------	------------	--

colour of uprights

Section: Volumes Cut/Fill - Sub Upright Parameters

The fields and buttons used in this section have the following functions.

Field Description	Parameter name	Type	Pop-Up
Colour of sub uprights	volume_sub_upright_colour	colour box	

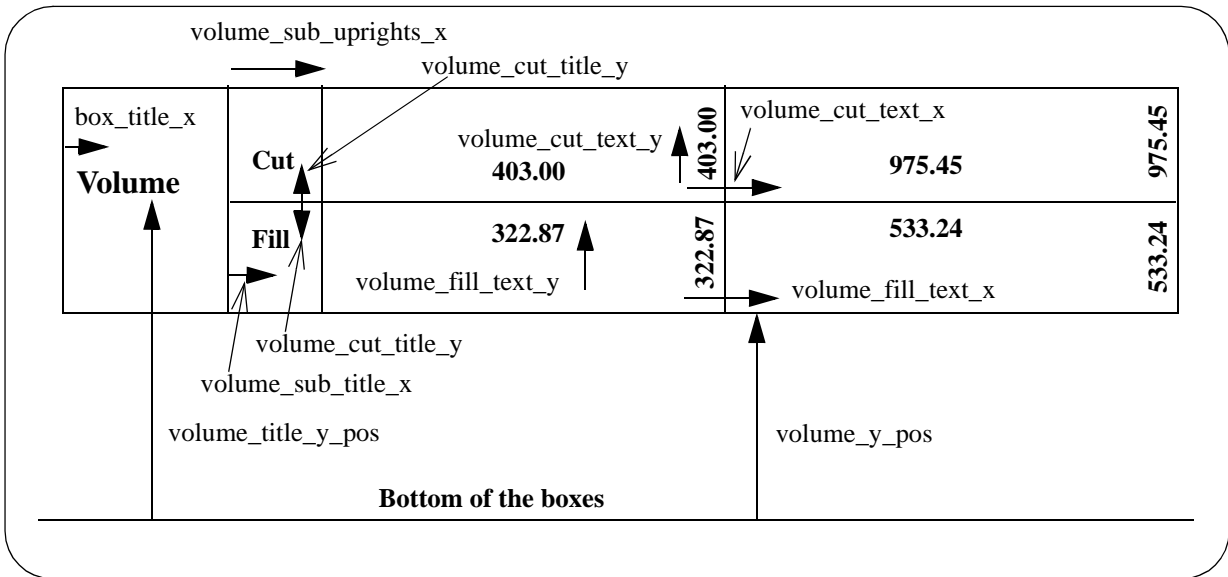
colour of sub uprights line

Sub upright X position (mm)	volume_sub_uprights_x	input	
------------------------------------	-----------------------	-------	--

the x distance to move from the default sub uprights position.

Sub upright title X position (mm)	volume_sub_title_x	input	
--	--------------------	-------	--

the distance to move the sub title text from the volume sub uprights



Section_Long_Plot_Boxes_X_Y

X, Y

Section: X, Y Parameters

The values of the X and Y coordinate for selected chainages can be labelled as separate boxes.

The chainages specified are limited to the base set of chainages already defined in the chainage selection and staggering section. i.e. an upright must exist for the X and Y value to be labelled. Not all of the uprights have to be labelled, just those specified in this section.

There are plot parameters to control all aspects of the X and Y labelling.

Chainages are used for positioning X and Y labels.

The chainages for the long section plot relate to the primary string and are controlled by a set of parameters.

The fields and buttons used in this section have the following functions.

Field Description	Parameter name	Type	Pop-Up
X, Y order	xy_order	choice box	X before Y Y before X
<i>order to place X and Y boxes. X before Y indicates that the X box will appear closest to the bottom of the boxes and the Y box will be on top of it. Note: The boxes are placed from bottom to top.</i>			
Chord/arc chainage mode	xy_chord_arc	choice box	Do not use chord/arc Use chord/arc chainages
<i>mode to include chord/arc chainages.</i>			
Start chainage	xy_start_chainage	input box	
<i>start chainage of chainage range to be labelled.</i>			
End chainage	xy_end_chainage	input box	
<i>end chainage of chainage range to be labelled.</i>			
Chainage interval	xy_interval	input	
<i>the regular interval (0=no regulars).</i>			
Include tangents, spirals	xy_label_hcp	tick box	
<i>if ticked, include the tangents and spirals.</i>			
Include hip points	xy_label_hip	tick box	
<i>if ticked, include horizontal intersection points.</i>			
Include vip points	xy_label_vip	tick box	
<i>if ticked, include vertical intersection points.</i>			
Include tangent points	xy_label_vtp	tick box	
<i>if ticked, include tangent points.</i>			
Include crest points	xy_label_crest	tick box	
<i>if ticked, include crest points.</i>			
Include sag points	xy_label_sag	tick box	
<i>if ticked, include sag points.</i>			
Include change of vertical grade	xy_label_grade_change	tick box	
<i>if ticked, include changes in vertical grade.</i>			
Chainage weeding tolerance	xy_label_tolerance	input	
<i>if >0 then use as a weeding tolerance, if <=0 don't weed.</i>			
Files of special chainages	xy_special_n_file	file box	

$n = 1$ to 20 - include chainages from the file (one chainage per line)

Section_Long_Plot_Boxes_X_Y_X_parameters

X Parameters

Section: X Parameters

The fields and buttons used in this section have the following functions.

Field Description	Parameter name	Type	Pop-Up
Label X values/titles	x_label	tick box	

if ticked, the X values/titles will be labelled.

Section: X Title Parameters

The fields and buttons used in this section have the following functions.

Field Description	Parameter name	Type	Pop-Up
Title line 1	x_title	input	

1st line of X title.

Title line 2	x_title_2	input	
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second line of X title.

Textstyle	x_title_textstyle	text box	
------------------	-------------------	----------	--

textstyle for the X title

Colour	x_title_colour	colour box	
---------------	----------------	------------	--

colour of the X title

Text size (mm)	x_title_size	input	
-----------------------	--------------	-------	--

size of the X title

Text y position (mm)	x_title_y_pos	input	
-----------------------------	---------------	-------	--

if set, the height in mm above the bottom of all the boxes that the X title text is drawn. If not set, then the text is placed at a height that puts it inside the default box for the X labels.

Section: X Value Parameters

The fields and buttons used in this section have the following functions.

Field Description	Parameter name	Type	Pop-Up
Decimal places	x_label_decimals	input	

number of decimal places for X values

Textstyle	x_label_textstyle	text box	
------------------	-------------------	----------	--

textstyle for the X values

Colour	x_label_colour	colour box	
---------------	----------------	------------	--

colour of the X values

Text size (mm)	x_label_size	input	
-----------------------	--------------	-------	--

size of the X values

Text y position (mm) x_label_y_pos input

if set, the height in mm above the bottom of all the boxes that the X values are drawn. If not set, then the text is placed at a height that puts it inside the default box for the X labels.

Section_Long_Plot_Boxes_X_Y_Y_parameters

Y Parameters

Section: Y Parameters

The fields and buttons used in this section have the following functions.

Field Description	Parameter name	Type	Pop-Up
Label Y values/titles	y_label	tick box	

if ticked, the Y values/titles will be labelled.

Section: Y Title Parameters

The fields and buttons used in this section have the following functions.

Field Description	Parameter name	Type	Pop-Up
Title line 1	y_title	input	

1st line of Y title.

Title line 2	y_title_2	input	
---------------------	-----------	-------	--

second line of Y title.

Textstyle	y_title_textstyle	text box	
------------------	-------------------	----------	--

textstyle for the Y title

Colour	y_title_colour	colour box	
---------------	----------------	------------	--

colour of the Y title

Text size (mm)	y_title_size	input	
-----------------------	--------------	-------	--

size of the Y title

Text y position (mm)	y_title_y_pos	input	
-----------------------------	---------------	-------	--

if set, the height in mm above the bottom of all the boxes that the Y title text is drawn. If not set, then the text is placed at a height that puts it inside the default box for the Y labels.

Section: Y Value Parameters

The fields and buttons used in this section have the following functions.

Field Description	Parameter name	Type	Pop-Up
Decimal places	y_label_decimals	input	

number of decimal places for Y values

Textstyle	y_label_textstyle	text box	
------------------	-------------------	----------	--

textstyle for the Y values

Colour	y_label_colour	colour box	
---------------	----------------	------------	--

colour of the Y values

Text size (mm)	y_label_size	input	
-----------------------	--------------	-------	--

size of the Y values

Text y position (mm) y_label_y_pos input

if set, the height in mm above the bottom of all the boxes that the Y values are drawn. If not set, then the text is placed at a height that puts it inside the default box for the Y labels.

Chainage/Staggering

Section_Long_Plot_Chainage_Staggering

Chainage/Staggering

Section: Chainage/Staggering - Chainage Parameters

Chainages are used for positioning height labels, uprights (leader lines) and bubbles. The chainages for the long section plot relate to the primary string

The fields and buttons used in this section have the following functions.

Field Description	Parameter name	Type	Pop-Up
Chord/arc chainage mode chainages	chord_arc	choice box	Do not use chord/arc Use chord/arc chainages

mode to include chord/arc chainages.

Chainage interval chainage_interval input

the regular interval (0=no regulars).

Include start and end chainages

chainage_label_ends tick box

if ticked, include the start and end chainages.

Include tangents, spirals chainage_label_hcp tick box

if ticked, include the tangents and spirals.

Include hip points chainage_label_hip tick box

if ticked, include horizontal intersection points.

Include vip points chainage_label_vip tick box

if ticked, include vertical intersection points.

Include tangent points chainage_label_vtp tick box

if ticked, include tangent points.

Include crest points chainage_label_crest tick box

if ticked, include crest points.

Include sag points chainage_label_sag tick box

if ticked, include sag points.

Include change of vertical grade chainage_label_grade_change tick box

if ticked, include changes in vertical grade.

Chainage weeding tolerance chainage_label_tolerance input

if >0 then use as a weeding tolerance, if <=0 don't weed.

Merge in bubble chainages chainage_merge_bubbles tick box

if ticked, merge in bubble chainages.

Weeding tolerance after bubble merge chainage_merge_tolerance input

if > 0, weed after merge using specified weeding tolerance. If <= 0, don't weed after merge.

Files of special chainages chainage_special_n_file file box

n = 1 to 20 - include chainages from the file (one chainage per line)

Section_Long_Plot_Chainage_Staggering_Staggering Staggering

Section: Chainage/Staggering - Staggering Parameters

If the real chainage position is used for the horizontal position of the chainage/height/depth text, text over writing can easily occur.

To prevent over writing, the text can be **staggered**.

If the *stagger_mode* parameter is set to 1, the text position is adjusted so that the text does not over write.

The real chainage position is then indicated by the chainage markers which are drawn at the top of the text boxes from the staggered text position back to the actual chainage position of the text.

The fields and buttons used in this section have the following functions.

Field Description	Parameter name	Type	Pop-Up
Stagger mode	stagger_mode	choice box	no staggering, allow over writing Stagger text

stagger mode.

Distance from boxes to top of staggers (mm)

stagger_gap_top input

distance from the top of boxes to top of staggers in mm.

Distance from boxes to bottom of staggers (mm)

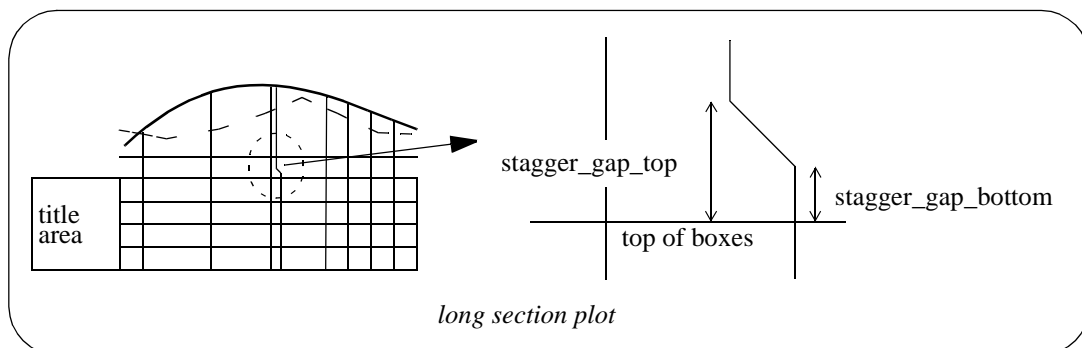
stagger_gap_bottom input

distance from the top of boxes to bottom of staggers in mm.

Stagger gap factor stagger_gap_factor input

*distance between staggers is box_text_size * stagger_gap_factor*

When staggering occurs, it is possible for the heights area to be longer than the graph area.



Uprights

Section_Long_Plot_Uprights

Uprights

Section: Upright Parameters

Uprights, or leader lines, can be drawn from the top of the staggers to the strings drawn on the plot.

The fields and buttons used in this section have the following functions.

Field Description	Parameter name	Type	Pop-Up
Upright draw mode	uprights_draw_mode	choice box	<i>none</i> max string height to stagger height uprights_y above boxes to primary string tin 1 tin 2 tin 3 tin 4 tin 5 tin 6 tin 7 tin 8 tin 9 tin 10 to offset 1 to offset 2 to offset 3 to offset 4 to offset 5 to offset 6 to offset 7 to offset 8 to offset 9 to offset 10

upright draw mode.

Uprights Y distance (mm) uprights_y input

*distance to draw the uprights for **uprights_draw_mode** = "to **uprights_y** above boxes"*

Uprights colour uprights_colour colour box

uprights colour. Default is box_colour

Uprights bottom mode uprights_bottom_mode choice box stop at top of boxes
draw to bottom of boxes
draw to **uprights_bottom_y**

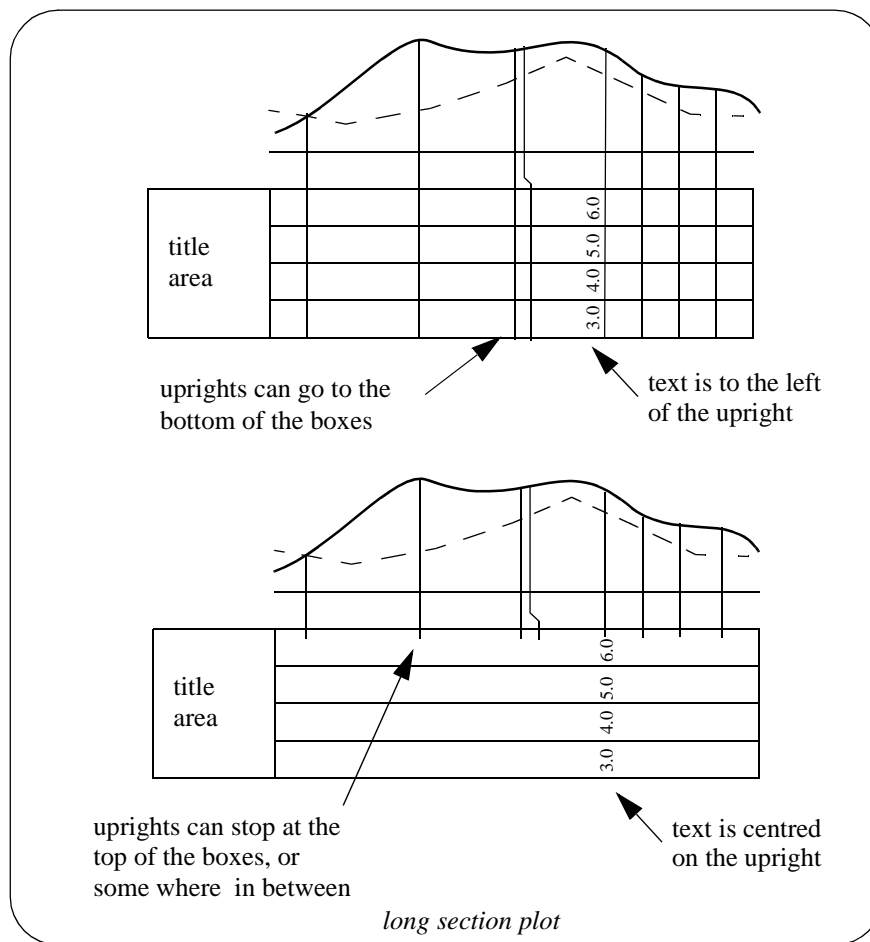
below top of boxes
 draw to uprights_bottom_y
 above bottom of boxes
 ticks at chainage

Upright draw mode below top of boxes.

Uprights bottom Y distance (mm) `uprights_bottom_y` input
distance in mm.

Uprights text offset factor `uprights_text_offset_factor` input
 move the text by this factor**size*.

When uprights go below the top of the boxes, the height and offset text is moved to the left so that the upright does not go through the text. The left hand side of the heights boxes also moves to the left to leave room for the height text.



Datum Area

Section_Long_Plot_Datum_area

Datum Area

The **datum area** is the region between the boxes area and the graph area.

Section: Datum Area - Datum Value Mode

The fields and buttons used in this section have the following functions.

Field Description	Parameter name	Type	Pop-Up
Use manual datum	manual_datum	tick box	

if ticked the datum will be calculated internally, else use the datum_value parameter for the datum.

Datum value	datum_value	input	
--------------------	-------------	-------	--

the value to be used for the datum.

Datum roundoff	datum_roundoff	input	
-----------------------	----------------	-------	--

the value to roundoff the datum value.

Decimal places for datum	datum_decimals	input	
---------------------------------	----------------	-------	--

If > 0, trailing zeros are removed after the decimal point. If < 0, the absolute value is taken as the number of decimal places to report i.e. no trailing zeros are removed

Section: Datum Area - Other Parameters

The fields and buttons used in this section have the following functions.

Field Description	Parameter name	Type	Pop-Up
Datum name	datum_name	input	

text to write before the datum value

Graph area to datum line gap (mm)

datum_above_gap	input
-----------------	-------

distance from the bottom of the graph area to the datum line.

Datum line gap to top of boxes (mm)

datum_below_gap	input
-----------------	-------

distance from datum line to top of boxes.

The **datum line** is positioned the distance *datum_below_gap* above the top of the boxes area and the graph area is positioned the distance *datum_above_gap* above the datum line.

Hence the graph area is distance (*datum_below_gap* + *datum_above_gap*) above the top of the boxes area.

The *datum_below_gap* and *datum_above_gap* can be zero or positive.

Datum linestyle	datum_linestyle	linestyle box
------------------------	-----------------	---------------

datum line linestyle (default solid)

Datum textstyle	datum_textstyle	text box
------------------------	-----------------	----------

textstyle for datum information

Datum text size (mm)	datum_text_size	input
-----------------------------	-----------------	-------

size of datum text and value (mm)

Datum colour	datum_colour	colour box
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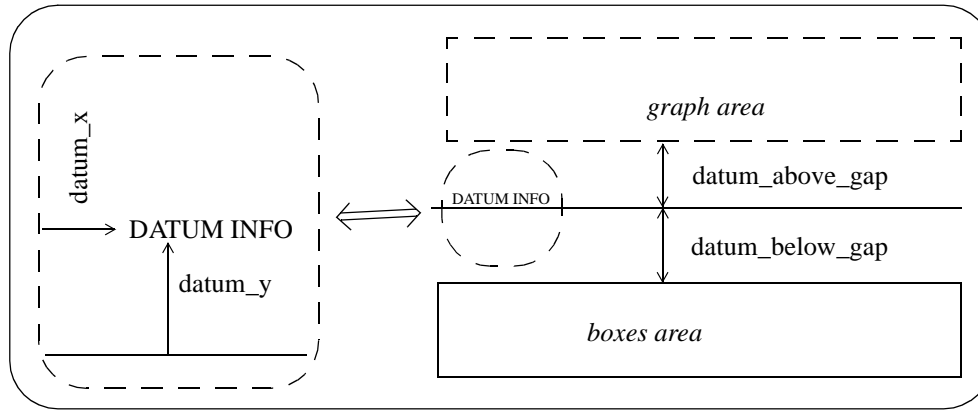
colour of the datum text and line.

X adjustment (mm) datum_x input

distance to move the datum text along the datum line

Y adjustment (mm) datum_y input

distance to raise the datum text above the datum line



Graph Area

Section_Long_Plot_Graph_area

Graph Area

The graph area sits on top of the boxes and datum areas, so there may not be enough room left on the sheet for the full plot height. In this case, the plot will be truncated at the top of the allowed graph area.

Section: Graph Area - Extra space parameters

The fields and buttons used in this section have the following functions.

Field Description	Parameter name	Type	Pop-Up
Extra space units	extra_space_units	choice box	world units millimetres

units for specifying extra space.

Extra space left (units) extra_space_left input

distance to subtract from left of plot area

Extra space right (units) extra_space_right input

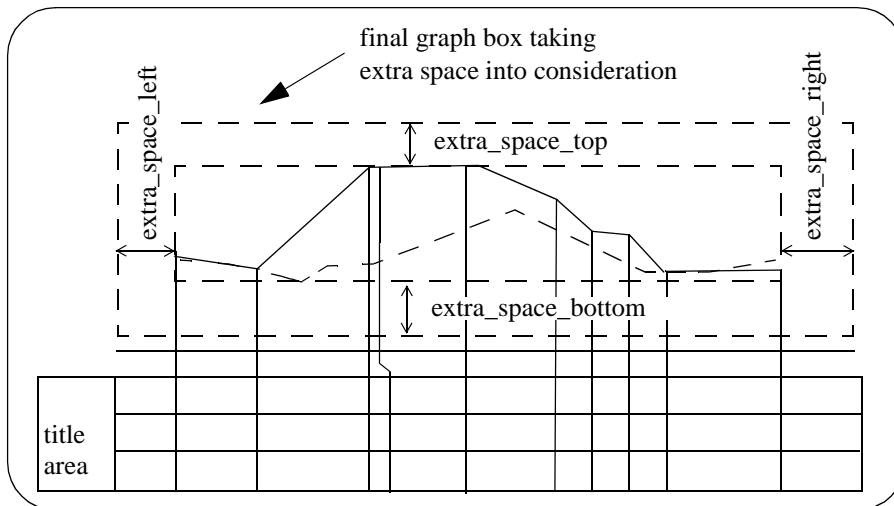
distance to add to right of plot area

Extra space top (units) extra_space_top input

distance to add to top of plot area

Extra space bottom (units) extra_space_bottom input

distance to subtract from bottom of plot area



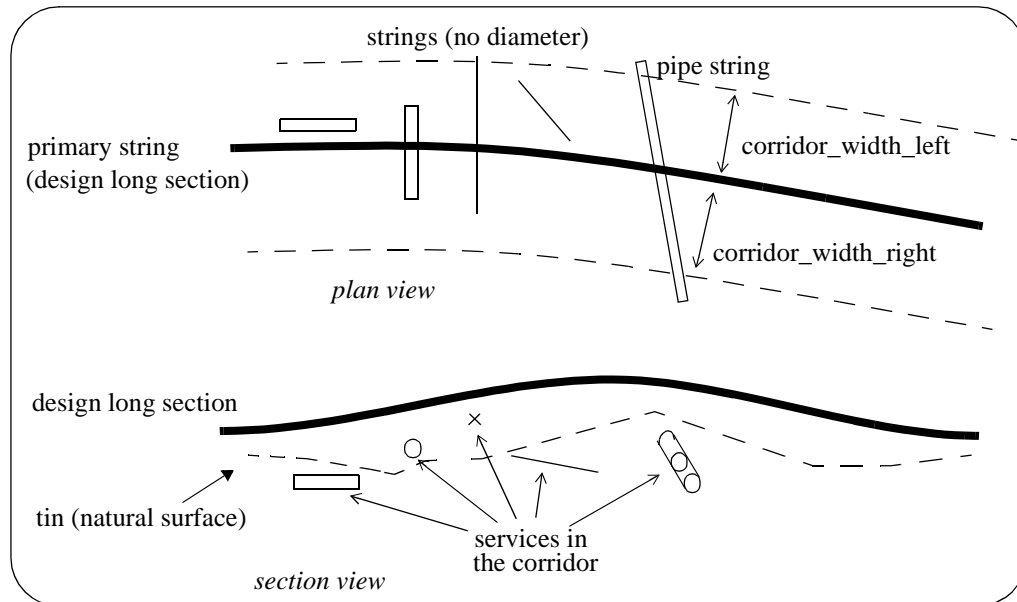
Corridors

Section_Long_Plot_Corridors

A corridor around the primary string is defined by giving a left and right corridor width.

Any string in a model added to the section view is checked to see if it appears in the corridor, and if it does, it is drawn on the long section plot.

To be drawn, strings do not have to cross the primary string, but just be in the corridor.



Panel field	Parameter name	Type
Left corridor width (world units)		
	corridor_width_left	input
<i>left corridor width</i>		
Right corridor width (world units)		
	corridor_width_right	input
<i>right corridor width</i>		
Left corridor overlap (world units)		
	corridor_overlap_left	input
<i>left corridor overlap</i>		
Right corridor overlap (world units)		
	corridor_overlap_right	input
<i>right corridor overlap</i>		
Chord-arc tolerance (world units)		
	corridor_chord_arc	input
<i>chord-arc tolerance used near any bends in the corridor.</i>		

Model selection

Panel field	Parameter name	Type
Corridor model	corridor_model_n	model box

models containing tins and service strings to be drawn on the section. Where n = 1, 2, ... ,100 given by line number on grid.

Bubbles

Section_Long_Plot_Bubbles

Bubbles

Section: Bubble Definition Parameters

Circles with the string name and a unique number (**bubbles**) can be drawn on the long section plot. Bubbles are normally used for lip profiles.

The chainages used for the bubbles are given by a set of parameters similar to the chainage parameters. The resulting set of bubbles are sequentially numbered (starting with one) in chainage order.

Although many bubbles can be defined by the bubble parameters, a bubble is only drawn on the plot if there is a labelled chainage to draw it above.

Hence not all bubbles given by the bubble chainage parameters are drawn but for the ones that are drawn, the bubble number is taken from the full bubble set.

The fields and buttons used in this section have the following functions.

Field Description	Parameter name	Type	Pop-Up
Bubble draw mode <i>draw bubble mode</i>	chainage_bubbles	choice box	Do not draw bubbles Draw bubbles
Bubble radius <i>radius of the bubbles</i>	bubble_radius	input	
Bubble colour <i>colour of the bubbles</i>	bubble_colour	colour box	
Bubble upright mode <i>draw bubble upright mode</i>	bubble_draw_upright	choice box	Do not draw bubble upright Draw bubble upright
Bubble start chainage <i>start chainage bubbles</i>	bubble_start_chainage	input	
Bubble end chainage <i>end chainage bubbles</i>	bubble_end_chainage	input	
Chord/arc chainage mode <i>chord/arc chainage mode</i>	bubble_chord_arc	choice box	Do not use chord/arc chainages Use chord/arc chainages
Bubble interval <i>include regular interval for bubbles</i>	bubble_interval	input	

Section_Long_Plot_Bubbles_Text

Text

Section: Bubble Definition - Text Parameters

The fields and buttons used in this section have the following functions.

Field Description	Parameter name	Type	Pop-Up
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Bubble text string name mode

bubble_text_string_name_mode

choice box Do not label with string name
Label with string name
Label with model->string name

mode of bubble text string name.

Pre text

bubble_pre_text

input

pre text for label

Post text

bubble_post_text

input

post text for label

Textstyle

bubble_textstyle

text box

textstyle of label of label

Size (mm)

bubble_text_size

input

size of label

Colour

bubble_text_colour

colour box

colour of label

Offset (mm)

bubble_text_offset

input

offset value for bubbles.

Upright distance (mm)

bubble_upright_distance

angle box

distance bubbles are above boxes/uprights

Bubble upright distance mode

bubble_mode

choice box

Distance is above boxes
Distance is above uprights

mode of bubble upright distance.

Section_Long_Plot_Bubbles_Label

Label

Section: Bubble Definition - Label Parameters

The fields and buttons used in this section have the following functions.

Field Description	Parameter name	Type	Pop-Up
Include tangents, spirals <i>if ticked, include the tangents and spirals.</i>	bubble_label_hcp	tick box	
Include hip points <i>if ticked, include horizontal intersection points.</i>	bubble_label_hip	tick box	
Include vip points <i>if ticked, include vertical intersection points.</i>	bubble_label_vip	tick box	
Include tangent points	bubble_label_vtp	tick box	

if ticked, include tangent points.

Include crest points bubble_label_crest tick box

if ticked, include crest points.

Include sag points bubble_label_sag tick box

if ticked, include sag points.

Include change of vertical grade

 bubble_label_grade_change tick box

if ticked, include changes in vertical grade.

Bubble weeding tolerance

 bubble_label_tolerance input

if >0 then use as a weeding tolerance, if <=0 don't weed.

Files of special chainages

 bubble_special_n_file file box

n = 1 to 20 - include chainages from the file (one chainage per line)

Quick Horizontal Geometry

Section_Long_Plot_Quick_horizontal_geometry

Quick Horizontal Geometry

Section: Quick Horizontal Geometry

The standard horizontal geometry arrows can be drawn at a given distance above the top of the boxes area.

The fields and buttons used in this section have the following functions.

Field Description	Parameter name	Type	Pop-Up
Distance above boxes (mm) <i>distance above boxes for drawing of arrows</i>	horizontal_geometry_y	input	

Section: Quick Horizontal Geometry - Left Side Label Parameters

The fields and buttons used in this section have the following functions.

Field Description	Parameter name	Type
Text <i>text for label</i>	horizontal_geometry_label_text	input
Textstyle <i>textstyle of label</i>	horizontal_geometry_label_textstyle	text box
Text colour <i>colour of label</i>	horizontal_geometry_label_text_colour	colour box
Text size (mm) <i>size of label</i>	horizontal_geometry_label_text_size	input

Section: Quick Horizontal Geometry - Arrow and text Parameters

The fields and buttons used in this section have the following functions.

Field Description	Parameter name	Type
Text colour <i>colour of arrow text</i>	horizontal_geometry_arrow_text_colour	colour box
Textstyle <i>textstyle of arrow text</i>	horizontal_geometry_arrow_textstyle	text box
Text size (mm) <i>size of arrow text</i>	horizontal_geometry_arrow_text_size	input
Decimal places <i>number of decimal places in arrow text</i>	horizontal_geometry_label_decimals	input
Arrow colour <i>colour of arrow</i>	horizontal_geometry_arrow_colour	colour box
Arrow height (mm) <i>size of arrow</i>	horizontal_geometry_arrow_height	input

Extensive Horizontal Geometry

Section_Long_Plot_Extensive_horizontal_geometry

Extensive Horizontal Geometry

Section: Extensive Horizontal Geometry Parameters

The standard horizontal geometry arrows can be drawn at a given distance above the top of the boxes area.

For complicated horizontal geometry labelling, there are sets of horizontal geometry labelling parameters which give tight control over the position and types of labels.

It is also possible to label the horizontal geometry of *alignment* strings other than the primary string. To plot such a string on the same plot, the chainage position of the horizontal geometry for the non-primary alignment strings is *projected* onto the primary string to give a primary string chainage for plotting. The values of the horizontal geometry (such as radius and spiral length) that are plotted are taken from the other string. Independently graded offset strings (such as a left and right kerbs) are the type of additional alignment strings that may need to be plotted on the same long section plot as the reference string (primary string).

For plotting horizontal geometry, the user can give up to twenty sets of these labels and they can be used to label spirals, curves and tangent information for the primary string and/or additional alignment strings.

Each label set consists of three parts:

- (a) a text label on the left hand side of the plot
- (b) an arrow
- (c) text on the arrows.

The fields and buttons used in this section have the following functions.

Field Description	Parameter name	Type	Pop-Up
Define set #		input	

where n = 1 to....20. The set enables the specification of a number of parameters for a number of specified extensive horizontal geometry.

For the following parameters, n takes the value 1 to 20 and specifies the nth parameter set.

Geometry to label	h_g_n_type	choice box	label spirals label horizontal curves label horizontal tangents
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specifies what geometry is to be labelled for the nominated set. If h_g_n_type is missing, then the set is ignored.

Value to label	h_g_n_value_mode	choice box	nothing length radius (for curve labelling) or radius*length (for spiral)
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specifies the value to label.

Y offset (mm)	h_g_n_label_y	input	
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distance of arrow line above top of the boxes.

If the set of parameters is to apply to the horizontal geometry of an alignment string *other* than the primary string, then the offset string can be specified.

Offset string	h_g_n_offset_string	select box	
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the name of the non-primary string, i.e.

`h_g_n_offset_string` "model->string_name"
 or
`h_g_n_offset_string` "string_name"

and the model is the *defined by offset_model*. *offset_model* has been defined in the section "Offset String Titles/Heights/Depths".

If the *h_g_n_offset_string* parameter does not exist, then the set of horizontal geometry parameters is applied to the primary string.

Section_Long_Plot_Extensive_horizontal_geometry_Left_hand_labels

Section: Extensive Horizontal Geometry - Left Hand Labels Parameters

The fields and buttons used in this section have the following functions.

Field Description	Parameter name	Type	Pop-Up
Use set #		input	

set #, as specified by the define set # parameter.

For the following parameters, n takes the value 1 to 20 and specifies the nth parameter set.

Label X (mm)	<code>h_g_n_label_x</code>	input	
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distance from the left hand side of the labels area to start the left hand label text.

Offset (mm)	<code>h_g_n_label_offset</code>	input	
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distance to raise the left hand label text above arrow line.

Text size (mm)	<code>h_g_n_label_text_size</code>	input	
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size of the left hand label text.

Text colour	<code>h_g_n_label_text_colour</code>	colour box	
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size of the left hand label text.

Text	<code>h_g_n_label_text</code>	input	
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left hand label text.

Textstyle	<code>h_g_n_label_textstyle</code>	text box	
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textstyle for the left hand label text.

Section_Long_Plot_Extensive_horizontal_geometry_Arrow_type

Section: Extensive Horizontal Geometry- Arrow Type Parameters

The fields and buttons used in this section have the following functions.

Field Description	Parameter name	Type	Pop-Up
Use set #		input	

set #, as specified by the define set # parameter.

For the following parameters, n takes the value 1 to 20 and specifies the nth parameter set.

Arrow type mode	<code>h_g_n_draw_mode</code>	choice box	arrow (1)
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line (2)

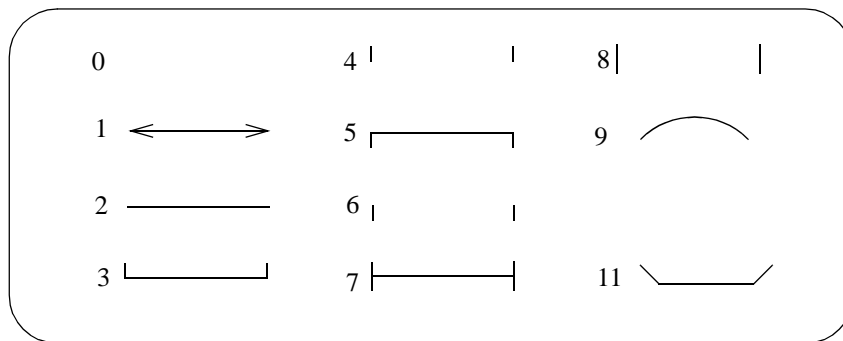
line with uprights at ends (3)

uprights with no lines (4)

line with downrights (5)

downrights with no lines (6)
 line with up and downrights
 at ends (7)
 up and downrights with no
 line (8)
 draw curve (9)
 radius*length curve (11)

specifies the arrow type to be drawn.



Left arrow gap (mm)	h_g_n_left_gap	input
<i>size of gap for left side of arrow.</i>		
Right arrow gap (mm)	h_g_n_right_gap	input
<i>size of gap for right side of arrow.</i>		
Arrow colour	h_g_n_colour	colour box
<i>colour of arrow text</i>		
Arrow height (mm)	h_g_n_height	input
<i>height of arrow in mm.</i>		
Leave gap in arrow for text	h_g_n_gap	tick box
<i>if ticked, a gap will be left for text.</i>		

Section_Long_Plot_Extensive_horizontal_geometry_Arrow_text

Section: Extensive Horizontal Geometry - Arrow Text Parameters

The fields and buttons used in this section have the following functions.

Field Description	Parameter name	Type	Pop-Up
Use set #		input	
<i>set #, as specified by the define set # parameter.</i>			
Text colour	h_g_n_text_colour	colour box	
<i>colour of arrow text</i>			
Text size (mm)	h_g_n_text_size	input	
<i>size of arrow text</i>			

Text offset (mm)	h_g_n_text_offset	input
<i>distance to raise the text above the arrow line.</i>		
Arrow text pre-text	h_g_n_pre_text	input
<i>text before the arrow text</i>		
Arrow text post-text	h_g_n_post_text	input
<i>text after the arrow text</i>		
Textstyle	h_g_n_textstyle	text box
<i>textstyle of arrow text</i>		
Decimal places	h_g_n_no_decimals	input
<i>number of decimal places in arrow text. If > 0, all trailing zeros after the decimal place are removed. If < 0, the absolute value is taken as the number of decimal places and no trailing zeros are removed after the decimal point.</i>		
Rotate text to fit	h_g_n_rotate	tick box
<i>if ticked, the text on the arrows will be rotated to fit.</i>		

Quick Vertical Geometry

Section_Long_Plot_Quick_vertical_geometry

Quick Vertical Geometry

Section: Quick Vertical Geometry - Grade

The fields and buttons used in this section have the following functions.

Field Description	Parameter name	Type	Pop-Up
Distance above boxes (mm)	vertical_geometry_grade_y	input	

distance above boxes. If 0, don't draw.

Section: Quick Vertical Geometry - Length

The fields and buttons used in this section have the following functions.

Field Description	Parameter name	Type	Pop-Up
Distance above boxes (mm)	vertical_geometry_length_y	input	

distance above boxes. If 0, don't draw.

Section: Quick Vertical Geometry - Common Parameters

The fields and buttons used in this section have the following functions.

Field Description	Parameter name	Type	Pop-Up
Arrow mode	vertical_geometry_arrow_mode	input	ticks arrows

arrow mode.

Arrow colour	vertical_geometry_arrow_colour	colour box	
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arrow colour.

Arrow height (mm)	vertical_geometry_arrow_height	input	
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height of arrow in mm.

Section_Long_Plot_Quick_vertical_geometry_Grade_labels

Grade Labels

Section: Quick Vertical Geometry - Grade Left Hand Label Parameters

The fields and buttons used in this section have the following functions.

Field Description	Parameter name	Type	Pop-Up
Text	vertical_geometry_label_grade_text	input	

text for left hand grade label.

Textstyle vertical_geometry_label_grade_textstyle
textstyle box

textstyle for left hand grade label.

Text colour vertical_geometry_label_grade_text_colour
colour box

colour of left hand grade label text

Text size (mm) vertical_geometry_label_grade_text_size
input

size of left hand grade label text

Section: Quick Vertical Geometry - Grade Arrow And Text Parameters

The fields and buttons used in this section have the following functions.

Field Description	Parameter name	Type	Pop-Up
Grade mode	vertical_geometry_grade_mode	choice box	% 1 in

mode of grade for grade arrow text.

Grade decimal places vertical_geometry_label_grade_decimals
input

number of decimal places for grade arrow text.

Grade arrow textstyle vertical_geometry_arrow_grade_textstyle
textstyle box

textstyle for grade arrow text.

Grade arrow text colour vertical_geometry_arrow_grade_text_colour
colour box

colour of grade arrow text.

Grade arrow text size (mm)
vertical_geometry_arrow_grade_text_size
input

size of grade arrow text

Section_Long_Plot_Quick_vertical_geometry_Length_labels

Length Labels

Section: Quick Vertical Geometry - Length Left Hand Label Parameters

The fields and buttons used in this section have the following functions.

Field Description	Parameter name	Type	Pop-Up
Text	vertical_geometry_label_length_text	input	

text for left hand length label.

Textstyle vertical_geometry_label_length_textstyle
textstyle box

textstyle for left hand length label.

Text colour vertical_geometry_label_length_text_colour
colour box

colour of left hand length label

Text size (mm) vertical_geometry_label_length_text_size
input

size of left hand length label

Section: Quick Vertical Geometry - Grade Arrow And Text Parameters

The fields and buttons used in this section have the following functions.

Field Description	Parameter name	Type	Pop-Up
Length mode	vertical_geometry_length_mode	choice box	length radius k value mixed - length for parabolic, radius for circular

mode of length for length labels.

Length decimal places vertical_geometry_label_length_decimals
input

number of decimal places for length arrow labels.

Length arrow textstyle vertical_geometry_arrow_length_textstyle
textstyle box

textstyle for length arrow labels.

Length arrow text colour vertical_geometry_arrow_length_text_colour
colour box

colour of length arrow labels.

Length arrow text size (mm)
vertical_geometry_arrow_length_text_size
input

size of length arrow labels



Extensive Vertical Geometry

Section_Long_Plot_Extensive_vertical_geometry

Extensive Vertical Geometry

Section: Extensive Vertical Geometry Parameters

For complicated vertical geometry labelling of the *primary alignment* string, there are sets of vertical geometry labelling parameters which give tight control over the position and types of labels.

It is also possible to label the vertical geometry of *alignment* strings other than the primary string. To plot such a string on the same plot, the chainage position of the vertical geometry for the non-primary alignment strings is *projected* onto the primary string to give a primary string chainage for plotting. The values of the vertical geometry (such as grade and curve length) that are plotted are taken from the other string. Independently graded offset strings (such as a left and right kerbs) are the type of additional alignment strings that may need to be plotted on the same long section plot as the reference string (primary string).

For plotting vertical geometry, the user can give up to twenty sets of these labels and they can be used to label grades or vertical curve information for the primary string and/or additional alignment strings.

Each label set consists of three parts:

- a text label on the left hand side of the plot
- an arrow
- text on the arrows.

The fields and buttons used in this section have the following functions.

Field Description	Parameter name	Type	Pop-Up
Define set #		input	

where n = 1 to....20. The set enables the specification of a number of parameters for a number of specified extensive horizontal geometry.

For the following parameters, n takes the value 1 to 20 and specifies the nth parameter set.

Geometry to label	v_g_n_type	choice box	label grades label vg curve information
--------------------------	------------	------------	--

specifies what geometry is to be labelled for the nominated set. If v_g_n_type is missing, then the set is ignored.

Value to label	v_g_n_value_mode	choice box	nothing %grade or parab length, arc length 1 in grade or radius mm grade or K value ch length between curve points per chord(QR) or curve constant (QR).
-----------------------	------------------	------------	--

specifies the value to label. This will be dependant on the v_g_n_type chosen.

Vertical curve points to draw the arrows between (for grade labelling only)

Points to draw arrows between

v_g_n_between_mode choice box between chainages at the vips between chainages at the vtps

specifies where to draw the arrows between (for grade labelling only).

Y offset (mm) v_g_n_label_y input
distance of arrow line above top of the boxes. This value can be negative

If the set of parameters is to apply to the vertical geometry of an alignment string *other* than the primary string, then the following parameter can define the other alignment string

Offset string v_g_n_offset_string select box
the name of the non-primary string. i.e.

v_g_n_offset_string "model->string_name"
 or
 v_g_n_offset_string "string_name"

and the model is the *defined by offset_model*. *offset_model has been defined in the section “Offset String Titles/Heights/Depths”* .

If the *v_g_n_offset_string* parameter does not exist, then the set of vertical geometry parameters is applied to the primary string.

Section_Long_Plot_Extensive_vertical_geometry_Left_hand_labels

Section: Extensive Vertical Geometry - Left Hand Labels Parameters

The fields and buttons used in this section have the following functions.

Field Description	Parameter name	Type	Pop-Up
Use set #		input	

set #, as specified by the define set # parameter.

For the following parameters, n takes the value 1 to 20 and specifies the nth parameter set.

Label X (mm) v_g_n_label_x input
distance from the left hand side of the labels area to start the left hand label text.

Offset (mm) v_g_n_label_offset input
distance to raise the left hand label text above arrow line.

Text size (mm) v_g_n_label_text_size input
size of the left hand label text.

Text colour v_g_n_label_text_colour colour box
size of the left hand label text.

Text v_g_n_label_text input
left hand label text.

Textstyle v_g_n_label_textstyle text box
textstyle for the left hand label text.

Section_Long_Plot_Extensive_vertical_geometry_Arrow_type

Section: Extensive Vertical Geometry - Arrow Type Parameters

The fields and buttons used in this section have the following functions.

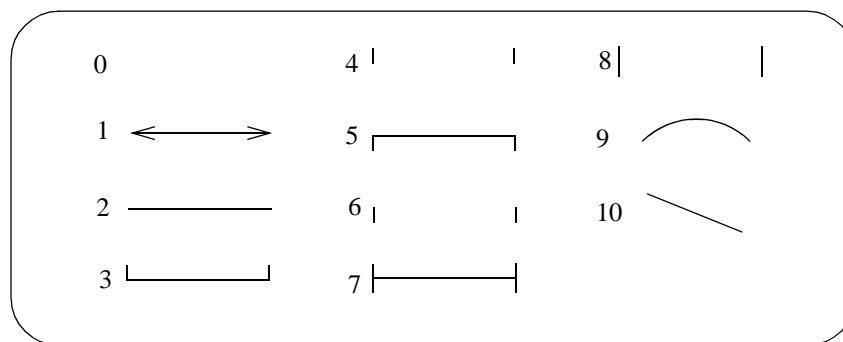
Field Description	Parameter name	Type	Pop-Up
Use set #		input	

set #, as specified by the define set # parameter.

For the following parameters, n takes the value 1 to 20 and specifies the nth parameter set.

Arrow type mode	v_g_n_draw_mode	choice box	Pop-Up
			arrow (1)
			line (2)
			line with uprights at ends (3)
			uprights with no lines (4)
			line with downrights (5)
			downrights with no lines (6)
			line with up and downrights at ends (7)
			up and downrights with no line (8)
			draw curve (9)
			draw grade (10)

specifies the arrow type to be drawn.



Left arrow gap (mm)	v_g_n_left_gap	input
<i>size of gap for left side for arrow.</i>		
Right arrow gap (mm)	v_g_n_right_gap	input
<i>size of gap for right side of arrow.</i>		
Arrow colour	v_g_n_colour	colour box
<i>colour of arrow text</i>		
Arrow height (mm)	v_g_n_height	input
<i>height of arrow in mm.</i>		
Leave gap in arrow for text	v_g_n_gap	tick box
<i>if ticked, a gap will be left for text.</i>		

Section_Long_Plot_Extensive_vertical_geometry_Arrow_text**Section: Extensive Vertical Geometry - Arrow Text Parameters**

The fields and buttons used in this section have the following functions.

Field Description	Parameter name	Type	Pop-Up
Use set # <i>set #, as specified by the define set # parameter.</i>		input	
Text colour <i>colour of arrow text</i>	v_g_n_text_colour	colour box	
Text size (mm) <i>size of arrow text</i>	v_g_n_text_size	input	
Text offset (mm) <i>distance to raise the text above the arrow line.</i>	v_g_n_text_offset	input	
Arrow text pre-text <i>text before the arrow text</i>	v_g_n_pre_text	input	
Arrow text post-text <i>text after the arrow text</i>	v_g_n_post_text	input	
Textstyle <i>textstyle of arrow text</i>	v_g_n_textstyle	text box	
Decimal places <i>number of decimal places in arrow text. If > 0, all trailing zeros after the decimal place are removed. If < 0, the absolute value is taken as the number of decimal places and no trailing zeros are removed after the decimal point.</i>	v_g_n_no_decimals	input	
Rotate text to fit <i>if ticked, the text on the arrows will be rotated to fit.</i>	v_g_n_rotate	tick box	

Labelling Points With Chainage, Height

Section_Long_Plot_Labelling_points_with_chainage_height

Labelling Points With Chainage, Height

Section: Labelling Points With Chainage, Height

The fields and buttons used in this section have the following functions.

Field Description	Parameter name	Type	Pop-Up
Define set #		input	

where $n = 1$ to....20. The set enables the specification of a number of parameters for a number of specified labels.

For the following parameters, n takes the value 1 to 20 and specifies the nth parameter set.

Label Type	label_n_type	choice box	chainage of vip, height of vip chainage of vip, height of primary crest sag vtp hcp change of grade mid-ordinate of the vertical curve

The chainage and/or height values for certain points (given by label_n_type) can be labelled.

If label_n_type is missing, then the set is ignored.

Label height mode	label_n_y_mode	choice box	height above boxes (mm) height above height value (mm) height above primary height (mm)

specifies which reference point the label_n_y distance is measured from.

Section_Long_Plot_Labelling_points_with_chainage_height_Label_position

Labelling Position

Section: Chainage/Height Label Position Parameters

The fields and buttons used in this section have the following functions.

Field Description	Parameter name	Type	Pop-Up
Use set #		input	

set #, as specified by the Define set # parameter.

For the following parameters, n takes the value 1 to 20 and specifies the nth parameter set.

Distance above point (mm)	label_n_y	input	

distance above point.

Angle (dms)	label_n_angle	angle box	
			<i>rotation about point.</i>
Distance along from point (mm)	label_n_x	input	
			<i>the distance along from the point in mm.</i>
Text raise height (mm)	label_n_offset	input	
			<i>the distance to raise the text in mm.</i>
Justification	label_n_justification	choice box	left end middle end

justification of the label.

Section_Long_Plot_Labelling_points_with_chainage_height_Label_text_type

Text Type

Section: Chainage/Height Label Text Type Parameters

The fields and buttons used in this section have the following functions.

Field Description	Parameter name	Type	Pop-Up
Use set #		input	

set #, as specified by the Define set # parameter.

For the following parameters, n takes the value 1 to 20 and specifies the nth parameter set.

Size (mm)	label_n_size	input	
			<i>size of the text.</i>
Colour	label_n_colour	colour box	
			<i>colour of text.</i>
Textstyle	label_n_textstyle	text box	
			<i>the textstyle of the text.</i>

Section_Long_Plot_Labelling_points_with_chainage_height_Label_text

Label Text

Section: Chainage/Height Label Text Parameters

The fields and buttons used in this section have the following functions.

Field Description	Parameter name	Type	Pop-Up
Use set #		input	

set #, as specified by the Define set # parameter.

For the following parameters, n takes the value 1 to 20 and specifies the nth parameter set.

Label type	label_n_value_mode	choice box	no values labelled val 1 = chainage val 1 = height val 1 = chainage, val2 =
-------------------	--------------------	------------	--

height
 val 1 = height, val2 =
 chainage

the value label mode.

Pre-text label_n_pre_text input

text before the label text

Mid-text label_n_mid_text input

text at mid position i.e. between val 1 and val 2.

Post-text label_n_post_text input

text after the label text

Decimal places val 1 label_n_no_decimals_1 input

number of decimal places in val 1.

Decimal places val 2 label_n_no_decimals_2 input

number of decimal places in val 2.

If the **number of decimal places is greater than zero** (> 0), then any trailing zeros after the decimal point are removed.

If the **number of decimal places is less than zero** (< 0), the absolute value is taken as the number of decimal places and **no** trailing zeros after the decimal point are removed.

Labelling Points With Symbols

Section_Long_Plot_Labelling_points_with_symbols

Labelling Points With Symbols

Section: Labelling Points With Symbols

Symbols can be placed at certain points given by *symbol_n_type*.

The symbol is drawn in a square box centred on (0,0) with sides of length two millimetres. That is, the box co-ordinates are (-1,-1), (1,1), (1,-1), (-1,-1).

The fields and buttons used in this section have the following functions.

Field Description	Parameter name	Type	Pop-Up
Set #		input	

where n = 1 to....20. The set enables the specification of a number of parameters for a number of specified symbols.

For the following parameters, n takes the value 1 to 20 and specifies the nth parameter set.

Symbol Type	symbol_n_type	choice box	chainage of vip, height of vip, height of primary crest, sag, vtp, hcp, change of grade, mid-ordinate of the vertical curve
-------------	---------------	------------	---

If *symbol_n_type* is missing, then the set is ignored.

Label height mode	symbol_n_y_mode	choice box	height above boxes (mm), height above height value (mm), height above primary height (mm)
-------------------	-----------------	------------	---

specifies which reference point the label_n_y distance is measured from.

Distance above point (mm)	symbol_n_y	input	distance above point given by mode.
---------------------------	------------	-------	-------------------------------------

Angle (dms)	symbol_n_angle	angle box	rotation about point.
-------------	----------------	-----------	-----------------------

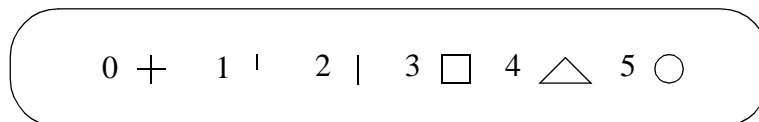
Distance along from point (mm)	symbol_n_x	input	the distance along from the point in mm.
--------------------------------	------------	-------	--

Size (mm)	symbol_n_size	input	the symbol size in mm.
-----------	---------------	-------	------------------------

Colour	symbol_n_colour	colour box	the symbol size in mm.
--------	-----------------	------------	------------------------

Symbol draw mode	symbol_n_draw_mode	choice box	height above boxes (mm)
			cross (0)
			upright from centre of box (1)
			up and downright from centre of box (2)
			square (3)
			triangle, base at bottom (4)
			circle (5)

draw mode for symbol



Hatching Cut/Fill

Section_Long_Plot_Hatching_cut_fill

This option is used to hatch cut and/or fill areas between sets of tins.

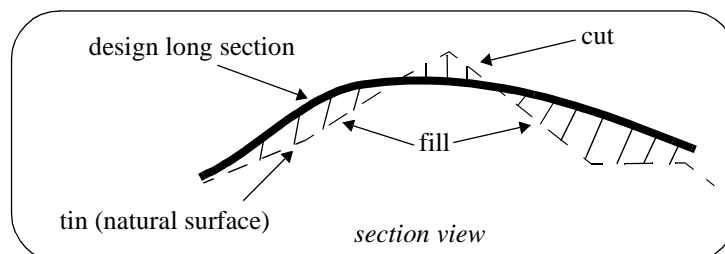
For each set, the name of the two tins, the hatch linestyle, colour and separation and whether cut and/or fill regions are required are all user definable.

Up to twenty (20) separate sets of tins may be hatched.

Panel Field	Parameter name	Type
Define Set #		input
	<i>set number to be used to define different original/new tin sets.</i>	
Original tin	hatch_original_tin_n	tin box
	<i>tin_name for original surface</i>	
New tin	hatch_new_tin_n	tin box
	<i>tin_name for final surface</i>	

Notes

- cut is when the new tin is below the original tin.
fill is when the new tin is above the original tin.
- cut hatching is turned off by setting *hatch_cut_separation_n* to 0.0.
fill hatching is turned off by setting *hatch_fill_separation_n* to 0.0.



Section_Long_Plot_Hatching_cut_fill_Cut

Cut

Panel Field	Parameter name	Type
Use Set #		input
	<i>set number as specified in the Define set#.</i>	
Cut separation (mm)	hatch_cut_separation_n	input
	<i>distance between cut hatch lines. If 0, no hatching.</i>	
Cut hatch angle (dms)	hatch_cut_angle_n	input
	<i>angle of hatching.</i>	
Cut colour	hatch_cut_colour_n	colour box
	<i>colour of the hatching.</i>	
Cut linestyle	hatch_cut_linestyle_n	linestyle box
	<i>linestyle of the hatching.</i>	
Draw sides of cuts	hatch_cut_draw_sides_n	choice box
	<i>draw mode for sides of cut regions.</i>	
Draw original tin	hatch_cut_draw_original_n	choice box
	<i>draw mode for sides of original tin in cut.</i>	
Draw new tin	hatch_cut_draw_new_n	choice box
	<i>draw mode for sides of new tin in cut.</i>	

Section_Long_Plot_Hatching_cut_fill_Fill

Fill

Panel Field	Parameter name	Type
Use Set #		input
	<i>set number as specified in the Define set#.</i>	
Fill separation (mm)	hatch_fill_separation_n	input
	<i>distance between fill hatch lines. If 0, no hatching.</i>	
Fill hatch angle (dms)	hatch_fill_angle_n	input
	<i>angle of hatching.</i>	
Fill colour	hatch_fill_colour_n	colour box
	<i>colour of the hatching.</i>	
Fill linestyle	hatch_fill_linestyle_n	linestyle box
	<i>linestyle of the hatching.</i>	
Draw sides of fills	hatch_fill_draw_sides_n	choice box
	<i>draw mode for sides of fill regions.</i>	
Draw original tin	hatch_fill_draw_original_n	choice box
	<i>draw mode for sides of original tin in fill.</i>	
Draw new tin	hatch_fill_draw_new_n	choice box
	<i>draw mode for sides of new tin in fill.</i>	

Cuts

Section_Long_Plot_Cuts

The cuts that the primary string (design line) makes through strings in any user-specified model can be automatically labelled on the long section plots.

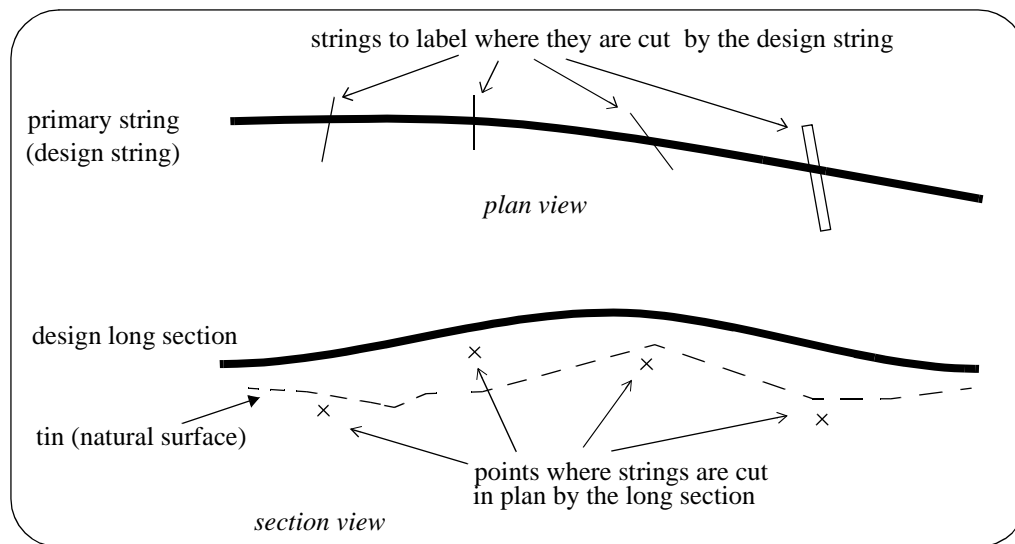
The **height**, **chainage** and **name** of the cut string can be labelled as well as a **symbol**. The height of tins at the same offset value can also be labelled.

The chainage position for the labelling is the chainage of the cut string.

The height position for the labelling can be specified as the:

- top of the boxes on the long section,
- height value of the cut string,
- height of the primary string,
- height of a tin.

The actual position of the label is defined relative to the above point.



Note: Only case (b) involves the actual height of the cut string. For all other cases, only the chainage of the cut string is used. Hence for all cases except (b), the string does need to have a sensible height to be used for cuts through strings. For example, a boundary string may have null heights but only the chainage is required and the height of the tin at that chainage can be used as the height (case (d)).

The method for specifying which strings are to be checked for cuts is by first specifying the **model** which contains the strings, and then a **name mask** which is used to restrict the strings in the model to only those whose names match the name mask.

Up to twenty five different sets of models and name masks can be used so that different cut sets can be labelled in different ways.

Panel Field	Parameter name	Type
Define Set #		input
	<i>set number to be used to define different model/mask sets.</i>	
Model	cuts_n_model	model box
	<i>model from which cut masks are derived</i>	
Name mask	cuts_n_mask	input

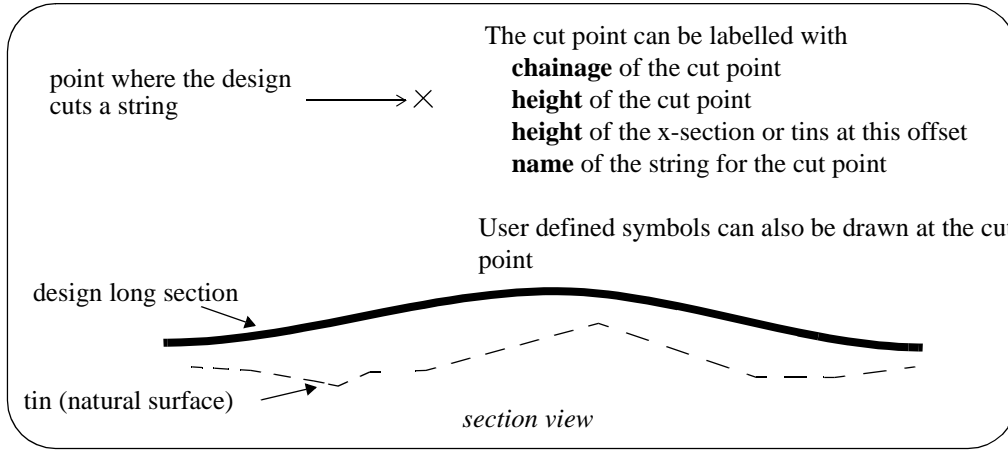
text string containing the name masks, each separated by one or more spaces, to test the string name against. Each mask can include wild cards and wild characters.

For example: "ke" or,
"?bank*" or, if both masks are required,
"ke* ?bank*"*

If cuts_n_mask is blank, then all strings in the model are used. This is equivalent to name mask being

set to "*".

All strings in the model *cuts_n_model* whose name satisfy the name mask *cuts_n_mask* are then checked for cuts with the design string, and if a cut occurs, the cut point will be labelled according to the rest of the parameters in the nth set.



Section_Long_Plot_Cuts_Chainage

Chainage

Panel Field	Parameter name	Type	Pop-Up
Use Set #		input	
<i>set number as specified in the Define set#.</i>			
Position	cuts_chainage_n_position	choice box	above cut string height value above top of boxes to primary string to tin 1 to tin 2 to tin 3 to tin 4 to tin 5 to tin 6 to tin 7 to tin 8 to tin 9 to tin 10
<i>position of chainage label.</i>			
X (mm)	cuts_chainage_n_x	input	
<i>horizontal adjustment to position of chainage text.</i>			
Y (mm)	cuts_chainage_n_y	input	
<i>vertical adjustment to position of chainage text.</i>			
Angle (dms)	cuts_chainage_n_angle	input	
<i>rotation of chainage text about position.</i>			
Colour	cuts_chainage_n_colour	colour box	
<i>colour of chainage text.</i>			
Size (mm)	cuts_chainage_n_size	input	

size of chainage text. A value of 0 means no label.

Textstyle cuts_chainage_n_textstyle
text box

textstyle of chainage text.

Pre-text cuts_chainage_n_pre_text
input

text before chainage text.

Post-text cuts_chainage_n_post_text
input

text after chainage text.

Justification cuts_chainage_n_justification
justification box
bottom-left
bottom-centre
bottom-right
bottom-decimal
middle-left
middle-centre
middle-right
middle-decimal
top-left
top-centre
top-right
top-decimal
decimal-left
decimal-centre
decimal-right
decimal-point

justification of the chainage text.

Decimals cuts_chainage_n_no_decimals
input

number of decimals in chainage.

Section_Long_Plot_Cuts_Heights

Heights

Panel Field	Parameter name	Type	Pop-Up
Use Set #		input	
	<i>set number as specified in the Define set#.</i>		
Mode	cuts_height_n_mode	choice box	use height of cut point use real height above boxes height of primary string use height of tin 1 use height of tin 2 use height of tin 3 use height of tin 4 use height of tin 5 use height of tin 6 use height of tin 7 use height of tin 8 use height of tin 9 use height of tin 10

determines which height value is labelled.

Position	cuts_height_n_position	choice box	at cut string above top of boxes above top of graph area to primary string to tin 1 to tin 2 to tin 3 to tin 4 to tin 5 to tin 6 to tin 7 to tin 8 to tin 9 to tin 10
-----------------	------------------------	------------	--

position of height label.

X (mm)	cuts_height_n_x	input
---------------	-----------------	-------

horizontal adjustment to position of height text.

Y (mm)	cuts_height_n_y	input
---------------	-----------------	-------

vertical adjustment to position of height text.

Angle (dms)	cuts_height_n_angle	input
--------------------	---------------------	-------

rotation of height text about position.

Colour	cuts_height_n_colour	colour box
---------------	----------------------	------------

colour of height text.

Size (mm)	cuts_height_n_size	input
------------------	--------------------	-------

size of height text. A value of 0 means no label.

Textstyle	cuts_height_n_textstyle	text box
------------------	-------------------------	----------

textstyle of height text.

Pre-text	cuts_height_n_pre_text	input
-----------------	------------------------	-------

text before height text.

Post-text	cuts_height_n_post_text	input
------------------	-------------------------	-------

text after height text.

Justification	points_height_n_justification	justification box
----------------------	-------------------------------	-------------------

- bottom-left
- bottom-centre
- bottom-right
- bottom-decimal
- middle-left
- middle-centre
- middle-right
- middle-decimal
- top-left
- top-centre
- top-right
- top-decimal
- decimal-left
- decimal-centre

decimal-right
decimal-point

justification of the height text.

Decimals cuts_height_n_no_decimals
input

number of decimals in height.

Section_Long_Plot_Cuts_Labels

Labels

Panel Field	Parameter name	Type	Pop-Up
Use Set #		input	

*set number as specified in the **Define set#**.*

Position	cuts_label_n_position	choice box	at cut string height above top of boxes above top of graph area to primary string to tin 1 to tin 2 to tin 3 to tin 4 to tin 5 to tin 6 to tin 7 to tin 8 to tin 9 to tin 10
-----------------	-----------------------	------------	---

position of label text.

Mode	cuts_label_n_mode	choice box	don't include string name include cut string name
-------------	-------------------	------------	--

determines whether the label includes the cut string name.

X (mm)	cuts_label_n_x	input	
---------------	----------------	-------	--

horizontal adjustment to position of label.

Y (mm)	cuts_label_n_y	input	
---------------	----------------	-------	--

vertical adjustment to position of label.

Angle (dms)	cuts_label_n_angle	input	
--------------------	--------------------	-------	--

rotation of label about position.

Colour	cuts_label_n_colour	colour box	
---------------	---------------------	------------	--

colour of label.

Size (mm)	cuts_label_n_size	input	
------------------	-------------------	-------	--

size of label. A value of 0 means no label.

Textstyle	cuts_label_n_textstyle	text box	
------------------	------------------------	----------	--

textstyle of label.

Pre-text	cuts_label_n_pre_text	input	
-----------------	-----------------------	-------	--

text before label.

Post-text	cuts_label_n_post_text	input	
------------------	------------------------	-------	--

text after label.

Justification	cuts_label_n_justification	justification box	bottom-left bottom-centre bottom-right bottom-decimal middle-left middle-centre middle-right middle-decimal top-left top-centre top-right top-decimal decimal-left decimal-centre decimal-right decimal-point
----------------------	----------------------------	-------------------	--

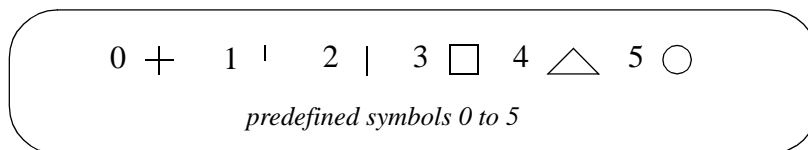
justification of the label.

Section_Long_Plot_Cuts_Symbols

Symbols

Panel Field	Parameter name	Type	Pop-Up
Use Set #		input	
	<i>set number as specified in the Define set#.</i>		
Mode	cuts_symbol_n_mode	choice box	cross (0) up from centre of box (1) up&down from box centre(2) square (3) triangle, base at bottom (4) circle (5) use a plot symbol

symbol mode.



Note: *If a plot symbol is to be used, the cuts_symbol_n_style parameter must be specified.*

Symbol	cuts_symbol_n_style	plot symbols
---------------	---------------------	--------------

a valid plot symbol can be selected.

Position	cuts_symbol_n_position	choice box	at cut string height above top of boxes above top of graph area to primary string to tin 1 to tin 2 to tin 3 to tin 4 to tin 5
-----------------	------------------------	------------	--

to tin 6
to tin 7
to tin 8
to tin 9
to tin 10

position of symbol.

X (mm)	cuts_symbol_n_x	input
	<i>horizontal adjustment to position of symbol.</i>	
Y (mm)	cuts_symbol_n_y	input
	<i>vertical adjustment to position of symbol.</i>	
Angle (dms)	cuts_symbol_n_angle	input
	<i>rotation of symbol about point.</i>	
Colour	cuts_symbol_n_colour	colour box
	<i>colour of symbol.</i>	
Size (mm)	cuts_symbol_n_size	input
	<i>size of symbol. A value of 0 means no symbol.</i>	

Primary String Name Label

Section_Long_Plot_Primary_string_name_label

The plot can be labelled with a name under the boxes area.

The name is made up of a concatenation of the text string names:

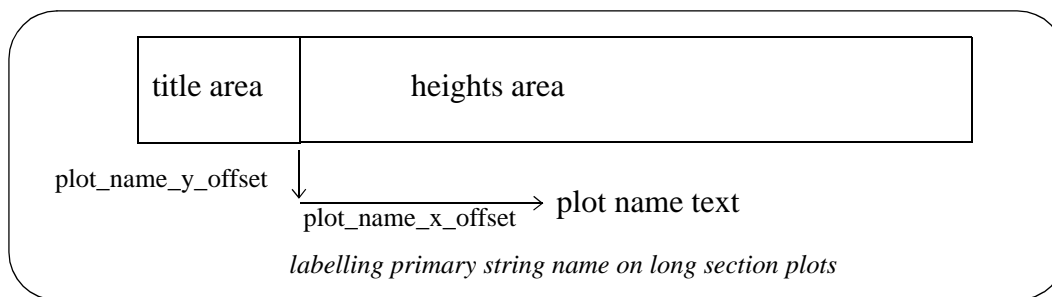
Panel Field	Parameter name	Type
Name mode	plot_name_string_name	choice box
	<i>determines what text is placed in the name labels.</i>	
Pre-text	plot_name_pre_text	input
	<i>text before label.</i>	
Post-text	plot_name_post_text	input
	<i>text after label.</i>	
Textstyle	plot_name_textstyle	text box
	<i>textstyle of label.</i>	
Size (mm)	plot_name_size	input
	<i>size of label.</i>	
Colour	plot_name_colour	colour box
	<i>colour of label.</i>	
X offset (mm)	plot_name_x_offset	input
	<i>horizontal adjustment to position of label.</i>	
Y offset (mm)	plot_name_y_offset	input
	<i>vertical adjustment to position of label.</i>	

The plot name is positioned under the boxes.

The *plot_name_x_offset* is measured from the beginning of the height boxes.

The default for *plot_name_x_offset* is centred on heights area.

The *plot_name_y_offset* is measured from the bottom of the box area with positive being down.



Scale labelling

The plot can be labelled with the horizontal and vertical scale under the boxes area.

The scale label is made up of concatenation the text strings:

scale_horizontal_pre_text horizontal scale value *scale_horizontal_post_text*
 and
scale_vertical_pre_text vertical scale value *scale_vertical_post_text*

The horizontal scale value is the value given by the scale parameter.

The scales are positioned under the boxes.

Section_Long_Plot_Scale_labelling

Section_Long_Plot_Scale_labelling_Horizontal

Horizontal

Section: Scale Labelling - Horizontal Parameters

The fields and buttons used in this section have the following functions.

Field Description	Parameter name	Type	Pop-Up
Pre-text <i>text before label</i>	<i>scale_horizontal_pre_text</i>	input	
Post-text <i>text after label</i>	<i>scale_horizontal_post_text</i>	input	
Textstyle <i>textstyle of label</i>	<i>scale_horizontal_textstyle</i>	text box	
Size (mm) <i>size of label</i>	<i>scale_horizontal_size</i>	input	
Colour <i>colour of label</i>	<i>scale_horizontal_colour</i>	colour box	
X offset (mm) <i>horizontal adjustment to position of label.</i>	<i>scale_horizontal_x_offset</i>	input	
Y offset (mm) <i>height adjustment to position of label.</i>	<i>scale_horizontal_y_offset</i>	input	
Decimal places	<i>scale_horizontal_decimals</i>	input	

height adjustment to position of label.

Section_Long_Plot_Scale_labelling_Vertical

Vertical

Section: Scale Labelling - Vertical Parameters

The fields and buttons used in this section have the following functions.

Field Description	Parameter name	Type	Pop-Up
Pre-text <i>text before label</i>	scale_vertical_pre_text	input	
Post-text <i>text after label</i>	scale_vertical_post_text	input	
Textstyle <i>textstyle of label</i>	scale_vertical_textstyle	text box	
Size (mm) <i>size of label</i>	scale_vertical_size	input	
Colour <i>colour of label</i>	scale_vertical_colour	colour box	
X offset (mm) <i>horizontal adjustment to position of label.</i>	scale_vertical_x_offset	input	
Y offset (mm) <i>height adjustment to position of label.</i>	scale_vertical_y_offset	input	
Decimal places <i>height adjustment to position of label.</i>	scale_vertical_decimals	input	

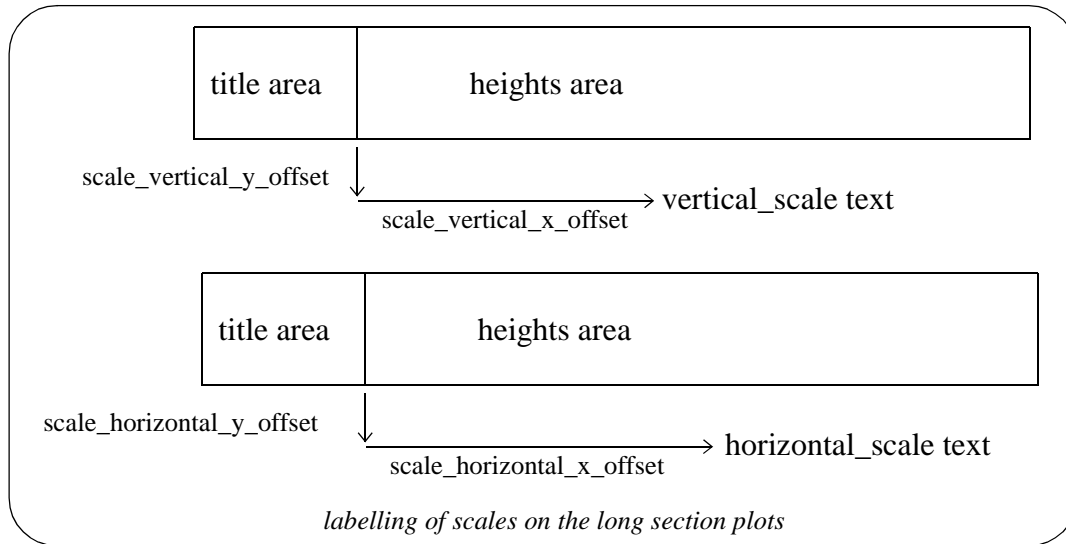
The *scale_vertical_x_offset* and *scale_horizontal_x_offset* are measured from the beginning of the heights area.

The default for *scale_vertical_x_offset* and *scale_horizontal_x_offset* are centred on the heights area.

The *scale_vertical_y_offset* and *scale_horizontal_y_offset* are measured from the bottom of the box area with positive being **down**.

If the **number of decimal places is greater than zero (> 0)**, then any trailing zeros after the decimal point are removed.

If the **number of decimal places is less than zero (< 0)**, the absolute value is taken as the number of decimal places and **no** trailing zeros after the decimal point are removed.



PPF's To Include

Section_Long_Plot_PPF_s_to_include

Panel Field	Parameter name	Type	Pop-Up
PPF files		input	

by including pre existing PPF files, the user can build up a modified version without having to set all the parameters.

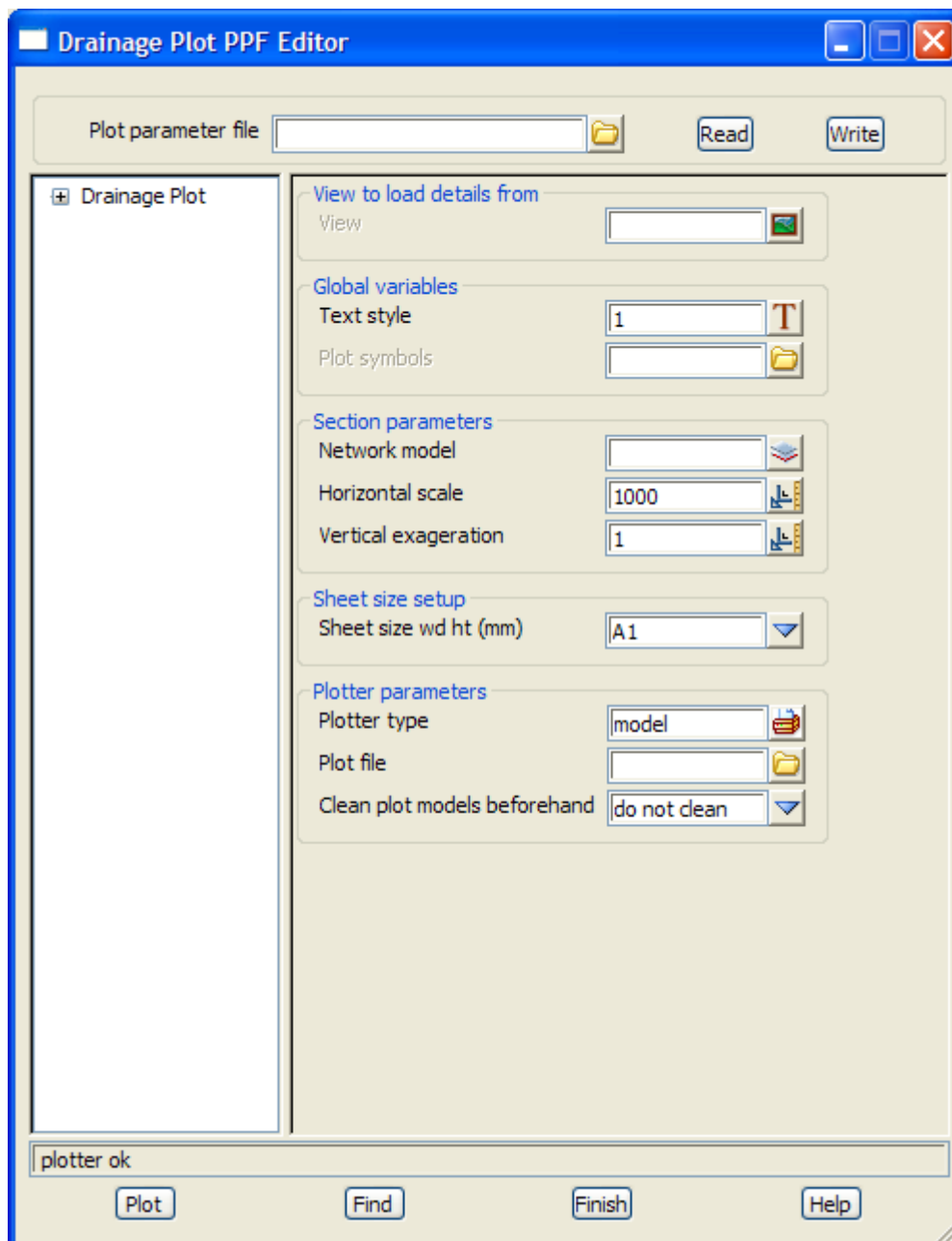
Drainage Plot PPF Editor

drainage_plot_ppf_editor

Position of option on menu: Plot =>Drainage Plot PPF Editor

The **drainage plot ppf editor** is for creating and/or editing a (binary) drainage and sewer long section ppf file and for creating a drainage and/or sewer long section plot. An ascii version of the file is also produced.

Note: binary and ascii ppf's are stored *within* the project (not in the folder containing the project). On selecting the Drainage plot ppf editor option, the **Drainage Plot PPF Editor** panel is displayed.



Panel field

Type

Plot parameter file

file box

name for the binary plot parameter file to read in or write out.

Read button

read the given plot parameter file in.

Write button

write out the plot parameters to the given plot parameter file. An ascii ppf file is also written out.

Plot button

use the plot parameters from the panel to create the plot.

Find button

brings up a search box. If a valid parameter name is keyed in followed by the enter key, the cursor will be placed in the appropriate field on the appropriate page.

Drainage Plot

Drainage_Plot

View to load details from

Panel field	Type	Pop-Up
View	view box	existing section views

on selection of an existing section view, the vertical exaggeration, network model to profile, corridor models and corridor settings from that section view are loaded into the ppf editor. The section view itself is not stored as a parameter in the ppf editor. It is only for convenience, in order to populate certain other parameters easily in the ppf editor, based on a particular section view that may currently exist.

Global variables

Panel field	Parameter name	Type	Pop-Up
Text style	global_textstyle	textstyle	available fonts
<i>default text style.</i>			
Plot Symbols	plot_symbols	file box	available symbol files
<i>specify a plot symbol file if it exists.</i>			

Section parameters

Panel field	Parameter name	Type	Pop-Up
Network model	network_model	model box	available models
<i>model containing the drainage strings to plot.</i>			
Horizontal scale	scale	input	
<i>horizontal scale to be used for the plot.</i>			
Vertical exaggeration	vertical_exaggeration	input	
<i>vertical exaggeration to be used for the plot.</i>			

Sheet size setup

The plot **page** or **sheet** is considered to have only positive co-ordinates with the origin (0,0) in the left hand corner. The units for the plot are millimetres.

Panel field	Parameter name	Type	Pop-Up
Sheet size wd ht (mm)	sheet_size	sheet size	available sheet sizes

sheet size to plot on.

Plotter parameters

Panel field	Parameter name	Type	Pop-Up
Plotter type	plotter_type	plotter box	available plotter types

plotter type to plot to.

Plot file stem	plot_stem	input	
-----------------------	-----------	-------	--

plot file name stem. A number is appended to the stem for each sheet plotted. The appropriate file extension is added dependant on the plotter type selected.

Clean plot models beforehand

plot_model_clean	choice box	do not clean prompt for clean always clean
------------------	------------	--

whether to clean (delete the elements in) any resultant plot models that may already exist, before generating the plot(s). This parameter is only applicable if plotting to a model or models. Note that if the models are cleaned using this parameter, any non-plot or locked elements found in the models will not be cleaned from the models, and the plot job will be cancelled.

Title block

Drainage_Plot_Title_block

Common title block parameters

Panel field	Parameter name	Type
Standard title	plot_border	tick box

if ticked, a standard 12d title block will be used.

Use title file	use_title_file	tick box
-----------------------	----------------	----------

if ticked, a user defined title file is used.

Title line 1	title_1	input
---------------------	---------	-------

if **Standard title** is ticked, **Title line 1** is the first line of title text. If **Use title file** is ticked, **Title line 1** is substituted for the title block variable \$title_1.

Title line 2	title_2	input
---------------------	---------	-------

if **Standard title** is ticked, **Title line 2** is the second line of title text. If **Use title file** is ticked, **Title line 2** is substituted for the title block variable \$title_2.

12d default title block parameters

Panel field	Parameter name	Type	Pop-Up
Text size	title_text_size	input	

text size of title text.

Text colour	title_colour	colour	available colours
--------------------	--------------	--------	-------------------

colour of title text.

Drainage_Plot_Title_block_User_title_info

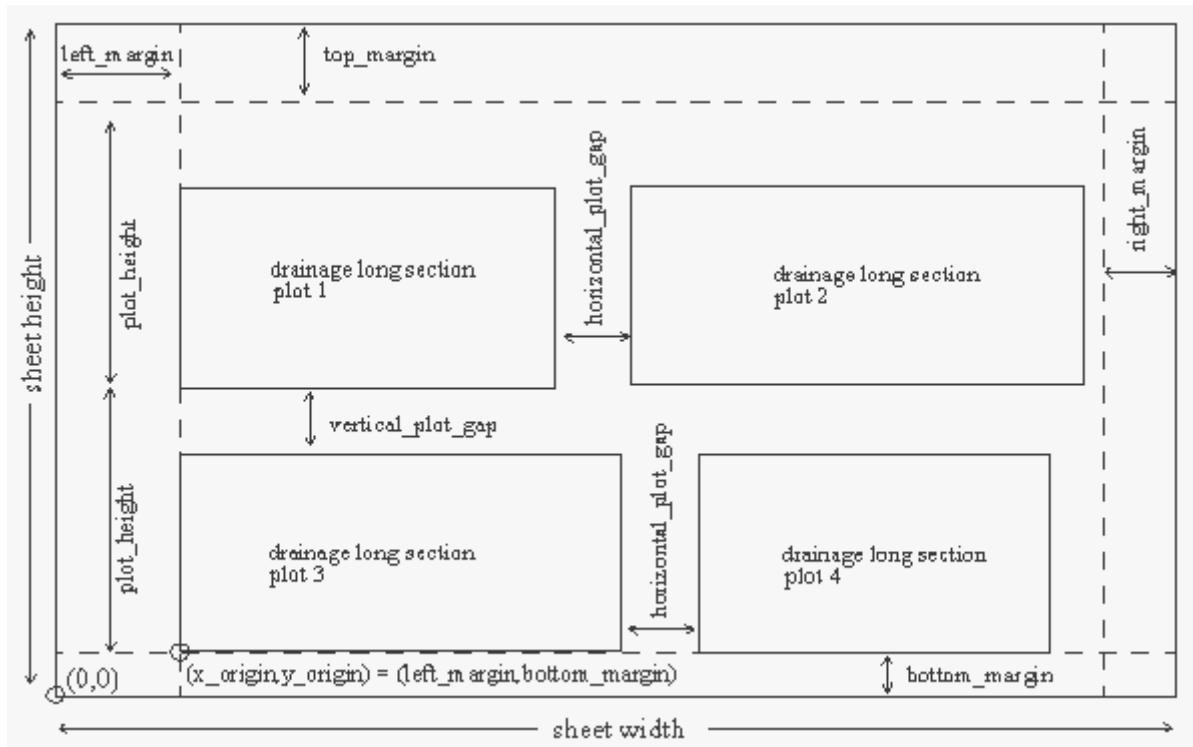
User title info

The parameters shown below are subject to the appropriate title block variables existing in the title file. For more information on these variables see the section "Title Block Variables".

Panel field	Parameter name	Type	Pop-Up
Title file	title_file	file box	available title files
<i>specifies the name of the title file to use. If a valid title file exists, the specified Name values will be filled out in the grid using the title block variable \$user_text_n.</i>			
Name		output	
<i>the alias for the nth user text specified in the title file.</i>			
Value	user_text_n	input	
<i>the alias text to be substituted in for the user text specified.</i>			
Time format	time_format	input	
<i>the time format relates to the \$time title block variable. For more information on the time formats see the section "Specifying the Format for \$time".</i>			
Start page number	start_page_number	input	
<i>used as the starting value for the title block variable \$page_number. If missing, \$page_number starts at 1.</i>			
Start drawing number	start_drawing_number	input	
<i>used as the starting value for the title block variable \$drawing_number. If missing, \$drawing_number starts at 1.</i>			
Drawing number prefix	drawing_number_prefix	input	
<i>the value entered is used for the title block variable \$drawing_number_prefix.</i>			
Drawing number postfix	drawing_number_postfix	input	
<i>the value entered is used for the title block variable \$drawing_number_postfix.</i>			

Plot sheet layout

[Drainage_Plot_Plot_sheet_layout](#)



Drainage_Plot_Plot_sheet_layout_Margins

Margins

Panel field	Parameter name	Type
Left (mm)	left_border_gap	input
<i>left border gap (in millimetres).</i>		
Right (mm)	right_border_gap	input
<i>right border gap (in millimetres).</i>		
Top (mm)	top_border_gap	input
<i>top border gap (in millimetres).</i>		
Bottom (mm)	bottom_border_gap	input
<i>bottom border gap (in millimetres).</i>		

Drainage_Plot_Plot_sheet_layout_Other_parameters

Other parameters

Panel field	Parameter name	Type	Pop-Up
Row per sheet mode	only_one_line	choice box	more than one row on sheet only one row on sheet
<i>whether to allow multiple rows on a sheet.</i>			
Plot height (mm)	plot_height	input	
<i>height of plot row (in millimetres).</i>			
Horizontal plot gap (mm)	horizontal_plot_gap	input	
<i>gap between plot columns (in millimetres).</i>			
Vertical plot gap (mm)	vertical_plot_gap	input	

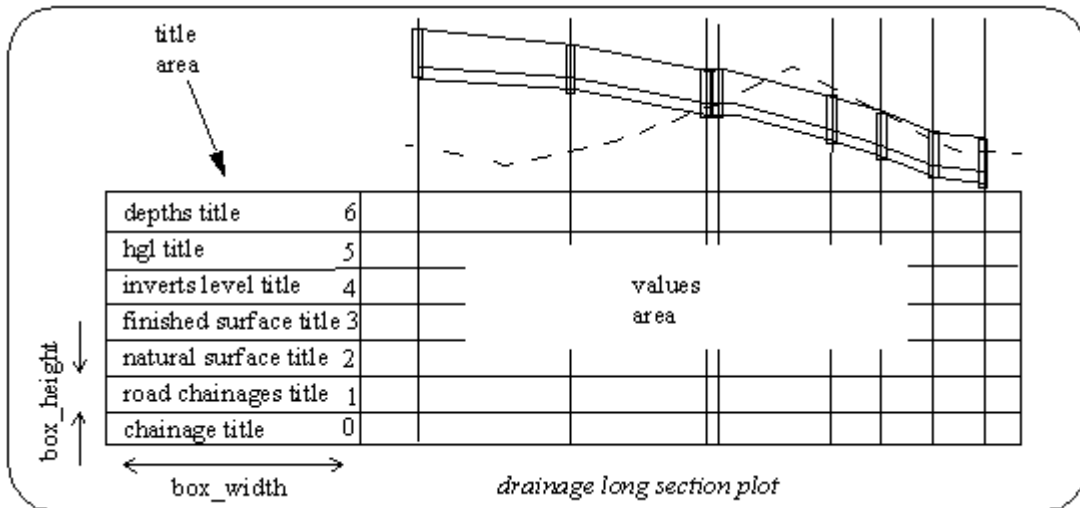
gap between plot rows (in millimetres).

Boxes

Drainage_Plot_Boxes

The Boxes Area on the drainage long section plot, is used to label points on the drainage strings with the following information: chainages, road centre line chainages, natural surface heights, finished surface heights, before pit and after pit invert levels, before pit and after pit hgl values, and before pit and after pit depths to inverts.

The default order of the boxes is as shown in the diagram, below.



The *chainage box* is hardwired to always appear first (at the bottom) in the order of boxes. If, you wish to change the order of any of the other boxes, or wish to omit any of the other boxes, you can do so by specifying the following box order parameters.

Panel Field	Parameter name	Type	Pop-Up
Box #	box_n_set	input	
<i>order (from 1 to 6) of the nth box type.</i>			
List #	box_n	choice box	road centre line chainages natural surface heights finished surface heights invert levels hgl values depths to inverts

box type for the nth set of box order parameters.

Drainage_Plot_Boxes_Title_area

Title area

Panel Field	Parameter name	Type	Pop-Up
Box width (mm)	box_width	input	
<i>width of the box title area.</i>			
Box height (mm)	box_height	input	
<i>default height of each box.</i>			
Colour of box line work	box_colour	colour box	available colours

colour of box line work.

Size of titles (mm) title_box_text_size input

default text size of box titles.

Colour of titles title_box_text_colour colour box available colours

default text colour of box titles.

Drainage_Plot_Boxes_Values_area

Values area

Panel Field	Parameter name	Type	Pop-Up
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Size of values (mm) box_text_size input

default text size of box values.

Colour of values box_text_colour colour box available colours

default text colour of box values.

Justification mode box_text_left_justify choice box top justify values
bottom justify values

whether to justify the (vertical) value text with the top or the bottom of the box.

Text side mode box_text_side choice box left
right
centre

whether to place the (vertical) value text to the left of, to the right of, or on the chainage uprights.

Decimal places of values number_of_decimals input

default number of decimal places for box values.

Drainage_Plot_Boxes_Chainage

Chainage

Panel Field	Parameter name	Type	Pop-Up
-------------	----------------	------	--------

Box height (mm) chainage_box_size input

height of chainage box (only required if different from default box_height).

Title parameters

Line 1 plot_title_chainage_name
input

first line of text for chainage box title.

Line 2 plot_title_chainage_name_2
input

optional second line of text for chainage box title.

Colour chainage_title_colour colour box available colours

text colour of chainage box title (required only if different from default title_box_text_colour).

Text size (mm) chainage_title_text_size input

text size of chainage box title (required only if different from default title_box_text_size).

Textstyle chainage_title_textstyle font box available fonts

font of chainage box title (required only if different from default global_textstyle).

Value parameters

Colour	chainage_text_colour	colour box	available colours
	<i>text colour of chainage box values (required only if different from default box_text_colour).</i>		
Text size (mm)	chainage_text_size	input	
	<i>text size of chainage box values (required only if different from default box_text_size).</i>		
Textstyle	chainage_textstyle	font box	available fonts
	<i>font of chainage box values (required only if different from default global_textstyle).</i>		
Decimal places	chainage_decimals	input	
	<i>decimal places for chainage box values (required only if different from default number_of_decimals).</i>		

Drainage_Plot_Boxes_Road_centre_line_chainage

Road centreline chainage

Panel Field	Parameter name	Type	Pop-Up
-------------	----------------	------	--------

Include centre line chainage box

draw_centre_chainage	checkbox
----------------------	----------

whether to include the road centreline chainage box in the boxes area.

Box height (mm)

centre_chainage_box_size	input
--------------------------	-------

height of road centreline chainage box (only required if different from default box_height).

Title parameters

Line 1	plot_title_centre_chainage_name	input
---------------	---------------------------------	-------

first line of text for road centreline chainage box title.

Line 2	plot_title_centre_chainage_name_2	input
---------------	-----------------------------------	-------

optional second line of text for road centreline chainage box title.

Colour	chainage_title_colour_cl	colour box	available colours
---------------	--------------------------	------------	-------------------

text colour of road centreline chainage box title (required only if different from default title_box_text_colour).

Text size (mm)	chainage_title_text_size_cl	input
-----------------------	-----------------------------	-------

text size of road centreline chainage box title (required only if different from default title_box_text_size).

Textstyle	chainage_title_textstyle_cl	font box	available fonts
------------------	-----------------------------	----------	-----------------

font of road centreline chainage box title (required only if different from default global_textstyle).

Value parameters

Colour	chainage_text_colour_cl	colour box	available colours
---------------	-------------------------	------------	-------------------

text colour of road centreline chainage box values (required only if different from default box_text_colour).

Text size (mm)	chainage_text_size_cl	input
-----------------------	-----------------------	-------

text size of road centreline chainage box values (required only if different from default box_text_size).

Textstyle	chainage_textstyle_cl	font box	available fonts
------------------	-----------------------	----------	-----------------

font of road centreline chainage box values (required only if different from default global_textstyle).

Decimal places	chainage_cl_decimals	input
-----------------------	----------------------	-------

decimal places for road centreline chainage box values (required only if different from default number_of_decimals).

Drainage_Plot_Boxes_Natural_surface

Natural surface

Panel Field	Parameter name	Type	Pop-Up
Draw text mode	draw_ns_text	choice box	don't include ns box include ns box

whether to include the natural surface box in the boxes area.

Box height (mm)	surface_box_size	input
------------------------	------------------	-------

height of natural surface box (only required if different from default box_height).

Title parameters

Line 1	plot_title_surface_name	input
---------------	-------------------------	-------

first line of text for natural surface box title.

Line 2	plot_title_surface_name_2	input
---------------	---------------------------	-------

optional second line of text for natural surface box title.

Colour	ns_title_colour	colour box	available colours
---------------	-----------------	------------	-------------------

text colour of natural surface box title (required only if different from default title_box_text_colour).

Text size (mm)	ns_title_text_size	input
-----------------------	--------------------	-------

text size of natural surface box title (required only if different from default title_box_text_size).

Textstyle	ns_title_textstyle	font box	available fonts
------------------	--------------------	----------	-----------------

font of natural surface box title (required only if different from default global_textstyle).

Value parameters

Colour	ns_text_colour	colour box	available colours
---------------	----------------	------------	-------------------

text colour of natural surface box values (required only if different from default box_text_colour).

Text size (mm)	ns_text_size	input
-----------------------	--------------	-------

text size of natural surface box values (required only if different from default box_text_size).

Textstyle	ns_textstyle	font box	available fonts
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font of natural surface box values (required only if different from default global_textstyle).

Decimal places	ns_decimals	input
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decimal places for natural surface box values (required only if different from default number_of_decimals).

Drainage_Plot_Boxes_Finished_surface

Finished surface

Panel Field	Parameter name	Type	Pop-Up
Draw text mode	draw_fs_text	choice box	don't include fs box include fs box

whether to include the finished surface box in the boxes area.

FS tin/Top of MH mode	draw_fs_mode	choice box	height from fs tin height from top of MH
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whether the finished surface height values come from the finished surface tin, or from the tops of the maintenance holes.

Box height (mm)	f_surface_box_size	input
------------------------	--------------------	-------

height of finished surface box (only required if different from default box_height).

Title parameters

Line 1	plot_title_finished_name	input
---------------	--------------------------	-------

first line of text for finished surface box title.

Line 2	plot_title_finished_name_2	input
---------------	----------------------------	-------

optional second line of text for finished surface box title.

Colour	fs_title_colour	colour box	available colours
---------------	-----------------	------------	-------------------

text colour of finished surface box title (required only if different from default title_box_text_colour).

Text size (mm)	fs_title_text_size	input
-----------------------	--------------------	-------

text size of finished surface box title (required only if different from default title_box_text_size).

Textstyle	fs_title_textstyle	font box	available fonts
------------------	--------------------	----------	-----------------

font of finished surface box title (required only if different from default global_textstyle).

Value parameters

Colour	fs_text_colour	colour box	available colours
---------------	----------------	------------	-------------------

text colour of finished surface box values (required only if different from default box_text_colour).

Text size (mm)	fs_text_size	input
-----------------------	--------------	-------

text size of finished surface box values (required only if different from default box_text_size).

Textstyle	fs_textstyle	font box	available fonts
------------------	--------------	----------	-----------------

font of finished surface box values (required only if different from default global_textstyle).

Decimal places	fs_decimals	input
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decimal places for finished surface box values (required only if different from default number_of_decimals).

Drainage_Plot_Boxes_Invert_levels

Invert levels

Panel Field	Parameter name	Type	Pop-Up
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Box height (mm)	invert_height_box_size	input
------------------------	------------------------	-------

height of invert level box (only required if different from default box_height).

Title parameters

Line 1	plot_title_invert_name	input
---------------	------------------------	-------

first line of text for invert level box title.

Line 2	plot_title_invert_name_2	input
---------------	--------------------------	-------

optional second line of text for invert level box title.

Colour	il_title_colour	colour box	available colours
---------------	-----------------	------------	-------------------

text colour of invert level box title (required only if different from default title_box_text_colour).

Text size (mm) il_title_text_size input

text size of invert level box title (required only if different from default title_box_text_size).

Textstyle il_title_textstyle font box available fonts

font of invert level box title (required only if different from default global_textstyle).

Value parameters

Colour il_text_colour colour box available colours

text colour of invert level box values (required only if different from default box_text_colour).

Text size (mm) il_text_size input

text size of invert level box values (required only if different from default box_text_size).

Textstyle il_textstyle font box available fonts

font of invert level box values (required only if different from default global_textstyle).

Decimal places il_decimals input

decimal places for invert level box values (required only if different from default number_of_decimals).

Drainage_Plot_Boxes_HGL

HGL

Panel Field	Parameter name	Type	Pop-Up
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Include HGL box

	draw_hgl_value	check box	
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whether to include the HGL box in the boxes area.

Box height (mm) hgl_box_size input

height of HGL box (only required if different from default box_height).

Title parameters

Line 1 plot_title_hgl_name input

first line of text for HGL box title.

Line 2 plot_title_hgl_name_2 input

optional second line of text for HGL box title.

Colour hgl_title_colour colour box available colours

text colour of HGL box title (required only if different from default title_box_text_colour).

Text size (mm) hgl_title_text_size input

text size of HGL box title (required only if different from default title_box_text_size).

Textstyle hgl_title_textstyle font box available fonts

font of HGL box title (required only if different from default global_textstyle).

Value parameters

Colour hgl_text_colour colour box available colours

text colour of HGL box values (required only if different from default box_text_colour).

Text size (mm) hgl_text_size input

text size of HGL box values (required only if different from default box_text_size).

Textstyle	hgl_textstyle	font box	available fonts
	<i>font of HGL box values (required only if different from default global_textstyle).</i>		
Decimal places	hgl_decimals	input	
	<i>decimal places for HGL box values (required only if different from default number_of_decimals).</i>		

Drainage_Plot_Boxes_Depths

Depths

Panel Field	Parameter name	Type	Pop-Up
Depth box mode	depth_mode	choice box	don't include depths box depths from fs tin depths from top of MH depths from ns tin

whether to include the depths (to inverts) box in the boxes area, and if so, whether the depths are measured from the finished surface tin, the tops of the maintenance holes, or the natural surface tin.

Box height (mm)	invert_depth_box_size	input	
	<i>height of depths box (only required if different from default box_height).</i>		

Title parameters

Line 1	plot_title_depth_name	input	
	<i>first line of text for depths box title.</i>		
Line 2	plot_title_depth_name_2	input	
	<i>optional second line of text for depths box title.</i>		
Colour	depth_title_colour	colour box	available colours
	<i>text colour of depths box title (required only if different from default title_box_text_colour).</i>		
Text size (mm)	depth_title_text_size	input	
	<i>text size of depths box title (required only if different from default title_box_text_size).</i>		
Textstyle	depth_title_textstyle	font box	available fonts
	<i>font of depths box title (required only if different from default global_textstyle).</i>		

Value parameters

Colour	depth_text_colour	colour box	available colours
	<i>text colour of depths box values (required only if different from default box_text_colour).</i>		
Text size (mm)	depth_text_size	input	
	<i>text size of depths box values (required only if different from default box_text_size).</i>		
Textstyle	depth_textstyle	font box	available fonts
	<i>font of depths box values (required only if different from default global_textstyle).</i>		
Decimal places	depth_decimals	input	
	<i>decimal places for depths box values (required only if different from default number_of_decimals).</i>		

Drainage_Plot_Boxes_Chainage_box_mode

Chainage box mode

Panel Field	Parameter name	Type	Pop-Up
Chainage box mode	chainage_box_mode	choice box	don't draw the chainage box draw the chainage box

whether to draw the line work around the chainage box.

Drainage_Plot_Boxes_Title_area_box_mode

Title area box mode

Panel Field	Parameter name	Type	Pop-Up
Title area box mode	draw_box_mode	choice box	do not draw title area box draw title area box, no lines draw title area box with lines

whether to draw the line work around the titles area, and if so, whether to draw lines separating each title as well.

Chainages/Uprights

Drainage_Plot_Chainages_Uprights

Uprights, or leader lines, can be drawn through the points on the drainage strings, anywhere from the top area to the bottom of the boxes area.

Upright parameters

Panel Field	Parameter name	Type	Pop-Up
Top of uprights mode	uprights_top_mode	choice box	stop at top of pit go to top area

determines how high on the plot, the uprights are drawn.

Bottom of uprights mode	uprights_bottom_mode	choice box	stop at top of boxes go to bottom of boxes
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determines how low on the plot, the uprights are drawn.

Colour of uprights to pits	manhole_line_colour	colour box	available colours
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colour of the uprights.

Chainage parameters

Panel Field	Parameter name	Type	Pop-Up
Chainage values at uprights	chainage_mode	choice box	pipe length chainage running chainage both pipe length and running

whether the chainage values represent the individual pipe lengths, the running chainages, or both.

Pipe length label position	centre_pipe_length	choice box	0 at start pit, length at end pit centre of pipe length
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determines how pipe length chainages are displayed. **Note:** if the centre of pipe length option is chosen, the pipe length chainage text is drawn horizontally, rather than vertically.

Drainage_Plot_Chainages_Uprights_Services

Services

Any services crossing the drainage strings (defined by specifying *corridor service models* in the *Corridors* section) can be automatically labelled with an upright, chainage and invert level labels (of the drainage string, placed within the appropriate boxes in the Boxes area), and a name label (that includes the crossing service string name, its diameter, and its invert level at the point of crossing).

Note: crossing services may also be labelled (independently) by utilising the parameters in the *Cuts* section.

Panel Field	Parameter name	Type	Pop-Up
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Service chainage values at uprights

service_chainage_mode	choice box	pipe length chainage running chainage both pipe length and running
-----------------------	------------	--

whether the crossing service chainage values represent the chainages from the previous pits, the running chainages, or both.

Colour of uprights to crossing services

service_line_colour	colour box	available colours
---------------------	------------	-------------------

colour of the crossing service uprights.

Service chainage text parameters

Panel Field	Parameter name	Type	Pop-Up
Colour	service_ch_text_colour	colour box	available colours

text colour of crossing service chainage box values (required only if different from default box_text_colour).

Text size (mm)	service_ch_text_size	input
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text size of crossing service chainage box values (required only if different from default box_text_size).

Textstyle	service_ch_textstyle	font box	available fonts
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font of crossing service chainage box values (required only if different from default global_textstyle).

Decimal places	service_ch_decimals	input
-----------------------	---------------------	-------

decimal places for crossing service chainage box values (required only if different from default number_of_decimals).

Service invert level text parameters

Panel Field	Parameter name	Type	Pop-Up
Colour	service_il_text_colour	colour box	available colours

text colour of crossing service invert level box values (required only if different from default box_text_colour).

Text size (mm)	service_il_text_size	input
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text size of crossing service invert level box values (required only if different from default box_text_size).

Textstyle	service_il_textstyle	font box	available fonts
------------------	----------------------	----------	-----------------

font of crossing service invert level box values (required only if different from default global_textstyle).

Decimal places	service_il_decimals	input
-----------------------	---------------------	-------

decimal places for crossing service invert level box values (required only if different from default number_of_decimals).

Service label text parameters

Panel Field	Parameter name	Type	Pop-Up
Distance of label below crossing point (mm)	service_name_y	input	

distance (in millimetres) of crossing service name labels below crossing points.

Colour	service_name_text_colour	colour box	available colours
---------------	--------------------------	------------	-------------------

text colour of crossing service name labels (required only if different from default box_text_colour).

Text size (mm) service_name_text_size input

text size of crossing service name labels (required only if different from default box_text_size).

Textstyle service_name_textstyle font box available fonts

font of crossing service name labels (required only if different from default global_textstyle).

Decimal places service_name_decimals input

decimal places for the crossing service invert levels that make up part of the crossing service name labels (required only if different from default number_of_decimals).

Drainage_Plot_Chainages_Uprights_Finished_surface_Top_of_MH_values

Finished surface/Top of MH values

In addition to the finished surface level labels within the Boxes area, more detailed vertical labels representing finished surface levels at the pits, can be added to accompany the pit uprights within the Graph area.

Panel Field	Parameter name	Type	Pop-Up
Finished surface draw mode			
	draw_fs_vertical	choice box	do not draw fs values always draw fs values only draw if different

whether to label the finished surface levels within the Graph area. Additional control is provided to only draw the labels if the finished surface level is different from the level at the top of the maintenance hole.

Finished surface value mode			
	draw_fs_vertical_mode	choice box	value from fs tin value from top of mh

whether the finished surface level label values come from the fs tin or the top of the maintenance holes.

Pre text	fs_vertical_pre_text	input
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label text before the finished surface level.

Post text	fs_vertical_post_text	input
------------------	-----------------------	-------

label text after the finished surface level.

Decimal places	fs_vertical_decimals	input
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decimal places for finished surface level values (required only if different from default number_of_decimals).

Colour	fs_vertical_colour	colour box	available colours
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text colour of finished surface level labels (required only if different from default box_text_colour).

Size (mm)	fs_vertical_size	input
------------------	------------------	-------

text size of finished surface level labels (required only if different from default box_text_size).

Textstyle	fs_vertical_textstyle	font box	available fonts
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font of finished surface level labels (required only if different from default global_textstyle).

X adjustment (mm)	fs_vertical_x	input
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horizontal adjustment to position of finished surface level labels.

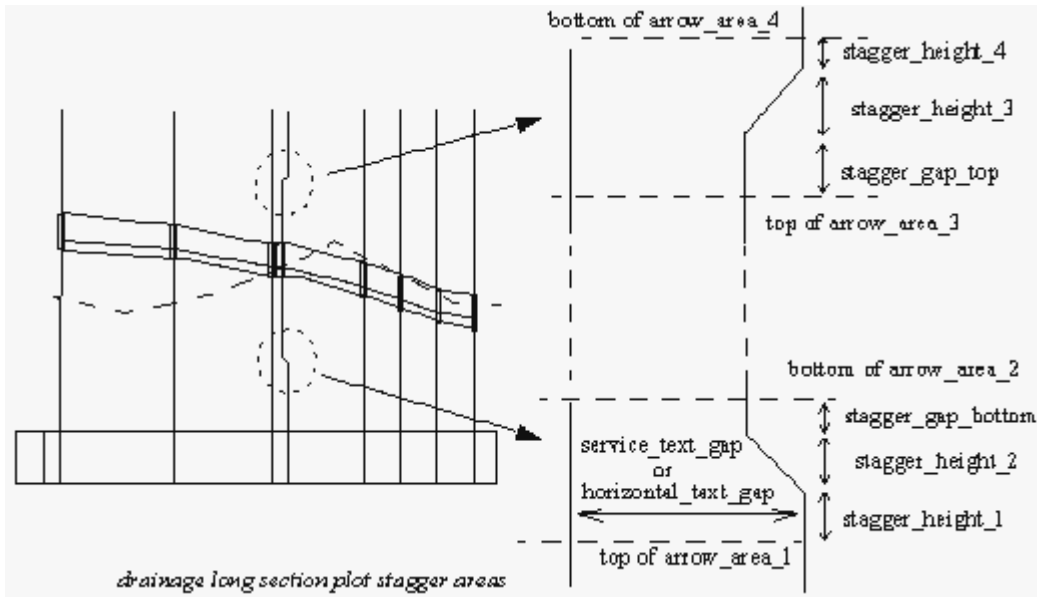
Y adjustment (mm)	fs_vertical_y	input
--------------------------	---------------	-------

vertical adjustment to position of finished surface level labels.

Drainage_Plot_Chainages_Uprights_Staggering

Staggering

Because the pit and service uprights are sometimes too close together to fit all the desired information in the Boxes and Arrows areas, the uprights can be staggered (widened) in such a way as to provide more space in these areas, below and above the Graph area, whilst still maintaining the correct upright spacing within the Graph area itself. Specifically, the staggering of the uprights occurs below the Graph area between Arrow areas 1 and 2, and above the Graph area between Arrow areas 3 and 4. As such, it is recommended that Arrow areas 2 and 3 be used only for information requiring minimal space.



Stagger area below graph area parameters

Panel Field	Parameter name	Type
Top of arrow area 1 to start of the staggers (mm)	stagger_height_1	input
<i>refer to stagger_height_1 on above diagram.</i>		
Distance over which stagger occurs (mm)	stagger_height_2	input
<i>refer to stagger_height_2 on above diagram.</i>		
End of the staggers to bottom of arrow area 2 (mm)	stagger_gap_bottom	input
<i>refer to stagger_gap_bottom on above diagram.</i>		

Stagger area above graph area parameters

Panel Field	Parameter name	Type
Top of arrow area 3 to start of the staggers (mm)	stagger_gap_top	input
<i>refer to stagger_gap_top on above diagram.</i>		
Distance over which stagger occurs (mm)	stagger_height_3	input
<i>refer to stagger_height_3 on above diagram.</i>		
End of the staggers to bottom of arrow area 4 (mm)		

	stagger_height_4	input
--	------------------	-------

refer to stagger_height_4 on above diagram.

Text offset parameters

Panel Field	Parameter name	Type
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Minimum distance for text after pit values (mm)

	horizontal_text_gap	input
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refer to horizontal_text_gap on above diagram.

Minimum distance for text after service values (mm)

	service_text_gap	input
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refer to service_text_gap on above diagram.

Datum area

Drainage_Plot_Datum_area

The Datum area is where each long section plot's datum value is drawn. The datum line for each long section plot is defined at the bottom of Arrow area 1.

Panel Field	Parameter name	Type
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Below datum area gap (mm)

	datum_gap	input
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distance from the top of the Boxes area to the bottom of Arrow area 1.

Drainage_Plot_Datum_area_Name

Name

The datum name (or title) is drawn at the datum line, above the Boxes title area.

Panel Field	Parameter name	Type	Pop-Up
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Datum name	datum_name	input
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title for the datum area.

X offset (mm)	datum_title_x	input
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horizontal adjustment to position of datum name.

Y offset (mm)	datum_title_y	input
----------------------	---------------	-------

vertical adjustment to position of datum name.

Textstyle	datum_title_textstyle	font box	available fonts
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font of datum name (required only if different from default global_textstyle).

Text size (mm)	datum_title_text_size	input
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text size of datum name (required only if different from default box_text_size).

Colour	datum_title_colour	colour box	available colours
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text colour of datum name (required only if different from default box_text_colour).

Drainage_Plot_Datum_area_Values

Values

The datum values are drawn at the datum lines, above the Box values areas.

Panel Field	Parameter name	Type	Pop-Up
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Decimal places	datum_decimals	input
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number of decimal places for datum values.

X offset (mm) datum_x input

horizontal adjustment to position of datum values.

Y offset (mm) datum_y input

vertical adjustment to position of datum values.

Textstyle datum_textstyle font box available fonts

font of datum values (required only if different from default global_textstyle).

Text size (mm) datum_text_size input

text size of datum values (required only if different from default box_text_size).

Colour datum_text_colour colour box available colours

text colour of datum values (required only if different from default box_text_colour).

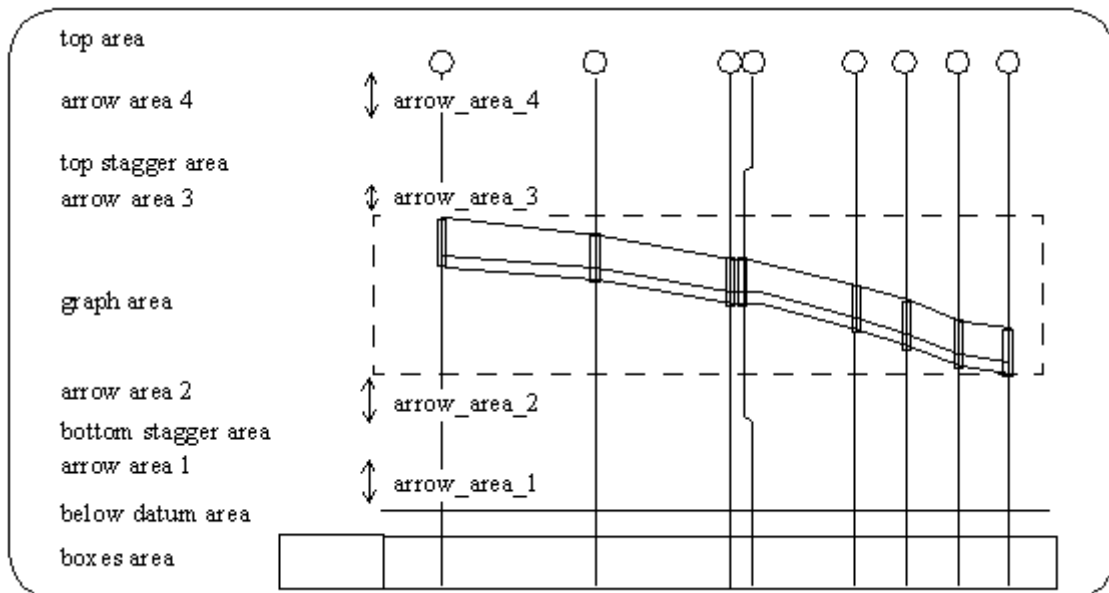
Arrows

Drainage_Plot_Arrows

The Arrow areas on the drainage long section plot, are used to label segments (individual pipes) on the drainage strings with the following information: grades, diameters and types, flow velocities, flow volumes, drainage line names, and any user-defined pipe attribute values.

There are four separate Arrow areas on the plot, any of which can be used to label the above information. From plot bottom to top, the Arrow areas are:

- Arrow area 1: staggered arrows below the Graph area,
- Arrow area 2: unstaggered arrows below the Graph area,
- Arrow area 3: unstaggered arrows above the Graph area,
- Arrow area 4: staggered arrows above the Graph area.



Panel Field Parameter name Type

Height of arrow area 1 (mm)
arrow_area_1 input

refer to arrow_area_1 on the above diagram.

Height of arrow area 2 (mm)
 arrow_area_2 input

refer to arrow_area_2 on the above diagram.

Height of arrow area 3 (mm)
 arrow_area_3 input

refer to arrow_area_3 on the above diagram.

Height of arrow area 4 (mm)
 arrow_area_4 input

refer to arrow_area_4 on the above diagram.

Drainage_Plot_Arrows_Grades

Grades

Panel Field	Parameter name	Type	Pop-Up
Draw pipe grade	draw_pipe_grade	check box	

whether to draw the pipe grades in one of the Arrow areas.

Arrow area for the arrow	pipe_grade_arrow_area	choice box	Area 1 Area 2 Area 3 Area 4
---------------------------------	-----------------------	------------	--------------------------------------

the desired Arrow area for the pipe grade information.

Y offset (mm)	pipe_grade_y	input	
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vertical offset of pipe grade information, measured upwards from the bottom of the selected Arrow area.

Grade mode	percentage_grade	choice box	1 in grade % grade
-------------------	------------------	------------	-----------------------

determines the format of the pipe grade information.

Drainage_Plot_Arrows_Grades_Title_text

Grades: Title text

Panel Field	Parameter name	Type	Pop-Up
Text	pipe_grade_title	input	

title for the pipe grade information.

Textstyle	pipe_grade_title_textstyle	font box	available fonts
------------------	----------------------------	----------	-----------------

font of pipe grade title.

Size (mm)	pipe_grade_title_text_size	input	
------------------	----------------------------	-------	--

text size of pipe grade title.

Colour	pipe_grade_title_text_colour	colour box	available colours
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text colour of pipe grade title.

Offset (mm)	pipe_grade_title_offset	input	
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vertical adjustment to position of pipe grade title.

X offset (mm)	pipe_grade_title_x	input	
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horizontal adjustment to position of pipe grade title.

Drainage_Plot_Arrows_Grades_Arrow_type

Grades: Arrow type

Panel Field	Parameter name	Type	Pop-Up
Arrow type	pipe_grade_arrow_mode	choice box	available arrow types
<i>arrow type (0 to 8) for the pipe grade information.</i>			
Colour	pipe_grade_arrow_colour	colour box	available colours
<i>arrow colour for pipe grade information.</i>			
Size (mm)	pipe_grade_arrow_size	input	
<i>arrow size for pipe grade information.</i>			
Arrow gap mode	pipe_grade_arrow_gap	choice box	no gap in arrow leave gap in arrow for text
<i>whether to put text gaps in the arrows, for pipe grade information.</i>			

Drainage_Plot_Arrows_Grades_Arrow_text

Grades: Arrow text

Panel Field	Parameter name	Type	Pop-Up
Pre text	pipe_grade_arrow_pre_text	input	
<i>label text before the pipe grade values.</i>			
Post text	pipe_grade_arrow_post_text	input	
<i>label text after the pipe grade values.</i>			
Decimal places	pipe_grade_arrow_decimals	input	
<i>decimal places for pipe grade values.</i>			
Colour	pipe_grade_arrow_text_colour	colour box	available colours
<i>text colour for pipe grade values.</i>			
Size (mm)	pipe_grade_arrow_text_size	input	
<i>text size for pipe grade values.</i>			
Textstyle	pipe_grade_arrow_textstyle	font box	available fonts
<i>font of pipe grade values.</i>			
Offset (mm)	pipe_grade_arrow_text_offset	input	
<i>vertical adjustment to position of pipe grade values.</i>			

Drainage_Plot_Arrows_Diameters

Diameters

Panel Field	Parameter name	Type	Pop-Up
Pipe diameter scale factor			

pipe_diameter_scale_factor
input

multiplier of pipe diameter values.

Draw pipe diameter mode

draw_pipe_diameter choice box don't draw pipe diameter
draw pipe diameter

whether to draw the pipe diameters in one of the Arrow areas.

Arrow area for the arrow

pipe_diameter_arrow_area
choice box Area 1
Area 2
Area 3
Area 4

the desired Arrow area for the pipe diameter information.

Y offset (mm)

pipe_diameter_y input

vertical offset of pipe diameter information, measured upwards from the bottom of the selected Arrow area.

Drainage_Plot_Arrows_Diameters_Title_text

Diameters: Title text

Panel Field	Parameter name	Type	Pop-Up
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Text	pipe_diameter_title	input	
-------------	---------------------	-------	--

title for the pipe diameter information.

Textstyle

pipe_diameter_title_textstyle	font box	available fonts
-------------------------------	----------	-----------------

font of pipe diameter title.

Size (mm)

pipe_diameter_title_text_size	input
-------------------------------	-------

text size of pipe diameter title.

Colour

pipe_diameter_title_text_colour	colour box	available colours
---------------------------------	------------	-------------------

text colour of pipe diameter title.

Offset (mm)

pipe_diameter_title_offset	input
----------------------------	-------

vertical adjustment to position of pipe diameter title.

X offset (mm)

pipe_diameter_title_x	input
-----------------------	-------

horizontal adjustment to position of pipe diameter title.

Drainage_Plot_Arrows_Diameters_Arrow_type

Diameters: Arrow type

Panel Field	Parameter name	Type	Pop-Up
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Arrow type	pipe_diameter_arrow_mode	choice box	available arrow types
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arrow type (0 to 8) for the pipe diameter information.

Colour

pipe_diameter_arrow_colour	colour box	available colours
----------------------------	------------	-------------------

arrow colour for pipe diameter information.

Size (mm) pipe_diameter_arrow_size
input

arrow size for pipe diameter information.

Arrow gap mode pipe_diameter_arrow_gap
choice box no gap in arrow
leave gap in arrow for text

whether to put text gaps in the arrows, for pipe diameter information.

Drainage_Plot_Arrows_Diameters_Arrow_text

Diameters: Arrow text

Panel Field	Parameter name	Type	Pop-Up
Pre text	pipe_diameter_arrow_pre_text	input	

label text before the pipe diameter values.

Post text pipe_diameter_arrow_post_text
input

label text after the pipe diameter values.

Pipe type mode pipe_type_mode
choice box don't include the pipe type
include the pipe type

whether to include the pipe type after the post text in the pipe diameter labels.

Colour pipe_diameter_arrow_text_colour
colour box available colours

text colour for pipe diameter values.

Size (mm) pipe_diameter_arrow_text_size
input

text size for pipe diameter values.

Textstyle pipe_diameter_arrow_textstyle
font box available fonts

font of pipe diameter values.

Offset (mm) pipe_diameter_arrow_text_offset
input

vertical adjustment to position of pipe diameter values.

Drainage_Plot_Arrows_Velocities

Velocities

Panel Field	Parameter name	Type	Pop-Up
Draw pipe velocity	draw_pipe_velocity	check box	

whether to draw the flow velocities in one of the Arrow areas.

Arrow area for the arrow pipe_velocity_arrow_areachoice box
Area 1
Area 2
Area 3
Area 4

the desired Arrow area for the flow velocity information.

Y offset (mm) pipe_velocity_y
input

vertical offset of flow velocity information, measured upwards from the bottom of the selected Arrow area.

Drainage_Plot_Arrows_Velocities_Title_text

Velocities: Title text

Panel Field	Parameter name	Type	Pop-Up
Text	pipe_velocity_title	input	
<i>title for the flow velocity information.</i>			
Textstyle	pipe_velocity_title_textstyle	font box	available fonts
<i>font of flow velocity title.</i>			
Size (mm)	pipe_velocity_title_text_size	input	
<i>text size of flow velocity title.</i>			
Colour	pipe_velocity_title_text_colour	colour box	available colours
<i>text colour of flow velocity title.</i>			
Offset (mm)	pipe_velocity_title_offset	input	
<i>vertical adjustment to position of flow velocity title.</i>			
X offset (mm)	pipe_velocity_title_x	input	
<i>horizontal adjustment to position of flow velocity title.</i>			

Drainage_Plot_Arrows_Velocities_Arrow_type

Velocities: Arrow type

Panel Field	Parameter name	Type	Pop-Up
Arrow type	pipe_velocity_arrow_mode	choice box	available arrow types
<i>arrow type (0 to 8) for the flow velocity information.</i>			
Colour	pipe_velocity_arrow_colour	colour box	available colours
<i>arrow colour for flow velocity information.</i>			
Size (mm)	pipe_velocity_arrow_size	input	
<i>arrow size for flow velocity information.</i>			
Arrow gap mode	pipe_velocity_arrow_gap	choice box	no gap in arrow leave gap in arrow for text
<i>whether to put text gaps in the arrows, for flow velocity information.</i>			

Drainage_Plot_Arrows_Velocities_Arrow_text

Velocities: Arrow text

Panel Field	Parameter name	Type	Pop-Up
Pre text	pipe_velocity_arrow_pre_text	input	
<i>label text before the flow velocity values.</i>			
Post text	pipe_velocity_arrow_post_text	input	

label text after the flow velocity values.

Decimal places pipe_velocity_arrow_decimals
input

decimal places for flow velocity values.

Colour pipe_velocity_arrow_text_colour
colour box available colours

text colour for flow velocity values.

Size (mm) pipe_velocity_arrow_text_size
input

text size for flow velocity values.

Textstyle pipe_velocity_arrow_textstyle
font box available fonts

font of flow velocity values.

Offset (mm) pipe_velocity_arrow_text_offset
input

vertical adjustment to position of flow velocity values.

Drainage_Plot_Arrows_Flow

Flow

Panel Field	Parameter name	Type	Pop-Up
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Draw pipe flow	draw_pipe_flow	check box	
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whether to draw the flow volumes in one of the Arrow areas.

Arrow area for the arrow	pipe_flow_arrow_area	choice box	Area 1 Area 2 Area 3 Area 4
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the desired Arrow area for the flow volume information.

Y offset (mm)	pipe_flow_y	input
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vertical offset of flow volume information, measured upwards from the bottom of the selected Arrow area.

Drainage_Plot_Arrows_Flow_Title_text

Flow: Title text

Panel Field	Parameter name	Type	Pop-Up
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Text	pipe_flow_title	input
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title for the flow volume information.

Textstyle	pipe_flow_title_textstyle	font box	available fonts
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font of flow volume title.

Size (mm)	pipe_flow_title_text_size	input
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text size of flow volume title.

Colour	pipe_flow_title_text_colour	colour box	available colours
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text colour of flow volume title.

Offset (mm)	pipe_flow_title_offset	input
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vertical adjustment to position of flow volume title.

X offset (mm) pipe_flow_title_x input

horizontal adjustment to position of flow volume title.

Drainage_Plot_Arrows_Flow_Arrow_type

Flow: Arrow type

Panel Field	Parameter name	Type	Pop-Up
Arrow type	pipe_flow_arrow_mode	choice box	available arrow types

arrow type (0 to 8) for the flow volume information.

Colour	pipe_flow_arrow_colour	colour box	available colours
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arrow colour for flow volume information.

Size (mm)	pipe_flow_arrow_size	input	
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arrow size for flow volume information.

Arrow gap mode	pipe_flow_arrow_gap	choice box	no gap in arrow leave gap in arrow for text
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whether to put text gaps in the arrows, for flow volume information.

Drainage_Plot_Arrows_Flow_Arrow_text

Flow: Arrow text

Panel Field	Parameter name	Type	Pop-Up
Pre text	pipe_flow_arrow_pre_text	input	

label text before the flow volume values.

Post text	pipe_flow_arrow_post_text	input	
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label text after the flow volume values.

Decimal places	pipe_flow_arrow_decimals	input	
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decimal places for flow volume values.

Colour	pipe_flow_arrow_text_colour	colour box	available colours
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text colour for flow volume values.

Size (mm)	pipe_flow_arrow_text_size	input	
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text size for flow volume values.

Textstyle	pipe_flow_arrow_textstyle	font box	available fonts
------------------	---------------------------	----------	-----------------

font of flow volume values.

Offset (mm)	pipe_flow_arrow_text_offset	input	
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vertical adjustment to position of flow volume values.

Drainage_Plot_Arrows_Drainage_line_name

Drainage line name

Panel Field	Parameter name	Type	Pop-Up
Draw drainage line	draw_drainage_line	check box	
<i>whether to draw the drainage line names in one of the Arrow areas.</i>			
Arrow area for the arrow	drainage_line_arrow_area	choice box	Area 1 Area 2 Area 3 Area 4
<i>the desired Arrow area for the drainage line name information.</i>			
Y offset (mm)	drainage_line_y	input	
<i>vertical offset of drainage line name information, measured upwards from the bottom of the selected Arrow area.</i>			

Drainage_Plot_Arrows_Drainage_line_name_Title_text

Drainage line name: Title text

Panel Field	Parameter name	Type	Pop-Up
Text	drainage_line_title	input	
<i>title for the drainage line name information.</i>			
Textstyle	drainage_line_title_textstyle	font box	available fonts
<i>font of drainage line name title.</i>			
Size (mm)	drainage_line_title_text_size	input	
<i>text size of drainage line name title.</i>			
Colour	drainage_line_title_text_colour	colour box	available colours
<i>text colour of drainage line name title.</i>			
Offset (mm)	drainage_line_title_offset	input	
<i>vertical adjustment to position of drainage line name title.</i>			
X offset (mm)	drainage_line_title_x	input	
<i>horizontal adjustment to position of drainage line name title.</i>			

Drainage_Plot_Arrows_Drainage_line_name_Arrow_type

Drainage line name: Arrow type

Panel Field	Parameter name	Type	Pop-Up
Arrow type	drainage_line_arrow_mode	choice box	available arrow types
<i>arrow type (0 to 8) for the drainage line name information.</i>			
Colour	drainage_line_arrow_colour	colour box	available colours
<i>arrow colour for drainage line name information.</i>			
Size (mm)	drainage_line_arrow_size	input	
<i>arrow size for drainage line name information.</i>			

Arrow gap mode drainage_line_arrow_gap choice box no gap in arrow
leave gap in arrow for text

whether to put text gaps in the arrows, for drainage line name information.

Drainage_Plot_Arrows_Drainage_line_name_Arrow_text

Drainage line name: Arrow text

Panel Field	Parameter name	Type	Pop-Up
Pre text	drainage_line_arrow_pre_text	input	
	<i>label text before the drainage line names.</i>		
Post text	drainage_line_arrow_post_text	input	
	<i>label text after the drainage line names.</i>		
Colour	drainage_line_arrow_text_colour	colour box	available colours
	<i>text colour for drainage line names.</i>		
Size (mm)	drainage_line_arrow_text_size	input	
	<i>text size for drainage line names.</i>		
Textstyle	drainage_line_arrow_textstyle	font box	available fonts
	<i>font of drainage line names.</i>		
Offset (mm)	drainage_line_arrow_text_offset	input	
	<i>vertical adjustment to position of drainage line names.</i>		

Drainage_Plot_Arrows_User_defined_pipe_attributes

User defined pipe attributes

User defined pipe attribute data can be drawn in the Arrow areas.

The following fields are required for each desired pipe attribute (set). Each set of fields forms one row of a grid.

Panel Field	Parameter name	Type	Pop-Up
Set #		input	
	<i>a unique integer n, greater than 0, to identify the nth set of pipe attribute plot parameters.</i>		
Draw pipe attribute mode	draw_pipe_attr_n	choice box	don't draw pipe attribute draw pipe attribute
	<i>whether to draw the nth set of pipe attribute data in one of the Arrow areas.</i>		
Attribute name	pipe_attr_n_name	input	
	<i>name of the nth pipe attribute.</i>		
Arrow area for the arrow	pipe_attr_n_arrow_area	choice box	Area 1 Area 2 Area 3 Area 4
	<i>the desired Arrow area for the nth set of pipe attribute data.</i>		
Y offset (mm)	pipe_attr_n_y	input	

vertical offset of the *n*th set of pipe attribute data, measured upwards from the bottom of the selected Arrow area.

Drainage_Plot_Arrows_User_defined_pipe_attributes_Title_text

User defined pipe attributes: Title text

The following fields are required for each desired pipe attribute (set). Each set of fields forms one row of a grid.

Panel Field	Parameter name	Type	Pop-Up
Set #		input	
	<i>a unique integer n, greater than 0, to identify the nth set of pipe attribute plot parameters. The Set # should match one of the Set #'s from the grid in the parent node: "User defined pipe attributes".</i>		
Text	pipe_attr_n_title	input	
	<i>title for the nth set of pipe attribute data.</i>		
Textstyle	pipe_attr_n_title_textstyle	font box	available fonts
	<i>font of the title for the nth set of pipe attribute data.</i>		
Size (mm)	pipe_attr_n_title_text_size	input	
	<i>text size of the title for the nth set of pipe attribute data.</i>		
Colour	pipe_attr_n_title_text_colour	colour box	available colours
	<i>text colour of the title for the nth set of pipe attribute data.</i>		
Offset (mm)	pipe_attr_n_title_offset	input	
	<i>vertical adjustment to position of the title for the nth set of pipe attribute data.</i>		
X offset (mm)	pipe_attr_n_title_x	input	
	<i>horizontal adjustment to position of the title for the nth set of pipe attribute data.</i>		

Drainage_Plot_Arrows_User_defined_pipe_attributes_Arrow_type

User defined pipe attributes: Arrow type

The following fields are required for each desired pipe attribute (set). Each set of fields forms one row of a grid.

Panel Field	Parameter name	Type	Pop-Up
Set #		input	
	<i>a unique integer n, greater than 0, to identify the nth set of pipe attribute plot parameters. The Set # should match one of the Set #'s from the grid in the parent node: "User defined pipe attributes".</i>		
Arrow type	pipe_attr_n_arrow_mode	choice box	available arrow types
	<i>arrow type (0 to 8) for the nth set of pipe attribute data.</i>		
Colour	pipe_attr_n_arrow_colour	colour box	available colours
	<i>arrow colour for the nth set of pipe attribute data.</i>		
Size (mm)	pipe_attr_n_arrow_size	input	
	<i>arrow size for the nth set of pipe attribute data.</i>		
Arrow gap mode	pipe_attr_n_arrow_gap	choice box	no gap in arrow leave gap in arrow for text
	<i>whether to put text gaps in the arrows, for the nth set of pipe attribute data.</i>		

Drainage_Plot_Arrows_User_defined_pipe_attributes_Arrow_text**User defined pipe attributes: Arrow text**

The following fields are required for each desired pipe attribute (set). Each set of fields forms one row of a grid.

Panel Field	Parameter name	Type	Pop-Up
Set #		input	
	<i>a unique integer n, greater than 0, to identify the nth set of pipe attribute plot parameters. The Set # should match one of the Set #'s from the grid in the parent node: "User defined pipe attributes".</i>		
Pre text	pipe_attr_n_arrow_pre_text	input	
	<i>label text before the values of the nth set of pipe attribute data.</i>		
Post text	pipe_attr_n_arrow_post_text	input	
	<i>label text after the values of the nth set of pipe attribute data.</i>		
Decimal places	pipe_attr_n_arrow_decimals	input	
	<i>decimal places the values of the nth set of pipe attribute data.</i>		
Colour	pipe_attr_n_arrow_text_colour	colour box	available colours
	<i>text colour for the values of the nth set of pipe attribute data.</i>		
Size (mm)	pipe_attr_n_arrow_text_size	input	
	<i>text size for the values of the nth set of pipe attribute data.</i>		
Textstyle	pipe_attr_n_arrow_textstyle	font box	available fonts
	<i>font for the values of the nth set of pipe attribute data.</i>		
Offset (mm)	pipe_attr_n_arrow_text_offset	input	
	<i>vertical adjustment to position of values of the nth set of pipe attribute data.</i>		

Graph area**Drainage_Plot_Graph_area**

The Graph area is where the diagram of the drainage line, in long-section, is drawn. In addition, if Hydraulic Grade Line (HGL) information is set, the HGL can also be drawn in the Graph area.

Panel Field	Parameter name	Type	Pop-Up
Draw hgl diag	draw_hgl_diag	check box	
	<i>whether to draw the HGL in the Graph area.</i>		
Colour of hgl	hgl_colour	colour box	available colours
	<i>colour of HGL.</i>		

Top area**Drainage_Plot_Top_area**

Panel Field	Parameter name	Type	Pop-Up
Line at the bottom of the top area mode			
	draw_top_line	choice box	don't draw line draw line

whether to draw a horizontal line at the bottom of the Top area.

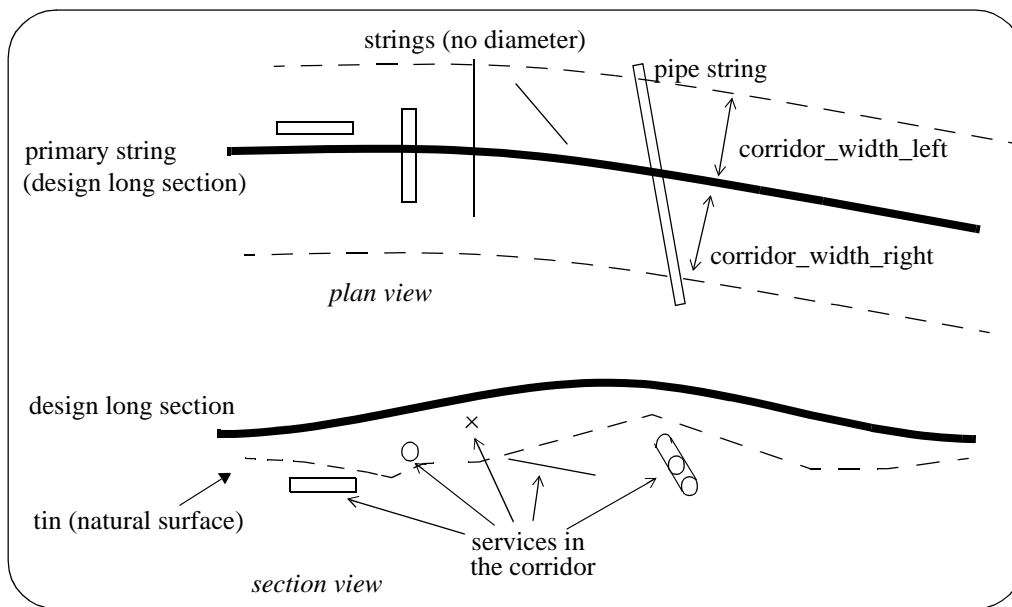
Corridors

Drainage_Plot_Corridors

A corridor around the primary string is defined by giving a left and right corridor width.

Any string in a model added to the section view is checked to see if it appears in the corridor, and if it does, it is drawn on the long section plot.

To be drawn, strings do not have to cross the primary string, but just be in the corridor.



Panel field	Parameter name	Type
Left corridor width (world units)		
	corridor_width_left	input
<i>left corridor width</i>		
Right corridor width (world units)		
	corridor_width_right	input
<i>right corridor width</i>		
Left corridor overlap (world units)		
	corridor_overlap_left	input
<i>left corridor overlap</i>		
Right corridor overlap (world units)		
	corridor_overlap_right	input
<i>right corridor overlap</i>		
Chord-arc tolerance (world units)		
	corridor_chord_arc	input
<i>chord-arc tolerance used near any bends in the corridor.</i>		

Drainage Plot Corridors_Model_selection

Panel field	Parameter name	Type
Corridor model	corridor_model_n	model box

models containing tins and service strings to be drawn on the section. Where $n = 1, 2, \dots, 100$ given by line number on grid.

Maintenance hole symbols

Drainage_Plot_Maintenance_hole_symbols

Symbols representing the different types of maintenance holes used, can be drawn on the plots.

The following fields form one set (grid row) of controls for the placement of MH symbols on the plot. Normally, the grid will contain one row for each MH type/symbol used.

Panel Field	Parameter name	Type	Pop-Up
Set #		input	

a unique integer n , greater than 0, to identify the n th set of MH symbol plot parameters.

MH type	manhole_symbol_n_type	choice box	available MH types
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the MH type to associate with the Set #, n .

MH symbol mode	manhole_symbol_n_mode	choice box	cross (0) up from centre of box (1) up&down from box centre(2) square (3) triangle, base at bottom (4) circle (5) use a symbol
-----------------------	-----------------------	------------	--

for the n th MH type, whether to use one of the hard-wired symbols (1-5), or a symbol from the defined symbols list.

MH symbol position	manhole_symbol_n_position	choice box	at top of mh above top of boxes above highest point to primary string to first found tin
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for the n th MH type, the desired position of the symbol.

Size (mm)	manhole_symbol_n_size	input
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for the n th MH type, the symbol size.

X (mm)	manhole_symbol_n_x	input
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for the n th MH type, the horizontal adjustment to the selected MH symbol position.

Y (mm)	manhole_symbol_n_y	input
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for the n th MH type, the vertical adjustment to the selected MH symbol position.

Symbol	manhole_symbol_n_style	choice box	available symbols
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for the n th MH type, and with manhole_symbol_n_mode set to use a symbol, the symbol to use from the defined symbols list.

Angle (dms)	manhole_symbol_n_angle	angle box	
	<i>for the nth MH type, the symbol angle.</i>		
Colour	manhole_symbol_n_colour	colour box	available colours
	<i>for the nth MH type, the symbol colour.</i>		

Maintenance hole names/types/bubbles

Drainage_Plot_Maintenance_hole_names_types_bubbles

Panel Field	Parameter name	Type	Pop-Up
Include line name mode	draw_line_name	choice box	don't include line name include line name
	<i>whether to include the drainage line name in the MH name label.</i>		
Include pit name mode	draw_pit_name	choice box	don't include pit name include pit name
	<i>whether to include the MH name in the MH name label.</i>		
Include pit type mode	draw_pit_type	choice box	don't include pit type include pit type
	<i>whether to include the MH type in the MH name label.</i>		
Size (mm)	bubble_text_size	input	
	<i>text size of MH name label.</i>		
Colour	bubble_text_colour	colour box	available colours
	<i>text colour of MH name label.</i>		
Textstyle	bubble_textstyle	font box	available fonts
	<i>font of MH name label.</i>		
X adjustment (mm)	bubble_text_x	input	
	<i>horizontal adjustment to position of MH name label.</i>		
Y adjustment (mm)	bubble_text_y	input	
	<i>vertical adjustment to position of MH name label.</i>		
Pre text	bubble_pre_text	input	
	<i>text to go before MH name label.</i>		
Post text	bubble_post_text	input	
	<i>text to go after MH name label.</i>		
Text angle (dms)	bubble_text_angle	angle box	
	<i>text angle of MH name label.</i>		
Text justification	bubble_text_justify	justification box	
	<i>text justification of MH name label.</i>		
Bubble radius (mm)	bubble_radius	input	
	<i>radius of bubble around MH name label. Zero (0) for no bubble.</i>		
Bubble colour	bubble_colour	colour box	available colours
	<i>colour of bubble around MH name label.</i>		

Bubble length (mm)	bubble_length	input	
	<i>length of bubble around MH name label. Zero (0) for circular bubble.</i>		
Bubble text position	draw_text_at_pit	choice box	draw bubble&text in top area draw bubble&text above pit
	<i>whether to position the MH name labels and bubbles in the Top area, or directly above the pits.</i>		
Distance to add to place bubble above the pit (mm)	distance_above_pit	input	
	<i>for draw_text_at_pit set to draw bubble & text above pit, distance to add between top of pit and bottom of bubble.</i>		

Pits/Junctions direction changes

[Drainage_Plot_Pits_Junctions_direction_changes](#)

[Drainage_Plot_Pits_Junctions_direction_changes_Junction_name](#)

Junction name

[Drainage_Plot_Pits_Junctions_direction_changes_Junction_angle](#)

Junction angle

Property controls/House connections

[Drainage_Plot_Property_controls_House_connections](#)

Property control parameters

House connection parameters

[Drainage_Plot_Property_controls_House_connections_House_connection_labels](#)

House connection labels

[Drainage_Plot_Property_controls_House_connections_House_connection_labels_House_connection_type](#)

House connection labels: House connection type

[Drainage_Plot_Property_controls_House_connections_House_connection_labels_Distance](#)

House connection labels: Distance

[Drainage_Plot_Property_controls_House_connections_House_connection_labels_Depths](#)

House connection labels: Depths

[Drainage_Plot_Property_controls_House_connections_House_connection_labels_Finished_surface](#)

House connection labels: Finished surface

[Drainage_Plot_Property_controls_House_connections_Property_control_labels_Invert_levels](#)

House connection labels: Invert levels

[Drainage_Plot_Property_controls_House_connections_Property_control_labels](#)

Property control labels

[Drainage_Plot_Property_controls_House_connections_Property_control_labels_Symbols](#)

Property control labels: Symbols

[Drainage_Plot_Property_controls_House_connections_Property_control_labels_Distance](#)

Property control labels: Distance

[Drainage_Plot_Property_controls_House_connections_Property_control_labels_Depths](#)

Property control labels: Depths

[Drainage_Plot_Property_controls_House_connections_Property_control_labels_Finished_surface](#)

Property control labels: Finished surface

[Drainage_Plot_Property_controls_House_connections_Property_control_labels_Invert_levels](#)

Property control labels: Invert levels

Hatching cut/fill

[Drainage_Plot_Hatching_cut_fill](#)

This option is used to hatch cut and/or fill areas between sets of tins.

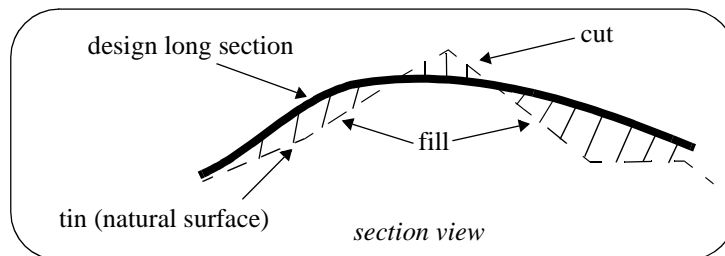
For each set, the name of the two tins, the hatch linestyle, colour and separation and whether cut and/or fill regions are required are all user definable.

Up to twenty (20) separate sets of tins may be hatched.

Panel Field	Parameter name	Type
Define Set #		input
<i>set number to be used to define different original/new tin sets.</i>		
Original tin	hatch_original_tin_n	tin box
<i>tin_name for original surface</i>		
New tin	hatch_new_tin_n	tin box
<i>tin_name for final surface</i>		

Notes

- (a) cut is when the new tin is below the original tin.
fill is when the new tin is above the original tin.
- (b) cut hatching is turned off by setting *hatch_cut_separation_n* to 0.0.
fill hatching is turned off by setting *hatch_fill_separation_n* to 0.0.



[Drainage_Plot_Hatching_cut_fill_Cut](#)

Cut

Panel Field	Parameter name	Type
Use Set #		input
<i>set number as specified in the Define set#.</i>		

Cut separation (mm)	hatch_cut_separation_n	input
	<i>distance between cut hatch lines. If 0, no hatching.</i>	
Cut hatch angle (dms)	hatch_cut_angle_n	input
	<i>angle of hatching.</i>	
Cut colour	hatch_cut_colour_n	colour box
	<i>colour of the hatching.</i>	
Cut linestyle	hatch_cut_linestyle_n	linestyle box
	<i>linestyle of the hatching.</i>	
Draw sides of cuts	hatch_cut_draw_sides_n	choice box
	<i>draw mode for sides of cut regions.</i>	
Draw original tin	hatch_cut_draw_original_n	choice box
	<i>draw mode for sides of original tin in cut.</i>	
Draw new tin	hatch_cut_draw_new_n	choice box
	<i>draw mode for sides of new tin in cut.</i>	

Drainage_Plot_Hatching_cut_fill_Fill

Fill

Panel Field	Parameter name	Type
Use Set #		input
	<i>set number as specified in the Define set#.</i>	
Fill separation (mm)	hatch_fill_separation_n	input
	<i>distance between fill hatch lines. If 0, no hatching.</i>	
Fill hatch angle (dms)	hatch_fill_angle_n	input
	<i>angle of hatching.</i>	
Fill colour	hatch_fill_colour_n	colour box
	<i>colour of the hatching.</i>	
Fill linestyle	hatch_fill_linestyle_n	linestyle box
	<i>linestyle of the hatching.</i>	
Draw sides of fills	hatch_fill_draw_sides_n	choice box
	<i>draw mode for sides of fill regions.</i>	
Draw original tin	hatch_fill_draw_original_n	choice box
	<i>draw mode for sides of original tin in fill.</i>	
Draw new tin	hatch_fill_draw_new_n	choice box
	<i>draw mode for sides of new tin in fill.</i>	

Cuts

Drainage_Plot_Cuts

The cuts that the primary string (design line) makes through strings in any user-specified model can be automatically labelled on the long section plots.

The **height**, **chainage** and **name** of the cut string can be labelled as well as a **symbol**. The height of tins at

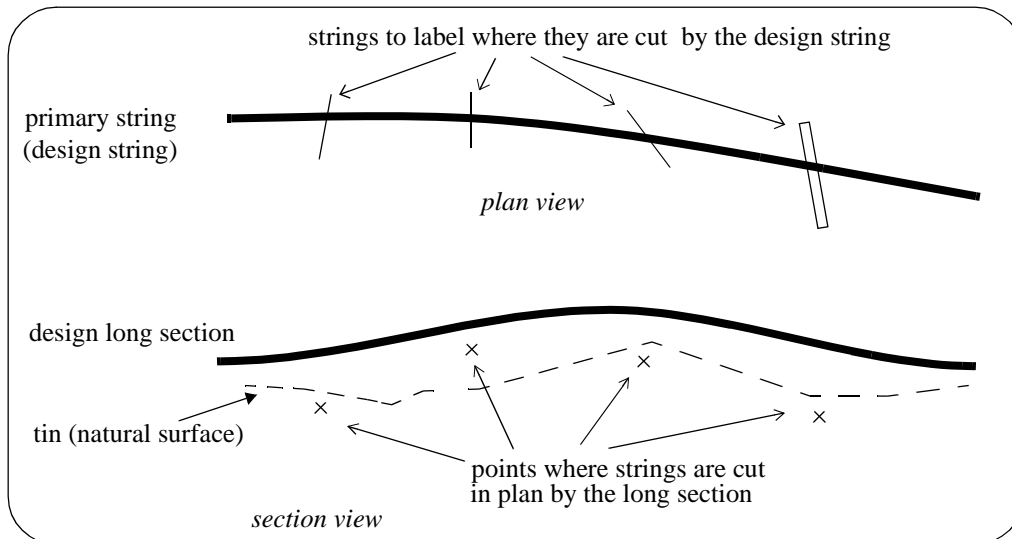
the same offset value can also be labelled.

The chainage position for the labelling is the chainage of the cut string.

The height position for the labelling can be specified as the:

- (a) top of the boxes on the long section,
- (b) height value of the cut string,
- (c) height of the primary string,
- (d) height of a tin.

The actual position of the label is defined relative to the above point.



Note: Only case (b) involves the actual height of the cut string. For all other cases, only the chainage of the cut string is used. Hence for all cases except (b), the string does need to have a sensible height to be used for cuts through strings. For example, a boundary string may have null heights but only the chainage is required and the height of the tin at that chainage can be used as the height (case (d)).

The method for specifying which strings are to be checked for cuts is by first specifying the **model** which contains the strings, and then a **name mask** which is used to restrict the strings in the model to only those whose names match the name mask.

Up to twenty five different sets of models and name masks can be used so that different cut sets can be labelled in different ways.

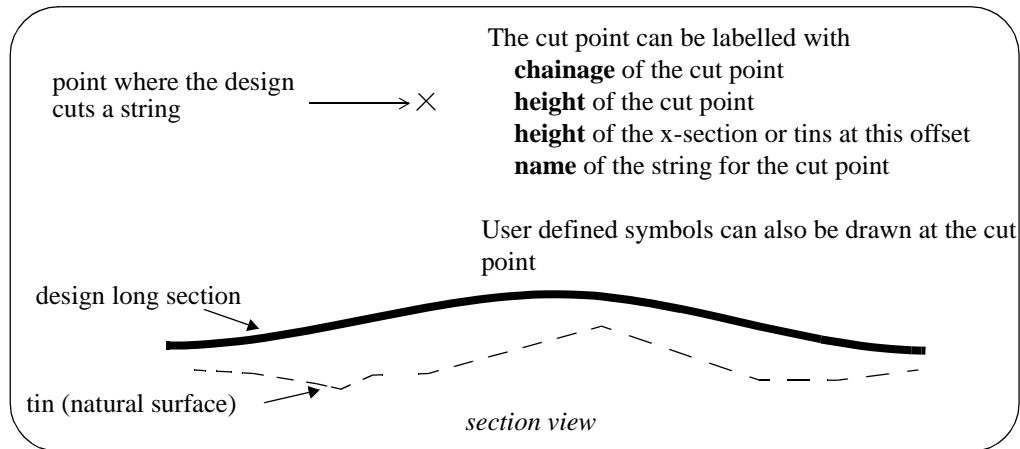
Panel Field	Parameter name	Type
Define Set #		input
<i>set number to be used to define different model/mask sets.</i>		
Model	cuts_n_model	model box
<i>model from which cut masks are derived</i>		
Name mask	cuts_n_mask	input

text string containing the name masks, each separated by one or more spaces, to test the string name against. Each mask can include wild cards and wild characters.

For example: "ke" or,
 "?bank*" or, if both masks are required,
 "ke* ?bank*"*

If cuts_n_mask is blank, then all strings in the model are used. This is equivalent to name mask being set to "".*

All strings in the model *cuts_n_model* whose name satisfy the name mask *cuts_n_mask* are then checked for cuts with the design string, and if a cut occurs, the cut point will be labelled according to the rest of the parameters in the nth set.



Drainage_Plot_Cuts_Chainage

Chainage

Panel Field	Parameter name	Type	Pop-Up
Use Set #		input	
	<i>set number as specified in the Define set#.</i>		
Position	cuts_chainage_n_position	choice box	above cut string height value above top of boxes to primary string to tin 1 to tin 2 to tin 3 to tin 4 to tin 5 to tin 6 to tin 7 to tin 8 to tin 9 to tin 10
	<i>position of chainage label.</i>		
X (mm)	cuts_chainage_n_x	input	
	<i>horizontal adjustment to position of chainage text.</i>		
Y (mm)	cuts_chainage_n_y	input	
	<i>vertical adjustment to position of chainage text.</i>		
Angle (dms)	cuts_chainage_n_angle	input	
	<i>rotation of chainage text about position.</i>		
Colour	cuts_chainage_n_colour	colour box	
	<i>colour of chainage text.</i>		
Size (mm)	cuts_chainage_n_size	input	
	<i>size of chainage text. A value of 0 means no label.</i>		
Textstyle	cuts_chainage_n_textstyle	text box	
	<i>textstyle of chainage text.</i>		

Pre-text	cuts_chainage_n_pre_text	input
	<i>text before chainage text.</i>	
Post-text	cuts_chainage_n_post_text	input
	<i>text after chainage text.</i>	
Justification	cuts_chainage_n_justification	justification box
		bottom-left bottom-centre bottom-right bottom-decimal middle-left middle-centre middle-right middle-decimal top-left top-centre top-right top-decimal decimal-left decimal-centre decimal-right decimal-point
	<i>justification of the chainage text.</i>	

Decimals	cuts_chainage_n_no_decimals	input
	<i>number of decimals in chainage.</i>	

Drainage_Plot_Cuts_Heights

Heights

Panel Field	Parameter name	Type	Pop-Up
Use Set #		input	
	<i>set number as specified in the Define set#.</i>		
Mode	cuts_height_n_mode	choice box	use height of cut point use real height above boxes height of primary string use height of tin 1 use height of tin 2 use height of tin 3 use height of tin 4 use height of tin 5 use height of tin 6 use height of tin 7 use height of tin 8 use height of tin 9 use height of tin 10
	<i>determines which height value is labelled.</i>		
Position	cuts_height_n_position	choice box	at cut string above top of boxes above top of graph area

to primary string
to tin 1
to tin 2
to tin 3
to tin 4
to tin 5
to tin 6
to tin 7
to tin 8
to tin 9
to tin 10

position of height label.

X (mm) cuts_height_n_x input

horizontal adjustment to position of height text.

Y (mm) cuts_height_n_y input

vertical adjustment to position of height text.

Angle (dms) cuts_height_n_angle input

rotation of height text about position.

Colour cuts_height_n_colour colour box

colour of height text.

Size (mm) cuts_height_n_size input

size of height text. A value of 0 means no label.

Textstyle cuts_height_n_textstyle text box

textstyle of height text.

Pre-text cuts_height_n_pre_text input

text before height text.

Post-text cuts_height_n_post_text input

text after height text.

Justification points_height_n_justification

justification box

bottom-left
bottom-centre
bottom-right
bottom-decimal
middle-left
middle-centre
middle-right
middle-decimal
top-left
top-centre
top-right
top-decimal
decimal-left
decimal-centre
decimal-right
decimal-point

justification of the height text.

Decimals cuts_height_n_no_decimals

input

*number of decimals in height.***Drainage_Plot_Cuts_Labels****Labels**

Panel Field	Parameter name	Type	Pop-Up
Use Set #		input	
	<i>set number as specified in the Define set#.</i>		
Position	cuts_label_n_position	choice box	at cut string height above top of boxes above top of graph area to primary string to tin 1 to tin 2 to tin 3 to tin 4 to tin 5 to tin 6 to tin 7 to tin 8 to tin 9 to tin 10
	<i>position of label text.</i>		
Mode	cuts_label_n_mode	choice box	don't include string name include cut string name
	<i>determines whether the label includes the cut string name.</i>		
X (mm)	cuts_label_n_x	input	
	<i>horizontal adjustment to position of label.</i>		
Y (mm)	cuts_label_n_y	input	
	<i>vertical adjustment to position of label.</i>		
Angle (dms)	cuts_label_n_angle	input	
	<i>rotation of label about position.</i>		
Colour	cuts_label_n_colour	colour box	
	<i>colour of label.</i>		
Size (mm)	cuts_label_n_size	input	
	<i>size of label. A value of 0 means no label.</i>		
Textstyle	cuts_label_n_textstyle	text box	
	<i>textstyle of label.</i>		
Pre-text	cuts_label_n_pre_text	input	
	<i>text before label.</i>		
Post-text	cuts_label_n_post_text	input	
	<i>text after label.</i>		
Justification	cuts_label_n_justification	justification box	bottom-left

bottom-centre
 bottom-right
 bottom-decimal
 middle-left
 middle-centre
 middle-right
 middle-decimal
 top-left
 top-centre
 top-right
 top-decimal
 decimal-left
 decimal-centre
 decimal-right
 decimal-point

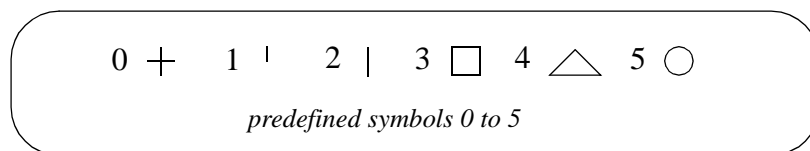
justification of the label.

Drainage_Plot_Cuts_Symbols

Symbols

Panel Field	Parameter name	Type	Pop-Up
Use Set #		input	
	<i>set number as specified in the Define set#.</i>		
Mode	cuts_symbol_n_mode	choice box	cross (0) up from centre of box (1) up&down from box centre(2) square (3) triangle, base at bottom (4) circle (5) use a plot symbol

symbol mode.



Note: *If a plot symbol is to be used, the cuts_symbol_n_style parameter must be specified.*

Symbol	cuts_symbol_n_style	plot symbols	
	<i>a valid plot symbol can be selected.</i>		
Position	cuts_symbol_n_position	choice box	at cut string height above top of boxes above top of graph area to primary string to tin 1 to tin 2 to tin 3 to tin 4 to tin 5 to tin 6 to tin 7 to tin 8 to tin 9 to tin 10

position of symbol.

X (mm)	cuts_symbol_n_x	input
<i>horizontal adjustment to position of symbol.</i>		
Y (mm)	cuts_symbol_n_y	input
<i>vertical adjustment to position of symbol.</i>		
Angle (dms)	cuts_symbol_n_angle	input
<i>rotation of symbol about point.</i>		
Colour	cuts_symbol_n_colour	colour box
<i>colour of symbol.</i>		
Size (mm)	cuts_symbol_n_size	input
<i>size of symbol. A value of 0 means no symbol.</i>		

Primary string name label

Drainage_Plot_Primary_string_name_label

The plot can be labelled with a name under the boxes area.

The name is made up of a concatenation of the text string names:

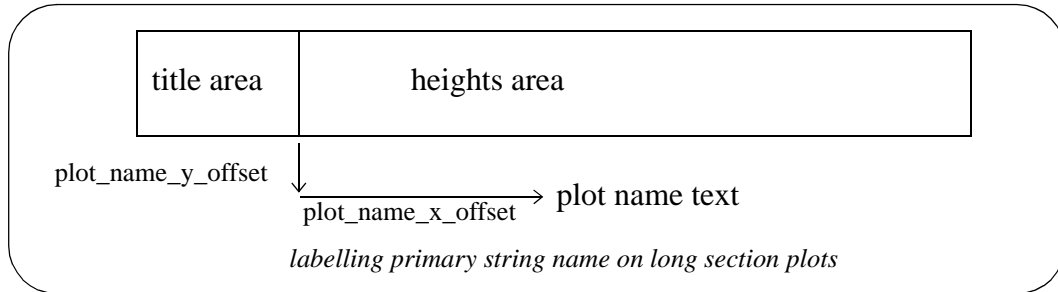
Panel Field	Parameter name	Type
Name mode	plot_name_string_name	choice box
<i>determines what text is placed in the name labels.</i>		
Pre-text	plot_name_pre_text	input
<i>text before label.</i>		
Post-text	plot_name_post_text	input
<i>text after label.</i>		
Textstyle	plot_name_textstyle	text box
<i>textstyle of label.</i>		
Size (mm)	plot_name_size	input
<i>size of label.</i>		
Colour	plot_name_colour	colour box
<i>colour of label.</i>		
X offset (mm)	plot_name_x_offset	input
<i>horizontal adjustment to position of label.</i>		
Y offset (mm)	plot_name_y_offset	input
<i>vertical adjustment to position of label.</i>		

The plot name is positioned under the boxes.

The *plot_name_x_offset* is measured from the beginning of the height boxes.

The default for *plot_name_x_offset* is centred on heights area.

The *plot_name_y_offset* is measured from the bottom of the box area with positive being down.



PPF's to include

Drainage_Plot_PPF_s_to_include

Panel Field	Parameter name	Type	Pop-Up
PPF files		input	

by including pre existing PPF files, the user can build up a modified version without having to set all the parameters.

Melbourne Water Plot PPF Editor

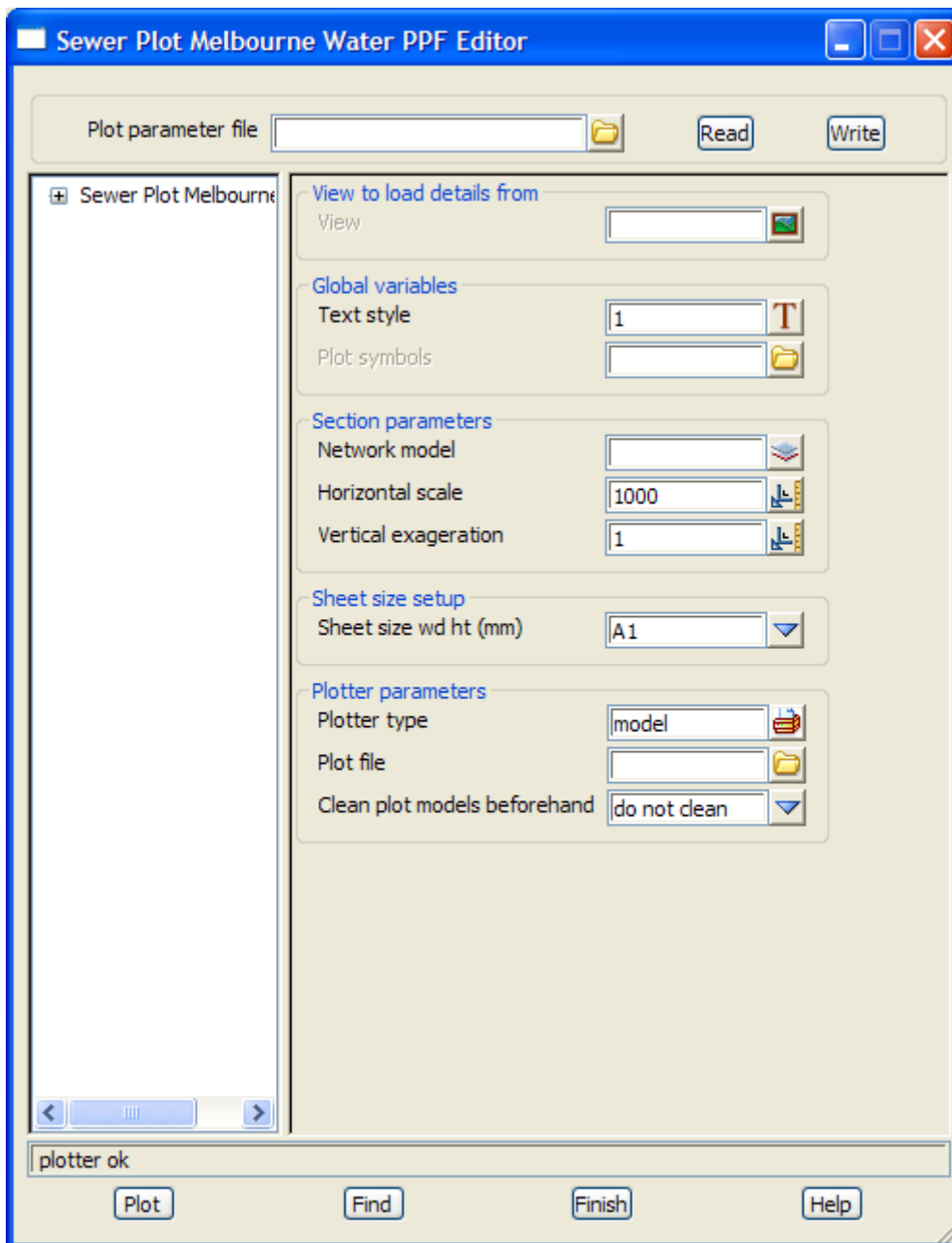
sewer_plot_melbourne_water_ppf_editor

Position of option on menu: Plot =>Melb Water Plot PPF Editor

The **Melb Water plot ppf editor** is for creating and/or editing a (binary) Melbourne Water sewer long section ppf file and for creating a Melbourne Water sewer long section plot. An ascii version of the file is also produced.

Note: binary and ascii ppf's are stored *within* the project (not in the folder containing the project).

On selecting the Melb Water plot ppf editor option, the **Sewer Plot Melbourne Water PPF Editor** panel is displayed.



Panel field	Type
Plot parameter file	file box

name for the binary plot parameter file to read in or write out.

Read button

read the given plot parameter file in.

Write button

write out the plot parameters to the given plot parameter file. An ascii ppf file is also written out.

Plot button

use the plot parameters from the panel to create the plot.

Find button

brings up a search box. If a valid parameter name is keyed in followed by the enter key, the cursor will be placed in the appropriate field on the appropriate page.

Pipeline Plot PPF Editor

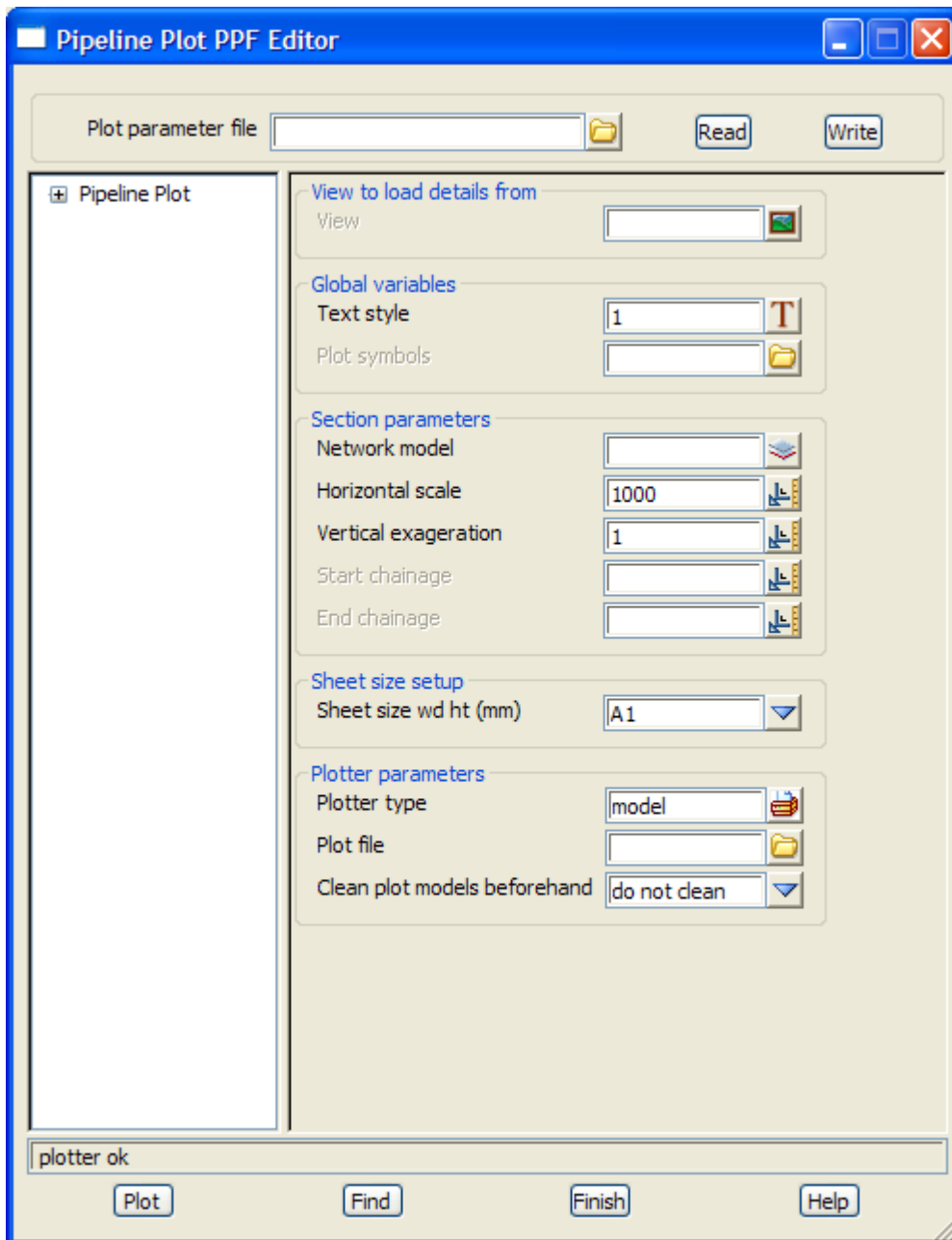
pipeline_plot_ppf_editor

Position of option on menu: Plot =>Pipeline Plot PPF Editor

The **pipeline plot ppf editor** is for creating and/or editing a (binary) pipeline long section ppf file and for creating a pipeline long section plot.

Note: binary ppf's are stored *within* the project (not in the folder containing the project as the ascii ppf's were).

On selecting the pipeline plot ppf editor option, the **Pipeline PPF Editor** panel is displayed.



Panel field	Type
Plot parameter file	file box

name for the binary plot parameter file to read in or write out.

Read button

read the given plot parameter file in.

Write button

write out the plot parameters to the given plot parameter file. An ascii ppf file is also written out.

Plot button

use the plot parameters from the panel to create the plot.

Find button

brings up a search box. If a valid parameter name is keyed in followed by the enter key, the cursor will be placed in the appropriate field on the appropriate page.

Drainage Plan Plot PPF Editor

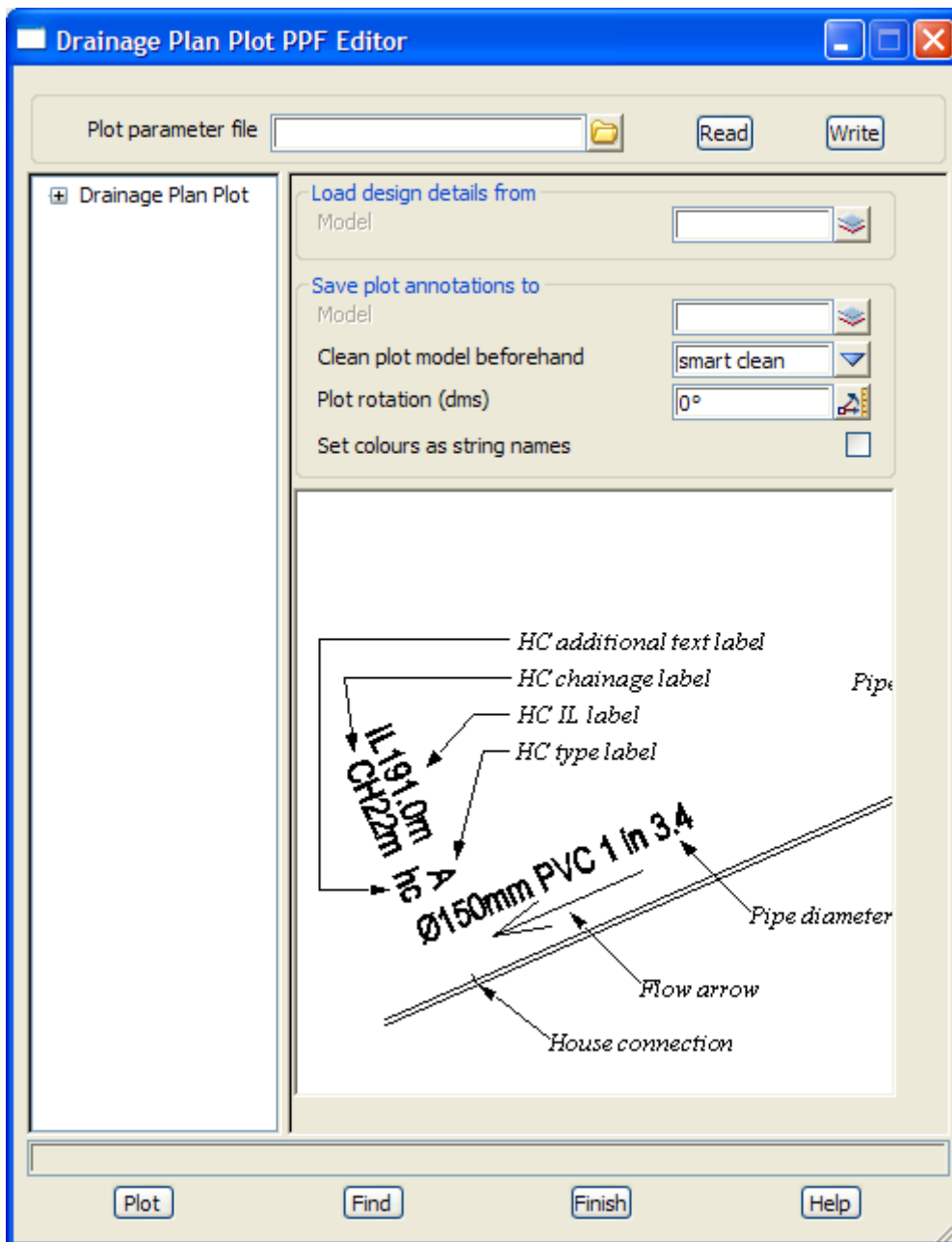
Drainage_Plan_Plot_PPF_Editor

Position of option on menu: Plot =>Drainage Plan Plot PPF Editor

The **drainage plan plot ppf editor** is for creating and/or editing a (binary) drainage and sewer plan plot ppf file and for creating a drainage and/or sewer plan annotation overlay model. An ascii version of the file is also produced.

Note: binary and ascii ppf's are stored *within* the project (not in the folder containing the project).

On selecting the Drainage plan plot ppf editor option, the **Drainage Plan Plot PPF Editor** panel is displayed.



Panel field	Type
Plot parameter file	file box

name for the binary plot parameter file to read in or write out.

Read button

read the given plot parameter file in.

Write button

write out the plot parameters to the given plot parameter file. An ascii ppf file is also written out.

Plot button

use the plot parameters from the panel to create the plot.

Find button

brings up a search box. If a valid parameter name is keyed in followed by the enter key, the cursor will be placed in the appropriate field on the appropriate page.

Drainage Plan Plot

Drainage_Plan_Plot

Note: When creating Drainage Plan Plot overlays, all distances and sizes (including text sizes, offsets, rises, etc.) are specified in world units.

Load design details from

Panel field	Parameter name	Type	Pop-Up
Model	input_model	model	available models

input model containing the drainage design strings.

Save plot annotations to

Panel field	Parameter name	Type	Pop-Up
Model	output_model	model	available models

output model to which the plot annotations are saved.

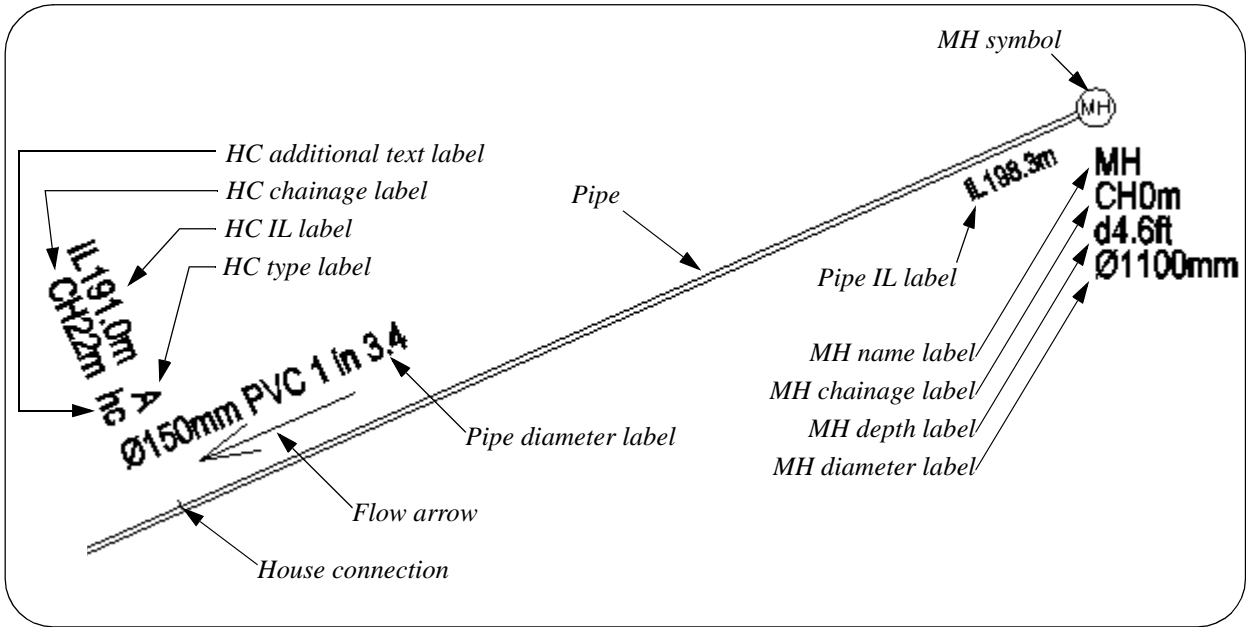
Clean plot model beforehand

plot_model_clean	choice box	smart clean full clean
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*determines how to clean (delete the elements in) the output model, if it exists, before generating the plot annotations. In the case of a **smart clean**, any existing text, flow arrow and bubble annotation elements found that match the annotations about to be generated, will retain their pre-existing positions. In the case of a **full clean**, no information about the pre-existing plot annotation is used, and the new plot annotation is created from scratch.*

Set colours as string names	colour_string_ naming_mode	tick box
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names all created plot annotation strings by their colour names. This will override any user specified string names defined in other sections.



Pipes

Drainage_Plan_Plot_Pipes

Pipe representation

The fields in this section are grid column fields that may each have up to 20 sets (rows) defined.

Panel field	Parameter name	Type	Pop-Up
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Min pipe diam (m)	pipe_dia_min_n	input	
<i>minimum pipe diameter in metres for the nth set of pipe representations.</i>			

Max pipe diam (m)	pipe_dia_max_n	input	
<i>maximum pipe diameter in metres for the nth set of pipe representations. All pipes with diameters that fall between the min and max diameters of this set (row), will be represented according to the values of the other fields in this set. Pipe diameters are defined in the drainage design strings.</i>			

Representation mode	pipe_dia_mode	choice box	none linestyle pipe linestyle and pipe
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determines whether to represent pipes as linestyles and/or solid pipes for the nth set of pipe representations.

Trim mode	trim_edge_mode	choice box	don't trim strings trim pipes trim linestyles trim pipes and linestyles
------------------	----------------	------------	--

determines whether to trim pipe and/or linestyle strings around maintenance holes for the nth set of pipe representations.

Colour	pipe_dia_colour_n	colour	available colours
<i>colour to use for the nth set of pipe representations.</i>			

Linestyle	pipe_dia_linestyle_n	linestyle	available linestyles
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linestyle to use for the nth set of pipe representations.

Linestyle string name pipe_dia_name_n input
string name of linestyles for the nth set of pipe representations.

Pipe string name pipe_edge_name_n input
string name of pipes for the nth set of pipe representations.

Pipe labels

Panel field	Parameter name	Type	Pop-Up
Rise mode	rise_mode	choice box	rise from centre of pipe rise from edge of pipe

determines where all pipe label text rise values are measured from.

Drainage_Plan_Plot_Pipes_Pipe_diameter_labels

Pipe diameter labels

Panel field	Parameter name	Type	Pop-Up
Label mode	pipe_label_mode	choice box	none pre dia post pre dia post grade pre dia post type grade

*determines what text is to be placed for the pipe diameter labels. Pipe types and grades can be included, in addition to diameters. Pipe diameters, types and grades are all defined in the drainage design strings. **Note:** if a pipe attribute of real type named "width" exists and is greater than zero, the pipe is considered to be rectangular and is labelled <width x height>, where the height takes the value of the pipe diameter.*

Text size pipe_label_size input

text size of the pipe diameter labels. The labels will only be created if the size is greater than zero.

Text offset pipe_label_offset input

distance to move the pipe diameter labels along the pipe, from the mid position of the pipe segment. Positive values are to the right.

Text rise pipe_label_rise input

distance to move the pipe diameter labels away from the pipe centreline or edge (depending on setting of rise_mode). A negative value will place the labels on the other side of the pipes.

Text colour pipe_label_colour colour available colours

colour of the pipe diameter labels.

Text style pipe_label_textstyle textstyle available fonts

font of the pipe diameter labels.

Pre text pipe_label_pre_text input

text to be placed before the diameter in the pipe diameter labels.

Post text pipe_label_post_text input

text to be placed after the diameter in the pipe diameter labels.

Units factor pipe_label_factor input

multiplier of diameter values. A Units factor of 1000 will result in the diameters being labelled in mm.

Decimal places pipe_label_decimals input

number of decimal places in labelled diameter values.

Text string name pipe_label_name input

string name of the pipe diameter labels.

Drainage_Plan_Plot_Pipes_Pipe_IL_labels

Pipe IL labels

Panel field Parameter name Type Pop-Up

Text size pipe_text_size_il input

text size of the pipe IL (Invert Level) labels. The labels will only be created if the size is greater than zero.

Text offset pipe_text_offset_il input

distance to move the pipe IL labels along the pipe, from the ends of the pipe. Positive values are towards the mid position of the pipe segment.

Text rise pipe_text_rise_il input

distance to move the pipe IL labels away from the pipe centreline or edge (depending on setting of rise_mode). A negative value will place the labels on the other side of the pipes.

Text colour pipe_text_colour_il colour available colours

colour of the pipe IL labels.

Text style pipe_text_textstyle_il textstyle available fonts

font of the pipe IL labels.

Pre text pipe_text_pre_text_il input

text to be placed before the IL in the pipe IL labels.

Post text pipe_text_post_text_il input

text to be placed after the IL in the pipe IL labels.

Units factor pipe_text_factor_il input

multiplier of IL values. A Units factor of 3.281 will result in the ILs being labelled in feet.

Decimal places pipe_text_decimals_il input

number of decimal places in labelled IL values.

Text string name pipe_text_name_il input

string name of the pipe IL labels.

Maintenance holes

Drainage_Plan_Plot_Maintenance_holes

Maintenance hole representation

Panel field Parameter name Type Pop-Up

MH symbol direction mode mh_symbol_dir_mode choice box

use symbol angle
left
right
average

determines what mode of direction is used to place the MH symbols.

MH symbol angle (dms) mh_symbol_angle angle

angle of MH symbol placement. This is only used depending on the setting of mh_symbol_dir_mode.

The remaining fields in this section are grid column fields that may each have up to 20 sets (rows) defined.

Panel field	Parameter name	Type	Pop-Up
MH type	mh_type_n	input	
	<i>MH type of the nth set of maintenance holes. All MHs of this type will be represented according to the values of the other fields in this set (row). MH types are defined in the drainage design strings.</i>		
MH mode	mh_mode_n	choice box	none text symbol circle
	<i>determines whether a text string, a symbol, or a circle is to be used to represent the nth set of maintenance holes.</i>		
MH Symbol or Text	mh_symbol_n	symbol	available symbols
	<i>symbol or text string to use to represent the nth set of maintenance holes. If mh_mode_n is set to "text", a text string can be typed in. If mh_mode_n is set to "symbol", the symbol name can be chosen from the pop-up list. Ignored if mh_mode_n is set to "circle".</i>		
Justification	mh_symbol_justify_n	choice box	left bottom left middle left top centre bottom centre middle centre top right bottom right middle right top
	<i>justification mode of the MH text for the nth set of maintenance holes, relative to the centres of the MHs. This will only be relevant if mh_mode_n is set to "text".</i>		
Size	mh_symbol_size_n	input	
	<i>size of the MH symbols or text strings for the nth set of maintenance holes. The symbols, circles or text strings will only be created if the size is greater than zero. In the case of a circle, the size is determined to match the diameter of the MH.</i>		
Offset	mh_symbol_offset_n	input	
	<i>distance to move the MH symbols, circles or text strings to the left or right of the MH centres, for the nth set of maintenance holes. Positive values are to the right. The direction of movement is parallel to the angle of the MH symbols (see mh_symbol_dir_mode and mh_symbol_angle).</i>		
Rise	mh_symbol_rise_n	input	
	<i>distance to move the MH symbols, circles or text strings above or below of the MH centres, for the nth set of maintenance holes. Positive values are upwards. The direction of movement is perpendicular to the angle of the MH symbols (see mh_symbol_dir_mode and mh_symbol_angle).</i>		
Colour	mh_symbol_colour_n	colour	available colours
	<i>colour of the MH symbols, circles or text strings, for the nth set maintenance holes.</i>		
Text style	mh_symbol_textstyle_n	textstyle	available fonts
	<i>font of the MH text for the nth set of maintenance holes. This will only be relevant if mh_mode_n is set to "text".</i>		
MH Symbol string name	mh_symbol_name_n	input	
	<i>string name of the MH symbols, circles or text strings for the nth set of maintenance holes.</i>		

Maintenance hole labels

Panel field	Parameter name	Type	Pop-Up
MH label direction mode	mh_text_mode	choice box	use label angle use pipe angle

determines what angle is to be used to position the maintenance hole label text.

MH label angle	mh_text_angle	angle
-----------------------	---------------	-------

angle of MH label text. This is only used depending on the setting of mh_text_mode.

MH label justification	mh_text_justify	choice box	left bottom left middle left top centre bottom centre middle centre top right bottom right middle right top
-------------------------------	-----------------	------------	---

justification mode of all MH label text strings, relative to the MH centres.

Drainage_Plan_Plot_Maintenance_holes_MH_name_labels

MH name labels

Panel field	Parameter name	Type	Pop-Up
Text size	mh_text_size	input	

text size of the MH name labels. The labels will only be created if the size is greater than zero. MH names are defined in the drainage design strings.

Text offset	mh_text_offset	input
--------------------	----------------	-------

distance to move the MH name labels to the left or right of the MH centres. Positive values are to the right. The direction of movement is parallel to the angle of the text, specified by parameters mh_text_mode and mh_text_angle. The justification of the text is specified by parameter mh_text_justify.

Text rise	mh_text_rise	input
------------------	--------------	-------

distance to move the MH name labels above or below the MH centres. Positive values are above. The direction of movement is perpendicular to the angle of the text, specified by parameters mh_text_mode and mh_text_angle. The justification of the text is specified by parameter mh_text_justify.

Text colour	mh_text_colour	colour	available colours
--------------------	----------------	--------	-------------------

colour of the MH name labels.

Text style	mh_text_textstyle	textstyle	available fonts
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font of the MH name labels.

Pre text	mh_text_pre	input
-----------------	-------------	-------

text to be placed before the MH name in the MH name labels.

Post text	mh_text_post	input
------------------	--------------	-------

text to be placed after the MH name in the MH name labels.

Text string name	mh_text_name	input
-------------------------	--------------	-------

string name of the MH name labels.

Drainage_Plan_Plot_Maintenance_holes_MH_diameter_labels

MH diameter labels

Only label if diameter is outside range:

Panel field	Parameter name	Type
Min	mh_text_min_dia	input
Max	mh_text_max_dia	input

range of MH diameters for which the MH diameter labels will not be created. Both Min and Max are entered in metres.

Panel field	Parameter name	Type	Pop-Up
Text size	mh_text_size_dia	input	

text size of the MH diameter labels. The labels will only be created if the size is greater than zero. MH diameters are defined in the drainage design strings.

Text offset	mh_text_offset_dia	input
--------------------	--------------------	-------

distance to move the MH diameter labels to the left or right of the MH centres. Positive values are to the right. The direction of movement is parallel to the angle of the text, specified by parameters mh_text_mode and mh_text_angle. The justification of the text is specified by parameter mh_text_justify.

Text rise	mh_text_rise_dia	input
------------------	------------------	-------

distance to move the MH diameter labels above or below the MH centres. Positive values are above. The direction of movement is perpendicular to the angle of the text, specified by parameters mh_text_mode and mh_text_angle. The justification of the text is specified by parameter mh_text_justify.

Text colour	mh_text_colour_dia	colour	available colours
--------------------	--------------------	--------	-------------------

colour of the MH diameter labels.

Text style	mh_text_textstyle_dia	textstyle	available fonts
-------------------	-----------------------	-----------	-----------------

font of the MH diameter labels.

Pre text	mh_text_pre_dia	input
-----------------	-----------------	-------

text to be placed before the diameter in the MH diameter labels.

Post text	mh_text_post_dia	input
------------------	------------------	-------

text to be placed after the diameter in the MH diameter labels.

Units factor	mh_text_factor_dia	input
---------------------	--------------------	-------

multiplier of diameter values. A Units factor of 1000 will result in the diameters being labelled in mm.

Decimal places	mh_text_decimals_dia	input
-----------------------	----------------------	-------

number of decimal places in labelled diameter values.

Text string name	mh_text_name_dia	input
-------------------------	------------------	-------

string name of the MH diameter labels.

Drainage_Plan_Plot_Maintenance_holes_MH_depth_labels**MH depth labels**

Panel field	Parameter name	Type	Pop-Up
Text size	mh_text_size_depth	input	

text size of the MH depth labels. The labels will only be created if the size is greater than zero. MH depths are defined in the drainage design strings.

Text offset	mh_text_offset_depth	input
--------------------	----------------------	-------

distance to move the MH depth labels to the left or right of the MH centres. Positive values are to the right. The direction of movement is parallel to the angle of the text, specified by parameters

`mh_text_mode` and `mh_text_angle`. The justification of the text is specified by parameter `mh_text_justify`.

Text rise	<code>mh_text_rise_depth</code>	input	
<i>distance to move the MH depth labels above or below the MH centres. Positive values are above. The direction of movement is perpendicular to the angle of the text, specified by parameters <code>mh_text_mode</code> and <code>mh_text_angle</code>. The justification of the text is specified by parameter <code>mh_text_justify</code>.</i>			
Text colour	<code>mh_text_colour_depth</code>	colour	available colours
<i>colour of the MH depth labels.</i>			
Text style	<code>mh_text_textstyle_depth</code>	textstyle	available fonts
<i>font of the MH depth labels.</i>			
Pre text	<code>mh_text_pre_depth</code>	input	
<i>text to be placed before the depth in the MH depth labels.</i>			
Post text	<code>mh_text_post_depth</code>	input	
<i>text to be placed after the depth in the MH depth labels.</i>			
Units factor	<code>mh_text_factor_depth</code>	input	
<i>multiplier of depth values. A Units factor of 3.281 will result in the depths being labelled in feet.</i>			
Decimal places	<code>mh_text_decimals_depth</code>	input	
<i>number of decimal places in labelled depth values.</i>			
Text string name	<code>mh_text_name_depth</code>	input	
<i>string name of the MH depth labels.</i>			

Drainage Plan Plot Maintenance_holes_MH_chainage_labels

MH chainage labels

Panel field	Parameter name	Type	Pop-Up
Chainage mode	<code>mh_text_mode_ch</code>	choice box	running chainage previous chainage next chainage
<i>determines what chainage values will be labelled at the MHs. The "running chainage" option refers to the start of the drainage design string. The "previous chainage" and "next chainage" options refer to the previous and next MHs respectively.</i>			
Text size	<code>mh_text_size_ch</code>	input	
<i>text size of the MH chainage labels. The labels will only be created if the size is greater than zero.</i>			
Text offset	<code>mh_text_offset_ch</code>	input	
<i>distance to move the MH chainage labels to the left or right of the MH centres. Positive values are to the right. The direction of movement is parallel to the angle of the text, specified by parameters <code>mh_text_mode</code> and <code>mh_text_angle</code>. The justification of the text is specified by parameter <code>mh_text_justify</code>.</i>			
Text rise	<code>mh_text_rise_ch</code>	input	
<i>distance to move the MH chainage labels above or below the MH centres. Positive values are above. The direction of movement is perpendicular to the angle of the text, specified by parameters <code>mh_text_mode</code> and <code>mh_text_angle</code>. The justification of the text is specified by parameter <code>mh_text_justify</code>.</i>			
Text colour	<code>mh_text_colour_ch</code>	colour	available colours

colour of the MH chainage labels.

Text style	mh_text_textstyle_ch	textstyle	available fonts
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font of the MH chainage labels.

Pre text	mh_text_pre_ch	input
-----------------	----------------	-------

text to be placed before the chainage in the MH chainage labels.

Post text	mh_text_post_ch	input
------------------	-----------------	-------

text to be placed after the chainage in the MH chainage labels.

Units factor	mh_text_factor_ch	input
---------------------	-------------------	-------

multiplier of chainage values. A Units factor of 3.281 will result in the chainages being labelled in feet.

Decimal places	mh_text_decimals_ch	input
-----------------------	---------------------	-------

number of decimal places in labelled chainage values.

Text string name	mh_text_name_ch	input
-------------------------	-----------------	-------

string name of the MH chainage labels.

House Connections

Drainage_Plan_Plot_House_connections

House connection representation

Panel field	Parameter name	Type	Pop-Up
HC linestyle	hc_line_style	linestyle	available linestyles

linestyle with which to represent the house connections to the pipes. The HCs will be represented as lines perpendicular to the pipe, from the pipe centreline, to the sides of the pipe that the HCs are on.

HC colour	hc_colour	colour	available colours
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colour of the house connection linestyles

HC string name	hc_line_name	input
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string name of the HC lines.

The remaining fields in this section are grid column fields that may each have up to 6 sets (rows) defined.

Panel field	Parameter name	Type	Pop-Up
HC Type	hc_types_n	input	

HC type of the nth set of house connections. All HCs of this type will be represented according to the values of the other fields in this set (row). HC types are defined in the drainage design strings. There are only 6 different HC types used in 12d Model.

HC Type label	hc_type_text_n	input
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text label to be associated with the HC type of the nth set of house connections.

Label HC Type	hc_type_tp_n	tick box
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label the types of the HCs of the nth set of house connections. Depending on the HC type, it may not be desired to label the type.

Label HC IL	hc_type_il_n	tick box
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label the ILs of the HCs of the nth set of house connections. Depending on the HC type, it may not make sense to label the IL.

Label HC Chainage	hc_type_ch_n	tick box
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label the chainages of the HCs of the nth set of house connections. Depending on the HC type, it may not make sense to label the chainages.

Label HC Additional text hc_type_at_n tick box

label the Additional text of the HCs of the nth set of house connections. Depending on the HC type, it may not be desired to label the Additional text.

Drainage_Plan_Plot_House_conections_HC_type_labels

HC type labels

Panel field	Parameter name	Type	Pop-Up
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Text size	hc_type_size	input	
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text size of the HC type labels. The labels will only be created if the size is greater than zero and the parameter hc_type_tp_n is set to "on" for the nth set of house connections. The HC type labels are associated with the HC types are defined by the parameter set hc_type_text_n.

Text offset	hc_type_offset	input	
--------------------	----------------	-------	--

distance to move the HC type labels away from the pipe centreline. Negative values are converted to positive. HC label text is always placed perpendicular to the pipe (or parallel to the HC line) and on the same side of the pipe as the HC. The text will be automatically left justified or right justified, depending on the side.

Text rise	hc_type_rise	input	
------------------	--------------	-------	--

distance to move the HC type labels above or below the HC lines. Positive values are above. The direction of movement is parallel to the pipe (or perpendicular to the HC line). The text will be automatically bottom justified.

Text colour	hc_type_colour	colour	available colours
--------------------	----------------	--------	-------------------

colour of the HC type labels.

Text style	hc_type_textstyle	textstyle	available fonts
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font of the HC type labels.

Text string name	hc_type_name	input	
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string name of the HC type labels.

Drainage_Plan_Plot_House_conections_HC_IL_labels

HC IL labels

Panel field	Parameter name	Type	Pop-Up
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Text size	hc_il_size	input	
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text size of the HC IL (Invert Level) labels. The labels will only be created if the size is greater than zero and the parameter hc_type_il_n is set to "on" for the nth set of house connections.

Text offset	hc_il_offset	input	
--------------------	--------------	-------	--

distance to move the HC IL labels away from the pipe centreline. Negative values are converted to positive. HC label text is always placed perpendicular to the pipe (or parallel to the HC line) and on the same side of the pipe as the HC. The text will be automatically left justified or right justified, depending on the side.

Text rise	hc_il_rise	input	
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distance to move the HC IL labels above or below the HC lines. Positive values are above. The direction of movement is parallel to the pipe (or perpendicular to the HC line). The text will be automatically bottom justified.

Text colour	hc_il_colour	colour	available colours
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colour of the HC IL labels.

Text style	hc_il_textstyle	textstyle	available fonts
	<i>font of the HC IL labels.</i>		
Pre text	hc_il_pre	input	
	<i>text to be placed before the IL in the HC IL labels.</i>		
Post text	hc_il_post	input	
	<i>text to be placed after the IL in the HC IL labels.</i>		
Units factor	hc_il_factor	input	
	<i>multiplier of IL values. A Units factor of 3.281 will result in the ILs being labelled in feet.</i>		
Decimal places	hc_il_decimals	input	
	<i>number of decimal places in labelled IL values.</i>		
Text string name	hc_il_name	input	
	<i>string name of the HC IL labels.</i>		

Drainage_Plan_Plot_House_connections_HC_chainage_labels

HC chainage labels

Panel field	Parameter name	Type	Pop-Up
Chainage mode	hc_chain_mode	choice box	hc lot offset running chainage previous chainage next chainage

determines what chainage values will be labelled at the HCs. The "running chainage" option refers to the start of the drainage design string. The "previous chainage" and "next chainage" options refer to the previous and next MHs respectively. The "hc lot offset" option is a special one that looks for a user-defined attribute called "<hc_name> hc lot offset" in the house connections along the drainage design strings. If the attribute is found, its value is set as the HC chainage label. If the attribute is not found, the value of the HC chainage label is set to a default HC Lot Offset of 5.0.

Text size	hc_chain_size	input	
------------------	---------------	-------	--

text size of the HC chainage labels. The labels will only be created if the size is greater than zero and the parameter hc_type_ch_n is set to "on" for the nth set of house connections.

Text offset	hc_chain_offset	input	
--------------------	-----------------	-------	--

distance to move the HC chainage labels away from the pipe centreline. Negative values are converted to positive. HC label text is always placed perpendicular to the pipe (or parallel to the HC line) and on the same side of the pipe as the HC. The text will be automatically left justified or right justified, depending on the side.

Text rise	hc_chain_rise	input	
------------------	---------------	-------	--

distance to move the HC chainage labels above or below the HC lines. Positive values are above. The direction of movement is parallel to the pipe (or perpendicular to the HC line). The text will be automatically bottom justified.

Text colour	hc_chain_colour	colour	available colours
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colour of the HC chainage labels.

Text style	hc_chain_textstyle	textstyle	available fonts
-------------------	--------------------	-----------	-----------------

font of the HC chainage labels.

Pre text	hc_chain_pre	input	
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text to be placed before the chainage in the HC chainage labels.

Post text	hc_chain_post	input	
	<i>text to be placed after the chainage in the HC chainage labels.</i>		
Units factor	hc_chain_factor	input	
	<i>multiplier of chainage values. A Units factor of 3.281 will result in the chainages being labelled in feet.</i>		
Decimal places	hc_chain_decimals	input	
	<i>number of decimal places in labelled chainage values.</i>		
Text string name	hc_chain_name	input	
	<i>string name of the HC chainage labels.</i>		

Drainage_Plan_Plot_House_conections_HC_additional_text_labels

HC additional text labels

Panel field	Parameter name	Type	Pop-Up
Additional text	hc_text	input	
	<i>the additional text to place near the HCs.</i>		
Text size	hc_text_size	input	
	<i>text size of the HC additional text labels. The labels will only be created if the size is greater than zero and the parameter hc_type_at_n is set to "on" for the nth set of house connections.</i>		
Text offset	hc_text_offset	input	
	<i>distance to move the HC additional text labels away from the pipe centreline. Negative values are converted to positive. HC label text is always placed perpendicular to the pipe (or parallel to the HC line) and on the same side of the pipe as the HC. The text will be automatically left justified or right justified, depending on the side.</i>		
Text rise	hc_text_rise	input	
	<i>distance to move the HC additional text labels above or below the HC lines. Positive values are above. The direction of movement is parallel to the pipe (or perpendicular to the HC line). The text will be automatically bottom justified.</i>		
Text colour	hc_text_colour	colour	available colours
	<i>colour of the HC additional text labels.</i>		
Text style	hc_text_textstyle	textstyle	available fonts
	<i>font of the HC additional text labels.</i>		
Text string name	hc_text_name	input	
	<i>string name of the HC additional text labels.</i>		

Bubbles

Drainage_Plan_Plot_Bubbles

Panel field	Parameter name	Type	Pop-Up
Draw bubbles	bubble_draw_mode	tick box	
	<i>draw bubbles (circles) around the MH name labels.</i>		
Bubble colour	bubble_colour	colours	available colours
	<i>colour of the bubbles.</i>		
Bubble factor	bubble_factor	input	
	<i>the initial radius of the bubble is calculated as half the text length of the MH name label. The bubble</i>		

factor is used to multiply the initial radius to give the final bubble radius. Factors greater than 1 will increase the bubble size.

Bubble string name	bubble_name	input
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string name of the bubbles.

Flow arrows

Drainage_Plan_Plot_Flow_arrows

Panel field	Parameter name	Type	Pop-Up
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Draw flow arrows	flow_arrow_mode	tick box
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draw flow arrows near the pipe diameter labels, showing the direction of flow in the pipes.

Arrow colour	flow_arrow_colour	colour box
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colour of the flow arrows.

Arrow length	flow_arrow_length	input
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length of the flow arrows. Setting the length to a negative number will place the arrow on the other side of the pipe (whilst still maintaining the correct arrow direction).

Arrow string name	flow_arrow_name	input
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string name of the flow arrows.

Plot Frame and PPF Editor

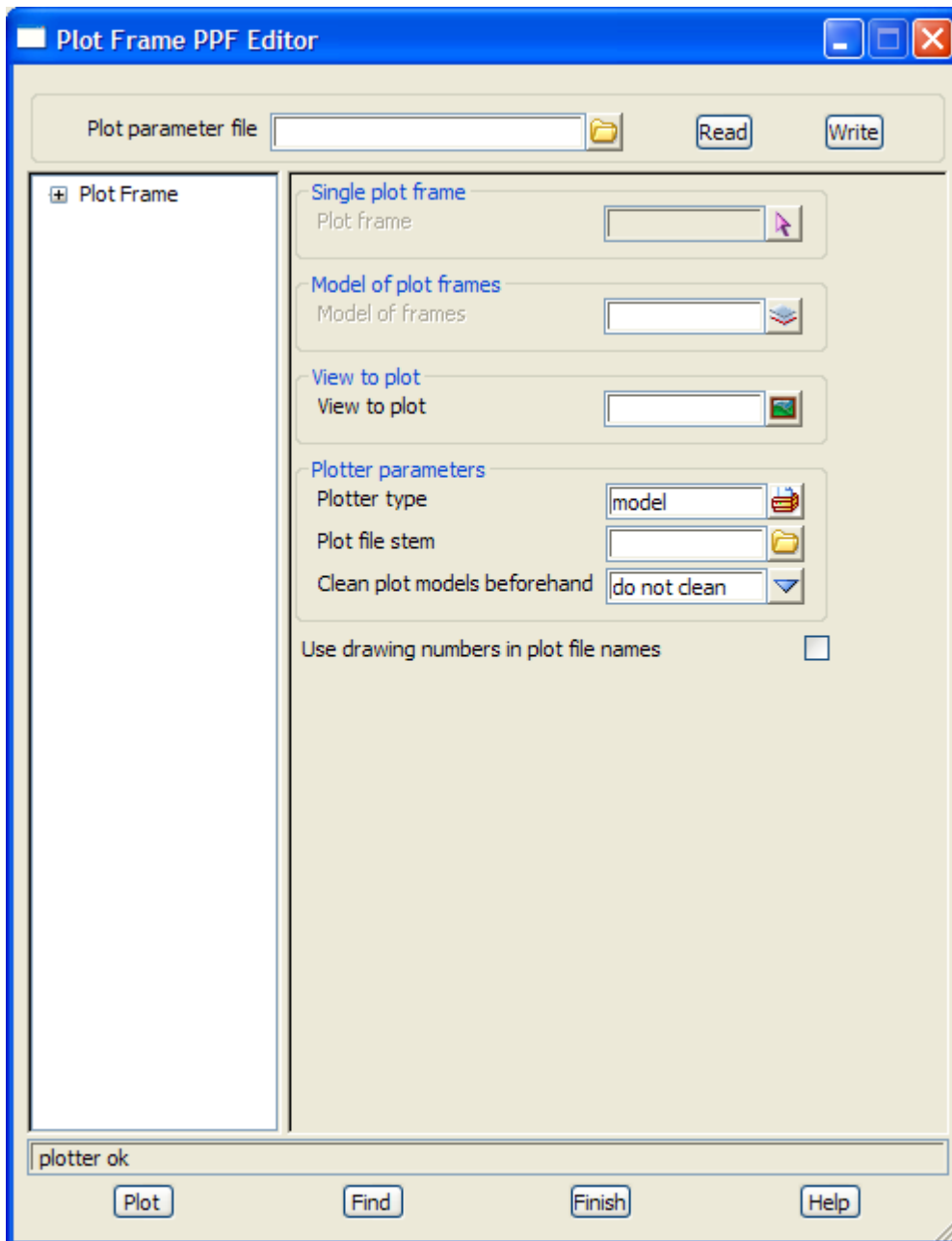
Plot_Frame_PPF_Editor

Position of option on menu: Plot =>Plot Frame and PPF Editor

The **Plot frame ppf editor** is for creating and/or editing a (binary) plot frame ppf file and for creating a cross section plot.

Note: binary ppf's are stored *within* the project (not in the folder containing the project as the ascii ppf's were).

On selecting the Plot frame and ppf editor option, the **Plot Frame PPF Editor** panel is displayed.



Panel field	Type
Plot parameter file	file box

name for the binary plot parameter file to read in or write out.

Read button

read the given plot parameter file in.

Write button

write out the plot parameters to the given plot parameter file. An ascii ppf file is also written out.

Plot button

use the plot parameters from the panel to create the plot.

Find button

brings up a search box. If a valid parameter name is keyed in followed by the enter key, the cursor will be placed in the appropriate field on the appropriate page.

Plot Frame

Plot_Frame

Plot frame

Section: Single Plot Frame

The fields and buttons used in this section have the following functions.

Field Description	Parameter name	Type	Pop-Up
Plot frame	single_frame	string	select box

select the plot frame to be plotted.

Section: Model of Plot Frames

The fields and buttons used in this section have the following functions.

Field Description	Parameter name	Type	Pop-Up
Model of frames	model_of_frames	model	box

model of plot frames to plot.

Section: View To Plot

The fields and buttons used in this section have the following functions.

Field Description	Parameter name	Type	Pop-Up
View to plot	view_name	model	box

view in which data to plot resides.

Section: Plotter parameters

The fields and buttons used in this section have the following functions.

Field Description	Parameter name	Type	Pop-Up
Plotter type	plotter_type	plotter	box

a valid plotting option is selected.

Plot file stem	plot_stem	plotter	box
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plot file name. The appropriate extension is added dependant on the plotter type selected.

Clean plot models beforehand

plot_model_clean	choice box	do not clean prompt for clean always clean
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whether to clean (delete the elements in) any resultant plot models that may already exist, before generating the plot(s). This parameter is only applicable if plotting to a model or models. Note that if the models are cleaned using this parameter, any non-plot or locked elements found in the models will not be cleaned from the models, and the plot job will be cancelled.

Title Block

Plot_Frame_Title_block

Common title block parameters

Panel field	Parameter name	Type
Standard title	plot_border	tick box
<i>if ticked, a standard 12d title block will be used.</i>		
Use title file	use_title_file	tick box
<i>if ticked, a user defined title file is used.</i>		
Title line 1	title_1	input
<i>if Standard title is ticked, Title line 1 is the first line of title text. If Use title file is ticked, Title line 1 is substituted for the title block variable \$title_1.</i>		
Title line 2	title_2	input
<i>if Standard title is ticked, Title line 2 is the second line of title text. If Use title file is ticked, Title line 2 is substituted for the title block variable \$title_2.</i>		

12d default title block parameters

Panel field	Parameter name	Type	Pop-Up
Text size	title_text_size	input	
<i>text size of title text.</i>			
Text colour	title_colour	colour	available colours
<i>colour of title text.</i>			

Plot_Frame_Title_block_User_title_info

User title info

The parameters shown below are subject to the appropriate title block variables existing in the title file. For more information on these variables see the section "Title Block Variables" .

Panel field	Parameter name	Type	Pop-Up
Title file	title_file	file box	available title files
<i>specifies the name of the title file to use. If a valid title file exists, the specified Name values will be filled out in the grid using the title block variable \$user_text_n.</i>			
Name		output	
<i>the alias for the nth user text specified in the title file.</i>			

Value	user_text_n	input
	<i>the alias text to be substituted in for the user text specified.</i>	
Time format	time_format	input
	<i>the time format relates to the \$time title block variable. For more information on the time formats see the section “Specifying the Format for \$time” .</i>	
Start page number	start_page_number	input
	<i>used as the starting value for the title block variable \$page_number. If missing, \$page_number starts at 1.</i>	
Start drawing number	start_drawing_number	input
	<i>used as the starting value for the title block variable \$drawing_number. If missing, \$drawing_number starts at 1.</i>	
Drawing number prefix	drawing_number_prefix	input
	<i>the value entered is used for the title block variable \$drawing_number_prefix.</i>	
Drawing number postfix	drawing_number_postfix	input
	<i>the value entered is used for the title block variable \$drawing_number_postfix.</i>	

User title info

The parameters shown below are subject to the appropriate title block variables existing in the title file. For more information on these variables see the section “Title Block Variables” .

Panel field	Parameter name	Type	Pop-Up
Title file	title_file	file box	available title files
	<i>specifies the name of the title file to use. If a valid title file exists, the specified Name values will be filled out in the grid using the title block variable \$user_text_n.</i>		
Name		output	
	<i>the alias for the nth user text specified in the title file.</i>		
Value	user_text_n	input	
	<i>the alias text to be substituted in for the user text specified.</i>		
Time format	time_format	input	
	<i>the time format relates to the \$time title block variable. For more information on the time formats see the section “Specifying the Format for \$time” .</i>		
Start page number	start_page_number	input	
	<i>used as the starting value for the title block variable \$page_number. If missing, \$page_number starts at 1.</i>		
Start drawing number	start_drawing_number	input	
	<i>used as the starting value for the title block variable \$drawing_number. If missing, \$drawing_number starts at 1.</i>		
Drawing number prefix	drawing_number_prefix	input	
	<i>the value entered is used for the title block variable \$drawing_number_prefix.</i>		
Drawing number postfix	drawing_number_postfix	input	
	<i>the value entered is used for the title block variable \$drawing_number_postfix.</i>		

Convert Ascii PPF to Binary

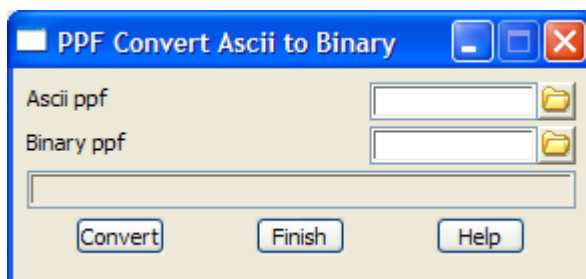
ppf_convert_ascii_to_binary

Position of option on menu: Plot =>Plot and PPF Editors =>PPF Convert Ascii to Binary

The **convert ascii ppf to binary** option is for converting the old ascii plot parameter files to the new binary plot parameter file format.

Note: binary ppf's are stored *within* the project (not in the folder containing the project as the ascii ppf's were).

On selecting the ppf convert ascii to binary option, the **ppf Convert Ascii to Binary** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
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Ascii ppf	file box		
<i>name of the ascii plot parameter file to convert.</i>			

Binary ppf	button		
<i>convert the ascii ppf to the equivalent binary ppf. The binary ppf file will be stored in the current project.</i>			

Convert	button		
<i>convert the ascii ppf to a binary ppf.</i>			

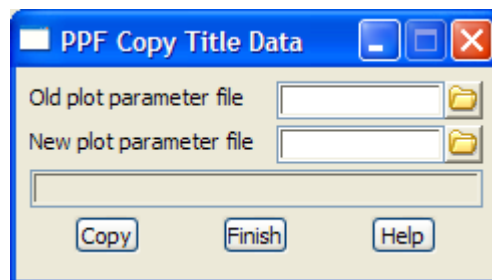
Copy Title Data

ppf_copy_title_data

Position of option on menu: Plot =>Plot and PPF Editors =>Copy title data

The **copy title data** option is for copying the title data in one binary plot parameter to another binary plot parameter file format.

On selecting the Copy title data option, the **PPF Copy Title Data** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Old plot parameter file	file box		
<i>name of the plot parameter file to copy the title data from.</i>			
New plot parameter file	button		
<i>name of the plot parameter file to copy the title data to.</i>			
Copy	button		
<i>copy the title data from one ppf file to another.</i>			

25 Reports

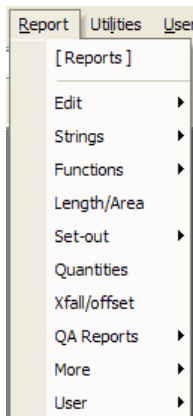
reports

Position of menu: It is on the main menu as Report

The Reports menu contains options to report on the strings in a model, polygon details (area, centroid), string set outs, string names, crest and sag points and x-falls.

The Reports menu is

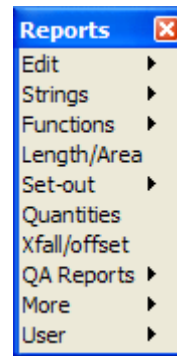
on Main menu



create floating *Reports* menu

Edit edit a .rpt file
Strings report on strings, crest/sag points, names
Functions report on functions
Length/Area length, area, centroid of strings
Set-out point and string set-out information
Quantities calculations of quantities
Xfall/offset report x-fall between two strings
QA Reports QA reports
More further reports

on 12d Model menu and floating menu



For the option/menu *Edit*, go to the section "Edit"

<i>Strings</i>	"Strings"
<i>Functions</i>	"Functions"
<i>Length/area</i>	"Length and Area"
<i>Set-out</i>	"Set-Out Reports"
<i>Quantities</i>	"Quantities"
<i>X-fall</i>	"X-Fall and Offset Report"
<i>QA reports</i>	"QA Reports"
<i>More</i>	"More Reports"

Each menu option will now be discussed.

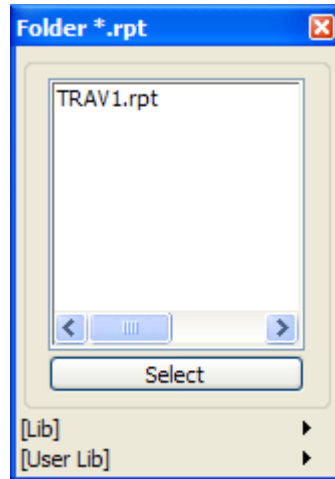
Edit

edit_a_file__rpt

Position on menu: Report =>Edit

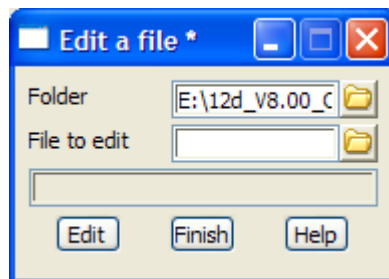
The Edit option is used to edit any (printer) reports ending in *.rpt.

On walking right on *Edit*, the list of files ending in *.rpt are displayed.



Double clicking on the report name will bring up the report in the system editor.

Clicking on the *Edit* at the top of the menu brings up the **Edit a file** panel.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Folder <i>the folder to look for the report file.</i>	folder box	current folder	folder browser
File to edit <i>name of the file to bring up in the system editor.</i>	file box		*.rpt

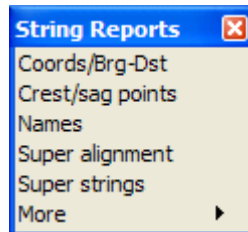
Strings

string_reports

Position of menu: Report =>Strings

The Strings menu contains options to report on selected strings, report the crest/sag points for a string and create a list of all the unique string names in a model or view.

The Strings walk-right menu is



For the option *Coords/Brg-Dst*, go to the section

Crest/sag points

Names

Super alignment

Super strings

More

"Coordinates or Bearing-Distance" .

"Crest/Sag Points" .

"Names" .

"Super Alignment"

"Report for Super Strings"

"More Strings Reports" .

Coordinates or Bearing-Distance

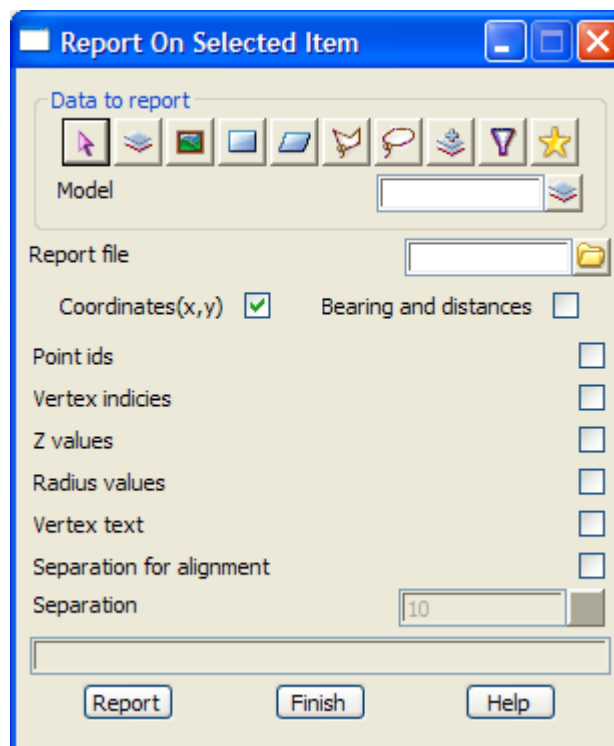
report_on_selected_item

Position of option on menu: Report =>Strings =>Coords/Brg-Dst

The **Coords/Brg-Dst** option is used to generate a report on selected items defined by a source box. The report can be of the form of coordinates of each point of a string, or the co-ordinates of the first point of a string and the bearings and distances from each other point of the string to the first point of the string.

For an alignment string it will report on the HIP's and VIPS. If there is a non-zero separation value, then at each chainages that are multiples of the separation value, the report also includes the chainage, x, y, z, bearing for horizontal and chainage, height (z), grade for vertical.

On selecting the Coords/Brg-Dst option, the **Report on Selected Item** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Data source type		Model	
<i>data selection type - for a full description go to "Data Source" in the chapter "Tools and Concepts"</i>			
Data source	input		
<i>source of data is to be processed.</i>			
Report file	input		*.rpt
<i>name of the file to report to.</i>			
Coordinates(x,y)	tick box	tick	
<i>if tick, the coordinate report parameters will be displayed which will determine what other information as well as the coordinate values will be placed in the report. NOTE: If an alignment string is part of the selection, the report will include all relevant details about the alignment. In this case the report will not use the coordinate report parameters as specified, for the alignment string.</i>			

Bearing and Distances tick box

if tick, the bearing and distance report parameters will be displayed which will determine what other information as well as the bearing and distance values will be placed in the report.

Coordinate report parameters

if the Coordinates(x,y) option is selected, the following parameters will be displayed

Point ids tick box

if selected, any valid point ids will be shown in the report.

Vertex indices tick box

if selected, vertex indices will be shown in the report.

Z Values tick box

if selected, any valid z values will be shown in the report.

Radius values tick box

if selected, any valid radius values will be shown in the report.

Vertex Text tick box

if selected, any valid vertex text values will be shown in the report.

Separation for Alignment tick box

if selected, the separation for alignment box will be enabled.

Separation input box 10

if enabled by ticking the previous tick box, the alignment string information will be reported at a chainage interval given by the separation value.

Report button

run the option and create the report.

Crest/Sag Points

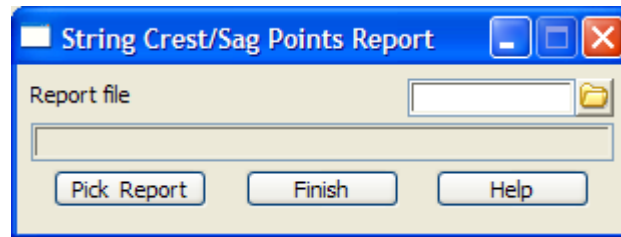
string_crest_sag_points_report

Position of option on menu: Report =>Strings =>Crest sag points

The crest/sag points option is used to generate a (printer) report on the crests and sags points of a string.

A number of strings can be reported on by selecting them in turn

On selecting the crest/sag points option, the **string crest/sag points report** panel is displayed.



The fields and buttons in this panel are used as follows

Field Description	Type	Defaults	Pop-Up
Report file <i>name of the file to contain the reports on the crest and sag points of strings.</i>	input		*.rpt

Pick & Report button
*as strings are selected, the crest and sag points report is generated and appended to the report file.
 The cycle is terminated by clicking RB to raise the pick ops menu and selecting cancel from it.*

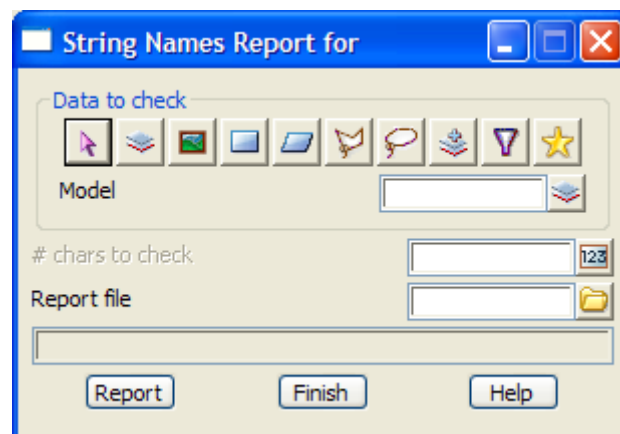
Names

string_names_report_for

Position of option on menu: Report =>Strings =>Names

The names option is used to report on all the unique strings in a model or on a view.

Selecting Names displays the **String Names Report for** panel.



If the **report** button is selected, then all the strings in the model/view given by the model/view to report field will be checked and all unique names, plus a frequency count, will be written to the report file.

The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Data source type		Model	
<i>data selection type - for a full description go to "Data Source" in the chapter "Tools and Concepts"</i>			
Data source			
<i>type of data source.</i>			
# chars to check	input		
<i>if non blank, the number of characters to be used in the string name when checking for uniqueness. If blank, then the entire string name is used.</i>			
Report file	file box		*.rpt files
<i>name of the file for the report.</i>			
Report	button		
<i>report on all the unique string names in model/view.</i>			

Super Alignment

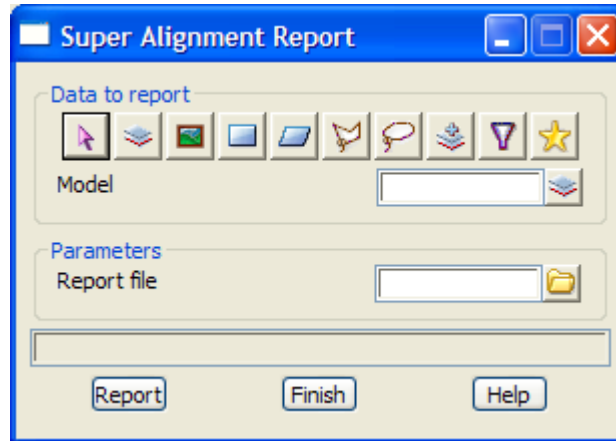
super_alignment_report

Position of option on menu: Report =>Strings =>Super alignment

Report on the super alignment that gives information on the horizontal and vertical components.

This option is under development.

On selecting the Super alignment option, the **Super Alignment Report** panel is displayed.



The fields and buttons used in this panel have the following functions.

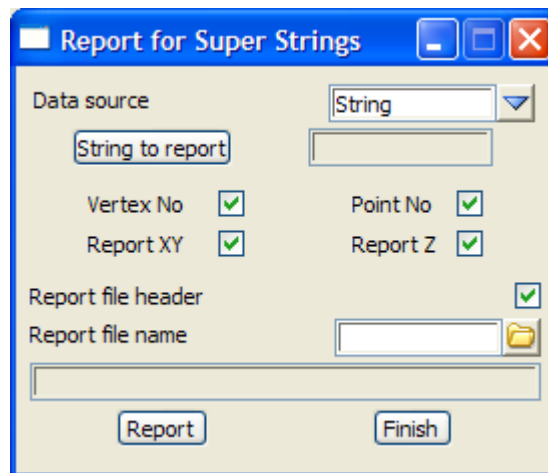
Field Description	Type	Defaults	Pop-Up
Data source type		Model	
<i>data selection type - for a full description go to "Data Source" in the chapter "Tools and Concepts"</i>			
Data source			
<i>type of data source.</i>			
Report file	input		*.rpt
<i>name of the file to report to.</i>			
Report	button		
<i>run the option and create the report.</i>			

Report for Super Strings

report_super_string_panel

Position of option on menu: Report =>Strings =>Super strings

This option reports on information in the super string.



The fields and buttons used in this panel have the following functions:

Field Description	Type	Defaults	Pop-Up
Data source type		Model	
<i>data selection type - for a full description go to "Data Source" in the chapter "Tools and Concepts"</i>			
Data source			
<i>type of data source.</i>			
Vertex index	tick box	tick	
<i>if tick, vertex indices are reported.</i>			
Point id	tick box	tick	
<i>if tick, point ids are reported.</i>			
Report XY	tick box	tick	
<i>if tick, x and y values are reported.</i>			
Report Z	tick box	tick	
<i>if tick, z values are reported.</i>			
Report file header	input box	tick	
<i>if tick, a header including the date and model name and string names is included.</i>			
Report file name	input box		
<i>name of the report.</i>			
Report	button		
<i>Run the option.</i>			

More Strings Reports

`more_string_reports`

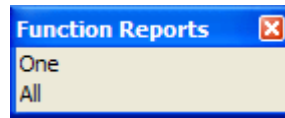
There are currently no options on this menu.

Functions

function_reports

Position of menu: Report =>Functions

A report can be made on a function. The function walk-right menu is



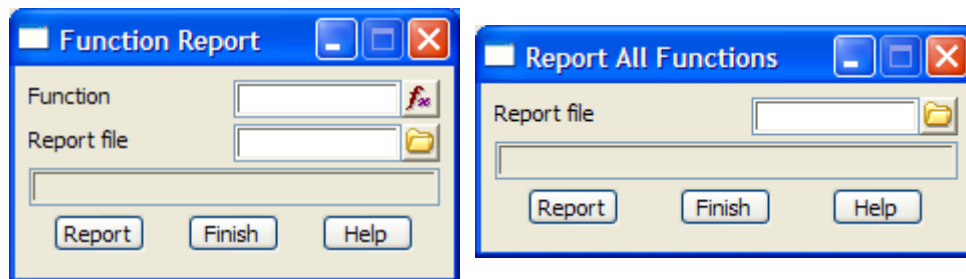
Report a Function, Report all Functions

report_all_functions function_report

Position of option on menu: Report =>Functions =>One

Position of option on menu: Report =>Functions =>All

On selecting the report or report all option, the **function report/ report all functions** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Function <i>name of the function to be reported.</i>	function box		available functions
Report file <i>name of the file to write the report to.</i>	file box		*.rpt files
Report <i>after selecting this button, a report on the function/ all functions is produced.</i>	button		

Length and Area

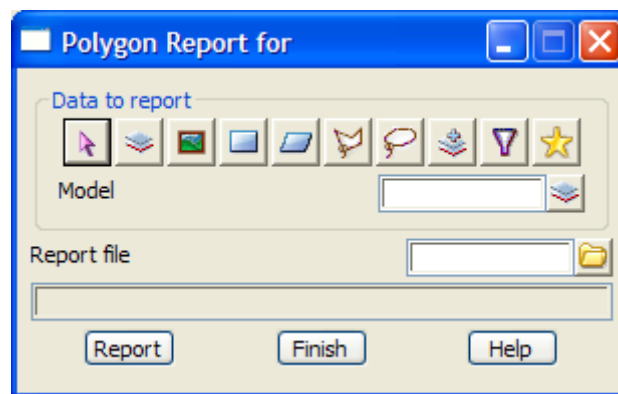
polygon_report_for

Position of option on menu: Report =>Length/Area

The Length/area (Polygons) option creates a report containing the following information for each selected string:

- ▲ string name
- ▲ if the string is closed or not
- ▲ length of the string
- ▲ area of the string (if not closed, join first and last points)
- ▲ centroid co-ordinates

On selecting the Length/Area option, the **Polygon Report for** panel is displayed.



The fields and buttons in this panel are used as follows

Field Description	Type	Defaults	Pop-Up
Data source type		Model	
<i>data selection type - for a full description go to "Data Source" in the chapter "Tools and Concepts"</i>			
Data source			
<i>type of data source.</i>			
Report file	input		*.rpt
<i>file for the polygon reports.</i>			
Report	button		
<i>produce a polygon report for all strings selected in the Data source.</i>			

Set-Out Reports

set_out_report

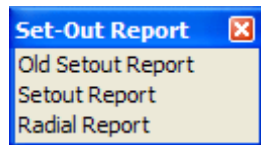
Position of menu: Report =>Set-out

The Set out report options are for reporting the bearing and distance from a selected instrument station to individual points, strings, models of strings or views of strings.

In the *Setout report*, a backsight stations can be selected and the bearing of the **line** from the instrument station to the backsight station reported. Individual backsight points or strings of backsight points can be selected for reporting.

In the *Radial report*, the report can be sorted by point number, bearing or distance.

The set outs walk-right menu is



old set out report fro V5.0

set out report for strings

set out report sorted by name, distance or bearing

For the option *Old setout report*, go to the section "Old Setout Report"

Setout report

"Setout Report"

Radial report

"Radial Report"

The menu options will now be discussed.

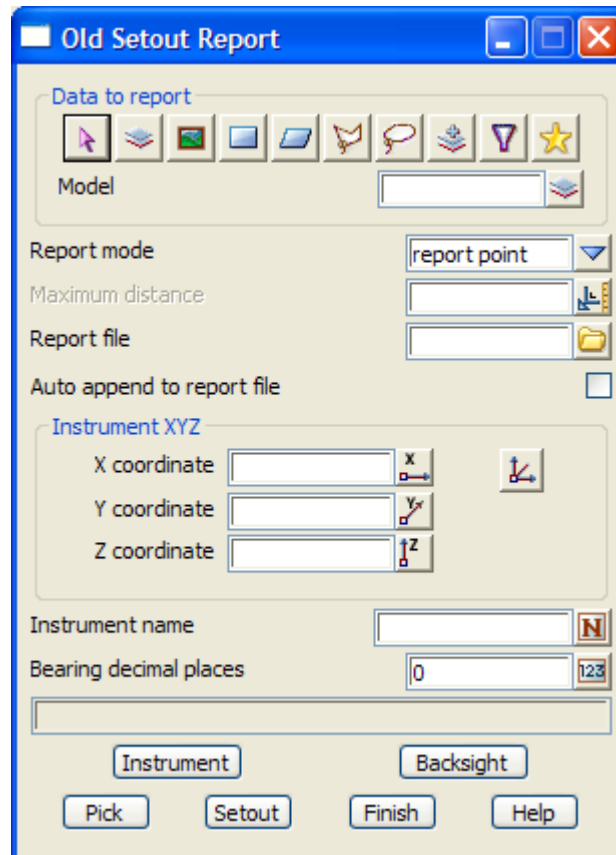
Old Setout Report

old_setout_report

Position of option on menu: Report =>Set out =>Old setout report

The setout report from 12d Model V5. This option has been rewritten for 12d Model V6 and is called **Setout Report**.

On selecting the **Old setout report** option, the **Old Setout Report** panel is displayed.



The fields and buttons in this panel are used as follows

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Data source type		Model	
-------------------------	--	-------	--

data selection type - for a full description go to "Data Source" in the chapter "Tools and Concepts"

Data source			
--------------------	--	--	--

type of data source.

Report mode	input		report points, report string
--------------------	-------	--	------------------------------

*if **report points**, report selected points. Otherwise report on all points in the selected string.*

Maximum distance	input		
-------------------------	-------	--	--

*if **non-blank**, any points further than the maximum distance from the instrument station will not be reported on. If **blank**, all selected points will be reported on*

Report file	input		
--------------------	-------	--	--

file for the backsight and setout reports

Instrument XYZ/name	output		
----------------------------	--------	--	--

co-ordinates/name of the current instrument station

Bearing decimal places input
number of decimal places to report the bearings to

Instrument button
the required instrument station is selected and its name and position are reported in the instrument XYZ and instrument name panel fields.

Backsight button
a backsight is selected and written to the report file.

Pick button
*After pick is chosen, a set out report is written to the report file for any selected strings. If the report mode is **report point**, only the individual point is reported. If the report mode is **report string**, all the points in the string are reported.
The cycle is terminated by clicking RB to raise the **pick ops** menu and selecting **cancel** from it.*

Setouts button
produce a set out report for all the strings in the model/view given in the model/view field.

How to Use the Panel and Panel Messages

- (a) Enter the report file name and maximum distance.
- (b) The instrument station is chosen by activating the **station** button and selecting the required station point. It will then be reported in the file
- (c) Any backsight points to be reported can then be chosen by picking the **backsight** button and selecting the backsight point.
- (d) To report on individual strings or points, set the report mode to either point or string. The **pick** button is then activated and the individual points or strings selected. The cycle is terminated by clicking RB to raise the **pick ops** menu and selecting **cancel** from it.
To report on all the strings in a model/view, give the model/view in the model/view field, and select the **setout** button.

Note

The instrument station can be changed at any time by selecting the **station** button and picking the new station.

All backsight and set outs will then be taken from the new instrument station.

Setout Report

setout_report

Position of option on menu: Report =>Set out =>Setout report

In the *Setout report*, a backsight stations can be selected and the bearing of the **line** from the instrument station to the backsight station reported. Individual backsight points or strings of backsight points can be selected for reporting.

The instrument station can be changed at any time and new backsight and set outs reported.

The set out option prints the following information:

instrument station

string name, point number, x, y, z

backsight point

string name, point number, x, y, z, bearing to the line joining the instrument and backsight, horizontal distance, height difference between instrument station and the backsight

point set-out point

string name, point number, x, y, z, bearing, horizontal distance, height difference between instrument station and the point

On selecting the Setout report option, the **Setout Report** panel is displayed.

The fields and buttons in this panel are used as follows

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Data source type		Model	
-------------------------	--	-------	--

data selection type - for a full description go to "Data Source" in the chapter "Tools and Concepts"

Data source

type of data source.

Report mode choice box report points, report string
*if **report points**, report selected points. Otherwise report on all points in the selected string.*

Maximum distance input
*if **non-blank**, any points further that the maximum distance from the instrument station will not be reported on. If **blank**, all selected points will be reported on*

Report file file box
file for the backsight and setout reports

Instrument XYZ/name output
co-ordinates/name of the current instrument station

Bearing decimal places input
number of decimal places to report the bearings to

Instrument button
the required instrument station is selected and its name and position are reported in the instrument XYZ and instrument name panel fields.

Backsight button
a backsight is selected and written to the report file.

Pick button
*After pick is chosen, a set out report is written to the report file for any selected strings. If the report mode is **report point**, only the individual point is reported. If the report mode is **report string**, all the points in the string are reported.
The cycle is terminated by clicking RB to raise the **Pick ops** menu and selecting **Cancel** from it.*

Setouts button
produce a set out report for all the strings in the model/view given in the model/view field.

How to Use the Panel and Panel Messages

- (a) Enter the report file name and maximum distance.
- (b) The instrument station is chosen by activating the **station** button and selecting the required station point. It will then be reported in the file
- (c) Any backsight points to be reported can then be chosen by picking the **backsight** button and selecting the backsight point.
- (d) To report on individual strings or points, set the report mode to either point or string. The **pick** button is then activated and the individual points or strings selected. The cycle is terminated by clicking RB to raise the pick ops menu and selecting cancel from it.
To report on all the strings in a model/view, give the model/view in the model/view field, and select the **setout** button.

Note

The instrument station can be changed at any time by selecting the **station** button and picking the new station.

All backsight and set outs will then be taken from the new instrument station.

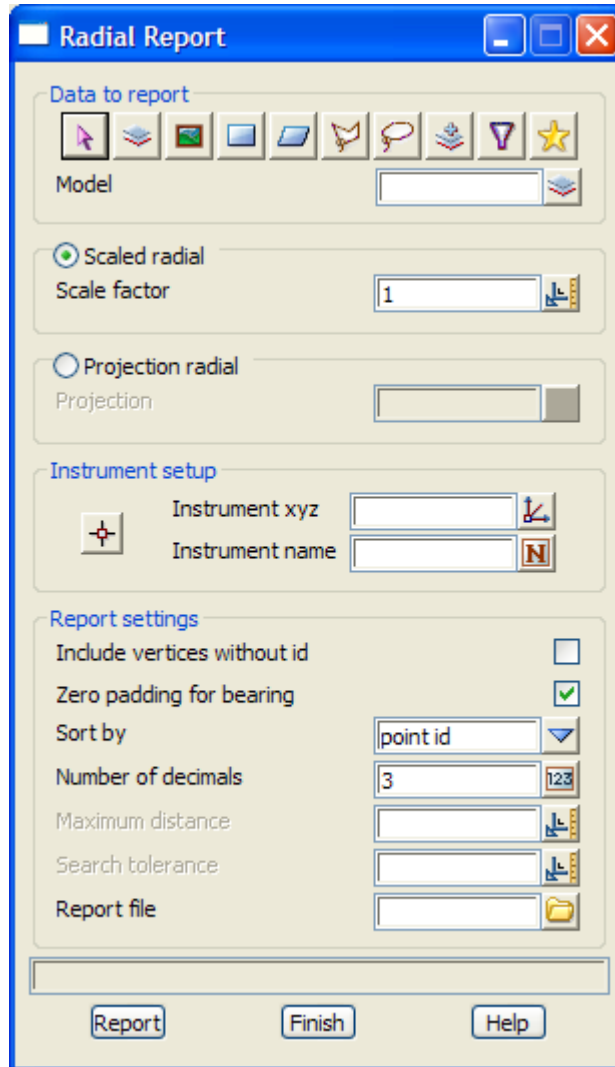
Radial Report

radial_report

Position of option on menu: Report =>Set out =>Radial report

The radial report reports the bearing and distance from the Instrument to selected vertices. the report can be sorted by point id, bearing or distance.

Selecting Radial report brings up the **Radial Report** panel.



The fields and buttons in this panel are used as follows

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Data source type

Model

data selection type - for a full description go to "Data Source" in the chapter "Tools and Concepts"

Data source

type of data source.

Scaled radial radio button

if selected, the report uses a fixed scale factor.

Scale factor input 1

if scaled radial is selected, the fixed scale factor to use

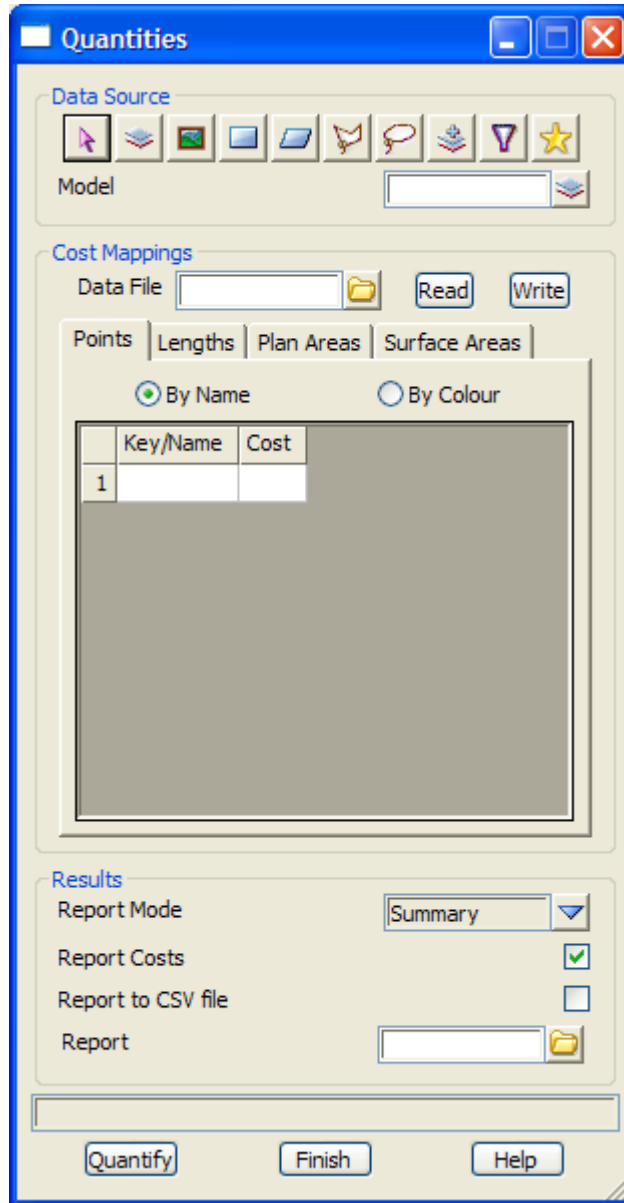
- Projection radial** radio button
if selected, the report uses a projection for calculating distances
- Projection** projection box available projections
*if **projection radial** is selected, the selected projection is used when calculating distances*
- Instrument setup**
*when the instrument point is selected, the **Instrument co-ordinates and name** is displayed in the Instrument xyz and Instrument name fields.*
- Report settings**
- Include points without id** tick box
*if **tick**, vertices with a non blank point id are included in the report.
if **not tick**, only vertices with non blank point id are included in the report.*
- Zero padding for bearing** tick box
*if **tick**, include extra zeros for minutes and seconds.*
- Sort by** choice box point id point id, bearing, distance
*if **point id**, the report is sorted by the point id's on the vertex.
bearing , the report is sorted by the bearing to the point.
distance , the report is sorted by the distance to the point.*
- Number of decimals** input 3
number of decimal places for reporting co-ordinates
- Maximum distance** input
*if **non-blank**, any vertices further than the maximum distance from the instrument station will not be reported on. If **blank**, all vertices points will be reported on*
- Search tolerance** input
when a vertex is found, any vertices with the same point id within the search distance of the vertex are not reported. Also no vertices closer to the instrument point than this distance will be reported.
- Report file** file box
file for the setout reports
- Report** button
produce the report

Quantities

quantities

Position of option on menu: Report =>Quantities

Selecting Quantities brings up the **Quantities** panel.



The fields and buttons in this panel are used as follows

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Data source type Model

data selection type - for a full description go to "Data Source" in the chapter "Tools and Concepts"

Data source

type of data source.

Data file file box

*set up file for the costing data - file is read/written using the **Read/Write** buttons.*

Costing tabs**Points tab and grid****By name****By colour**

for any string selected by the key/name or colour, the number of vertices in the string is multiplied by the cost and the total added to the quantities report.

Lengths tab and grid**By name****By colour**

for any string selected by the key/name or colour, the plan or 3d length of the string is multiplied by the cost and the total added to the quantities report.

Plan Areas tab and grid**By name****By colour**

for any string selected by the key/name or colour, the plan area of the string is multiplied by the cost and the total added to the quantities report.

Surface Areas tab and grid**By name****By colour**

for any string selected by the key/name or colour, the surface area of the string within the given tin is multiplied by the cost and the total added to the quantities report.

Report mode

choice box

Summary

Summary, Full

produce the quantity report.

Report costs

tick box

if tick, the cost used for each calculation is included in the report.

Report to CSV file

tick box

if tick, the report is written as a CSV file

Report

file box

name of the quantities report file

Quantify

button

produce the quantity report.

X-Fall and Offset Report

x_fall_report

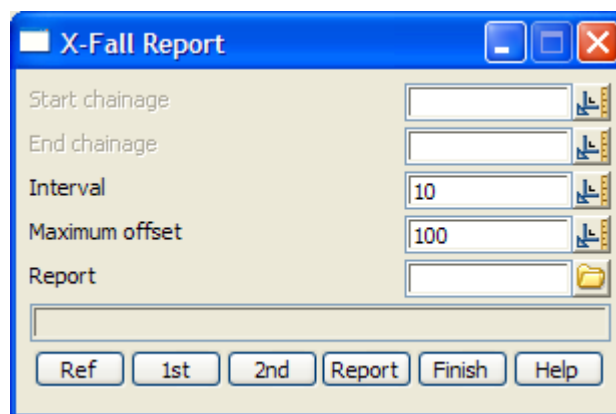
Position of option on menu: Report =>Xfall/offset

The x-fall report option reports on the horizontal and vertical offsets and the cross-fall between two strings.

The offsets are calculated as follows:

- a reference string is selected which is used to define chainages.
- lines perpendicular to the reference string are taken at regular chainages and intersected (in plan) with the first and second strings.
- the horizontal and vertical offsets and the cross-fall between the two strings is calculated at the intersection points.

On selecting the X-fall option, the **X-Fall Report** panel is displayed.



The fields and buttons in this panel are used as follows

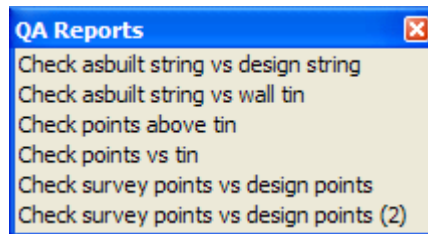
Field Description	Type	Defaults	Pop-Up
Start/End chainage <i>if blank, the start/end chainage of the reference string is used. if non-blank, the given chainage is used as the start/end chainage.</i>	input		
Interval <i>chainage interval to calculate values at.</i>	input	10	
Maximum offset <i>if non-blank, the maximum distance to search from the reference string to find the 1st and 2nd strings.</i>	input	100	
Report file <i>file for the x-fall report</i>	file box		*.rpt
Ref/1st/2nd <i>select the reference/first/second string.</i>	button		
Report <i>produce a offset and x-fall report between the first and second strings.</i>	button		

QA Reports

qa_reports

Position of menu: Report =>QA Reports

The QA options are for checking surveyed strings against design strings or tins.



For *Check asbuilt string vs design string*, go to the section "Check Asbuilt String vs Design String"

Check asbuilt string vs wall tin

"Check Asbuilt String vs Wall Tin"

Check points above tin

"Check Points Above a Tin"

Check points vs tin

"Check Points vs Tin"

Check survey points vs design points

"Check Survey Points vs Design Points" .

Check survey points vs design points (2)

"Check Survey Points vs Design Points

(2)" .

The menu options will now be discussed.

Check Asbuilt String vs Design String

asbuilt_vs_design_h_z_dif_panel

Position of option on menu: Report =>QA Reports =>Check asbuilt string vs design string

This panel is used to check the horizontal and vertical differences between two strings (usually “as built” and design). A control string is selected to provide the chainage and line to cut the two strings and calculate the difference along. The control string can be one of the two strings.

Selecting the Check asbuilt string vs design string brings up the **Check As Built String vs Design String** panel.

The fields and buttons used in this panel have the following functions:

Field Description	Type	Defaults	Pop-Up
As built string <i>string to compare</i>	string select		
Design string <i>string to compare</i>	string select		
Control string <i>string to use to define chainage and right angles. The line at right angles cuts the “as built” and “design” strings and is used to calculate the horizontal and vertical differences.</i>	string select		
Report horizontal difference <i>if tick, the horizontal differences are reported.</i>	tick box	tick	
Report vertical difference <i>if tick, the vertical differences are reported.</i>	tick box	tick	
Report at as built string’s vertices	tick box	tick	

if tick, the differences are reported at the vertices of the as built string.

Report at regular control line interval **tick box tick**

if tick, the differences are reported at the chainage interval given in the "Report interval" box.

Report interval

chainage interval of the control string to report the differences at.

Start chainage

start chainage of the control string to start reporting differences.

End chainage

end chainage of the control string to stop reporting differences.

Report file

name of the report file.

Report

run the option.

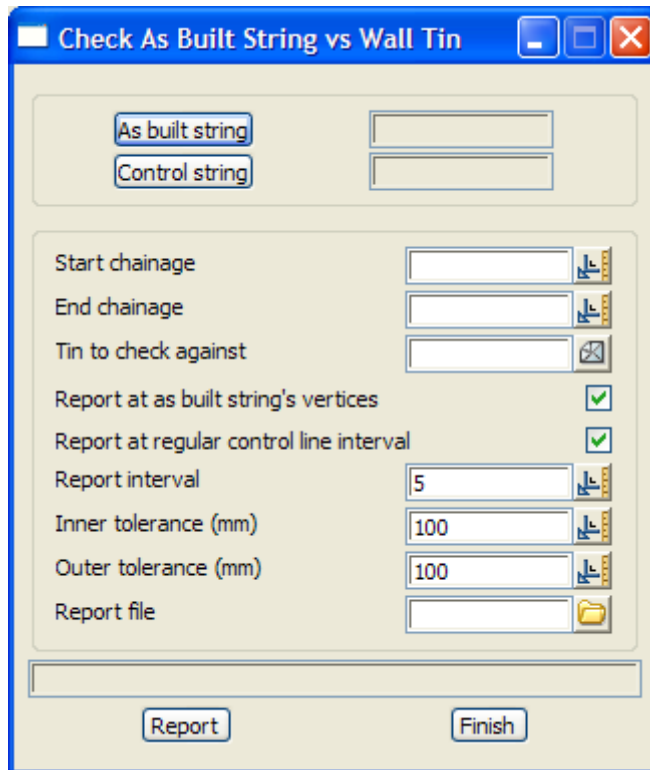
Check Asbuilt String vs Wall Tin

asbuilt_vs_tin_h_dif_panel

Position of option on menu: Report =>QA Reports =>Check asbuilt string vs wall tin

This panel is used to check the horizontal difference between a string (usually the “as built”) and a tin (usually a wall tin). A control string is selected to provide the chainage and bearing to project a horizontal line to cut the string and the tin and calculate the horizontal difference along. The control string can be the “as built” string.

Points that are different by a given inner and outer tolerance are flagged in the report.



The fields and buttons used in this panel have the following functions:

Field Description	Type	Defaults	Pop-Up
As built string <i>string to compare against the wall tin.</i>	string select		
Control string <i>string to use to define chainage and right angles. The horizontal line at right angles cuts the “as built” string and “tin to check against” tin that is used to calculate the horizontal differences.</i>	string select		
Start chainage <i>start chainage of the control string to start reporting differences.</i>	input box		
End chainage <i>end chainage of the control string to stop reporting differences.</i>	input box		
Tin to check against <i>tin to compare the as built string with.</i>	input box		available tins
Report at as built string’s vertices <i>if tick, the differences are reported at the vertices of the as built string.</i>	tick box	tick	

Report at regular control line interval tick box tick

if tick, the differences are reported at the chainage interval given in the "Report interval" box.

Report interval input box 5

chainage interval of the control string to report the differences at.

Inner tolerance (mm) input box 100

if the inner horizontal distance between the string and the wall is greater than this value (in units times 1000) then it is flagged in the report.

Outer tolerance (mm) input box 100

if the outer horizontal distance between the string and the wall is greater than this value (in units times 1000) then it is flagged in the report.

Report File input box

name of the report file.

Report button

run the option.

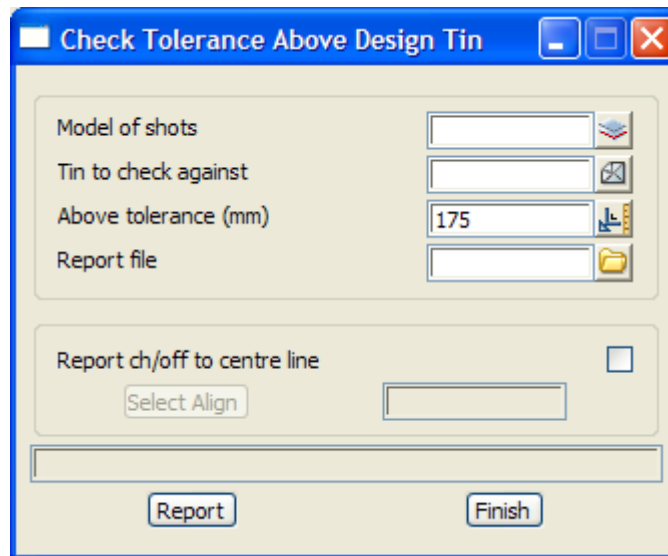
Check Points Above a Tin

Position of option on menu: Report =>QA Reports =>Check points above tin

This panel is used to check the z-value of points against the z-value of a tin at the same (x,y) locations and only report on those above the tin. To check points above and below a tin, go to the next section "Check Points vs Tin".

A z-tolerance above the tin is given and all points above the tin and outside the tolerance are especially flagged in the report.

Optionally the report can also include the chainage and offset of the points from a selected alignment string.



The fields and buttons used in this panel have the following functions:

Field Description	Type	Defaults	Pop-Up
Model of shots <i>model of points to check the z-value against the tin.</i>	model box		
Tin to check against <i>tin to check the z-values against</i>	tin box		
Above tolerance (mm) <i>if the z-value of the point is above the tin and the difference of the z-value of the point and the tin (times 1000), is greater than this amount then it is flagged in the report.</i>	input box	175	
Report file <i>name of the report file.</i>	file box		
Report ch/off to centre line <i>if tick, the chainage and offset of the points from the selected alignment string are included in the report.</i>	linetick box		
Select align <i>select the alignment string to calculate offset and chainage from.</i>	string select		
Report <i>run the option.</i>			

Check Points vs Tin

points_vs_tin_z_dif_panel

Position of option on menu: Report =>QA Reports =>Check points vs tin

For Check points above tin, go to "Check Points Above a Tin" .

This panel is used to check the z-value of points against the z-value of a tin at the same (x,y) locations, or if a **Layer depth** is given, the z-values of points are checked against the tin *minus* the layer depth.

Separate z-tolerances are supplied for **above** and **below** the tin and points outside either tolerance are especially flagged in the report.

Optionally the report can also include the chainage and offset of the points from a selected alignment string.

The fields and buttons used in this panel have the following functions:

Field Description	Type	Defaults	Pop-Up
Model of shots <i>model of points to check the z-value against the tin.</i>	model box		
Tin to check against <i>tin to check the z-values against</i>	tin box		
Above tolerance (mm) <i>if the z-value of the point is above the tin and the difference of the z-value of the point and the tin (times 1000), is greater than this amount then it is flagged in the report.</i>	input box	175	
Below tolerance (mm) <i>if the z-value of the point is below the tin and the absolute value of the difference of the z-value of the point and the tin (times 1000), is greater than this amount then it is flagged in the report.</i>	input box	175	
Layer depth <i>this value is subtracted form the z-value of the tin before the comparison is made with the z-value of the point.</i>	input box	0	
Report file	file box		

name of the report file.

Report ch/off to centre line tick box

if tick, the chainage and offset of the points from the selected alignment string are included in the report.

Select align string select

select the alignment string to calculate offset and chainage from.

Report

run the option.

Check Survey Points vs Design Points

survey_qa_panel

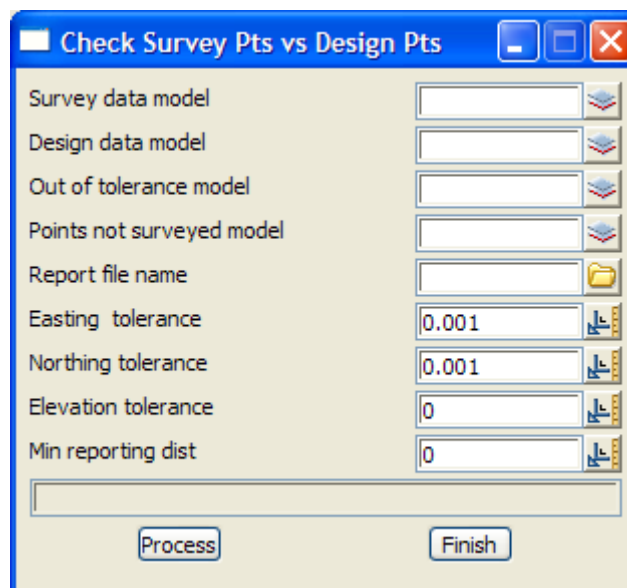
Position of option on menu: Report =>QA Reports =>Check survey points vs design points

This option is used to check surveyed points against the design points.

Separate tolerances are given for Eastings (x), Northings (y) and Elevations (z).

Any design points that have not been surveyed are noted and copies of points out of tolerance and/or points not surveyed can be automatically made.

NOTE - if a **radial** search distance is required in (x,y), go to the next section "Check Survey Points vs Design Points (2)".



The fields and buttons used in this panel have the following functions:

Field Description	Type	Defaults	Pop-Up
Survey data model <i>model of points to be compared against the design points.</i>	model box		available models
Design data model <i>points to be compared against.</i>	model box		available models
Out of tolerance model <i>copies of any points out of tolerance are added to this model.</i>	model box		available models
Points not surveyed model <i>copies of any points from the design model that have not been surveyed.</i>	input box		
Report file name <i>name of the report.</i>	input box		
Easting tolerance <i>tolerance in the x direction.</i>	input box	0.001	
Northing tolerance <i>tolerance in the y-direction.</i>	input box	0.001	
Elevation tolerance	input box	0	

tolerance in the z-direction.

Min reporting dist input box 0
xxxxx

Process button
run the option.

Check Survey Points vs Design Points (2)

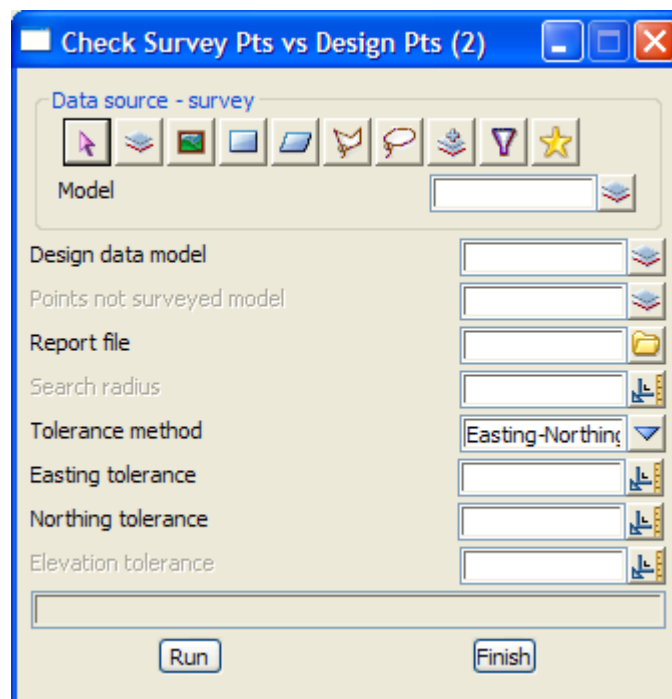
survey_qa_panel

Position of option on menu: Report =>QA Reports =>Check survey points vs design points (2)

This option is used to check surveyed points against the design points.

The (x,y) search distance can be either one radial distance or a separate x and y distance.

Any design points that have not been surveyed are noted and can be optionally copied to a model.



The fields and buttons used in this panel have the following functions:

Field Description	Type	Defaults	Pop-Up
Data source type		Model	
<i>data selection type - for a full description go to "Data Source" in the chapter "Tools and Concepts"</i>			
Data source	input		
<i>source of data is to be processed.</i>			
Design data model	model box		available models
<i>points to be compared against.</i>			
Points not surveyed model	input box		
<i>copies of any points from the design model that have not been surveyed.</i>			
Report file name	file box		
<i>name of the report.</i>			
<i>copies of any points from the design model that have not been surveyed.</i>			
Tolerance method	check box	Easting-Northing	Easting-Northing, Distance
<i>if Easting-Northing, separate Easting (x) and Northing (y) tolerances are given to check against.</i>			
<i>If Distance, the test is for a radial distance, not a separate Easting (x) and Northing (y) tolerances.</i>			
if Easting-Northing			

Easting tolerance input box 0.001
tolerance in the x direction.

Northing tolerance input box 0.001
tolerance in the y-direction.

if Distance

Distance tolerance input box 0.001
radial tolerance for (x,y).

Elevation tolerance input box 0
tolerance in the z-direction.

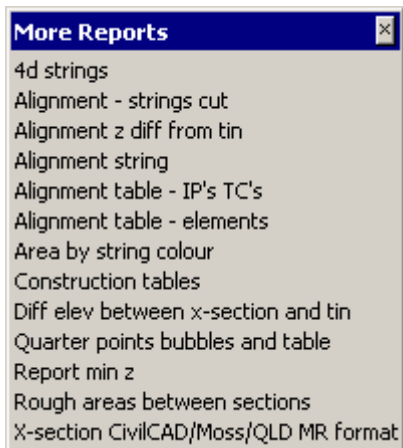
Process button
run the option.

More Reports

more_reports

Position of menu: Report =>More

More miscellaneous reports.



report on 4d strings
 report the strings that an alignment cuts
 give the differences from a tin to a string
 report on an alignment string
 create alignment report and/or table giving IP's and CT's
 create alignment report and/or table giving elements
 give plan areas summed by string colour
 give the differences from the points on a section to a tin
 report and/or table of quarter points for an arc
 report the minimum values on a x-section
 report of areas between sections
 report of a super string
 write out x-sections in a variety of formats

For the option/menu *4d string*, go to the section "Report for 4d Strings"

<i>Alignment - strings cut</i>	"Alignment - Strings Cut"
<i>Alignment z diff from tin</i>	"Report Z Differences from Alignment to Tin"
<i>Alignment string</i>	"Alignment Report"
<i>Alignment table - IP's TC's</i>	"Tabulate Alignment - IP's and CT's" in chapter "Drafting"
<i>Alignment table - elements</i>	"Tabulate Alignment - Elements" in chapter "Drafting"
<i>Area by string colour</i>	"Total of Plan Area by String Colour"
<i>Diff elev between x-sections and tin</i>	"Report Z Differences From X-Sections to a Tin"
<i>Quarter points bubble and table</i>	"Setout Lip Line" from the chapter "Survey"
<i>Report min z</i>	"Report Minimums Z-Value on a Cross Section"
<i>Rough areas between sections</i>	"Report Rough Areas"
<i>Super string</i>	"Report for Super Strings"
<i>X-section CivilCAD/Moss/QLD MRD format</i>	"X-Sections Report"

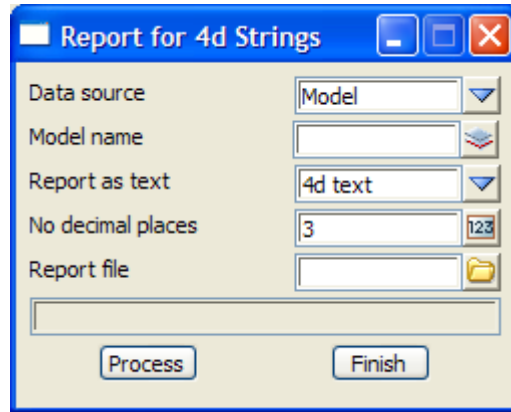
The menu options will now be discussed.

Report for 4d Strings

report_4d_panel

Position of option on menu: Report =>More =>Report for 4d strings

This panel is used to create a report for 4d strings where the x y and z values are printed out for each point plus either the 4d text for the point or the name of the string (repeated for each point).



The fields and buttons used in this panel have the following functions:

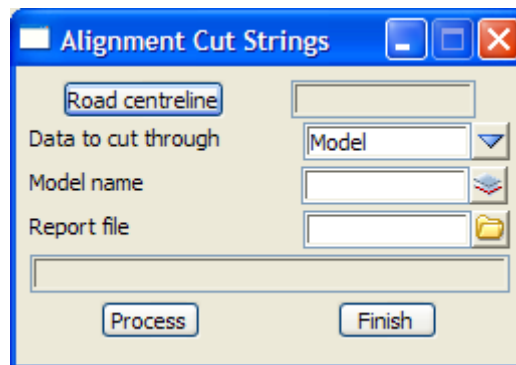
Field Description	Type	Defaults	Pop-Up
Data source <i>data source type.</i>	choice box	model	string, model, view
Model/View/String <i>Data source to do report of 4d strings on.</i>	data source		
Report as text <i>if 4d text, the 4d text for the point is written out after the x, y and z values. If string name, the string name is written out after the x, y and z values.</i>	file	4d text	string name 4d text
No decimal places <i>number of decimal places to use in the x, y and z values.</i>	input	3	
Report file <i>name of the report file.</i>	file		
Process <i>run the option.</i>	button		

Alignment - Strings Cut

alignment_cut_strings_panel

Position of option on menu: Report =>More =>Alignment - strings cut

This option is used to create a report of the position and angle that strings make where they cut a selected alignment string.



The fields and buttons used in this panel have the following functions:

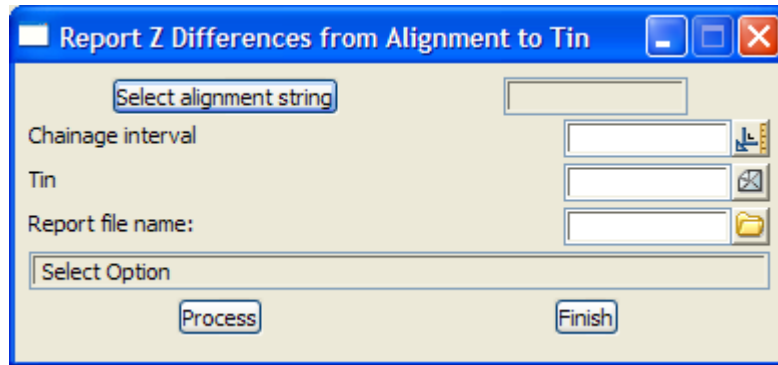
Field Description	Type	Defaults	Pop-Up
Road centreline <i>select the alignment string to report the cuts for.</i>	string select		
Data source <i>source of the data</i>	choice box	Model	String/Model/View
Data <i>method a specifying data</i>			
Report file <i>name of the report file.</i>	input box		*.rpt files
Process <i>run the option.</i>	button		

Report Z Differences from Alignment to Tin

aligndiff_panel

Position of option on menu: Report =>More =>Report z differences from alignment to tin

This panel is used to create a report of the difference in z-values between an alignment string and a tin. The differences are reported at a given chainage interval along the alignment string.



The fields and buttons used in this panel have the following functions:

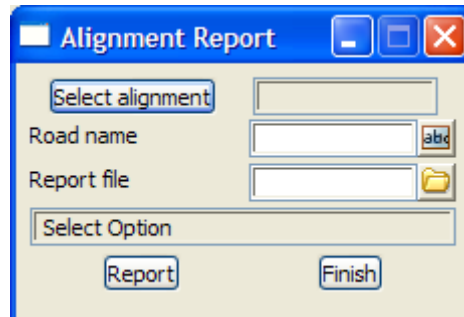
Field Description	Type	Defaults	Pop-Up
Select alignment string <i>select the alignment string to report z-differences for.</i>	string select		
Chainage interval <i>interval to report on.</i>	input box		
Tin <i>tin to get z-values from.</i>	input box		available tins
Report file name <i>name of the report file.</i>	input box		*.rpt files
Process <i>run the option.</i>	button		

Alignment Report

align_report_panel

Position of option on menu: Report =>More =>Alignment string

This panel is used to report the tangent points and centres of arcs for an alignment string.



The fields and buttons used in this panel have the following functions:

Field Description	Type	Defaults	Pop-Up
Select alignment string <i>select the alignment string to report on.</i>	string select		
Report file name <i>name of the report file.</i>	input box		
Report <i>run the option.</i>	button		

Alignment Table - IP's, TC's

Position of option on menu: Report =>More =>Alignment table - IP's and TC's

Create table of IP and CT points for an alignment string.

This panel has already been documented.

See "Tabulate Alignment - IP's and CT's" in chapter "Drafting"

Alignment Table - Elements

Position of option on menu: Report =>More =>Alignment table - elements

Create table of horizontal elements for an alignment string.

This panel has already been documented.

See "Tabulate Alignment - Elements" in chapter "Drafting"

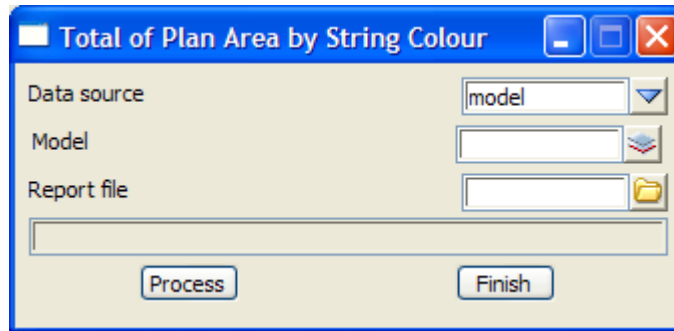
Total of Plan Area by String Colour

plan_areas_panel

Position of option on menu: Report =>More =>Area by string colour

This panel is used to calculate the sum of the plan area of all strings of the same colour. This is especially useful for calculating the plan areas of faces produced for slope areas, volumes etc.

A report giving the total plan area for each different colour is produced.



The fields and buttons used in this panel have the following functions:

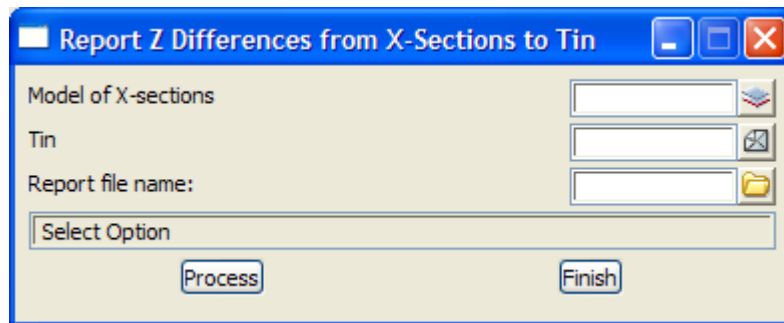
Field Description	Type	Defaults	Pop-Up
Data source <i>Type of data to calculate areas for.</i>	data source	model	model, view
Model/View <i>Data source to calculate the areas and sum by colour.</i>	data source		
Report file <i>Report giving the total plan areas of the strings for each colour.</i>	input box		
Process <i>Run the option</i>	button		

Report Z Differences From X-Sections to a Tin

xdiff_panel

Position of option on menu: Report =>More =>Diff elev between x-section and tin

This panel is used to report the z differences between the points on cross sections and the corresponding z-values from a tin.



The fields and buttons used in this panel have the following functions:

Field Description	Type	Defaults	Pop-Up
Model of X-Sections <i>model of cross sections to report on.</i>	model box		available models
Tin <i>tin to get z-values from.</i>	tin box		
Report file name <i>name of the report file.</i>	file box		
Process <i>run the option.</i>	button		

Quarter Points Report

Position of option on menu: Report =>More =>Quarter points bubbles and table

This option is used to create bubbles and/or a report for the critical horizontal and vertical points and quarter points (by chord or by chainage) for any arcs in an alignment string.

This option has already been documented as

Survey =>Setout =>Setout lip line

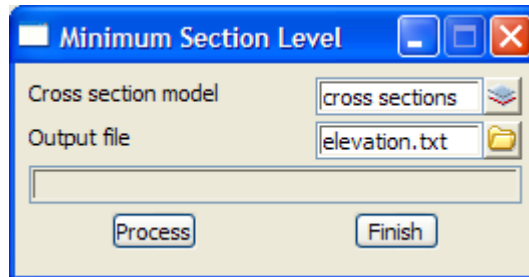
in the section "Setout Lip Line" of the chapter "Survey" .

Report Minimums Z-Value on a Cross Section

minimum_section_level_panel

Position of option on menu: Report =>More =>Report min z

This panel creates a report giving the minimum z-value on a cross section.



The fields and buttons used in this panel have the following functions:

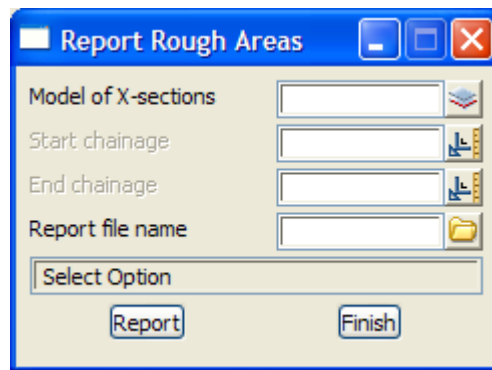
Field Description	Type	Defaults	Pop-Up
Cross section model <i>model of cross sections to report on.</i>	model box		
Output file <i>file to write section names and minimum z-values to.</i>	file box		*.txt files
Process <i>run the option.</i>	button		

Report Rough Areas

rough_area_panel

Position of option on menu: Report =>More =>Rough areas between sections

This panel is used to



The fields and buttons used in this panel have the following functions:

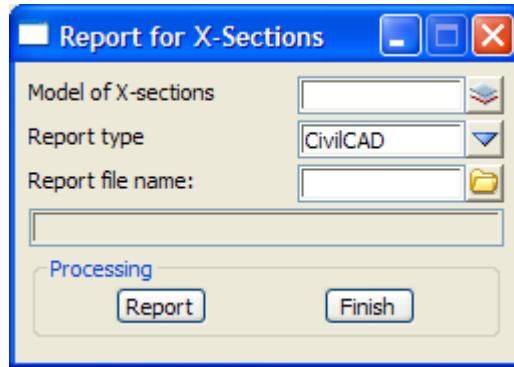
Field Description	Type	Defaults	Pop-Up
Model of x-sections xxxxx	input box		
Start chainage xxxxx	input box		
End chainage xxxxx	input box		
Report file name <i>name of the report file.</i>	input box		
Report <i>run the option.</i>	button		

X-Sections Report

xreport_panel

Position of option on menu: Report =>More =>X-section CivilCAD/Moss/QLD MR format

This panel is used to write out cross sections in a variety of formats.



The fields and buttons used in this panel have the following functions:

Field Description	Type	Defaults	Pop-Up
Model of x-sections <i>model of cross sections to write out.</i>	input box		available models
Report type <i>format of the report.</i>	file box	CivilCAD	CivilCAD, Moss MainRoad Qld, Brief
Report file name <i>name of the report file.</i>	input box		
Report <i>run the option.</i>	button		

26 Utilities

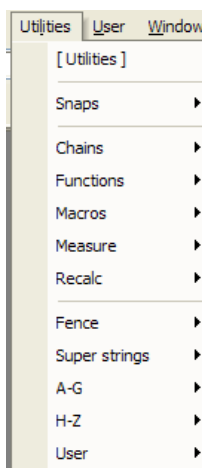
utilities

Position of menu: It is on the main menu as Utilities

The utilities menu contains a collection of useful operations that don't easily fit under any of the other menus.

For ease of selection, the frequently used utilities are placed on the first level of the menu. All the other utilities are split alphabetically between two walk-right menus - the utilities walk-right menus for A-G and H-Z.

on Main menu

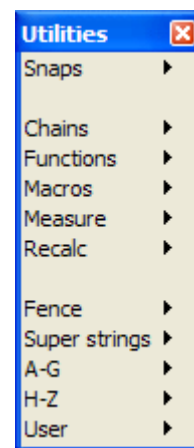


create floating Utilities menu
snaps

edit, create, delete etc. for chains
edit, create, delete etc. for functions
compiling and running macros.
measure distances, angles etc.
re-calc functions

find inside and outside of a polygon
super string options
utilities from A to G
utilities from H to Z

on 12d Model menu
and floating menu



For the option/menu *Snaps*, go to the section

Chains

Functions

Macros

Measure

Recalc

Fence

Super strings

A-G

H-Z

"Snaps"

"Chains"

"Functions"

"Macros"

"Measure"

"Recalc"

"Fence"

"Super Strings" in the chapter "Strings"

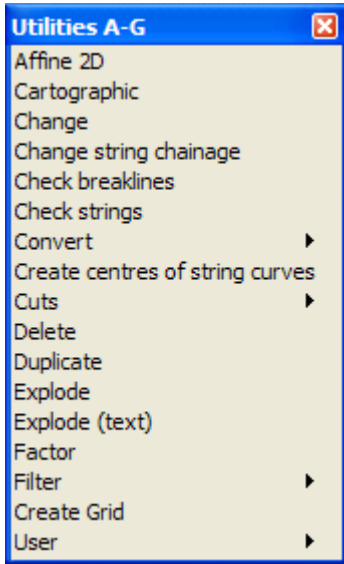
"Utilities A-G"

"Utilities H-Z"

Utilities A-G

utilities_a_g

Position on menu: Utilities =>A-G



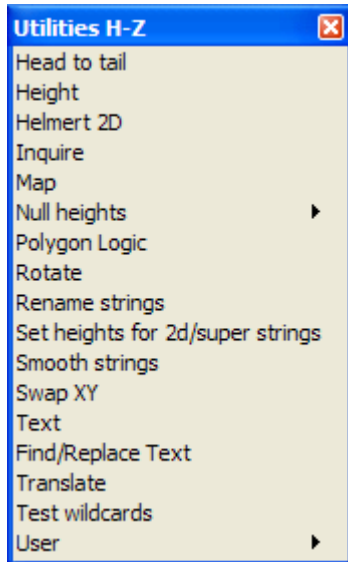
perform 2D affine transformation
 perform cartographic projections
 change colour, model etc. of strings
 change string chainage
 check breaklines
 check strings
 convert 2d to 3d, 3d to 2d etc.
 create centres of curves
 calculate cuts through strings
 delete strings
 duplicate strings
 explode strings into lines and arcs
 explode text into lines and arcs
 multiply the x,y,z values by factors
 data filters
 create a world grid

For the option <i>Affine</i> , go to the section	"2D Affine"
<i>Cartographic</i>	"Cartographic Projections"
<i>Change</i>	"Change"
<i>Change string chainage</i>	"Change String Chainage"
<i>Check breaklines</i>	"Check Breaklines" in the chapter "Triangles"
<i>Check strings</i>	"Check Strings"
<i>Convert</i>	"Convert"
<i>Create centres of string curves</i>	"Create Centre Points for Curves of Strings" in the chapter "Survey"
<i>Cuts</i>	"Cuts"
<i>Delete</i>	"Delete"
<i>Duplicate</i>	"Duplicate"
<i>Explode</i>	"Explode"
<i>Explode (text)</i>	"Explode Text"
<i>Factor</i>	"Factor"
<i>Filter</i>	"Filter"
<i>Create Grid</i>	"Create Grid"

Utilities H-Z

[utilities_h_z](#)

Position of menu: Utilities =>H-Z



join strings with common ends
 give strings new height
 2D Helmert transformation
 highlight strings
 use mapping file on strings
 set heights to null value
 form unions/intersections etc. of polygons
 rotate strings in model/view
 rename strings
 set heights for 2d/3d super strings
 smooth strings
 swap x and y co-ordinates of strings
 modify text parameters
 find and replace text
 translate strings in model/view
 testing pattern and expression matching

For the option *Head to tail*, go to the section "Head to Tail"

<i>Height</i>	"Set Height"
<i>Helmert 2D</i>	"2D Helmert"
<i>Inquire</i>	"Inquire"
<i>Map</i>	"Map"
<i>Null heights</i>	"Null Heights"
<i>Rename strings</i>	"Rename Strings"
<i>Rotate</i>	"Rotate"
<i>Set heights for 2d/super strings</i>	"Set Heights for 2d/Super Strings"
<i>Smooth strings</i>	"Smooth Strings"
<i>Swap XY</i>	"Swap XY"
<i>Text</i>	"Text"
<i>Find/replace text</i>	"Replace Text" in the Chapter "Drafting"
<i>Translate</i>	"Translate"
<i>Text wildcards</i>	"Test Wildcards"

Snaps

snaps_ops

Position of menu: Utilities =>Snaps

The snaps option allows the user to set snapping modes for use during pick operations. The snapping modes have been discussed in detail in the “Snaps” section in the chapter “Tools and Concepts” .

The Snaps walk-right menu provides a full snap menu, abbreviated snap menus laid out either horizontally or vertically, and a snaps cogo menu for creating special point positions using coordinate geometry commands.



full snaps menu
brief snaps laid out vertically
snaps cogo
under development

For the option *Snaps*, go to the section “Snaps” .

Snaps (Vert) “Snaps (Vert)” .

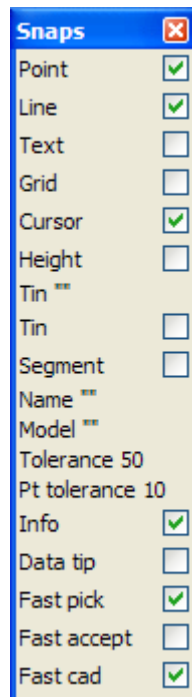
Cogo “Snaps Cogo” .

Snaps

snaps

Position of option on menu: Utilities =>Snaps =>Snaps

The Snaps menu provides tick boxes to turn the various snap modes on or off and options to set tin, string and model names. Any combination of snap modes and names can be set.



point snap on/off
line snap on/off
text snap on/off
grid snap on/off
allow cursor point on/off
ask for z value at each point in edits
name of tin to snap to
tin snap on/off
turn segment snap on/off
restriction on string names
restriction on model names
set snap tolerance
set point snap tolerance
bring up info panel on/off
turns data tips on/off
turns fast pick on/off

The snaps point, line, grid, cursor, tin and info are all set on or off using the tick boxes.

The *snap tolerance* is displayed on the Tolerance line on the menu.

The *point snap tolerance* is displayed on the Pt tolerance line on the menu.

For more information on snaps, go to the “Snaps” section in the chapter “Tools and Concepts” .

snap_tin

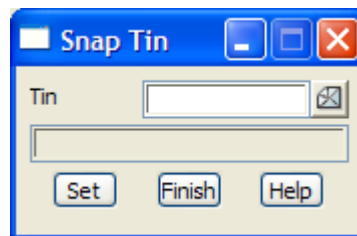
Tin Snap

Tin snap means that when an (x,y) point is selected, the z-value for the point is taken to be the z-value on the tin at the same (x,y) position.

To use tin snap, the name of the tin to snap to must first be set. Then, snapping to that tin is controlled by the state of the tin snap tick box.

If the tick box is **on** (a tick), snapping to the tin is used. If the tick box is **off** (a cross or nothing), no tin snaps are used.

The name of the tin to snap to is set by selecting the tin option and entering the tin name in the **Snap Tin** panel and selecting the **set** button.



When a name is set, the tin tick box is automatically set to on.

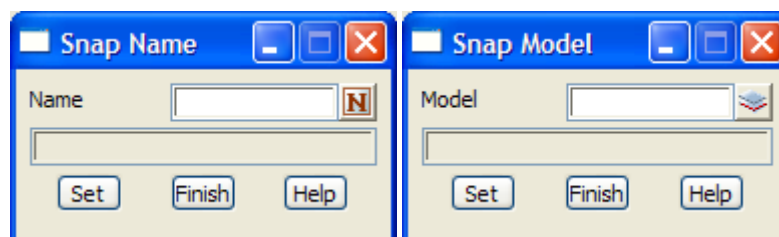
For more information on snaps, go to the “Snaps” section in the chapter “Tools and Concepts” .

snap_name

snap_model

Name and Model Snap

The user can restrict the snap to specific strings and/or models by selecting the name or model option. This brings up the **snap name** or **Snap Model** panel. The string name (model name) used to restrict the snap is entered into the name (model) field. The values are then set by selecting the **set** button.



When **12d Model** creates a new project, **line** and **point** snap are set to **on** and all other snaps set off.

For more information on snaps, go to the “Snaps” section in the chapter “Tools and Concepts” .

point_snap_tolerance

Point Snap Tolerance

Point snap tolerance is not a tick box but a menu item. The point snap tolerance value is the

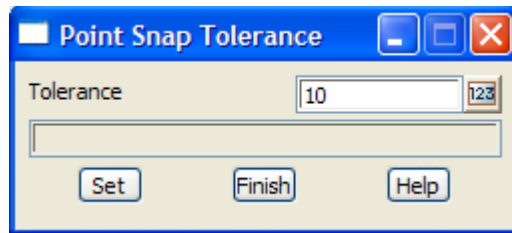
distance to be used for considering vertices over anything else when point snap is on.

The point snap tolerance distance is given in screen units (pixels). There are one thousand pixels per screen width, hence a point snap tolerance of say 10 means that the point snap distance about a vertex is one hundredth of the screen width.

The *point snap tolerance* is given in terms of screen units rather than world units because it is a distance on the screen, independent of any co-ordinate system being used in a view.

The current point snap tolerance value is displayed as **Pt tolerance** on the *Snap* menu.

The *Point snap tolerance* is modified by selecting the Pt tolerance item on the Snaps menu to bring up the **Point Snap Tolerance** panel.



The **point snap tolerance** to be used to restrict the point snap is entered into the panel and then the **Set** button selected. The default tolerance is 10.

For more information on snaps, go to the “Snaps” section in the chapter “Tools and Concepts” .
[snap_tolerance](#)

Snap Tolerance

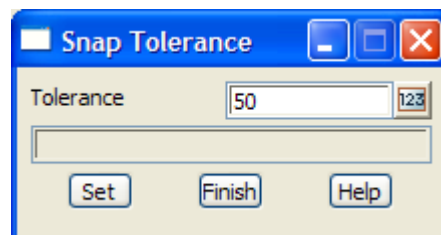
Snap tolerance is not a tick box but a menu item. The snap tolerance value is the distance to be used for considering data when snaps are on.

The snap tolerance distance is given in screen units (pixels). There are one thousand pixels per screen width, hence a snap tolerance of say 50 means that the snap distance about a point, line etc. is one twentieth of the screen width.

Snap tolerance is given in terms of screen units rather than world units because it is a distance on the screen, independent of any co-ordinate system being used in a view.

The current snap tolerance value is displayed as **Tolerance** on the *Snap* menu.

The *Snap tolerance* is modified by selecting the Tolerance item on the Snaps menu to bring up the **Snap Tolerance** panel.



To change the snap tolerance, type a new value into the Tolerance panel field and then click LB on the **Set** button.

For more information on snaps, go to the “Snaps” section in the chapter “Tools and Concepts” .

Info Snap

If info snap is set, then the information panel comes up whenever a string is picked.

Summarising, the available snap modes are

- ▲ point - diamond cursor
- ▲ line - square
- ▲ grid - circle
- ▲ cursor - circle
- ▲ tin - squiggles under a line
- ▲ name
- ▲ model
- ▲ info

On starting up a new project, point and line snap are on, all others off and tolerance is set to 50.

When an existing project is saved, the snap settings, snap tolerance and positions of any snaps menus on the screen, are also saved.

For more information on snaps, go to the “Snaps” section in the chapter “Tools and Concepts” .

Snaps (Vert)

h vertical_snaps

Position of option on menu: Utilities =>Snaps =>Snaps (Vert)

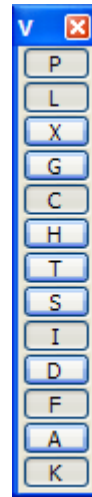
The snaps (vert) menu provides the same tick boxes as the snaps menu to turn the various snap modes on or off, however the snap descriptions are abbreviated to one character to reduce the menu size.

The Snaps and Snaps (vert) menu are



The Snaps are

- P** Point snap (on)
- L** Line snap (on)
- X** Text snap (off)
- G** Grid snap (off)
- C** Cursor snap (on)
- H** Height snap (off)
- T** Tin snap (off)
- S** Segment snap (off)
- I** Info snap (on)
- D** Data tip (off)
- F** Fast accept (on)
- A** Fast accept (off)
- K** Construction snap (on)



For more information on snaps, go to the “Snaps” section in the chapter “Tools and Concepts” .

Snaps Cogo

`snaps_cogo`

`snap_create`

`snap_fillet`

`snap_locate`

`snap_divide`

`snap_intersect`

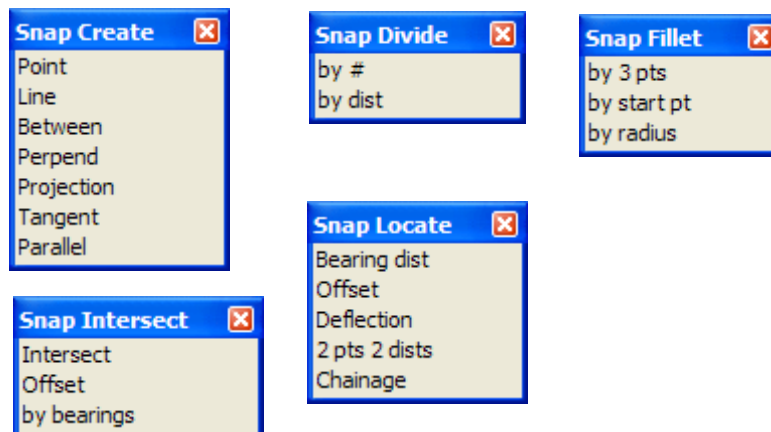
Position of menu: Utilities =>Snaps =>Cogo

The snaps cogo options are used to create the point required for any 12d Model select operation. For example, selecting the next point in **append** in an editor. The result of the snaps cogo is returned to the **select operation** as the selected point.

Walking right on the cogo option brings up the snaps cogo menu



and the walk-right menus for each of the snaps cogo menu items are



Note on Combining Snaps Cogos

When using a snaps cogo option, another select is often required and it is permissible to use other snaps cogo option to create the point for that select.

For example, the required point is the point halfway between two other points **dropped perpendicularly** onto an arc.

Such a combined result can be achieved using snaps cogo however the order of selecting the snaps cogo options may at first seem to be the reverse of what is required.

For the above example, the snaps cogo perpen must be selected before the between option.

This is because when the perpen snap cogo option is selected, it asks the user to **select** the point to drop and it is then that the snaps cogo between option is used to find the midpoint of two selected point. The result of the between then becomes the point to drop for the perpen.

If the between option had been selected first, the resultant midpoint would have been returned

as the selected point and that select completed.

Snaps New

xtra_snaps

Position of menu: Utilities =>Snaps =>New

The xtra snaps menu is currently under development.

Chains

chains

Position of menu: Utilities =>Chains

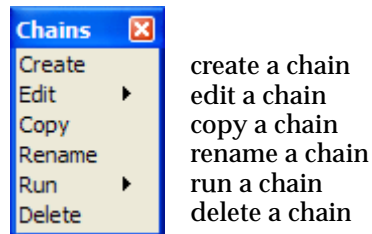
A *Chain* is a list of items that are run in the order that they appear in the list.

Things that can be run in a *Chain* are:

- (a) functions
- (b) other chains
- (c) super alignment resolves
- (d) plot parameter files
- (e) some 12d Model options
- (f) some screen layout files
- (g) macro that don't have a panel
- (h) an external command line
- (i) some special hardwired commands such as delete a tin, delete all tins, delete a model, delete all models, clean a model, delete a file, compare files, redraw all views, comments

So in its simplest form, a *chain* can run a user specified list of functions.

The Chains walk-right menu is



For the option *Create*, go to the section "Create/Edit a Chain"

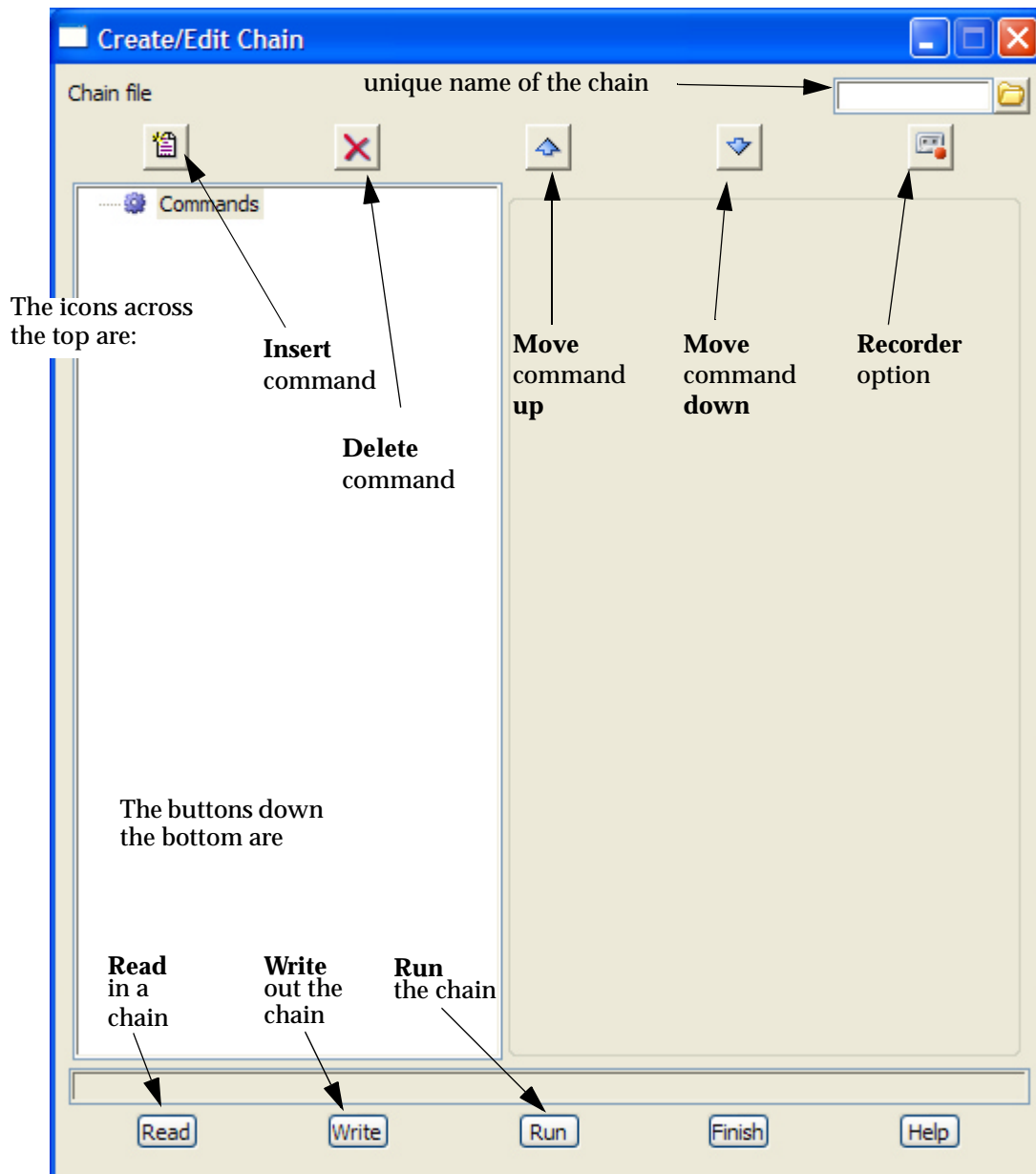
<i>Edit</i>	"Edit a Chain"
<i>Copy</i>	"Copy a Chain"
<i>Rename</i>	"Rename Chains"
<i>Run</i>	"Run a Chain"
<i>Delete</i>	"Delete a Chain"

Create/Edit a Chain

Position of option on menu: Utilities =>Chains =>Create

`create_edit_chain`

Selecting Create brings up the **Create/Edit Chain** panel which is used to create, edit and run chains.

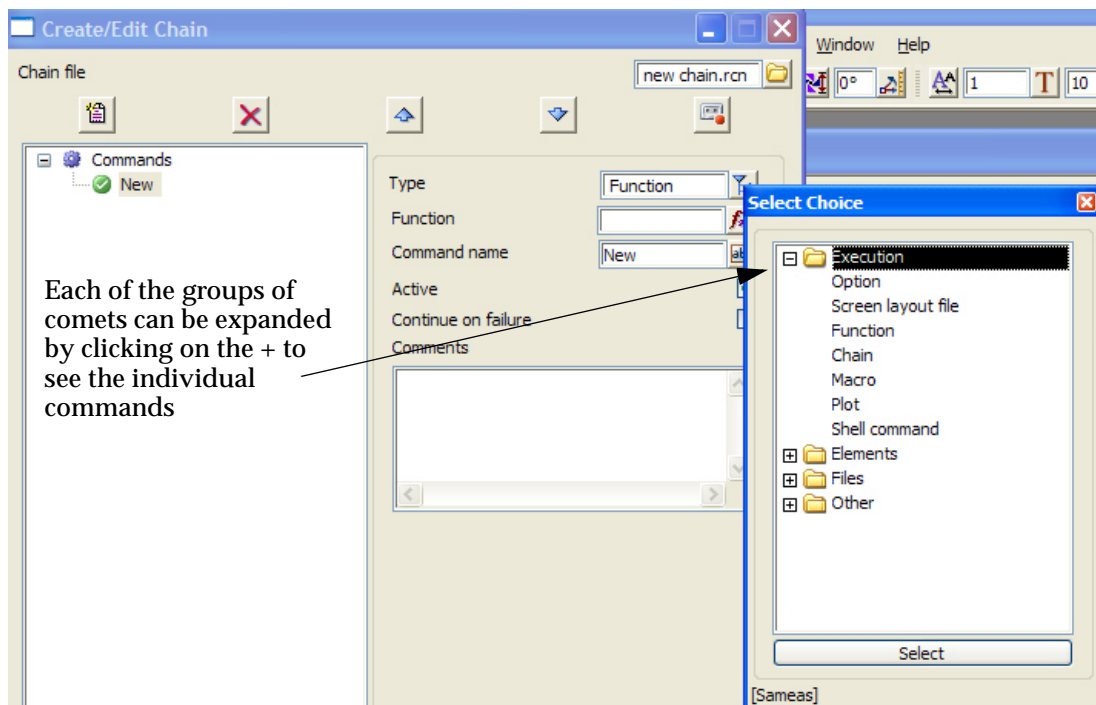
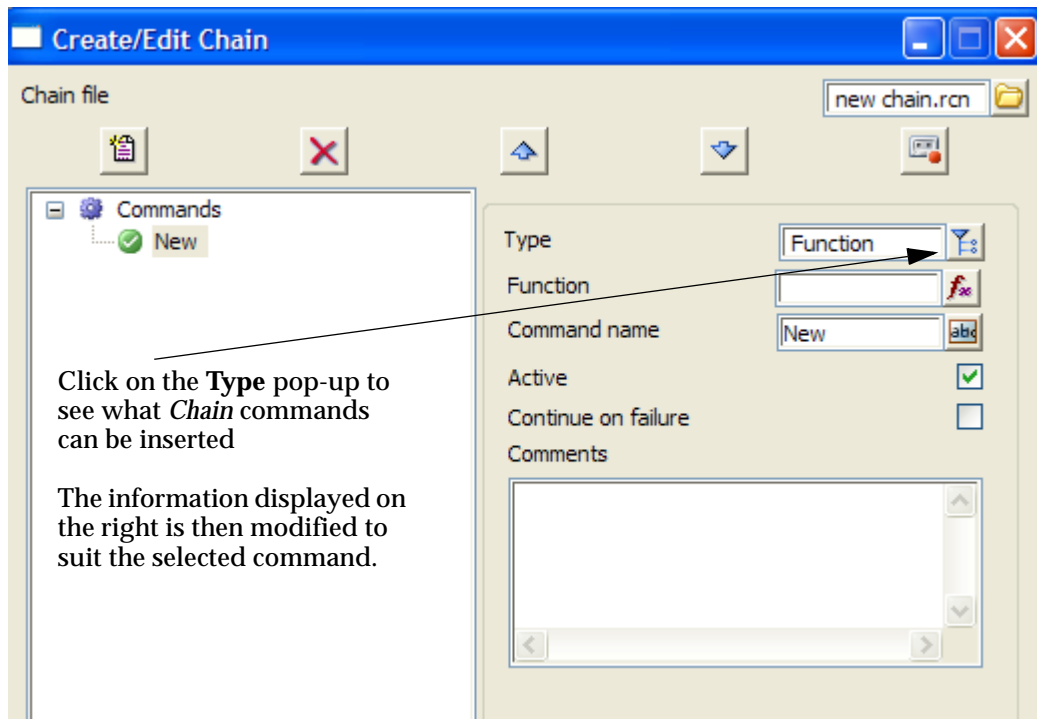


To create a new chain, a unique name is typed into the **Chain file** box (say *new chain*) and the **Write** button selected.

The chain is then built up by *inserting commands* using the **Insert** icon.

Inserting a Command:

Clicking on the **Insert** icon insert a new command into the chain and on the right hand side of the panel, has the information for defining the new command.



The **Chain** commands are:

Under **Execution**

Option – run a *12d Model* option. **Note** - only some options can be run.

Screen layout file – run an existing screen layout file. **Note** - only some slf's can be run.

Function – recalc a 12d function

Chain – run an existing chain

Macro – run a 12d Model macro that doesn't have a panel

Plot - run a plot parameter file

Shell command - run an external program, Microsoft command line etc.

Under **Elements**

Resolve SA – resolve a selected super alignment

Clean model

Delete tin

Delete model

Delete all tins

Delete all models

Delete all templates

Delete all empty models

Under **Files**

Delete file

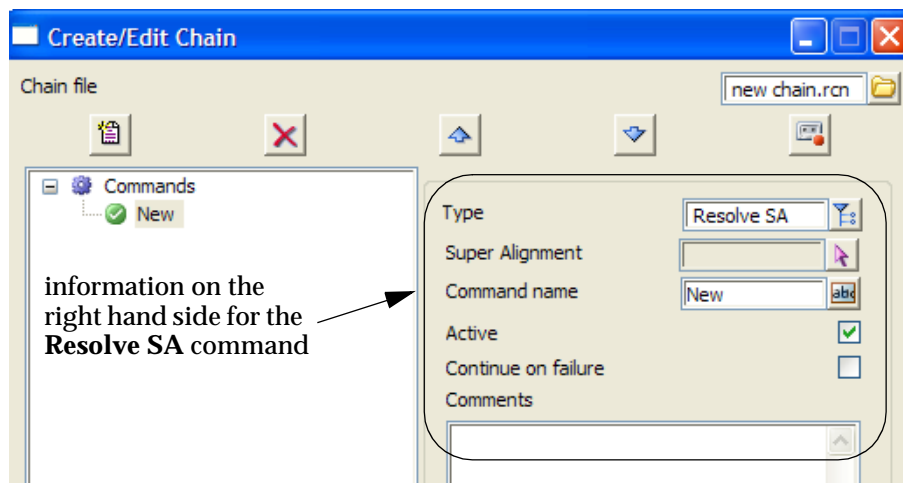
Compare - compare two text files

Under **Other**

Comment

Redraw all views

Selecting a command will update the right hand side of the panel with information for that particular command. For example, for the **Resolve SA** command



The common fields used in the right hand side are:

Command name - each command is given a default *Command name* composed of the command and the extra information such as the name of the super alignment. The *Command name* does not have to be unique and can be changed at any time.

Active - if ticked on then the command is run when the chain is run. If not ticked, the command is not run.

Continue on failure - if ticked **on**, the chain will continue running if an error occurs with this command. If not ticked, the chain will stop running if an error occurs in this command.

Comments - comments recorded for the options.

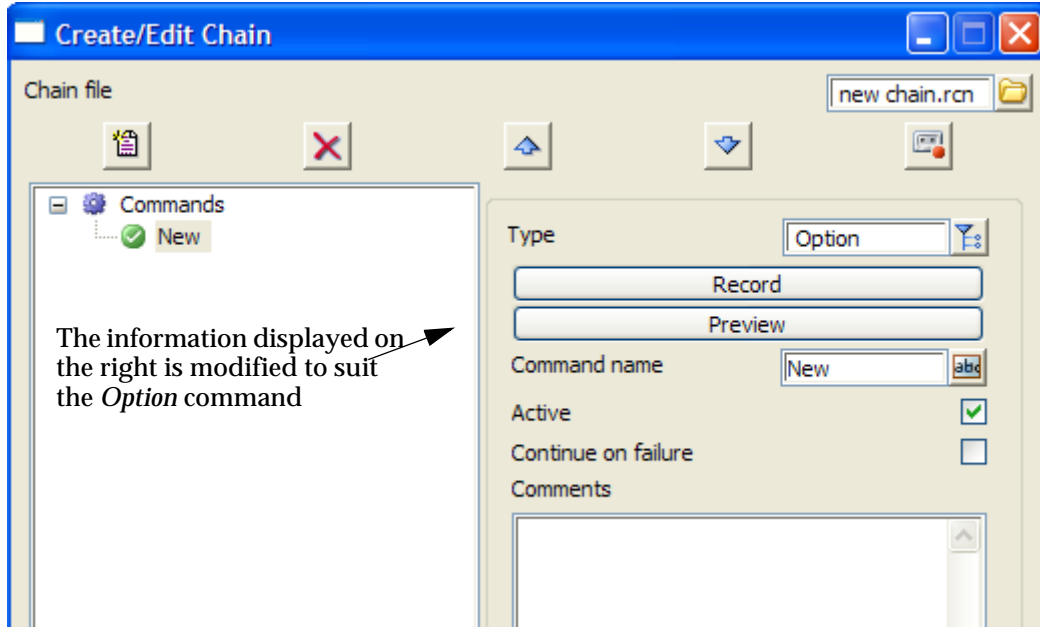
When a chain is running, message and error messages are written to the **Output window**.

Important Note - each time a command is inserted or modified, the **Write** button must be clicked to write out the modified chain.

Special Chain Commands

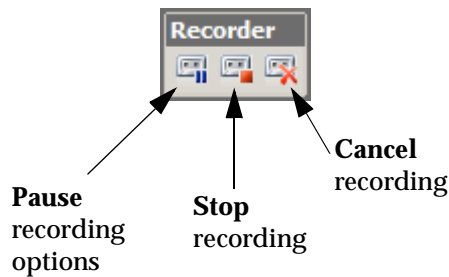
Option

Selecting the Option command modifies the information on the right side of the panel to suit the Option command.

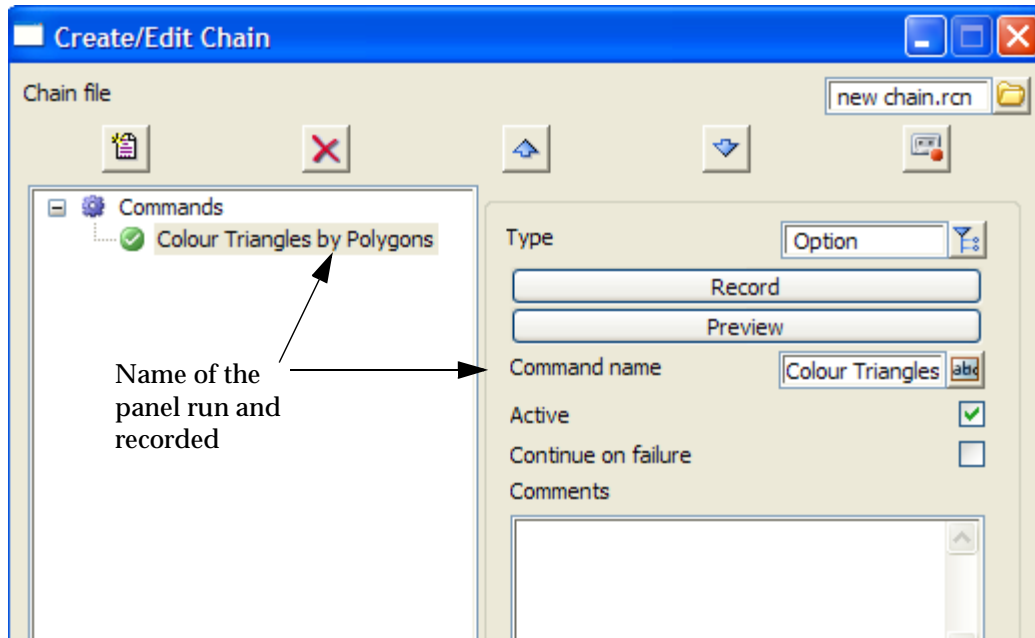


Clicking on the **Record** button starts a “one option” record cycle.

The **Recorder** panel is placed on the screen and you **run** the 12d Model panel option that you wish to record (not 12d macro options, user macros or CAD commands)



Once the option is run, the **Recorder** panel is automatically removed and the **Option** in the **Create/Edit Chain** panel given the name of the 12d Model panel that was run.



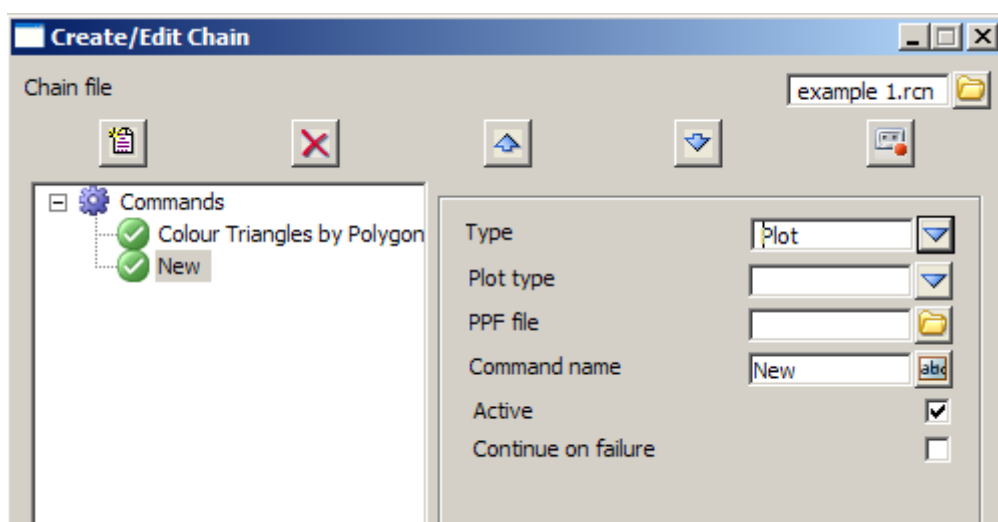
Click on the **Write** button at the bottom of the **Create/Edit Chain** panel to update the chain information.

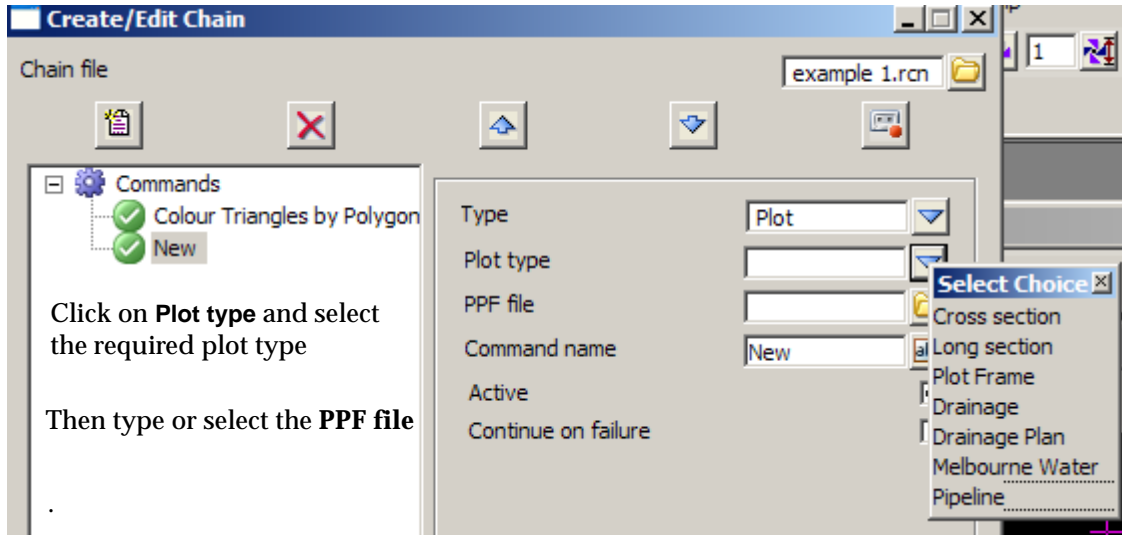
Important Note - the **Preview** button brings up the recorded panel with all the information filled in *that can be validated by the panel fields*. So sometimes **Preview** can not display the recorded information. Also **Preview** is for display only and can't be used to modify **Option**.

Important Fudge - often this will work to change the information in **Option**. Select **Preview** to bring up the recorded panel with all the information filled in. Then hit the **Record** button on the **Option**, make the changes you want and run the panel. This will record the new information in place of the existing information.

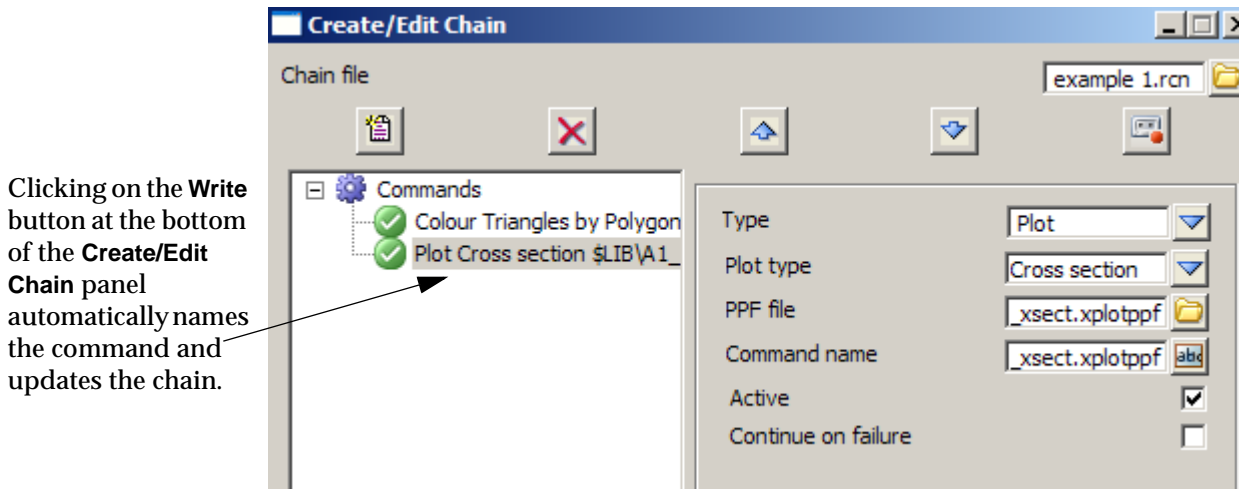
Plot

Selecting the **Plot** command modifies the information on the right side of the panel to suit the **Plot** command.





Clicking on the **Write** button at the bottom of the **Create/Edit Chain** panel names the command and updates the chain information.

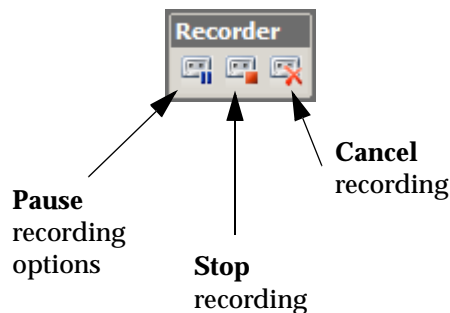


Clicking on the **Write** button at the bottom of the **Create/Edit Chain** panel automatically names the command and updates the chain.

How to use the Recorder Icon

The **Recorder** option is like the *Macro* option in Word – it records the running of many 12d Model panel options so that they can be replayed. Note that it **can not** record running 12d Macros or CAD commands. The **Recorder** creates an **Option** command for each 12d Model option recorded

Clicking on the **Recorder** icon brings up the **Recorder** toolbar with icons to **Pause**, **Stop** and **Cancel** the recording.



Simply **run** the 12d Model panel options that you wish to record (not 12d macro options, user macros or CAD commands) until you hit the **Stop** icon. Each 12d Model option that is run will be added as a Run Option command to current chain.

Important Notes

1. Macros or CAD commands **can not** be recorded, and not all non-macro 12d panel options can be recorded. For example, if a screen layout file can not be created for an option, then it can't be recorded.
2. When recording, the *12d Model* panel option must be filled in and run. This may restrict what can be done.

Saving a Chain

After each item is added to the chain, click on **Write** to save the chain.

Running a Chain

There is a **Run** button on the **Create/Edit Chain** panel to run a chain.

However a chain can also be run simply by clicking on the **name** of the chain in the list created by walking right on

Recalc =>Run chain

Similarly editing an existing chain can easily be done by clicking on the name of the chain in the list created by walking right on

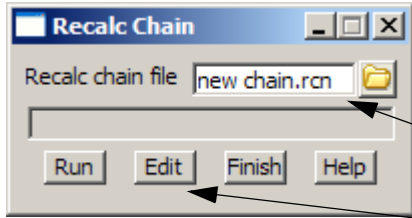
Recalc =>Edit chain

This brings up the **Create/Edit Chain** panel with the selected chain in the editor.

Aside - the Recalc Chain Panel

recalc_chain

The **Recalc Chain** panel comes up if you click on **Utilities =>Chains =>Edit** without walking right or **Utilities =>Recalc =>Edit chain** without walking right.



to **create** a chain, type in a new name for the chain (the **.rcn** will automatically be added)

and then click on **Edit**.

This will bring up the **Create/Edit Chain** panel.

Special Notes on Recording Options

1. Use Unique String Names for String Selects

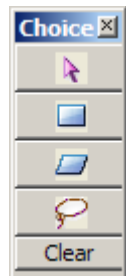
String selects on panels record the id and the name of the string, and the model id and the name of the model containing the string.

When the option is run in the chain, the string is first searched for using the model and string id's but if that fails then a string of the recorded name is searched for in the recorded model name.

If the string name is unique in the model then the correct string will be selected. If there is more than one string with the same name in the model, then the first string of that name that is found will be used.

2. Polygon Selects

String selects can be recorded for a *Polygon box* but *Rectangle*, *Parallelogram* or *Lasso* can not be recorded.



- ← string select - will record
- ← rectangle - **won't** record
- ← parallelogram - **won't** record
- ← lasso - **won't** record

Edit a Chain

Position of option on menu: Utilities =>Chains =>Edit

The Edit walk-right menu displays all the chains in the project and double clicking on a chain in the list will bring up the **Create/Edit a Chain** panel (see "Create/Edit a Chain").

Run a Chain

Position of option on menu: Utilities =>Chains =>Run

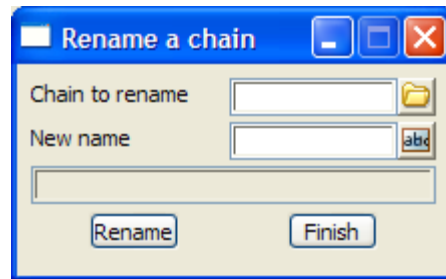
The Run walk-right menu displays all the chains in the project and double clicking on a chain in the list will run the chain.

Rename Chains

rename_a_chain

Position of option on menu: Utilities =>Chains =>Rename

On selecting the Rename option, the **Rename a Chain** panel is displayed and is used to change the names of existing chains.



The fields and buttons used in this panel have the following functions.

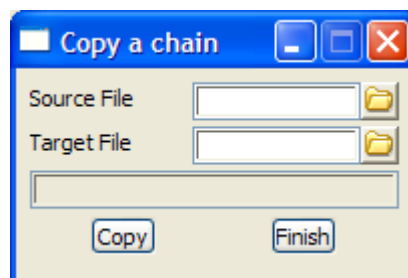
Field Description	Type	Defaults	Pop-Up
Chain to rename <i>chain to be renamed.</i>	folder box		available *.rcn files
New name <i>new name for the chain</i>	input		
Rename <i>Change the name of the chain</i>	button		

Copy a Chain

copy_a_chain

Position of option on menu: Utilities =>Chains =>Copy

On selecting the Copy option, the **Rename a Chain** panel is displayed and is copy chains.



The fields and buttons used in this panel have the following functions.

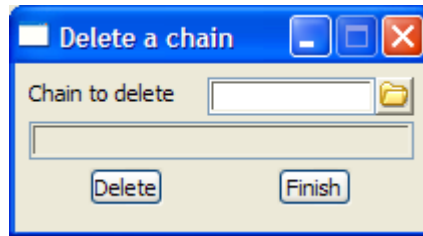
Field Description	Type	Defaults	Pop-Up
Chain to copy <i>chain to be renamed</i>	folder box		available *.rcn files
New name <i>new name for the chain</i>	input		
Copy <i>Copy the chain</i>	button		

Delete a Chain

delete_a_chain

Position of option on menu: Utilities =>Chains =>Delete

On selecting the Delete option, the **Delete a Chain** panel is displayed and is used to delete chains.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Chain to delete <i>name of the chain to delete</i>	folder box		available *.rcn files
Delete	button		
<i>Delete the chain given in the Chain to delete field.</i>			

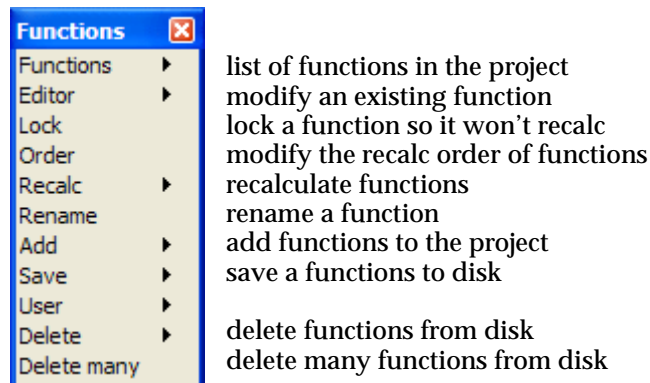
Functions

functions

Position of menu: Utilities =>Functions

Functions are used in the template and interface options to collect special data together. This allows 12d Model to recognize when some of the data has been modified and that some of the data is no longer valid. It is then possible to re-run the functions (re-calc the functions) and update the modified data.

The functions walk-right menu is



The Functions walk-right simply lists all the functions that have been defined in the project. The other options in this menu will now be described in more detail.

For the option <i>Editor</i> , go to the section	"Editor"
<i>Lock</i>	"Lock"
<i>Order</i>	"Order"
<i>Recalc</i>	"Recalc"
<i>Rename</i>	"Rename"
<i>Add</i>	"Add"
<i>Save</i>	"Save"
<i>Delete</i>	"Delete"

Editor

On walking right on the editor menu option, a list of defined functions appears.

By selecting the highlighted name of a function to be edited, the appropriate function panel filled with the information from the selected function, is displayed

The information in the selected function can then be modified.

Important Note

The defined functions menu also has a [Same as] option which is used to select the function to be edited by simply picking **any string** that was created by the function.

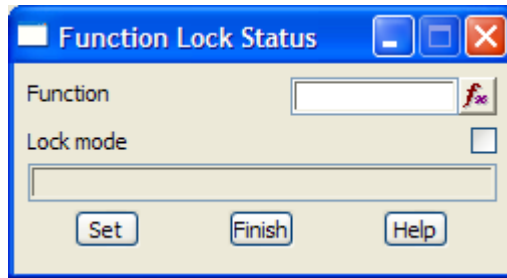
Lock

function_lock_status

Position of option on menu: Utilities =>Functions =>Lock

The function lock option is used to *lock* a function so that it can't be re-calculated.

On selecting the lock option, the **function lock status** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Function <i>name of the function to lock/unlock.</i>	input		available functions
Lock model <i>display and modifies the lock status for the given function. If tick, the function is locked an won't re-calculate.</i>	tick box		
Set <i>set the lock mode for the selected function.</i>	button		

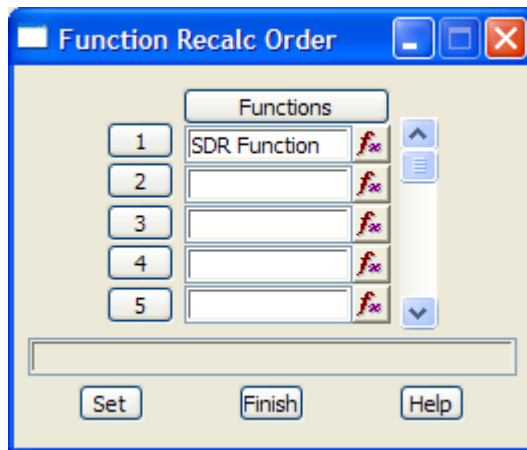
Order

function_recalc_order

Position of option on menu: Utilities =>Functions =>Order

The default recalculation order for functions is the order in which the functions were created however the order option is used to **modify** the function recalc order.

On selecting the order or option, the **function recalc order** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Functions <i>list of functions in their recalculation order. Functions should only appear once in the list.</i>	table		available functions
Set <i>record the order of functions in the table.</i>	button		

Note - all functions must still exist somewhere in the re-arranged recalc order.

Recalc

Position of option on menu: Utilities =>Functions =>Recalc

The recalc menu is the same as the menu.

Utilities =>Recalc

For more information, please go to the section “Recalc” of this chapter.

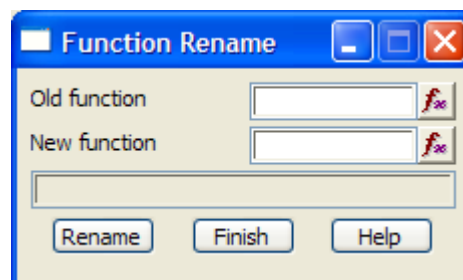
Rename

function_rename

Position of option on menu: Utilities =>Functions =>Rename

On selecting the rename option, the **function rename** panel is displayed.

This panel can be used to change the names of existing functions



The fields and buttons used in this panel have the following functions.

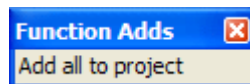
Field Description	Type	Defaults	Pop-Up
Old function <i>name of the function to be renamed.</i>	input		available functions
New function <i>new name for the function</i>	input		
Rename <i>Change the name of the function in the old function field to the name given in the new function field.</i>	button		

Add

function_adds

Position of menu: Utilities =>Functions =>Add

The function add option brings up the walk-right menu, function adds

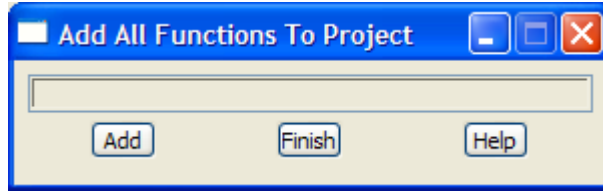


add_all_functions_to_project

Position of option on menu: Utilities =>Functions =>Add =>Add all to project

On selecting the add all to project option, the **add all functions to project** panel is displayed.

This panel is used to add all removed functions to the project.



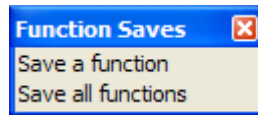
Save

function_saves

Position of menu: Utilities =>Functions =>Save

Functions can be saved on disk so that they can be used for future project work.

The function save walk-right menu is



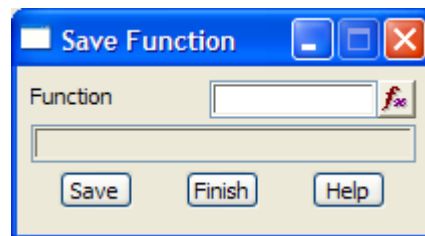
Note - Modified or new functions are automatically saved when a project is saved.

Save a Function

save_function

Position of option on menu: Utilities =>Functions =>Save =>Save a function

On selecting the save a function option, the **save function** panel is displayed.



The fields and buttons used in this panel have the following functions.

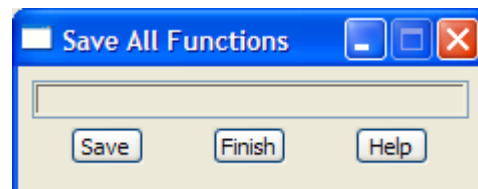
Field Description	Type	Defaults	Pop-Up
Function <i>name of the function to be saved.</i>	input		available functions
Save <i>after selecting this button, the function given in the function field will be saved to disk.</i>	button		

Save All Functions

save_all_functions

Position of option on menu: Utilities =>Functions =>Save =>Save all functions

On selecting the save all option, the **save all functions** panel is displayed.



By selecting the **save** button, all functions in the working project will be saved to disk. Unless an error occurs, the panel will be removed after the saving is completed.

Delete

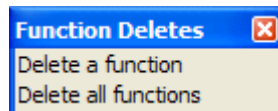
function_deletes

Position of menu: Utilities =>Functions =>Delete

Using the delete option, functions can be deleted from disk so that they no longer can be accessed or take up disk space.

To help protect the user against disasters, when a function is selected for deletion, a yes-no pop-up menu is used to confirm that the user did intend deleting the function.

If deletion is confirmed, the selected function is removed from the project and deleted from the disk. The function delete walk-right menu is



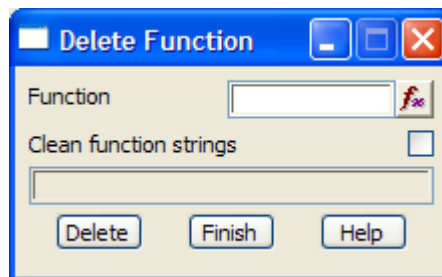
Delete a Function

delete_function

Position of option on menu: Utilities =>Functions =>Delete =>Delete a function

The delete a function option can be used to delete a function in the working project.

On selecting the delete a function option, the **delete function** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Function <i>name of the function to be deleted.</i>	function box		all project functions
Clean function strings <i>if tick, delete all the strings created by the function</i>	tick box		
Delete <i>after selecting this button, the function given in the function field will be deleted from the computer disk. A yes-no pop-up is used to confirm that deletion is required.</i>	button		

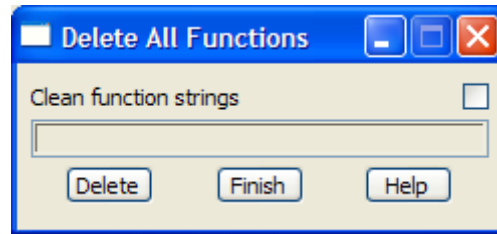
Delete All Functions

delete_all_functions

Position of option on menu: Utilities =>Functions =>Delete =>Delete all functions

The delete all functions option will delete all of the functions in the working project.

On selecting the delete all functions option, the **delete all functions** panel is displayed.



Clean function strings tick box

if tick, delete all the strings created by all the function

After selecting the **Delete** button, a yes-no pop-up is used to confirm that deletion is required. If it is, all functions in the working project will be deleted from disk and unless an error occurs, the panel will be removed.

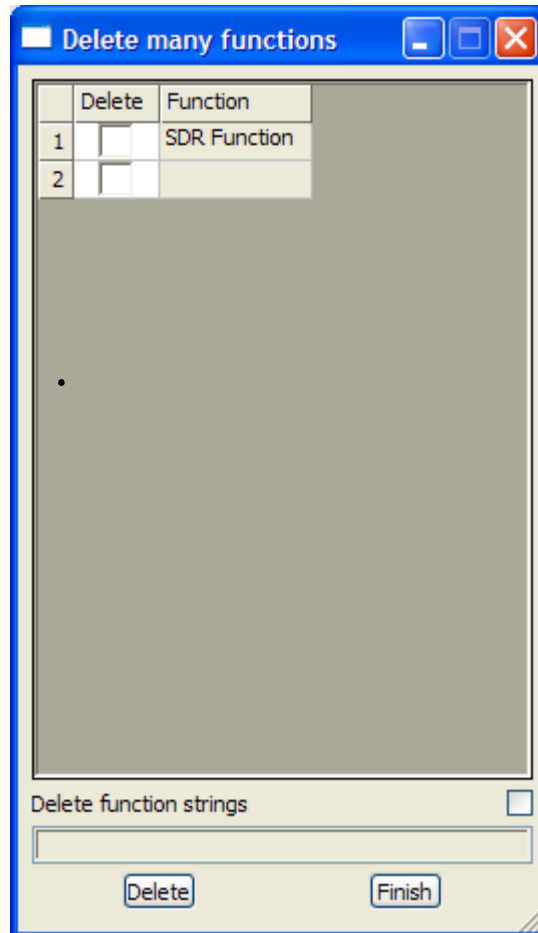
Delete Many Functions

delete_many_functions

Position of menu: Utilities =>Functions =>Delete many

The Delete many option deletes one or more functions in the working project.

Selecting the Delete many, displays the **Delete Many Functions** panel.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Delete <i>if tick, delete the selected function listed after the tick</i>	tick box		
Function <i>name of all the functions in the project</i>	input		all project functions
Delete function strings <i>if tick, delete all the strings created by the selected functions</i>	tick box		
Delete <i>delete all the ticked functions in the function field</i>	button		

Macros

macros

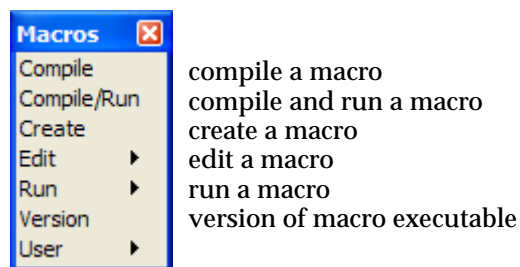
Position of menu: Utilities =>Macros

The 4D Solutions Macro Language (4DML) is a powerful programming language designed to run from within 12d Model. Its main purpose is to allow users to enhance the existing 12d Model package by writing their own programs (4DML's or macros).

4DML's can be compiled from within or outside 12d Model but can only be run from within 12d Model.

The macros menu has options to compile macros, compile and run macros or just run macros. A full description of macros is given in the 12d Model Macro Language manual.

The macros walk- right menu is



For the option *Compile*, go to the section “Compile”

<i>Compile/run</i>	“Compile and Run”
<i>Create</i>	“Create”
<i>Edit</i>	“Edit”
<i>Run</i>	“Run”
<i>Version</i>	“Version”

The options will now be described.

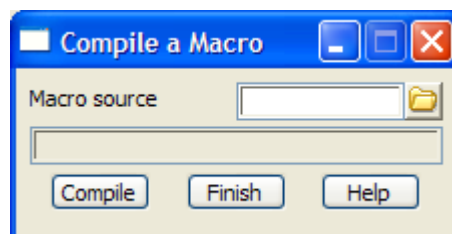
Compile

compile_a_macro

Position of option on menu: Utilities =>Macros =>Compile

The compile option is used to compile the macro source code into a executable program which can then be run from within 12d Model.

On selecting the option, the **compile a macro** panel is placed on the screen.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Macro source <i>the name of the macro source file.</i>	input		*.4dm files
Compile <i>compile the code file given in the macro source field.</i>	button		

Compile and Run

compile_run_a_macro

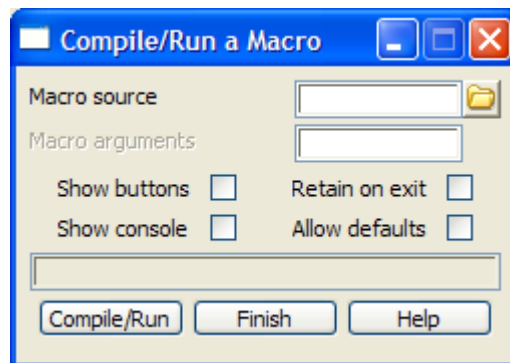
Position of option on menu: Utilities =>Macros =>Compile/Run

The compile and run option compiles the macro source code into a executable program, and if there are no errors, runs the program.

When a macro is run, a **macro console** panel is placed on the screen to provide an i/o and message area for the macro. It is possible to bring up the macro console with or without the **restart**, **abort** and **finish** buttons.

When the macro finishes, the macro console can be left on the screen or removed.

Selecting the **compile & run** menu option, brings up the **compile/run a macro** panel:



The fields and buttons used in these panels have the following functions.

Field Description	Type	Defaults	Pop-Up
Macro source <i>the name of the macro source file.</i>	input		*.4dm files
Macro arguments <i>if non-blank, a text line which is passed to the program as an argument line.</i>	input		
Show buttons <i>if tick, the macro console panel has abort, restart and finish buttons on it.</i>	tick box		
Retain on exit <i>if tick, the macro console panel remains on the screen after the macro has finished running.</i>	tick box	tick	
Show console <i>if tick, the macro console panel is placed on the screen. if non-tick, the macro console panel is not displayed - used mainly with panels.</i>	tick box	tick	
Allow defaults <i>if tick, the default value for a prompt is displayed in the macro console panel.</i>	tick box		
Compile/Run <i>compile the code file given in the macro source field and if the compile is successful, run the program.</i>	button		

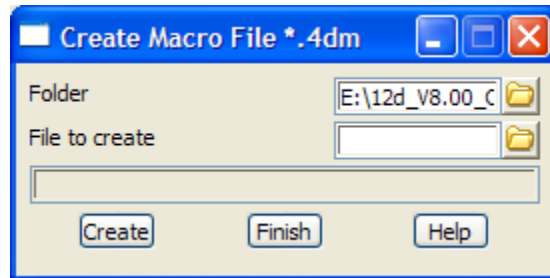
Create

create_macro_file__4dm

Position of option on menu: Utilities =>Macros =>Create

The macros=>create option is used to create macro files (*.4dm) with the editor pointed to by the EDIT_4D environment variable.

Selecting macros=>create brings up the **create macro file *.4dm** panel.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Folder <i>name of the folder to create the .4dm file in.</i>	input	current folder	
File to create <i>name of the file, in folder, to create.</i>	input		*.4dm files
Create <i>create the file given by the folder and file to create panel fields. A macro header is set up in the file.</i>	button		

Edit

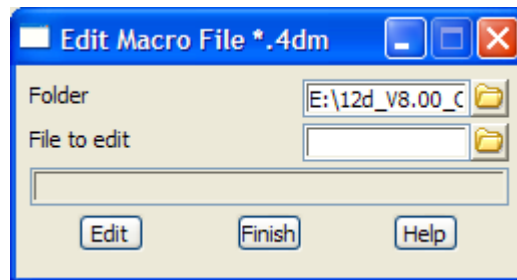
`edit_macro_file__4dm`

Position of option on menu: Utilities =>Macros =>Edit

The macros=>edit option is used to edit macro files (*.4dm) with the editor pointed to by the EDIT_4D environment variable.

The macros=>edit option has two modes of operation - selecting the macros=>edit itself, or by activating the macros=>edit option's walk-right menu, **folder *.4dm**.

Selecting macros=>edit itself brings up the **edit macro file *.4dm** panel.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Folder <i>name of the folder for the .4dm file.</i>	input	current folder	
File to edit <i>name of the file, in folder, to edit.</i>	input		*.4dm files
Edit <i>edit the file given by the folder and file to edit panel fields. If the file given in the file to edit field does not exist, then a new file is created which already has each of the macro header set up.</i>	button		

The macros=>edit walk-right menu provides a list all the many template files (files ending in .mtf) in the current folder. When a file is selected from the list, it is automatically loaded into the editor.

Run

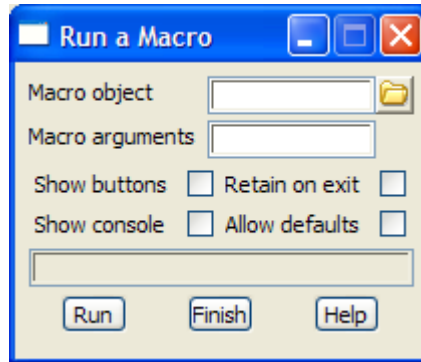
run_a_macro

Position of option on menu: Utilities =>Macros =>Run

The run option runs an existing macro executable program (produced by the compile process).

Like the **compile and run** option, the run options can run the macro executable with or without buttons on the macro console, and leave or remove the macro console once the macro has been executed.

Selecting the **run** menu option, brings up the **run a macro** panel:



The fields and buttons used in these panels have the following functions.

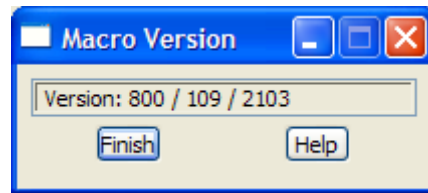
Field Description	Type	Defaults	Pop-Up
Macro object <i>the name of the macro object or executable program.</i>	input		*.4dm files
Macro arguments <i>if non-blank, a text line which is passed to the program as an argument line.</i>	input		
Show buttons <i>if tick, the macro console panel has abort, restart and finish buttons on it.</i>	tick box		
Retain on exit <i>if tick, the macro console panel remains on the screen after the macro has finished running.</i>	tick box		tick
Show console <i>if tick, the macro console panel is placed on the screen. if non-tick, the macro console panel is not displayed - used mainly with panels.</i>	tick box	tick	
Allow defaults <i>if tick, the default value for a prompt is displayed in the macro console panel.</i>	tick box		
Run <i>run the executable given in the macro object field.</i>	button		

Version

macro_version

Position of option on menu: Utilities =>Macros =>Version

The **version** option simply brings up a panel giving information about the macro process.



Measure

measure

Position of menu: Utilities =>Measure

The measure menu contains two options to display the

delta x, delta y, horizontal distance, angle and bearing

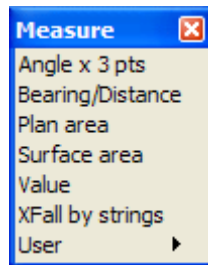
between points, and for a section view, the

delta chainage, delta height, slope distance and % grade

between points are calculated and displayed.

There are also options to calculate the plan area of polygons, the surface area of a tin within a polygon, run measures and dynamic measures and dynamically calculate and display the x-fall between two strings.

The measure walk- right menu is



measure angle by 3 points
distance/bearing with scale option
plan areas
surface area for a tin
any measures
dynamic x-fall between strings

Note

The measure option has another mode of operation. Rather than moving onto the walk-right arrow, if LB is clicked when the measure button is highlighted on the 12d Model=>utilities menu, the **distance/bearing** panel is displayed on the screen.

For the option *Angle x 3 pts*, go to the section "Angle by 3 Points"

Bearing/distance

"Bearing and Distance"

Plan area

"Plan Area"

Surface area

"Surface Area" in the chapter "Triangles"

Value

"Value"

Xfall by strings

"X Fall by Strings"

The options in the menu will now be described.

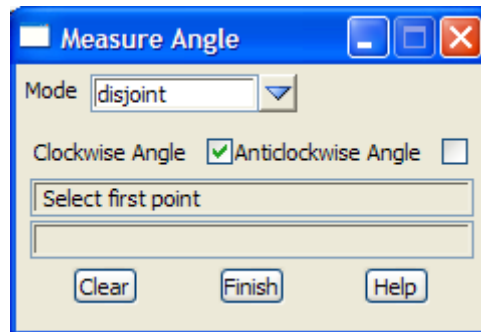
Angle by 3 Points

measure_angle

Position of option on menu: Utilities =>Measure =>Angle x 3 pts

The angle by 3 pts option is used to calculate the angle formed by selected three positions. the angle can be expressed as a clockwise or anti-clockwise angle.

On selecting the angle x 3 pts option, the **measure angle** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Mode	input	disjoint	disjoint, continuous

In disjoint mode, only the angle between the three selected positions is reported. After the angle is reported, the user can select the 1st point in the sequence.

In continuous mode, after the initial reporting of the angle, the user is prompted for the 3rd point of the new angle to be measured. By default, the previous 2nd point becomes the first point and the previous 3rd point becomes the 2nd point. This allows just one point (the third point) to be selected and the angle reported will change accordingly.

Clockwise angle tick box
if tick, then the angle is measured in the clockwise (forward) direction.

Anti-clockwise angle tick box
if tick, then the angle is measured in the anti-clockwise direction.

Clear button
when this button is selected, the sequence is re-initialised.

Note - after two positions are selected, the angle to the cursor position is dynamically calculated and displayed as the cursor moves around the view.

Bearing and Distance

measure_bearing_distance

Position of option on menu: Utilities =>Measure =>Bearing/Distance

The distance/bearing option is used to calculate the

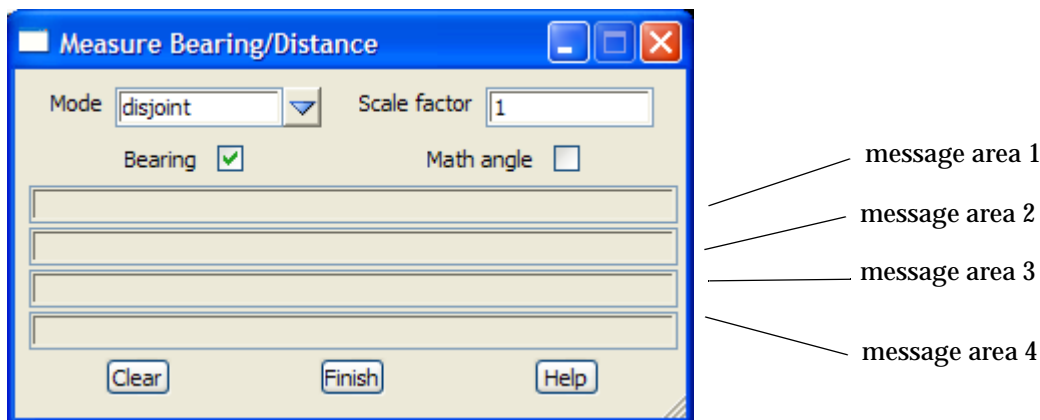
(a) the bearing measured in a clockwise direction between the positive y-axis and the (imaginary) line joining two selected points (when the bearing tick box is selected)

or

the bearing measured in an anticlockwise direction between the positive x-axis and the (imaginary) line joining two selected points (when the math angle tick box is selected)

(b) the distance between two user selected points.

On selecting the distance/bearing option, the **measure distance/bearing** panel is displayed.



This panel is principally used to display the distances between, and bearing of the line joining, pairs of user selected points.

message area 1 : brg = plane dist = ellipsoid dist =

where brg is the angle measured clockwise from north and is calculated using the coordinate values (Inverse value)

plane dist is the distance calculated using the coordinate values (Inverse value)

ellipsoid dist is the distance calculated by dividing the plane distance by the current scale factor

message area 2: dx = dy = dht = (if applicable)

where dx is the difference in x value between the two coordinates

dy is the difference in y value between the two coordinates

dz is the difference in z value between the two coordinates

If valid height values exist for two consecutive points the grade and slope is also reported

message area 3: grade % = slope =

If the measurement mode is set to continuous, the sum distances will be shown for the route taken

message area 4: Sum plane dist = Sum ellip dist =

where Sum plane dist, is the accumulative length of the route taken calculated using plane distances.

Sum ellip dist, is the Sum plane dist / scale factor.

The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Mode	input	disjoint	disjoint, continuous
<i>In disjoint mode, only the distance between the two points and the bearing (in degrees, minutes and seconds) of the (imaginary) line connecting the two points are displayed.</i>			
<i>In continuous mode, after the initial reporting of the bearing/distance, the user is prompted to select the next point (2nd point). In this case the previously selected second point becomes the first point.</i>			
Scale	input/output	1.0	
<i>the scale factor which will be used to convert plane distances to ellipsoid distances. i.e ellipsoid distance = plane distance / scale factor</i>			
Bearing	tick box	ticked	
<i>if ticked, the measured vectors can be displayed as bearings (angles measured from north, clockwise)</i>			
Math angle	tick box	un-ticked	
<i>if ticked, the measured vectors can be displayed as a mathematical angle (measured from east in a anti-clockwise direction).</i>			
Clear	button		
<i>when this button is selected, the selection sequence is re-initialised.</i>			

Plan Area

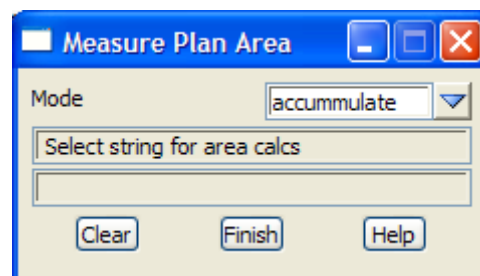
measure_plan_area

Position of option on menu: Utilities =>Measure =>Plan area

The plan area option is used to calculate the plan areas enclosed by strings.

If a string is not closed, the first and last points are considered to be connected to form a polygon.

On selecting the option, the **measure plan area** panel is placed on the screen.



This panel is principally used to display the plan areas of strings selected by the user.

The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Mode	input	disjoint	disjoint, continuous
<i>If disjoint, only the area of the selected string is displayed. If continuous, the total of the areas is also displayed.</i>			
Clear	button		
<i>when this button is selected, the total-to-date of the area is reset to zero and the selection sequence begun.</i>			

How to Use the Panel and Panel Messages

The measure area cycle consists is as follows:

- (a) the string is selected with the mouse.

message area 1 select string for area calcs
 message area 2

(b) repeat step (a) to find more areas and accumulate them. If the accumulator is to be zeroed, simply select the **clear** button again.

The area of the selected string is displayed in message area 2.

If the mode is set to continuous, the accumulated areas (sum) of the selected strings is also displayed.

message area 1 select string for area calcs
 message area 2 area = *value* sum = *value*

The cycle can then be repeated for as many strings as needed without leaving the option.

The accumulated total is reset to zero (cleared) by selecting the **clear** button again.

Surface Area

Position of option on menu: Utilities =>Measure =>Surface area

The surface area option calculates and reports the surface area of a tin restricted to a user specified polygon.

This option has already been documented as Tins=>Tin analysis=>Surface area.

See the section “Surface Area” n the chapter “Triangles” .

Value

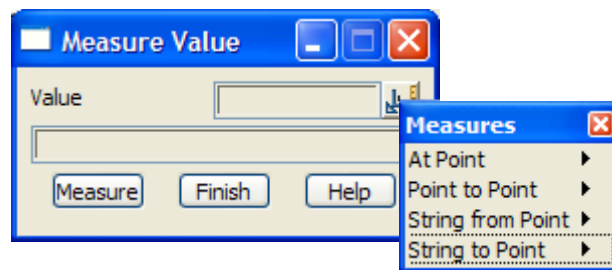
measure_value

Position of option on menu: Utilities =>Measure =>Value

The value option is used to calculate and display any of the measures available in the measures pop-up menu.

The **measures** are documented under “Measures” in the chapter “Tools and Concepts” .

On selecting the option, the **measure value area** panel and the **measures** menu is placed on the screen.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Value	output		
<i>the value calculated by the selected measure option.</i>			

X Fall by Strings

[xfall_between_2_strings_inquire](#)

Position of option on menu: Utilities =>Measure =>XFall by strings

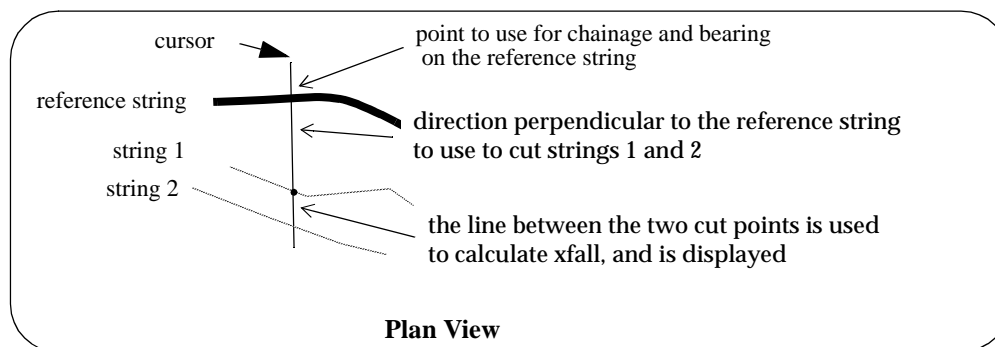
In this option, the user selects a reference string to define what is meant by chainage and right angles, and then selects two strings to calculate the x-fall between.

Once the three strings are selected, as the cursor moves around in a plan view, the cursor position is dropped perpendicularly onto the reference string.

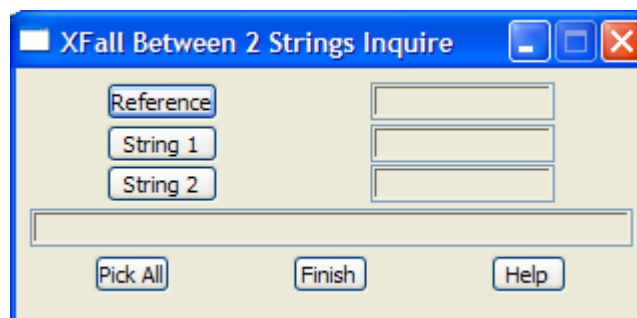
At the dropped chainage, a line is taken at right angles to the reference point and extended until it cuts the two selected strings. The xfall is then calculated between the cut points on the strings.

Then the chainage and the xfall are dynamically displayed in the panel message area.

The line joining the two strings is dynamically displayed on the plan view.



On selecting the Xfall by strings option, the **xfall between 2 strings inquire** panel is displayed.



The fields and buttons used in the two panel have the following functions.

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Reference	string-select		
------------------	---------------	--	--

the selected string is used to defined the meaning of chainage and bearing for the inquire. The cursor is dropped perpendicularly onto the reference string and at the dropped chainage, a line is taken at right angles to the reference point and extended until it cuts string 1 and string 2. The xfall is then calculate and displayed for the two cut points.

String 1/2	string-select		
-------------------	---------------	--	--

the two strings to calculate x-fall between.

Pick all	button		
-----------------	--------	--	--

if pick all is selected, the user is asked to sequentially select the three strings: reference string, string 1 and string 2. The strings are automatically assigned to the appropriate string-select panel fields.

Recalc

recalc

Position of menu: Utilities =>Recalc

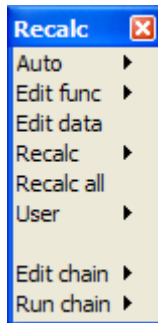
Once a function has been applied, the calculated information is only correct whilst the initial data is not modified in any way. If any modifications are made to the data, then the function must be re-run and all the associated information recalculated and redrawn, and any perspective views associated with the function set with the new eye and target positions, and redrawn.

There are date and time stamps for all string, tin and template information in 12d Model and this enables 12d Model to determine what information has been modified since a function was last run and what re-calculations are required.

The recalc option is designed to **re-run** functions

If LB is clicked whilst the recalc menu option is highlighted, all the template functions with **auto recalc** set **on**, and that have had their initial data modified since their last re-run, will be recalculated and all appropriate information updated. The data will be redrawn on any views that is was on before the recalc.

The Recalc walk-right menu has four options:



For the option <i>Auto</i> , go to the section	"Auto"
<i>Editor</i>	"Editor"
<i>Edit data</i>	"Edit Data from String"
<i>Recalc</i>	"Recalc"
<i>Recalc all</i>	"Recalc All"
<i>Edit chain</i>	"Edit Chain"
<i>Run chain</i>	"Run Chain"

Auto

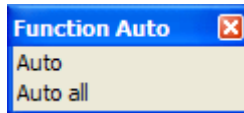
function_auto

Position of option on menu: Utilities =>Recalc =>Auto

The auto option allows the user to specify whether a function is automatically recalced if another function, tin, template or string that it depends upon, is modified or recalced.

Individual functions or all functions can have auto-recalc mode turned on or off and the default for a new function is **off**.

The function auto menu is

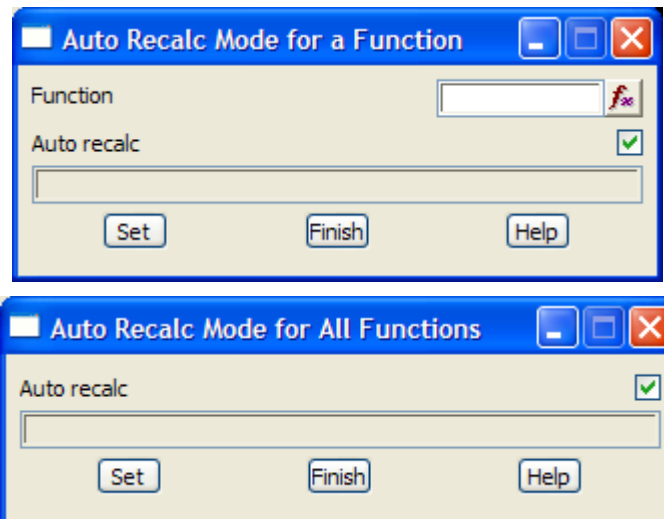


auto_recalc_mode_for_a_function auto_recalc_mode_for_all_functions

Position of option on menu: Utilities =>Recalc =>Auto =>Auto

Position of option on menu: Utilities =>Recalc =>Auto =>Auto all

The **auto** and **auto all** menu options bring up the **auto recalc mode for a function** and **auto recalc mode for all functions** panels respectively.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Function <i>name of the function to be have auto recalc mode set on/off.</i>	input		available functions
Auto recalc <i>if tick, the function is set to auto-recalculate. Otherwise auto recalc is set off.</i>	tick box	tick	
Set <i>Set the auto recalc mode for the selected function/all functions.</i>	button		

Editor

edit_function

Position of option on menu: Utilities =>Recalc =>Editor

The recalc=>editor option is used to edit function.

The recalc=>editor walk-right menu provides a list all the defined functions in the project.

When a function is selected from the list, it is automatically loaded into the appropriate function panel for the selected function, and displayed

The information in the selected function can then be modified.

Important Note

The defined functions menu also has a [Same as] option which is used to select the function to be edited by simply picking **any string** that was created by the function. This is documented in the

next section “Edit Function from String”

Edit Function from String

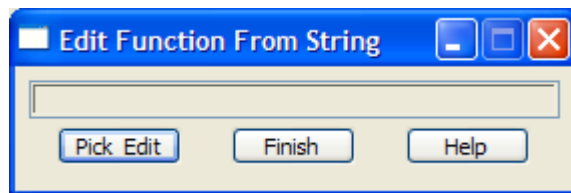
edit_function_from_string

Position of option on menu: Utilities =>Recalc =>Editor =>[Same as]

Position of option on menu: Utilities =>Recalc =>Recalc =>[Same as]

The Edit Function from String option allows the user to start up the *Function editor* by simply selecting a string that was created by the function.

On selecting the option, the **Edit Function from String** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Pick Edit	button		

select data that was created by a function and the appropriate function editor is then opened.

Edit Data from String

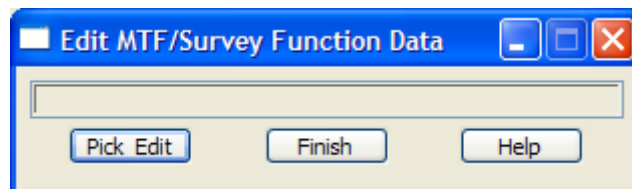
edit_MTF_survey_function_data

Position of option on menu: Utilities =>Recalc =>Edit data

The Edit data option allows the user to start up the *MTF editor* by simply selecting a string that was created using an Apply Templates function (and hence an MTF file). The MTF file used in the *Apply Templates* function is automatically loaded into MTF editor (go to “MTF Edit”).

Similarly the Edit data option also allows the user to start up the *Survey Field Data editor* by simply selecting a string that was created using a *Survey Data Reduction* function. All the data produced by the *Survey Data Reduction* function is automatically loaded into the *Survey Field Data* editor (go to the section “Survey Field Data Editor”).

On selecting the Edit data option, the **Edit MTF/Survey Function Data** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Pick Edit	button		

select data that was created by applying an MTF file or a Survey Data Reduction function. The

appropriate MTF editor or Survey Field Data editor that created the selected data, is then opened.

For information on the *Survey Field Data Editor*, go to the section “Survey Field Data Editor” .

For information on the *MTF Editor*, go to “MTF Edit” .

Recalc

recalc_function

Position of menu: Utilities =>Recalc =>Recalc

The Recalc option is used to recalculate a user selected function, and all functions that depend on the function that have auto recalc set on.

The Recalc walk-right menu lists all the existing functions and by selecting a function name, the function will be forced to re-run and all appropriate information and views for that function will be updated.

The existing functions menu also has a [Changed] option which recalcs all changed functions.

The existing functions menu has a [Same as] option which is used to select the function to be recalced by simply picking **any string** that was created by the function. This is documented in the next section “Recalc Function from String”

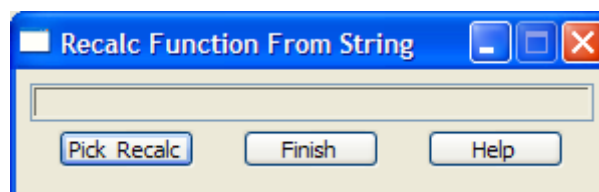
Recalc Function from String

recalc_function_from_string

Position of option on menu: Utilities =>Recalc =>Recalc =>[Same as]

The Recalc Function from String option allows the user to recalcd a function by simply selecting a string that was created by the function.

On selecting the option, the **Recalc Function from String** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Pick Edit	button		

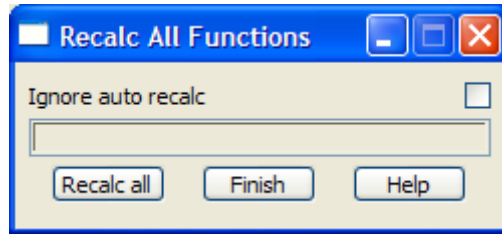
select data that was created by a function and the appropriate function will be recalced.

Recalc All

recalc_all_functions

Position of option on menu: Utilities =>Recalc =>Recalc all

The recalcd all option re-runs all functions regardless of their date and time stamps.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Ignore auto recalc	tick box		
<i>if not tick, all functions that have the auto-recalc flag set on are re-calculated.</i>			
<i>If tick, the auto-recalc flag is ignored and all functions are re-calculated.</i>			

Edit Chain

folder__rcn folder__rcn

Position of option on menu: Utilities =>Recalc =>Edit chain

The Recalc=>Edit chain option is used to edit chains.

The Recalc=>Edit chain walk-right menu provides a list all the defined chains in the project.

When a chain is selected from the list, it is automatically loaded into the **Edit/Create Chain** panel ready for editing.

Run Chain

Position of option on menu: Utilities =>Recalc =>Run chain

The Recalc=>Run chain option is used to run chains.

The Recalc=>Run chain walk-right menu provides a list all the defined chains in the project.

When a chain is selected from the list, it is automatically run.

Fence

fence

Position of menu: Utilities =>Fence

It is often necessary to divide strings into those parts that are within a certain region and those parts that are outside the region. In 12d Model, the fence option is the method of achieving this result.

Given a string to be used as a fence, the 12d Model fencing options will process strings in a model/view against the fence and break the strings into the parts inside the fence string and those parts outside the fence string.

Any 2d, 3d or interface line-strings that cut the fence polygon will have points inserted at the intersections with the fence polygon. The z-value at the intersection point will be interpolated from the adjacent points in the line-string.

Point strings do not have any extra points added to them.

Restrictions

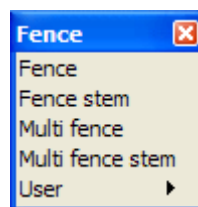
- ▲ only 2d, 3d and interface strings can be split using the fence option.
- ▲ 4d strings are treated as though they were point strings.
- ▲ arcs are considered to be **inside** the fence if the minimum bounding rectangles of the fence and arc overlap.
- ▲ alignment, pipeline, drainage, sewer strings are not processed by the fence option

Notes

1. if the fence string is not closed, the first and last points are joined together to form a closed polygon as the fence.
2. a string may be broken into a number of pieces if it wanders in and out of the fence string.
3. the fence string is not processed against itself even if it is in the model or view being fenced.
4. unpredictable results will occur if any strings being fenced lie on top of the fence. If problems occur, parallel the fence in or out by a millimetre.

The fence options allows the user to choose a single string to be used as the polygon fence or a number of strings to be used as polygons and process the data against all the strings in one operation.

The fence walk-right menu is



For the option <i>Fence</i> , go to the section	"Fence"
<i>Fence stem</i>	"Fence Stem"
Multi fence	"Multi Fence"
Multi fence stem	"Multi Fence Stem"

Fence

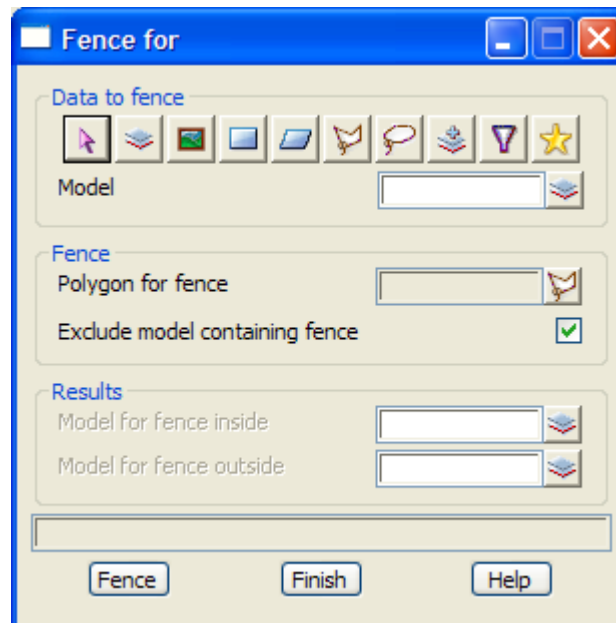
fence_for

Position of option on menu: Utilities =>Fence =>Fence

In this option, the user selects a single string to be used as a polygon fence. If the string is not closed, the first and last points are joined together to form a polygon.

The Fence option will process a selected string or all the strings in a model/view/string against this fence and break the strings into the parts inside the fence string and those parts outside the fence string.

On selecting the Fence option and then the appropriate **Data Source** in the panel, the **Fence for** panel is displayed.



The fields and buttons used in the two panel have the following functions.

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Data source type

Model

data selection type - for a full description go to "Data Source" in the chapter "Tools and Concepts"

Data source

data source for strings to fence.

Polygon for fence string-select

the selected string will be used as the polygon to act as a fence to separate data into an inside and an outside.

Exclude model containing fence tick box tick

if tick, no data in the model containing the fence string will be fenced.

if not tick, all the appropriate data in the model containing the fence string will be fenced.

Model for fence inside input

available models

if non-blank, name of the model to contain the data inside of the fence string.

If blank, then no fence inside will be calculated.

Model for fence outside input

available models

if non-blank, name of the model to contain the data outside of the fence string.

If blank, then no fence outside will be calculated.

Fence button

on selecting **fence**, the appropriate strings in the data source will be divided by the fence string (selected by the **poly** button) into the parts of the strings inside the fence string and the parts of the string outside the fence string. Any line-strings that cut the fence string will have a point inserted at the intersection with the fence string and the z-value for this point interpolated from the points on either side of it in the line-string.

How to Use the Panel and Panel Messages

- (a) Select a fence polygon string by choosing **Polygon to fence**
- (b) Fence processing begins on selecting the **Fence** button.

Progress messages - sent to the panel message area

calculating inside-outside

calculating inside

calculating outside

fencing *string name*

Completion message - sent to the panel message area

finished fence

<esc> can be used to abort the fence option.

Fence Stem

fence_stem

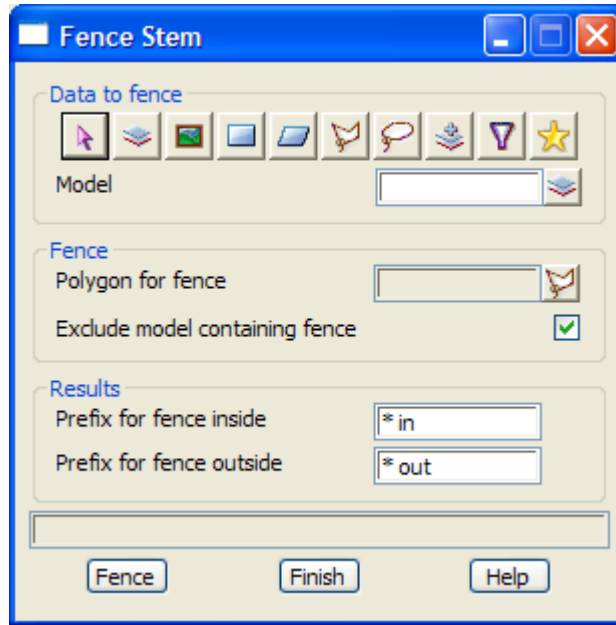
Position of option on menu: Utilities =>Fence =>Fence stem

As for the Fence option, the user selects a single string to be used as a polygon fence. If the string is not closed, the first and last points are joined together to form a polygon.

The Fence Stem option will process a selected string or all the strings in a model/view against this fence and break the strings into the parts inside the fence string and those parts outside the fence string. The inside and outside will then be put into models of the same name as the original model modified by a prefix and/or postfix.

This means that unlike the fence option, when fencing a view with the Fence Stem option, the inside/outside for each model on the view goes to distinct models using the prefix/postfix for the inside/outside model names.

On selecting the **Fence Stem** option and then the appropriate **Data Source** in the panel, the **Fence Stem** panel is displayed.



The fields and buttons used in the two panel have the following functions.

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Data source type		Model	
<i>data selection type - for a full description go to "Data Source" in the chapter "Tools and Concepts"</i>			

Data source
data source for strings to fence.

Prefix for fence inside	input		available models
<i>if non-blank, prefix*postfix to adjust the data model name to be the model to contain the data inside of the fence string.</i>			
<i>If blank, then no fence inside will be calculated.</i>			

Prefix for fence outside	input		available models
<i>if non-blank, prefix*postfix to adjust the data model name to be the model to contain the data outside of the fence string.</i>			
<i>If blank, then no fence outside will be calculated.</i>			

Polygon for fence	string-select		
<i>the selected string will be used as the polygon to act as a fence to separate data into an inside and an outside.</i>			

Exclude model containing fence	tick box	tick	
<i>if tick, no data in the model containing the fence string will be fenced.</i>			
<i>if not tick, all the appropriate data in the model containing the fence string will be fenced.</i>			

Fence	button		
<i>on selecting Fence, the appropriate strings in the data source will be divided by the fence string into the parts of the strings inside the fence string and the parts of the string outside the fence string. Any line-strings that cut the fence string will have a point inserted at the intersection with the fence string and the z-value for this point interpolated from the points on either side of it in the line-string.</i>			

<esc> can be used to abort the fence option.

Multi Fence

multi_fence

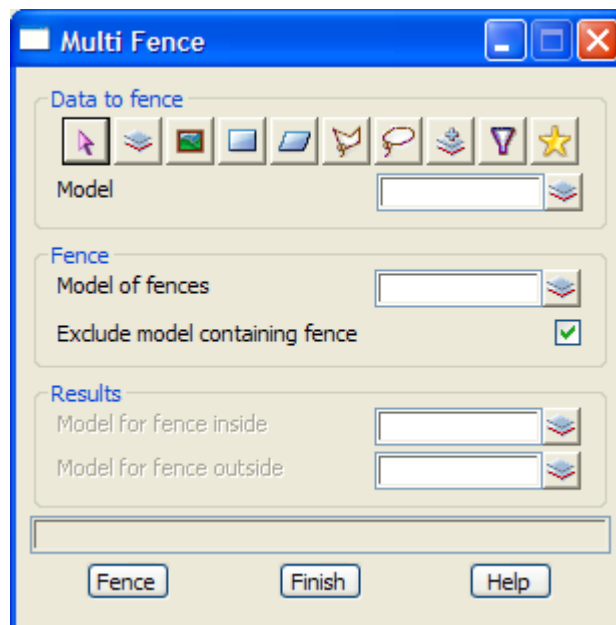
Position of option on menu: Utilities =>Fence =>Multi fence

It is often necessary to fence data against more than one polygon.

In the Multi-fence option, the user provides a model containing all the polygons to be used as fences. The Multi-fence option will process the selected string or all the strings in a model/view against all the polygons in the polygon model.

The data will be clipped and the **outside** is considered to be those bits are **outside all** of the polygons and the inside is the remainder, i.e. the bits **inside any one** of the polygon.

On selecting the Multi fence option and then the appropriate **Data Source** in the panel, the **Multi Fence String/Model/View** panel is displayed.



The fields and buttons have the following functions.

Field Description	Type	Defaults	Pop-Up
Data source type		Model	
<i>data selection type - for a full description go to "Data Source" in the chapter "Tools and Concepts"</i>			
Data source			
<i>data source for strings to fence.</i>			
Model of fences	input		available models
<i>name of the model that contains the polygons to be used as fences.</i>			
Model for fence inside	input		available models
<i>name of the model to contain the data that is inside any one of the fences. If this field is blank, then no fence inside will be calculated.</i>			
Model for fence outside	input		available models
<i>name of the model to contain the data outside all of the fences. If this field is blank, then no fence outside will be calculated.</i>			
Exclude model containing fence	tick box	tick	
<i>if tick, no data in the model containing the fence string will be fenced.</i>			
<i>if not tick, all the appropriate data in the model containing the fence string will be fenced.</i>			

Fence button

the appropriate strings in the data source will be divided by the fence polygons (from the model of fences) into the parts of the strings inside any one fence and the parts of the string outside all of the fences. Any line-strings that cut the fences will have a point inserted at the intersection with each fence and the z-value for this point interpolated from the points on either side of it in the line-string.

<esc> can be used to abort the multi- fence option.

Multi Fence Stem

multi_fence_stem

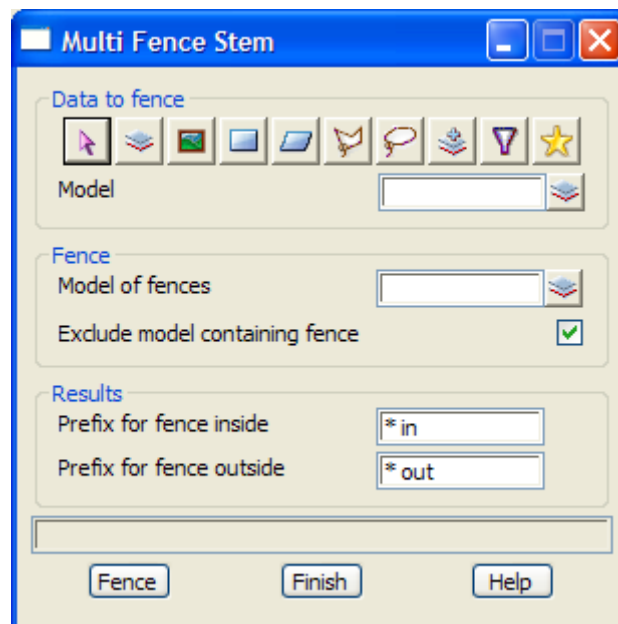
Position of option on menu: Utilities =>Fence =>Multi fence stem

It is often necessary to fence data against more than one polygon.

In the multi-fence stem option, the user provides a model containing all the polygons to be used as fences. The multi-fence stem option will process selected strings or all the strings in a model/view against all the polygons in the polygon model.

The data will be clipped and the **outside** is considered to be those bits are **outside all** of the polygons and the **inside** is the remainder, i.e. the bits **inside any one** of the polygon.

On selecting the Multi fence stem option and then the appropriate **Data Source** in the panel, the **Multi Fence Stem String/Model/View** panel is displayed.



The fields and buttons have the following functions.

Field Description	Type	Defaults	Pop-Up
Data source type <i>data selection type - for a full description go to "Data Source" in the chapter "Tools and Concepts"</i>		Model	
Data source <i>data source for strings to fence.</i>			
Model of fences <i>name of the model that contains the polygons to be used as fences.</i>	input		available models
Prefix for fence inside <i>if non-blank, prefix*postfix to adjust the data model name to be the model to contain the data inside of the fence string. If blank, then no fence inside will be calculated.</i>	input		available models
Prefix for fence outside <i>if non-blank, prefix*postfix to adjust the data model name to be the model to contain the data outside of the fence string. If blank, then no fence outside will be calculated.</i>	input		available models

Exclude model containing fence tick box tick

*if **tick**, no data in the model containing the fence string will be fenced.*

*if **not tick**, all the appropriate data in the model containing the fence string will be fenced.*

Fence button

the appropriate strings in the data source will be divided by the fence polygons (from the model of fences) into the parts of the strings inside any one fence and the parts of the string outside all of the fences. Any line-strings that cut the fences will have a point inserted at the intersection with each fence and the z-value for this point interpolated from the points on either side of it in the line-string.

<esc> can be used to abort the multi- fence option.

2D Affine

affine_2d

Position of option on menu: Utilities =>A-G =>Affine

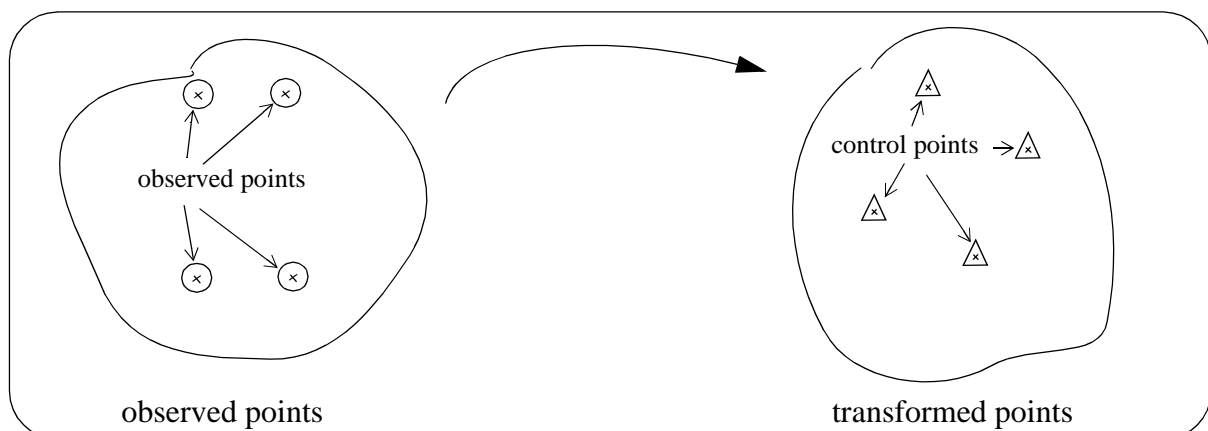
A affine transformation is a two dimensional linear transformation consisting of a 2D-translation (shift) of the data, a rotation and scaling of the data in two perpendicular directions. Hence there are six parameters to be specified.

The most frequent method of defining an affine transformation is not by explicitly giving the affine transformation parameters but by specifying the final (transformed) and existing (observed) coordinates for three or more user selected points. The six parameters are then calculated using least squares.

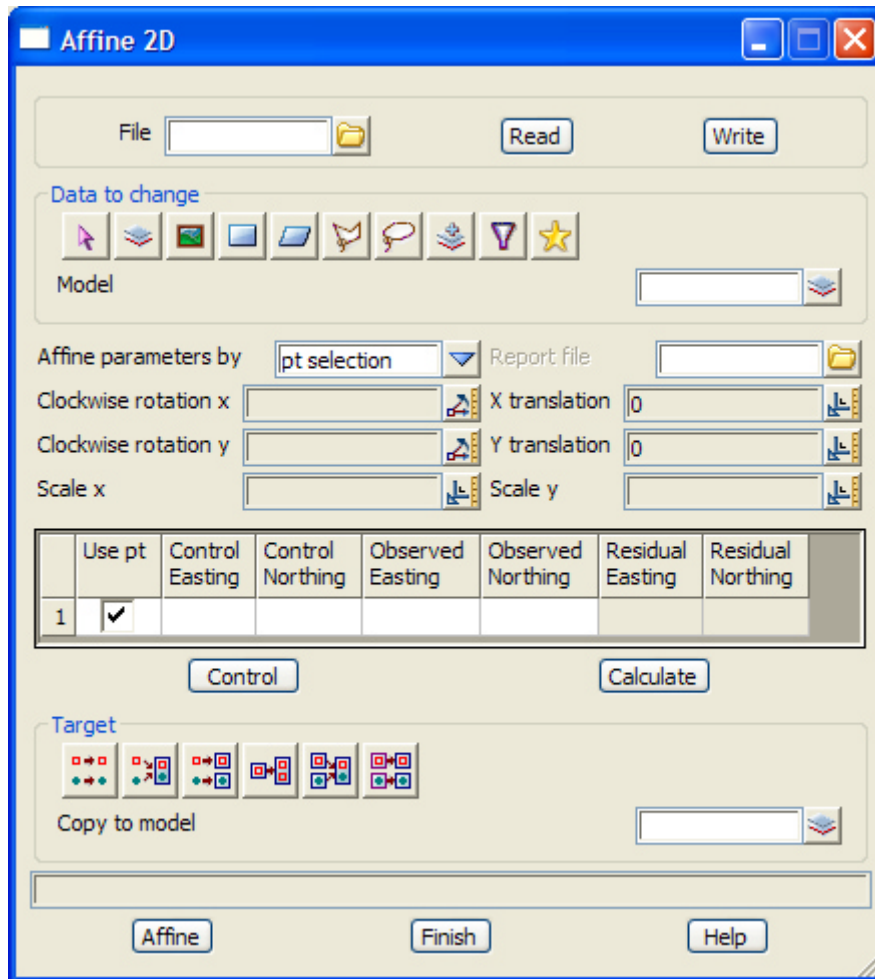
These special user selected points **in the final co-ordinate system** are known as **control points** and **observed points** in the un-transformed system.

The affine transformation (for going from the observed points to the control points) can be calculated and used to convert the existing co-ordinates of items to their new transformed co-ordinates.

IMPORTANT NOTE - make certain that the control and observed points are not selected so that all the control points are not on a straight line or all the observed points are not on a straight line.



On selecting **Affine**, the **Affine Transformation of** panel is displayed.



The main purpose of this panel is to display the affine transformation parameters. The fields and buttons used in the **Affine Transformation of** panel will be discussed after describing how to select the affine control points.

After selecting **Affine** option, the **Affine Transformation of** panel is placed on the screen and the option then sits waiting for the user to define how the affine parameters will be determined. The user selects the **Affine parameters by** choice box to choose if entry is by way of selecting points (default) or if the parameters are to be entered manually.

If the pt selection option is chosen, the user can start the selection of points by selecting the **Control** button. The selection should start with the control point, accepting that point then selecting the corresponding observed point. The control points are shown as triangles and the observed points are shown as circles. Lines are drawn between the control-observed pair for clarity.

Accepting the 2nd point (observed point) re-initialises the selection sequence so any further sets of points can be selected by selecting a control point and so on. The co-ordinates of the control points and observed points are added to the grid on the selection of two valid points. The use pt field is ticked by default.

The **calculate** button calculates the affine transformation parameters based all the control points in the grid control with the use pt field tick box ticked on. The residuals are then placed into the grid. The calculated parameters are placed into the parameters section of the panel.

If the direct entry method is chosen, the grid will disappear leaving only the parameter section. The user then fills out the relevant information.

The affine parameters are

- the x-scale factor for the existing co-ordinates with respect to the new coordinates
- the y-scale factor for the existing co-ordinates with respect to the new coordinates
- the rotation of the x-axis of the existing co-ordinates to align it with the new x co-ordinates axis
- the rotation of the y-axis of the existing co-ordinates to align it with the new y co-ordinates axis
- the x and y translation of the existing co-ordinates after the scalings and rotations have been applied

The fields and buttons in the panel have the following functions

Field Description	Type	Defaults	Pop-Up
File <i>a filename can be specified for reading or writing a file.</i>	file box		*.aaf files
Read <i>if a valid file exists, the file contents can be loaded into the panel.</i>	button		
Write <i>if a valid name is specified, the user can write the input data to a file.</i>	button		
Data source type <i>data selection type - for a full description go to "Data Source" in the chapter "Tools and Concepts"</i>		Model	
Data source <i>source of data is to be processed.</i>	input		
Affine parameters by <i>the parameter entry method.</i>	choice	pt selection	pt selection direct entry
Report file <i>if not blank, write a report on the Affine transformation.</i>			*.rpt files
Rotation x <i>the rotation of the x-axes of the existing points with respect to the transformed x-axis.</i>	input/output		
Rotation y <i>the rotation of the y-axes of the existing points with respect to the transformed y-axis.</i>	input/output		
Scale x <i>the x-scale factor for the existing co-ordinates with respect to the transformed coordinates</i>	input/output		
Scale y <i>the x-scale factor for the existing co-ordinates with respect to the transformed coordinates</i>	input/output		
X Translation <i>the x translation of the existing co-ordinates with respect to the transformed coordinates</i>	input/output		
Y Translation <i>the y translation of the existing co-ordinates with respect to the transformed coordinates</i>	input/output		
Control <i>restarts the selection process for choosing more control points.</i>	button		
Calculate <i>calculate the Affine parameters from the selected points shown in the grid.</i>	button		

Target type

data target type - for a full description go to “Data Target” in the chapter “Tools and Concepts”

Target info

input

extra information required for the target.

Affine

button

apply the affine transformation to the data specified in the source box, and put it into the appropriate target area.

Cartographic Projections

Position of option on menu: Utilities =>A-G =>Cartographic

The **Cartographic** option is used to transform data based on the same datum between

- (a) two different cartographic projections (based on the same datum)
- (b) longitude and latitude and a cartographic projection (based on the same datum)
- (c) a cartographic projection and longitude and latitude (based on the same datum).

The *Cartographic* option has already been documented in the section “Cartographic” in the chapter “Survey”

Change

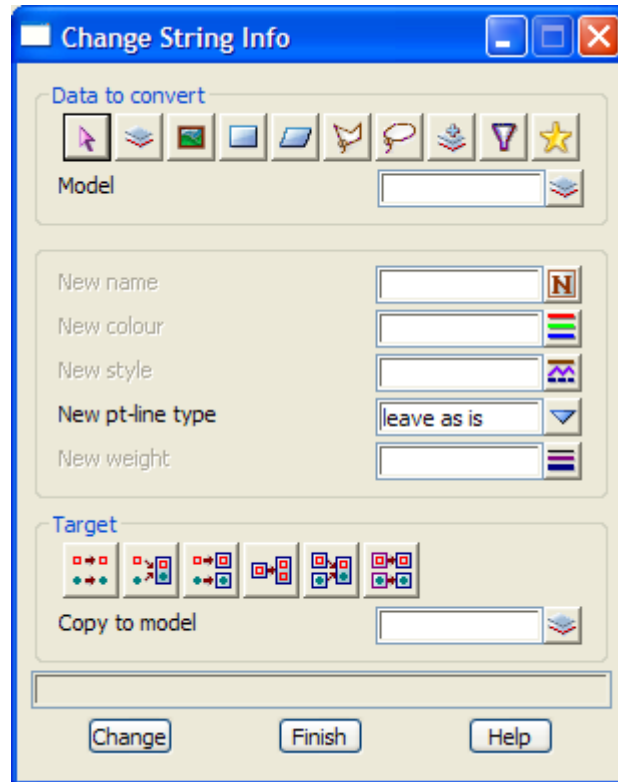
change_string_info

Position of option on menu: Utilities =>A-G =>Change

This Change option is similar to the Change option from the Strings edits menu.

For the selected strings, Change can modify the colour, name, breakline type, style and model of each string.

On selecting the Change option, the **Change string info** panel is displayed.



The fields and buttons used in the panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Data source type		Model	
<i>data selection type - for a full description go to "Data Source" in the chapter "Tools and Concepts"</i>			
Data source	input		
<i>source of data is to be processed.</i>			
New name	input		
<i>if non-blank, then the name of the selected strings will be changed to the name given in the new name field.</i>			
New colour	input		available colours
<i>if non-blank, then the colour of the selected strings will be changed to the colour given in the new colour field.</i>			
New style	input		
<i>if non-blank, then the linestyle of the selected strings will be changed to the given in the new style field.</i>			

New pt-line type input leave as is leave as is, point, line
if leave as is, then the point-line type of the selected string will be not be changed.
If point string or line string, then the point-line type of the selected string will be changed to that type.

New weight input leave as is leave as is, point, line
*if non-blank, then the weight of the selected strings will be changed to the
given in the new weight field.*

Target type

data target type - for a full description go to "Data Target" in the chapter "Tools and Concepts"

Target info input
extra information required for the target.

Change button
process the selected string

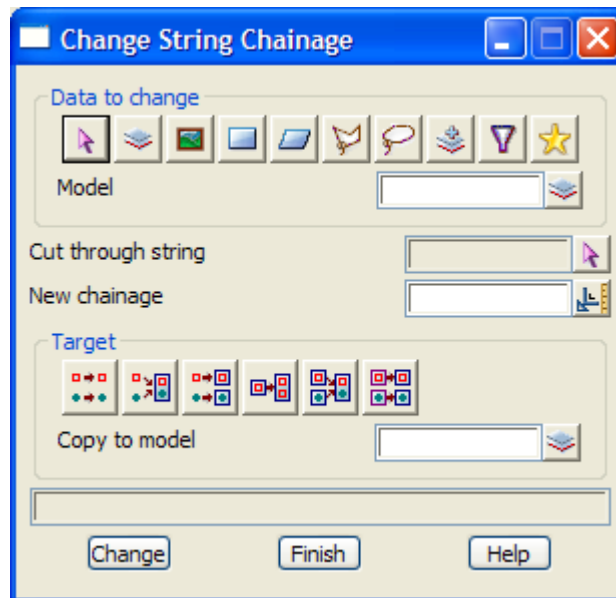
Change String Chainage

change_string_chainage

Position of option on menu: Utilities =>A-G =>Change string chainage

This Change string chainage sets the start chainage of the selected strings to a given chainage value.

Selecting the Change string chainage brings up the **Change string chainage** panel.



The fields and buttons used in the panel have the following functions.

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Data source type

Model

data selection type - for a full description go to "Data Source" in the chapter "Tools and Concepts"

Data source

input

source of data is to be processed.

New chainage

input

value to set the start chainage of all the selected strings to.

Target type

data target type - for a full description go to "Data Target" in the chapter "Tools and Concepts"

Target info

input

extra information required for the target.

Change

button

process the selected string

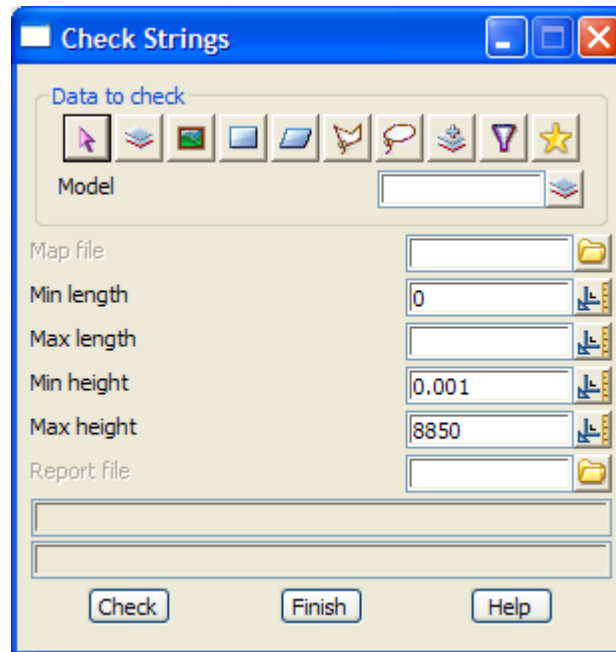
Check Strings

check_strings

Position of option on menu: Utilities =>A-G =>Check strings

Check strings compares selected strings against a mapping file and also checks distances between vertices on strings.

Selecting Check strings brings up the **Check Strings** panel.



The fields and buttons used in the panel have the following functions.

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Data source type		Model	
-------------------------	--	-------	--

data selection type - for a full description go to "Data Source" in the chapter "Tools and Concepts"

Data source	input		
--------------------	-------	--	--

source of data is to be processed.

Map file	map file box		
-----------------	--------------	--	--

if a map file is picked then each selected string is compared against the map file keys and if any matches occur, the string attributes must agree with the map file fields of the matched key. Any differences will be reported to the Output window and the Report file.

Min length	input		
-------------------	-------	--	--

report if any distances between string vertices is less than Min length.

Max length	input		
-------------------	-------	--	--

report if any distances between string vertices is greater than Max length.

Min height	input		
-------------------	-------	--	--

report if any vertex height is less than Min height.

Max height	input		
-------------------	-------	--	--

report if any vertex height is greater than Max height.

Report file			
--------------------	--	--	--

if non blank, any failures are reported in this file.

Check button
process the selected strings

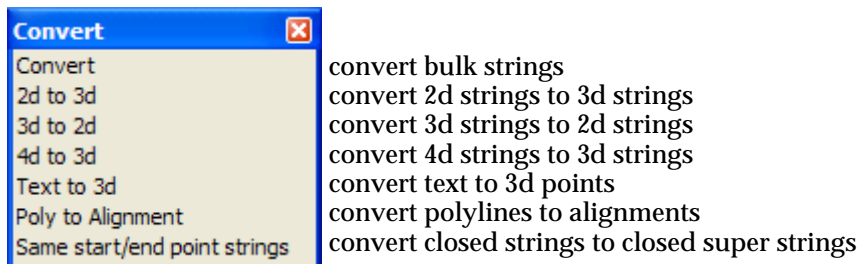
Convert

convert

Position of menu: Utilities =>A-G =>Convert

The convert options is designed to convert large numbers of strings between string types. There is also a global convert option which will convert even more string types.

The convert walk-right menu is



For the option *Convert*, go to the section

2d to 3d

3d to 2d

4d to 3d

Text to 3d

Poly to alignment

Same start/end point strings

“Convert”

“2d to 3d”

“3d to 2d”

“4d to 3d”

“Text to 3d”

“Poly to Alignment”

“Same Start/End Point Strings”

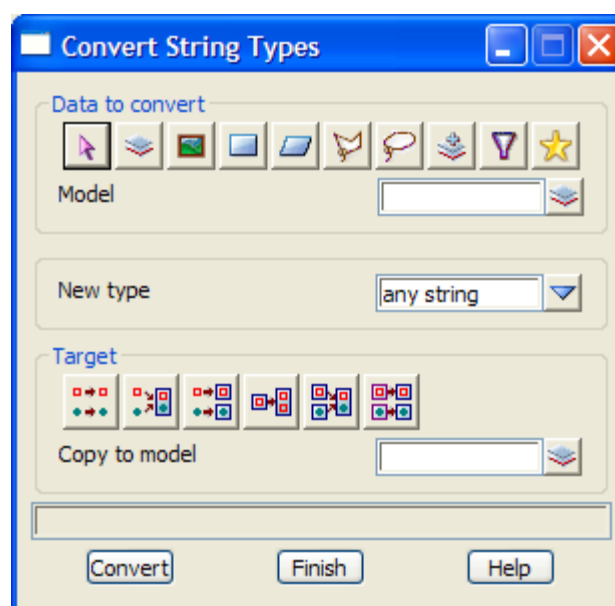
Convert

convert_string_types

Position of option on menu: Utilities =>A-G =>Convert =>Convert

The Convert option converts strings to a selected string type.

On selecting the Convert option, the **Convert String Types** panel is displayed.



The fields and buttons in this panel are used as follows

Field	Description	Type	Defaults	Pop-Up
Data source type				Model
	<i>data selection type - for a full description go to "Data Source" in the chapter "Tools and Concepts"</i>			
Data source		input		
	<i>source of data is to be processed.</i>			
New type		string type box		all string types
	<i>the type of string to try and convert the data to.</i>			
Target type				
	<i>data target type - for a full description go to "Data Target" in the chapter "Tools and Concepts"</i>			
Target info		input		
	<i>extra information required for the target.</i>			
Convert		button		
	<i>convert all the selected strings to the type given in the New type field.</i>			

2d to 3d

convert_2d_to_3d_strings_in

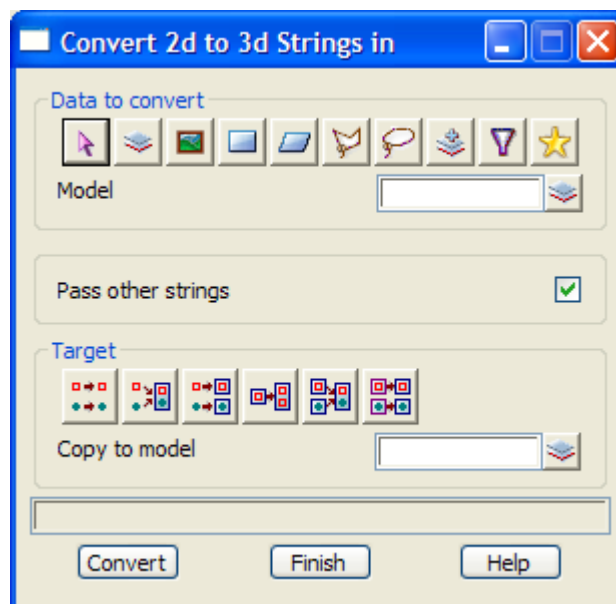
Position of option on menu: Utilities =>A-G =>Convert =>2d to 3d

The main difference between a 2d and a 3d string is that all the points in a 2d string have the same height. Hence to modify the z-values at individual points, a string must be 3d.

The 2d to 3d option is used to turn 2d (contour) strings into 3d strings.

This option is especially useful when a large number of strings have been read in with constant z-values (for example, cadastre) and the user then wants to modify the heights at each point on the string.

On selecting 2d to 3d and then the appropriate **Data Source** in the panel, the **Convert 2d to 3d Strings in** panel is displayed.



The fields and buttons in this panel are used as follows

Field	Description	Type	Defaults	Pop-Up
Data source type				Model

data selection type - for a full description go to “Data Source” in the chapter “Tools and Concepts”

Data source input
source of data is to be processed.

Pass other strings tick box tick
if tick, copies of all other strings are passed through to the model for converted strings

Target type
data target type - for a full description go to “Data Target” in the chapter “Tools and Concepts”

Target info input
extra information required for the target.

Convert button
convert all the 2d string in the model/view given in the data source to 3d strings.

3d to 2d

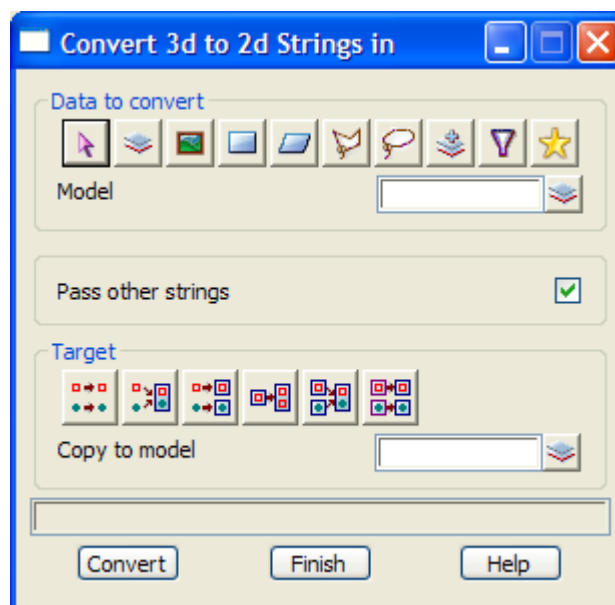
[convert_3d_to_2d_strings_in](#)

Position of option on menu: Utilities =>A-G =>Convert =>3d to 2d

The difference between a 3d and a 2d string is that all the points in a 2d string have the same height. The 3d to 2d option turns 3d string with a constant height into 2d strings. That is, it only converts 3d strings that have the **same** height at each point.

This option is useful when contours strings have come from another system as 3d strings, not 2d strings.

On selecting 3d to 2d and then the appropriate **Data Source** in the panel, the **Convert 3d to 2d Strings in** panel is displayed.



The fields and buttons in this panel are used as follows

Field Description	Type	Defaults	Pop-Up
Data source type		Model	

data selection type - for a full description go to “Data Source” in the chapter “Tools and Concepts”

Data source input
source of data is to be processed.

Pass other strings tick box tick
if tick, copies of all other strings are passed through to the model for 2d strings

Target type
data target type - for a full description go to “Data Target” in the chapter “Tools and Concepts”

Target info input
extra information required for the target.

Convert button
*convert all the 3d strings with **constant** height in the model/view given in the model/view field, to 2d strings.*

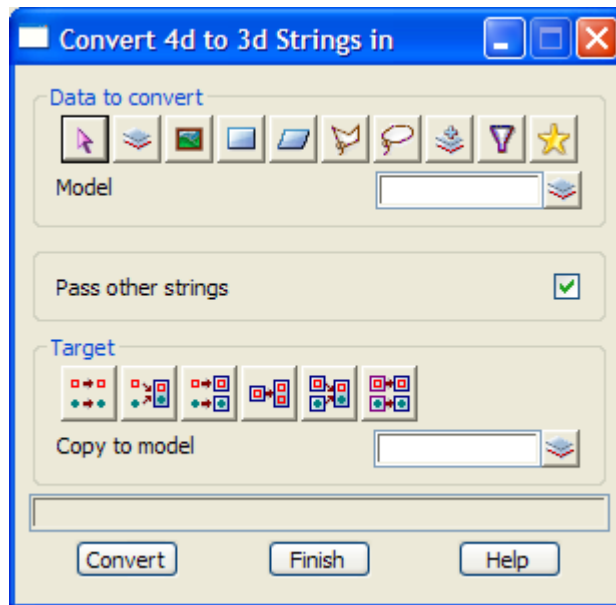
4d to 3d

convert_4d_to_3d_strings_in

Position of option on menu: Utilities =>A-G =>Convert =>4d to 3d

The difference between a 4d and a 3d string is that a 4d string can have a text label at each point on the string. The 4d to 3d option turns 4d string into 3d strings by stripping off the text labels at each point of the 4d string.

On selecting 4d to 3d and then the appropriate **Data Source** in the panel, the **Convert 4d to 3d Strings** in panel is displayed.



The fields and buttons in this panel are used as follows

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Data source type Model
data selection type - for a full description go to “Data Source” in the chapter “Tools and Concepts”

Data source input
source of data is to be processed.

Pass other strings tick tick
if tick, copy all other strings and pass them through to the model for 3d strings

Target type
data target type - for a full description go to “Data Target” in the chapter “Tools and Concepts”

Target info input
extra information required for the target.

Convert button
convert all the 4d strings in the model/view to 3d strings.

Text to 3d

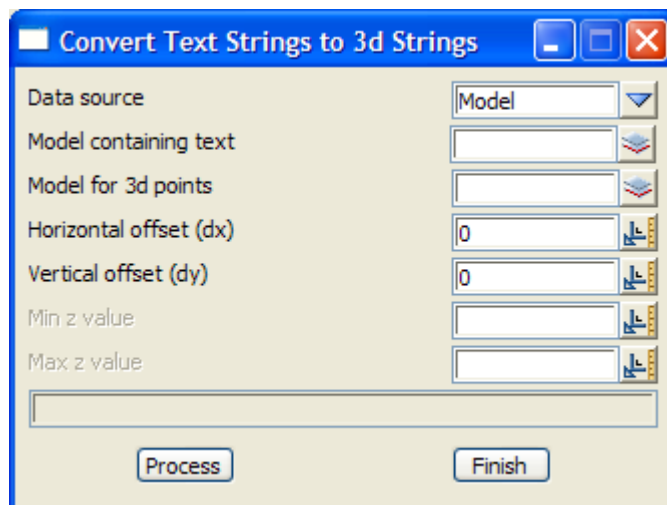
text_to3d_panel

Position of option on menu: Utilities =>A-G =>Convert =>Text to 3d

Sometimes when data for points is received from a CAD systems, all that is received is the text of the z-value of the point and no actual point.

The *Text to 3d* option will find text representing a z-value and create a new point using the justification point of the text as the (x,y) position and the value of the text as the z-value.

On selecting Text to 3d, the **Convert Text Strings to 3d Strings** panel is displayed.



The fields and buttons in this panel are used as follows

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Data source type		Model	
-------------------------	--	-------	--

data selection type - for a full description go to "Data Source" in the chapter "Tools and Concepts"

Data source	input		
--------------------	-------	--	--

source of data of the text to be processed.

Model for 3d points	model box		available models
----------------------------	-----------	--	------------------

model to place the 3d points in.

Horizontal offset (dx)	input	0	
-------------------------------	-------	---	--

the x-value for created point is the text justification point less the horizontal offset.

Vertical offset (dy)	input	0	
-----------------------------	-------	---	--

the y-value for created point is the text justification point less the vertical offset.

Min z value	input		
--------------------	-------	--	--

if non-blank, only convert text with z-value greater than Min z value.

Max z value	input		
--------------------	-------	--	--

if non-blank, only convert text with z-value less than Max z value.

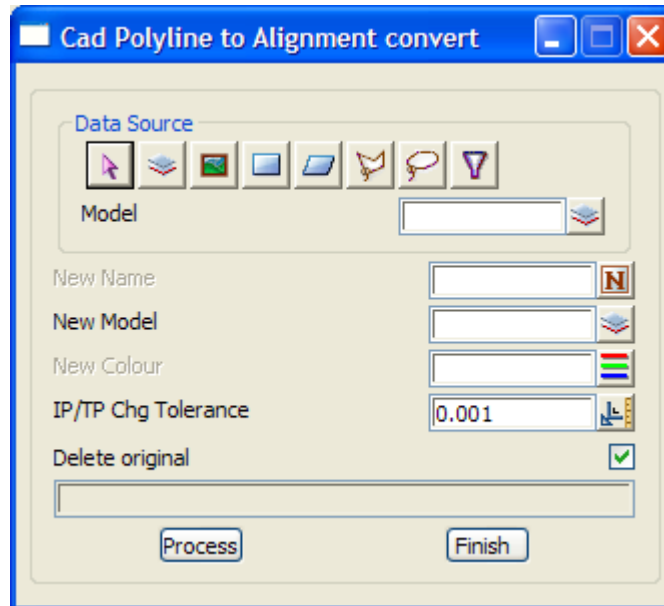
Process button
convert all the selected text strings to 3d strings.

Poly to Alignment

Cad_polylines_to_alignment_convert

Position of option on menu: Utilities =>A-G =>Convert =>Poly to alignment

Selecting Poly to alignment brings up the **CAD Polyline to Alignment Convert** panel.



The fields and buttons in this panel are used as follows

Field Description	Type	Defaults	Pop-Up
Data source type		Model	
<i>data selection type - for a full description go to "Data Source" in the chapter "Tools and Concepts"</i>			
Data source	input		
<i>source of data of the text to be processed.</i>			
New name	name box		available names
<i>if non blank, new name for the converted strings</i>			
New model	model box		available models
<i>new model for the converted strings</i>			
New colour	colour box		available colours
<i>if non blank, new colour for the converted strings</i>			
IP/TP chg tolerance	input	0.001	0.001
Delete original	tick box		tick
<i>if tick, the original strings are deleted.</i>			
Process	button		
<i>convert all the selected alignments.</i>			

Same Start/End Point Strings

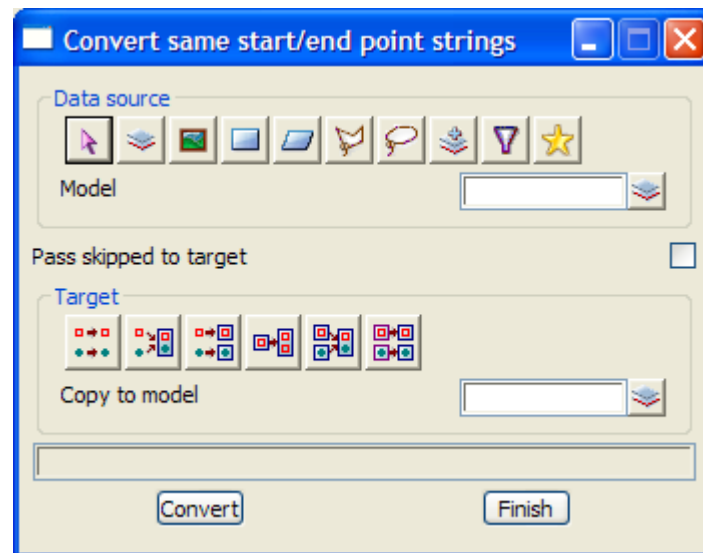
convert_same_start_end_point_strings

Position of option on menu: Utilities =>A-G =>Convert =>Same start/end point strings

When non super string strings are closed, an extra vertex identical to the first vertex is added to the end of the string. For super strings, there is a **closed string** flag and no duplication of the first and last vertices is required.

This options converts closed non super strings to closed super strings and deletes the duplicated vertex.

Selecting Same string/end point strings brings up the **Convert Same Start/End Point Strings** panel.



The fields and buttons in this panel are used as follows

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Data source type

Model

data selection type - for a full description go to "Data Source" in the chapter "Tools and Concepts"

Data source input

source of data is to be processed.

Pass other strings tick tick

if tick, copy all other strings and pass them through to the target model

Target type

data target type - for a full description go to "Data Target" in the chapter "Tools and Concepts"

Target info input

extra information required for the target.

Convert button

convert all the closed strings to closed super strings.

Cuts

cuts

Position of menu: Utilities =>A-G =>Cuts

The cuts option is used to create intersections through string data rather than tins.

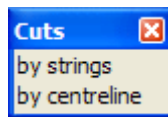
That is, it calculates the cuts that a plan string makes with each of the strings in a model or view, and creates cut points with the z-value from the cut strings.

The cut points that the plan string creates are connected as a 4d string - the x-section of cuts through a model or view - with the z value coming from the cut string, and the text at the point being the name of string that was cut.

There are two methods for generating the cuts x-sections

- (a) by taking sections along selected strings or all the strings in a model or view
- (b) by taking sections at regular intervals and perpendicular to a selected centre line string.

The cuts walk-right menu contains these two methods



For the option *by strings*, go to the section "Cuts by Strings".

by centreline

"Cuts by Centreline".

Cuts by Strings

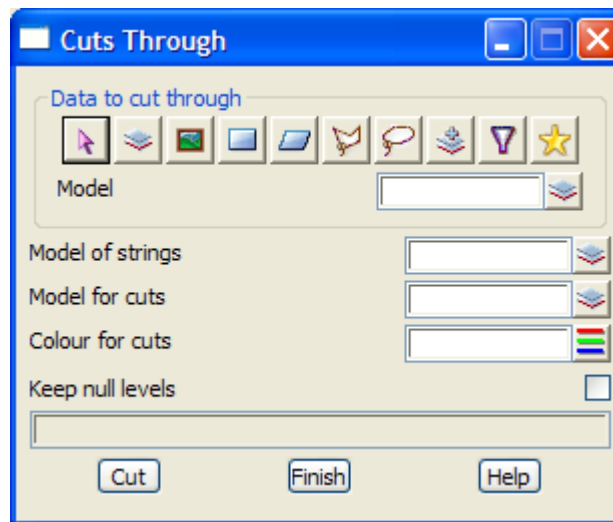
cuts_through

Position of option on menu: Utilities =>A-G =>Cuts =>by strings

For this method of generating cuts through strings, either individual strings are selected or a model or view of strings is specified by the user. These strings are then

For each of the selected strings, the plan representation of the string is cut through the model or view of strings to generate cut x-sections.

On selecting the **by strings** option and then the appropriate **Data Source** in the panel, the **Cuts Through** panel is displayed.



The fields and buttons in this panel are used as follows

Field Description	Type	Defaults	Pop-Up
Data source type		Model	
<i>data selection type - for a full description go to "Data Source" in the chapter "Tools and Concepts"</i>			
Data source	input		
<i>source of data is to be processed.</i>			
Model of strings	input		available models
<i>each string in this model will be processed against all the strings in the view/model to cut through. Not used with the pick button.</i>			
Model for cuts	input		available models
<i>model to place the cut x-sections into.</i>			
Colour for cuts	input		available colours
<i>colour for the cut x- section strings</i>			
Cut	button		
<i>each string in the model of strings is processed against all the strings in the view/model to cut through. The 4d strings of cuts are placed in the model for cuts.</i>			

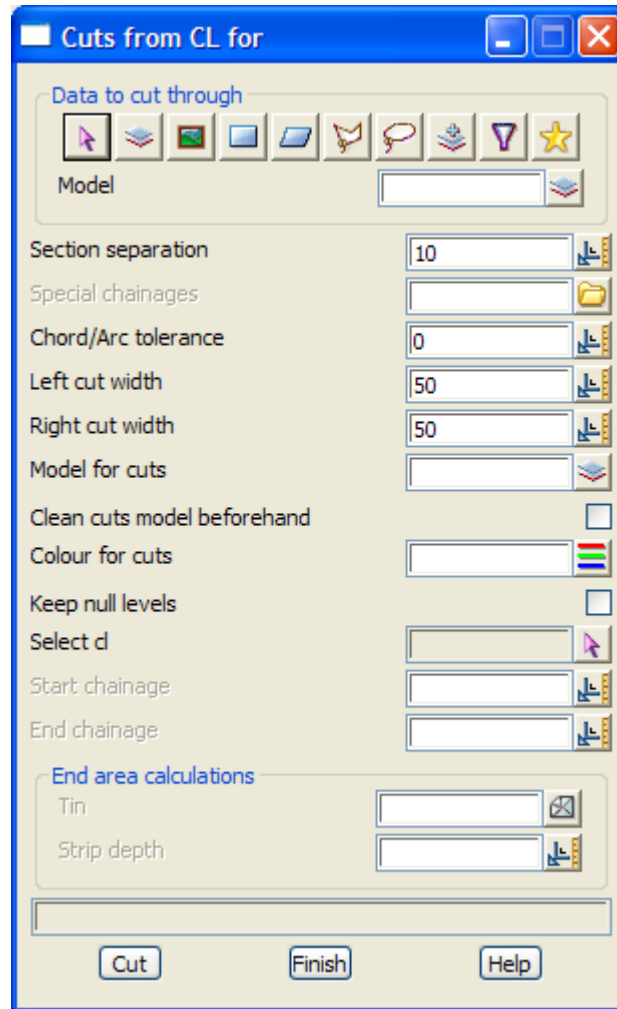
Cuts by Centreline

cuts_from_cl_for

Position of option on menu: Utilities =>A-G =>Cuts =>by centreline

For by centreline, a centre line string is selected by the user and section lines are created in plan at regular intervals perpendicular to the selected string. Cut x-sections are then generated for the plan section lines by taking cuts through the model or view of strings, by the plan sections.

On selecting the by centreline option, the **Cuts from CL for** panel is displayed.



The fields and buttons in this panel are used as follows

Field Description	Type	Defaults	Pop-Up
Data source type		Model	
<i>data selection type - for a full description go to "Data Source" in the chapter "Tools and Concepts"</i>			
Data source	input		
<i>source of data is to be processed.</i>			
Section separation	input	10.0	
<i>the distance along the selected centre line to generate plan section lines to be used to cut through the model or view.</i>			
Special chainages	input		*.spf files
<i>a file containing chainages, one per line, that are also used as chainages to create cross sections at.</i>			

Chord/arc tolerance input default chord/arc tolerance
the chord to arc tolerance to use on the selected string for determining how many plan sections are created around horizontal curves.

Left/Right cut width input 50
the left/right distance to go out from the centre line for creating a section to cut through the strings.

Model for cuts input available models
model to place the cut x-section strings into.

Clean cuts model beforehand tick box
if tick, the model is cleaned of all data before new sections are created.

Colour for cuts colour box available colours
colour for the cut section strings

Keep null levels tick box
if tick, then if a null level exists on the string being cut, then a null level point is created.

Select cl string-select
the selected cl string is used to create plan section lines at regular intervals and perpendicular to the centre line string. These strings are cut through the model/view of strings.

Start/End chainage input
if non-blank then sections for the cuts are restricted to between the given start and end chainage of the selected cl string.

End Area Calculations

Tin tin box available tins
if non-blank, the cut and fill areas for the section against the tin are calculated and added as attributes to the section.

Strip depth input
if non-zero, then a strip depth is removed from the tin before the cut and fill areas for the section against the tin are calculated.

Cut button
each plan section line generated down the selected centre line string is processed against all the strings in the view/model. The 4d strings of cuts are placed in the model for cuts.

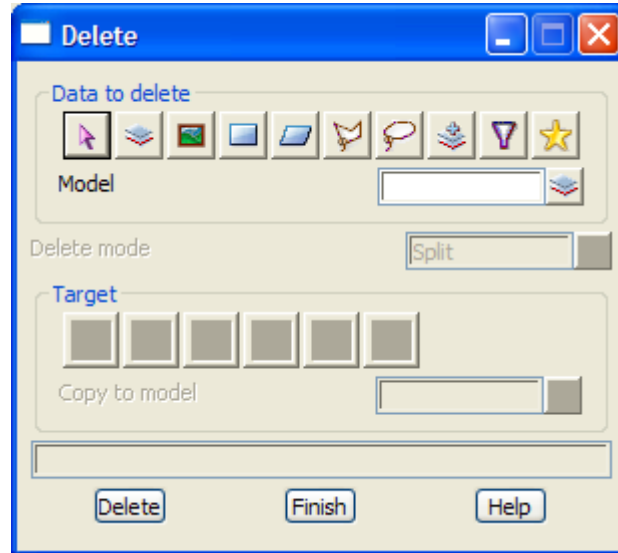
Delete

delete

Position of option on menu: Utilities =>A-G =>Delete

The Delete option deletes all the selected strings.

On selecting the Delete option, the **Delete** panel is displayed.



The fields and buttons in this panel are used as follows

Field	Description	Type	Defaults	Pop-Up
-------	-------------	------	----------	--------

Data source type

Model

data selection type - for a full description go to "Data Source" in the chapter "Tools and Concepts"

Data source

input

source of data is to be processed.

Delete

button

delete the selected strings.

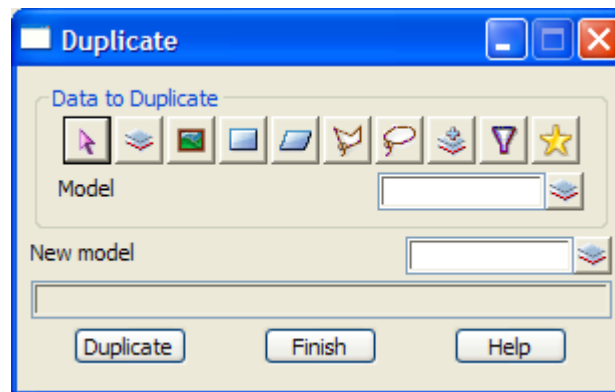
Duplicate

duplicate

Position of option on menu: Utilities =>A-G =>Duplicate

The duplicate option is used to make a duplicate of a string, an entire model or duplicates of all the models on a view.

On selecting **Duplicate** and then the appropriate **Data Source** in the panel, the **Duplicate** panel is displayed.



The fields and buttons used in the panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Data source type		Model	
<i>data selection type - for a full description go to "Data Source" in the chapter "Tools and Concepts"</i>			
Data source	input		
<i>source of data is to be processed.</i>			
New model	input		available models
<i>name of the model to place the duplicated strings into.</i>			
Duplicate	button		
<i>duplicate all the strings in the model/view given in the model/view field and add them to the model given in the new model field.</i>			

<esc> can be used to abort the duplicate option.

Explode

explode_strings_in

Position of option on menu: Utilities =>A-G =>Explode

The explode option is used to explode line strings and polylines into two point lines and polylines and point strings into individual points. Alignment, pipeline, sewer and drainage strings are not exploded.

The option can be used in three ways - an individual string can be selected for exploding, the name of the model to be exploded can be entered or a view name entered and all the models in the view will be exploded and placed in one new model.

On selecting **Explode** and then the appropriate **Data Source** in the panel, the **Explode Strings in** panel is displayed.



The fields and buttons used in the panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Data source type		Model	
<i>data selection type - for a full description go to "Data Source" in the chapter "Tools and Concepts"</i>			
Data source	input		
<i>source of data is to be processed.</i>			
Pass other strings	tick box	tick	
<i>if tick, copies of all other strings and passed through to the exploded model.</i>			
Target type			
<i>data target type - for a full description go to "Data Target" in the chapter "Tools and Concepts"</i>			
Target info	input		
<i>extra information required for the target.</i>			
Explode	button		
<i>explode all the strings in the data source and process them according to the target box.</i>			

Explode Text

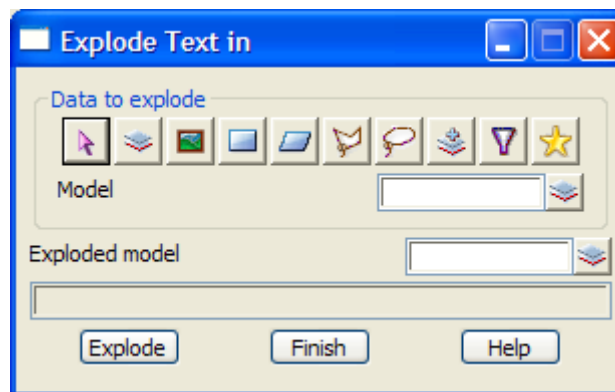
explode_text_in

Position of option on menu: Utilities =>A-G =>Explode (text)

The explode text option is used to explodes text in text strings and the text from 4d strings, into its component arcs and lines.

Like explode, the option can be used in three ways - individual strings can be selected for exploding, the name of the model to be exploded can be entered or a view name entered and all the models in the view will be exploded and placed in one new model.

On selecting Explode Text and then the appropriate **Data Source** in the panel, the **Explode Text in** panel is displayed.



The fields and buttons used in the panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Data source type		Model	
<i>data selection type - for a full description go to "Data Source" in the chapter "Tools and Concepts"</i>			
Data source	input		
<i>source of data is to be processed.</i>			
Exploded model	input		available models
<i>name of the model to place the exploded text strings and text of 4d strings into.</i>			
Explode	button		
<i>explode all the selected text and add them to the model given in the exploded model field.</i>			

Factor

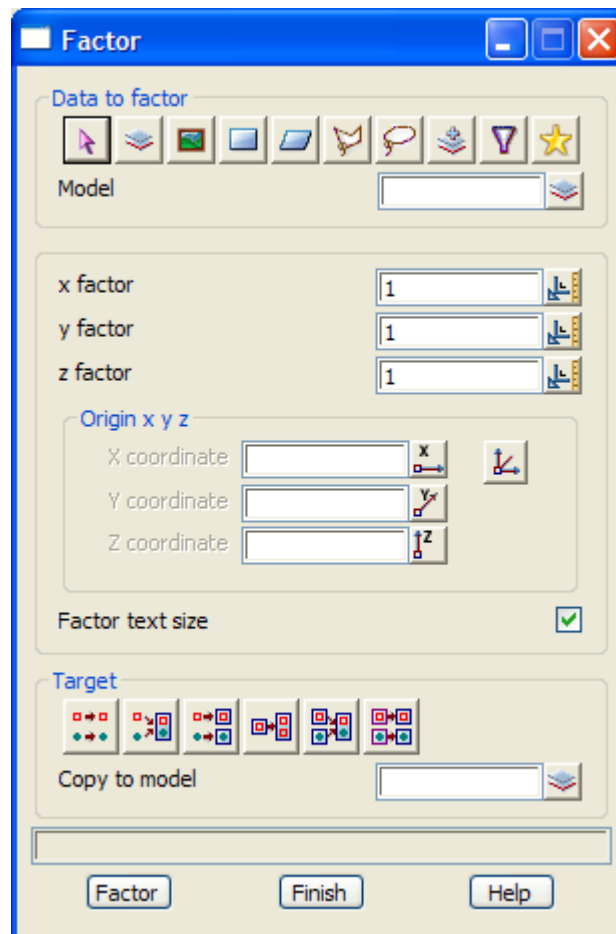
factor

Position of option on menu: Utilities =>A-G =>Factor

The factor option is used to multiply the x,y and z values of a selected string, or for all the strings in a given model or view, by user supplied factors.

The option is useful for changing the units of any data in a model (e.g. imperial to metric).

On selecting Factor and then the appropriate **Data Source** in the panel, the Factor panel is displayed.



Field Description	Type	Defaults	Pop-Up
Data source type		Model	
<i>data selection type - for a full description go to "Data Source" in the chapter "Tools and Concepts"</i>			
Data source	input		
<i>source of data is to be processed.</i>			
x/y/z factor	input	1.0	
<i>factor to multiply the x/y/z-values of a string by.</i>			
Origin x y z	input		xyz ops menu
<i>field with x y z value to be used as (x,y,z) origin for the factor. if blank, an origin of (0,0,0) is used.</i>			
Factor text size	tick box	tick	
<i>if tick, the size of text is factored.</i>			

Target type

data target type - for a full description go to "Data Target" in the chapter "Tools and Concepts"

Target info input

extra information required for the target.

Factor button

multiply the (x,y,z) values of the selected strings by the x,y and z factors given in the appropriate panel fields.

WARNING - if the x factor and y factor are not equal, then arcs in arcs, circles, alignment and polyline strings can not be factored. For these cases, the y factor will be set the x-factor and then applied to the arcs.

Filter

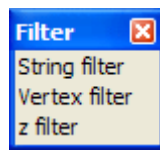
filter

Position of menu: Utilities =>A-G =>Filter

The filter options are used to remove surplus points from strings. Three types of filters are currently supported in 12d Model

- ▲ a string filter, which removes points from 2d and/or 3d line strings that do not deviate by more than a specified offset tolerance from straight lines joining successive string points (in three dimensions for 3d strings)
- ▲ a vertex-filter which removes adjacent vertices closer than a given user defined (x,y) and z distance
- ▲ a z-filter which eliminates points not contained within a specified z-range

The filter walk-right menu is



filter 2d and 3d strings
removes close adjacent vertices
filter z values

For the option *String filter*, go to the section "String Filter".

Vertex filter

"Vertex Filter".

z filter

"Z Filter".

String Filter

filter_strings_in

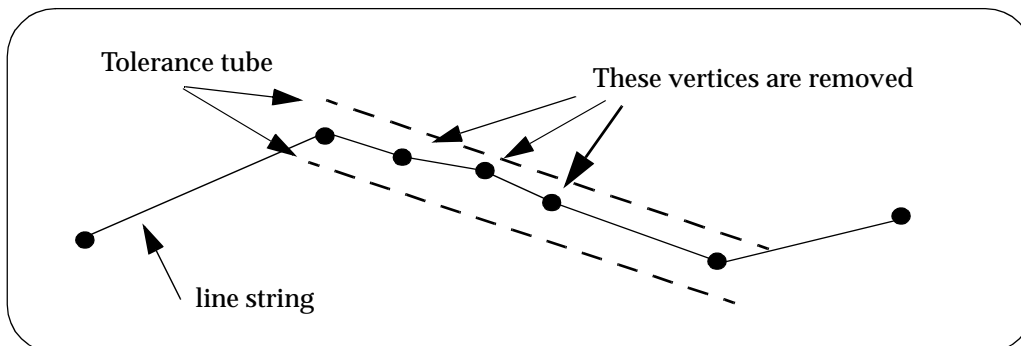
Position of option on menu: Utilities =>A-G =>Filter =>String filter

The String filter option is used to remove surplus vertices from 2d strings (contours) and 3d strings.

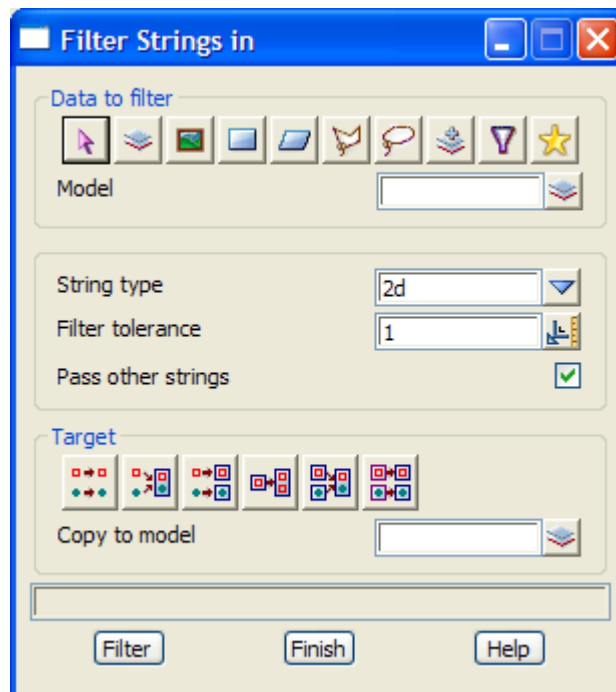
Using a user defined tolerance, string vertices that are within an offset tolerance (in three dimensions) of straight lines are removed. The tolerance value used normally depends on the data set and the job that the data is being used for.

That is, the string filter removes vertices from 2d and/or 3d line strings that do not deviate by more than a specified offset tolerance from straight lines joining successive string vertices (in three dimensions for 3d strings)

NOTE - string filter does not apply to point strings.



On selecting String filter the Filter **Strings in** panel is displayed.



The fields and buttons in this panel are used as follows

Field Description	Type	Defaults	Pop-Up
Data source type		Model	
<i>data selection type - for a full description go to "Data Source" in the chapter "Tools and Concepts"</i>			
Data source	input		
<i>source of data is to be processed.</i>			
String type	input	2d	2d, 2d & 3d
<i>string types to be filtered</i>			
Filter tolerance	input	1	
<i>tolerance to be used in filtering</i>			
Pass other strings	tick box	tick	
<i>if tick, pass all other strings through to the model for filtered strings</i>			
Target type			
<i>data target type - for a full description go to "Data Target" in the chapter "Tools and Concepts"</i>			
Target info	input		
<i>extra information required for the target.</i>			
Filter	button		
<i>filter all the selected strings.</i>			

Vertex Filter

filter_adjacent_vertices_in

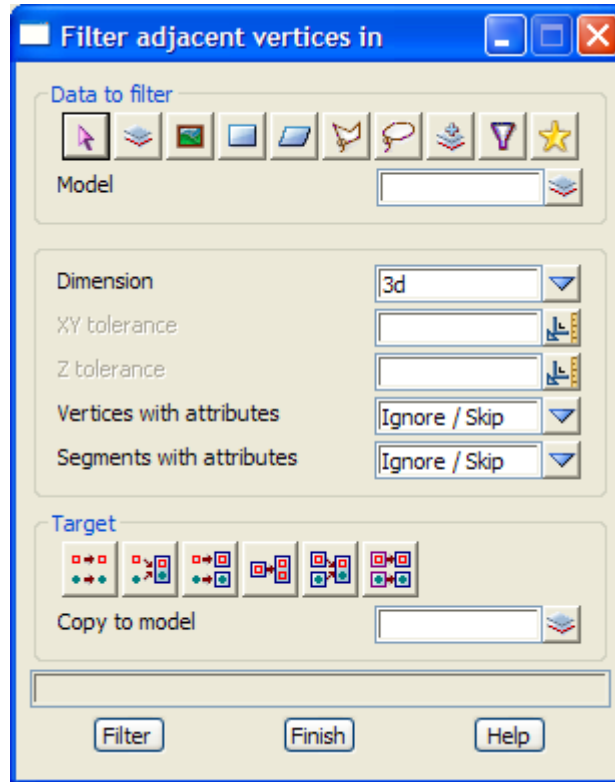
Position of option on menu: Utilities =>A-G =>Filter =>Vertex filter

The Vertex filter option is used to remove close adjacent vertices from selected strings. The strings

can be *point* or *line* strings.

The option can remove adjacent string vertices that are equal to a given tolerance either in plan position only (i.e. have similar x and y co-ordinates) or equal to a given tolerance for x, y and z co-ordinates.

On selecting **Vertex filter** the **Filter Adjacent Vertices in** panel is displayed.



The fields and buttons in this panel are used as follows

Field Description	Type	Defaults	Pop-Up
Data source type <i>data selection type - for a full description go to "Data Source" in the chapter "Tools and Concepts"</i>		Model	
Data source <i>source of data is to be processed.</i>	input		
Dimension <i>if 2d, adjacent string vertices with equal x and y co-ordinates are filtered. If 3d, adjacent string vertices with equal x, y and z co-ordinates are filtered.</i>	input	2d	2d,3d
xy tolerance <i>the distance to use for checking if adjacent vertices are too close in (x,y)</i>	input		
z tolerance <i>the delta-z to use for checking if adjacent vertices are too close in z</i>	input		
Vertices with attributes <i>if Ignore/skip, don't drop any vertices with attributes. If Merge attributes, merge the attributes from a dropped vertex with the kept vertex. If Lose attributes, drop the attributes from a dropped vertex.</i>	choice box	Ignore/skip	Ignore/skip, Merge attributes Lose attributes
Segments with attributes	choice box	Ignore/skip	Ignore/skip, Merge attributes Lose attributes

*if **Ignore/skip**, don't drop any vertices of segments with attributes.*

*If **Merge attributes**, merge the attributes from a dropped segment with the kept segment.*

*If **Lose attributes**, drop the attributes from a dropped segment.*

Target type

data target type - for a full description go to "Data Target" in the chapter "Tools and Concepts"

Target info input

extra information required for the target.

Filter button

filter the selected strings.

Z Filter

z_filter_strings_in

Position of option on menu: Utilities =>A-G =>Filter =>Z filter

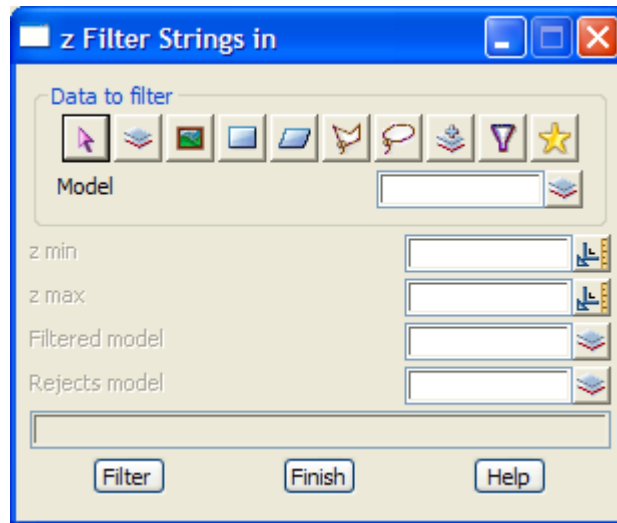
It is often necessary to remove data which is not within a certain z range. For example, all points with z-values below 0.0. The z filter option allows the user to define a z-range by specifying a minimum and maximum z value.

Strings of type 2d, 3d and 4d can then be processed against the z-range and new strings created containing only those points that are

- (a) within the z-range - accepted points
- or
- (b) outside the z-range - rejected points

For all other string types, the entire string is accepted if any part of the string is within the z-range, otherwise it is rejected.

On selecting Z filter and then the appropriate **Data Source** in the panel, the Z Filter **Strings in** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Data source type		Model	
<i>data selection type - for a full description go to "Data Source" in the chapter "Tools and Concepts"</i>			
Data source	input		
<i>source of data is to be processed.</i>			
z min	input		
<i>minimum z value to be accepted, If this field is blank, all string z-values pass the minimum test.</i>			
z max	input		
<i>maximum z value to be accepted, If this field is blank, all string z-values pass the maximum test.</i>			
Filtered model	input		available models
<i>if non-blank, the name of the model to place the accepted string points in. The string has the same name as the original string. If blank, the accepted point strings are not saved.</i>			
Rejects model	input		available models
<i>if non-blank, then strings containing the rejected points are placed in this model. The strings of rejected points have the same name as the original strings. If blank, the rejected point strings are not saved.</i>			

Filter button

z, filter the selected strings by the *z* minimum and *z* maximum values.

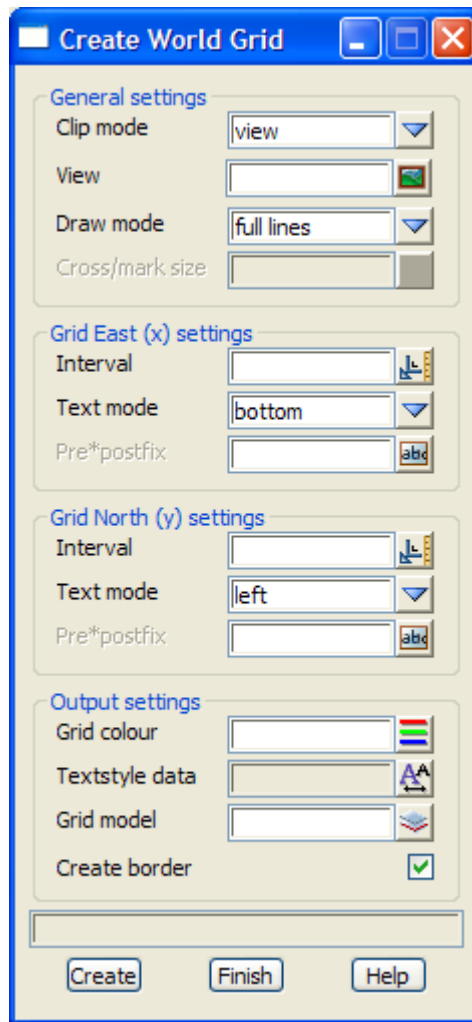
Create Grid

create_world_grid

Position of option on menu: Utilities =>A-F =>Create grid

Create Grid is used to create the line work for a grid in world units. Mainly used for output to other packages that don't create grids.

Selecting Create Grid brings up the **Create World Grid** panel.



The fields and buttons in this panel are used as follows

Field Description	Type	Defaults	Pop-Up
Clip mode	choice box	View	View, Rectangle
<i>if View, a view is used to define extents of the grid.</i>			
<i>If Rectangle, a rectangle is drawn and used to define extents of the grid.</i>			
Draw mode	choice box	full lines	full lines, crosses, marks
<i>type of line work for the grid</i>			
Grid East (x) settings:			
Interval	input		
<i>x-delta to use for the grid lines</i>			
Text mode	choice box	bottom	off, bottom, top, top & bottom

if off, no text is created for the x-grid lines.

If bottom, text is created only at the bottom of the x-grid lines.

If top, text is created only at the top of the x-grid lines.

If top & bottom, text is created at the top and bottom of the x-grid lines.

Pre*postfix text

*if non blank, pre*post text to use for the labels on the x-grid lines*

Grid North (y) settings:

Interval input

y-delta to use for the grid lines

Text mode choice box left off, left, right, left & right

if off, no text is created for the y-grid lines.

If left, text is created only at the left of the y-grid lines.

If right, text is created only at the right of the y-grid lines.

If left & right, text is created at the left and right of the y-grid lines.

Pre*postfix text

*if non blank, pre*post text to use for the labels on the y-grid lines*

Grid colour colour box available colours

colour for the grid lines

Textstyle data textstyle data

textstyle data to use for the grid text

Grid model model box available models

model for the grid lines and text

Create border tick box tick

if tick, create a rectangle border around the area

Create button

create the grid

Head to Tail

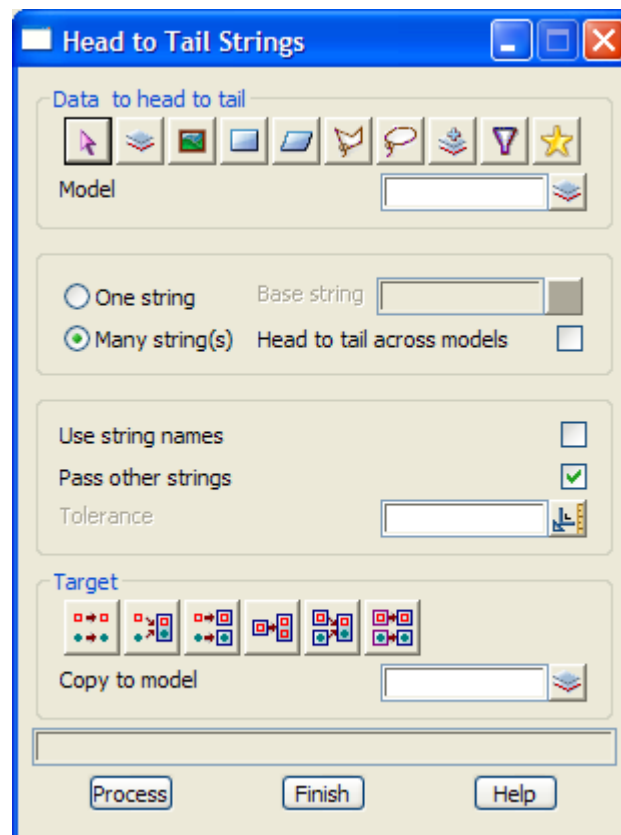
head_to_tail_strings

Position of option on menu: Utilities =>H-Z =>Head to tail

The head to tail option is used to process a model or view of strings and join strings with common end points together.

If requested, strings are only joined if they have matching names as well as matching end points.

On selecting the **Head to tail** and then the appropriate **Data Source** in the panel, the **Head to Tail Strings** in panel is displayed.



The fields and buttons in this panel are used as follows

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Data source type		Model	
-------------------------	--	-------	--

data selection type - for a full description go to "Data Source" in the chapter "Tools and Concepts"

Data source	input		
--------------------	-------	--	--

source of data is to be processed.

One string or Many strings	radio button		
-----------------------------------	--------------	--	--

*if **One String** is selected, then a Base string is selected and only the head-to-tailed string containing the Base string is created.*

*If **Many strings** is selected, then head to tailing occurs for all the strings in the Data source.*

Head to tail across models	tick box		
-----------------------------------	----------	--	--

*if **tick**, then strings can be created from head to tailing strings from any of the selected models.*

*If **not tick**, then strings will only be head to tailed with strings from the same model.*

Use string names tick box

*if **tick**, the string names must also match for the strings to be joined.*

Pass other strings tick box tick

*if **tick**, any string not joined will also copied to the joined model.*

Tolerance input 0.0005

If the distance between two end points is less than tolerance, then the points are considered the same and the strings may be joined.

Target type

data target type - for a full description go to “Data Target” in the chapter “Tools and Concepts”

Target info input

extra information required for the target.

Process button

*check all the strings in the given model/view and join them together if they have common end points and, if use string names is **tick**, the same name.*

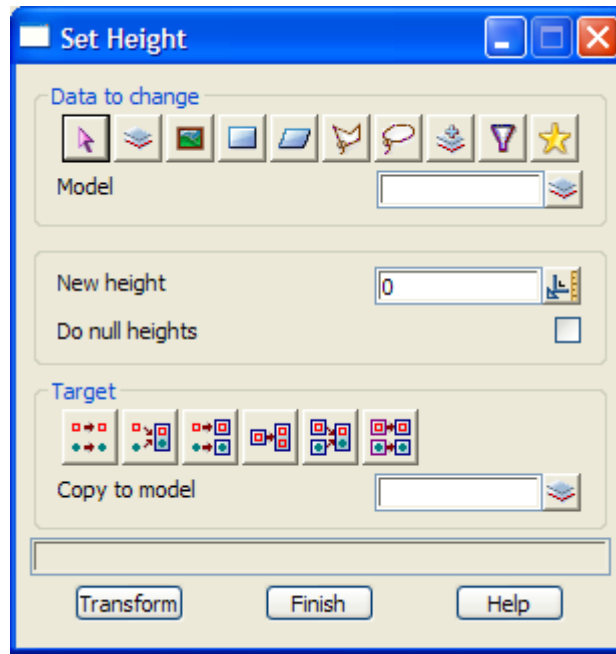
Set Height

set_height

Position of option on menu: Utilities =>H-Z =>Height

For the selected strings, Height will set all the z-values to the given height.

Selecting Height displays the **Set Height** panel.



The fields and buttons used in the panel have the following functions.

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Data source type

Model

data selection type - for a full description go to "Data Source" in the chapter "Tools and Concepts"

Data source

input

source of data is to be processed.

New height

input

0

the new height to set all the z-values in the selected strings to.

Do null heights

tick box

if tick, null heights are set to the new height.

If not tick, null heights are not modified.

Target type

data target type - for a full description go to "Data Target" in the chapter "Tools and Concepts"

Target info

input

extra information required for the target.

Set

button

process the selected string

2D Helmert

helmert_2d

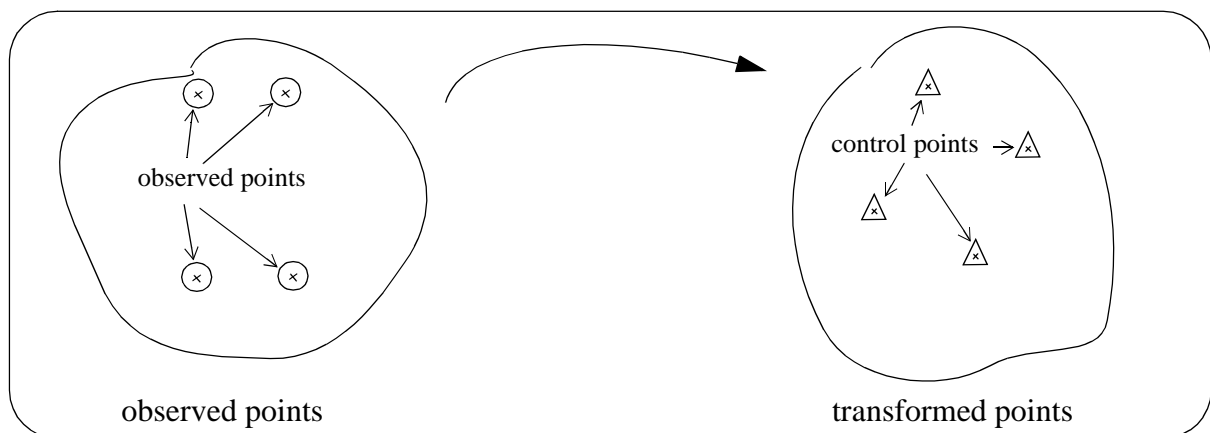
Position of option on menu: Utilities =>H-Z =>Helmert 2D

A Helmert transformation is a two dimensional linear transformation consisting of a scaling, rotation and translation (shift) of data. This type of transformation is often required for converting data between a local and another co-ordinate system.

The most frequent method of defining a Helmert transformation is not by explicitly giving the Helmert transformation parameters but by specifying the final (transformed) and existing (observed) coordinates for two or more user selected points.

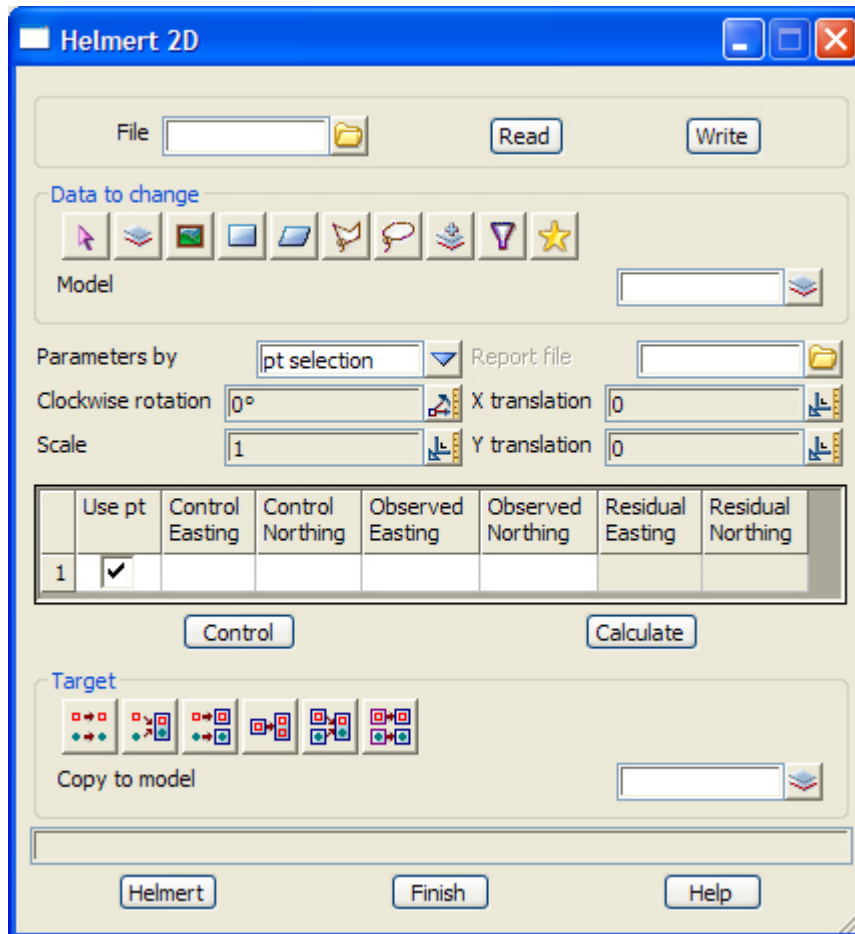
These special user selected points in the final co-ordinate system are known as **control points** and **observed points** in the un-transformed system.

The Helmert transformation (for going from the observed points to the control points) can be calculated and used to convert the existing co-ordinates of items to their new transformed co-ordinates



See example after the panel description.

On selecting the Helmert option, the Helmert 2D panel is displayed.



The main purpose of this panel is to display the helmert transformation parameters. The fields and buttons used in the **Helmert 2D** panel will be discussed after describing how to select the helmert control points.

After selecting Helmert 2D option, the **Helmert 2D** panel is placed on the screen and the option then sits waiting for the user to define how the helmert parameters will be determined. The user selects the **parameters by** choice box to choose if entry is by way of selecting points (default) or if the parameters are to be entered manually.

If the pt selection option is chosen, the user can start the selection of points by selecting the **Control** button. The selection should start with the control point, accepting that point then selecting the corresponding observed point. The control points are shown as triangles and the observed points are shown as circles. Lines are drawn between the control-observed pair for clarity.

Accepting the 2nd point (observed point) re-initialises the selection sequence so any further sets of points can be selected by selecting a control point and so on. The co-ordinates of the control points and observed points are added to the grid on the selection of two valid points. The use pt field is ticked by default.

The **calculate** button calculates the helmert transformation parameters based all the control points in the grid control with the use pt field tick box ticked on. The residuals are then placed into the grid. The calculated parameters are placed into the parameters section of the panel.

If the direct entry method is chosen, the grid will disappear leaving only the parameter section. The user then fills out the relevant information.

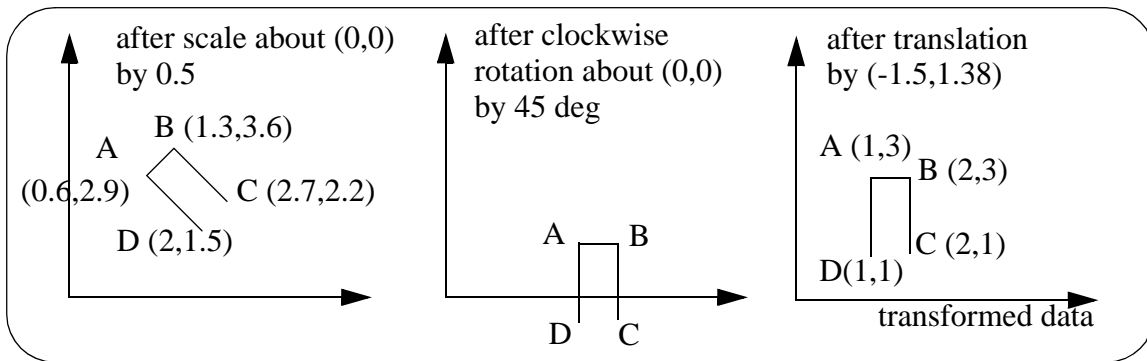
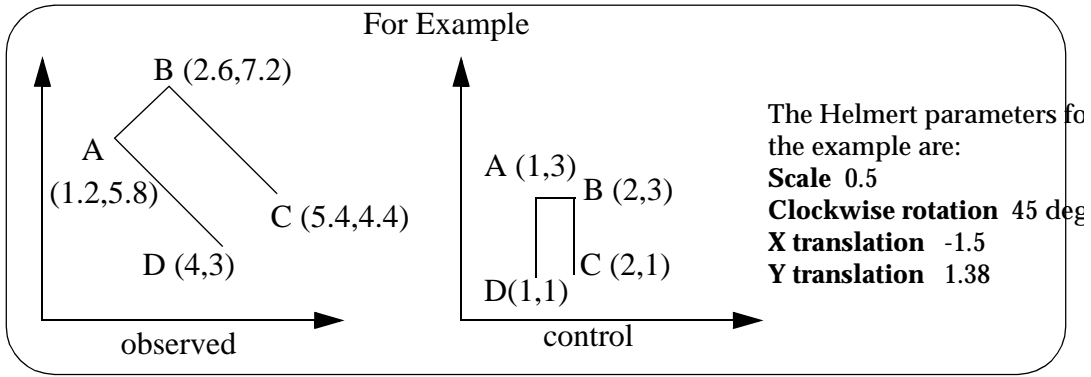
The helmert parameters are

- (a) the scale factor for the existing co-ordinates with respect to the new coordinates

- (b) the rotation of the existing co-ordinates to align it with the new co-ordinates axis
- (c) the x and y translation of the existing co-ordinates after the scalings and rotations have been applied

The fields and buttons in the panel have the following functions

Field Description	Type	Defaults	Pop-Up
File <i>a file name can be specified for reading or writing a file.</i>	file box		*.hel files
Read <i>if a valid file exists, the file contents can be loaded into the panel.</i>	button		
Write <i>if a valid name is specified, the user can write the input data to a file.</i>	button		
Data source type <i>data selection type - for a full description go to "Data Source" in the chapter "Tools and Concepts"</i>		Model	
Data source <i>source of data is to be processed.</i>	input		
Helmert parameters by <i>the parameter entry method.</i>	choice	pt selection	pt selection direct entry
Report file <i>if not blank, write a report on the Helmert transformation.</i>			*.rpt files
Rotation <i>the rotation of the axes of the existing points with respect to the transformed axes.</i>	input/output		
Scale <i>the scale factor for the existing co-ordinates with respect to the transformed coordinates</i>	input/output		
X Translation <i>the x translation of the existing co-ordinates with respect to the transformed x coordinates</i>	input/output		
Y Translation <i>the y translation of the existing co-ordinates with respect to the transformed y coordinates</i>	input/output		
Control <i>restarts the selection process for choosing more control points.</i>	button		
Calculate <i>calculate the helmert parameters from the selected points shown in the grid.</i>	button		
Target type <i>data target type - for a full description go to "Data Target" in the chapter "Tools and Concepts"</i>			
Target info <i>extra information required for the target.</i>	input		
Helmert <i>apply the helmert transformation to the data specified in the source box, and put it into the appropriate target area.</i>	button		
Finish <i>end the option, remove this panel and the Helmert control points table from the screen.</i>	button		



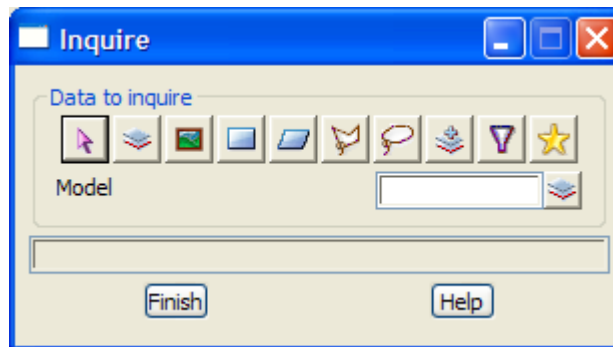
Inquire

inquire

Position of option on menu: Utilities =>H-Z =>Inquire

The Inquire option simply highlights all the selected strings.

On selecting the Inquire option, the **Inquire** panel is displayed.



The fields and buttons used in the panel have the following functions.

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Data source type		Model	
-------------------------	--	-------	--

data selection type - for a full description go to "Data Source" in the chapter "Tools and Concepts"

Data source	input		
--------------------	-------	--	--

source of data is to be processed.

Target type			
--------------------	--	--	--

data target type - for a full description go to "Data Target" in the chapter "Tools and Concepts"

Target info	input		
--------------------	-------	--	--

extra information required for the target.

Map

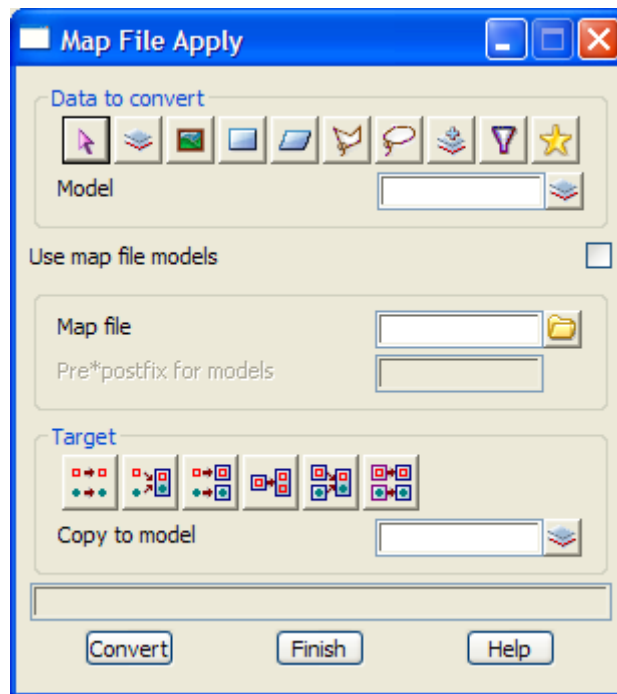
map_file_apply

Position of option on menu: Utilities =>H-Z =>Map

The map option applies a 12d Model input mapping file to the selected strings. The map file can be used to change string attributes such as string names, models, colours, breakline type and style, apply extrudes, apply polygon fills etc.

The layout and operation of a mapping file is described in the section “Map File” in the chapter “File I/O” .

Selecting Map displays the **Map File Apply** panel.



The fields and buttons used in the panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Data source type		Model	
<i>data selection type - for a full description go to “Data Source” in the chapter “Tools and Concepts”</i>			
Data source	input		
<i>source of data is to be processed.</i>			
Use map file models	tick box		
<i>if tick, use the models from the map file.</i>			
<i>If not tick, use the models from the Target.</i>			
Map file	map file box		*.mf files
<i>the map file to use.</i>			
Prefix for models	input		available models
<i>If non-blank, the prefix for models field gives the characters to be prepended and appended to the model names given in the mapping file. The prepended and appended characters are entered into the prefix for models field, separated by a *. For example, pre*pos would add pre before each model name and pos after each model name. For prepend only, no * is required.</i>			

Target type

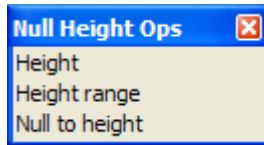
Null Heights

null_height_ops

Position of option on menu: Utilities =>H-Z =>Null heights

A null value is used as a z-value (height) when no actual z-value exists at the point. That is, the point has valid x and y co-ordinates but no valid z-value.

The null heights walk-right menu is



For the option *Height*, go to the section "Heights" .

Height range "Height Range" .

Null to height "Null to Height" .

Heights

null_height_of

Position of option on menu: Utilities =>H-Z =>Null heights =>Height

The null heights option is used to set z-values of a user given value to 12d Model's null value. It can be applied to all the strings in a given model or view.

On selecting **Heights** and then the appropriate **Data Source** in the panel, the **Null Heights of** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Data source type		Model	
-------------------------	--	-------	--

data selection type - for a full description go to "Data Source" in the chapter "Tools and Concepts"

Data source	input		
--------------------	-------	--	--

source of data is to be processed.

Height to null input
height value to set to the null value.

Target type
data target type - for a full description go to "Data Target" in the chapter "Tools and Concepts"

Target info input
extra information required for the target.

Null button
test all the z-values in the selected strings and if the value is equal to the height to null value, set the z-value to null.

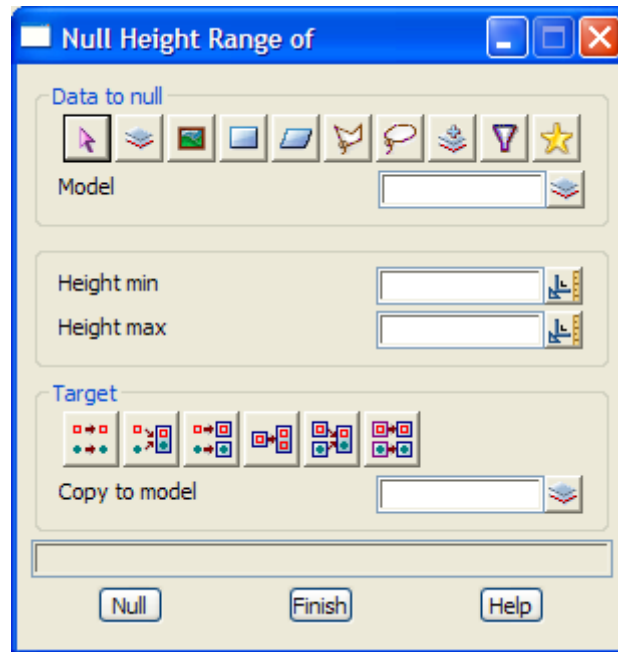
Height Range

null_height_range_of

Position of option on menu: Utilities =>H-Z =>Null heights =>Null range

The null height range option is used to set z-values within a user given range to 12d Model's null value. It can be applied to selected strings, or all the strings in a given model or view.

On selecting Height range and then the appropriate Data Source in the panel, the Null Height Range of panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Data source type		Model	
<i>data selection type - for a full description go to "Data Source" in the chapter "Tools and Concepts"</i>			
Data source	input		
<i>source of data is to be processed.</i>			
Height min	input		
<i>minimum value of the heights to be set as null values.</i>			
Height max	input		
<i>maximum value of the heights to be set as null values.</i>			
Target type			
<i>data target type - for a full description go to "Data Target" in the chapter "Tools and Concepts"</i>			
Target info	input		
<i>extra information required for the target.</i>			
Null	button		
<i>test all the z-values in the selected strings and if the value is between the height min and height max value, set the z-value to null.</i>			

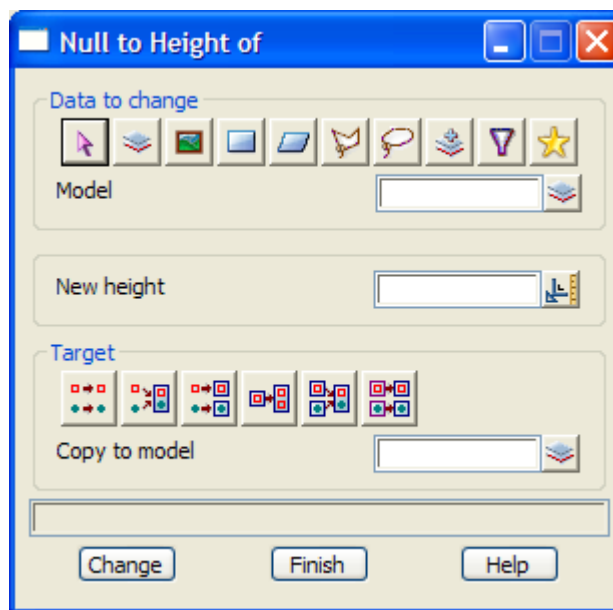
Null to Height

null_to_height_of

Position of option on menu: Utilities =>H-Z =>Null heights =>Null to height

The null to height option is used to set null z-values to a user given value. It can be applied selected strings or to all the strings in a given model or view.

On selecting **Null to height range** and then the appropriate **Data Source** in the panel, the **Null to Height of** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Data source type		Model	
-------------------------	--	-------	--

data selection type - for a full description go to "Data Source" in the chapter "Tools and Concepts"

Data source	input		
--------------------	-------	--	--

source of data is to be processed.

New height	input		
-------------------	-------	--	--

height value to change null values to.

Target type			
--------------------	--	--	--

data target type - for a full description go to "Data Target" in the chapter "Tools and Concepts"

Target info	input		
--------------------	-------	--	--

extra information required for the target.

Change	button		
---------------	--------	--	--

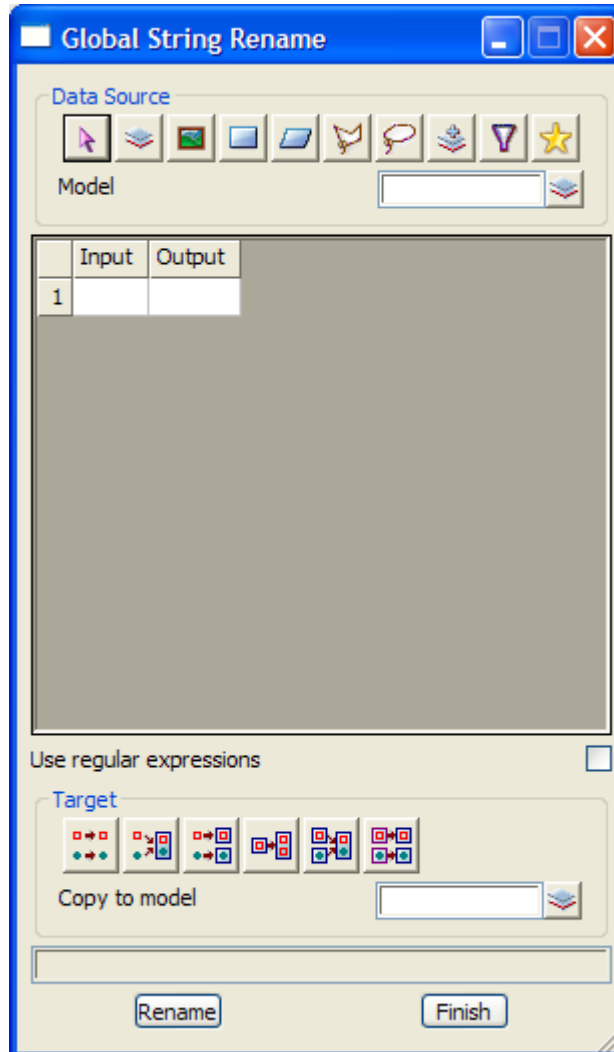
Change all the null z-values in all the strings in the model/view given in the model/view to change field to the value given in the new height field.

Rename Strings

global_string_rename

Position of option on menu: Utilities =>H-Z =>Rename strings

Selecting Rename strings brings up the **Global String Rename** panel.



The fields and buttons used in the rotate panel have the following functions.

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Data source type		Model	
-------------------------	--	-------	--

data selection type - for a full description go to "Data Source" in the chapter "Tools and Concepts"

Data source	input		
--------------------	-------	--	--

source of data is to be processed.

Input			
--------------	--	--	--

method of selecting strings

Output			
---------------	--	--	--

method of changing strings

Use regular expressions	tick box		
--------------------------------	----------	--	--

if tick, Input is a regular expressions.

Target type

data target type - for a full description go to "Data Target" in the chapter "Tools and Concepts"

Target info input

extra information required for the target.

Rename button

rename the selected data.

Rotate

rotate

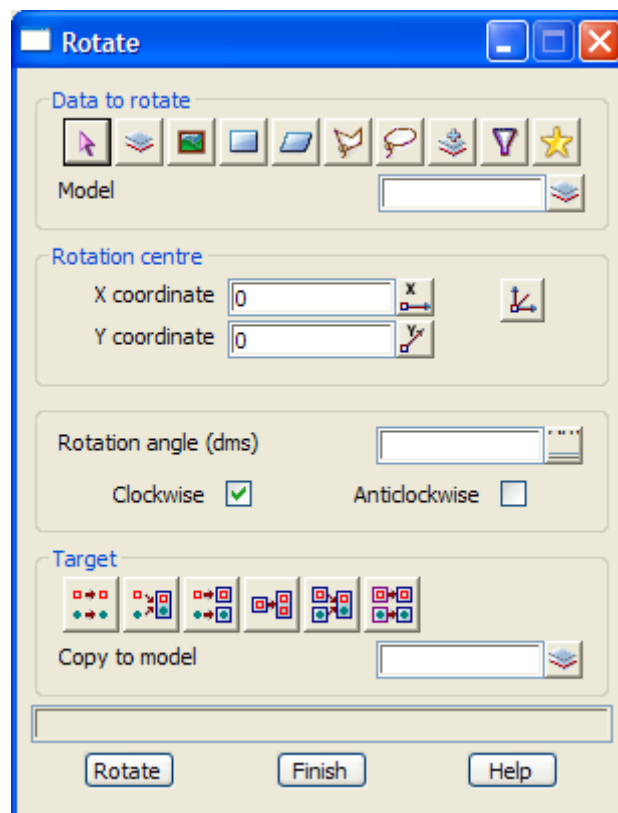
Position of option on menu: Utilities =>H-Z =>Rotate

The rotate option is used to rotate all the strings in a model or on a view about a central point (the rotation centre). The strings are rotated through a user supplied angle and can be moved or copied to their new rotated position.

The difference between a copy and a move is that if a string is copied, a copy of the string is rotated and the original string left untouched, whereas for a move, the actual string is moved from its original position to the new rotated position.

The rotated strings can either be placed in their original models, or moved/copied to a new model.

On selecting **Rotate** and then the appropriate **Data Source** in the panel, the **Rotate String/Model/View** panel is displayed.



The centre of the rotation is defined by selecting the **Centre** button and picking a point as the new centre. The centre can be changed at any time by using the **Centre** button to select another centre.

The fields and buttons used in the rotate panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Data source type		Model	
<i>data selection type - for a full description go to "Data Source" in the chapter "Tools and Concepts"</i>			
Data source	input		
<i>source of data is to be processed.</i>			
Rotation centre			xyz ops
<i>select the centre of the rotation. The centre can be changed at any time.</i>			

Rotation angle (dms) angle box

the angle in degrees to rotate the string through. The angle is measured about the rotation centre point in either a clockwise or anticlockwise direction.

Target type

data target type - for a full description go to "Data Target" in the chapter "Tools and Concepts"

Target info input

extra information required for the target.

Rotate button

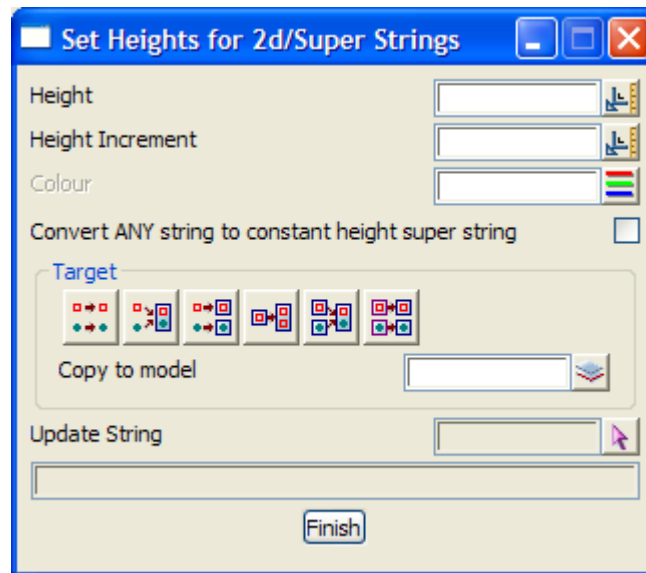
rotate the selected data.

Set Heights for 2d/Super Strings

set_heights_for_2d_super_stringsl

Position of option on menu: Utilities =>H-Z =>Set heights for 2d/super strings

This panel is used to quickly change the height of 2d strings or 2d super strings (super strings with a constant z value). An initial height and increment is given. As each string is processed, it is given the height and the height then incremented.



The fields and buttons used in this panel have the following functions:

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Height	input		
---------------	-------	--	--

Height to use for the next selected string. This is incremented by the "Height increment" after each string is accepted.

Height increment	input		
-------------------------	-------	--	--

As each string is accepted, the "Height" value is incremented by this value.

Colour	input		available colours
---------------	-------	--	-------------------

If non-blank, the selected strings are given this colour when their z-value is changed.

Target type			
--------------------	--	--	--

place to put the processed string. Data target type - for a full description go to "Data Target" in the chapter "Tools and Concepts"

Target info	input		
--------------------	-------	--	--

extra information required for the target.

Update string	string select		
----------------------	---------------	--	--

After clicking on the select arrow, 2d strings are selected and when accepted, have their z-value changed to the value in the Height field. The height value is then automatically incremented. The next string is then selected and accepted (without needing to click on Pick again). This continues until Cancel is selected from the "Pick Ops" menu.

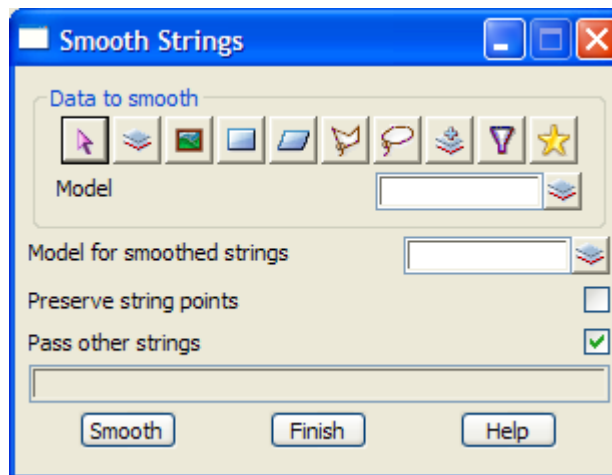
Smooth Strings

smooth_strings

Position of option on menu: Utilities =>H-Z =>Smooth strings

The smooth options are used to add extra points into 2d or 3d strings to make a smoother string.

On selecting Smooth strings and then the appropriate **Data Source** in the panel, the Smooth Strings panel is displayed.



The fields and buttons in this panel are used as follows

Field Description	Type	Defaults	Pop-Up
Data source type		Model	
<i>data selection type - for a full description go to "Data Source" in the chapter "Tools and Concepts"</i>			
Data source	input		
<i>data source to be smoothed.</i>			
Model for smoothed strings	input		available models
<i>model for the smoothed strings to go to</i>			
Preserve string points	tick box		
<i>if tick, the smoothed strings will still contain all the original points.</i>			
<i>if not tick, the smoothed strings may deviate from the original string points</i>			
Pass other strings	tick box	tick	
<i>if tick, any strings that can't be smoothed are copied and added to the smoothed strings model.</i>			
Smooth	button		
<i>smooth the selected strings.</i>			

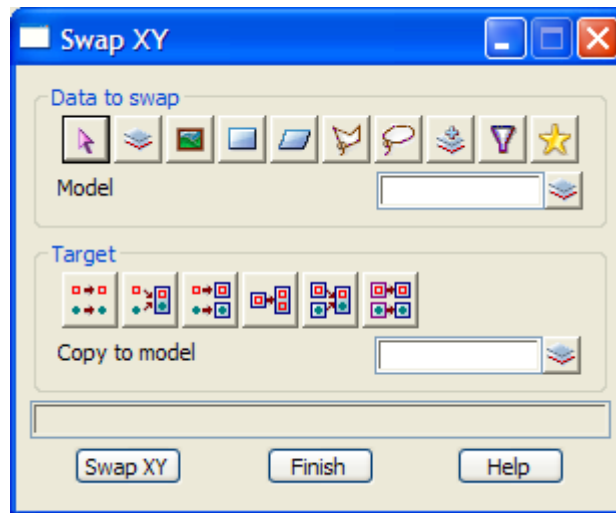
Swap XY

swap_xy

Position of option on menu: Utilities =>H-Z =>Swap XY

The swap xy option is used to swap the (x,y) co-ordinates of selected strings, or all strings in a model or view.

On selecting **Swap XY** and then the appropriate **Data Source** in the panel, the **Swap XY String/Model/View** panel is displayed.



The fields and buttons used in the panel have the following functions.

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Data source type

Model

data selection type - for a full description go to "Data Source" in the chapter "Tools and Concepts"

Data source

input

source of data is to be processed.

Target type

data target type - for a full description go to "Data Target" in the chapter "Tools and Concepts"

Target info

input

extra information required for the target.

Swap XY

button

swap the selected strings and add them to the target.

Text

change_text_info

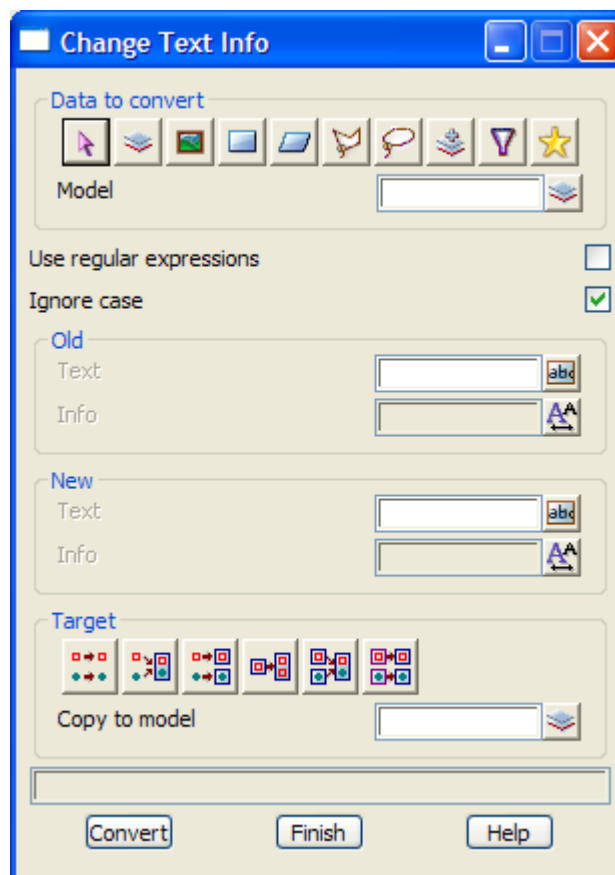
Position of option on menu: Utilities =>H-Z =>Text

The Text option is used to change the text style, units, height, offset, justification, angle and text for text, 4d strings and super strings.

For this option the selection process is extended.

After the data is selected as defined by the Data source, the two extra parameters, Old text and Old info, are used to further specify which text is to be modified.

On selecting the Text option, the **Change Text Info** panel is displayed.



The fields and buttons used in the panel have the following functions.

Field Description	Type
Data source type	Model
<i>data selection type - for a full description go to "Data Source" in the chapter "Tools and Concepts"</i>	
Data source	input
<i>source of data is to be processed.</i>	
Old text	input
<i>if the old text field is non-blank, then any text in 4d or text strings will be checked for a match against this value. Wild cards and characters can be used.</i>	
Old text info	input
<i>if non-blank, then only strings with matching text info will be selected.</i>	
New text	input

if non-blank, then any selected text the selected strings will be modified to this value. Wild cards and characters can be used.

New text info input

if non-blank, then the select text on the selected strings will be set the given text info.

Target type

data target type - for a full description go to "Data Target" in the chapter "Tools and Concepts"

Target info input

extra information required for the target.

Convert button

run the option and change the selected text.

Translate

translate

Position of option on menu: Utilities =>H-Z =>Translate

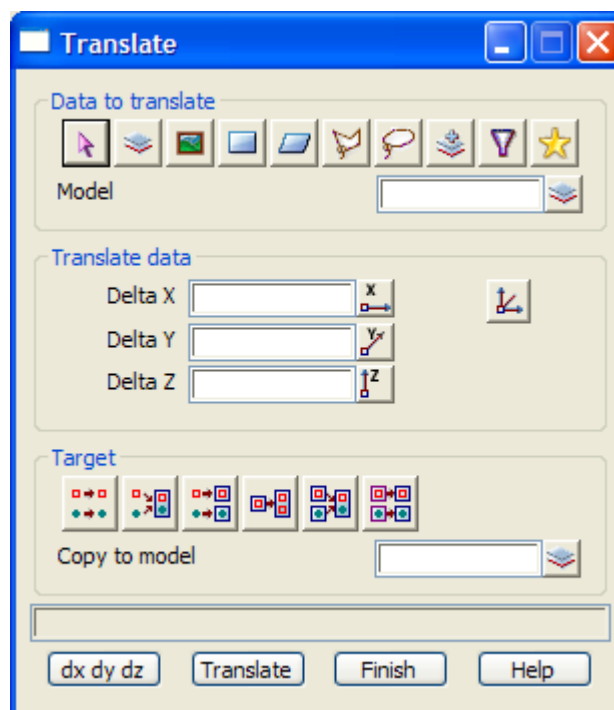
The translate option is used to translate through a user supplied translation vector (dx,dy,dz) any selected strings, or all the strings in a model or on a view.

The strings can be translated in the x,y and z directions and be moved or copied to their new translated positions.

The difference between a copy and a move is that if a string is copied, a copy of the string is translated and the original string left untouched, whereas for a move, the actual string is moved from its original position to the new translated position.

The translated strings can be left in their original models, or moved/copied to a new model.

On selecting Translate, the **translate** panel is displayed.



The translation (dx dy dz) can be typing into the dx dy dz field or by picking the **dx dy dz** button and then selecting two points with the cursor. When two points are selected, the difference vector of the two selected points is taken as the translation vector (dx,dy,dz). The (dx,dy,dz) value is piped into the dx dy dz field.

The fields and buttons used in the translate panel have the following functions.

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Data source type		Model	
-------------------------	--	-------	--

data selection type - for a full description go to "Data Source" in the chapter "Tools and Concepts"

Data source	input		
--------------------	-------	--	--

source of data is to be processed.

dx dy dz	input		
-----------------	-------	--	--

the translation vector (dx,dy,dz). This vector is added to all points in the strings.

Target type			
-------------	--	--	--

data target type - for a full description go to "Data Target" in the chapter "Tools and Concepts"

Target info input
extra information required for the target.

dx dy dz button
after selecting dx dy dz, two points are selected by the uses and the difference between the points is placed in the dx dy dz field.

Translate button
translate the selected strings and add them to the model given in the new model field.

How to Use the Panel

- (a) Enter the Data source for the strings are to translated.
- (b) Define the translation vector (dx dy dz) by either typing the value into the dx dy dz field or by selecting the **dx dy dz** button and picking two points to define the translation vector. The resulting (dx dy dz) values are piped into the dx dy dz field.
- (c) Select the target mode.
- (d) Selecting the **Translate** button then does the required translations (moves or copies).

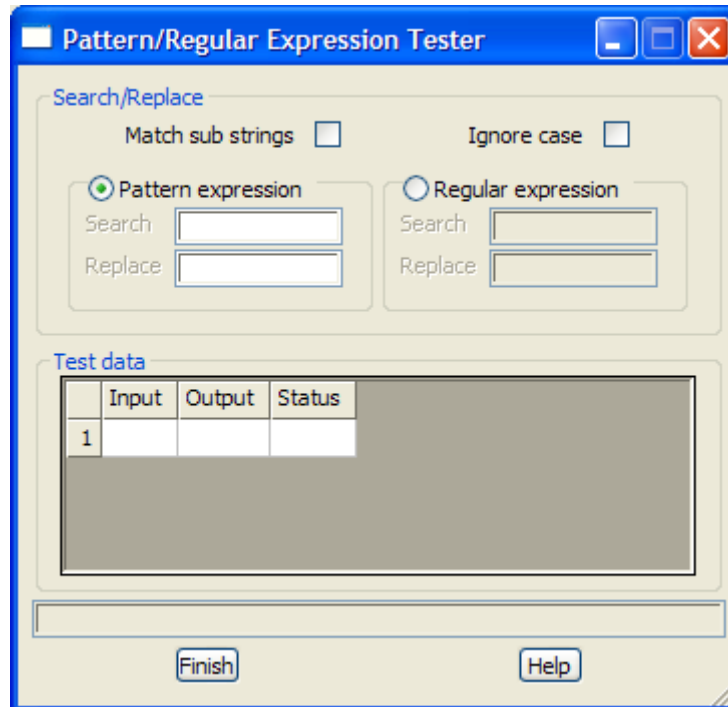
Test Wildcards

`pattern_regular_expression_tester`

Position of option on menu: Utilities =>H-Z =>Test wildcards

The test wildcards option is used to test the effect of pattern expressions and regular expressions on text.

On selecting the Test wildcards option, the **Pattern/Regular Expression Tester** panel is displayed.



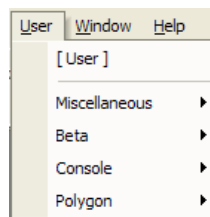
The *Search/Replace* criteria and the *Pattern expression* or *Regular expression* is applied to the data in the *Input* column and the results are placed in the *Output* column.

27 User

User Defined Menus

The User walk-right menu is

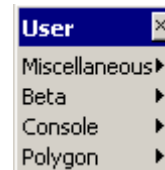
on Main menu



create floating User menu
miscellaneous macros
beta macros
console macros
polygon macros

on 12d Model

User floating me



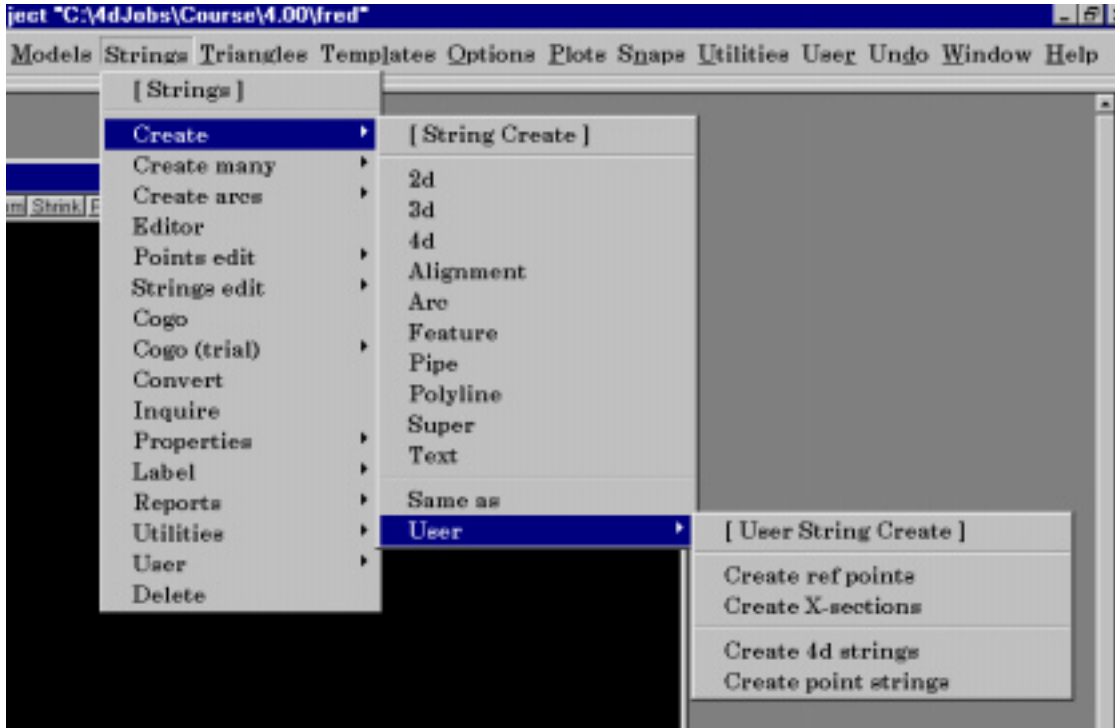
To help customise 12d Model, there is a pull down menu User on the Main menu and User menus on many of the pull down menus on the Main menu. All the User menus are totally defined from the files *Usermenu.4d*, created by the user, and *Xtramenu.4d*, supplied by 12D Solutions.

The User menus can run 12d Model macros, external programs, and bring up 12d Model screen layout files, panels and menus.

The User menus can have their own walk-right menus, with walk-rights menus etc. and so can be used to build sophisticated tailored additions to 12d Model. Each of the user defined menus are floating (tear away) menus.

The User menus are divided in two with any menu options supplied by the user (in *Usermenu.4d*) on the top with the 12D Solutions options (in *Xtramenu.4d*) underneath.

All the options under User and User menus are either customers own macros or unsupported macros from 12D Solutions which may not be documented.



The default name for the user definition file for User is

usermenu.4d

which is searched for in the standard set up areas (local, USER_4D, user, set_ups etc.) or set by the environment variable

```
USER_OPTIONS_4D    file    // Customers User menu definition
```

The format for the user defined menu is given in the Appendix, **Function Keys, Menus**.

The default name for the 12D Solutions definition file which includes some macro for User is

xtramenu.4d

which is also searched for in the standard set up areas (local, USER_4D, user, set_ups etc.) or set by the environment variable

```
EXTRA_OPTIONS_4D  file    // 12D Solutions User menu definitions
```

The format for the user defined menu is also given in the Appendix, **Function Keys, Menus**.

Important Note

The file *xtramenu.4d* is for use by 12D Solutions only. Please do not modify it because it may be over written in future updates. The file *usermenu.4d* is for Customer use.

For quick reference, most of the unsupported macros provided by 12D Solutions on any of the User menus are on the menu User =>Miscellaneous on the main menu.

All the options under User and User menus are either customers own macros or unsupported macros from 12D Solutions which may not be documented.

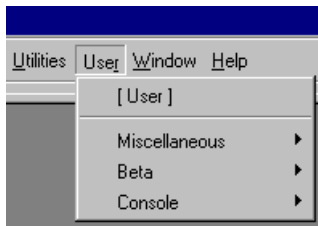
User

user

All the options under User and User menus are either customers own macros or unsupported macros from 12D Solutions which may not be documented. For more information on *User* menus, go to “User Defined Menus”

The User walk-right menu is

on Main menu



create floating User menu
 miscellaneous macros
 beta macros
 console macros
 polygon macros

on 12d Model
 User floating me



For *Miscellaneous*, go to the section “Miscellaneous”

<i>Beta</i>	“Beta”
<i>Console</i>	“Console”
<i>Polygon</i>	“Polygon”

Miscellaneous

miscellaneous

a_to_c

d_to_k

l_to_q

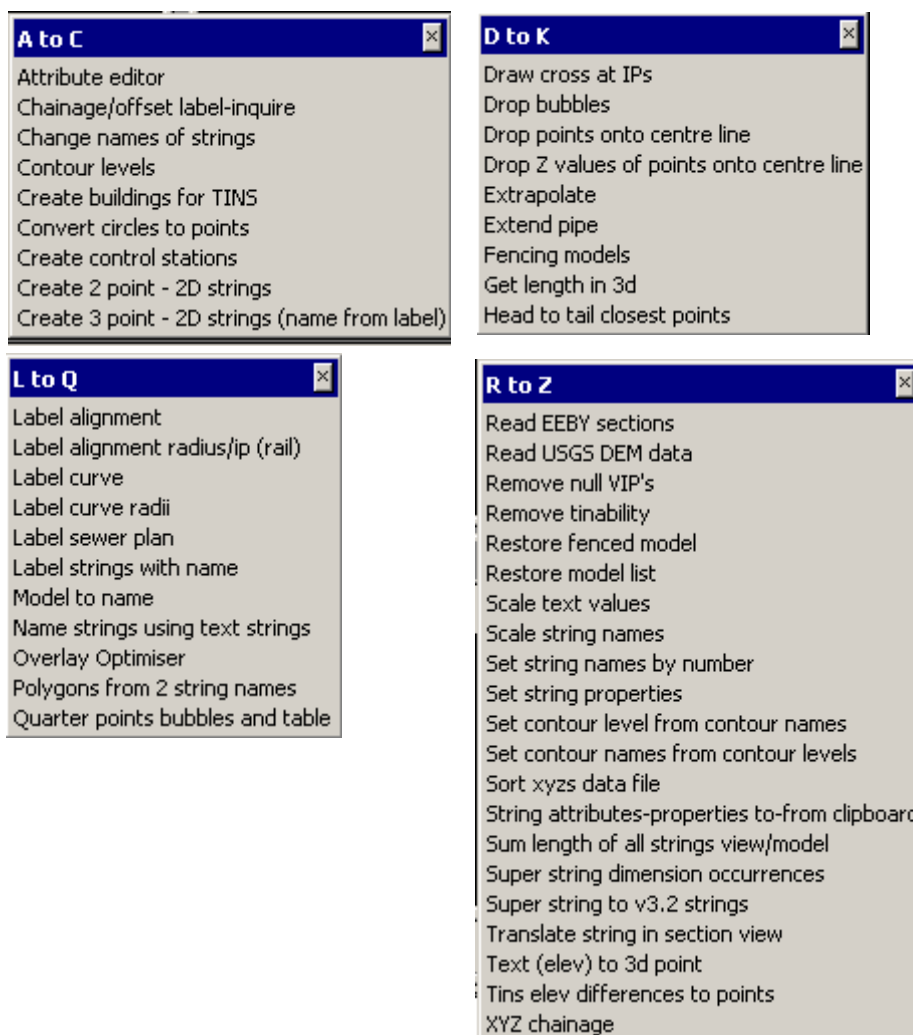
r_to_z

All the options under User and User menus are either customers own macros or unsupported macros from 12D Solutions which may not be documented. For more information on *User* menus, go to “User Defined Menus”

The walk rights User =>Miscellaneous menu is:



and the walk rights on the Miscellaneous menus are:



For *Attribute Editor*, go to the section

Chainage/offset label inquire

Change names of strings

Contour levels

Create buildings for TINS

Create points for circle centres

Create control stations

Create 2 point - 2D strings

Create 3 point - 2D strings (name from label)

Draw cross at IPs

“Drafting”

Drop bubbles

Drop points onto centreline

Drop Z values of points onto centre lines

Extrapolate

Extend pipe

Fencing models

Get length in 3d

Head to tail closest points

Label alignment

“XXX New Name”

“Set Heights for 2d (contour) Strings”

“XXX Create Building for a Tin”

“Create Points for Centre of Circles”

“XXX Create Control Stations”

“XXX Create 2d String from Two Points”

“XXX Create 3 Point 2d Strings”

“Create Crosses at String Points” in the chapter

“XXX Drop Bubbles”

“XXX Drop Points onto Alignment”

“XXX Drop z-value onto Centreline”

“Extrapolate Point”

“XXX Create VicRoad Pipe”

“XXX Fencing Models”

“Length in 3d”

“XXX Head to Tail Closest Points”

this is a console macro

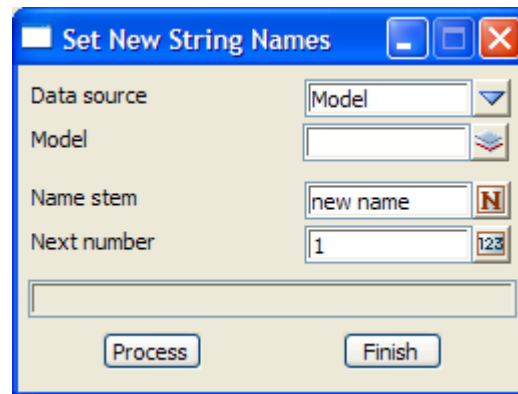
<i>Label alignment radius/ip (rail)</i>	“XXX Label Alignment Radius”
<i>Label curve</i>	<i>this is a console macro</i>
<i>Label curve radii</i>	<i>this is a console macro</i>
<i>Label sewer plan</i>	“XXX Label Sewer Plan (old)”
<i>Label strings with name</i>	“XXX Name Strings by Nearby Text”
<i>Model to name</i>	“XXX Name Strings by Model Name”
<i>Name strings using text strings</i>	“XXX Name Section Strings by Picking Text”
<i>Overlay Optimiser</i>	“XXX Pavement Overlay Optimiser”
<i>Polygon from 2 string names</i>	“Polygons from Sections” in the chapter “Design”
<i>Quarter points bubbles and table</i>	“Setout Lip Line” in the chapter “Survey”
<i>Read EEBY sections</i>	
<i>Read USGS DEM data</i>	“XXX Read USGS DEM Data”
<i>Remove null VIPs</i>	“Remove Null VIP Points”
<i>Remove tinability</i>	“XXX Remove Tinability”
<i>Restore fenced model</i>	“XXX Restore Fenced Model”
<i>Restore model list</i>	“Models Save/Restore” in the chapter “Views”
<i>Scale text values</i>	“XXX Scale Text Values”
<i>Scale string names</i>	“XXX Scale String Names”
<i>Set string names by number</i>	“XXX Set String Names by Number”
<i>Set string properties</i>	“XXX String Operations”
<i>Set contour levels from contour names</i>	“Set Contour Levels from String Names”
<i>Set contour names from contour levels</i>	“Set Contour Names From Contour
Levels”	
<i>Sort xyzs data file</i>	“XXX Sort XYZs Data File”
<i>String attributes properties to-from clipboard</i>	“XXX String Attributes To-From Clipboard”
<i>Sum length of all strings model/view</i>	“Polygon”
<i>Super string dimension occurrences</i>	“XXX Super String Dimension Occurrences”
<i>Super string to V3.2 strings</i>	“XXX Transform V4 to V3.2”
<i>Translate string in section view</i>	“XXX Section Move”
<i>Text (elev) to 3d point</i>	“Text to 3d” in the chapter “Utilities”
<i>Tin elev differences to points</i>	“Z Differences from Tins” in the chapter “Triangles”
<i>XYZ chainage</i>	

XXX New Name

newname_panel

Position of option on menu: User =>A to C =>Change name of strings

Note - This is an unsupported option which may not be fully documented.



The fields and buttons used in this panel have the following functions:

Field Description	Type	Defaults	Pop-Up
Data source		Model	string, model, view
Model/View/String of circles			
<i>type of source of the data to process.</i>			
Model for centres	model box		available models
<i>source of data to process.</i>			
Name stem	input		
Process	button		

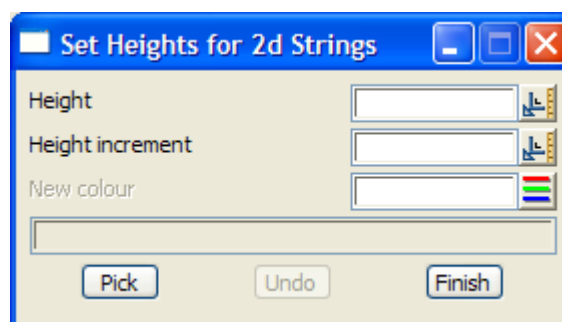
Set Heights for 2d (contour) Strings

contour_levels_panel

Position of option on menu: User =>A to C =>Contour levels

Note - This is an unsupported option which may not be fully documented.

This panel is used to quickly change the height of contour strings. An initial height and increment is given. As each string is accepted, it is given the height and the height then incremented.



The fields and buttons used in this panel have the following functions:

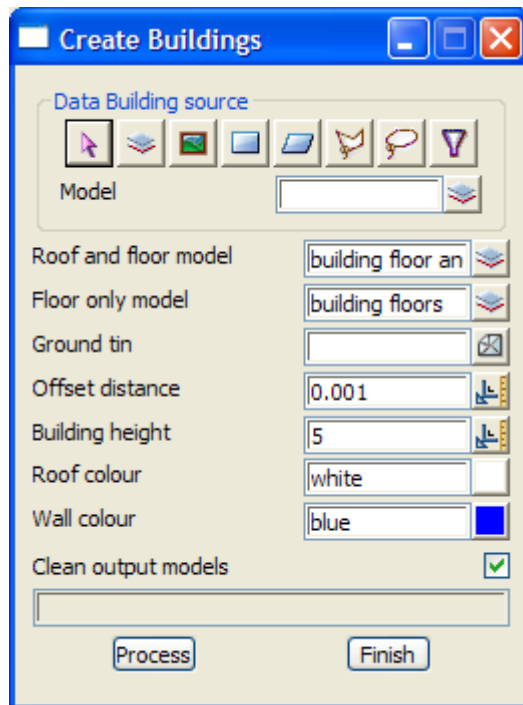
Field Description	Type	Defaults	Pop-Up
Height <i>Height to use for the next selected string. This is incremented by the "Height increment" after each string is accepted.</i>	input		
Height increment <i>As each string is accepted, the "Height" value is incremented by this value.</i>	input		
New colour <i>If non-blank, the selected strings are given this colour when their z-value is changed.</i>	input		available colours
Pick <i>After clicking on Pick, 2d strings are selected and when accepted, have their z-value changed to the value in the Height field. The height value is then automatically incremented. The next string is then selected and accepted (without needing to click on Pick again). This continues until Cancel is selected from the "Pick Ops" menu.</i>	input		
Undo <i>Undo the last height change. This can be selected up to 200 times.</i>	button		

XXX Create Building for a Tin

buildings_panel

Position of option on menu: User =>A to C =>Create buildings for tin

Note - This is an unsupported option which may not be fully documented.



The fields and buttons used in this panel have the following functions:

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

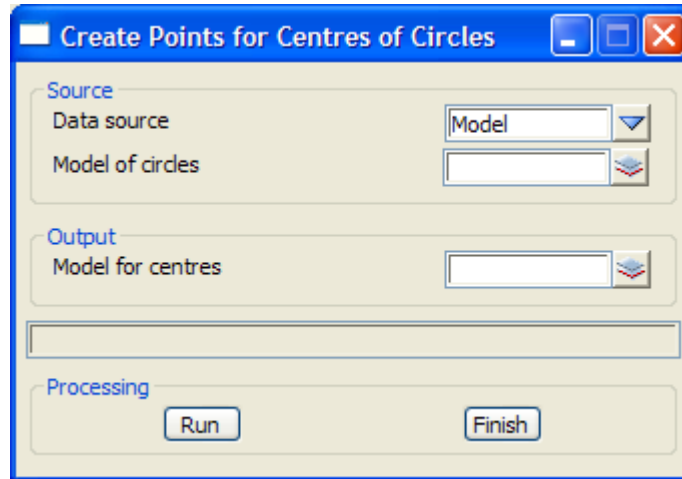
Create Points for Centre of Circles

circles_centres_panel

Position of option on menu: User =>A to C =>Convert circles to points

Note - This is an unsupported option which may not be fully documented.

This options creates points at the centres of circles.



The fields and buttons used in this panel have the following functions:

Field Description	Type	Defaults	Pop-Up
Data source		Model	string, model, view
Model/View/string of circles <i>source of the circles to create centre points for.</i>			
Model for centres <i>model to place the created centre points in.</i>	model box		available models
Run <i>run the option.</i>	button		

XXX Create Control Stations

buildings_panel

Position of option on menu: User =>A to C =>Create control stations

Note - This is an unsupported option which may not be fully documented.

The fields and buttons used in this panel have the following functions:

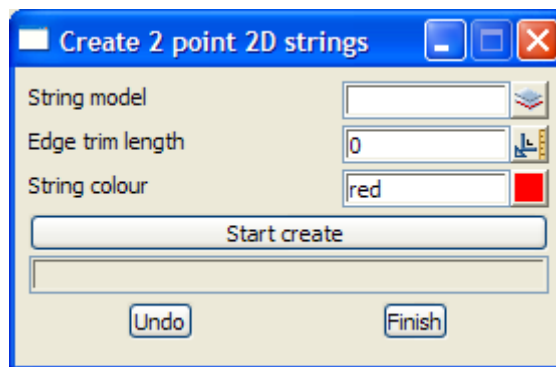
Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

XXX Create 2d String from Two Points

[rivers_shape_string_create_panel](#)

Position of option on menu: User =>A to C =>Create 2 point - 2d strings

Note - This is an unsupported option which may not be fully documented.



The fields and buttons used in this panel have the following functions:

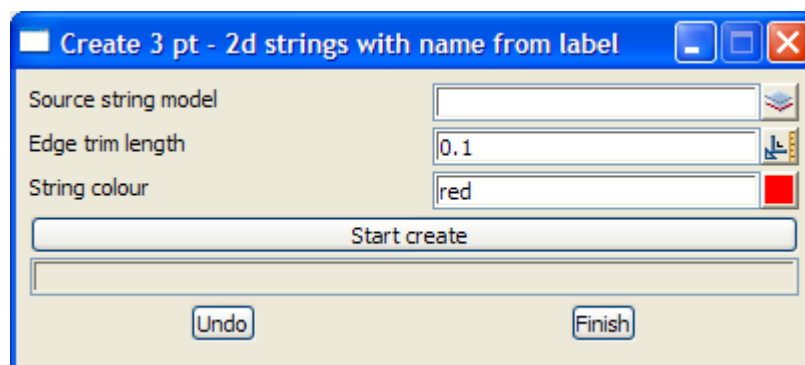
Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

XXX Create 3 Point 2d Strings

[rivers_source_string_create_panel](#)

Position of option on menu: User =>A to C =>Create 3 point - 2d strings

Note - This is an unsupported option which may not be fully documented.



The fields and buttons used in this panel have the following functions:

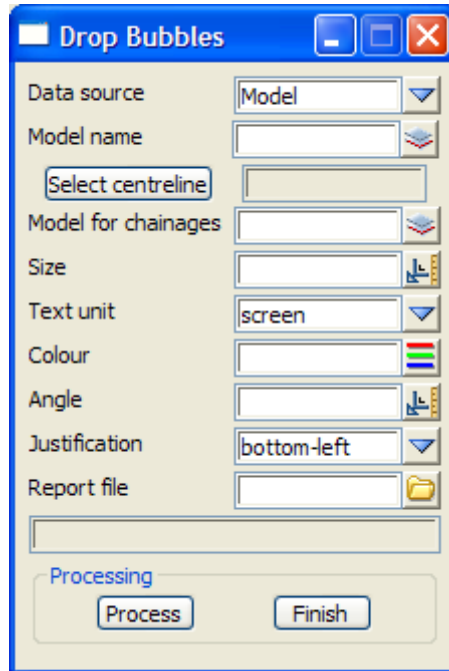
Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

XXX Drop Bubbles

drop_bubble_panel

Position of option on menu: User =>D to K =>Drop bubbles

Note - This is an unsupported option which may not be fully documented.



The fields and buttons used in this panel have the following functions:

Field Description	Type	Defaults	Pop-Up
Data source xxxxx		model	
Model name xxxxx			
Select centreline xxxxx			
Model for chainages xxxxx			
Size xxxxx			
Text unit xxxxx		pixels	
Colour xxxxx			
Angle xxxxx			
Justification xxxxx		bottom-left	

Report file

XXXXX

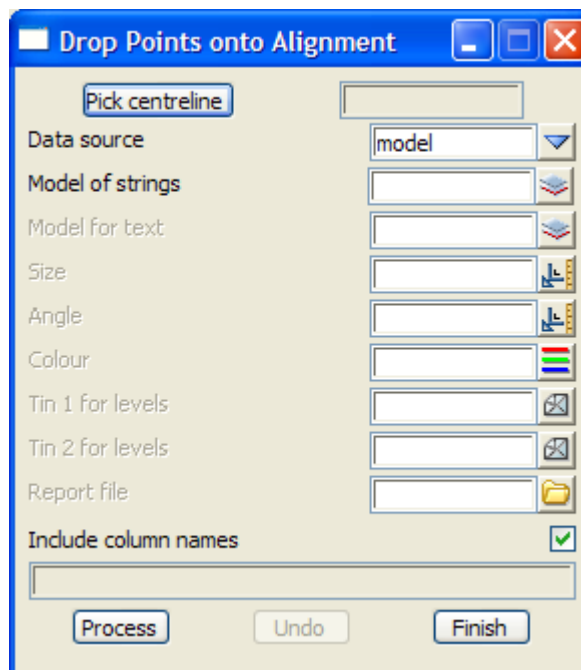
Process

XXXXX

XXX Drop Points onto Alignment

drop_points_panel

Position of option on menu: User =>D to K =>Drop points onto alignment

Note - This is an unsupported option which may not be fully documented.

The fields and buttons used in this panel have the following functions:

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Pick Centreline

XXXXX

Data source

model

XXXXX

Model of strings

XXXXX

Model for text

XXXXX

Size

XXXXX

Angle

XXXXX

Colour

XXXXX

Tin 1 for levels

XXXXX

Tin 2 for levels

XXXXX

Report file

XXXXX

Process

button

XXXXX

Undo

button

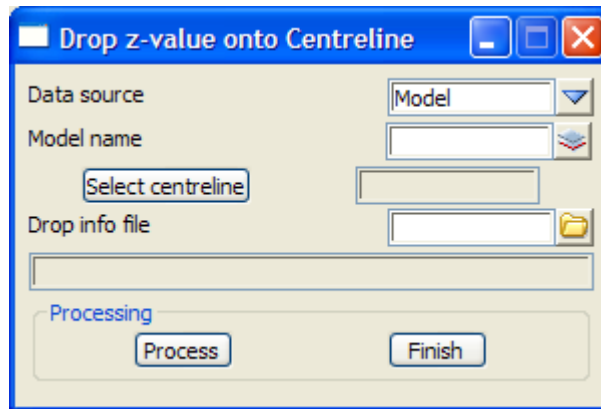
XXXXX

XXX Drop z-value onto Centreline

drop_zvalue_onto_centreline_panel

Position of option on menu: User =>D to K =>Drop points on centreline

Note - This is an unsupported option which may not be fully documented.



The fields and buttons used in this panel have the following functions:

Field Description	Type	Defaults	Pop-Up
Data source		model	
XXXXX			
Model name			
XXXXX			
Select centreline			
XXXXX			
Drop info file			
XXXXX			
Process	button		
XXXXX			

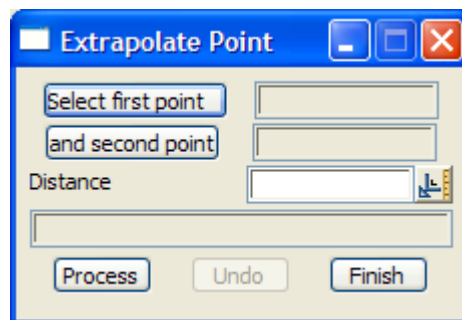
Extrapolate Point

extrapolate_panel

Position of option on menu: User =>D to K =>Extrapolate

Note - This is an unsupported option which may not be fully documented.

This option is used to select two point and then creates a new point a given distance from the second point along the line from the first point to the second point. The z-value for the point is the extrapolated z-value from the two selected points.



The fields and buttons used in this panel have the following functions:

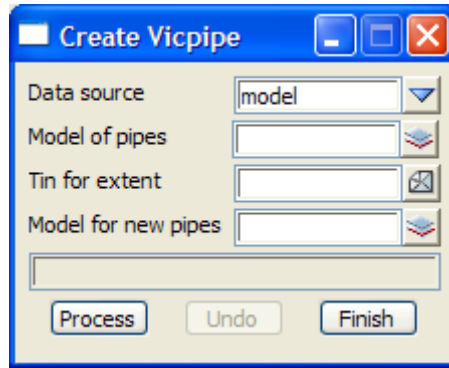
Field Description	Type	Defaults	Pop-Up
Select first point <i>select the first point to use in the extrapolation.</i>	string select		
and second point <i>select the second point to use in the extrapolation.</i>	string select		
Distance <i>distance to project from the second point along the line from the first to the second point.</i>	output box		
Process <i>run the option.</i>	button		
Undo <i>undo the last extrapolated point created since the panel has been up.</i>	button		

XXX Create VicRoad Pipe

vicpipe_panel

Position of option on menu: User =>D to K =>Extend pipe

Note - This is an unsupported option which may not be fully documented.



The fields and buttons used in this panel have the following functions:

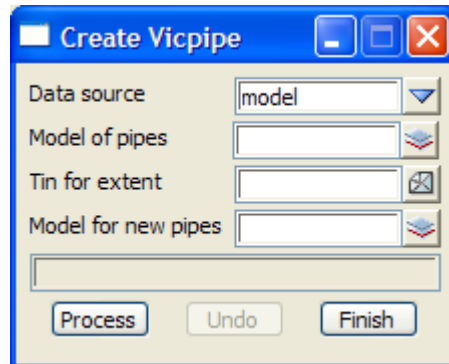
Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

XXX Fencing Models

mod_fence_panel

Position of option on menu: User =>D to K =>Fencing models

Note - This is an unsupported option which may not be fully documented.



The fields and buttons used in this panel have the following functions:

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

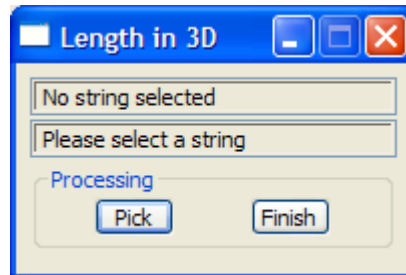
Length in 3d

length_3d_panel

Position of option on menu: User =>D to K =>Get length in 3d

Note - This is an unsupported option which may not be fully documented.

This panel is used to calculate the 3d length of a selected string.



The fields and buttons used in this panel have the following functions:

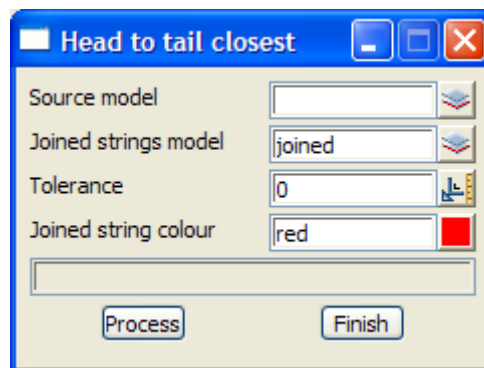
Field Description	Type	Defaults	Pop-Up
Pick	button		
<i>select the string to calculated the 3d length for.</i>			

XXX Head to Tail Closest Points

head_to_tail_closest_panel

Position of option on menu: User =>D to K =>Head to tail closest points

Note - This is an unsupported option which may not be fully documented.



The fields and buttons used in this panel have the following functions:

Field Description	Type	Defaults	Pop-Up

XXX Label Alignment

Position of option on menu: User =>L to Q =>Label alignment

Note - This is an unsupported option which may not be fully documented.

The fields and buttons used in this panel have the following functions:

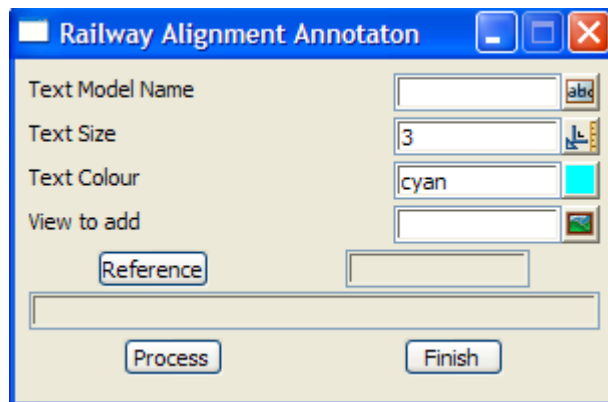
Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

XXX Label Alignment Radius

rail_align_panel

Position of option on menu: User =>L to Q =>Label alignment radius/ip (rail)

Note - This is an unsupported option which may not be fully documented.



The fields and buttons used in this panel have the following functions:

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

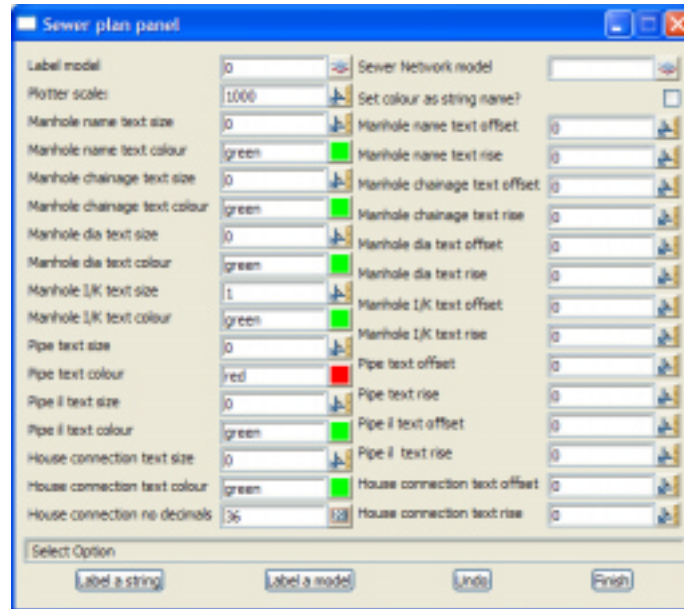
XXX Label Sewer Plan (old)

sewer_plan_panel

Position of option on menu: User =>L to Q =>Label sewer plan

Note - This is an unsupported option which may not be fully documented.

This option has been superseded.

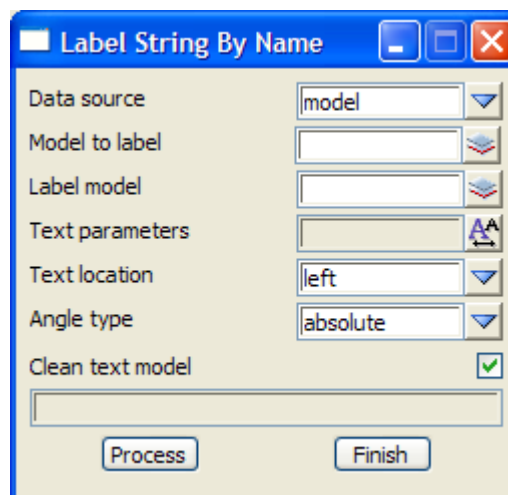


XXX Name Strings by Nearby Text

[label_string_by_name_panel](#)

Position of option on menu: User =>L to Q =>Label strings with name

Note - This is an unsupported option which may not be fully documented.



The fields and buttons used in this panel have the following functions:

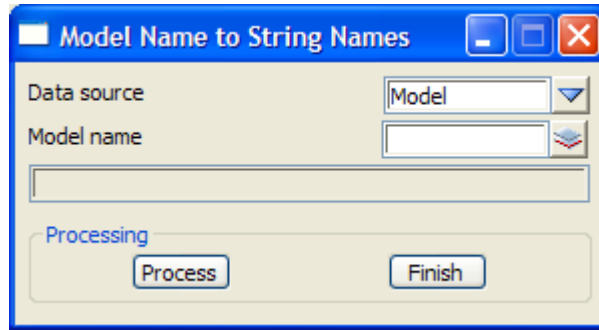
Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

XXX Name Strings by Model Name

[model_to_name_panel](#)

Position of option on menu: User =>L to Q =>Model to name

Note - This is an unsupported option which may not be fully documented.



The fields and buttons used in this panel have the following functions:

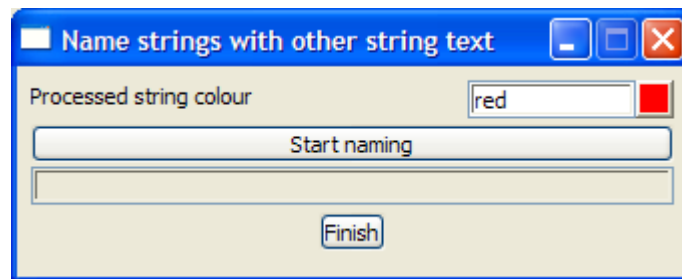
Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

XXX Name Section Strings by Picking Text

[string_names_from_strings_panel](#)

Position of option on menu: User =>L to Q =>Name strings using text strings

Note - This is an unsupported option which may not be fully documented.



The fields and buttons used in this panel have the following functions:

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

XXX Pavement Overlay Optimiser

Position of option on menu: User =>L to Q =>Overlay optimiser

Note - This is an unsupported option which may not be fully documented.

The fields and buttons used in this panel have the following functions:

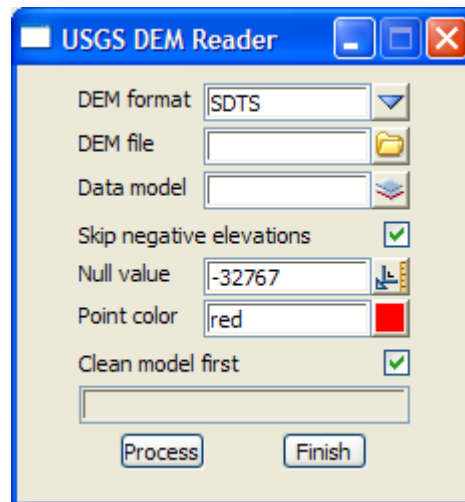
Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

XXX Read USGS DEM Data

[rivers_dem_reader_panel](#)

Position of option on menu: User =>R to Z =>Read USGS DEM data

Note - This is an unsupported option which may not be fully documented.



The fields and buttons used in this panel have the following functions:

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

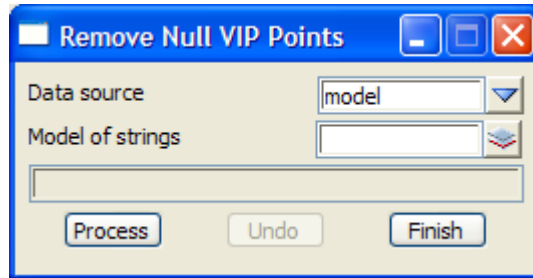
Remove Null VIP Points

remove_null_vips_panel

Position of option on menu: User =>R to Z =>Remove null VIP's

Note - This is an unsupported option which may not be fully documented.

This option is used to remove any null vertical intersection points from alignment strings.



The fields and buttons used in this panel have the following functions:

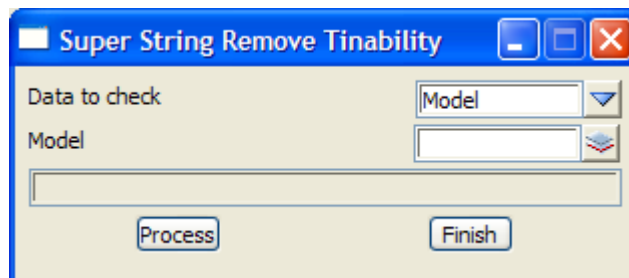
Field Description	Type	Defaults	Pop-Up
Data source <i>Type of data to remove null vips for.</i>	data source	Model	String, Model, View
Model/View/String <i>Data source for all the alignment strings to remove all null vips from.</i>	data source		
Process <i>Run the option.</i>	button		

XXX Remove Tinability

super_remove_tinability_panel

Position of option on menu: User =>R to Z =>Remove tinability

Note - This is an unsupported option which may not be fully documented.



The fields and buttons used in this panel have the following functions:

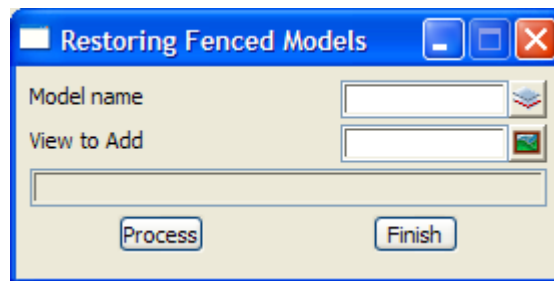
Field Description	Type	Defaults	Pop-Up

XXX Restore Fenced Model

mod_res_panel

Position of option on menu: User =>R to Z =>Restore fenced model

Note - This is an unsupported option which may not be fully documented.



The fields and buttons used in this panel have the following functions:

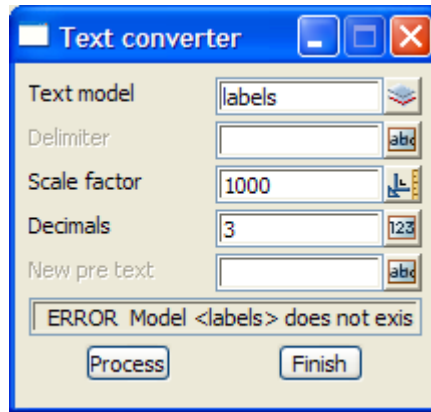
Field Description	Type	Defaults	Pop-Up
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XXX Scale Text Values

text_convert_panel

Position of option on menu: User =>R to Z=>Scale text values

Note - This is an unsupported option which may not be fully documented.



The fields and buttons used in this panel have the following functions:

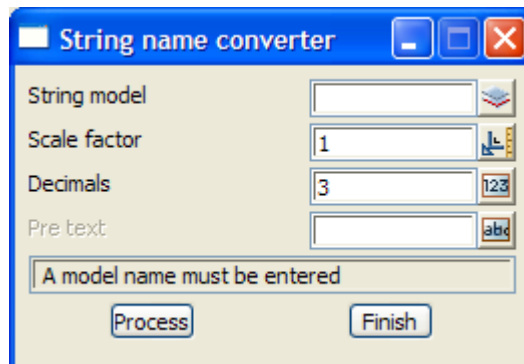
Field Description	Type	Defaults	Pop-Up
Text model xxxxx	input box	labels	
Scale factor xxxxx	input box	1000	
Decimals xxxxx	input box	3	
Process xxxxx	button		

XXX Scale String Names

string_name_convert_panel

Position of option on menu: User =>R to Z=>Scale string names

Note - This is an unsupported option which may not be fully documented.



The fields and buttons used in this panel have the following functions:

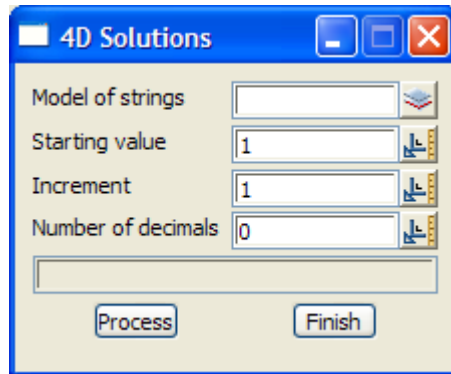
Field Description	Type	Defaults	Pop-Up
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XXX Set String Names by Number

[string_name_by_number_panel](#)

Position of option on menu: User =>R to Z=>Set string names by number

Note - This is an unsupported option which may not be fully documented.



The fields and buttons used in this panel have the following functions:

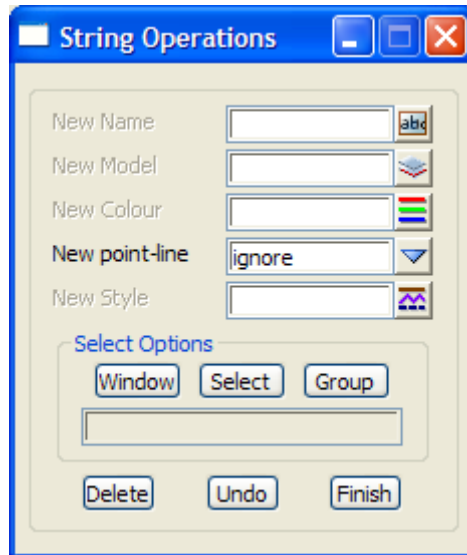
Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

XXX String Operations

string_ops_panel

Position of option on menu: User =>R to Z=>Set string properties

Note - This is an unsupported option which may not be fully documented.



The fields and buttons used in this panel have the following functions:

Field Description	Type	Defaults	Pop-Up
new name xxxxx	input box		
new model xxxxx	input box		
new colour xxxxx	input box		
new-point-line xxxxx	input box	ignore	
new style xxxxx	input box		
window xxxxx	button		
select xxxxx	button		
group xxxxx	button		
delete xxxxx	button		
window xxxxx	button		

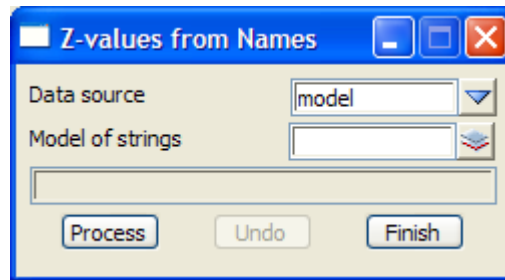
Set Contour Levels from String Names

level_from_name_panel

Position of option on menu: User =>R to Z=>Set contour level from contour name

Note - This is an unsupported option which may not be fully documented.

This operates on contour strings and sets the contour z-value to be the value of the name of the contour string. The z-values may need to be factored to bring them into the correct units.



The fields and buttons used in this panel have the following functions:

Field Description	Type	Defaults	Pop-Up
Data source <i>Type of data to set contour z-values for.</i>	data source	Model	Model, View
Model/View <i>Data source to of contours to set z-values for.</i>	data source		
Process <i>Run the option</i>	button		
Undo <i>Undo the last set of contours labelled since the panel was up.</i>	button		

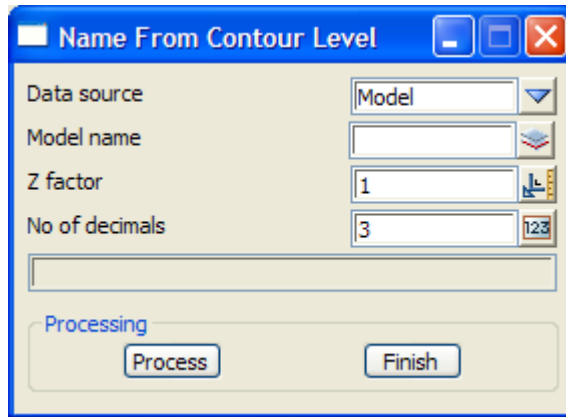
Set Contour Names From Contour Levels

name_contour_panel

Position of option on menu: User =>R to Z=>Set contour names from contour levels

Note - This is an unsupported option which may not be fully documented.

This option operates on contours only and sets the string name to be the contour z value multiplied by the given factor.



The fields and buttons used in this panel have the following functions:

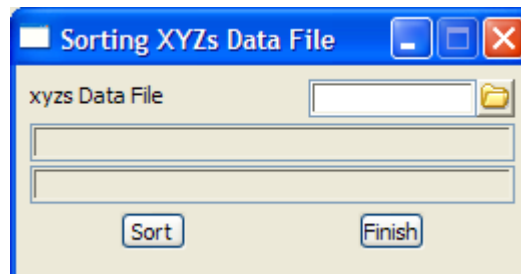
Field Description	Type	Defaults	Pop-Up
Data source <i>Type of data to label contours strings for.</i>	data source	Model	String, Model, View
Model/View/String <i>Data source to calculate label the contours for.</i>	data source		
Z factor <i>Value to multiply the z values by before creating the string name.</i>	input	1	
No of decimals <i>Number of decimals places to use in the string name.</i>	input	3	
Process <i>Run the option.</i>	button		

XXX Sort XYZs Data File

[xyzs_sort_panel](#)

Position of option on menu: User =>R to Z=>Sort xyz data file

Note - This is an unsupported option which may not be fully documented.



The fields and buttons used in this panel have the following functions:

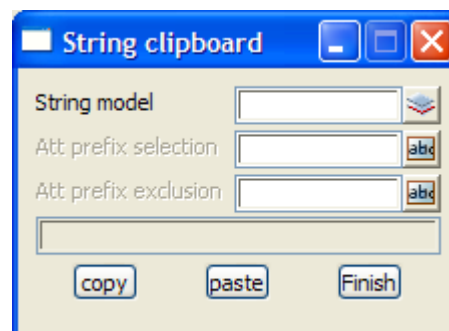
Field Description	Type	Defaults	Pop-Up
Xyzs data file xxxxx	input box		
Sort xxxxx	button		

XXX String Attributes To-From Clipboard

[string_to_panel](#)

Position of option on menu: User =>R to Z =>String attributes to-from clipboard

Note - This is an unsupported option which may not be fully documented.



The fields and buttons used in this panel have the following functions:

Field Description	Type	Defaults	Pop-Up
String model	input box		
Att prefix selection	input box		
Att prefix exclusion	input box		
copy	button		
paste	button		
Finish	button		

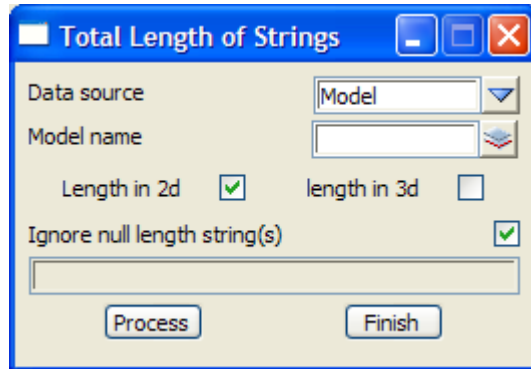
Total Length of Strings

totallengths_panel

Position of option on menu: User =>R to Z=>Sum length of all strings

Note - This is an unsupported option which may not be fully documented.

This panel is used to calculate the total length of the strings in a selected model or view.



The fields and buttons used in this panel have the following functions:

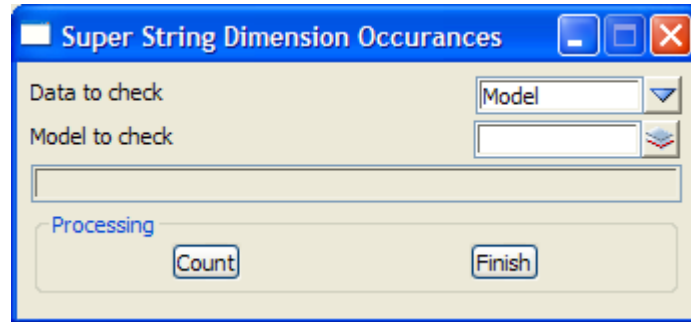
Field Description	Type	Defaults	Pop-Up
Data source <i>data source type</i>			model, view, string
Data source <i>data source to calculate lengths for.</i>			
Length in 2d/3d <i>if 2d, the lengths are only calculated in 2d. If 3d, the lengths are calculated in 3d.</i>	radio button	2d	
Ignore null length string(s) <i>if tick, strings of null length are ignored in the string count and hence don't affect the average length.</i>	tick box	tick	
Process <i>run the option</i>	button		

XXX Super String Dimension Occurrences

super_remove_radius_panel

Position of option on menu: User =>R to Z=>Super string dimension occurrences

Note - This is an unsupported option which may not be fully documented.



The fields and buttons used in this panel have the following functions:

Field Description	Type	Defaults	Pop-Up
data to check xxxxx	input box		
model to check xxxxx	input box		
count xxxxx	button		

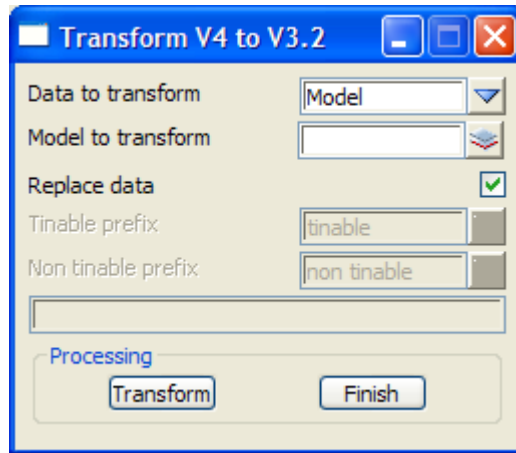
XXX Transform V4 to V3.2

super_to_v32_panel

Position of option on menu: User =>R to Z=>Super string to V3.2 strings

Note - This is an unsupported option which may not be fully documented.

This panel convert a super string from 12d Model V4.0 format to V3.2 strings.



The fields and buttons used in this panel have the following functions:

Field Description	Type	Defaults	Pop-Up
Data to transform xxxxx	input box	model	
Model to transform xxxxx	input box		
Replace data xxxxx	tick box	tick	
Tunable prefix xxxxx	input box	tunable	
Non tunable prefix xxxxx	input box	non tunable	
Transform xxxxx	button		

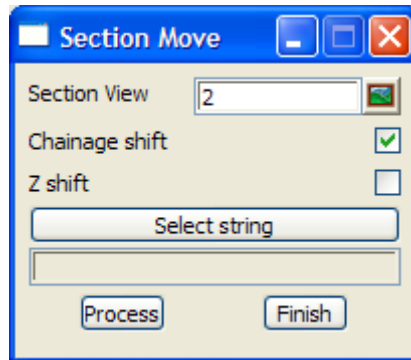
XXX Section Move

section_move_panel

Position of option on menu: User =>R to Z=>Translate string in section view

Note - This is an unsupported option which may not be fully documented.

This panel is used to translate a string on a section view.



The fields and buttons used in this panel have the following functions:

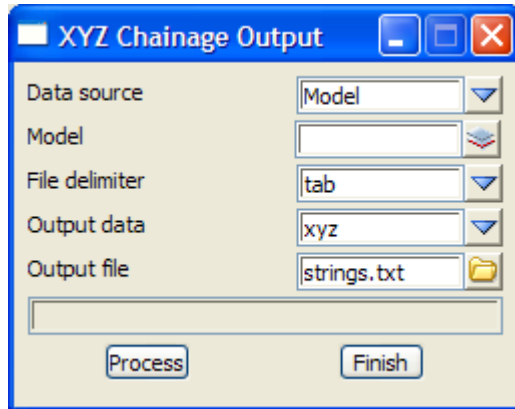
Field Description	Type	Defaults	Pop-Up
section view xxxxx	input box	2	
chainage shift xxxxx	tick box	tick	
z shift xxxxx	tick box		
select string xxxxx	button		
process xxxxx	button		

XXX Output XYZ and Chainage

xyz_chainage_output_panel

Position of option on menu: User =>R to Z=>XYZ chainage

Note - This is an unsupported option which may not be fully documented.



The fields and buttons used in this panel have the following functions:

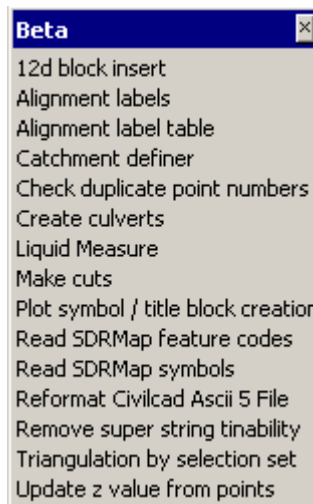
Field Description	Type	Defaults	Pop-Up
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Beta

beta

All the options under User and User menus are either customers own macros or unsupported macros from 12D Solutions which may not be documented. For more information on *User* menus, go to “User Defined Menus”

The walk rights Beta menu is:



For *Alignment labels*, go to the section “XXX Alignment Labels”

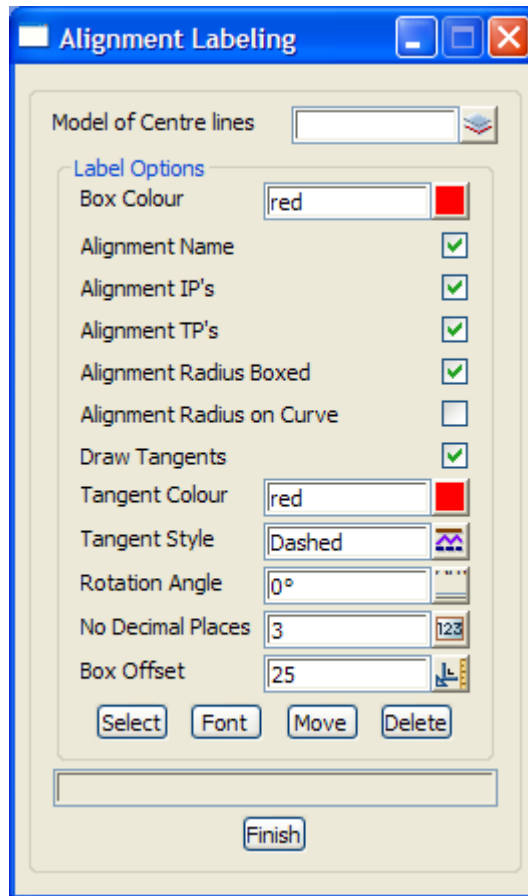
<i>Alignment label table</i>	“XXX Table of Alignment Labels”
<i>Catchment definer</i>	“XXX Catchment Definer”
<i>Check duplicate point numbers</i>	“XXX Check Duplicate Point Numbers”
<i>Create culverts</i>	“XXX Create Culvert”
<i>Liquid measure</i>	“XXX Liquid Measure”
<i>Make cuts</i>	“XXX Make Cuts Through Strings”
<i>Plot symbol/title block</i>	“XXX Plot Symbol and Title Block Creation (old)”
<i>Read SDRMap feature codes</i>	“XXX Read SDRMap Feature Code”
<i>Read SDRMap symbols</i>	“XXX Read SDRMap Symbols”
<i>Reformat CivilCAD Ascii 5 file</i>	“XXX Reformat CivilCAD Ascii 5 file”
<i>Remove super string tinability</i>	“XXX Remove Super String Tinability”
<i>Triangulate by selection set</i>	“XXX Triangulate by Selection Set”
<i>Update z values from points</i>	“XXX Update Z Values from Points”

XXX Alignment Labels

align_label_panel

Position of option on menu: User =>Beta =>Alignment labels

Note - This is an unsupported option which may not be fully documented.



The fields and buttons used in this panel have the following functions:

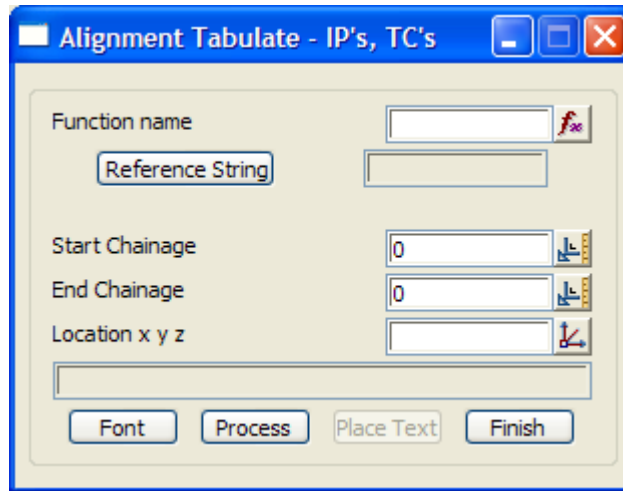
Field Description	Type	Defaults	Pop-Up
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XXX Table of Alignment Labels

Align_label_table_panel

Position of option on menu: User =>Beta =>Alignment label table

Note - This is an unsupported option which may not be fully documented.



The fields and buttons used in this panel have the following functions:

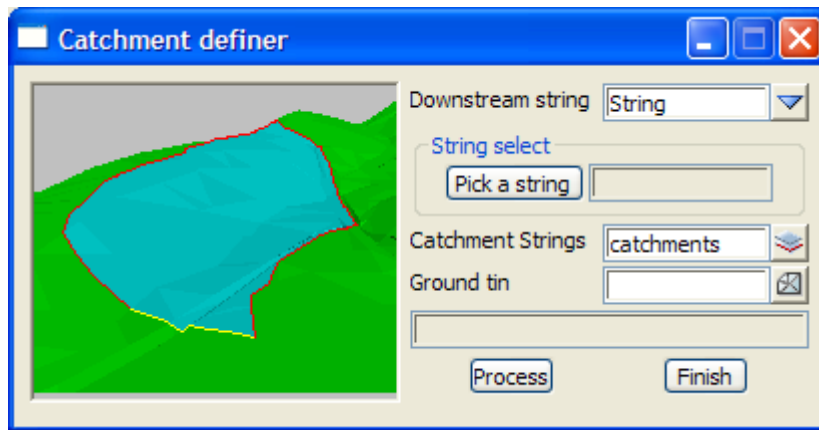
Field Description	Type	Defaults	Pop-Up
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XXX Catchment Definer

Catchment_areas_panel

Position of option on menu: User =>Beta =>Catchment definer

Note - This is an unsupported option which may not be fully documented.



The fields and buttons used in this panel have the following functions:

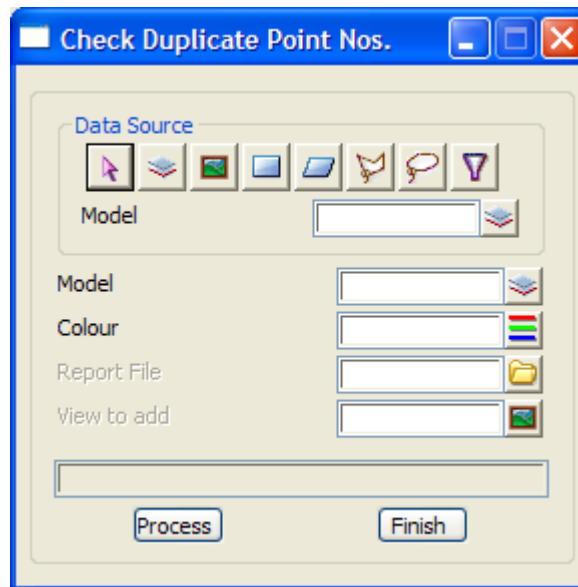
Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

XXX Check Duplicate Point Numbers

Dup_pt_nos_panel

Position of option on menu: User =>Beta =>Check duplicate point numbers

Note - This is an unsupported option which may not be fully documented.



The fields and buttons used in this panel have the following functions:

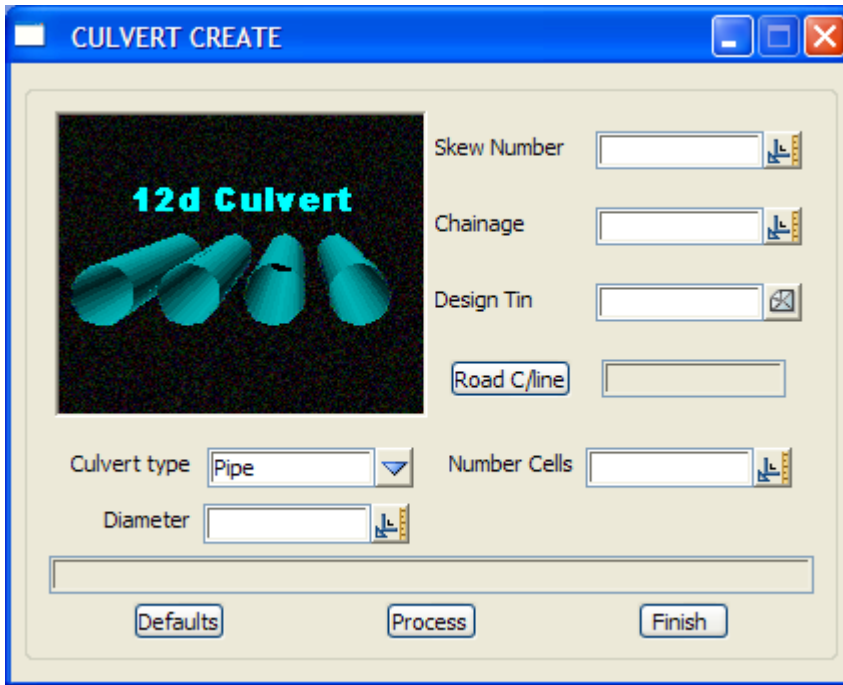
Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

XXX Create Culvert

3d_culvert_panel

Position of option on menu: User =>Beta =>Create culvert

Note - This is an unsupported option which may not be fully documented.



The fields and buttons used in this panel have the following functions:

Field Description	Type	Defaults	Pop-Up
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XXX Liquid Measure

liquid_meas_panel

Position of option on menu: User =>Beta =>Liquid measure

Note - This is an unsupported option which may not be fully documented.

The fields and buttons used in this panel have the following functions:

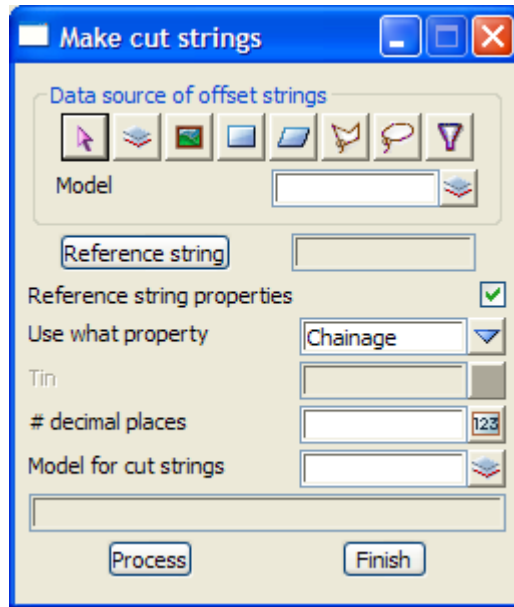
Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

XXX Make Cuts Through Strings

Make_Cuts_panel

Position of option on menu: User =>Beta =>Make cuts

Note - This is an unsupported option which may not be fully documented.



The fields and buttons used in this panel have the following functions:

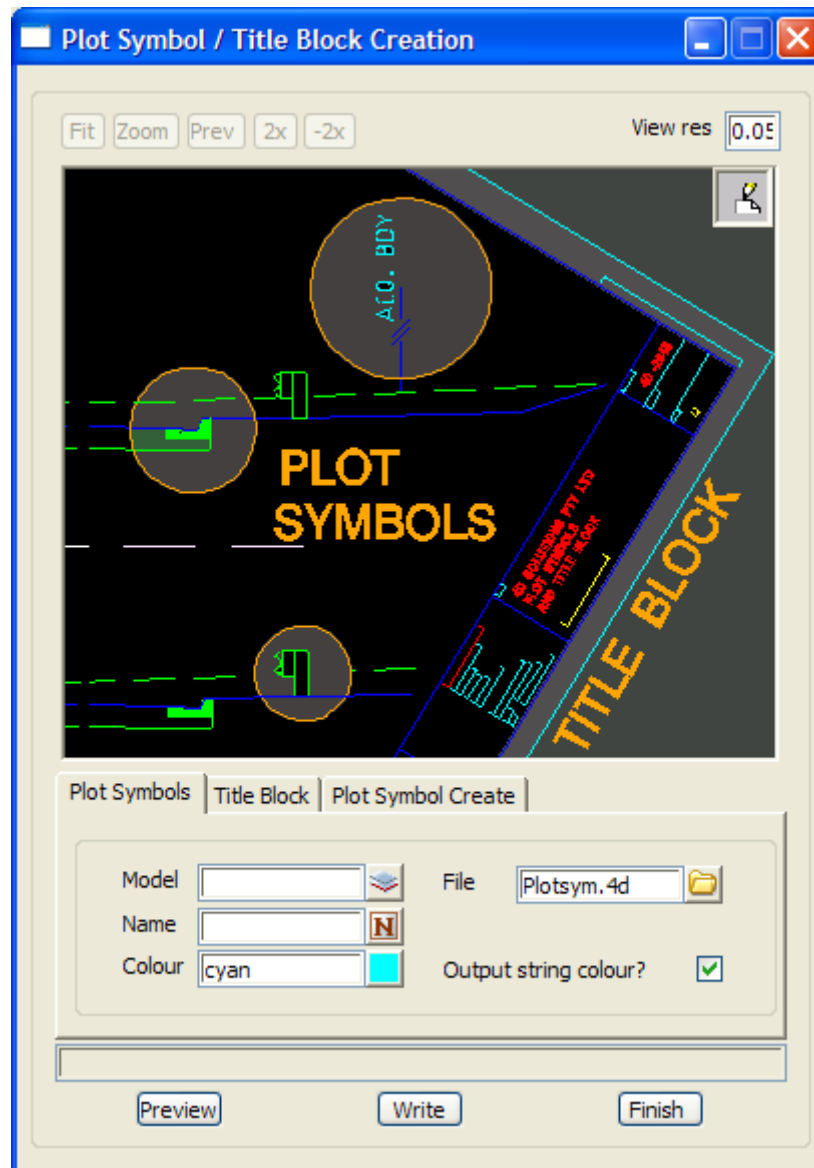
Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

XXX Plot Symbol and Title Block Creation (old)

`psym_drawbox_panel`

Position of option on menu: User =>Beta =>Plot symbol/title block creation

Note - This is an unsupported option which may not be fully documented.



The fields and buttons used in this panel have the following functions:

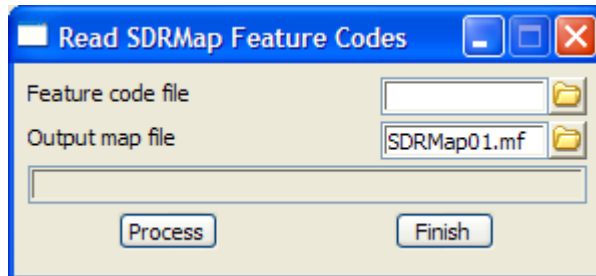
Field Description	Type	Defaults	Pop-Up
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XXX Read SDRMap Feature Code

SDRMap_Read_Feature_Codes_panel

Position of option on menu: User =>Beta =>Read SDRMap feature codes

Note - This is an unsupported option which may not be fully documented.



The fields and buttons used in this panel have the following functions:

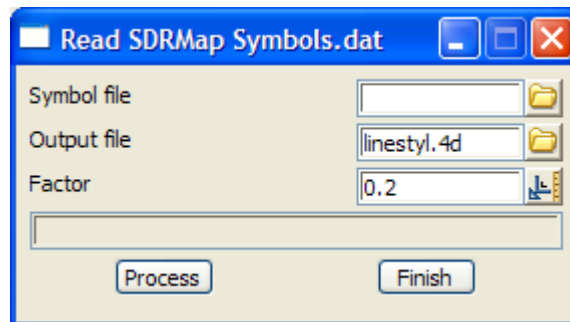
Field Description	Type	Defaults	Pop-Up
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XXX Read SDRMap Symbols

SDRMap_Read_Symbols_panel

Position of option on menu: User =>Beta =>Read SDRMap symbols

Note - This is an unsupported option which may not be fully documented.



The fields and buttons used in this panel have the following functions:

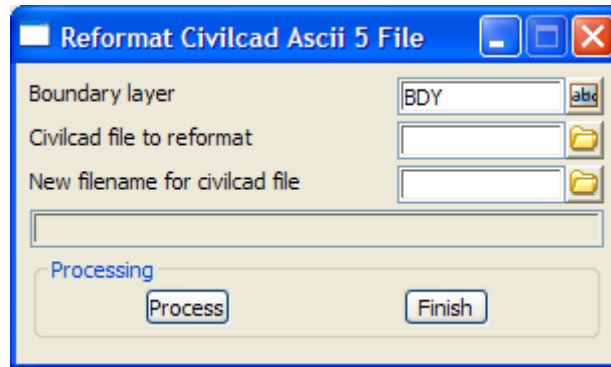
Field Description	Type	Defaults	Pop-Up
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XXX Reformat CivilCAD Ascii 5 file

reformat_as5_panel

Position of option on menu: User =>Beta =>Reformat CivilCAD Ascii 5 file

Note - This is an unsupported option which may not be fully documented.



The fields and buttons used in this panel have the following functions:

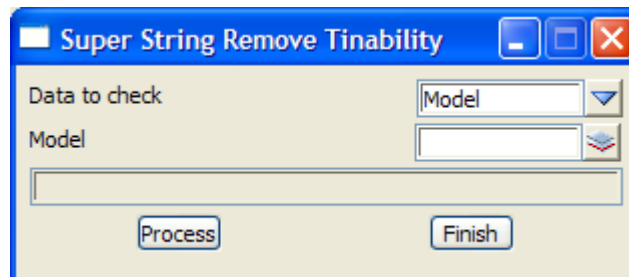
Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

XXX Remove Super String Tinability

`super_remove_tinability_panel`

Position of option on menu: User =>Beta =>Remove super string tinability

Note - This is an unsupported option which may not be fully documented.



The fields and buttons used in this panel have the following functions:

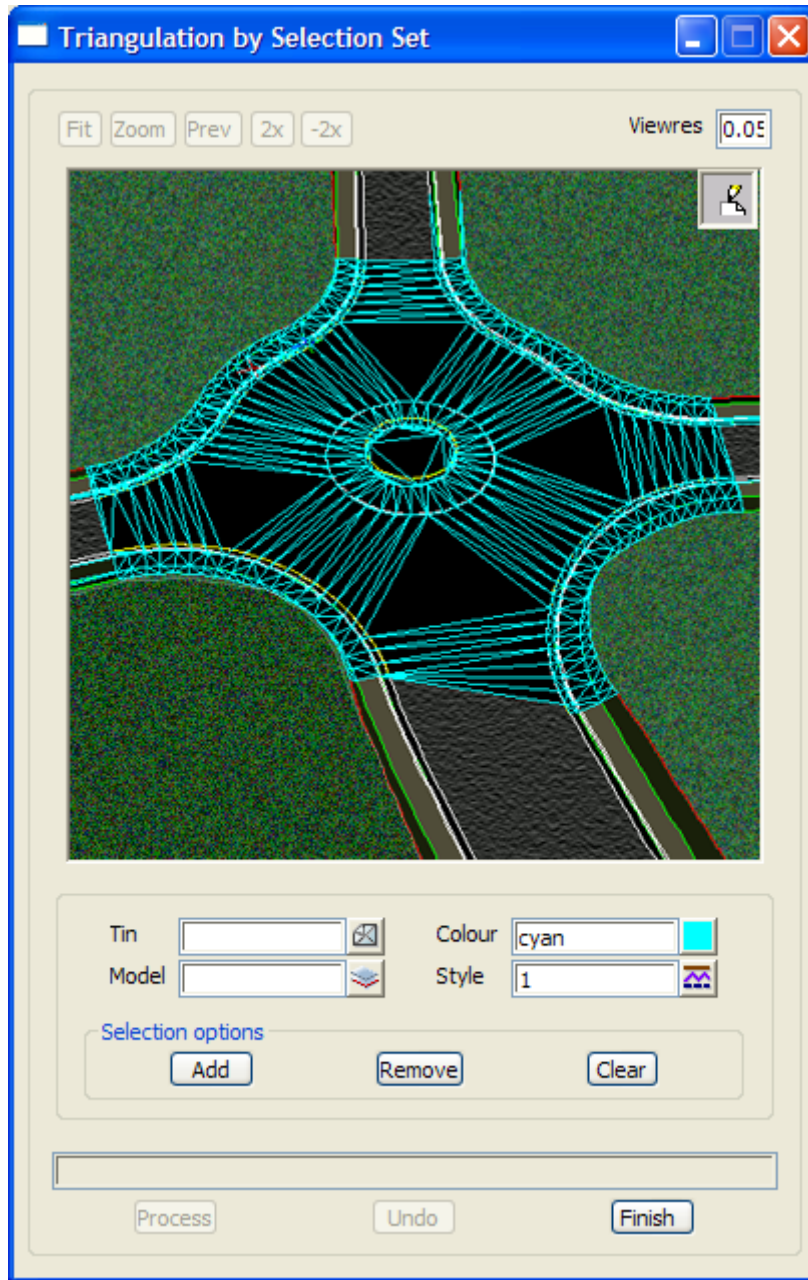
Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

XXX Triangulate by Selection Set

tri_drawbox_panel

Position of option on menu: User =>Beta =>Triangulation by selection set

Note - This is an unsupported option which may not be fully documented.



The fields and buttons used in this panel have the following functions:

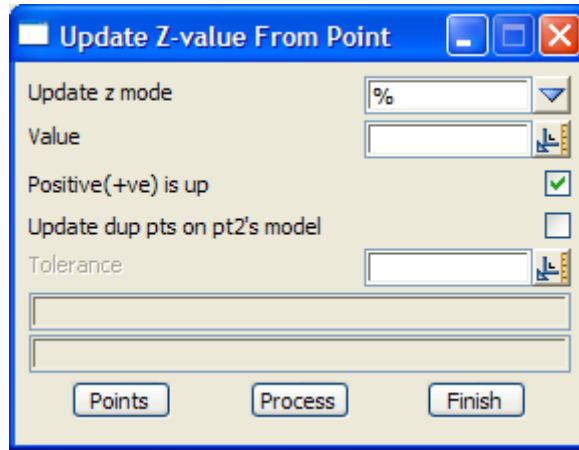
Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

XXX Update Z Values from Points

Update_z_value_from_point_panel

Position of option on menu: User =>Beta =>Update z value from points

Note - This is an unsupported option which may not be fully documented.



The fields and buttons used in this panel have the following functions:

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Console

console

All the options under User and User menus are either customers own macros or unsupported macros from 12D Solutions which may not be documented. For more information on *User* menus, go to “User Defined Menus”

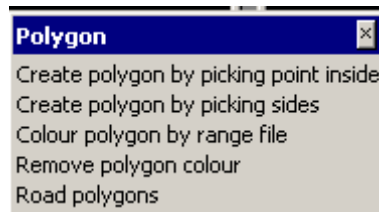
All the macros on the Console menu only use the console panel and so do not support a F1 key for help.

The User =>Console rights menu is:



Polygon

The Polygon walk-right menu is



create polygon by picking point inside
 create polygon by picking sides
 colour polygon by range file
 remove polygon colour
 road polygons

and each option in this menu will now be discussed.

For the option *Create polygon by picking point inside area*, go to the section “Surrounding Polygon” in the chapter “Strings”

For the option *Create polygon by picking sides*, go to the section “Create Polygon by Picking Sides”

Colour polygons from range file

“Colour Polygons by Range File”

Remove polygon colour

“Remove Polygon Colour”

Road polygons

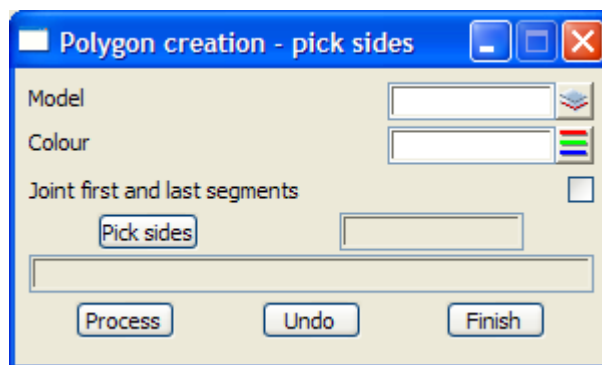
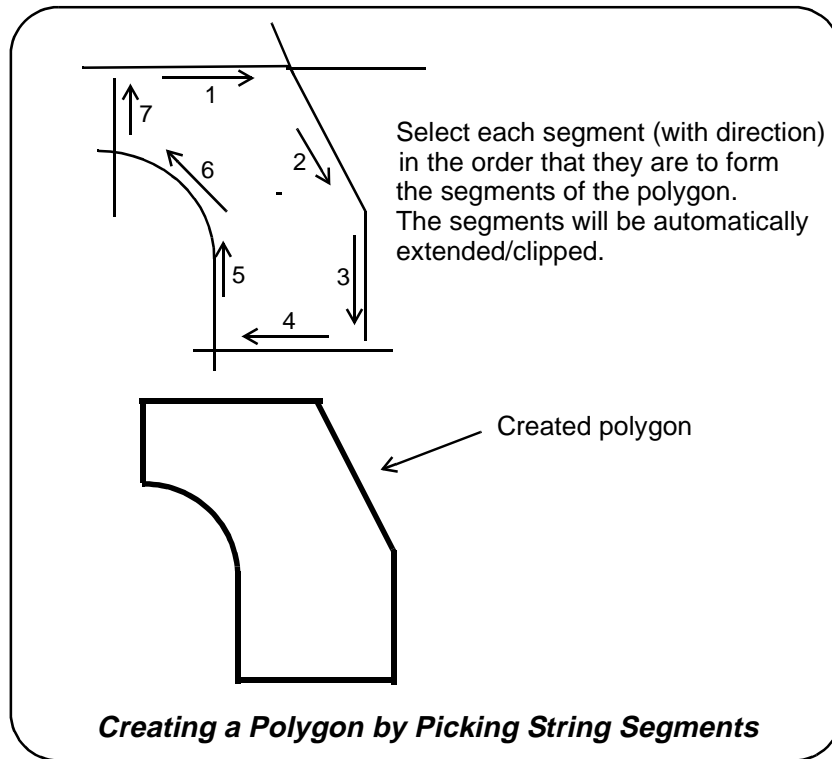
“Road Polygons” in the chapter “Design”

Create Polygon by Picking Sides

polygon_creation_pick_panel

Position of option on menu: User => Polygon => Create polygon by picking sides

This option creates a polygon by a picking each segment in its order (and with direction) around the polygon. Segments will be automatically extended or clipped to form the polygon.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Model for polygon <i>model for the created polygon</i>	model box		available models
Lot colour <i>colour for the created polygon</i>	colour box		available colours
Join first and last segment <i>if tick, join the end of the last selected segment to the start of the first selected segment to form the final</i>	tick box		

side of the polygon. The segments may be automatically trimmed/extended.

Pick sides string select

pick, with direction, the segments to be joined together to form the sides of the polygon.

Process button

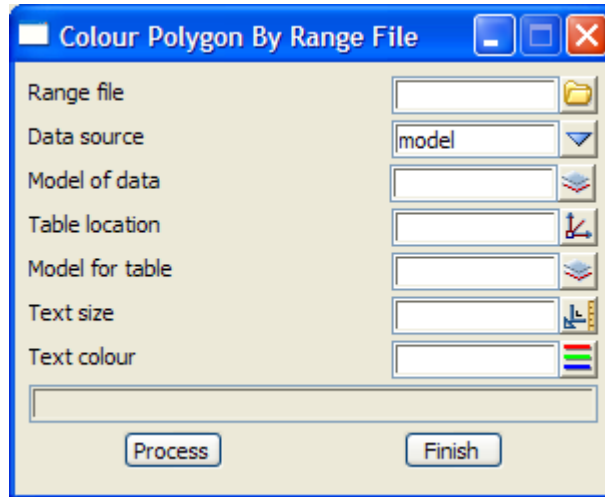
create the polygon from the selected segments.

Colour Polygons by Range File

colour_polygon_by_range_file_panel

Position of option on menu: User =>Polygon =>Colour polygons by range file

This option creates a polygon by a picking each segment in its order (and with direction) around the polygon. Segments will be automatically extended or clipped to form the polygon.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Range file <i>range file for colouring polygons.</i>	file box		*.lrf
Data source type <i>data source type.</i>		model	model, view
Data source <i>data source for polygons to be coloured.</i>			
Table location <i>position of the table.</i>	position select box		
Model for table <i>model for the table of statistics on the polygon areas.</i>	model box		available models
Text colour <i>colour of the text.</i>	colour box		available colours
Text size (w) <i>size of the text for the table.</i>	double box		
Process <i>select all the polygons given by the Data source and colour them according to the lot range file.</i>	button		

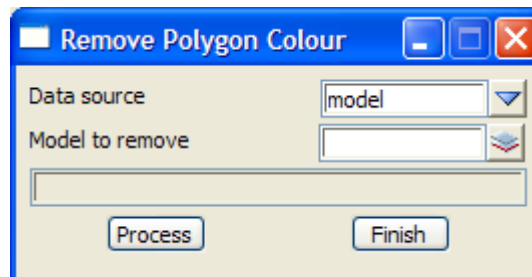
Remove Polygon Colour

`remove_polygon_colour_panel`

Position of option on menu: Design =>Estate/Lots =>Lot utilities =>Remove polygon colour

Note - This is an unsupported option which may not be fully documented.

This option removes the colour of all the selected polygons.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Data source type <i>data source type.</i>		model	model, view

Data source

data source for polygons to have their colour removed.

Process

button

select all the polygons given by the Data source and remove the polygon colour.

Undocumented User Menus

user_model_utilites user_models user_strings_create user_create_circles user_create_arcs
user_points_edit user_strings_edit user_string_labelling

user_strings user_tin_create user_tin_colouring user_tin_inquire user_tin_null user_tin_utilities
user_triangles user_survey

user_templates_utilities user_templates user_design_functions user_template_boxing user_mtf
user_end_area_volumes user_exact_volumes user_volumes

user_roads user_plots user_reports user_fence user_functions user_macros user_measure
user_recalc

user_utilities_a-g user_utilities_h-z user_utilities

user_projects

user_data_input

user_file_i_o

The options on a **User** menu are either customer's macros or unsupported macros from 12D Solutions and may not be documented.

28 Window

Window

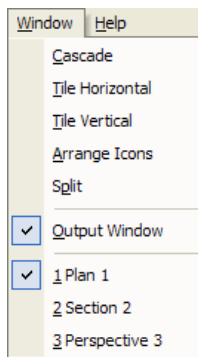
window

The **12d** Model window menu contains options to cascade, tile horizontally and vertically.

The **Output window** can also be toggled on and off.

The Window on main menu and walk-right menus are

on Main menu



cascade the non-minimized views

horizontally tile the non-minimized views

vertically tile the non-minimized views

place all minimized view icons at the bottom of the views area

toggle the output window on/off

list of existing views

29 Help

help

Position of menu: It is on the main menu as Help

From *12d Model V5.0* onwards, the two-volume paper Reference Manual has been replaced by electronic help accessed from within 12d Model.

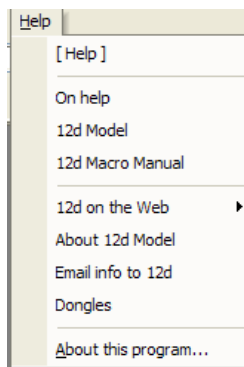
The entire 12d Model Help manual can be accessed by selecting *12d Model* on the Help menu item on the main *12d Model* menu.

Alternatively, individual topics for a panel or menu can be invoked by pressing the F1 key whenever the focus is on the menu or panel, or by clicking on the *Help* button on any 12d Model panel.

The **12d** Model help menu contains options to access Microsoft's Help on Microsoft's Help, the 12d Model Help and the 12d Model Macro Programming Language Help, plus links to the 12D Solutions web site www.12d.com.

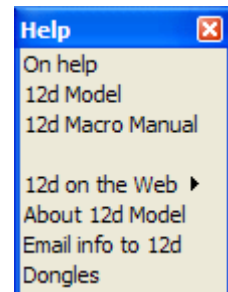
The help on main menu and walk-right menus are

on Main menu



create floating Help menu
help on Microsoft's help system
contents of 12d Model help
help on 12d macro programming language
links to www.12d.com
dongle number, 12d Model modules
email information about 12d Model to 12D Solutions
dongle testing panel

floating Help menu



For the option *On help*, go to the section

12d Model
12d Macro manual
12d on the web
About 12d Model
Email info to 12d

"On Help" .

"12d Model Contents" .
"12d Model Macro Manual" .
"12d on the Web" .
"About 12d Model" .
"Email Info to 12d" .

More information on the Help system will now be given.

On Help

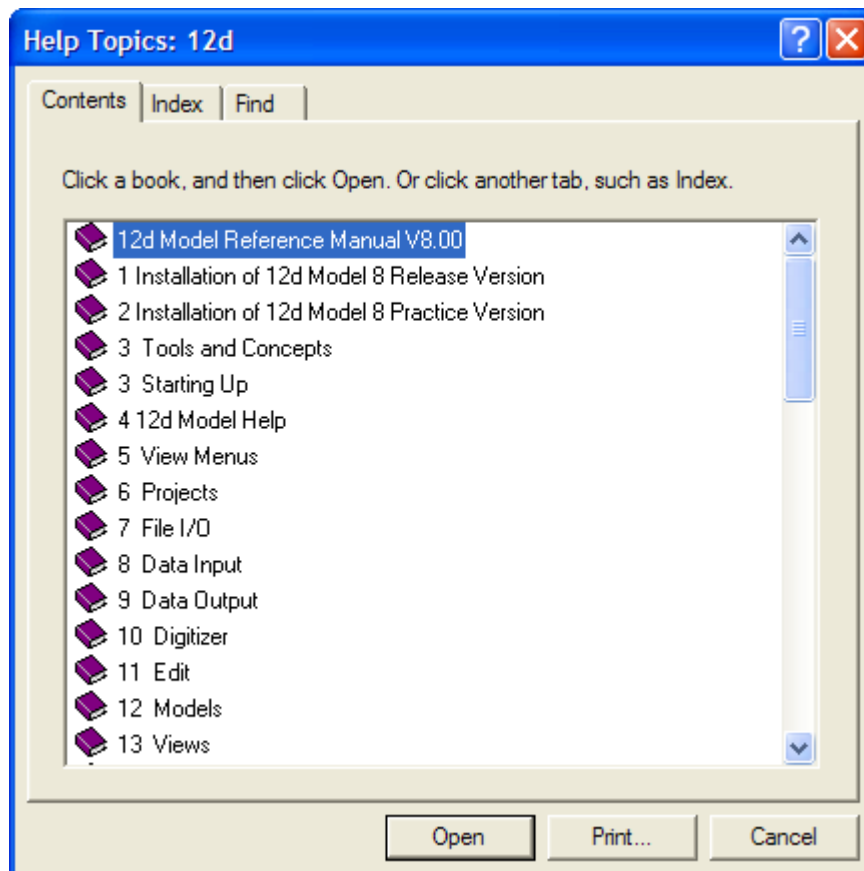
Position of option on menu: Help =>On help
Help on Microsoft's *Help* system.

Please continue to the next section "12d Model Contents" .

12d Model Contents

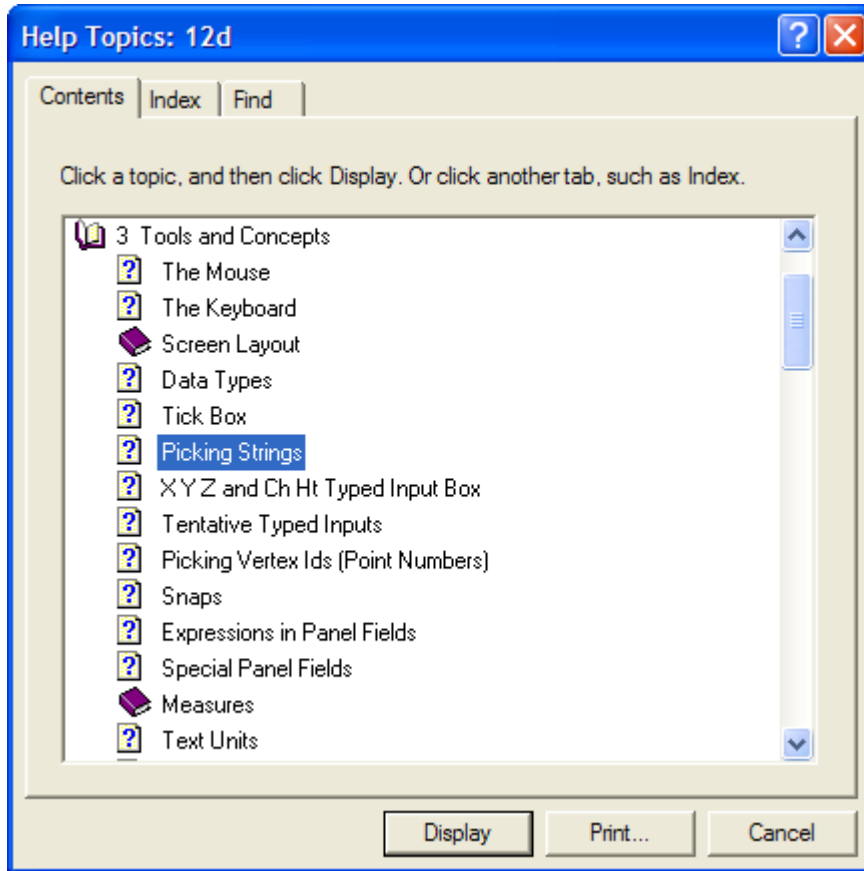
Position of option on menu: Help =>12d Model

The **12d Model** option allows you to look at the overall structure of the 12d Model Help and access any part of it.

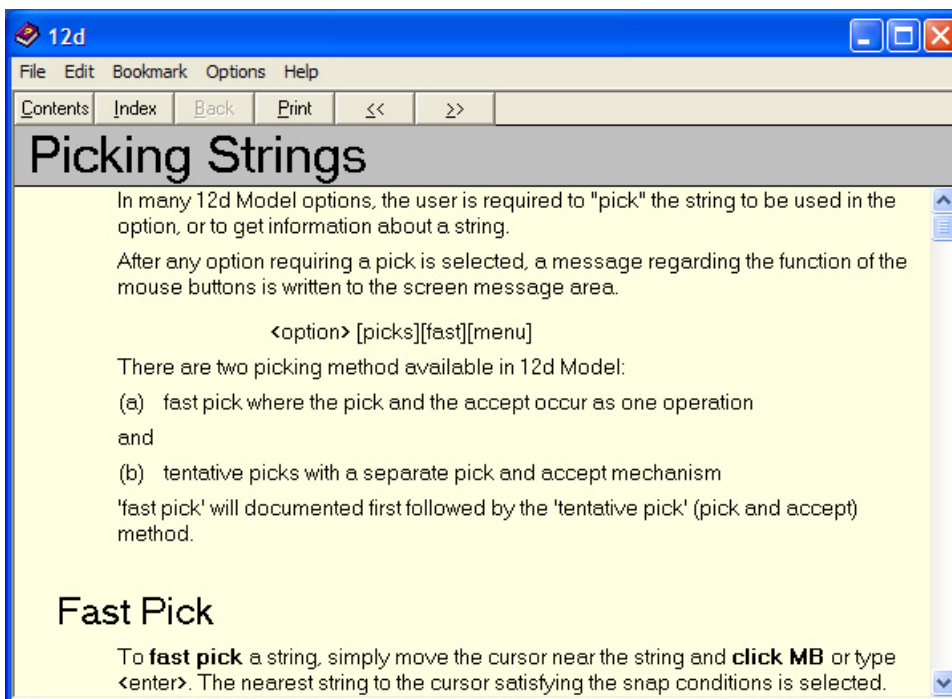


Warning - only *topics* in the Help can be accessed through the *Contents* list so any folders in the Content folders must be expanded until topics are displayed. *Topics* can be easily identified because they have a question mark beside them indicating that Help is available.

For example, double clicking on '*Tools and Concepts*' expands the next level of '*Tools and Concepts*'.



Double clicking on the topic 'Picking Strings' will then display the topic in the Help. The *Contents* then disappear leaving *Help* open at the selected topic.



Double clicking on 'Contents' on the top of the Help will bring the Contents listing back up.

For information on the **Index** tab, please continue to the next section "Index" .

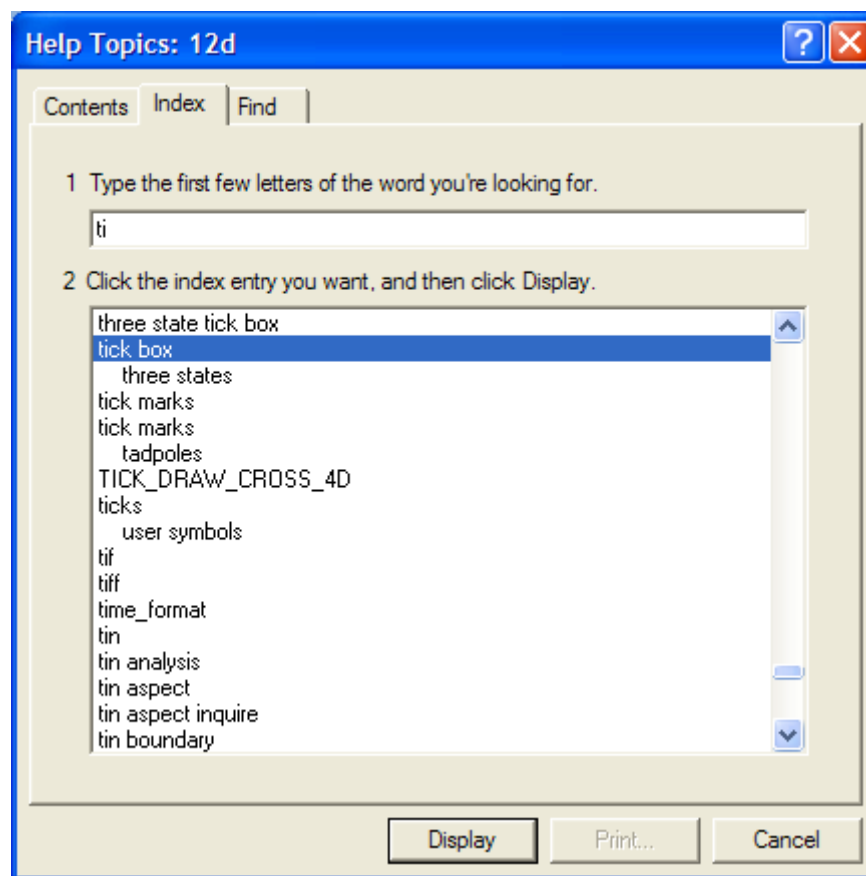
For information on the **Find** tab, please continue to the next section "Find" .

For information on the **Help** button on a panel, please continue to the section "Panel Help Button" .

Index

The *Index* option searches through all entries in the Index of the Help.

As the first few characters of the required entry are typed in, the matching index entries are displayed.



Double clicking on the displayed entries will go to the topic in the Help containing the selected index entry. If more than one topic includes the index entry, then the list of topics is displayed.

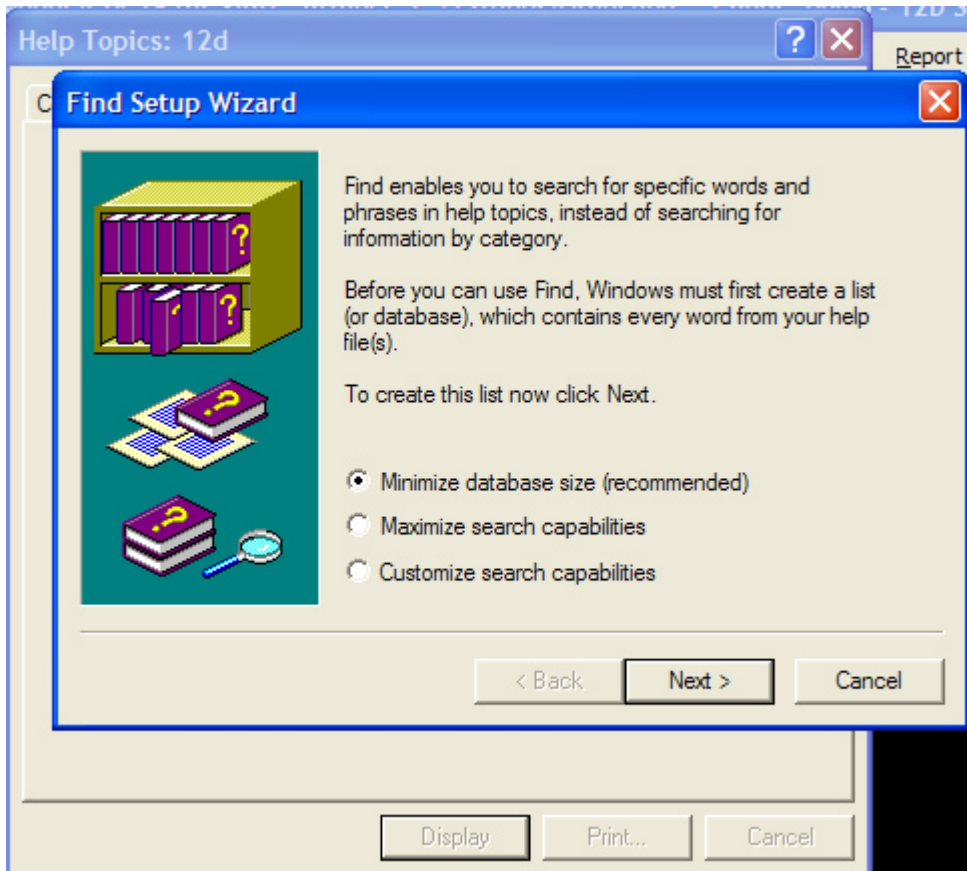
If the index has sub-indices, they can be searched by first typing in the main index followed by a comma, then a space and the first few characters of the sub-index.

For information on the **Find** tab, please continue to the next section "Find" .

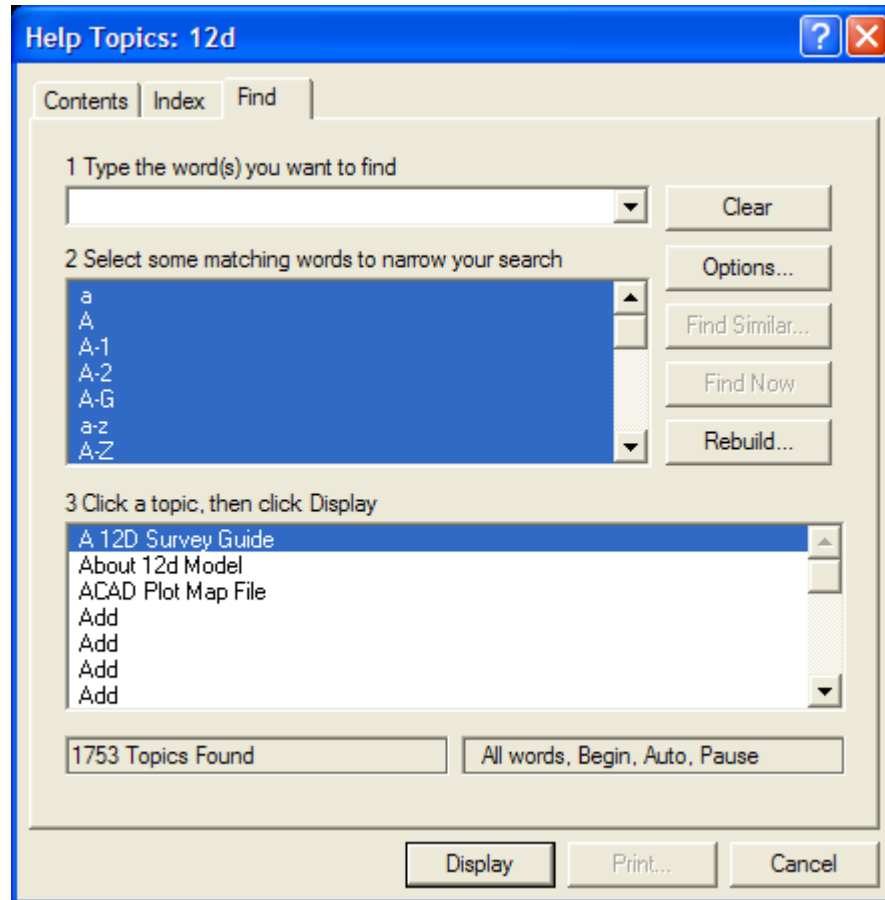
Find

The most powerful searching method for the Help system is *Find*.

Simply click on the *Find* tab to search for words or phrases that may be contained in a Help topic. If *Find* is being invoked for the first time, the 'Find Setup Wizard' runs to create an index of every word in the Help.



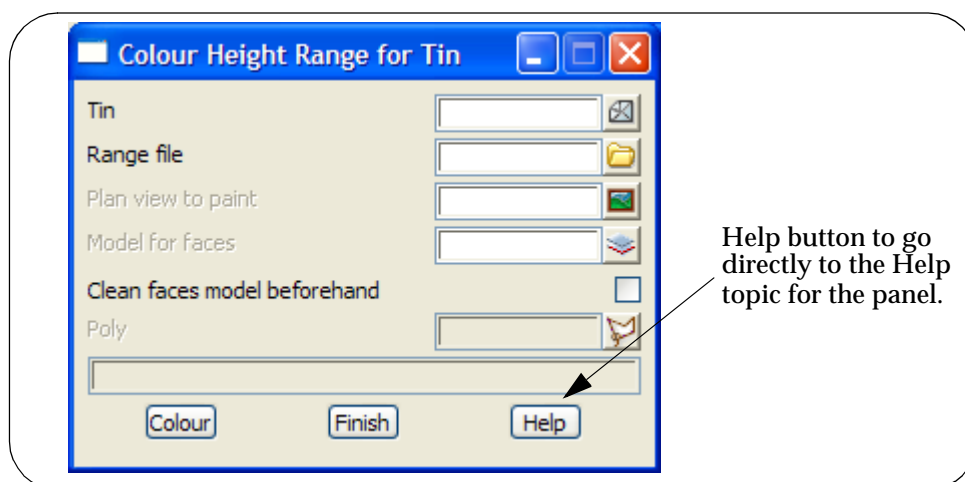
From then on, selecting the *Find* tab goes straight to the *Find* screen.



Please continue to the next section “Panel Help Button” .

Panel Help Button

Every panel has a Help button which when selected goes to the *topic* describing that panel.



Please continue to the next section “F1 Key” .

F1 Key

Another method of invoking *Help* is by using the F1 key as follows:

when a menu or panel is on the screen and has focus (the menu or panel title area will be highlighted), pressing F1 will bring up the help for that menu or panel.

Warning - some of the items on the *Strings* menu automatically start up a string select and change the focus from the panel to a View. This means that pressing F1 will bring up the *Help* for the View and not the Help for the panel.

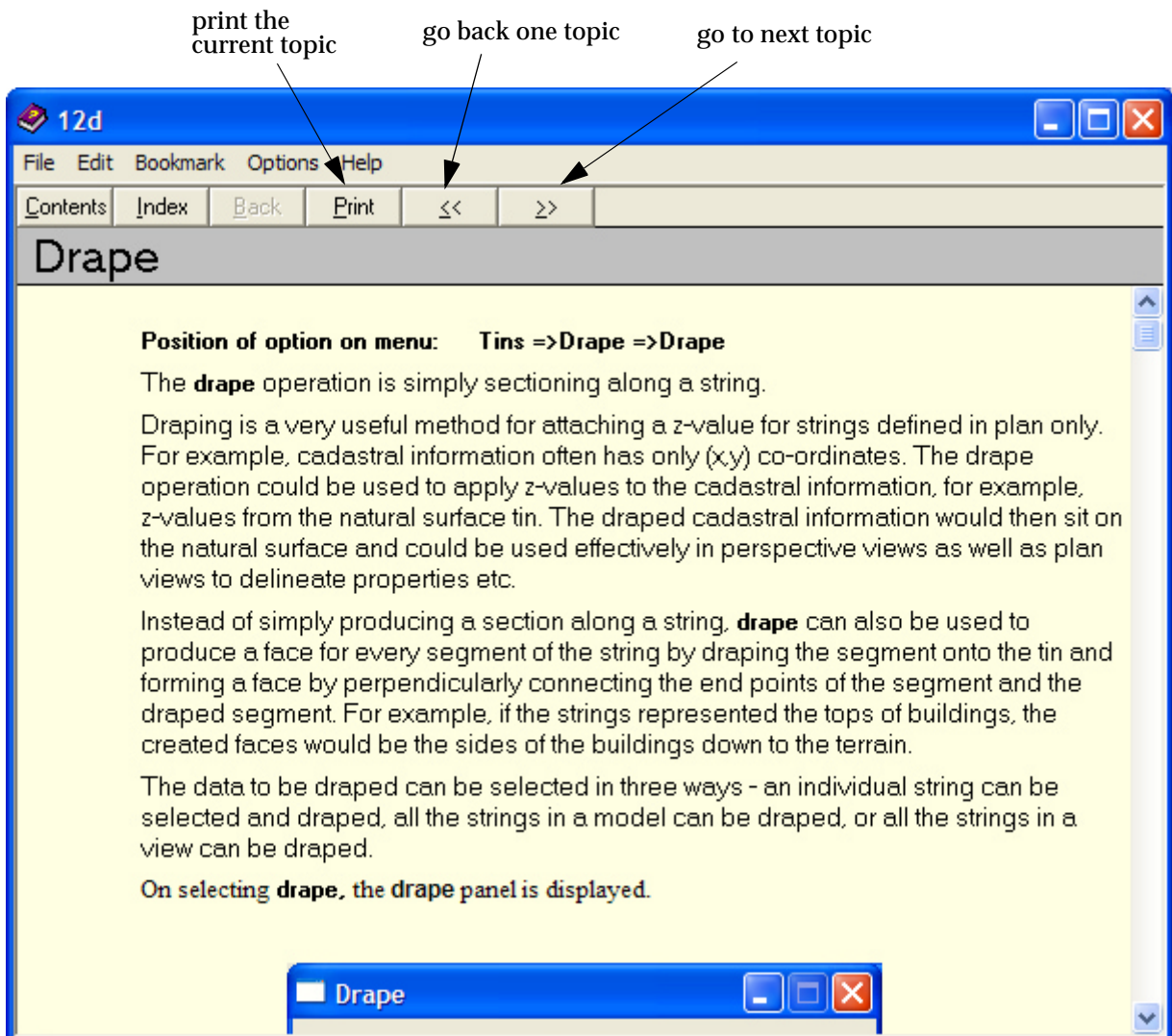
To get Help for such a panel, click on the panel to bring the focus back to the panel before pressing F1. The top of the panel will highlight showing that it has focus.

Please continue to the next section “Navigating in Help” .

Navigating in Help

Once at a *topic* in the Help, the << and >> buttons at the top of the Help topic will go to the previous and next Help topics respectively.

Individual Help topics can be printed by clicking **Print** at the top of the Help page.



Because it is difficult to print large sections in Microsoft's Help system, a PDF file of the entire 12d Model Reference Manual has been created and can be used to print out large sections of the manual.

The *12d Model Reference Manual* PDF file is on the 12d Model Installation CD in the folder *Documentation\Reference_Manual*.

12d Model Macro Manual

Position of option on menu: Help =>12d Macro manual

12d Model includes a powerful programming language (macro language 4DML).

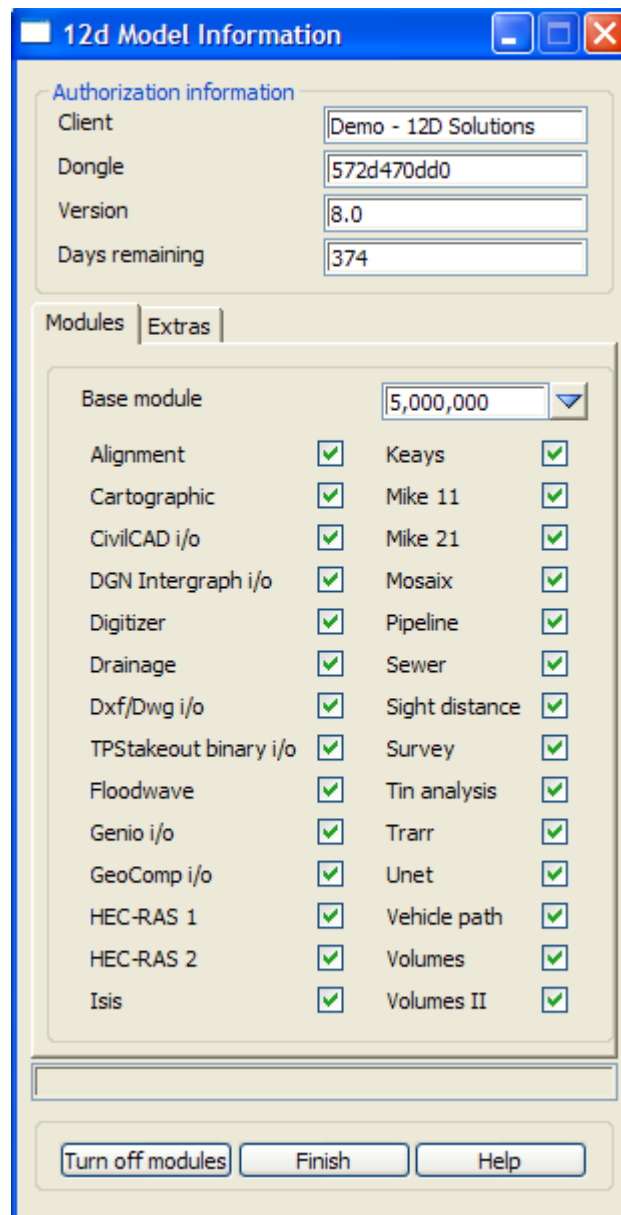
About 12d Model

12d_model_information

Position of option on menu: Help =>About 12d Model

The About 12d Model option displays information about the current authorization 12d Model such as the Client name, dongle number and authorized modules.

On selecting the About 12d Model option, the **12d Model Information** panel is displayed.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Client

name of the authorized client.

Dongle

number of the dongle.

Version

12d Model version number.

Days remaining

number of days left for the authorisation.

Module information

Base module

number of allowed points in the base module.

Alignment

tick box

if tick, the Alignment design module is authorized.

...

Email Info to 12d

[email_information_on_12d_model_to_12d_solutions](#)

Position of option on menu: Help =>Email info to 12d

The Email info to 12d option emails information about the current version of 12d Model to 12d Solutions Pty Ltd. This is usually used for debugging authorization problems.

On selecting the Email info to 12d option, the **12d Model Information** panel is displayed.

The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

First name/Last name/Company name

information about the user and the Company owning the license of 12d Model.

Email button

try to send an email containing information about 12d Model and the user to 12d Solutions Pty Ltd.

Save button

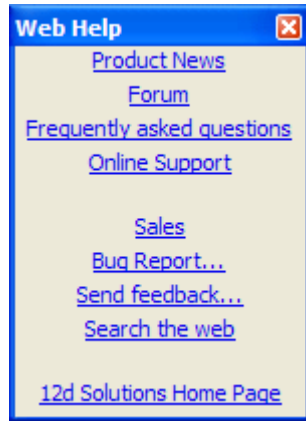
*if the **Email** button does not send an email, the **Save** button can be used to write the information out to a file called **12d_auth.txt**. This file can then be emailed to **support@12d.com**.*

12d on the Web

web_help

Position of menu: Help =>12d on the web

The 12d on the web walk-right menu contains links to the 12DSolutions web site *www.12d.com*.



link to “www.12d.com/model”

link to 12d Model forum

link to FAQs

support contacts

sales contacts

on-line bugs and enhancement form

send email to 12D Solutions

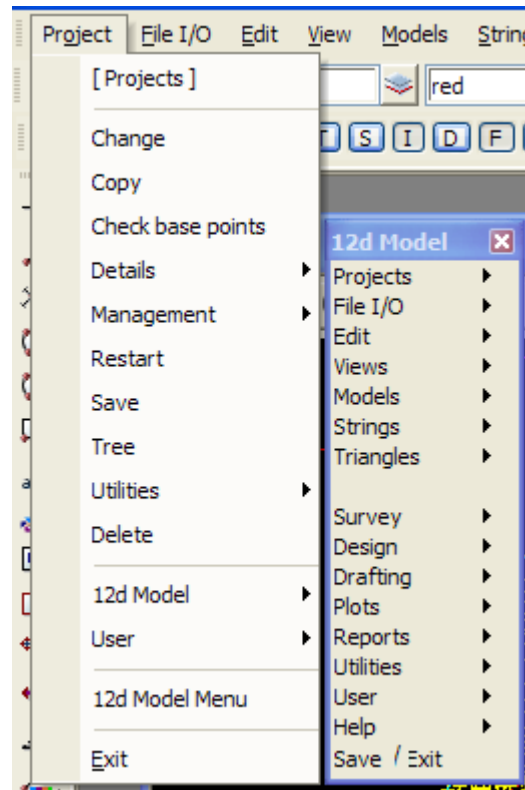
link to *Google*

12D Solutions home page

30 Save and Exit

save_project_reminder

Save and Exit are available from both the Main Menu under Project or on the floating 12d Model menu.

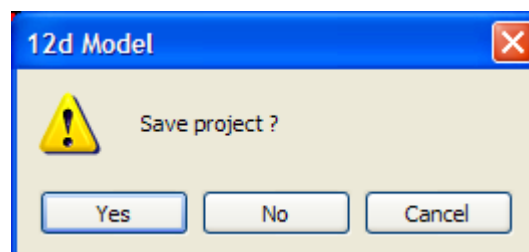


Save and Exit from Main Menu

Selecting Save from the Main Menu=>Projects menu simply saves all data in the project modified since the last save.

When Exit is selected from the bottom of the Main Menu=>Projects menu and a save is not needed, 12d Model exits the project.

If Exit is selected from the bottom of the Main Menu=>Projects menu and a save is needed, then the **Save Project ?** yes-no panel is placed on the screen.



If **Yes** is selected, then 12d Model saves the project and exits.

If **No** is selected, then 12d Model does not save the project and exits.

If **Cancel** is selected, then the Exit is aborted and 12d Model stays in the project.

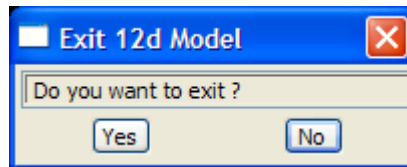
Note: when exiting 12d Model, the user is reminded if any *mtf* files modified by the 12d Model *mtf editor* have not been saved, or any string editors are still running.

Save and Exit from 12d Model Menu

`exit_12d_model`

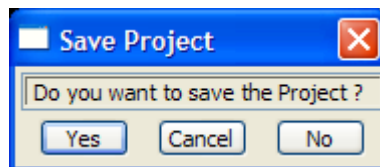
When Save is selected from the left hand side of the bottom of the 12d Model menu (Save / Exit menu option), all the information modified since the last save is written to disk.

When Exit is selected from the right hand side of the bottom of the 12d Model menu (Save / Exit menu option), an **Exit12d Model** panel is fired up.



Selecting **No** removes the **yes-no** pop-up and leaves the user in 12d Model.

If **Yes** is selected and a modification to the project has been made since the last project save, a **Save Project** panel is fired up.



If **yes** is selected, the project is **saved** and 12d Model terminates.

If **no** is selected, the project is **not saved** and 12d Model terminates.

If **cancel** is selected, the exit option is **aborted** and the user is left in 12d Model.

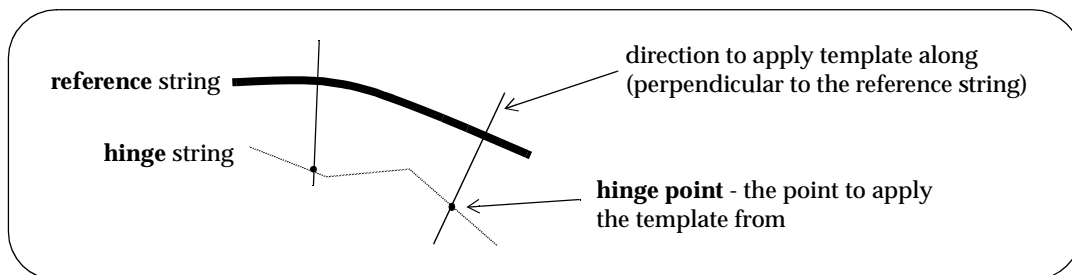
Note: When exiting 12d Model, the user is reminded if any *mtf* files modified by the 12d Model *mtf editor* have not been saved, or any string editors are still running.

Advanced Usage

31 Advanced Design

mtf_edit

12d Model uses templates as a quick and easy method for defining design details along a string. The **apply** options are used to create strings and sections using the **reference** string to define the chainage and what is perpendicular at each chainage, and a **hinge** string from where the template links are defined. The template defines a point name and colour for each template link. Cross sections can be created with point names corresponding to the template links, and strings formed by joining the same named points from consecutive cross sections.



For simple work, the Design=>Apply=> Apply option cuts a left and right template into a surface to produce a design.

For more complex work, the Design=>Apply=> Apply many option allows more detailed control over the design process. In fact, it is actually string design and it is not necessary to have any templates at all for apply many.

The **apply many** option uses a **file** (the **many templates file** or **mtf**) to describe

- which templates are applied to the left and right side of the hinge string (with linear interpolation between templates and gaps allowed)
- special chainages for creating extra cross sections
- hinge modifiers for adjusting the hinge string
- template modifiers for extra adjustment of the points created by the templates
- stripping depths
- boxing
- width to define the limit of searches for strings
- modify the z-values of strings

The **mtf** can be created and edited **interactively** from within **12d** Model or it can be created and edited from a text editor such as PFE, or any combination of the two methods.

A simple method for creating and/or editing an **mtf** is from the **apply many** option itself.

Once the **apply many** option has been selected and the **Apply Templates Function** panel is on the screen, simply enter the name of the mtf file into the *templates file* field of the **Apply Templates Function** panel, click on [+] to bring up the pop-up menu and select [Edit] from the pop-up.

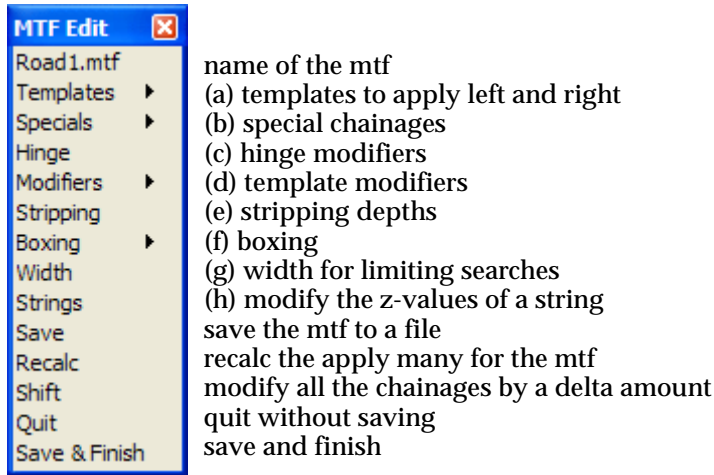
If the **mtf** file does not exist, then the **Create MTF File** panel (with the mtf file name already filled in) is placed on the screen and the user simply selects the **Create** button.

Alternatively, an mtf can be created inside **12d** Model using the **Create MTF File** panel and edited

using the MTF Edit menu.

Finally, a text editor such as PFE can be used to create and/or edit an mtf.

When interactively creating the **mtf**, the **mtf** edit menu contains all the options for (a) to (h). For example, the MTF Edit menu for the mtf file "Road1.mtf" is:



The documentation order will be the same as the order on the above MTF Edit menu.

The **interactive commands** for each of (a) to (h) will be described in the following sections.

The format of the **text version** of the MTF file is given in the section "Text Version of the MTF" . Unlike the interactive commands, the text form of the MTF file allows substitutions (see the section "Substitutions in the Many Templates File").

For documentation on the option/menus on the MTF Edit menu:

for	<i>Templates</i> ,	go to the section "Templates"
	<i>Specials</i>	"Specials"
	<i>Hinge</i>	"Hinge Modifiers"
	<i>Modifiers</i>	"Template Modifiers"
	<i>Stripping</i>	"Stripping"
	<i>Boxing</i>	"Boxing"
	<i>Width</i>	"Width"
	<i>Strings</i>	"String Modifiers"
	<i>Shift</i>	"Shift"

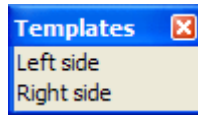
Following the documentation of the MTF editor, the full definition of boxing is given in the section "Full Definition of Boxing" and the full definition of the Decisions button on **Template Create/Edit** panel is given in the section "Full Definition of Template Decisions"

Please continue to the next section "Templates" .

Templates

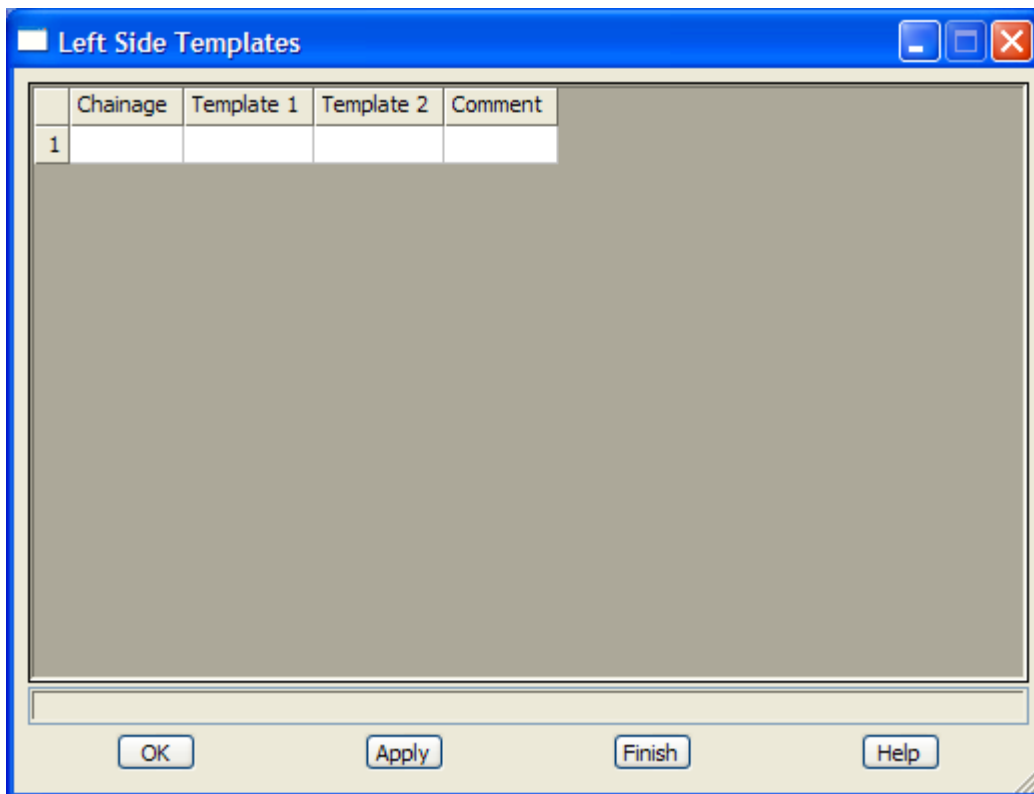
mtf_edit_templates

The templates walk-right brings up the templates menu with options to create the left_side and right_side sections of the mtf file.



mtf_edit_templates

Selecting the left side or right side option brings up the left side templates or left side templates panels respectively.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Chainage	column header		sort by chainage for the field - measure
<i>list of chainages for applying templates on the left/right hand side of the hinge string.</i>			
Template 1	column header		for the field - available templates
<i>template to start applying at the chainage on the same row. If template 2 is blank, then template 1 is applied until the next chainage in the chainage column.</i>			
Template 2	column header		for the field - available templates

*template to linearly interpolate to and finish with at the next chainage in the chainage column.
In the file, the two templates will be separated by a comma.*

Note - template 2 must have the same number of fixed and variable links as template 1 otherwise a gap of the section separation length will be left between the end of template 1 and the start of template 2.

Comment column header

comment to add to the end of the line. In the file, the comment will be preceded by //.

OK/Apply button

OK stores the values in the fields and removes the panel.

Apply stores the values and leaves the panel on the screen.

Please continue to the next section "Specials" .

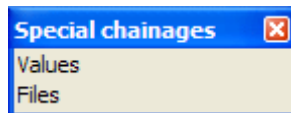
Specials

mtf_edit_special_chainages

The **apply many** option automatically creates sections at a number of chainages including the supplied chainage interval, horizontal critical points and template change points.

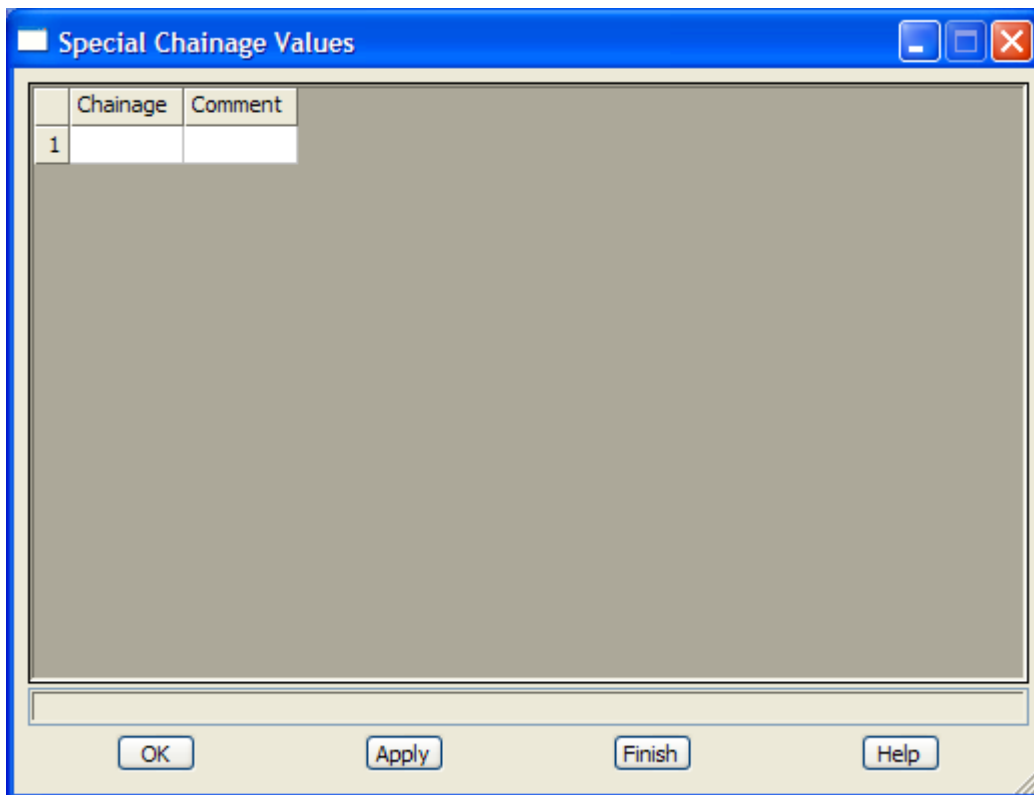
However it is also possible to add extra sections at special chainages using the **specials** keyword in the many template file or the specials option from the mtf edit menu.

Walking right on the specials menu brings up the special chainages walk-right menu:



mtf_edit_special_chainage_values

Selecting the values option brings up the **special chainage values** panel



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Special chainages	column header		sort by chainage for the fields - measure

list of special chainages for creating sections at.

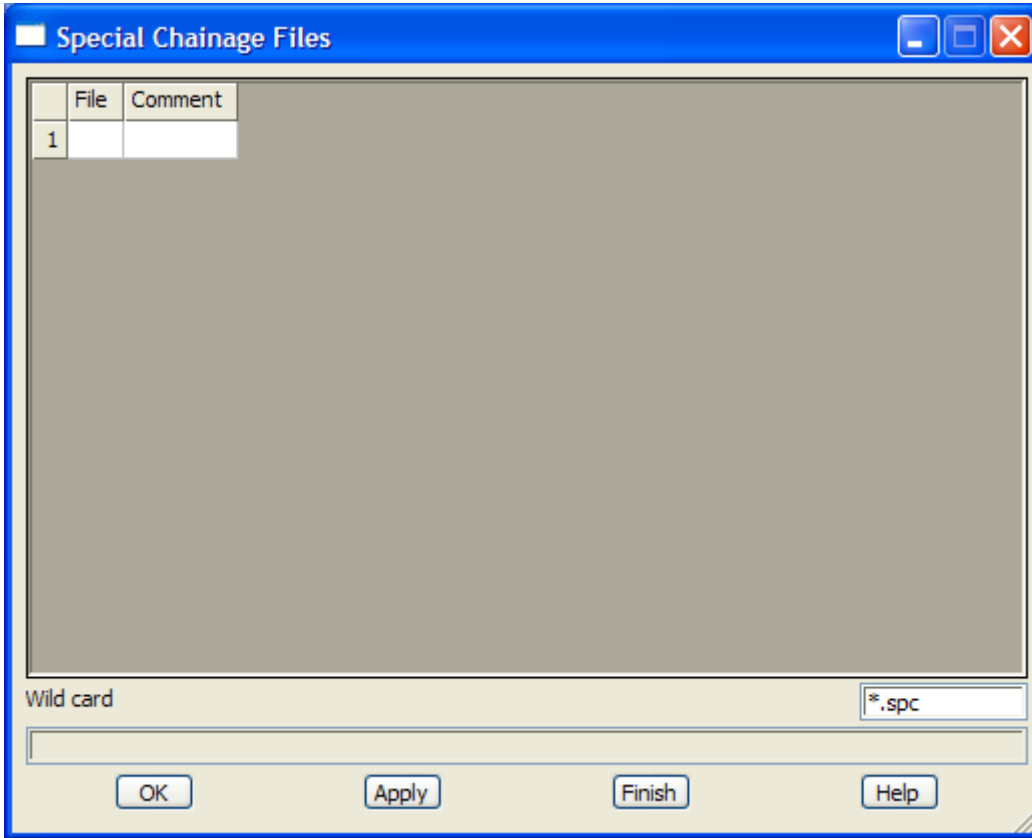
Comment	column header
<i>comment to add to the end of the line. In the file, the comment will be preceded by //.</i>	

OK/Apply	button
-----------------	--------

OK stores the values in the fields and removes the panel.
Apply stores the values and leaves the panel on the screen.

mtf_edit_special_chainage_files

Selecting the files option brings up the **special chainage files** panel



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Special chainage files	column header		size menu for the fields -*.spc files

list of files of special chainages for creating sections at.

Comment	column header		
			<i>comment to add to the end of the line. In the file, the comment will be preceded by //.</i>

Wild card	input	*.spc	
			<i>the wild card used for pop-ups in the special chainage files fields.</i>

OK/Apply	button		
			<i>OK stores the values in the fields and removes the panel. Apply stores the values and leaves the panel on the screen.</i>

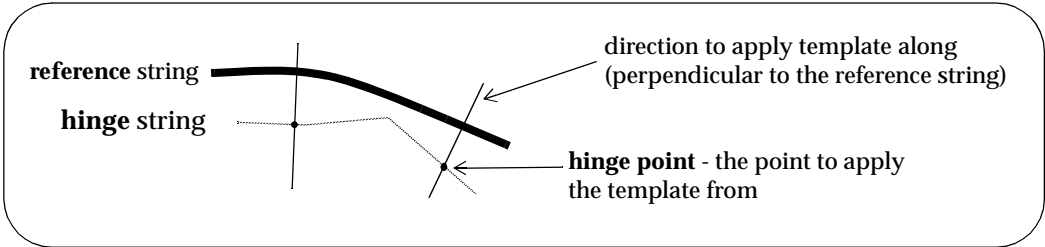
Please continue to the next section “Hinge Modifiers” .

Hinge Modifiers

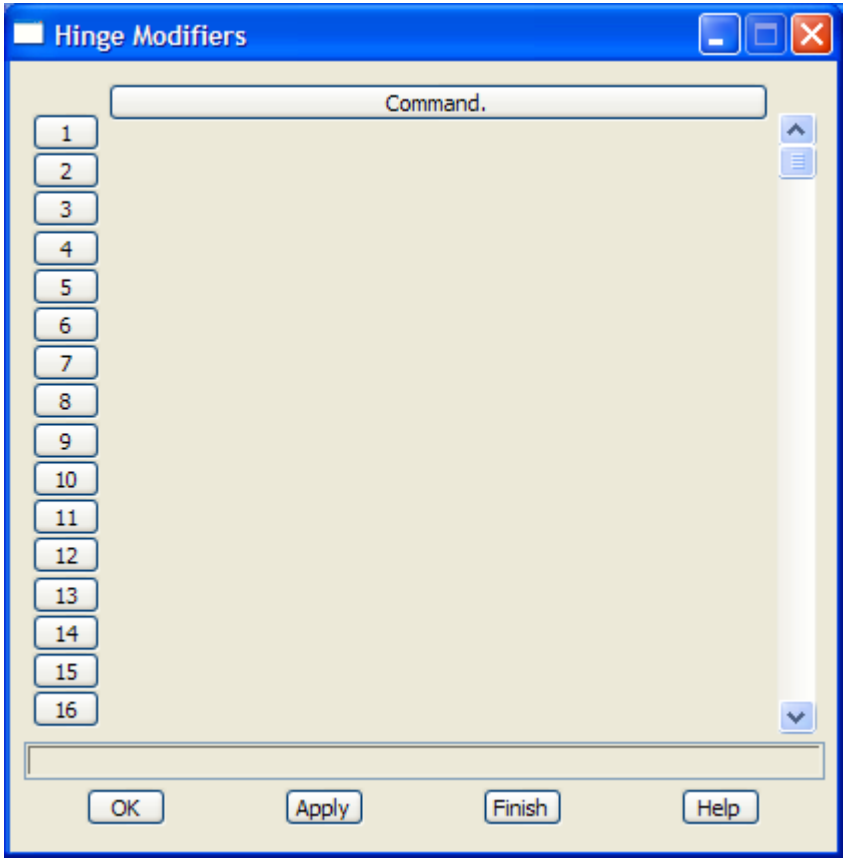
mtf_edit_hinge_modifiers

The **hinge string** is selected using the hinge panel field in either the **apply template function** or **apply templates function** panels.

Hinge modifiers are used to **modify** the position of the point on the hinge string that the template is applied to (the **hinge point**).



Selecting Hinge from the MTF Edit menu brings up the **Hinge Modifiers** panel.



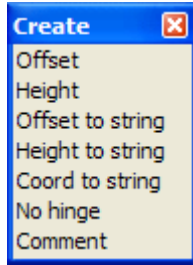
The **Hinge Modifiers** panel consists of a scrolling command fields and an **OK** or **Apply** button to record the results.

The **width** of the command area in the **Hinge Modifiers** panel is controlled by the environment variable **DEFAULT_TABLE_WIDTH_4D**.

The **commands** in the hinge modifier field can be **offset**, **height**, **offset to string**, **heights to string**, **coord to string**, **no hinge** and **comment**.

mtf_edit_hinge_create

If the command line is **empty**, clicking LB in the command line will bring up the Create menu which contains all the available hinge commands.



adjust offset of hinge string
 " height " " "
 use offset to a string
 use height from a string
 take coords from a string
 stop the apply
 comment

Selecting a menu item will bring up an associated panel which displays the information required for the hinge command.

When the panel is filled in and **OK** or **Apply** selected, the panel information is written out to the command line in the correct format for that hinge command.

If the command line is **not empty**, clicking LB in the command line will bring up the associated panel for the hinge command in the command line.

The information in the panel can be modified and if **OK** or **Apply** is selected, the modified panel information is written out to the command line in the correct format for that hinge command.

Each of the panels created by selecting the command from the Create menu, will now be described.

The typed form of the command will be given in the section "Hinge Modifier File Format" and an example is given in the section "A Hinge Modifier Example"

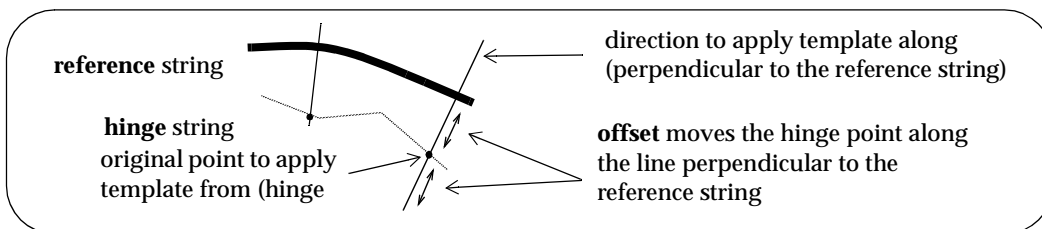
For documentation on the option on the Hinge modifier Create menus:

for	<i>Offset</i> ,	go to the section "Offset"
	<i>Height</i>	"Height"
	<i>Offset to string</i>	"Offset to String"
	<i>Height to string</i>	"Height to String"
	<i>Coord to sting</i>	"Coord to String"
	<i>No hinge</i>	"No Hinge"
	<i>Comment</i>	"Comment"

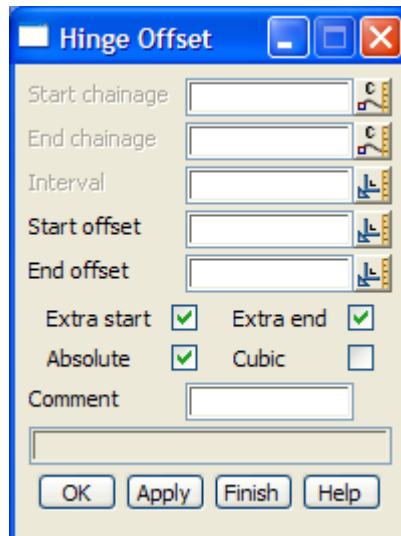
[mtf_edit_hinge_hinge_offset](#)

Offset

The **offset** modifier will move the hinge point a given offset distance (perpendicular to the reference string) from its current plan position. A positive offset is to the right of the hinge string and a negative offset to the left.



Selecting the offset option brings up the **hinge offset** panel



The fields and buttons used in this panel have the following functions.

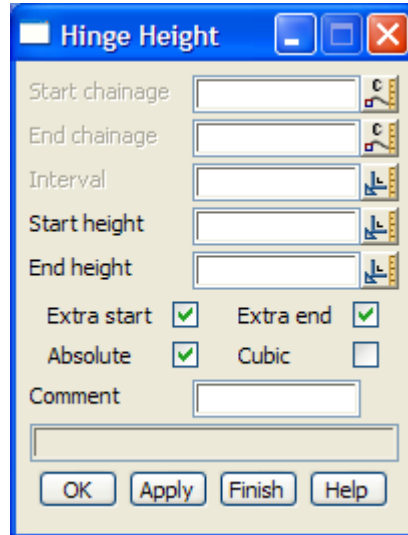
Field Description	Type	Defaults	Pop-Up
Start/End chainage <i>start/end chainages for modifying the offset from the hinge string.</i>	input		measures menu
Interval <i>if non blank, the interval to use to create cross sections and strings over the given chainage range. If blank, the Section separation value from the Apply Many panel is used.</i>	input		
Start/End offset <i>start/end offset.</i>	input		measures menu
Extra start/end <i>if tick, add an extra x-section 0.1 mm before the start/end chainage.</i>	tick box	tick	
Absolute <i>if tick, the offset is set to the values given in the start and end value fields. if not tick, the values given in the start and end value fields are added to the existing offsets.</i>	tick box	tick	
Cubic <i>if tick, the offset is varied as a reverse cubic between the start and end chainages. if not tick, the offset is varied linearly between the start and end chainages.</i>	tick box		
Comment <i>comment to add to the end of the line. In the file, the comment will be preceded by //.</i>	input		
OK/Apply <i>OK stores the values in the fields and removes the panel. Apply stores the values and leaves the panel on the screen.</i>	button		

[mtf_edit_hinge_hinge_height](#)

Height

The **height** modifier varies the height of the hinge point between the given chainages.

Selecting the height option brings up the **hinge height** panel



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Start/End chainage <i>start/end chainages for modifying the height of the hinge string.</i>	input		measures menu
Start/End height <i>start/end height.</i>	input		measures menu
Interval <i>if non blank, the interval to use to create cross sections and strings over the given chainage range. If blank, the Section separation value from the Apply Many panel is used.</i>	input		
Extra start/end <i>if tick, add an extra x-section 0.1 mm before the start/end chainage.</i>	tick box	tick	
Absolute <i>if tick, the height is set to the values given in the start and end value fields. if not tick, the values given in the start and end value fields are added to the existing heights.</i>	tick box	tick	
Cubic <i>if tick, the height is varied as a reverse cubic between the start and end chainages. if not tick, the height is varied linearly between the start and end chainages.</i>	tick box		
Comment <i>comment to add to the end of the line. In the file, the comment will be preceded by //.</i>	input		
OK/Apply <i>OK stores the values in the fields and removes the panel. Apply stores the values and leaves the panel on the screen.</i>	button		

[mtf_edit_hinge_hinge_offset_to_string](#)

Offset to String

Selecting the offset to string option brings up the **hinge offset to string** panel



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Start/End chainage <i>if non blank, start/end chainages for modifying the offset of the hinge string. If blank, the modifier is applied for the length of the selected string.</i>	input		measures menu
Interval <i>if non blank, the interval to use to create cross sections and strings over the given chainage range. If blank, the Section separation value from the Apply Many panel is used.</i>	input		
String <i>select string to use for defining offset from hinge.</i>	string-select		
Extra start/end <i>if tick, add an extra x-section 0.1 mm before the start/end chainage.</i>	tick box	tick	
Comment <i>comment to add to the end of the line. In the file, the comment will be preceded by //.</i>	input		
OK/Apply <i>OK stores the values in the fields and removes the panel. Apply stores the values and leaves the panel on the screen.</i>	button		

[mtf_edit_hinge_hinge_height_to_string](#)

Height to String

The height of the hinge point can also be specified by **taking the height from another 12d Model string.**

Selecting the height to string option brings up the **hinge height to string** panel



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Start/End chainage	input		measures menu

*if **non blank**, start/end chainages for modifying the height of the hinge string.
If **blank**, the modifier is applied for the length of the selected string.*

Interval	input		
-----------------	-------	--	--

*if **non blank**, the interval to use to create cross sections and strings over the given chainage range.
If **blank**, the Section separation value from the **Apply Many** panel is used.*

String	string-select		
---------------	---------------	--	--

select string to use for defining height of hinge.

Extra start/end	tick box	tick	
------------------------	----------	------	--

*if **tick**, add an extra x-section 0.1 mm **before** the start/end chainage.*

Comment	input		
----------------	-------	--	--

comment to add to the end of the line. In the file, the comment will be preceded by //.

OK/Apply	button		
-----------------	--------	--	--

***OK** stores the values in the fields and removes the panel.
Apply stores the values and leaves the panel on the screen.*

[mtf_edit_hinge_hinge_coord_to_string](#)

Coord to String

The **coord** modifier is used to replace the x, y and z position of the hinge point by the x, y and z position of **another 12d Model string** between given chainages. Hence **coord** replaces the hinge string by another string between the given chainages.

Selecting the Coord to string option brings up the **hinge coord to string** panel



The fields and buttons used in this panel have the following functions.

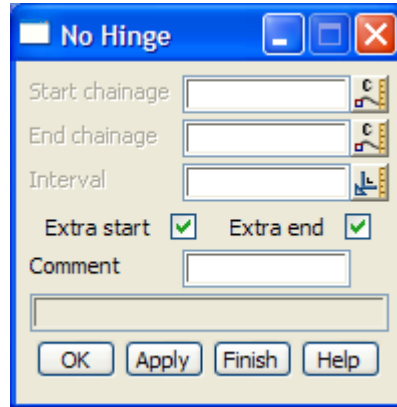
Field Description	Type	Defaults	Pop-Up
Start/End chainage	input		measures menu
<i>if non blank, start/end chainages for modifying the coordinates of the hinge string.</i>			
<i>If blank, the modifier is applied for the length of the selected string.</i>			
Interval	input		
<i>if non blank, the interval to use to create cross sections and strings over the given chainage range.</i>			
<i>If blank, the Section separation value from the Apply Many panel is used.</i>			
String	string-select		
<i>select string to use for defining the coordinates of the hinge string.</i>			
Extra start/end	tick box		
<i>if tick, add an extra x-section 0.1 mm before the start/end chainage.</i>			
Comment	input		
<i>comment to add to the end of the line. In the file, the comment will be preceded by //.</i>			
OK/Apply	button		
<i>OK stores the values in the fields and removes the panel.</i>			
<i>Apply stores the values and leaves the panel on the screen.</i>			

[mtf_edit_hinge_no_hinge](#)

No Hinge

The **nohinge** modifier is used to **stop** the hinge string (and hence the apply) between given chainages. This will leave a gap in the strings created by the apply between the given chainages.

Selecting the no hinge option brings up the **no hinge** panel



The fields and buttons used in this panel have the following functions.

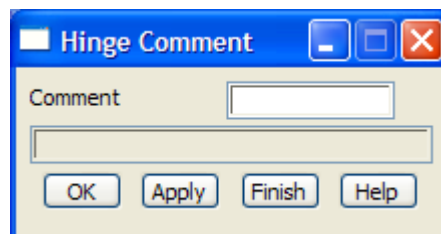
Field Description	Type	Defaults	Pop-Up
Start/End chainage <i>start/end chainages to stop the apply.</i>	input		measures menu
Interval <i>if non blank, the interval to use to create cross sections and strings over the given chainage range. If blank, the Section separation value from the Apply Many panel is used.</i>	input		
Extra start/end <i>if tick, add an extra x-section 0.1 mm before the start/end chainage.</i>	tick box		
Comment <i>comment to add to the end of the line. In the file, the comment will be preceded by //.</i>	input		
OK/Apply <i>OK stores the values in the fields and removes the panel. Apply stores the values and leaves the panel on the screen.</i>	button		

mtf_edit_hinge_hinge_comment

Comment

The **comment** option inserts a comment line.

Selecting the Comment option brings up the **Hinge Comment** panel



The fields and buttons used in this panel have the following functions.

Comment <i>comment line. In the file, the comment will be preceded by //.</i>	input		
OK/Apply <i>OK stores the values in the fields and removes the panel.</i>	button		

Apply stores the values and leaves the panel on the screen.

Please continue to the next section “Template Modifiers” .

Template Modifiers

The standard **many templates file (mtf)** is used to define what templates are used on either side of the hinge and defines where the templates stop and start, and allows for linearly interpolation between two templates over a chainage range. The information is given in the `left_side` and `right_side` blocks of information in the **many templates file** and/or the templates section of the mtf edit menu.

Template modifiers are used to **modify** the definitions in the `left_side` and `right_side` definitions and are given as **left_side_modifier** and **right_side_modifier** in the mtf file and/or the modifiers section of the mtf edit menu.

That is, for the left side say, the application of templates is first defined in the `left_side` command section and then **modified** by commands in the `left_side_modifier` section. In this case, the `left_side` set must be before the `left_side_modifier` in the many templates file.

However, the modifiers **also include** commands to **insert** and **remove** template links independently of whether a template has been used or not.

Hence the left side modifiers can be **self contained** without needing a `left_side` command.

Similarly for the right side.

The template modifiers can be used to

- insert a fixed, cut or fill link
- remove a fixed, cut or fill link

and change the

- width of a fixed link
- height of a fixed link
- xfall of a fixed link
- width of a variable cut link
- height of a variable cut link
- slope of a variable cut link

- width of a variable fill link
- height of a variable fill link
- slope of a variable fill link

- width of the final link
- cut slope of the final link
- fill slope of the final link

Most of the modifiers have a common methodology:

- (a) a link from a template (referenced by its name from the template definition) is created, removed or modified between a start and end chainage.
- (b) values being modified are given for the start chainage and the end chainage. How the values are interpreted depends on other parameters for the command.
- (c) more than one modifier may exist for a link at a given chainage and are applied in the order that they appear.
- (d) if no modifier exists for a link at a given chainage, the link reverts back to the template definition given by `left_side` or `right_side`

Notes

1. When a fixed link is defined, it is given as two of the three variables width, height and xfall. Only the two variables used to define the link can be changed by template modifiers.
2. Similarly, when a variable cut or fill link is defined, it is given as two of the three variables width, height and slope. Only the two variables used to define the link can be changed by

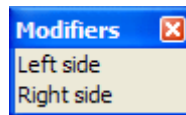
template modifiers.

Please continue to the next section “Template Modifiers in MTF Edit” .

Template Modifiers in MTF Edit

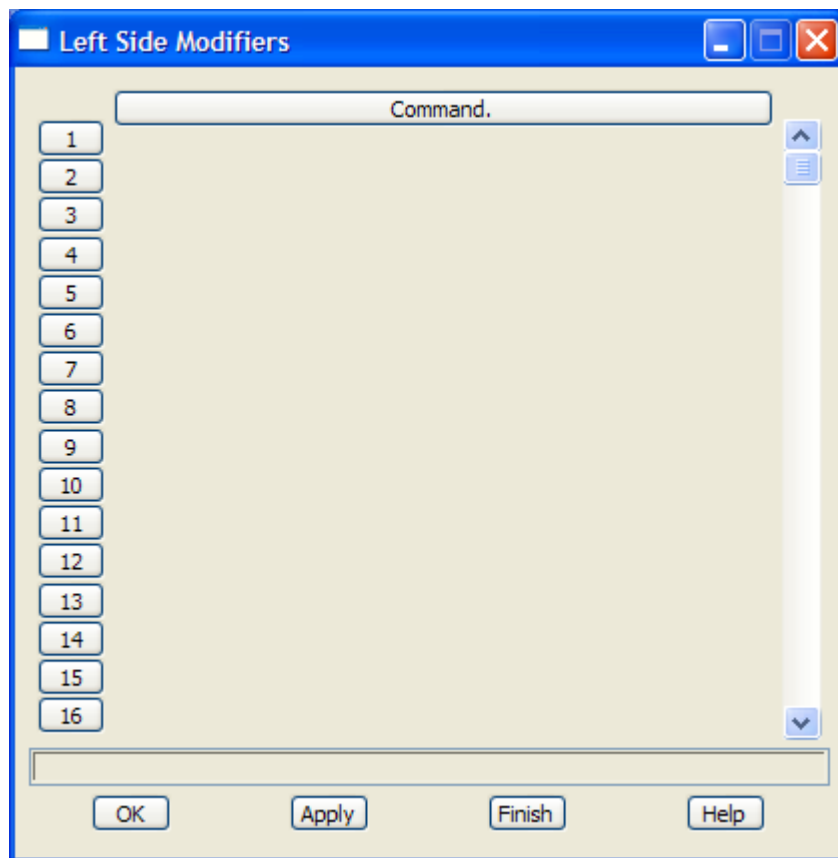
`mtf_edit_modifiers`

The modifiers walk-right brings up the modifiers menu with options to modify the left_side and right_side sections of the mtf file.



The left side modifier option will be described in detail. The right side is exactly the same so will not be described.

Selecting left side from the mtf edit=>left side menu brings up the **left side modifiers** panel.

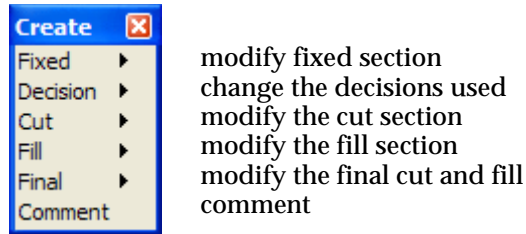


The **left side modifiers** panel consists of a scrolling command fields and a **OK** or **Apply** button to record the results.

The **width** of the command area in the **Left Side Modifiers** panel is controlled by the environment variable `DEFAULT_TABLE_WIDTH_4D`.

`mtf_edit_modify_create`

If the command line is **empty**, clicking LB in the command line will bring up the Create menu which contains all the available hinge commands.



Selecting a menu item will bring up an associated panel which displays the information required for the modifier command.

When the panel is filled in and **OK** or **Apply** selected, the panel information is written out to the command line in the correct format for that modifier command.

If the command line is **not empty**, clicking LB in the command line will bring up the associated panel for the modifier command in the command line.

The information in the panel can be changed and if **OK** or **Apply** is selected, the changed panel information is written out to the command line in the correct format for that modifier command.

Each of the panels created by selecting a command from the Create menu, will now be described.

The command itself, and its typed format, has already been described in the previous section on the template modifier file format.

The typed format of the command will be given for each panel.

For documentation on the option on the Left/Right Side modifier Create menu:

for	<i>Fixed</i> ,	go to the section "Fixed Modifiers"
	<i>Decision</i>	"Decision"
	<i>Cut</i>	"Cut Modifiers"
	<i>Fill</i>	"Fill Modifiers"
	<i>Final</i>	"Final Modifiers"

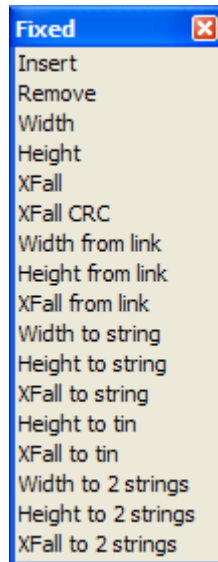
The text form of the Left/Right side template modifiers is given in the section "Template Modifiers File Format"

Please continue to the next section "Fixed Modifiers".

Fixed Modifiers

mtf_edit_modify_create_fixed

The fixed walk-right brings up the fixed menu with options to modify the fixed links of the template.



To go straight to the documentation on each of the options on the Fixed modifier menu:

For	<i>Insert</i> ,	go to the section "Fixed Insert" .
	<i>Remove</i>	"Fixed Remove"
	<i>Width/Height</i>	"Fixed Width and Height"
	<i>Xfall from link</i>	"Fixed Xfall"
	<i>Xfall CRC</i>	"Fixed Xfall CRC"
	<i>Width/Height/Xfall from link</i>	"Fixed Width, Height and Xfall from a Link"
	<i>Width/Height/Xfall to string</i>	"Fixed Width, Height and Xfall to a String"
	<i>Height/Xfall to tin</i>	"Fixed Height to Tin and Xfall to Tin"
	<i>Width/Height/Xfall to 2 strings</i>	"Fixed Width, Height and Xfall between Two Strings"

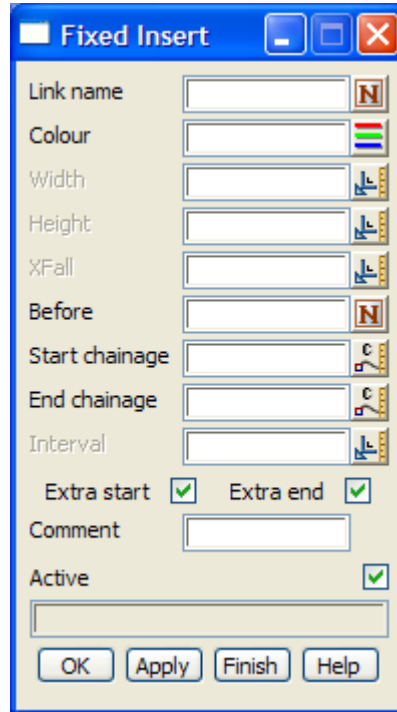
Each of the options from this menu will now be described.

[mtf_edit_modify_fixed_insert_](#)

Fixed Insert

Fixed links can be inserted by specifying either width and height, width and xfall, or height and xfall.

Selecting the insert option brings up the **fixed insert** panel



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Link name <i>name of the link to create.</i>	input		select name menu
Colour <i>colour of the link being created.</i>	input		available colours
Width /height/xfall <i>width/ height/ crossfall of the link being created - only use two of the three.</i>	input		measures menu
Before <i>if non-blank, the name of the string to insert the new string before. If blank, the link is appended to the end of the fixed part of the template.</i>	input		select name menu
Start/End chainage <i>start/end chainages for inserting the new template link.</i>	input		measures menu
Interval <i>if non blank, the interval to use to create cross sections and strings over the given chainage range. If blank, the Section separation value from the Apply Many panel is used.</i>	input		
Extra start/end <i>if tick, add an extra x-section 0.1 mm before the start/end chainage.</i>	tick box		
Comment <i>comment to add to the end of the line. In the file, the comment will be preceded by //.</i>	input		
Active <i>if tick, use this modifier. if not tick, don't use this modifier.</i>	tick box	tick	

OK/Apply button

OK stores the values in the fields and removes the panel.

Apply stores the values and leaves the panel on the screen.

[mtf_edit_modify_fixed_remove](#)

Fixed Remove

Fixed links can be deleted between given chainages by using the **fixed remove** option.

Selecting the remove option brings up the **fixed remove** panel

The fields and buttons used in this panel have the following functions.

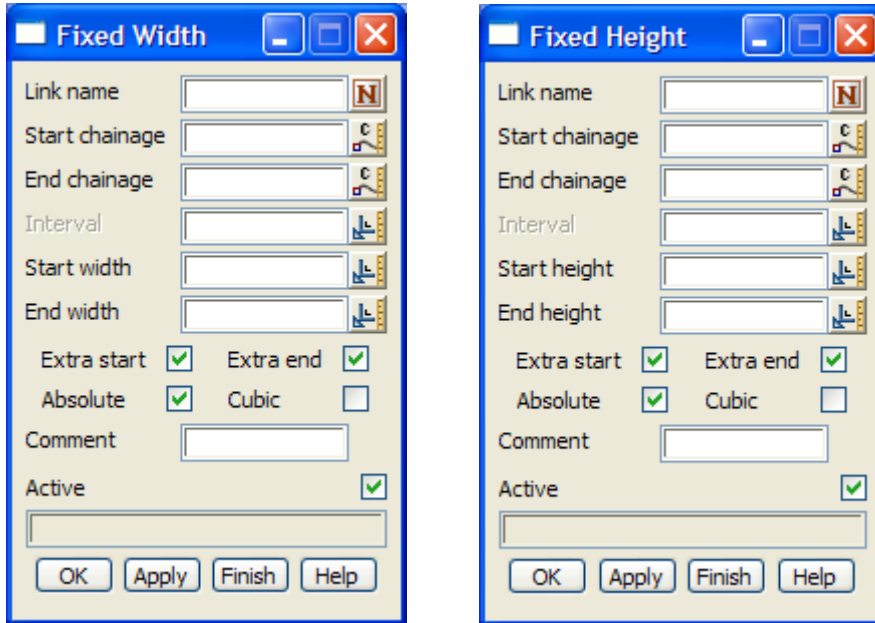
Field Description	Type	Defaults	Pop-Up
Link name <i>name of the link to removed.</i>	input		select name menu
Start/End chainage <i>start/end chainages for removing the template link.</i>	input		measures menu
Interval <i>if non blank, the interval to use to create cross sections and strings over the given chainage range. If blank, the Section separation value from the Apply Many panel is used.</i>	input		
Extra start/end <i>if tick, add an extra x-section 0.1 mm before the start/end chainage.</i>	tick box		
Comment <i>comment to add to the end of the line. In the file, the comment will be preceded by //.</i>	input		
Active <i>if tick, use this modifier. if not tick, don't use this modifier.</i>	tick box	tick	
OK/Apply OK stores the values in the fields and removes the panel. Apply stores the values and leaves the panel on the screen.	button		

[mtf_edit_modify_fixed_width](#) [mtf_edit_modify_fixed_height](#)

Fixed Width and Height

The **width** modifier is used to modify the width of fixed links originally defined by width. The **height** modifier is used to modify the height of fixed links originally defined by height.

Selecting the **width** and **height** option brings up the **fixed width** and **fixed height** panels respectively.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Link name <i>name of the link to modify.</i>	input		select name menu
Start/End chainage <i>start/end chainages for modifying the template link.</i>	input		measures menu
Interval <i>if non blank, the interval to use to create cross sections and strings over the given chainage range. If blank, the Section separation value from the Apply Many panel is used.</i>	input		
Start/End width/height <i>start/end width/height for modifying the template link.</i>	input		measures menu
Extra start/end <i>if tick, add an extra x-section 0.1 mm before the start/end chainage.</i>	tick box		
Absolute <i>if tick, the width/height is set to the values given in the start and end value fields. If not tick, the values given in the start and end value fields are added to the existing widths/heights.</i>	tick box	tick	
Cubic <i>if tick, the width/height is varied as a reverse cubic between the start and end chainages. If not tick, the width/height is varied linearly between the start and end chainages.</i>	tick box		
Comment <i>comment to add to the end of the line. In the file, the comment will be preceded by //.</i>	input		

Active tick box tick

*if tick, use this modifier.
if not tick, don't use this modifier.*

OK/Apply button

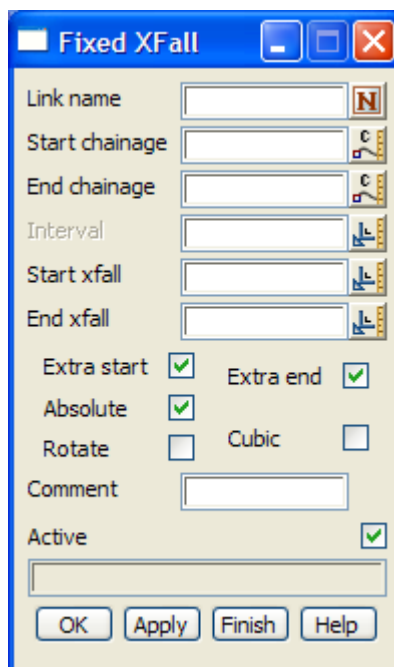
OK stores the values in the fields and removes the panel.
Apply stores the values and leaves the panel on the screen.

mtf_edit_modify_fixed_xfall

Fixed Xfall

The **xfall** modifier is used to modify the cross fall of fixed links originally defined by cross fall.

Selecting the xfall option brings up the **fixed xfall** panel



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Link name <i>name of the link to modify.</i>	input		select name menu
Start/End chainage <i>start/end chainages for modifying the template link.</i>	input		measures menu
Interval <i>if non blank, the interval to use to create cross sections and strings over the given chainage range. If blank, the Section separation value from the Apply Many panel is used.</i>	input		
Start/End xfall <i>start/end crossfall for modifying the template link.</i>	input		measures menu
Extra start/end <i>if tick, add an extra x-section 0.1 mm before the start/end chainage.</i>	tick box		

Absolute tick box tick

*if tick, the xfall is set to the values given in the start and end xfall fields.
if not tick, the values given in the start and end xfall fields are added to the existing xfall.*

Cubic and Rotate tick boxes:

*Only none or one of **Cubic** and **Rotate** can be set to **tick**.
The **default** is none - that is, **neither is ticked** and in the default case, the crossfall is varied **linearly with respect to crossfall** between the start and end chainages.*

Cubic tick box

if tick, the crossfall is varied as a reverse cubic between the start and end chainages.

Rotate tick box

*if tick, the xfall is varied linearly **with respect to the angle**, between the start and end chainages.*

Comment input

comment to add to the end of the line. In the file, the comment will be preceded by //.

Active tick box tick

*if tick, use this modifier.
if not tick, don't use this modifier.*

OK/Apply button

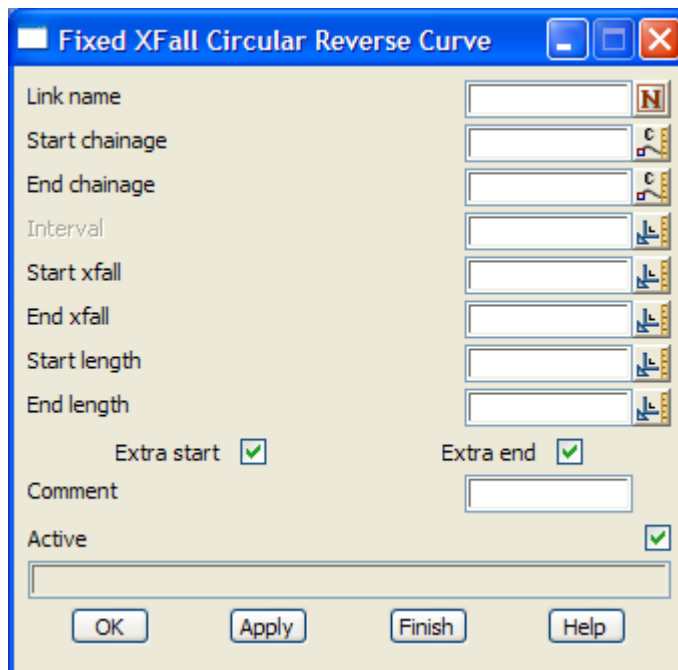
*OK stores the values in the fields and removes the panel.
Apply stores the values and leaves the panel on the screen.*

[mtf_edit_modify_fixed_xfall_0](#)

Fixed Xfall CRC

The **xfall_crc** modifier is used to modify the cross fall of fixed links originally defined by **xfall** and uses the **circular reverse curve** formula to modify the cross fall.

Selecting the xfall crc option brings up the **fixed xfall circular reverse curves** panel



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Link name <i>name of the link to modify.</i>	input		select name menu
Start/End chainage <i>start/end chainages for modifying the template link.</i>	input		measures menu
Interval <i>if non blank, the interval to use to create cross sections and strings over the given chainage range. If blank, the Section separation value from the Apply Many panel is used.</i>	input		
Start/End xfall <i>start/end crossfall for modifying the template link.</i>	input		measures menu
Start/End length <i>start/end length for circular arcs.</i>	input		measures menu
Extra start/end <i>if tick, add an extra x-section 0.1 mm before the start/end chainage.</i>	tick box		
Comment <i>comment to add to the end of the line. In the file, the comment will be preceded by //.</i>	input		
Active <i>if tick, use this modifier. if not tick, don't use this modifier.</i>	tick box	tick	
OK/Apply <i>OK stores the values in the fields and removes the panel. Apply stores the values and leaves the panel on the screen.</i>	button		
mtf_edit_modify_fixed_width_from_link mtf_edit_modify_fixed_height_from_link mtf_edit_modify_fixed_xfall_from_link			

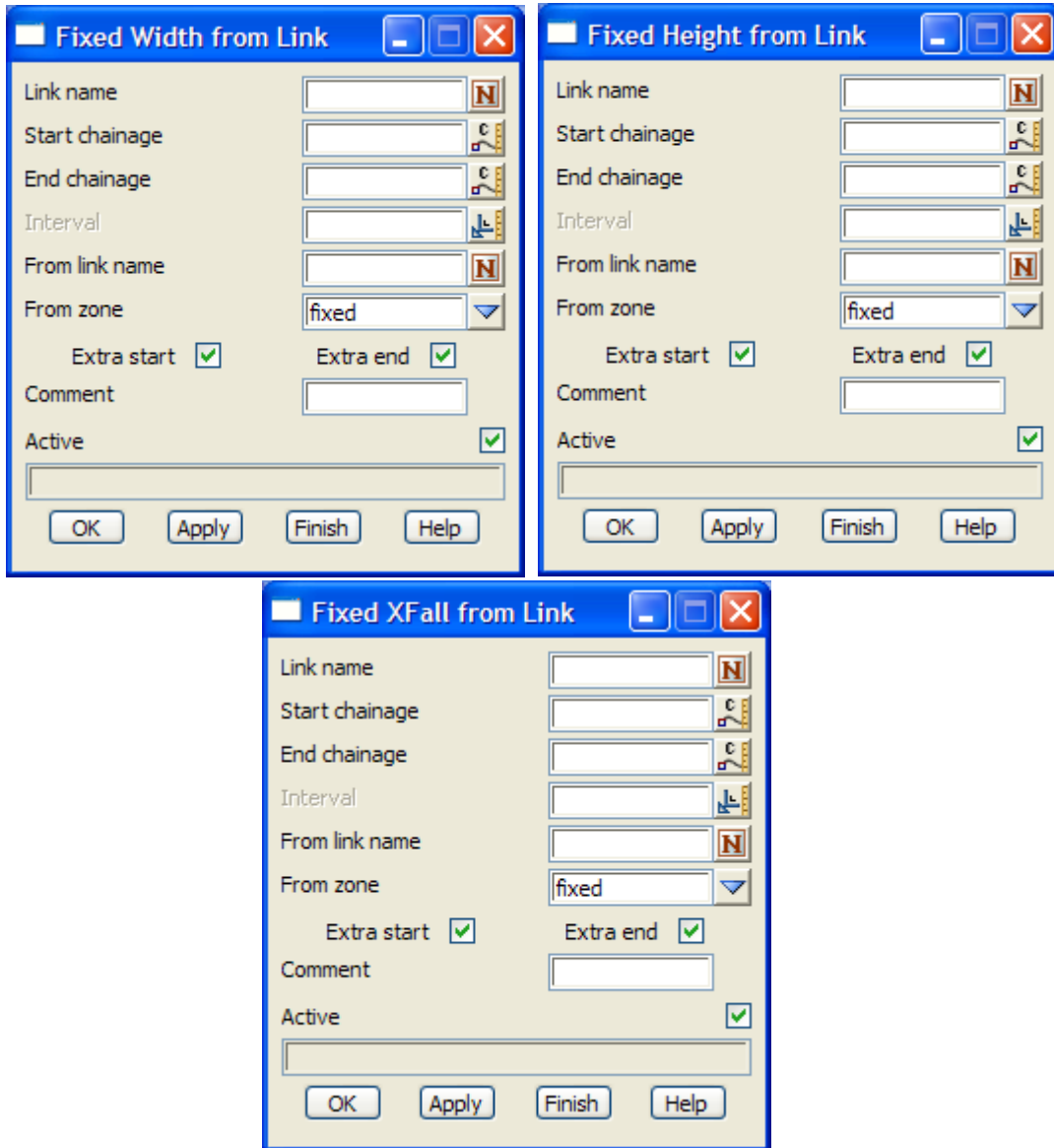
Fixed Width, Height and Xfall from a Link

The **width from link** modifier is used to modify the width of fixed links originally defined by width to be the same width as another link. That is, the width of the link is a **copy** of the **width** of another link.

The **height from link** modifier is used to modify the height of fixed links originally defined by height to be the same height as another link. That is, the height of the link is a **copy** of the **height** of another link.

The **xfall from link** modifier is used to modify the cross fall of fixed links originally defined by xfall to be the same xfall as another link. That is, the cross fall of the link is a **copy** of the **cross fall** of another link. The link to copy cross fall from can be defined in terms of cross fall or slope. If the link to copy is defined by slope, then the cross fall is calculated to match the slope.

Selecting the width from link, height from link or xfall from link option brings up the **fixed width from link**, **fixed height from link** and **fixed xfall from link** panels respectively.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Link name <i>name of the link to modify.</i>	input		select name menu
Start/End chainage <i>start/end chainages for modifying the template link.</i>	input		measures menu
Interval <i>if non blank, the interval to use to create cross sections and strings over the given chainage range. If blank, the Section separation value from the Apply Many panel is used.</i>	input		
From link name <i>template link to take width/height/xfall from.</i>	input		select name menu
From zone <i>zone that the template link to take width/height/xfall from, comes from.</i>	input	fixed	fixed, cut, fill

Extra start/end	tick box	
	<i>if tick, add an extra x-section 0.1 mm before the start/end chainage.</i>	
Comment	input	
	<i>comment to add to the end of the line. In the file, the comment will be preceded by //.</i>	
Active	tick box	tick
	<i>if tick, use this modifier.</i>	
	<i>if not tick, don't use this modifier.</i>	
OK/Apply	button	
	<i>OK stores the values in the fields and removes the panel.</i>	
	<i>Apply stores the values and leaves the panel on the screen.</i>	
	<i>mtf_edit_modify_fixed_width_to_string mtf_edit_modify_fixed_height_to_string</i>	
	<i>mtf_edit_modify_fixed_xfall_to_string</i>	

Fixed Width, Height and Xfall to a String

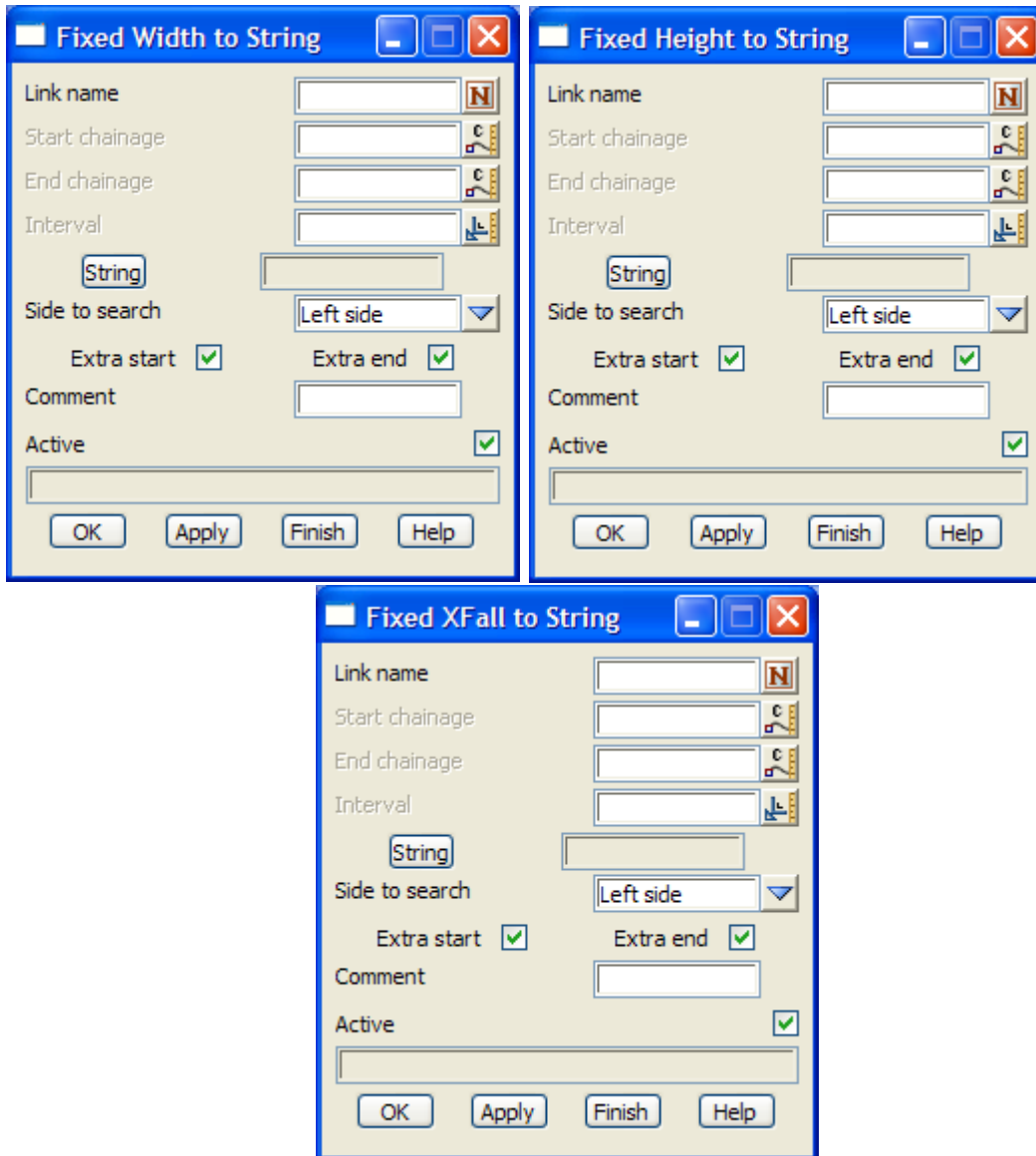
The **width** for a link can be varied by **going out to another 12d Model string**.

The **height** for a link can be varied by **taking the height from another 12d Model string**.

The **xfall** of a link can be defined by using the xfall from the **beginning of the link** (i.e. the end of the previous link or the hinge string if it is the first link) **to another 12d Model string**.

Using two of the above modifiers together and with the same string will place the end point of the link on the selected string. For example, using *width to string* and *xfall to string* with the same string will place the end of the link on that string.

Selecting the width to string, height to string or xfall to string option brings up the **fixed width to string**, **fixed height to string** and **fixed xfall to string** panels respectively.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Link name <i>name of the link to modify.</i>	input		select name menu
Start/End chainage <i>if non blank, start/end chainages for modifying the template link. If blank, the modifier is applied for the length of the selected string.</i>	input		measures menu
Start/End chainage <i>if non blank, start/end chainages for modifying the template link. If blank, the modifier is applied for the length of the selected string.</i>	input		measures menu
Interval <i>if non blank, the interval to use to create cross sections and strings over the given chainage range. If blank, the Section separation value from the Apply Many panel is used.</i>	input		
String	string-select		

select string to use for defining width/height/crossfall for the link.

Side to search input left side left side, right side, both sides
side of the hinge string to start searching to find the string to define width/height/crossfall.

Extra start/end tick box
if tick, add an extra x-section 0.1 mm before the start/end chainage.

Comment input
comment to add to the end of the line. In the file, the comment will be preceded by //.

Active tick box tick
*if tick, use this modifier.
 if not tick, don't use this modifier.*

OK/Apply button
*OK stores the values in the fields and removes the panel.
 Apply stores the values and leaves the panel on the screen.*

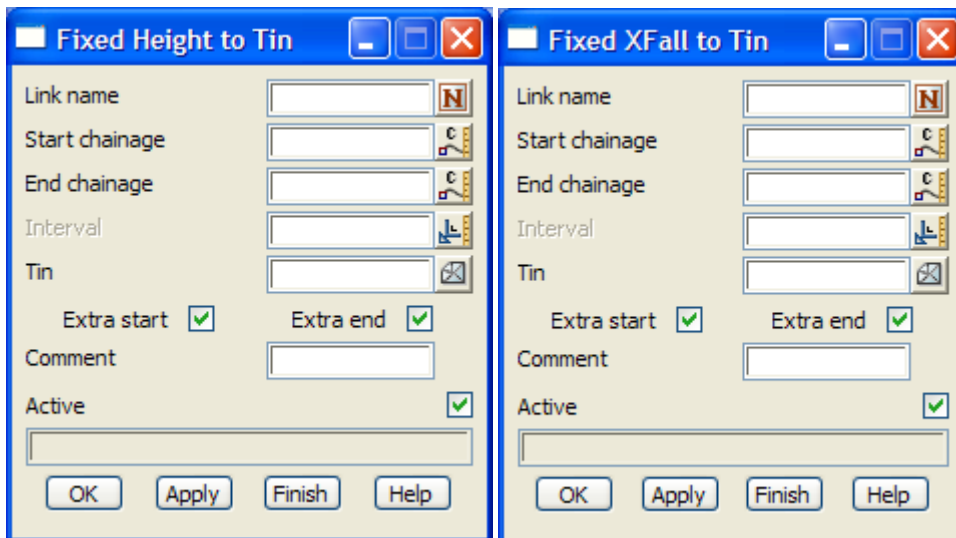
[mtf_edit_modify_fixed_height_to_tin](#) [mtf_edit_modify_fixed_xfall_to_tin](#)

Fixed Height to Tin and Xfall to Tin

The **height to tin** modifier is used to modify the *height* of the link so that the link will sit on the tin at the given width. Note that **height to tin** can only be used for a fixed link defined by *width* and *height*.

The **xfall to tin** modifier is used to modify the *xfall* of the link so that the link will sit on the tin at the given width. Note that **xfall to tin** can only be used for a fixed link defined by *width* and *xfall*.

Selecting the height to tin or xfall to tin option brings up the **fixed height to tin** and **fixed xfall to tin** panels respectively.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Link name <i>name of the link to modify.</i>	input		select name menu
Start/End chainage	input		measures menu

start/end chainages for modifying the template link.

Interval input

*if **non blank**, the interval to use to create cross sections and strings over the given chainage range.
If **blank**, the Section separation value from the **Apply Many** panel is used.*

Tin input available tins

the tin to use for defining the height/xfall

Extra start/end tick box

*if **tick**, add an extra x-section 0.1 mm **before** the start/end chainage.*

Comment input

comment to add to the end of the line. In the file, the comment will be preceded by //.

Active tick box tick

*if **tick**, use this modifier.
if **not tick**, don't use this modifier.*

OK/Apply button

***OK** stores the values in the fields and removes the panel.
Apply stores the values and leaves the panel on the screen.*

[mtf_edit_modify_fixed_width_to_2_strings](#) [mtf_edit_modify_fixed_height_to_2_strings](#)
[mtf_edit_modify_fixed_xfall_to_2_strings](#)

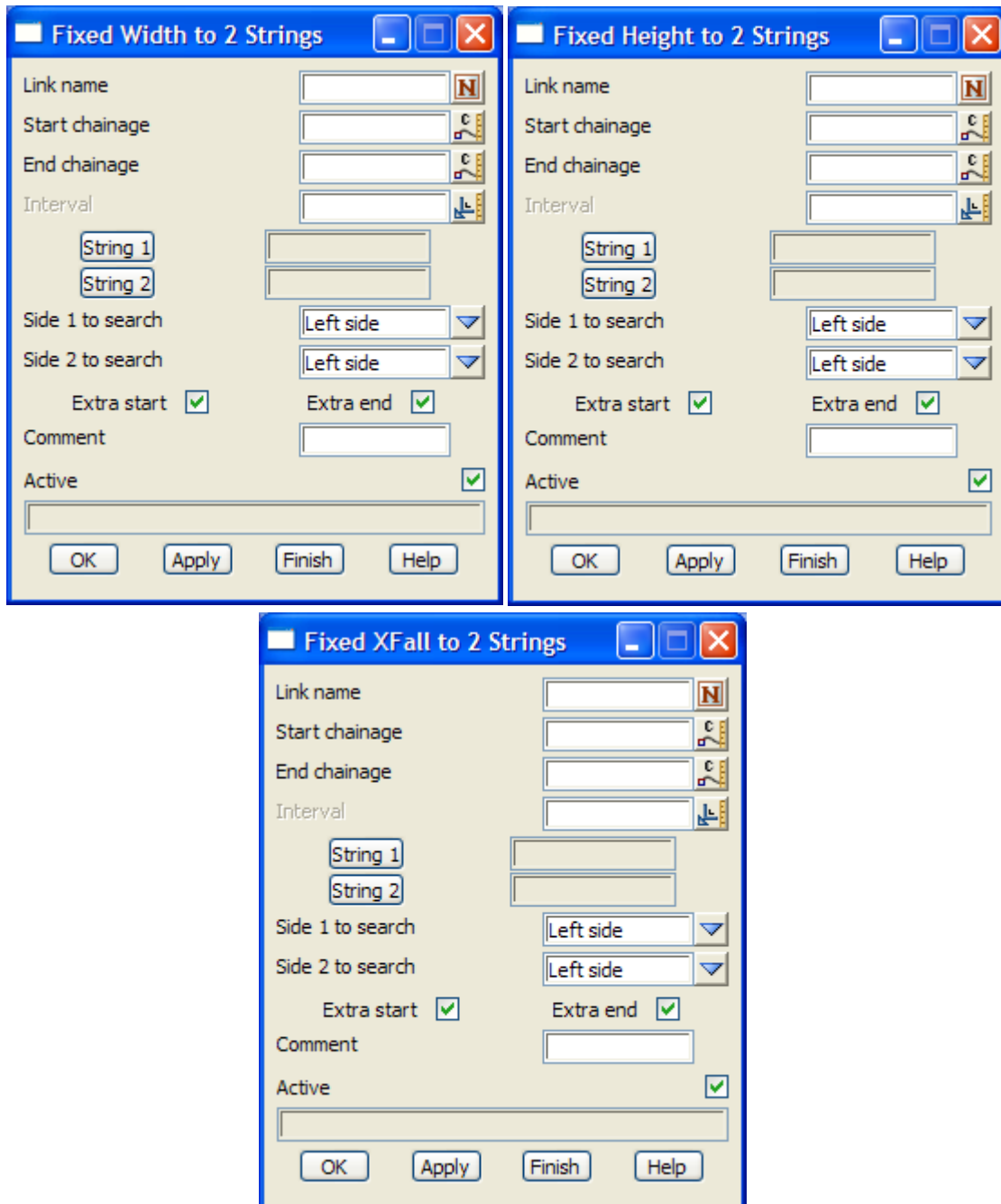
Fixed Width, Height and Xfall between Two Strings

The **width** for a link can be defined by taking the **width between two** existing **12d Model strings**.

The **height** for a link can be defined by taking the **height between two** existing **12d Model strings**.

The **xfall** for a link can be defined by taking the **xfall between two** existing **12d Model strings**.

Selecting the **width to 2 strings**, **height to 2 strings** or **xfall to 2 strings** option brings up the **fixed width to 2 strings**, **fixed height to 2 strings**, and **fixed xfall to 2 strings** panels respectively.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Link name <i>name of the link to modify.</i>	input		select name menu
Start/End chainage <i>start/end chainages for modifying the template link.</i>	input		measures menu
Interval <i>if non blank, the interval to use to create cross sections and strings over the given chainage range. If blank, the Section separation value from the Apply Many panel is used.</i>	input		
String 1	string-select		

select the first string to use for defining width/height/crossfall for the link.

String 2 string-select

select the second string to use for defining width/height/crossfall for the link.

Side 1 to search input left side left side, right side, both sides

side of the hinge string to start searching to find string 1 to use in defining width/height/crossfall.

Side 2 to search input left side left side, right side, both sides

side of the hinge string to start searching to find string 2 to use in defining width/height/crossfall.

Extra start/end tick box

*if **tick**, add an extra x-section 0.1 mm **before** the start/end chainage.*

Comment input

comment to add to the end of the line. In the file, the comment will be preceded by //.

Active tick box tick

*if **tick**, use this modifier.*

*if **not tick**, don't use this modifier.*

OK/Apply button

***OK** stores the values in the fields and removes the panel.*

***Apply** stores the values and leaves the panel on the screen.*

Please continue to the next section "Decision" .

Decision

[mtf_edit_modify_create_decision](#)

[mtf_edit_decision_change](#)

Decision Change

Each template is made up of the sections fixed, decisions, cut, fill and final cut/fill. If a template has a decisions section then by default the decisions section it is used instead of the cut, fill and final cut/fill sections.

Hence by default, if the decisions section of a template exists then it is used but if the decisions section does not exist, then the cut, fill and final cut/fill sections of the template are used over the chainage range.

For an Apply Many, the template specified for a chainage range in the Templates section of the MTF (see “Templates”) is called the *original* template for that chainage range.

Using the **decision** modifier, it is possible to **override** the defaults for the original template, and for a given chainage range:

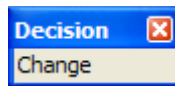
use the *decisions* section **from another** template instead of the decisions or cut/fill sections of the original template.

or

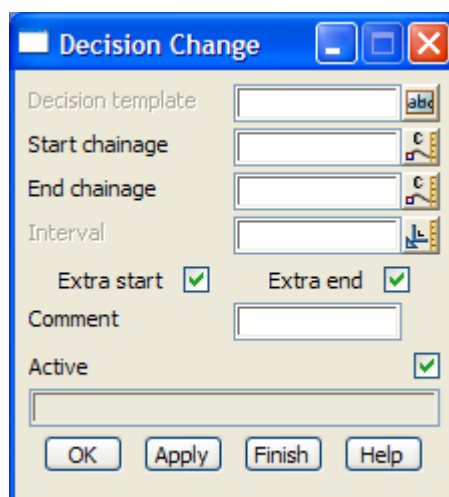
use the cut, fill and final cut/fill sections of the original template **instead** of the decisions section of the original template.

The fixed part of the *original* template is *still used* in either case.

The decision walk-right brings up the decision menu with the change option which nominates what decision templates are used for what chainage ranges.



Selecting the change option brings up the **Decision Change** panel



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Decision template	input		available templates

if **non-blank**, this is the template whose decisions section is used over the given chainage range.
If **blank**, the cut, fill and final cut/fill sections of the original template are used over the chainage range instead of the decision section of the original template.

Note that if the new template has no decisions, then the **cut and fill section** of the original template is used instead of the decisions section of the original template. That is, it is equivalent to leaving the **Decisions template** field blank.

Start/End chainage input measures menu
start/end chainages for using the decisions.

Interval input
*if non blank, the interval to use to create cross sections and vertices of the strings over the given chainage range.
If blank, the Section separation value from the **Apply Many** panel is used.*

Extra start/end tick box
*if tick, add an extra x-section 0.1 mm **before** the start/end chainage.*

Comment input
comment to add to the end of the line. In the file, the comment will be preceded by //.

Active tick box tick
*if tick, use this modifier.
if not tick, don't use this modifier.*

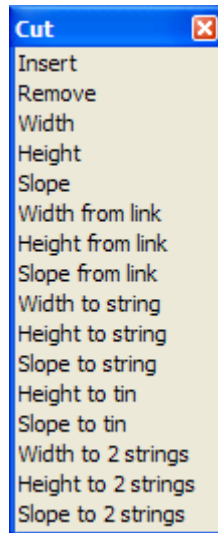
OK/Apply button
*OK stores the values in the fields and removes the panel.
Apply stores the values and leaves the panel on the screen.*

Please continue to the next section "Cut Modifiers" .

Cut Modifiers

[mtf_edit_modify_create_cut](#)

The Cut walk-right brings up the Cut menu with options to modify the cut links of the template.



For <i>Insert</i> ,	go to the section	"Cut Insert"
<i>Remove</i>		"Cut Remove"
<i>Width/Height</i>		"Cut Width and Height"
<i>Slope</i>		"Cut Slope"
<i>Width/Height/Slope from link</i>		"Cut Width, Height and Slope from a Link"
<i>Width/Height/Slope to string</i>		"Cut Width, Height and Slope to a String"
<i>Height/Slope to tin</i>		"Cut Height to Tin and Slope to Tin"
<i>Width/Height/Slope to 2 strings</i>		"Cut Width, Height and Slope between Two Strings"

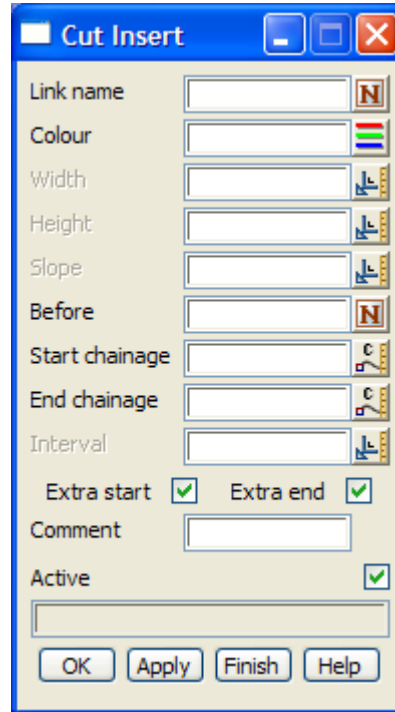
Each of the options from this menu will now be described.

[mtf_edit_modify_cut_insert](#)

Cut Insert

Cut links can be created by the **cut insert** modifier and by specifying either the width and height, width and slope or height and slope.

Selecting the insert option brings up the **Cut Insert** panel



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Link name <i>name of the link to create.</i>	input		select name menu
Colour <i>colour of the link being created.</i>	input		available colours
Width /height/slope <i>width/ height/slope of the link being created - only use two of the three.</i>	input		measures menu
Before <i>if non-blank, the name of the string to insert the new string before. If blank, the link is appended to the end of the fixed part of the template.</i>	input		select name menu
Start/End chainage <i>start/end chainages for inserting the new template link.</i>	input		measures menu
Interval <i>if non blank, the interval to use to create cross sections and vertices of the strings over the given chainage range. If blank, the Section separation value from the Apply Many panel is used.</i>	input		
Extra start/end <i>if tick, add an extra x-section 0.1 mm before the start/end chainage.</i>	tick box		
Comment <i>comment to add to the end of the line. In the file, the comment will be preceded by //.</i>	input		
Active <i>if tick, use this modifier. if not tick, don't use this modifier.</i>	tick box	tick	

OK/Apply button

OK stores the values in the fields and removes the panel.

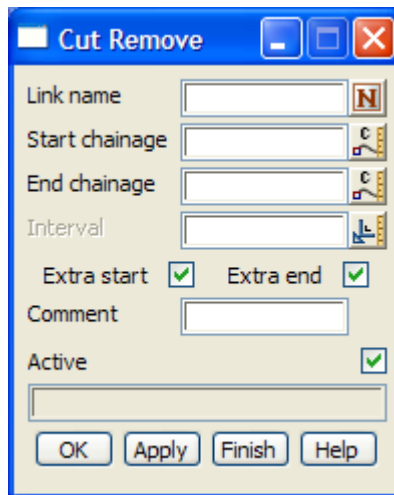
Apply stores the values and leaves the panel on the screen.

`mtf_edit_modify_cut_remove`

Cut Remove

Cut links can be deleted between given chainages by using the **cut remove** modifier.

Selecting the remove option brings up the **cut remove** panel



The fields and buttons used in this panel have the following functions.

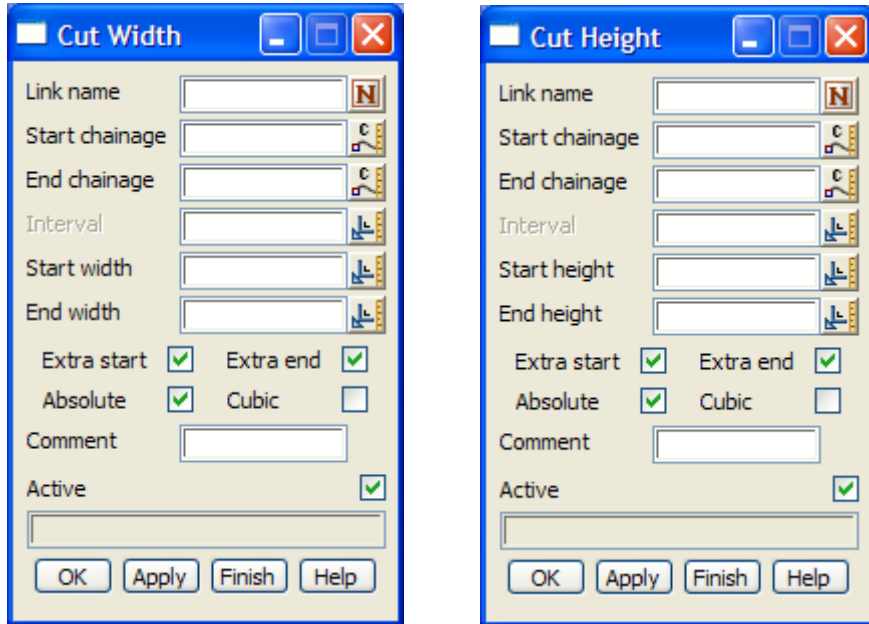
Field Description	Type	Defaults	Pop-Up
Link name <i>name of the link to removed.</i>	input		select name menu
Start/End chainage <i>start/end chainages for removing the template link.</i>	input		measures menu
Interval <i>if non blank, the interval to use to create cross sections and strings over the given chainage range. If blank, the Section separation value from the Apply Many panel is used.</i>	input		
Extra start/end <i>if tick, add an extra x-section 0.1 mm before the start/end chainage.</i>	tick box		
Comment <i>comment to add to the end of the line. In the file, the comment will be preceded by //.</i>	input		
Active <i>if tick, use this modifier. if not tick, don't use this modifier.</i>	tick box	tick	
OK/Apply OK stores the values in the fields and removes the panel. Apply stores the values and leaves the panel on the screen.	button		

`mtf_edit_modify_cut_width` `mtf_edit_modify_cut_height`

Cut Width and Height

The **cut width** modifier is used to modify the width of variable cut links originally defined by width. Similarly the **cut height** modifier is used to modify the height of variable cut links originally defined by height.

Selecting the **width** and **height** option brings up the **cut width** and **cut height** panels respectively.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Link name <i>name of the link to modify.</i>	input		select name menu
Start/End chainage <i>start/end chainages for modifying the template link.</i>	input		measures menu
Interval <i>if non blank, the interval to use to create cross sections and strings over the given chainage range. If blank, the Section separation value from the Apply Many panel is used.</i>	input		
Start/End width/height <i>start/end width/height for modifying the template link.</i>	input		measures menu
Extra start/end <i>if tick, add an extra x-section 0.1 mm before the start/end chainage.</i>	tick box		
Absolute <i>if tick, the width/height is set to the values given in the start and end value fields. if not tick, the values given in the start and end value fields are added to the existing widths/heights.</i>	tick box	tick	
Cubic <i>if tick, the width/height is varied as a reverse cubic between the start and end chainages. if not tick, the width/height is varied linearly between the start and end chainages.</i>	tick box		
Comment <i>comment to add to the end of the line. In the file, the comment will be preceded by //.</i>	input		

Active tick box tick

*if tick, use this modifier.
if not tick, don't use this modifier.*

OK/Apply button

OK stores the values in the fields and removes the panel.
Apply stores the values and leaves the panel on the screen.

mtf_edit_modify_cut_slope

Cut Slope

The **cut slope** modifier is used to modify the slope of variable cut links originally defined by slope.

Selecting the slope option brings up the **cut slope** panel

The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Link name <i>name of the link to modify.</i>	input		select name menu
Start/End chainage <i>start/end chainages for modifying the template link.</i>	input		measures menu
Interval <i>if non blank, the interval to use to create cross sections and strings over the given chainage range. if blank, the Section separation value from the Apply Many panel is used.</i>	input		
Start/End slope <i>start/end slope for modifying the template link.</i>	input		measures menu
Extra start/end <i>if tick, add an extra x-section 0.1 mm before the start/end chainage.</i>	tick box		

Absolute tick box tick

if tick, the slope is set to the values given in the start and end slope fields.

if not tick, the slopes given in the start and end value fields are added to the existing slopes.

Cubic and Rotate tick boxes:

Only none or one of Cubic and Rotate can be set to tick.

The default is none - that is, neither is ticked and in the default case, the slope is varied linearly with respect to slope between the start and end chainages.

Cubic tick box

if tick, the slope is varied as a reverse cubic between the start and end chainages.

Rotate tick box

if tick, the slope is varied linearly with respect to the angle, between the start and end chainages.

Comment input

comment to add to the end of the line. In the file, the comment will be preceded by //.

Active tick box tick

if tick, use this modifier.

if not tick, don't use this modifier.

OK/Apply button

OK stores the values in the fields and removes the panel.

Apply stores the values and leaves the panel on the screen.

[mtf_edit_modify_cut_width_from_link](#) [mtf_edit_modify_cut_height_from_link](#)
[mtf_edit_modify_cut_slope_from_link](#)

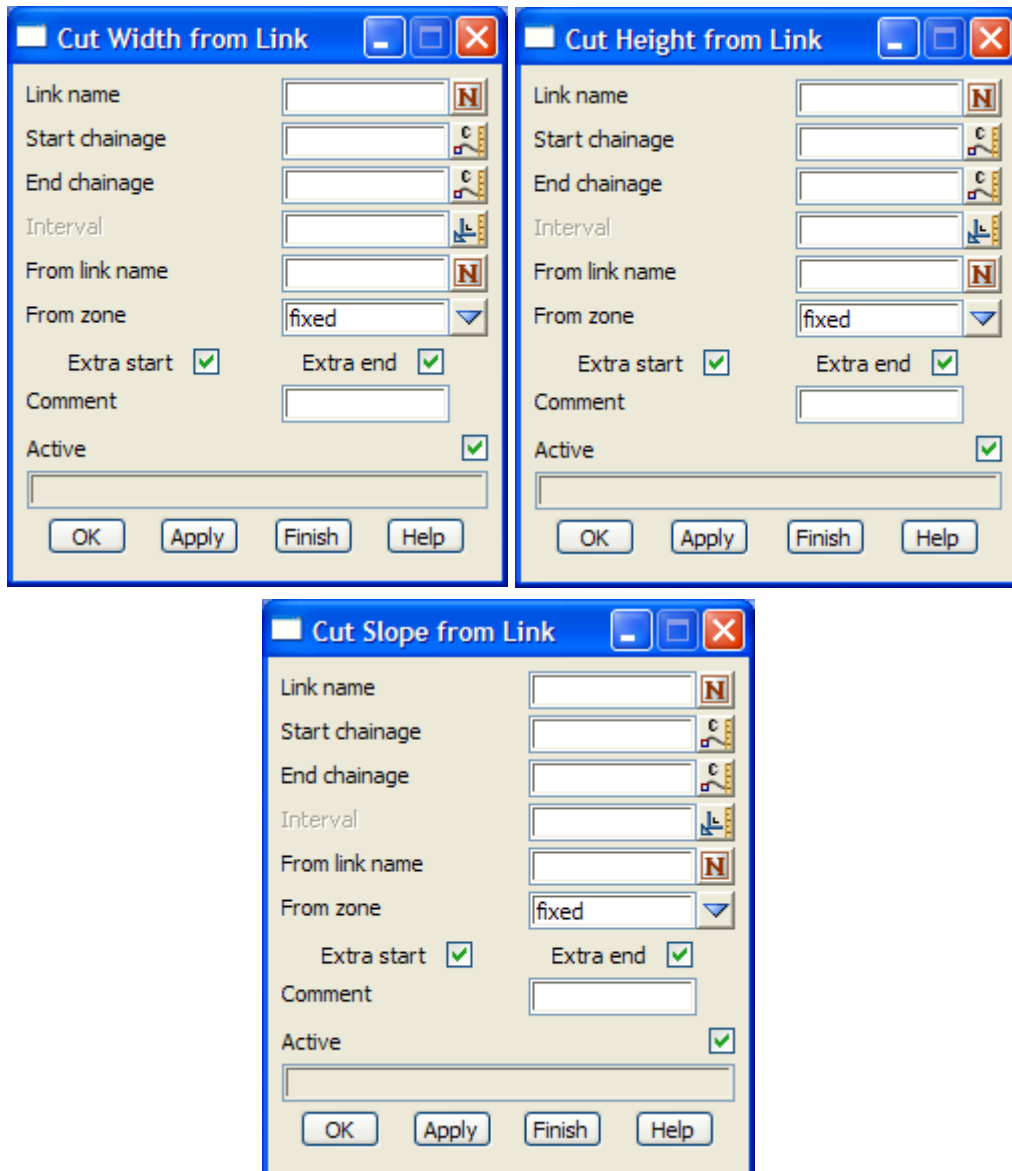
Cut Width, Height and Slope from a Link

The **width from link** modifier is used to modify the width of cut links originally defined by width to be the same width as another link. That is, the width of the link is a copy of the width of another link.

The **height from link** modifier is used to modify the height of cut links originally defined by height to be the same height as another link. That is, the height of the link is a copy of the height of another link.

The **slope from link** modifier is used to modify the slope of cut links originally defined by slope to be the same slope as another link. That is, the slope of the link is a copy of the slope of another link. The link to copy slope from can be defined in terms of slope or cross fall. If the link to copy is defined by cross fall, then the slope is calculated to match the cross fall.

Selecting the width from link, height from link or slope from link option brings up the **cut width from link**, **cut height from link** and **cut slope from link** panels respectively.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Link name <i>name of the link to modify.</i>	input		select name menu
Start/End chainage <i>start/end chainages for modifying the template link.</i>	input		measures menu
Interval <i>if non blank, the interval to use to create cross sections and strings over the given chainage range. If blank, the Section separation value from the Apply Many panel is used.</i>	input		
From link name <i>template link to take width/height/slope from.</i>	input		select name menu
From zone <i>zone that the template link to take width/height/slope from, comes from.</i>	input	fixed	fixed, cut, fill

Extra start/end tick box

*if **tick**, add an extra x-section 0.1 mm **before** the start/end chainage.*

Comment input

comment to add to the end of the line. In the file, the comment will be preceded by //.

Active tick box tick

*if **tick**, use this modifier.*

*if **not tick**, don't use this modifier.*

OK/Apply button

***OK** stores the values in the fields and removes the panel.*

***Apply** stores the values and leaves the panel on the screen.*

*mtf_edit_modify_cut_width_to_string mtf_edit_modify_cut_height_to_string
mtf_edit_modify_cut_slope_to_string*

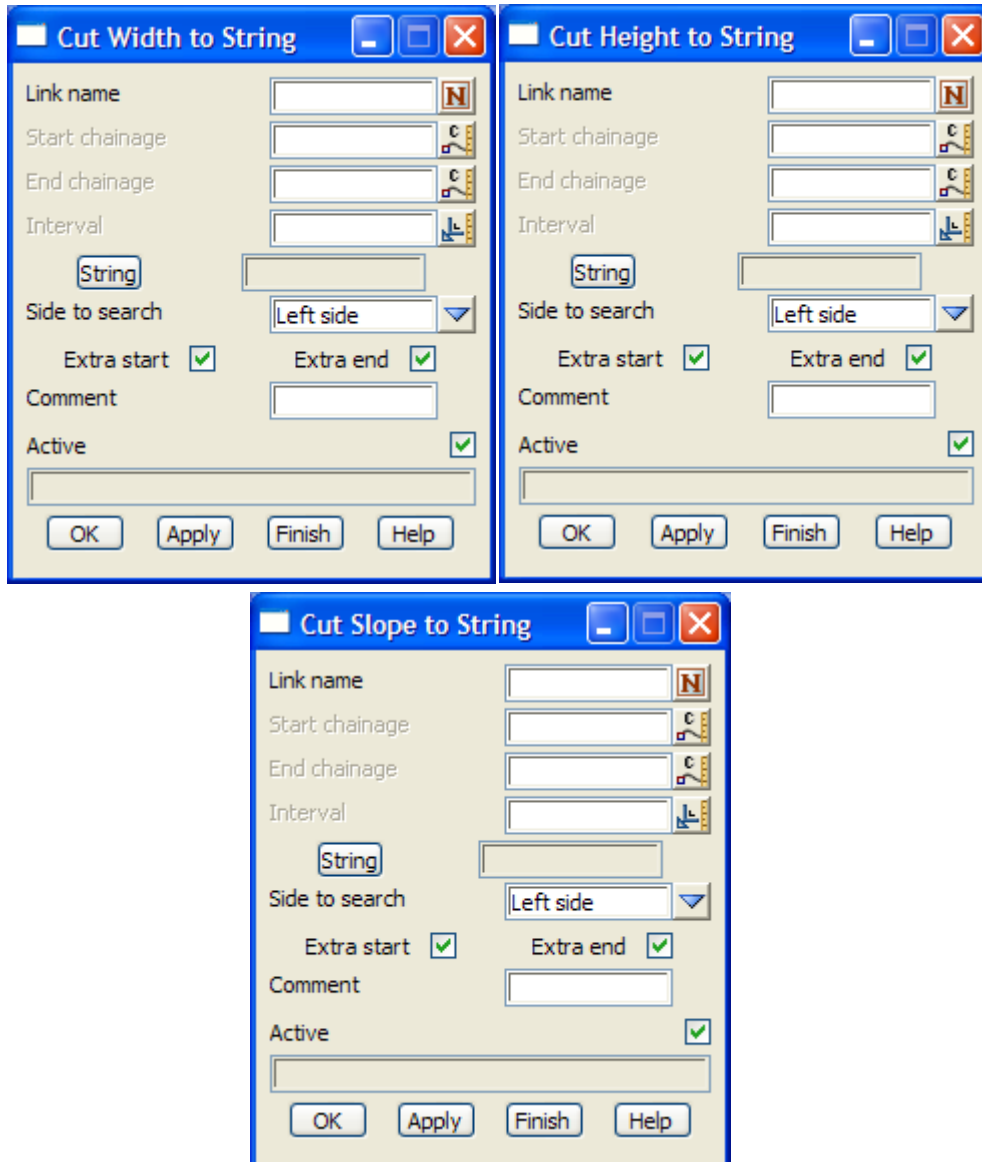
Cut Width, Height and Slope to a String

The **width** for a cut link can be varied by **going out to another existing string**.

The **height** for a cut link can be varied by **taking the height from another existing string**.

The **slope** of a cut link can be defined by using the slope from the **beginning of the link** (i.e. the end of the previous link or the hinge string if it is the first link) **to another existing string**.

Selecting the width to string, height to string or slope to string option brings up the **cut width to string**, **cut height to string** and **cut slope to string** panels respectively.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Link name <i>name of the link to modify.</i>	input		select name menu
Start/End chainage <i>if non blank, start/end chainages for modifying the template link. If blank, the modifier is applied for the length of the selected string.</i>	input		measures menu
Interval <i>if non blank, the interval to use to create cross sections and strings over the given chainage range. If blank, the Section separation value from the Apply Many panel is used.</i>	input		
String <i>select string to use for defining width/height/slope for the link.</i>	string-select		
Side to search sides	input	left side	left side, right side, both

side of the hinge string to start searching to find the string to define width/height/slope.

Extra start/end tick box

if **tick**, add an extra x-section 0.1 mm **before** the start/end chainage.

Comment input

comment to add to the end of the line. In the file, the comment will be preceded by //.

Active tick box tick

if **tick**, use this modifier.

if **not tick**, don't use this modifier.

OK/Apply button

OK stores the values in the fields and removes the panel.

Apply stores the values and leaves the panel on the screen.

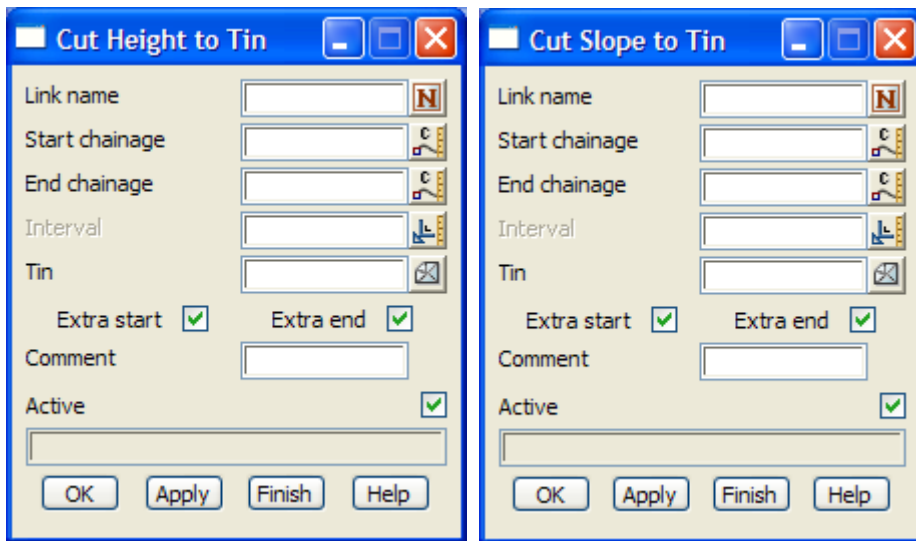
[mtf_edit_modify_cut_height_to_tin](#) [mtf_edit_modify_cut_slope_to_tin](#)

Cut Height to Tin and Slope to Tin

The **height to tin** modifier is used to modify the height of the cut link so that the link will sit on the tin at the given width. Note that **height to tin** can only be used for a cut link defined by *width* and *height*.

The **slope to tin** modifier is used to modify the slope of the link so that the link will sit on the tin at the given width. Note that **slope to tin** can only be used for a cut link defined by *width* and *slope*.

Selecting the **height to tin** or **slope to tin** option brings up the **cut height to tin** and **cut slope to tin** panels respectively.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Link name	input		select name menu
<i>name of the link to modify.</i>			
Start/End chainage	input		measures menu
<i>start/end chainages for modifying the template link.</i>			

Interval	input	
	<i>if non blank, the interval to use to create cross sections and strings over the given chainage range.</i>	
	<i>if blank, the Section separation value from the Apply Many panel is used.</i>	
Tin	input	available tins
	<i>the tin to use for defining the height/slope</i>	
Extra start/end	tick box	
	<i>if tick, add an extra x-section 0.1 mm before the start/end chainage.</i>	
Comment	input	
	<i>comment to add to the end of the line. In the file, the comment will be preceded by //.</i>	
Active	tick box	tick
	<i>if tick, use this modifier.</i>	
	<i>if not tick, don't use this modifier.</i>	
OK/Apply	button	
	<i>OK stores the values in the fields and removes the panel.</i>	
	<i>Apply stores the values and leaves the panel on the screen.</i>	
	<i>mtf_edit_modify_cut_width_to_2_strings mtf_edit_modify_cut_height_to_2_strings</i>	
	<i>mtf_edit_modify_cut_slope_to_2_strings</i>	

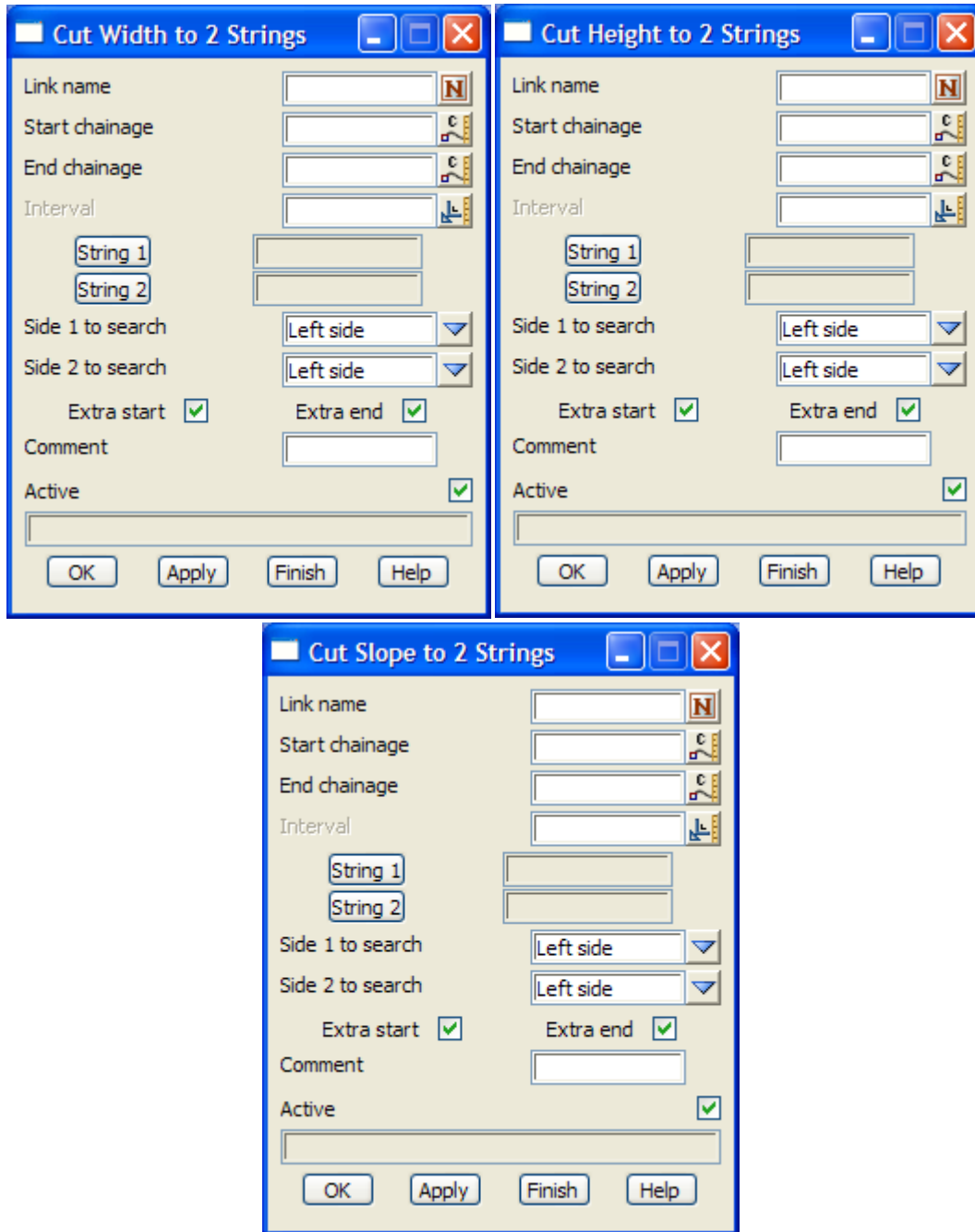
Cut Width, Height and Slope between Two Strings

The **width** for a cut link can be defined by taking the **width between two existing strings**.

The **height** for a cut link can be defined by taking the **height between two existing strings**.

The **slope** for a cut link can be defined by taking the **slope between two existing strings**.

Selecting the width to 2 strings, height to 2 strings or slope to 2 strings option brings up the **cut width to 2 strings**, **cut height to 2 strings** and **cut slope to 2 string** panels respectively.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Link name <i>name of the link to modify.</i>	input		select name menu
Start/End chainage <i>start/end chainages for modifying the template link.</i>	input		measures menu
Interval <i>if non blank, the interval to use to create cross sections and strings over the given chainage range. If blank, the Section separation value from the Apply Many panel is used.</i>	input		
String 1	string-select		

select the first string to use for defining width/height/slope for the link.

String 2 string-select

select the second string to use for defining width/height/slope for the link.

Side 1 to search input left side left side, right side, both sides
side of the hinge string to start searching to find string 1 to use in defining width/height/slope.

Side 2 to search input left side left side, right side, both sides
side of the hinge string to start searching to find string 2 to use in defining width/height/slope.

Extra start/end tick box
*if tick, add an extra x-section 0.1 mm **before** the start/end chainage.*

Comment input
comment to add to the end of the line. In the file, the comment will be preceded by //.

Active tick box tick
*if tick, use this modifier.
 if not tick, don't use this modifier.*

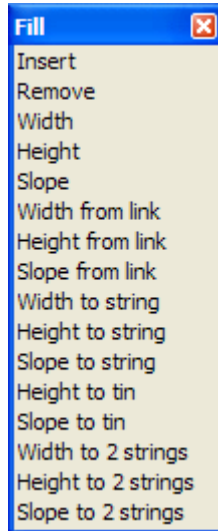
OK/Apply button
*OK stores the values in the fields and removes the panel.
 Apply stores the values and leaves the panel on the screen.*

Please continue to the next section "Fill Modifiers" .

Fill Modifiers

mtf_edit_modify_create_fill

The fill walk-right brings up the fill menu with options to modify the fill links of the template.



For	<i>Insert</i>	go to the section	"Fill Insert"
	<i>Remove</i>		"Fill Remove"
	<i>Width/Height</i>		"Fill Width and Height"
	<i>Slope</i>		"Fill Slope"
	<i>Width/Height/Slope from link</i>		"Fill Width, Height and Slope from a Link"
	<i>Width/Height/Slope to string</i>		"Fill Width, Height and Slope to a String"
	<i>Height/Slope to tin</i>		"Fill Height to Tin and Slope to Tin"
	<i>Width/Height/Slope to 2 strings</i>		"Fill Width, Height and Slope between Two Strings"

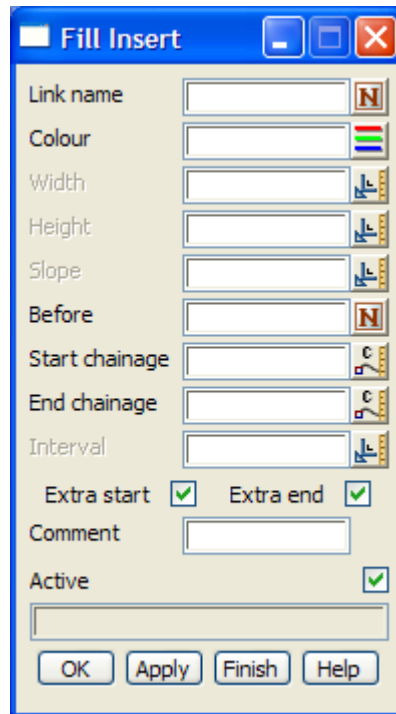
Each of the options from this menu will now be described.

mtf_edit_modify_fill_insert

Fill Insert

Fill links can be created by the **fill insert** modifier and by specifying either the width and height, width and slope or height and slope.

Selecting the insert option brings up the **fill insert** panel



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Link name <i>name of the link to create.</i>	input		select name menu
Colour <i>colour of the link being created.</i>	input		available colours
Width /height/slope <i>width/ height/slope of the link being created - only use two of the three.</i>	input		measures menu
Before <i>if non-blank, the name of the string to insert the new string before. If blank, the link is appended to the end of the fixed part of the template.</i>	input		select name menu
Start/End chainage <i>start/end chainages for inserting the new template link.</i>	input		measures menu
Interval <i>if non blank, the interval to use to create cross sections and strings over the given chainage range. If blank, the Section separation value from the Apply Many panel is used.</i>	input		
Extra start/end <i>if tick, add an extra x-section 0.1 mm before the start/end chainage.</i>	tick box		
Comment <i>comment to add to the end of the line. In the file, the comment will be preceded by //.</i>	input		
Active <i>if tick, use this modifier. if not tick, don't use this modifier.</i>	tick box	tick	

OK/Apply button

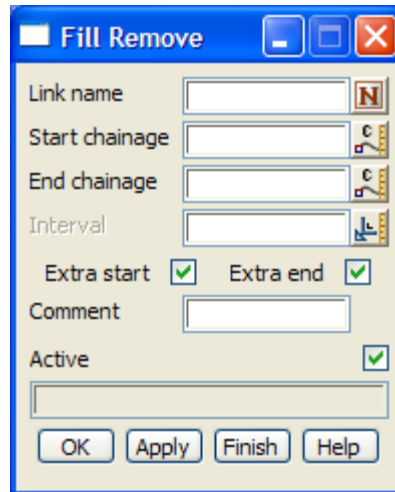
OK stores the values in the fields and removes the panel.
Apply stores the values and leaves the panel on the screen.

mtf_edit_modify_fill_remove

Fill Remove

Fill links can be deleted between given chainages by using the **fill remove** modifier.

Selecting the remove option brings up the **fill remove** panel



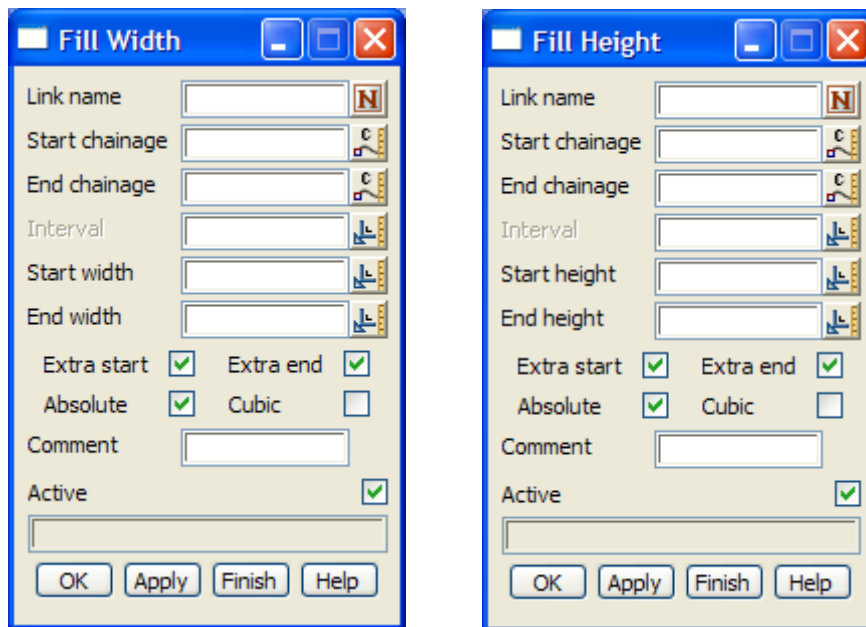
The fields and buttons used in this panel have the following functions.

Field	Description	Type	Defaults	Pop-Up
Link name	<i>name of the link to removed.</i>	input		select name menu
Start/End chainage	<i>start/end chainages for removing the template link.</i>	input		measures menu
Interval	<i>if non blank, the interval to use to create cross sections and strings over the given chainage range. If blank, the Section separation value from the Apply Many panel is used.</i>	input		
Extra start/end	<i>if tick, add an extra x-section 0.1 mm before the start/end chainage.</i>	tick box		
Comment	<i>comment to add to the end of the line. In the file, the comment will be preceded by //.</i>	input		
Active	<i>if tick, use this modifier. if not tick, don't use this modifier.</i>	tick box	tick	
OK/Apply		button		
	<i>OK stores the values in the fields and removes the panel. Apply stores the values and leaves the panel on the screen.</i>			
	mtf_edit_modify_fill_width mtf_edit_modify_fill_height			

Fill Width and Height

The **fill width** modifier is used to modify the width of variable fill links originally defined by width. Similarly the **fill height** modifier is used to modify the height of variable fill links originally defined by height.

Selecting the **width** and **height** option brings up the **fill width** and **fill height** panels respectively.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Link name <i>name of the link to modify.</i>	input		select name menu
Start/End chainage <i>start/end chainages for modifying the template link.</i>	input		measures menu
Interval <i>if non blank, the interval to use to create cross sections and strings over the given chainage range. If blank, the Section separation value from the Apply Many panel is used.</i>	input		
Start/End width/height <i>start/end width/height for modifying the template link.</i>	input		measures menu
Extra start/end <i>if tick, add an extra x-section 0.1 mm before the start/end chainage.</i>	tick box		
Absolute <i>if tick, the width/height is set to the values given in the start and end width/height fields. if not tick, the values given in the start and end height/width fields are added to the existing widths/heights.</i>	tick box	tick	
Cubic <i>if tick, the width/height is varied as a reverse cubic between the start and end chainages. if not tick, the width/height is varied linearly between the start and end chainages.</i>	tick box		
Comment	input		

comment to add to the end of the line. In the file, the comment will be preceded by //.

Active tick box tick

if tick, use this modifier.

if not tick, don't use this modifier.

OK/Apply button

OK stores the values in the fields and removes the panel.

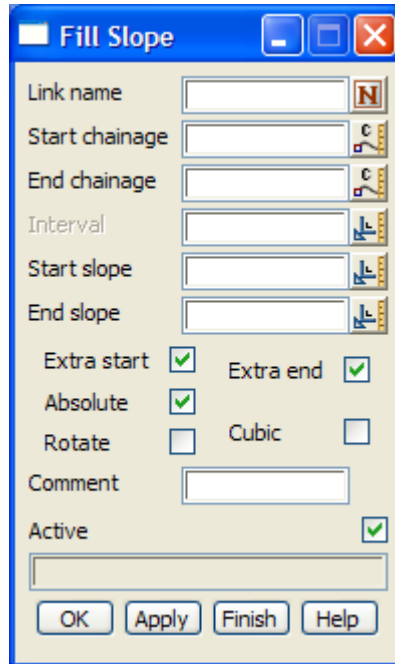
Apply stores the values and leaves the panel on the screen.

mtf_edit_modify_fill_slope

Fill Slope

The **fill slope** modifier is used to modify the slope of variable fill links originally defined by slope.

Selecting the slope option brings up the **fill slope** panel



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Link name <i>name of the link to modify.</i>	input		select name menu
Start/End chainage <i>start/end chainages for modifying the template link.</i>	input		measures menu
Interval <i>if non blank, the interval to use to create cross sections and strings over the given chainage range. If blank, the Section separation value from the Apply Many panel is used.</i>	input		
Start/End slope <i>start/end slope for modifying the template link.</i>	input		measures menu
Extra start/end	tick box		

if **tick**, add an extra x-section 0.1 mm **before** the start/end chainage.

Absolute tick box tick

if **tick**, the slope is set to the values given in the start and end slope fields.

if **not tick**, the values given in the start and end slope fields are added to the existing slopes.

Cubic and Rotate tick boxes:

Only **none** or **one** of **Cubic** and **Rotate** can be set to **tick**.

The **default** is **none** - that is, **neither is ticked** and in the default case, the slope is varied **linearly with respect to slope** between the start and end chainages.

Cubic tick box

if **tick**, the slope is varied as a reverse cubic between the start and end chainages.

Rotate tick box

if **tick**, the slope is varied linearly **with respect to the angle**, between the start and end chainages.

Comment input

comment to add to the end of the line. In the file, the comment will be preceded by //.

Active tick box tick

if **tick**, use this modifier.

if **not tick**, don't use this modifier.

OK/Apply button

OK stores the values in the fields and removes the panel.

Apply stores the values and leaves the panel on the screen.

[mtf_edit_modify_fill_width_from_link](#) [mtf_edit_modify_fill_height_from_link](#)
[mtf_edit_modify_fill_slope_from_link](#)

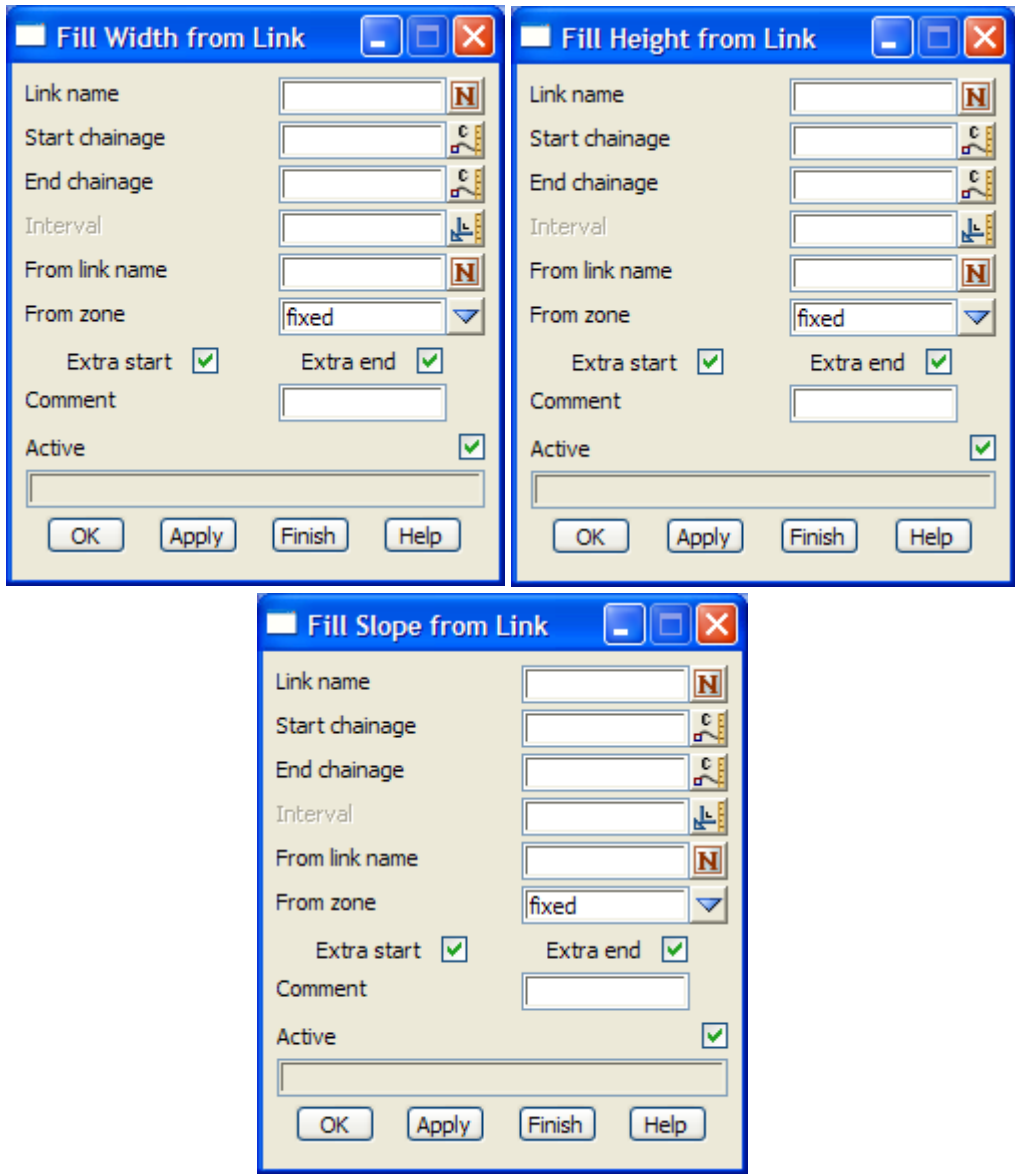
Fill Width, Height and Slope from a Link

The **width from link** modifier is used to modify the width of fill links originally defined by width to be the same width as another link. That is, the width of the link is a copy of the width of another link.

The **height from link** modifier is used to modify the height of fill links originally defined by height to be the same height as another link. That is, the height of the link is a copy of the height of another link.

The **slope from link** modifier is used to modify the slope of fill links originally defined by slope to be the same slope as another link. That is, the slope of the link is a copy of the slope of another link. The link to copy slope from can be defined in terms of slope or cross fall. If the link to copy is defined by cross fall, then the slope is calculated to match the cross fall.

Selecting the width from link, height from link or slope from link option brings up the **fill width from link**, **fill height from link** and **fill slope from link** panels respectively.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Link name <i>name of the link to modify.</i>	input		select name menu
Start/End chainage <i>start/end chainages for modifying the template link.</i>	input		measures menu
Interval <i>if non blank, the interval to use to create cross sections and strings over the given chainage range. If blank, the Section separation value from the Apply Many panel is used.</i>	input		
From link name <i>template link to take width/height/slope from.</i>	input		select name menu
From zone <i>zone that the template link to take width/height/slope from, comes from.</i>	input	fixed	fixed, cut, fill

Extra start/end	tick box	
	<i>if tick, add an extra x-section 0.1 mm before the start/end chainage.</i>	
Comment	input	
	<i>comment to add to the end of the line. In the file, the comment will be preceded by //.</i>	
Active	tick box	tick
	<i>if tick, use this modifier.</i>	
	<i>if not tick, don't use this modifier.</i>	
OK/Apply	button	
	<i>OK stores the values in the fields and removes the panel.</i>	
	<i>Apply stores the values and leaves the panel on the screen.</i>	
	<i>mtf_edit_modify_fill_width_to_string mtf_edit_modify_fill_height_to_string</i>	
	<i>mtf_edit_modify_fill_slope_to_string</i>	

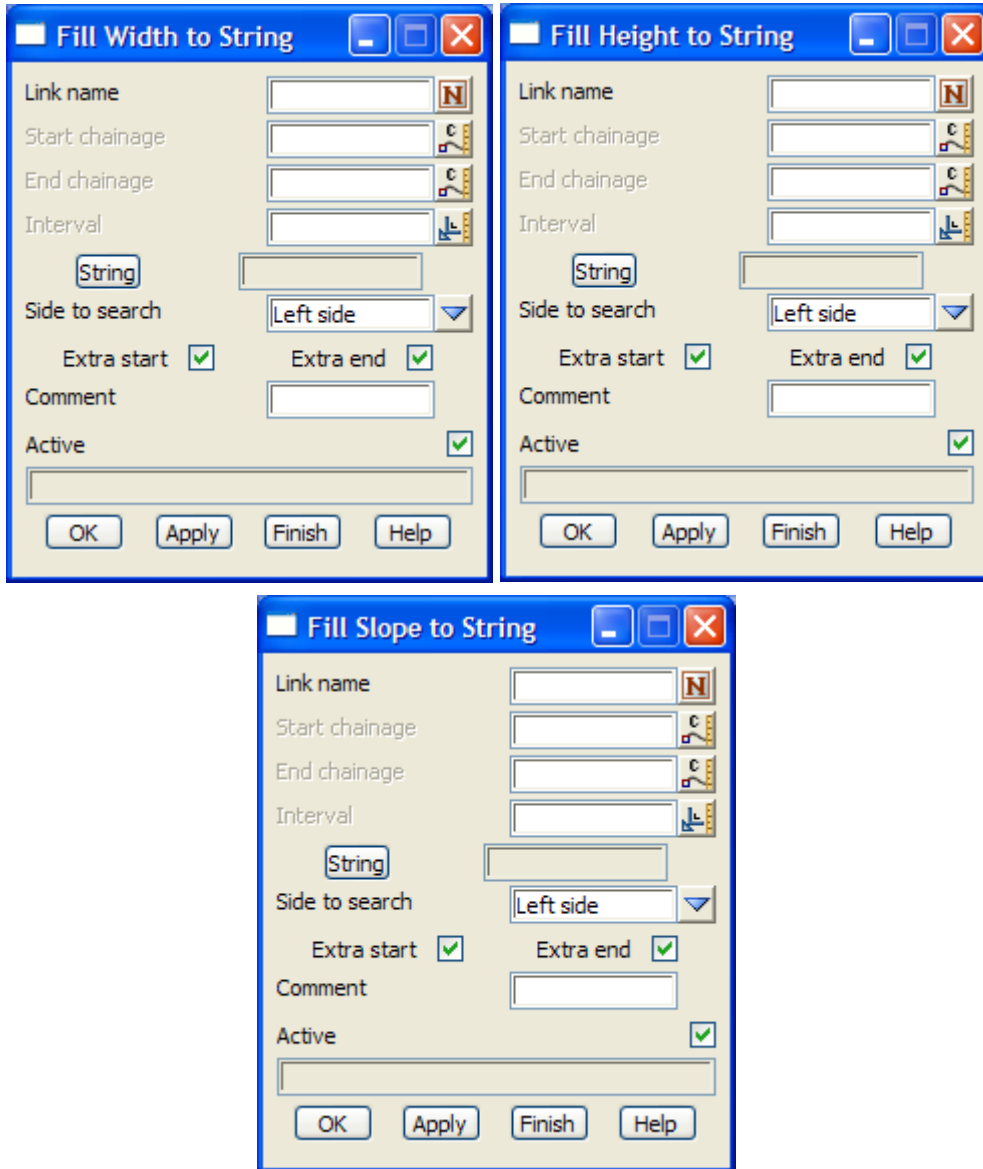
Fill Width, Height and Slope to a String

The **width** for a fill link can be varied by **going out to another** existing **string**.

The **height** for a fill link can be varied by **taking the height from another** existing **string**.

The **slope** of a fill link can be defined by using the slope from the **beginning of the link** (i.e. the end of the previous link or the hinge string if it is the first link) **to another** existing **string**.

Selecting the width to string, height to string or slope to string option brings up the fill width to string, fill height to string and fill slope to string panels respectively.



The fields and buttons used in this panel have the following functions.

Field	Description	Type	Defaults	Pop-Up
Link name	<i>name of the link to modify.</i>	input		select name menu
Start/End chainage	<i>if non blank, start/end chainages for modifying the template link. If blank, the modifier is applied for the length of the selected string.</i>	input		measures menu
Interval	<i>if non blank, the interval to use to create cross sections and strings over the given chainage range. If blank, the Section separation value from the Apply Many panel is used.</i>	input		
String	<i>select string to use for defining width/height/slope for the link.</i>	string-select		
Side to search		input	left side	left side, right side, both sides

side of the hinge string to start searching to find the string to define width/height/slope.

Extra start/end tick box

if **tick**, add an extra x-section 0.1 mm **before** the start/end chainage.

Comment input

comment to add to the end of the line. In the file, the comment will be preceded by //.

Active tick box tick

if **tick**, use this modifier.

if **not tick**, don't use this modifier.

OK/Apply button

OK stores the values in the fields and removes the panel.

Apply stores the values and leaves the panel on the screen.

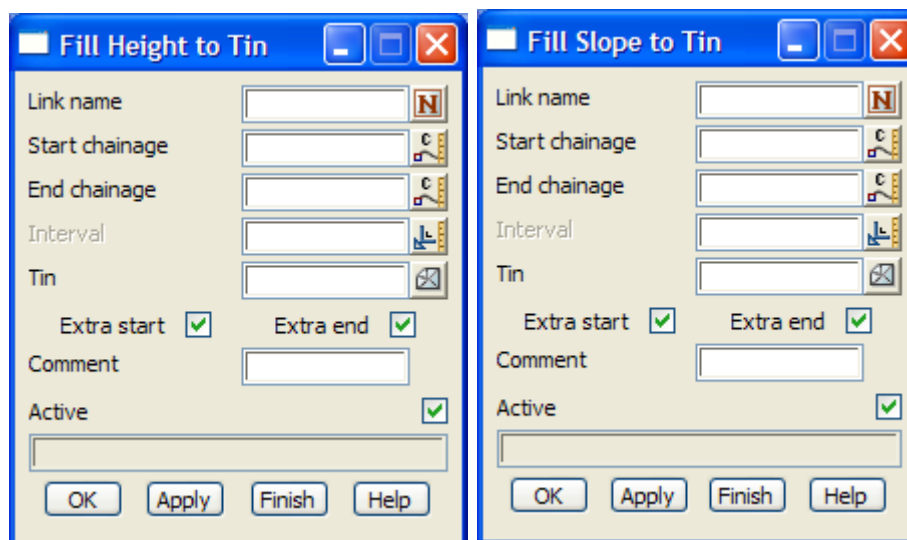
The typed formats of the width to a string, height to a string and slope to a string command for a [mtf_edit_modify_fill_height_to_tin](#) [mtf_edit_modify_fill_slope_to_tin](#)

Fill Height to Tin and Slope to Tin

The **height to tin** modifier is used to modify the height of the fill link so that the link will sit on the tin at the given width. Note that **height to tin** can only be used for a fill link defined by *width* and *height*.

The **slope to tin** modifier is used to modify the slope of the link so that the link will sit on the tin at the given width. Note that **slope to tin** can only be used for a cut link defined by *width* and *slope*.

Selecting the height to tin or slope to tin option brings up the **fill height to tin** and **fill slope to tin** panels respectively.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Link name	input		select name menu
<i>name of the link to modify.</i>			
Start/End chainage	input		measures menu

start/end chainages for modifying the template link.

Interval input

*if **non blank**, the interval to use to create cross sections and strings over the given chainage range.
If **blank**, the Section separation value from the **Apply Many** panel is used.*

Tin input available tins

the tin to use for defining the height/slope

Extra start/end tick box

*if **tick**, add an extra x-section 0.1 mm **before** the start/end chainage.*

Comment input

comment to add to the end of the line. In the file, the comment will be preceded by //.

Active tick box tick

*if **tick**, use this modifier.*

*if **not tick**, don't use this modifier.*

OK/Apply button

OK stores the values in the fields and removes the panel.

Apply stores the values and leaves the panel on the screen.

[mtf_edit_modify_fill_width_to_2_strings](#) [mtf_edit_modify_fill_height_to_2_strings](#)
[mtf_edit_modify_fill_slope_to_2_strings](#)

Fill Width, Height and Slope between Two Strings

The **width** for a fill link can be defined by taking the **width between two existing strings**.

The **height** for a fill link can be defined by taking the **height between two existing strings**.

The **slope** for a fill link can be defined by taking the **slope between two existing strings**.

Selecting the width to 2 strings, height to 2 strings or slope to 2 strings option brings up the **fill width to 2 strings**, **fill height to 2 strings** and **fill slope to 2 string** panels respectively.

The image shows three dialog boxes for template modification:

- Fill Width to 2 Strings:** Contains fields for Link name, Start chainage, End chainage, Interval, String 1, String 2, Side 1 to search (Left side), Side 2 to search (Left side), Extra start (checked), Extra end (checked), Comment, and Active (checked). Buttons: OK, Apply, Finish, Help.
- Fill Height to 2 Strings:** Identical layout to the Width dialog.
- Fill Slope to 2 Strings:** Identical layout to the Width dialog.

The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Link name <i>name of the link to modify.</i>	input		select name menu
Start/End chainage <i>start/end chainages for modifying the template link.</i>	input		measures menu
Interval <i>if non blank, the interval to use to create cross sections and strings over the given chainage range. If blank, the Section separation value from the Apply Many panel is used.</i>	input		
String 1	string-select		

select the first string to use for defining width/height/slope for the link.

String 2 string-select

select the second string to use for defining width/height/slope for the link.

Side 1 to search input left side left side, right side, both sides
side of the hinge string to start searching to find string 1 to use in defining width/height/slope.

Side 2 to search input left side left side, right side, both sides
side of the hinge string to start searching to find string 2 to use in defining width/height/slope.

Extra start/end tick box
*if **tick**, add an extra x-section 0.1 mm **before** the start/end chainage.*

Comment input
comment to add to the end of the line. In the file, the comment will be preceded by //.

Active tick box tick
*if **tick**, use this modifier.
if **not tick**, don't use this modifier.*

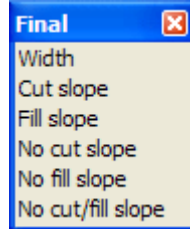
OK/Apply button
***OK** stores the values in the fields and removes the panel.
Apply stores the values and leaves the panel on the screen.*

Please continue to the next section "Final Modifiers" .

Final Modifiers

mtf_edit_modify_create_final

The final walk-right brings up the final menu with options to modify the final cut and fill links of the template.



For <i>Width</i> ,	go to the section	“Final Width”
<i>Cut slope</i>		“Final Cut or Final Fill Slope”
<i>Fill slope</i>		“Final Cut or Final Fill Slope”
<i>No cut slope</i>		“Final No Cut Slope and/or Final No Fill Slope”
<i>No fill slope</i>		“Final No Cut Slope and/or Final No Fill Slope”
<i>No cut/fill slope</i>		“Final No Cut Slope and/or Final No Fill Slope”

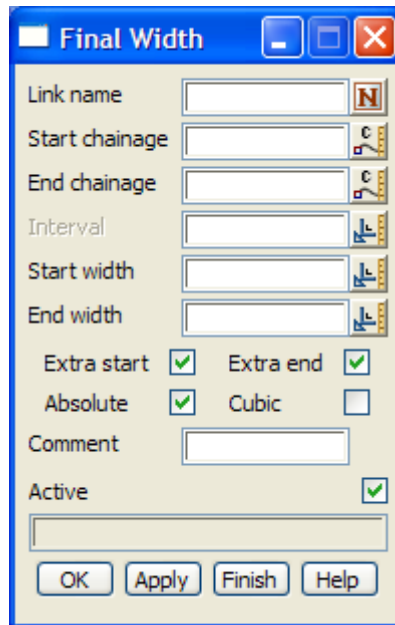
Each of the options from this menu will now be described.

mtf_edit_modify_final_width

Final Width

The **final width** modifier varies the width of the *final* link of the template.

Selecting the width option brings up the **final width** panel.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Link name	input		select name menu

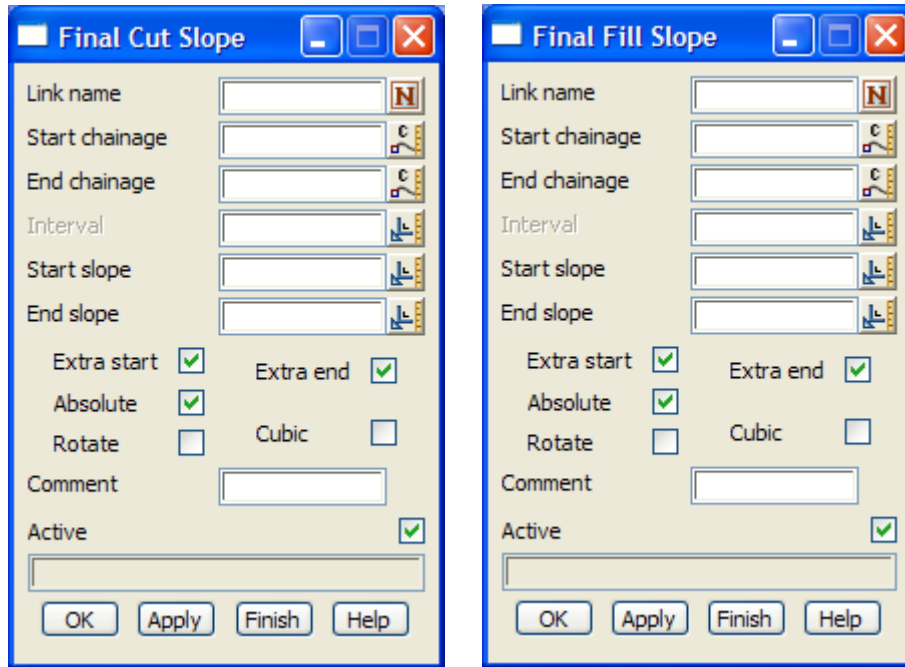
	<i>name of the link to modify.</i>	
Start/End chainage	input	measures menu
	<i>start/end chainages for modifying the template link.</i>	
Interval	input	
	<i>if non blank, the interval to use to create cross sections and strings over the given chainage range. If blank, the Section separation value from the Apply Many panel is used.</i>	
Start/End value	input	measures menu
	<i>start/end width for modifying the template link.</i>	
Extra start/end	tick box	
	<i>if tick, add an extra x-section 0.1 mm before the start/end chainage.</i>	
Absolute	tick box	tick
	<i>if tick, the width is set to the values given in the start and end width fields. if not tick, the width given in the start and end width fields are added to the existing widths.</i>	
Cubic	tick box	
	<i>if tick, the width is varied as a reverse cubic between the start and end chainages. if not tick, the width is varied linearly between the start and end chainages.</i>	
Comment	input	
	<i>comment to add to the end of the line. In the file, the comment will be preceded by //.</i>	
Active	tick box	tick
	<i>if tick, use this modifier. if not tick, don't use this modifier.</i>	
OK/Apply	button	
	<i>OK stores the values in the fields and removes the panel. Apply stores the values and leaves the panel on the screen.</i>	

mtf_edit_modify_final_cut_slope mtf_edit_modify_final_fill_slope

Final Cut or Final Fill Slope

The final **cut slope** modifier varies the cut slope of the *final* link of the template and the final **fill slope** modifier varies the fill slope of the *final* link of the template.

Selecting the cut slope or fill slope options brings up the **cut slope** and **fill slope** panels respectively.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Link name	input		select name menu

name of the link to modify.

Start/End chainage	input		measures menu
---------------------------	-------	--	---------------

start/end chainages for modifying the template link.

Interval	input		
-----------------	-------	--	--

*if non blank, the interval to use to create cross sections and strings over the given chainage range.
If blank, the Section separation value from the Apply Many panel is used.*

Start/End slope	input		measures menu
------------------------	-------	--	---------------

start/end slope for modifying the template link.

Extra start/end	tick box		
------------------------	----------	--	--

if tick, add an extra x-section 0.1 mm before the start/end chainage.

Absolute	tick box	tick	
-----------------	----------	------	--

*if tick, the slope is set to the values given in the start and end slope fields.
if not tick, the values given in the start and end slope fields are added to the existing slope.*

Cubic	tick box		
--------------	----------	--	--

if tick, the slope is varied as a reverse cubic between the start and end chainages.

Rotate	tick box		
---------------	----------	--	--

if tick, the slope is varied linearly with respect to the angle, between the start and end chainages.

Note -

Only one of cubic and rotate can be set to tick.

If both are set to not tick, then the slope is varied linearly respect to slope between the start and end chainages (the default).

Comment	input		
----------------	-------	--	--

comment to add to the end of the line. In the file, the comment will be preceded by //.

Active tick box tick

*if tick, use this modifier.
if not tick, don't use this modifier.*

OK/Apply button

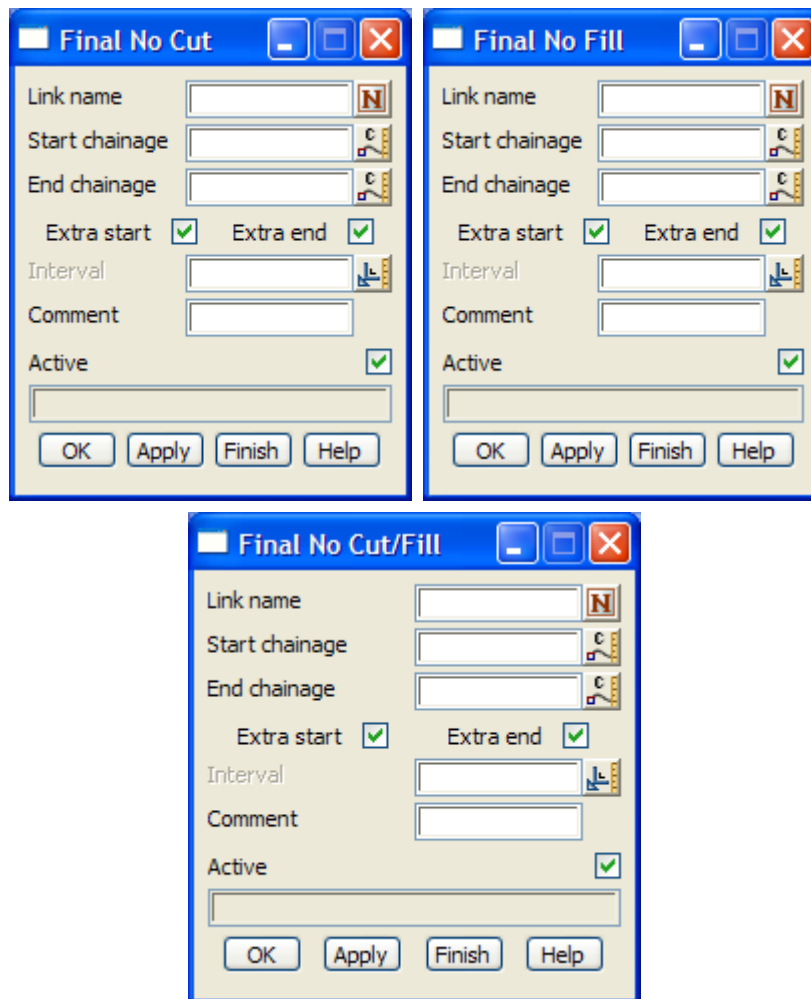
*OK stores the values in the fields and removes the panel.
Apply stores the values and leaves the panel on the screen.*

- mtf_edit_modify_final_no_cut
- mtf_edit_modify_final_no_fill
- mtf_edit_modify_final_no_cut_fill

Final No Cut Slope and/or Final No Fill Slope

The final link can be stopped altogether in either cut or fill or both. The **no cut slope** modifier stops the final link when it is in *cut*, the **no fill slope** modifier stops the final link when it is in *fill* and the **no cut/fill fill slope** modifier stops the final link when it is in *cut and fill*.

Selecting the No cut slope, No fill slope or No cut/fill slope options brings up the **Final No Cut**, **Final No Fill** or **Final No Cut/Fill** panels or respectively.



The fields and buttons used in this panel have the following functions.

Field	Description	Type	Defaults	Pop-Up
-------	-------------	------	----------	--------

Link name	input	select name menu
	<i>name of the link to modify.</i>	
Start/End chainage	input	measures menu
	<i>start/end chainages for stopping the template link.</i>	
Interval	input	
	<i>if non blank, the interval to use to create cross sections and strings over the given chainage range.</i>	
	<i>If blank, the Section separation value from the Apply Many panel is used.</i>	
Extra start/end	tick box	
	<i>if tick, add an extra x-section 0.1 mm before the start/end chainage.</i>	
Comment	input	
	<i>comment to add to the end of the line. In the file, the comment will be preceded by //.</i>	
Active	tick box	tick
	<i>if tick, use this modifier.</i>	
	<i>if not tick, don't use this modifier.</i>	
OK/Apply	button	
	<i>OK stores the values in the fields and removes the panel.</i>	
	<i>Apply stores the values and leaves the panel on the screen.</i>	

Please continue to the next section "Stripping" .

Stripping

mtf_edit_stripping_changes

A fixed stripping depth can be specified in the apply option whilst the **apply many** option allows for stripping depths which can **vary along the design**.

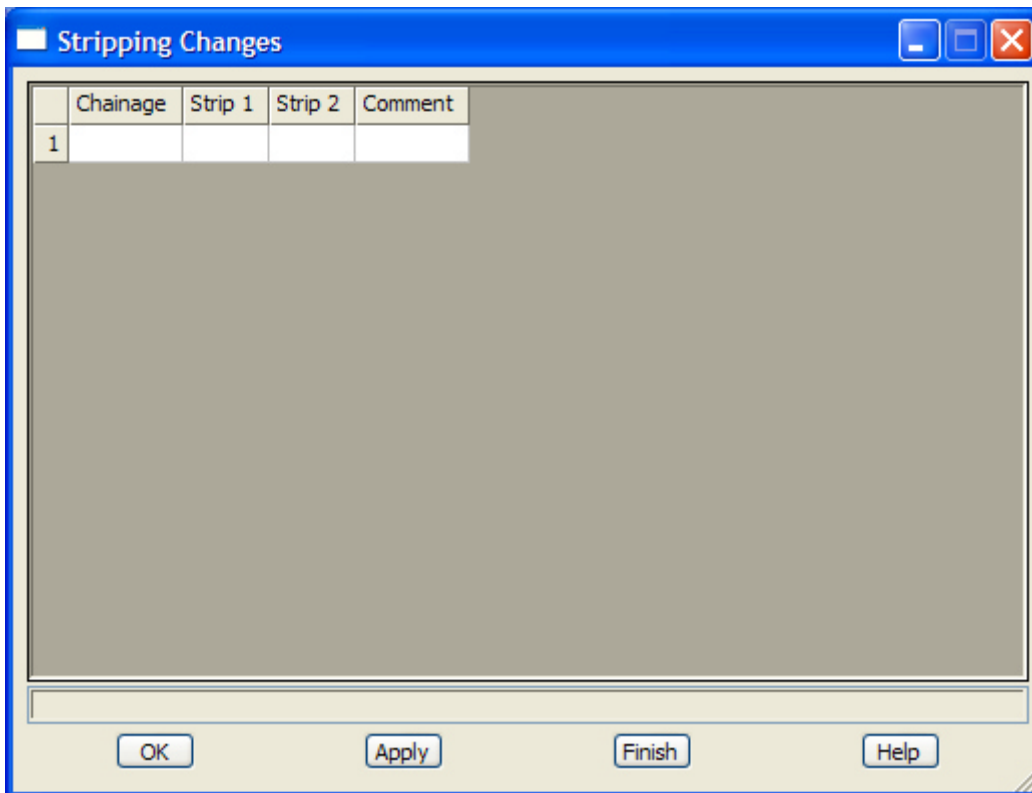
If a non-zero stripping depth exists at a chainage, the **cut** and **fill** calculations are done with respect to the section through the tin dropped in height by the stripping depth.

However, the **design strings** are generated by battering into the **unstripped** surface, and the stripping volume is the volume between the stripped and unstripped surface for the design.

Stripping depths are defined for chainages along the reference string and can be linearly interpolated between chainages.

NOTE: Cut and fill areas and volumes are adjusted for the stripping depths. The total stripping volume is given at the end of the volumes report.

Selecting the stripping option on the MTF edit menu brings up the **stripping changes** panel



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Chainage	column header		
<i>list of chainages for defining stripping depth.</i>			
Strip depth 1	column header		for the field - measures menu
<i>strip depth to apply at the chainage given for this row of information. If strip depth 2 is blank, then strip depth 1 is applied until the next chainage in the chainage column.</i>			

Strip depth 2 column header for the field - measures
menu

if non-blank, the strip depth to linearly interpolate to and finish with at the next chainage in the chainage column.

if blank, then strip depth 1 applies to the next chainage in the chainage column.

In the mtf file, the two depths will be separated by a comma.

Comment column header

comment to add to the end of the line. In the file, the comment will be preceded by //.

OK/Apply button

OK stores the values in the fields and removes the panel.

Apply stores the values and leaves the panel on the screen.

Please continue to the next section "Boxing" .

Boxing

mtf_edit_boxing

In the **many templates file**, up to eight (8) layers of boxing can be defined.

For each layer, the boxing is defined in one or two parts - the left boxing and the right boxing.

The left boxing or the right boxing can define the boxing for the entire template and then only one is needed.

If left and right boxing are **both** defined at a section, then the *last point of the left boxing* is automatically connected to the *first point of the right boxing*.

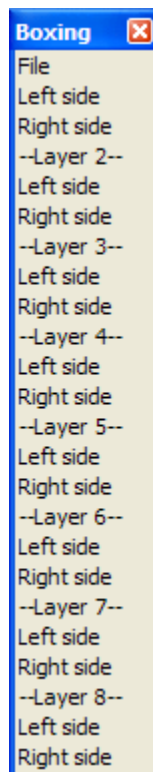
Warning - the left boxing must end before the right boxing begins. If there is an overlap, the right boxing will be pushed to the end of the left boxing.

Warning - no interpolation or modifiers exist for boxing.

For the definition of boxing, go to the section “Full Definition of Boxing”

When boxing is used in the **Apply many**, the cut and fill areas and volumes are also calculated for all the inter-boxing layers. The **last layer** defined is also referred to as the **subgrade** layer and volumes are also given for the natural surface to the subgrade and the design to the subgrade.

The boxing walk-right in the mtf edit menu brings up the boxing menu with options to specify the file supplying the boxing definitions and options to apply the definitions to the right and left side of the template.



For	<i>File</i> ,	go to the section	“Boxing File”
	<i>Left/Right side</i>		“Left Side and Right Side Boxing”
	<i>Left/Right side for each layer</i>		“Left Side and Right Side Boxing”

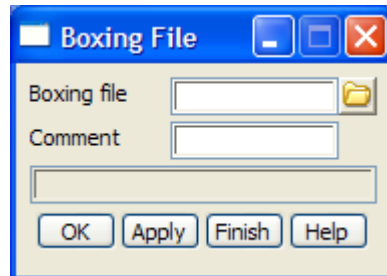
Each of the options from this menu will now described.

mtf_edit_boxing_file

Boxing File

Selecting file from the boxing menu brings up the **boxing file** panel for defining the boxing definitions to be used in this apply many.

For the definition of boxing, go to the section “Full Definition of Boxing”



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Boxing file <i>name of the file containing the boxing definitions to be used for the mtf.</i>	input		*.bf files
Comment <i>comment to add to the end of the line. In the file, the comment will be preceded by //.</i>	column header		
OK/Apply <i>OK stores the values in the fields and removes the panel. Apply stores the values and leaves the panel on the screen.</i>	button		

[mtf_edit_boxing_changes](#)

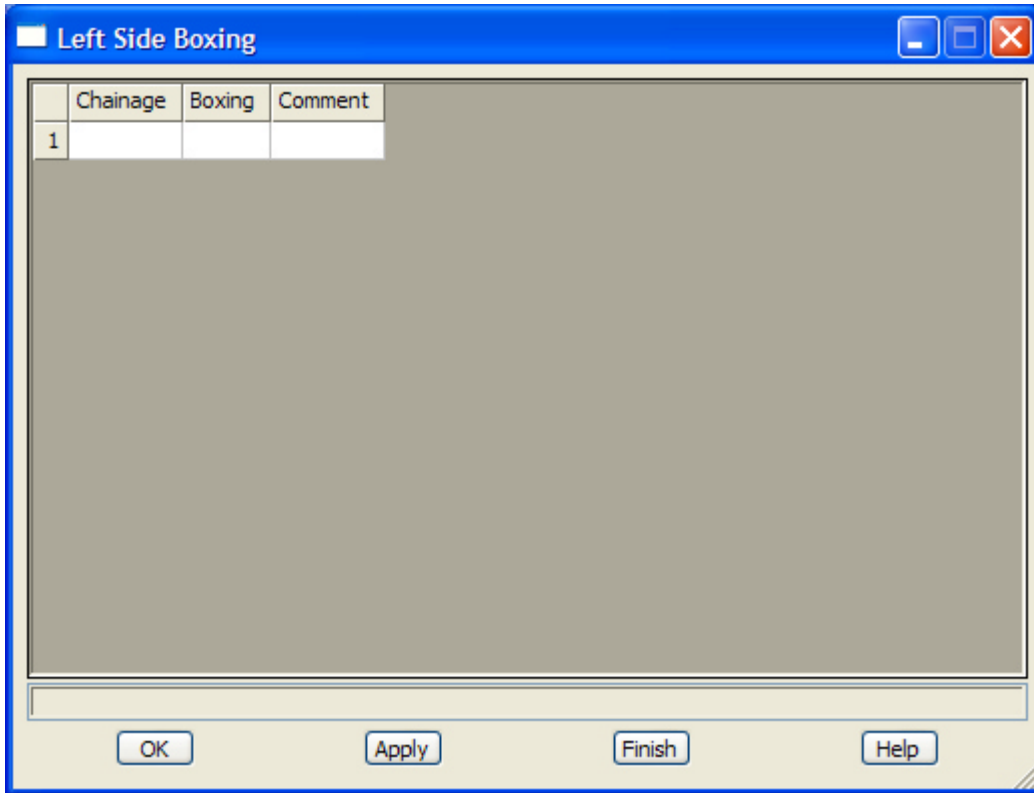
Left Side and Right Side Boxing

The panels brought up by selecting Left side or Right side from the Boxing menu brings up the **Left Side Boxing** and **Right Side Boxing** panels respectively. This is for the first layer of boxing.

The left side and right side panels define for each boxing layer, what boxing definitions (from the boxing file) are applied to chainages along the reference string.

For the definition of boxing, go to the section “Full Definition of Boxing”

The panels brought up by selecting Left side or Right side for Layer 2 to Layer 8 from the Boxing menu brings up similar panels for each of the layers and so won't be documented separately.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Chainage column header
chainage to start applying the boxing definition at.

Boxing rule column header for the fields - available boxing
boxing definition to apply from this chainage to the next in the chainage list.

Comment column header
comment to add to the end of the line. In the file, the comment will be preceded by //.

OK/Apply button
OK stores the values in the fields and removes the panel.
Apply stores the values and leaves the panel on the screen.

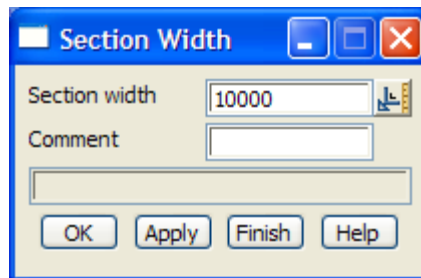
Please continue to the next section "Width" .

Width

mtf_edit_section_width

A **section width** is used to limit the distance to search along a section when trying to find strings used in any of the mtf commands.

Selecting width from the mtf edit men brings up the **section width** panel for setting the width.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Section width	input	10000	

***Section width** defines the perpendicular offset from the Hinge string. It is used to limit the search distance for strings when performing MTF modifier commands.*

Comment column header

comment to add to the end of the line. In the file, the comment will be preceded by //.

OK/Apply button

***OK** stores the values in the fields and removes the panel.*

***Apply** stores the values and leaves the panel on the screen.*

Please continue to the next section “String Modifiers” .

String Modifiers

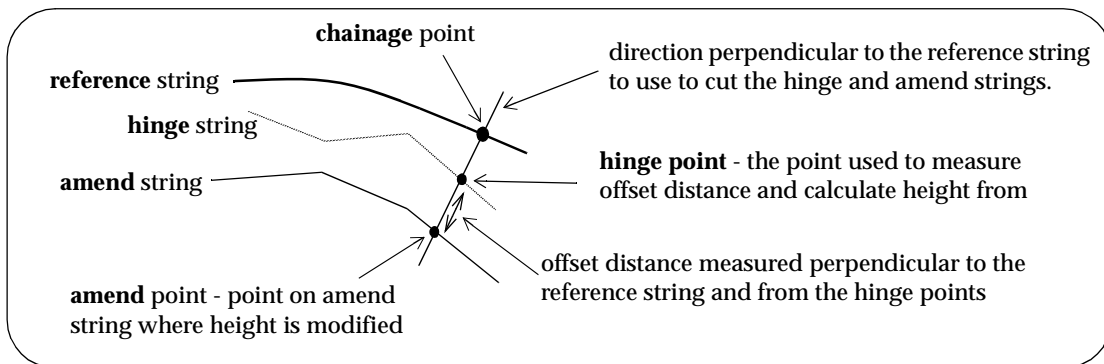
Unlike the other MTF options, the **string modifier** options modify the *heights* on an **existing** string called the **amend string**.

Like the apply options, a reference string is used to define chainage and what is perpendicular at each chainage. A hinge string is used to define offsets and heights. If no hinge string is selected, the reference string is also used as the hinge string.

For a given chainage on the reference string (chainage point), a line perpendicular to the reference string is constructed to cut through the hinge string and the amend string (the cut points are called the **hinge point** and the **amend point**).

Horizontal offset is defined as the offset value from the hinge point, and the height of the **amend** point is a modification of the height at the hinge point.

The string modifier options create and/or modify the heights of the **amend** points on the amend string.

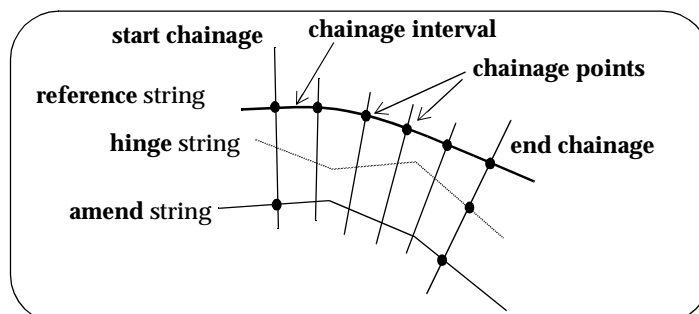


The *height* of the amend point is *derived from the hinge point* by starting with the height of the hinge point and applying a crossfall to it across the offset distance from the hinge string to the amend string.

The cross fall can be defined by either:

- (a) giving the cross fall
- or
- (b) using the cross fall between two user selected strings.

For the string options, the length of string being modified is restricted by giving a start and end reference chainage. A chainage interval can also be specified to define extra reference chainage points to use between the start and end chainages.



How and where the amend string is modified depends on the *type* of string and whether the chainage interval is blank (null) or not.

What Points are Modified

For 3d, 4d, polyline and super strings:

If the chainage interval is not blank:

- (a) The start and end chainage points are projected *from the reference string* and **inserted** into the **amend** string. The *heights* of the inserted points are defined by the string modifier command.
- (b) The chainage points at the given chainage interval are also projected from the reference string and **inserted** into the **amend** string. The *heights* of the inserted points are defined by the string modifier command.
- (c) Finally, the **vertices** of the **amend** string are dropped perpendicularly *back onto* the hinge and reference string and then those points used to modify the *heights* of the same vertices of the amend string.

If the chainage interval is blank:

- (a) The start and end chainage points are projected *from the reference string* and **inserted** into the **amend** string. The *heights* of the inserted points are defined by the string modifier command.
- (b) The **vertices** of the **amend** string are dropped perpendicular *back onto* the hinge and reference string and then those points used to modify the *heights* of the same vertices of the amend string.

For Alignment strings:

If the chainage interval is not blank:

- (a) All the vertical geometry is removed between the start and end chainages. That is, the vertical intersection points (VIP's) and their associated vertical curves are removed.
- (b) The start and end chainage points are projected *from the reference string* and **vertical intersection points (VIP's)** **inserted** into the **amend** string. The *height* of the inserted VIP points are defined by the string modifier command.

If the chainage interval is blank:

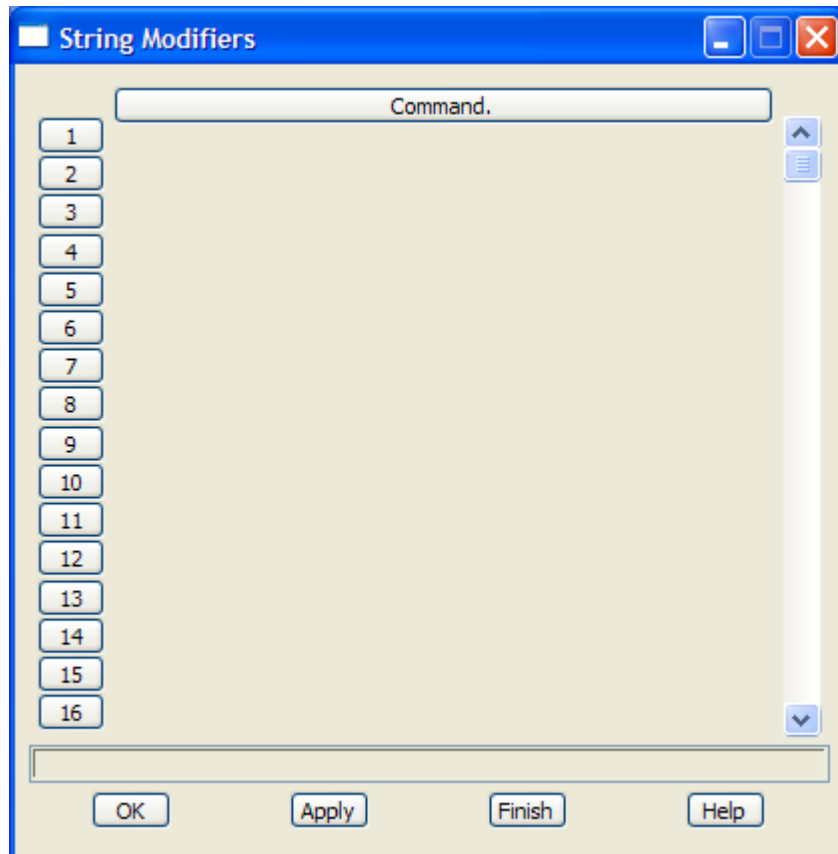
- (a) The start and end chainage points are projected *from the reference string* and **vertical intersection points (VIP's)** **inserted** into the **amend** string. The *heights* of the inserted VIP points are defined by the string modifier command.
- (b) The **vertical intersection points (VIP's)** of the **amend** string are dropped perpendicularly *back onto* the hinge and reference strings and then those points used to modify the *heights* of the same VIP's of the amend string. The vertical curves for the VIP's are not changed.

[string_modifiers](#)

String Modifiers in MTF Edit

For information on how the String Modifiers in the MTF editor work, please go to the previous section “String Modifiers” .

Selecting Strings from the MTF Edit menu brings up the **String Modifiers** panel.

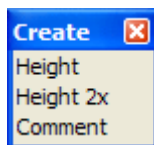


The **String Modifiers** panel consists of a scrolling command fields and an **OK** or **Apply** button to record the results.

The **width** of the command area in the **String Modifiers** panel is controlled by the environment variable `DEFAULT_TABLE_WIDTH_4D`.

[create_mtf_string_modifiers](#)

If the command line is **empty**, clicking LB in the command line will bring up the Create menu which contains the available String commands.



modify by xfall and height
 modify by 2-strings
 comment

Selecting a menu item will bring up an associated panel which displays the information required for the modifier command.

When the panel is filled in and **OK** or **Apply** selected, the panel information is written out to the command line in the correct format for that modifier command.

If the command line is **not empty**, clicking LB in the command line will bring up the associated panel for the modifier command in the command line.

The information in the panel can be changed and if **OK** or **Apply** is selected, the changed panel information is written out to the command line in the correct format for that modifier command.

Each of the panels created by selecting a command from the Create menu, will now be described.

mtf_edit_string_modify_by_xfall_height

Height

The *height* the Height string modifier calculates for the amend point is given by:

- (a) if the absolute flag is not set, the height of the hinge point, otherwise zero.
- plus
- (b) the interpolated height for the user given heights at the start and end chainages
- plus
- (c) the interpolated height for the user given cross falls at the start and end chainage.

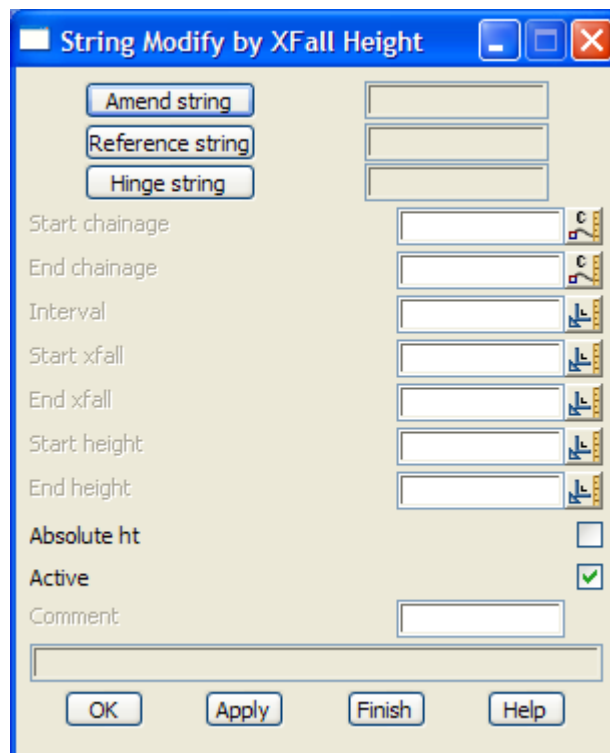
That is, if the absolute flag is not set:

$$\text{new height} = \text{hinge height} + (\text{interpolated height}) + (\text{interpolated xfall}) \times (\text{offset distance})$$

If the absolute flag is set:

$$\text{new height} = (\text{interpolated height}) + (\text{interpolated xfall}) \times (\text{offset distance})$$

Selecting the Height option brings up the **String Modify by Xfall Height** panel



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Amend string <i>select string to have heights amended.</i>	string-select		
Reference string <i>select reference string.</i>	string-select		
Hinge string <i>select hinge string.</i>	string-select		
Start/End chainage <i>start/end chainage on the reference string for applying the modifier.</i>	input		measures menu
Interval <i>if non blank, the chainage separation to apply the modifier. if blank, the Section separation value from the Apply Many panel is used.</i>	input		
Start/End xfall <i>start/end crossfall for the modifier.</i>	input		measures menu
Start/End height <i>start/end height for modifier.</i>	input		measures menu
Absolute height <i>if tick, the calculated height does not include the hinge height. if not tick, the calculated height includes the hinge height.</i>	tick box		
Comment <i>comment to add to the end of the line. In the file, the comment will be preceded by //.</i>	input		
Active <i>if tick, use this modifier. if not tick, don't use this modifier.</i>	tick box	tick	
OK/Apply <i>OK stores the values in the fields and removes the panel. Apply stores the values and leaves the panel on the screen.</i>	button		

For more information on how the String Modifiers in the MTF editor work, please go to the section "String Modifiers" .

[mtf_edit_string_modify_by_2_strings](#)

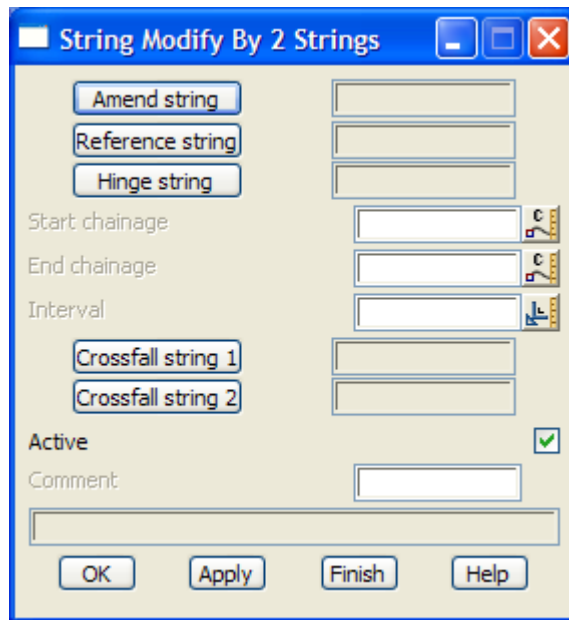
Height 2X

The *height* the Height 2x string modifier calculates for the amend point is given by:

- (a) the height of the hinge point
- plus
- (b) the offset distance multiplied by the cross fall between two user selected strings.

$$\text{new height} = \text{hinge height} + (\text{xfall between string 1 and string 2}) \times (\text{offset distance})$$

Selecting the Height 2x option brings up the **String Modify by 2 Strings** panel



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Amend string <i>select string to have heights amended.</i>	string-select		
Reference string <i>select reference string.</i>	string-select		
Hinge string <i>select hinge string.</i>	string-select		
Start/End chainage <i>start/end chainage on the reference string for applying the modifier.</i>	input		measures menu
Interval <i>if non blank, the chainage separation to apply the modifier. If blank, the Section separation value from the Apply Many panel is used.</i>	input		
Crossfall string 1 <i>select first string to define crossfall by.</i>	string-select		
Crossfall string 2 <i>select second string to define crossfall by.</i>	string-select		
Comment <i>comment to add to the end of the line. In the file, the comment will be preceded by //.</i>	input		
Active <i>if tick, use this modifier. if not tick, don't use this modifier.</i>	tick box	tick	
OK/Apply <i>OK stores the values in the fields and removes the panel.</i>	button		

Apply stores the values and leaves the panel on the screen.

For more information on how the String Modifiers in the MTF editor work, please go to the section “String Modifiers” .

Shift

mtf_edit_shift_chainages

In an *mtf*, many modifiers are defined in terms of chainage on the reference string. For example, the width modifier is defined to apply between a given start and end chainage on the reference string.

If the horizontal geometry of the reference string is modified, many of the reference chainages in the *mtf* will be incorrect. **Shift** can help correct the chainages in the *mtf* file when modifications are made to the reference string horizontal geometry *after the mtf has been defined*.

For the *mtf* and all special chainage files referred to in the *mtf*, **Shift** adds a delta chainage (the *shift distance*) to chainages within a user specified range.

However depending on the type of modifications made to the reference string, **shift** may have to be applied a number of times over a number of different chainage ranges. And apart from a simple change of start chainage, there may be chainages that can not be corrected with **Shift**.

Before using **Shift**, it is necessary to know **how** the reference string has changed from its original position so to use **shift** it is advantageous to make a **copy** of the reference string **before** any changes are made.

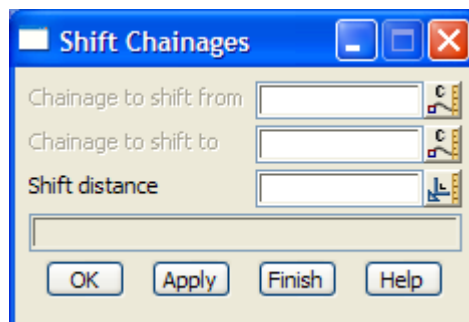
Examples Using Shift:

1. If only the start chainage of the reference string was modified, **shift** would be applied to the *mtf* for the entire **original** reference string and end chainages, with a *shift distance* equal to the difference between the new and the old start chainages for the reference string. For this case the horizontal geometry has not changed, just the chainages.
2. If the radius of a horizontal curve is changed in the middle of the reference string, all chainages from the beginning of the string up to point where the horizontal geometry starts to change would stay the same. At some point after the modified curve, the horizontal geometry of the string is unchanged and for this section of the *mtf*, a shift distance equal to the difference between the new and the old chainages of a non-modified point.

In all areas where the horizontal geometry has been modified, the chainages in the *mtf* would have to be carefully examined to see what changes are required.

Warning: Shift option is very powerful but is also very dangerous.

Selecting **Shift** brings up the **Shift Chainages** panel.



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Chainage to shift from	chainage box		measure chainage
<i>chainage in the mtf to start adding the Shift distance</i>			

*Any chainages in the mtf file (and any associated special chainage files) between the **Chainage to shift from** and the **Chainage to shift to** will have Shift distance added to them.*

Chainage to shift to chainage box measure chainage
chainage in the mtf to stop adding the Shift distance

*Any chainages in the mtf file (and any associated special chainage files) between the **Chainage to shift from** and the **Chainage to shift to** will have Shift distance added to them.*

Shift distance input
*delta chainage to add to all the chainages in the mtf file and any special chainages that are between the **Chainage to shift from** and the **Chainage to shift to***

OK/Apply button

OK applies the shift and removes the panel.

Apply applies the shift and leaves the panel on the screen.

Text Version of the MTF

In the text version of the mtf file, most of (a) to (h) begin with a key word, following by an equals sign (=) and then special commands enclosed in { }.

```
key_word = {
           commands
        }
```

The key words for each case above are

- (a) left_side, right_side
- (b) specials
- (c) hinge_modifier
- (d) left_side_modifier, right_side_modifier
- (e) stripping
- (f) boxing_file, left_boxing, right_boxing
- (g) section_width
- (h) string_modifiers

If any of the key words exist, then they must be in the following order in the **mtf** file:

```
left_side           = { ... }
right_side          = { ... }
specials            = { ... }
hinge_modifier      = { ... }
left_side_modifier  = { ... }
right_side_modifier = { ... }
stripping           = { ... }
boxing_file         = "something.bf"
left_boxing         = { ... }
right_boxing        = { ... }
section_width       = value
string_modifiers    = { ... }
```

The format for *boxing_file* is simply

```
boxing_file = "something.bf"
```

where *something.bf* is the name of a file containing boxing definitions to use for the mtf.

The format for (g) is simply

```
section_width = value // default is 10000
```

where *value* is the distance to search from the hinge string for strings required in some options. If *section_width* is missing, then it takes the default value of 10000.

The key words, *left_side* and *right_side* which are for initially applying templates (for part(a)), have already been described under the Design=>Apply=>Apply many option but will be summarised in the next section "Templates" .

The documentation for the **text file syntax** of the MTF file now follows.

Left Side, Right Side File Format

The file format for the `left_side` and `right_side` sections of the `mtf` file has been given in the section Apply Many of the chapter, Templates.

Summarizing, the templates on the left and right hand sides of the centre line are specified separately in the many templates file.

The left-side (right-side) definition begins with the key words

```
left_side =           right_side =
```

with a list of chainages (in ascending order, one per line) with template names. This list of chainages and templates is enclosed in curly braces `{}`.

The chainage-template lists are assembled as follows

- (a) To represent a template starting at a given chainage, the chainage value followed by the template name is given. The chainage and name are separated by one or more spaces. For example, the template `std` starting at chainage 150 is represented by

```
150      std
```

The template is assumed to apply until the chainage given on the next line of the left-side definition.

If the template is to go to the end of the centre-line, add a line with a chainage greater than or equal to the end chainage. For example,

```
150      std
99999
```

- (b) if no template exists from a chainage, simply include the chainage with no template name following it. For example, if there is no template from chainage 250, this is represented by

```
250
```

The non-existence of a template is assumed to apply until the chainage given on the next line of the left-side definition

- (c) the case of a linear change from one template to another template over a specified chainage range is represented by giving the start chainage of the linear change, followed on the same line by the start template, a comma, and the end template. For example, if the template is to vary linearly between the template `std` and the template `left`, beginning at the chainage 350, then the line in the file would be

```
350      std, left
```

The linear change takes place over the interval beginning at the chainage given on the defining line and ending at the chainage given on the next line of the left-side. Distances and percent cross-falls are interpolated linearly and slopes are interpolated on the radian value of the slope angles.

A Left and Right Side File Example

```
left_side = {
    100      std
    200      std , "left 1"
    250      "left 1"
    300
    350      std
    99999
}
right_side = {
    100      std
    200      std , right
```

```
        250      right
        300      right , std
        350      std
        400
    }
```

The `left_side` describes the situation:

1. the left-hand side of the centre-line has no template from the beginning of the centre-line until chainage 100.
2. at chainage 100, the template **std** begins and continues until chainage 200.
3. there is a linear change from the template **std** to the template **left 1** between chainage 200 and chainage 250.
4. the template **left 1** goes from chainage 250 to chainage 300.
5. there is a gap between chainage 300 and chainage 350.
6. the template **std** goes from chainage 350 to chainage 99999, or if the end chainage is smaller than 99999, to the end of the centre-line.

Specials File Format

In the many templates file, the **specials** definition begins with the key word

```
specials =
```

This is followed by a list of

(a) chainages, in any order, one per line

and/or

(b) the names of files (enclosed in quotes “”) which include lists of chainages (The default ending for a special chainage file is *.spc)

The list of chainages and/or file names is enclosed in curly braces {}.

A Specials Example

```
specials = {
    125.3
    1925.4
    “fred”           // file of chainages to read in
    3007
    “joe”
}
```


Hinge Modifier File Format

In the many templates file, the **hinge modifier** definition begins with the key word

```
hinge_modifier =
```

followed by one or more of the hinge modifier commands **offset**, **height**, **coord** and **nohinge** enclosing curly braces {}.

```
hinge_modifier = {
    hinge modifier commands
}
```

The definition of the hinge modifier commands will now be given.

Offset

The **offset** modifier will move the hinge point a given offset distance (perpendicular to the reference string) from its current plan position. A positive offset is to the right of the hinge string and a negative offset to the left.

The format of the modifier to vary the **offset** is

```
offset st_ch end_ch st_offset end_offset absrel type extra_start extra_end
```

where

st_ch start chainage for the modifier

end_ch end chainage for the modifier

st_offset offset to be used at the start modifier chainage, st_ch

end_offset offset to be used at the end modifier chainage, end_ch.

absrel relative (default) or absolute

type linear (default) or cubic

extra_start optional - adds in an extra x-section 0.1mm before start chainage

extra_end optional - adds in an extra x-section 0.1mm before end chainage

If **absrel** is **relative** (the default) then

the st_offset is added to the current position of the hinge point at chainage st_ch.

the end_offset is added to the current position of the hinge point at chainage end_ch.

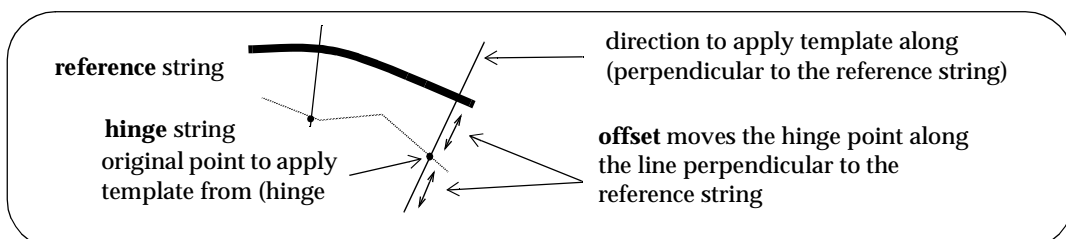
If **absrel** is **absolute**, then

the offset of the hinge point is taken with respect to the original position of the hinge string at chainage st_ch.

the offset of the hinge point is taken with respect to the original position of the hinge string at chainage end_ch.

If **type** is **linear** (the default), then the offset is varied linearly (with respect to the reference chainage) between the offsets at chainage st_ch and chainage end_ch.

If **type** is **cubic**, then the offset is varied as a reverse cubic (with respect to the reference chainage) between the offsets at chainage st_ch and chainage end_ch.



Offset to String

The offset for the hinge point can also be varied by **going out to another 12d Model string**.

offset st_ch end_ch full_string_name extra_start extra_end

where

st_ch start chainage for the modifier

end_ch end chainage for the modifier

full_string_name name of a 12d Model string to take the hinge point out to. The format of the string name is "model_name->string_name".

extra_start optional - adds in an extra x-section 0.1mm before start chainage

extra_end optional - adds in an extra x-section 0.1mm before end chainage

Height

The **height** modifier varies the height of the hinge point between the given chainages.

height st_ch end_ch st_height end_height absrel type extra_start extra_end

where

st_ch start chainage for the modifier

end_ch end chainage for the modifier

st_height height to be used at the start modifier chainage, st_ch

end_height height to be used at the end modifier chainage, end_ch.

absrel relative (default) or absolute

type linear (default) or cubic

extra_start optional - adds in an extra x-section 0.1mm before start chainage

extra_end optional - adds in an extra x-section 0.1mm before end chainage

If **absrel** is **relative** (the default) then

the st_height is added to the current height of the hinge point at chainage st_ch.

the end_height is added to the current height of the hinge point at chainage end_ch.

If **absrel** is **absolute**, then

the height of the hinge point is set to st_height above the original hinge string at chainage st_ch.

the height of the hinge point is set to end_height above the original hinge string at chainage end_ch.

If **type** is **linear** (the default), then the height is varied linearly (with respect to the reference chainage) between the height at chainage st_ch and chainage end_ch.

If **type** is **cubic**, then the height is varied as a reverse cubic (with respect to the reference chainage) between the height at chainage st_ch and chainage end_ch.

Height to String

The height of the hinge point can also be specified by **taking the height from another 12d Model string**.

height st_ch end_ch full_string_name extra_start extra_end

where

st_ch start chainage for the modifier

end_ch end chainage for the modifier

full_string_name name of a 12d Model string to take the hinge point height from. The format of the string name is "model_name->string_name".

extra_start optional - adds in an extra x-section 0.1mm before start chainage

`extra_end` optional - adds in an extra x-section 0.1mm before end chainage

Coord to String

The **coord** modifier is used to replace the x, y and z position of the hinge point by the x, y and z position of **another 12d Model string** between given chainages. Hence **coord** replaces the hinge string by another string between the given chainages.

```
coord st_ch end_ch full_string_name extra_start extra_end
```

where

`st_ch` start chainage for the modifier

`end_ch` end chainage for the modifier

`full_string_name` name of the **12d Model string** used to replace the hinge string between the chainages `st_ch` and `end_ch`. The format of the string name is "model_name->string_name".

`extra_start` optional - adds in an extra x-section 0.1mm before start chainage

`extra_end` optional - adds in an extra x-section 0.1mm before end chainage

Nohinge

The **nohinge** modifier is used to **stop** the hinge string (and hence the apply) between given chainages. This will leave a gap in the strings created by the apply between the given chainages.

```
nohinge st_ch end_ch extra_start extra_end
```

where

`st_ch` start chainage to stop the apply

`end_ch` end chainage for stopping the apply

`extra_start` optional - adds in an extra x-section 0.1mm before start chainage

`extra_end` optional - adds in an extra x-section 0.1mm before end chainage

Please continue to the next section "A Hinge Modifier Example" .

A Hinge Modifier Example

```
hinge_modifier = {
    offset  0 250 0 3 // linearly offset the hinge by 0 to 3
                // over the chainage range 0 to 250.
    height 125 300 2 2 // add 2 to the hinge height
                // over the chainage range 125 to 300.
    coord  300 400 "mod->new_string" // use the position of the string
                // new_string over the chainage
                // range 300 to 400.
    nohinge 400 500 2 2 // stop the apply between the chainages
                // over the chainage range 400 to 500.
}
```

Please continue to the next section "Template Modifiers" .

Template Modifiers File Format

In the many templates file, the **template modifier** definition begins with the key word

`left_side_modifier =`

and/or

`right_side_modifier =`

followed by one or more of the template modifier commands enclosing curly braces { }

(a) insert commands

insert, insert_cut, insert_fill

(b) remove commands

remove, remove_cut, remove_fill

(c) fixed link modifiers

**width, height, xfall, xfall_crc, copy_width, copy_height, copy_xfall,
tin_height, tin_xfall**

(d) stop and start decisions commands

decision

(e) variable cut and fill link modifiers

**cut_width, cut_height, cut_slope, copy_cut_width, copy_cut_height,
copy_cut_slope, tin_cut_height, tin_cut_slope**

**fill_width, fill_height, fill_slope, copy_fill_width, copy_fill_height,
copy_fill_slope, tin_fill_height, tin_fill_slope**

(f) final cut/fill link modifiers

final_width, final_cut_slope, final_no_cut_slope

final_fill_slope, final_no_fill_slope

That is,

```
left_side_modifier = {
                    } template modifier commands
```

and/or

```
right_side_modifier = {
                      } template modifier commands
```

The definition of the template modifier commands and their file format will now be given.

Please continue to the next section "Insert Modifiers".

Insert Modifiers

Fixed Link Insert

Fixed links can be created by one of three **insert** commands by specifying either width and height, width and xfall, or height and xfall.

insert link_name colour width height **unknown** st_ch end_ch *optional*// use width, height

insert link_name colour width **unknown** xfall st_ch end_ch *optional*// use width, xfall

insert link_name colour **unknown** height xfall st_ch end_ch *optional*// use height, xfall

where **unknown** takes the place of the one of width, height or xfall not being used, and

link_name	name of the link being created
colour	colour of the link being created
width, height, xfall	width, height or xfall of the created link
st_ch	start chainage for creating the link
end_ch	end chainage for creating the link

and *optional* can be none, one or more of the following

name	if non-blank, insert before the link name in the template if blank, then append after the last link of the fixed template table
extra_start	optional - adds in an extra x-section 0.1 mm before start chainage
extra_end	optional - adds in an extra x-section 0.1 mm before end chainage

Cut and Fill Link Insert

Cut and fill links can be created by one of three **insert** commands by specifying either width and height, width and slope, or height and slope.

insert_cut link_name colour width height **unknown** st_ch end_ch *optional*// width, ht

insert_fill link_name colour width height **unknown** st_ch end_ch *optional*// width, ht

insert_cut link_name colour width **unknown** slope st_ch end_ch *optional*// width, slope

insert_fill link_name colour width **unknown** slope st_ch end_ch *optional*// width, slope

insert_cut link_name colour **unknown** height slope st_ch end_ch *optional*// ht, slope

insert_fill link_name colour **unknown** height slope st_ch end_ch *optional*// ht, slope

where **unknown** takes the place of the one of width, height or slope not being used, and

link_name	name of the link being created
colour	colour of the link being created
width, height, slope	width, height or slope of the created link
st_ch	start chainage for creating the link
end_ch	end chainage for creating the link

and *optional* can be none, one or more of the following

name	if non-blank, insert before the link name in the template if blank, then append after the last link of the fixed template table
extra_start	optional - adds in an extra x-section 0.1 mm before start chainage
extra_end	optional - adds in an extra x-section 0.1 mm before end chainage

Please continue to the next section "Remove Modifiers" .

Remove Modifiers

Fixed, cut and fill links can be deleted by one of three **remove** commands:

remove link_list st_ch end_ch *optional*

remove_cut link_list st_ch end_ch *optional*

remove_fill link_list st_ch end_ch *optional*

where

link_list one or more names of links to be removed, in the form
name1 name2 ... namei

st_ch start chainage for removing the link

end_ch end chainage for removing the link

and *optional* can be none, one or two of

extra_start optional - adds in an extra x-section 0.1 mm before start chainage

extra_end optional - adds in an extra x-section 0.1 mm before end chainage

Please continue to the next section "Fixed Link Modifiers".

Fixed Link Modifiers

Width

The **width** modifier is used to modify the width of fixed links originally defined by width.

The format of the modifier to vary the **width** of the fixed links given by link_list is

width link_list st_ch end_ch st_wid end_wid absrel type extra_start extra_end

where

link_list one or more names of fixed links given in the template definition; with format
name1 name2 ... namei

st_ch start chainage for the modifier

end_ch end chainage for the modifier

st_wid width to be used at the start modifier chainage, st_ch

end_wid width to be used at the end modifier chainage, end_ch.

absrel relative (default) or absolute

type linear (default) or cubic

extra_start optional - adds in an extra x-section 0.1mm before start chainage

extra_end optional - adds in an extra x-section 0.1mm before end chainage

If **absrel** is **relative** (the default) then

the st_wid is added to the current width of links in link_list at chainage st_ch.

the end_wid is added to the current width of links in link_list at chainage
end_ch.

If **absrel** is **absolute**, then

the width of links in link_list are set to st_wid at chainage st_ch.

the width of links in link_list are set to end_wid at chainage end_ch.

If **type** is **linear** (the default), then the width of links in link_list are varied linearly (with respect to the reference chainage) between the width at chainage st_ch and chainage end_ch.

If **type** is **cubic**, then the width of links in link_list is varied as a reverse cubic (with respect to the reference chainage) between the width at chainage st_ch and chainage end_ch.

The width for a link can also be varied by **going out to another 12d Model string** or by taking the **width between two 12d Model strings**.

width link_list st_ch end_ch full_string_name side ext_start ext_end
width link_list st_ch end_ch str_name_1 side_1 str_name_2 side_2 ext_start ext_end
 where

link_list	one or more names of fixed links given in the template definition; with format name1 name2 ... namei
st_ch	start chainage for the modifier
end_ch	end chainage for the modifier
full_string_name	name of a 12d Model string to take links in link_list out to. The format of the string name is "model_name->string_name".
side	side to search for string: -1 for left, 0 for left and right, 1 for right
ext_start	optional - adds in an extra x-section 0.1mm before start chainage
ext_end	optional - adds in an extra x-section 0.1mm before end chainage
str_name_1	name of the first 12d Model string. The format of the string name is "model_name->string_name".
side_1	side to search for string_1: -1 for left, 0 for left and right, 1 for right
str_name_2	name of the second 12d Model string. The format of the string name is "model_name->string_name".
side_2	side to search for string_2: -1 for left, 0 for left and right, 1 for right

The **width** of links in link_list are taken to be the distance between **str_name_1** and **str_name_2**.

Width from Link

The **width from link** modifier is used to modify the width of fixed links originally defined by width to be the same as another link. That is, the width of the link is a copy of the width of another link.

The format of the modifier to vary the **width from link** of the fixed links given by link_list is

copy_width link_list st_ch end_ch from_link zone extra_start extra_end
 where

link_list	one or more names of fixed links given in the template definition; with format name1 name2 ... namei
st_ch	start chainage for the modifier
end_ch	end chainage for the modifier
from_link	name of link to take the width from
zone	section of the template that the from_link is from (i.e. fixed, cut or fill)
extra_start	optional - adds in an extra x-section 0.1mm before start chainage
extra_end	optional - adds in an extra x-section 0.1mm before end chainage

Height

The **height** modifier is used to modify the height of fixed links originally defined by height.

The format of the modifier to vary the **height** of the fixed links in the **link_list** is almost identical to varying the width and is:

height link_list st_ch end_ch st_ht end_ht absrel type extra_start extra_end
where

link_list one or more names of fixed links given in the template definition; with format name1 name2 ... namei
st_ch start chainage for the modifier
end_ch end chainage for the modifier
st_ht height to be used at the start modifier chainage, st_ch
end_wid height to be used at the end modifier chainage, end_ch.
absrel relative (default) or absolute
type linear (default) or cubic
extra_start optional - adds in an extra x-section 0.1mm before start chainage
extra_end optional - adds in an extra x-section 0.1mm before end chainage

If **absrel** is **relative** (the default) then

the st_ht is added to the current height of links in link_list at chainage st_ch.
the end_ht is added to the current height of links in link_list at chainage end_ch.

If **absrel** is **absolute**, then

the height of links in link_list are set to st_ht at chainage st_ch.
the height of links in link_list are set to end_ht at chainage end_ch.

If **type** is **linear** (the default), then the height of links in link_list are varied linearly (with respect to the reference chainage) between the height at chainage st_ch and chainage end_ch.

If **type** is **cubic**, then the height of links in link_list is varied as a reverse cubic (with respect to the reference chainage) between the height at chainage st_ch and chainage end_ch.

The height for a link can also be varied by **taking the height from a 12d Model string** or by taking the **height between two 12d Model strings**.

height link_list st_ch end_ch full_string_name side extra_start extra_end
height link_list st_ch end_ch str_name_1 side1 str_name_2 side2 extra_start extra_end
where

link_list one or more names of fixed links given in the template definition; with format name1 name2 ... namei
st_ch start chainage for the modifier
end_ch end chainage for the modifier
full_string_name name of a 12d Model string to take links in link_list out to. The format of the string name is "model_name->string_name".
side side to search for string: -1 for left, 0 for left and right, 1 for right
extra_start optional - adds in an extra x-section 0.1mm before start chainage
extra_end optional - adds in an extra x-section 0.1mm before end chainage
str_name_1 name of the first 12d Model string. The format of the string name is "model_name->string_name".
side2 side to search for string: -1 for left, 0 for left and right, 1 for right
str_name_2 name of the second 12d Model string. The format of the string name is "model_name->string_name".
side2 side to search for string: -1 for left, 0 for left and right, 1 for right
The **height** of links in link_list are taken to be the height between **str_name_1** and **str_name_2**.

Height from Link

The **height from link** modifier is used to modify the height of fixed links originally defined by height to be the same height as another link. That is, the height of the link is a copy of the height of another link.

The format of the modifier to vary the **height from link** of the fixed links given by link_list is

copy_height link_list st_ch end_ch from_link zone extra_start extra_end

where

link_list	one or more names of fixed links given in the template definition; with format name1 name2 ... namei
st_ch	start chainage for the modifier
end_ch	end chainage for the modifier
from_link	name of link to take the height from
zone	section of the template that the from_link is from (i.e. fixed, cut or fill)
extra_start	optional - adds in an extra x-section 0.1mm before start chainage
extra_end	optional - adds in an extra x-section 0.1mm before end chainage

Cross Fall

The **xfall** modifier is used to modify the cross fall of fixed links originally defined by xfall.

The format of the modifier to vary the cross-fall of the fixed links in the **link_list** is almost identical to varying the width and is:

xfall link_list st_ch end_ch st_xfall end_xfall absrel type extra_start extra_end

where

link_list	one or more names of fixed links given in the template definition; with format name1 name2 ... namei
st_ch	start chainage for the modifier
end_ch	end chainage for the modifier
st_xfall	xfall to be used at the start modifier chainage, st_ch
end_xfall	xfall to be used at the end modifier chainage, end_ch.
absrel	relative (default) or absolute
type	linear (default) or cubic
extra_start	optional - adds in an extra x-section 0.1mm before start chainage
extra_end	optional - adds in an extra x-section 0.1mm before end chainage

If **absrel** is **relative** (the default) then

the st_xfall is added to the current xfall of links in link_list at chainage st_ch.

the end_xfall is added to the current xfall of links in link_list at chainage end_ch.

If **absrel** is **absolute**, then

the xfall of links in link_list are set to st_xfall at chainage st_ch.

the xfall of links in link_list are set to end_xfall at chainage end_ch.

If **type** is **linear** (the default), then the xfall of links in link_list are varied linearly (with respect to the reference chainage) between the xfall at chainage st_ch and chainage end_ch.

cubic, then the xfall of links in link_list are varied as a reverse cubic (with respect to the reference chainage) between the xfall at chainage st_ch and chainage end_ch.

rotate, then the angle of the xfall of the links in link_list is varied linearly (with respect to the reference chainage) between the angle of the xfall at chainage st_ch and chainage end_ch.

The **xfall** of a link can be defined by using the xfall from the **beginning of the link** (i.e. the end of the previous link or the hinge string if it is the first link) **to another 12d Model string**, or by taking the **xfall between two 12d Model strings**.

```
xfall link_list st_ch end_ch full_string_name side extra_start extra_end
xfall link_list st_ch end_ch str_name_1 side1 str_name_2 side2 extra_start extra_end
```

where

link_list	one or more names of fixed links given in the template definition; with format name1 name2 ... namei
st_ch	start chainage for the modifier
end_ch	end chainage for the modifier
full_string_name	name of a 12d Model string to use to calculate xfall. The format of the string name is "model_name->string_name".
side	side to search for string: -1 for left, 0 for left and right, 1 for right
extra_start	optional - adds in an extra x-section 0.1mm before start chainage
extra_end	optional - adds in an extra x-section 0.1mm before end chainage
str_name_1	name of the first 12d Model string. The format of the string name is "model_name->string_name".
side1	side to search for string_1: -1 for left, 0 for left and right, 1 for right
str_name_2	name of the second 12d Model string.
side2	side to search for string_2: -1 for left, 0 for left and right, 1 for right

The **xfall** of links in link_list are taken to be the xfall between **str_name_1** and **str_name_2**.

Cross Fall Circular Reverse Curve

The **xfall_crc** modifier is used to modify the cross fall of fixed links originally defined by **xfall** using the circular reverse curve formula.

The format of the modifier to vary the cross-fall of the fixed links (using circular reverse curves) in the **link_list** is:

```
xfall_crc link_list st_ch end_ch st_xfall end_xfall st_len end_len extra_start extra_end
```

where

link_list	one or more names of fixed links given in the template definition; with format name1 name2 ... namei
st_ch	start chainage for the modifier
end_ch	end chainage for the modifier
st_xfall	xfall to be used at the start modifier chainage, st_ch
end_xfall	xfall to be used at the end modifier chainage, end_ch.
st_len	length of the start circular arc to be used at the start modifier chainage, st_ch.
end_len	length of the end circular arc to finish at the end modifier chainage, st_ch.
extra_start	optional - adds in an extra x-section 0.1mm before start chainage
extra_end	optional - adds in an extra x-section 0.1mm before end chainage

Xfall from Link

The **xfall from link** modifier is used to modify the xfall of fixed links originally defined by xfall to be the same xfall as another link. That is, the xfall of the link is a copy of the xfall of another link.

The format of the modifier to vary the **xfall from link** of the fixed links given by link_list is

copy_xfall link_list st_ch end_ch from_link zone extra_start extra_end

where

link_list one or more names of fixed links given in the template definition; with format name1 name2 ... namei

st_ch start chainage for the modifier

end_ch end chainage for the modifier

from_link name of the link to take the xfall from

zone section of the template that the from_link is from (i.e. fixed, cut or fill)

extra_start optional - adds in an extra x-section 0.1mm before start chainage

extra_end optional - adds in an extra x-section 0.1mm before end chainage

Important Note

The link to copy cross fall from can be defined in terms of cross fall or slope.

If the link to copy is defined by slope, then the cross fall is calculated to match the slope.

Tin Height

The **tin height** modifier is used to modify the height of the link so that the link will sit on the tin at the given width.

The tin height can only be used for a fixed link defined by width and height.

The format of the modifier to vary the **tin height** of the fixed links in the **link_list** is:

tin_height link_list st_ch end_ch tin_name extra_start extra_end

where

link_list one or more names of fixed links given in the template definition; with format name1 name2 ... namei

st_ch start chainage for the modifier

end_ch end chainage for the modifier

tin_name name of the tin to be used in defining the height.

extra_start optional - adds in an extra x-section 0.1mm before start chainage

extra_end optional - adds in an extra x-section 0.1mm before end chainage

Tin Xfall

The **tin xfall** modifier is used to modify the xfall of the link so that the link will sit on the tin at the given width.

The tin xfall can only be used for a fixed link defined by width and xfall.

The format of the modifier to vary the **tin xfall** of the fixed links in the **link_list** is:

tin_xfall link_list st_ch end_ch tin_name extra_start extra_end

where

link_list one or more names of fixed links given in the template definition; with format name1 name2 ... namei

st_ch start chainage for the modifier

end_ch end chainage for the modifier

tin_name name of the tin to be used in defining the xfall.

extra_start optional - adds in an extra x-section 0.1mm before start chainage

extra_end optional - adds in an extra x-section 0.1mm before end chainage

Please continue to the next section "Decision".

Decision

Each template is made up of the sections fixed, decisions, cut, fill and final cut/fill. If a template has a decisions section then by default it is used instead of the cut, fill and final cut/fill sections.

Hence by default, either the
decisions section

or

the cut, fill and final cut/fill sections

from the template being used over the chainage range.

Using the **decision** modifier, it is possible to override the default and for a given chainage range use the cut, fill and final cut/fill sections **instead** of the decisions section

or

use the decisions section **from another** template instead of the current templates sections.

The format of the decision modifier is

decision template_name st_ch end_ch *optional*

decision " " st_ch end_ch *optional*

where

template_name name of template to take the decision section from.

If the template name is given as " ", then the decision section for the template being used in the chainage range is ignored, and the cut, fill and final cut/fill tables for the template are used instead. Hence this overrides the default of using the decisions section in preference to the cut, fill and final cut/fill sections of the template.

st_ch start chainage for applying/removing the decision

end_ch end chainage for applying/removing the decision

and *optional* can be none, one or two of

extra_start optional - adds in an extra x-section 0.1 mm before start chainage

extra_end optional - adds in an extra x-section 0.1 mm before end chainage

Note

The full description of the **decisions** section of a template is given later in this chapter.

Please continue to the next section "Variable Link Modifiers".

Variable Link Modifiers

Cut and Fill Width

The **cut_width** modifier is used to modify the width of variable cut links originally defined by width. Similarly the **fill_width** modifier is used to modify the width of variable fill links originally defined by width.

The format of the modifier to vary the width of the variable cut/fill links in **link_list** is

cut_width link_list st_ch end_ch st_wid end_wid absrel type extra_start extra_end
fill_width link_list st_ch end_ch st_wid end_wid absrel type extra_start extra_end

where

<code>link_list</code>	one or more names of cut/fill links given in the template definition; with format <code>name1 name2 ... namei</code>
<code>st_ch</code>	start chainage for the modifier
<code>end_ch</code>	end chainage for the modifier
<code>st_wid</code>	width to be used at the start modifier chainage, <code>st_ch</code>
<code>end_wid</code>	width to be used at the end modifier chainage, <code>end_ch</code> .
<code>absrel</code>	relative (default) or absolute
<code>type</code>	linear (default) or cubic
<code>extra_start</code>	optional - adds in an extra x-section 0.1mm before start chainage
<code>extra_end</code>	optional - adds in an extra x-section 0.1mm before end chainage

If **absrel** is **relative** (the default) then

the `st_wid` is added to the current width of links in `link_list` at chainage `st_ch`.
the `end_wid` is added to the current width of links in `link_list` at chainage `end_ch`.

If **absrel** is **absolute**, then

the width of links in `link_list` are set to `st_wid` at chainage `st_ch`.
the width of links in `link_list` are set to `end_wid` at chainage `end_ch`.

If **type** is **linear** (the default), then the width of links in `link_list` are varied linearly (with respect to the reference chainage) between the width at chainage `st_ch` and chainage `end_ch`.

If **type** is **cubic**, then the width of links in `link_list` are varied as a reverse cubic (with respect to the reference chainage) between the width at chainage `st_ch` and chainage `end_ch`.

The **width** for a variable link can also be varied by **going out to another 12d Model string**.

cut_width `link_list st_ch end_ch full_string_name side extra_start extra_end`
fill_width `link_list st_ch end_ch full_string_name side extra_start extra_end`

where

<code>link_list</code>	one or more names of cut/fill links given in the template definition; with format <code>name1 name2 ... namei</code>
<code>st_ch</code>	start chainage for the modifier
<code>end_ch</code>	end chainage for the modifier
<code>full_string_name</code>	name of a 12d Model string to take links in <code>link_list</code> out to. The format of the string name is "model_name->string_name".
<code>side</code>	side to search for string: -1 for left, 0 for left and right, 1 for right
<code>extra_start</code>	optional - adds in an extra x-section 0.1mm before start chainage
<code>extra_end</code>	optional - adds in an extra x-section 0.1mm before end chainage

The **width** for a link can also be varied by using the **width between two 12d Model strings** `str_name_1` and `str_name_2`.

cut_width `link_list st_ch end_ch str_name_1 side1 str_name_2 side2 extra_start extra_end`
fill_width `link_list st_ch end_ch str_name_1 side1 str_name_2 side2 extra_start extra_end`

Cut and Fill Width from Link

The cut and fill **width from link** modifiers are used to modify the width of cut and fill links originally defined by width, to be the same as another link. That is, the width of the link is a copy of the width of another link.

The format of the modifier to vary the cut and fill **width from link** of the fixed links given by `link_list` is

copy_cut_width link_list st_ch end_ch from_link zone extra_start extra_end
copy_fill_width link_list st_ch end_ch from_link zone extra_start extra_end

where

link_list one or more names of fixed links given in the template definition; with format name1 name2 ... namei
st_ch start chainage for the modifier
end_ch end chainage for the modifier
from_link name of the link to take the width from
zone section of the template that the from_link is from (i.e. fixed, cut or fill)
extra_start optional - adds in an extra x-section 0.1mm before start chainage
extra_end optional - adds in an extra x-section 0.1mm before end chainage

Cut and Fill Height

The **cut_height** modifier is used to modify the height of variable cut links originally defined by height. Similarly the **fill_height** modifier is used to modify the height of variable fill links originally defined by height.

The format of the modifier to vary the height of the variable cut/fill links in **link_list** is

cut_height link_list st_ch end_ch st_ht end_ht absrel type extra_start extra_end
fill_height link_list st_ch end_ch st_ht end_ht absrel type extra_start extra_end

where

link_list one or more names of cut/fill links given in the template definition; with format name1 name2 ... namei
st_ch start chainage for the modifier
end_ch end chainage for the modifier
st_ht height to be used at the start modifier chainage, st_ch
end_ht height to be used at the end modifier chainage, end_ch.
absrel relative (default) or absolute
type linear (default) or cubic
extra_start optional - adds in an extra x-section 0.1mm before start chainage
extra_end optional - adds in an extra x-section 0.1mm before end chainage

If **absrel** is **relative** (the default) then

the st_ht is added to the current height of links in link_list at chainage st_ch.
the end_ht is added to the current height of links in link_list at chainage end_ch.

If **absrel** is **absolute**, then

the height of links in link_list are set to st_ht at chainage st_ch.
the height of links in link_list are set to end_ht at chainage end_ch.

If **type** is **linear** (the default), then the height of links in link_list are varied linearly (with respect to the reference chainage) between the height at chainage st_ch and chainage end_ch.

If **type** is **cubic**, then the height of links in link_list are varied as a reverse cubic (with respect to the reference chainage) between the height at chainage st_ch and chainage end_ch.

The **height** for a variable link can also be varied by **taking the height from a 12d Model string**.

cut_height link_list st_ch end_ch full_string_name side extra_start extra_end
fill_height link_list st_ch end_ch full_string_name side extra_start extra_end

where

link_list	one or more names of cut/fill links given in the template definition; with format name1 name2 ... namei
st_ch	start chainage for the modifier
end_ch	end chainage for the modifier
full_string_name	name of a 12d Model string to take links in link_list out to. The format of the string name is "model_name->string_name".
side	side to search for string: -1 for left, 0 for left and right, 1 for right
extra_start	optional - adds in an extra x-section 0.1mm before start chainage
extra_end	optional - adds in an extra x-section 0.1mm before end chainage

The **height** for a link can also be varied by using the **height between two 12d Model strings str_name_1 and str_name_2**.

cut_height link_list st_ch end_ch str_name_1 side1 str_name_2 side2 extra_start extra_end
fill_height link_list st_ch end_ch str_name_1 side1 str_name_2 side2 extra_start extra_end

Cut and Fill Height from Link

The cut and fill **height from link** modifiers are used to modify the height of cut and fill links originally defined by height, to be the same as another link. That is, the height of the link is a copy of the height of another link.

The format of the modifier to vary the cut and fill **height from link** of the fixed links given by link_list is

copy_cut_height link_list st_ch end_ch from_link zone extra_start extra_end
copy_fill_height link_list st_ch end_ch from_link zone extra_start extra_end

where

link_list	one or more names of fixed links given in the template definition; with format name1 name2 ... namei
st_ch	start chainage for the modifier
end_ch	end chainage for the modifier
from_link	name of the link to take the height from
zone	section of the template that the from_link is from (i.e. fixed, cut or fill)
extra_start	optional - adds in an extra x-section 0.1mm before start chainage
extra_end	optional - adds in an extra x-section 0.1mm before end chainage

Cut and Fill Slope

The **cut_slope** modifier is used to modify the slope of variable cut links originally defined by slope. Similarly the **fill_slope** modifier is used to modify the slope of variable fill links originally defined by slope.

The format of the modifier to vary the cut/fill slope of the variable links in **link_list** is

cut_slope link_list st_ch end_ch st_slope end_slope absrel type extra_start extra_end
fill_slope link_list st_ch end_ch st_slope end_slope absrel type extra_start extra_end

where

link_list	one or more names of cut/fill links given in the template definition; with format name1 name2 ... namei
st_ch	start chainage for the modifier
end_ch	end chainage for the modifier
st_slope	slope to be used at the start modifier chainage, st_ch
end_slope	slope to be used at the end modifier chainage, end_ch.
absrel	relative (default) or absolute
type	linear (default) or cubic
extra_start	optional - adds in an extra x-section 0.1mm before start chainage
extra_end	optional - adds in an extra x-section 0.1mm before end chainage

If **absrel** is **relative** (the default) then

the **st_slope** is added to the current slope of links in **link_list** at chainage **st_ch**.
the **end_slope** is added to the current slope of links in **link_list** at chainage **end_ch**.

If **absrel** is **absolute**, then

the slope of links in **link_list** is set to **st_slope** at chainage **st_ch**.
the slope of links in **link_list** is set to **end_slope** at chainage **end_ch**.

If **type** is **linear** (the default), then the slope of links in **link_list** is varied linearly (with respect to the reference chainage) between the slope at chainage **st_ch** and chainage **end_ch**.

cubic, then the angle of the slope of links in **link_list** are varied as a reverse cubic (with respect to the reference chainage) between the angle of the slope at chainage **st_ch** and chainage **end_ch**.

rotate, then the angle of the slope of the links in **link_list** are varied linearly (with respect to the reference chainage) between the angle of the slope at chainage **st_ch** and chainage **end_ch**.

The **slope** of a link can also be defined by using the slope from the **beginning of the link** (i.e. the end of the previous link or the hinge string if its the first link) to a given **12d** Model string.

cut_slope link_list st_ch end_ch full_string_name side extra_start extra_end
fill_slope link_list st_ch end_ch full_string_name side extra_start extra_end

where

link_list	one or more names of cut/fill links given in the template definition; with format name1 name2 ... namei
st_ch	start chainage for the modifier
end_ch	end chainage for the modifier
full_string_name	name of a 12d Model string to use to calculate slope. The format of the string name is "model_name->string_name".
side	side to search for string: -1 for left, 0 for left and right, 1 for right
extra_start	optional - adds in an extra x-section 0.1mm before start chainage

`extra_end` optional - adds in an extra x-section 0.1mm before end chainage

The **slope** of a link can also be defined by using the slope **between two 12d Model strings** `str_name_1` and `str_name_2`.

`cut_slope link_list st_ch end_ch str_name_1 side1 str_name_2 side2 extra_start extra_end`
`fill_slope link_list st_ch end_ch str_name_1 side1 str_name_2 side2 extra_start extra_end`

Cut and Fill Slope from Link

The cut and fill **slope from link** modifiers are used to modify the slope of cut and fill links originally defined by slope, to be the same **slope** or **xfall** as another link. That is, the slope of the link is a copy of the slope of another link.

The format of the modifier to vary the cut and fill **slope from link** of the fixed links given by `link_list` is

`copy_cut_slope link_list st_ch end_ch from_link zone extra_start extra_end`
`copy_fill_slope link_list st_ch end_ch from_link zone extra_start extra_end`

where

`link_list` one or more names of fixed links given in the template definition; with format `name1 name2 ... namei`
`st_ch` start chainage for the modifier
`end_ch` end chainage for the modifier
`from_link` name of the link to take the slope or xfall from
`zone` section of the template that the `from_link` is from (i.e. fixed, cut or fill)
`extra_start` optional - adds in an extra x-section 0.1mm before start chainage
`extra_end` optional - adds in an extra x-section 0.1mm before end chainage

Important Note

The link to copy slope from can be defined in terms of slope or **cross fall**.

If the link to copy is defined by cross fall, then the slope is calculated to match the cross fall.

Hence this command can be used with cut and fill slopes to match to rotation of cross fall of fixed links for super-elevation.

Cut and Fill Tin Height

The **cut and fill tin height** modifiers are used to modify the height of the link so that the link will sit on the tin at the given width.

The tin height can only be used for a cut or fill link defined by width and height.

The format of the modifiers to vary the **cut and fill tin height** of the links in the `link_list` are:

`tin_cut_height link_list st_ch end_ch tin_name extra_start extra_end`
`tin_fill_height link_list st_ch end_ch tin_name extra_start extra_end`

where

`link_list` one or more names of cut/fill links given in the template definition; with format `name1 name2 ... namei`
`st_ch` start chainage for the modifier
`end_ch` end chainage for the modifier
`tin_name` name of the tin to be used in defining the height.
`extra_start` optional - adds in an extra x-section 0.1mm before start chainage
`extra_end` optional - adds in an extra x-section 0.1mm before end chainage

Cut and Fill Tin Slope

The **cut and fill tin slope** modifier is used to modify the slope of the link so that the link will sit on the tin at the given width.

The cut and fill tin slope can only be used for a cut/fill link defined by width and slope.

The format of the modifiers to vary the **cut and fill tin slope** of the links in the **link_list** are:

```
tin_cut_slope link_list st_ch end_ch tin_name extra_start extra_end
tin_fill_slope link_list st_ch end_ch tin_name extra_start extra_end
```

where

link_list one or more names of fixed links given in the template definition; with format name1 name2 ... namei

st_ch start chainage for the modifier

end_ch end chainage for the modifier

tin_name name of the tin to be used in defining the slope.

extra_start optional - adds in an extra x-section 0.1mm before start chainage

extra_end optional - adds in an extra x-section 0.1mm before end chainage

Please continue to the next section "Final Link Modifiers" .

Final Link Modifiers

Final Width

The format of the modifier to **vary the width** of the final cut and fill link **link_name** is

```
final_width link_name st_ch end_ch st_wid end_wid absrel type extra_start extra_end
```

where

link_name name of final link given in the template definition

st_ch start chainage for the modifier

end_ch end chainage for the modifier

st_wid width to be used at the start modifier chainage, **st_ch**

end_wid width to be used at the end modifier chainage, **end_ch**.

absrel relative (default) or absolute

type linear (default) or cubic

extra_start optional - adds in an extra x-section 0.1mm before start chainage

extra_end optional - adds in an extra x-section 0.1mm before end chainage

If **absrel** is **relative** (the default) then

the **st_wid** is added to the current width of **link_name** at chainage **st_ch**.

the **end_wid** is added to the current width of **link_name** at chainage **end_ch**.

If **absrel** is **absolute**, then

the width of **link_name** is set to **st_wid** at chainage **st_ch**.

the width of **link_name** is set to **end_wid** at chainage **end_ch**.

If **type** is **linear** (the default), then the width of **link_name** is varied linearly (with respect to the reference chainage) between the width at chainage **st_ch** and chainage **end_ch**.

If **type** is **cubic**, then the width of **link_name** is varied as a reverse cubic (with respect to the reference chainage) between the width at chainage **st_ch** and chainage **end_ch**.

Final Cut and Fill Slope

The format of the modifier to vary the cut/fill slope of the final link **link_name** is

final_cut_slope link_name st_ch end_ch st_slope end_slope absrel type ext_st ext_end
final_fill_slope link_name st_ch end_ch st_slope end_slope absrel type ext_st ext_end

where

link_name	name of final link given in the template definition
st_ch	start chainage for the modifier
end_ch	end chainage for the modifier
st_slope	slope to be used at the start modifier chainage, st_ch
end_slope	slope to be used at the end modifier chainage, end_ch.
absrel	relative (default) or absolute
type	linear (default) or cubic
ext_st	optional - adds in an extra x-section 0.1mm before start chainage
ext_end	optional - adds in an extra x-section 0.1mm before end chainage

If **absrel** is **relative** (the default) then

the st_slope is added to the current slope of link_name at chainage st_ch.

the end_slope is added to the current slope of link_name at chainage end_ch.

If **absrel** is **absolute**, then

the slope of link_name is set to st_slope at chainage st_ch.

the slope of link_name is set to end_slope at chainage end_ch.

If **type** is **linear** (the default), then the slope of link_name is varied linearly (with respect to the reference chainage) between the slope at chainage st_ch and chainage end_ch.

cubic, then the angle of the slope of link_name is varied as a reverse cubic (with respect to the reference chainage) between the angle of the slope at chainage st_ch and chainage end_ch.

Stopping Final Cut and Fill Slope

The final link can be stopped altogether in either cut or fill.

The format of the modifier to stop the cut/fill slope of the final link link_name is

final_no_cut_slope link_name st_ch end_ch extra_start extra_end
final_no_fill_slope link_name st_ch end_ch extra_start extra_end

where

link_name	name of final link given in the template definition
st_ch	start chainage for the final link to stop
end_ch	end chainage for the final link to stop
extra_start	optional - adds in an extra x-section 0.1mm before start chainage
extra_end	optional - adds in an extra x-section 0.1mm before end chainage

Please continue to the next section "A Template Modifier File Example".

A Template Modifier File Example

```
left_side = {
  -99999.9  "std"
  99999.9
}

right_side = {
  -99999.9  "std"
  99999.9
}
```

```

//                                     -- assumes ---
left_side_modifier = {
  width "kerb" 103 203.0 0.0 3.0 absolute linear // widen from width 0 to width 3 - linear
  width "kerb" 203.0 303.0 3.0 3.0 absolute // keep width at 3
  width "kerb" 303.0 403.0 3.0 0.0 absolute // widen from width 3 to width 0 - linear
  width "kerb" 153.0 253.0 0.0 9.0 cubic relative
  width "kerb" 253.0 353.0 9.0 0.0 cubic // relative is default
  xfall "kerb" 53.0 153.0 0.0 6.0 relative linear
  xfall "kerb" 153.0 353.0 6.0 6.0 relative // linear
  xfall "kerb" 353.0 453.0 6.0 0.0 // relative & linear
  width "kerb" 440.0 480.0 "table drain->table drain" extra_start extra_end
  xfall "kerb" 440.0 480.0 "table drain->table drain" extra_start extra_end
  width "kerb" 440.0 480.0 1.0 1.0 relative
  cut_width "a" 103.0 203.0 0.0 9.0
  cut_width "a" 203.0 303.0 9.0 9.0
  cut_width "a" 303.0 403.0 9.0 0.0
  cut_slope "a" 103.0 203.0 0.0 3.0
  cut_slope "a" 203.0 303.0 3.0 3.0
  cut_slope "a" 303.0 403.0 3.0 0.0
  cut_width "a" 500.0 520.0 "table drain->table drain" extra_start extra_end
  cut_slope "a" 500.0 520.0 "table drain->table drain" extra_start extra_end
  fill_width "a" 103.0 203.0 0.0 9.0
  fill_width "a" 203.0 303.0 9.0 9.0
  fill_width "a" 303.0 403.0 9.0 0.0
  fill_slope "a" 103.0 203.0 0.0 3.0
  fill_slope "a" 203.0 303.0 3.0 3.0
  fill_slope "a" 303.0 403.0 3.0 0.0
  fill_width "a" 560.0 610.0 "table drain->table drain" extra_start extra_end
  fill_slope "a" 560.0 610.0 "table drain->table drain" extra_start extra_end
  final_width "final" 103.0 403.0 100.0 50.0
  final_cut_slope "final" 103.0 403.0 0.0 3.0
  final_fill_slope "final" 103.0 403.0 0.0 2.0
  final_no_cut_slope "final" 190.0 310.0 extra_start extra_end
  final_no_fill_slope "final" 190.0 310.0 extra_start extra_end
}
right_side_modifier = {
}

```

Stripping File Format

The stripping depth is given in the many templates file (*.mtf) and is similar to the format for applying templates except there is no separate left and right side.

The stripping definition begins with the key words

```
stripping =
```

A list of chainages (in ascending order, one per line) with corresponding stripping depth then follows. The list of chainages and stripping depths is enclosed in curly braces {}.

The chainage-stripping lists are assembled as follows

- (a) to represent a stripping depth starting at a given chainage, the chainage value followed by the stripping depth is given. The chainage and stripping depth are separated by one or more spaces. For example, the stripping depth **0.03** starting at chainage 150 is represented by

```
150           0.03
```

The stripping depth is assumed to apply until the chainage given on the next line of the stripping definition.

If the stripping depth is to go to the end of the reference string, add a line with a chainage greater than or equal to the end chainage. For example

```
150           0.03
9999          0.0
```

Warning - unlike applying templates, a stripping depth **must exist** after a chainage, however the stripping depth can be zero.

- (b) linearly varying stripping depth between chainages is represented by giving the **start chainage** for the variation followed on the same line by the **start depth** and the **end depth** separated by a comma.

The linear change takes place over the interval beginning at this chainage and ending at the chainage given on the next line of the stripping definition.

For example, to linearly vary the stripping depth from 0.02 to 0.03 between the chainages 350 and 500, use

```
350           0.02 , 0.03
500           0.03
```

A Stripping Example

An example of a stripping command is

```
stripping = {
                -999      0.03
                30       0.0
                70       0.03,0.05
                110.5    0.05
                999      0.05
            }
```

Boxing File Format

Apart from a key word specifying whether the following part of the definition is for the left or the right, the set out for the left boxing is identical to the right boxing. Hence only the left boxing will be described in detail.

The left boxing definition begins with the key words

```
left_boxing =
```

A list of chainages (in ascending order, one per line) with corresponding boxing names then follows. The list of chainages and boxing is enclosed in curly braces { }.

The chainage-boxing lists are assembled as follows

- (a) to represent a boxing starting at a given chainage, the chainage value followed by the boxing name is given. The chainage and boxing name are separated by one or more spaces.

For example, the boxing **left** starting at chainage 150 is represented by

```
150      left
```

The boxing is assumed to apply until the chainage given on the next line of the `left_boxing` definition.

- (b) if no boxing exists from a chainage, simply include the chainage with no boxing name following it. For example, if there is no boxing from chainage 250, this is represented by

```
250
```

The non-existence of boxing is assumed until the chainage given on the next line of the `left_side` definition.

If the boxing is to go to the end of the reference string, add a line with a chainage greater than or equal to the end chainage. For example

```
150      left
9999
```

When using the **apply many** option, the name of the boxing definitions file is given by a **boxing_file** command in the **many templates file**.

```
boxing_file =      boxing_definitions_file
```

When using the **boxing many** option, if a file name is given in the **boxing file** panel field, it is used for the boxing definitions file, otherwise the `boxing_file` command in the many templates file is used.

Note - if the boxing name includes spaces, then the name must be enclosed in quotes ". For example, "left 1".

An Applying Boxing Example

```
boxing_file = "boxing_for_client.bf"
left_boxing = {
                -999      left
                30
                70        "left narrow"
                110.5     left
                999
            }
right_boxing = {
                -999      right
                30
                70        "right narrow"
                110.5     right
                999
            }
```

Warning - no interpolation or modifiers exist for boxing.

Width File Format

The format for **section width** in the mtf file is simply

```
section_width = value // default is 10000
```

where *value* is the distance to search from the hinge string for strings required in some options. If `section_width` is missing, then it takes the default value of 10000.

For example

```
section_width = 100.0
```

String Modifiers File Format

In the many templates file, the **string modifiers** definition begins with the key word

```
string_modifiers =
```

followed by one or more occurrences of the string modifier command **height** enclosed by curly braces { }

The definition of the string modifier commands will now be given.

Height

The *height* the Height string modifier calculates for the amend point is given by:

- (a) if the absolute flag is not set, the height of the hinge point, otherwise zero.
plus
- (b) the interpolated height for the user given heights at the start and end chainages
plus
- (c) the interpolated height for the user given cross falls at the start and end chainage.

That is, if the absolute flag is not set:

$$\mathbf{new\ height} = \text{hinge height} + (\text{interpolated height}) + (\text{interpolated xfall}) \times (\text{offset distance})$$

If the absolute flag is set:

$$\mathbf{new\ height} = (\text{interpolated height}) + (\text{interpolated xfall}) \times (\text{offset distance})$$

The format of the Height string modifier is

height amend_str ref_str hinge_str st_ch end_ch ch_int st_xfall end_xfall st_ht end_ht absolute

where

amend_str	name of a 12d Model string to take the hinge point out to. The format of the string name is "model_name->string_name".
ref_str	name of reference string. The format of the string name is "model_name->string_name".
hinge_str	name of hinge string. The format of the string name is "model_name->string_name".
st_ch	start chainage for the modifier
end_ch	end chainage for the modifier
ch_int	interval between chainage points - can be the word <i>null</i>
st_xfall	xfall to be used at the start modifier chainage, st_ch
end_xfall	xfall to be used at the end modifier chainage, end_ch.
st_ht	height to be used at the start modifier chainage, st_ch
end_ht	height to be used at the end modifier chainage, end_ch.
absolute	<i>optional</i> - if it exists, include the height of the hinge string

Height and Two Strings

The *height* the Height 2x string modifier calculates for the amend point is given by:

(a) the height of the hinge point

plus

(b) the offset distance multiplied by the cross fall between two user selected strings.

$$\text{new height} = \text{hinge height} + (\text{xfall between string 1 and string 2}) \times (\text{offset distance})$$

The format of the Height 2x string modifier is

height amend_str ref_str hinge_str st_ch end_ch ch_int xfall_str1 xfall_str2

where

amend_str name of a 12d Model string to take the hinge point out to. The format of the string name is "model_name->string_name".

ref_str name of reference string. The format of the string name is "model_name->string_name".

hinge_str name of hinge string. The format of the string name is "model_name->string_name".

st_ch start chainage for the modifier

end_ch end chainage for the modifier

ch_int interval between chainage points - can be the word *null*

xfall_str_1 name of first string to calculate cross fall between. The format of the string name is "model_name->string_name".

xfall_str_2 name of second string to calculate cross fall between. The format of the string name is "model_name->string_name".

Substitutions in the Many Templates File

The **many template variables** are special variables standing for information about the reference string used in the apply many operation.

The many template variables are only evaluated when the many template file is used in an **apply many** operation and provide a mechanism to generalize the many template file.

The many template file also recognizes the CCCP preprocessor rules including #include, #define, #if etc.

Many Template Variables

The list of the many template variables is:

\$tangent_curve_n	chainage of the tangent curve point for the nth HIP
\$tangent_spiral_n	tangent spiral
\$curve_spiral_n	curve spiral
\$spiral_curve_n	spiral curve
\$curve_spiral_n	curve spiral
\$spiral_tangent_n	spiral tangent
\$curve_tangent_n	curve tangent
\$start_spiral_n	length of the start spiral on the nth HIP point
\$end_spiral_n	length of the end spiral
\$radius_n	absolute radius of the curve
\$signed_radius_n	signed radius of the curve
\$vertical_tangent_curve_n	chainage of the tangent curve point for the nth VIP
\$vertical_curve_tangent_n	chainage of the curve tangent point for the nth VIP
\$vertical_sag_n	chainage of the sag point for the nth HIP
\$vertical_crest_n	crest
\$vertical_crest_sag_n	crest or sag

For example,

\$tangent_spiral_3 get the chainage for the tangent spiral on HIP 3.

The variables can be used in expressions with the arithmetic operations +, -, * and / as long as the expression is surrounded by round brackets ().

For example, in the width command:

```
width E ($tangent_spiral_2 - 50) ($tangent_spiral_2 + 50) 3 5 absolute
```

the expression (\$tangent_spiral_2 - 50) will yield the chainage of fifty metres before the tangent spiral point of the second HIP point.

The variables can also be used in #define's and #include's according to the following CCCP rules.

(a) **#define** *NAME* *Expansion of NAME*

if the #define is longer than one line, the backslash character \ is added to the end of each line that has another line of the #define following to indicate that the #define continues to the next line.

- (b) **#define** can be used to define a block of things with more than one argument

For example,

```
#define SUPER(name,ip,xf1,xf2) \
\
xfall name START_TAPER(ip) xf1 xf2 absolute \
xfall name FIXED_TAPER(ip) xf2 xf2 absolute \
xfall name END_TAPER(ip) xf2 xf1 absolute
```

means that SUPER("EB",3,-3.0,3.0) will be expanded to the three lines:

```
xfall "EB" START_TAPER(3) -3.0 3.0 absolute
xfall "EB" FIXED_TAPER(3) 3.0 3.0 absolute
xfall "EB" END_TAPER(3) 3.0 -3.0 absolute
```

Note that \ is used to indicate that the #define continues to the next line.

- (c) **(if (express) {expression1} else {expression 2})**

is an expression *express*, which evaluates to

if *express* is true, then the value of the expression is *expression1* otherwise *expression 2*.

- (d) **word##p**

is equivalent to **wordp**

- (e) **#include file_name**

A number of #defines can be placed in a file and included in the mtf by using the #include.

As an example combining the above rules, the meaning of

```
LEADING_TAPER_START(2)
```

given by the following \$define:

```
#define LEADING_TAPER_START(ip) ( if($radius_##ip < 75) {$tangent_spiral_##ip - 50}\
else { $tangent_spiral_##ip - 75 } )
```

is

if the radius of the second HIP is less than 75, then set LEADING_TAPER_START(2) to the chainage of the tangent spiral point of the second HIP point, less fifty metres, **otherwise** LEADING_TAPER_START(2) is set to the chainage of the tangent spiral point of the second HIP point, less seventy five metres

A more complicated example now follows which shows how #defines can be used to easily apply super-elevation according to rules involving leading and trailing spirals.

```
// -----
#define LEADING_TAPER_START(ip) ( if($radius_##ip < 75)\
{ $tangent_spiral_##ip - 50 } else { $tangent_spiral_##ip - 75 } )

// Note: LEADING_TAPER_START evaluates to a chainage.

#define LEADING_TAPER_END(ip) ( if($radius_##ip < 75)\
{ $tangent_spiral_##ip + 10 } else { $tangent_spiral_##ip + 25 } )

// Note: LEADING_TAPER_END evaluates to a chainage.

#define TRAILING_TAPER_START(ip) ( if($radius_##ip < 75)\
{ $spiral_tangent_##ip - 10 } else { $spiral_tangent_##ip - 25 } )

// Note: TRAILING_TAPER_START evaluates to a chainage.

#define TRAILING_TAPER_END(ip) ( if($radius_##ip < 75)\
{ $spiral_tangent_##ip + 50 } else { $spiral_tangent_##ip + 75 } )
```

```

// Note: TRAILING_TAPER_END evaluates to a chainage.
#define START_TAPER(ip) LEADING_TAPER_START(ip)\
    LEADING_TAPER_END(ip)

// Note: START_TAPER evaluates to two chainages:    chainge1  chainage2.
#define FIXED_TAPER(ip) LEADING_TAPER_END(ip)\
    TRAILING_TAPER_START(ip)

// Note: FIXED_TAPER evaluates to two chainages:    chainge1  chainage2.
#define END_TAPER(ip) TRAILING_TAPER_START(ip)\
    TRAILING_TAPER_END(ip)

// Note: TRAILING_TAPER evaluates to two chainages:    chainge1  chainage2.

#define SUPER(name, ip, x1, x2) \
\
    xfall name START_TAPER(ip) x1 x2 absolute \
    xfall name FIXED_TAPER(ip) x2 x2 absolute \
    xfall name END_TAPER(ip) x2 x1 absolute

```

With the above #defines, SUPER evaluates to three lines of xfall template modifiers which rotates cross-fall, keeps it constant and then counter-rotates the cross-fall about leading and trailing spirals for an HIP point.

For example,

```
SUPER(EB,2,-3,3)
```

would give expand to the following three lines of xfall commands for link **EB** which will rotate xfall from -3 to 3, hold it at 3 and then rotate it back from 3 to -3, all about the leading and trailing spirals for horizontal intersection point number two:

```

xfall EB begin_chainage_for_start_taper end_chainage_for_start_taper -3 3 absolute
xfall EB begin_chainage_for_fixed_taper end_chainage_for_fixed_taper_ch 3 3 absolute
xfall EB begin_chainage_for_end_taper end_chainage_for_end_taper 3 -3 absolute

```

The above definitions of SUPER could be placed in a file, say

```
f:\12d\12dmodel\library\super_mtf.def
```

and then simply included into a mtf file using the a #include:

```
#include f:\12d\12dmodel\library\super_mtf.def
```

Examples of Substitutions in the Many Templates File

The following example shows how #defines can be used to easily apply super-elevation according to rules involving leading and trailing spirals.

The definition of SUPER is given in the file, f:\12d\12dmodel\library\super_mtf.def, which is simply included in the mtf file using a #include.

```
// -----
// include the file containing the definition of SUPER
// -----

#include "f:\12d\12dmodel\library\super_mtf.def"

// -----
// apply templates left and right and then modifier them
// -----

left_side = {
    -999999 std
    999999
}

right_side = {
    -999999 std
    999999
}

specials = {
}

hinge_modifier = {
}

left_side_modifier = {
// linearly widen the link EB by 12 metres and bring it back
// in again.

width EB ($tangent_spiral_2 - 50) ($tangent_spiral_2 + 50) 0 12
width EB ($tangent_spiral_2 + 50) ($spiral_tangent_7 - 50) 12 12
width EB ($spiral_tangent_7 - 50) ($spiral_tangent_7 + 50) 12 0

// define superelevation

    SUPER(EB,2,-3,3)
    SUPER(EB,4,-3,3)
    SUPER(EB,5,-3,3)
    SUPER(EB,6,-3,3)
}

right_side_modifier = {

    SUPER(EB,3,-3,3)
    SUPER(EB,7,-3,3)
}

stripping = {
}

//boxing_file = "yourfile.bf"
```

```
left_boxing = {  
}  
right_boxing = {  
}  
string_modifiers = {  
}  
//section_width = 10000.0
```

Full Definition of Boxing

Defining and applying boxing is similar to applying templates.

First there needs to be a file **defining the boxing** across a section (the boxing definition file, ending in .bf) and then there are commands for **applying the boxing definitions** along the reference string.

The boxing can be applied using any of the commands

- (a) apply many
- (b) boxing
- (c) boxing many.

For the **apply many** command, the boxing is defined in terms of the string names from the applied templates (**after** the LHS and RHS prefix adjustments).

For both the **boxing** and **boxing many** commands, the boxing is applied to a model of 4d strings representing x-sections across the whole road.

These labelled 4d strings can be generated by either

- (a) cuts through strings
- (b) apply many with the flag "sections as 4d" set

and the **text** at each point in the 4d string (point text) is the **name of the string** that the section cuts through at that point.

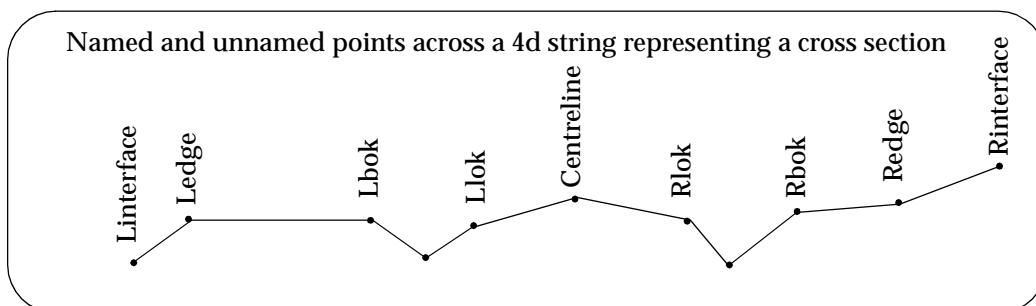
For the boxing to work properly, the string names created by the apply many, or the point names across the 4d string, must be unique for that section.

Note - in an apply many, the LHS, RHS prefix flag can be used to give strings different names even when the same template is used on the left and the right side.

Boxing sections are generated by the apply many, boxing and boxing commands but boxing strings are only generated by the apply many command. For the other cases, the option Strings=>Utilities=>Strings from sections can be used to create the boxing strings from the boxing sections.

Boxing Definitions

Boxing is defined by a series of commands going from **left to right** across the points of a cross section. (Cross sections are generated as 4d strings or super strings by options such as **apply** and **cuts**).



The definitions of boxing cross sections are set up in a file ending in .bf (called the boxing file) and any number of boxing definitions can be placed in the boxing file as long as each boxing definition is given a unique name.

The boxing file can be created with an editor or interactively from within 4d.

The interactive definition will now be described and the definition of the actual commands written to the file will be given later.

The boxing commands apply from the offset specified at the beginning of that command (**start offset** for the command) to the start offset of the **next** boxing command (like chainages and templates in the mtf). Hence the **end offset** for a command is the start offset of the following command in the file.

The **offsets** can be **fixed** values or can be specified **relative** to a point name on the super string or 4d string representing the x-section. One restriction is that all the points mentioned in a boxing definition, must be present in each x-section the boxing definition is applied to.

The terminology used to specify an offset relative to a point name is "relative point offset" and is defined to be the offset at a given named point on the cross section, plus a given offset value.

That is

take the **offset at** the 4d point or super string point called "**point name**" and add "**offset value**" to it (the offset value can be positive or negative).

If the "point name" is blank, then the "offset value" is taken to be the *actual* offset on the super string.

Hence the *offset* can be specified as either an actual **offset value** or given **relative to the name of a point** on the super string (**relative offset**). For convenience, the offset will be denoted by **relative point offset**.

The major advantage of defining boxing in terms of point names is that whenever the points are modified using template modifiers, the boxing across the section is also automatically modified.

A boxing definition may be used in either a `left_boxing` or `right_boxing` mtf command (see the section, creating boxing), however unlike the case for templates, the boxing definition is applied to the point names going from left to right regardless of whether the boxing definition is used on the left or the right.

In practice, the definitions for left and right boxing are usually different because of the necessity of having unique point names across the entire cross section.

Vertical Walls

If a boxing definition creates two different height values at the one offset (i.e. a wall), then extra offset points are automatically inserted into the boxing x-section (at 0.1 mm from the previous point) so that no points are on top of each other.

So in effect a vertical wall is created but since no points are created that are directly above each other, the data can be triangulated.

Please continue to the next section "Edit Boxing File" .

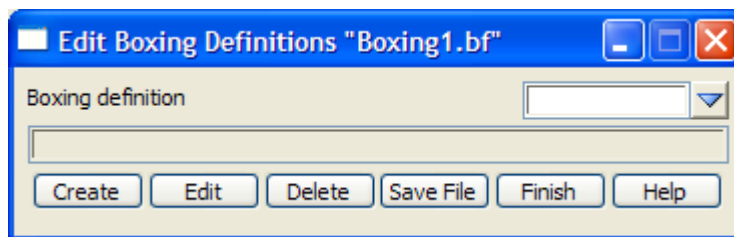
Edit Boxing File

edit_boxing_definitions

The option Design =>Boxing =>Create creates a boxing definition file and then brings up the **Edit Boxing Definitions** panel to create the actual boxing definitions (rules) to save in the boxing definitions file.

Similarly selecting a boxing file from the walk-right list of Design =>Boxing =>Edit also brings up the **Edit Boxing Definitions** panel to create/edit boxing definitions from the selected definitions file.

The **Edit Boxing Definitions** panel is



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Boxing definition	input		boxing definitions in file

name of the boxing definition (in the current boxing file) to create or edit.

Create button

*create a boxing definition with name given by the boxing definition panel field
If the boxing definition given in the boxing definition field **does not exist**, then the **boxing rules panel** is placed on the screen and is used to created the new boxing definitions for the boxing file.
If the boxing definition already exists, then nothing will happen on selecting **create**.*

Edit button

*edit an existing boxing definition with name given by the boxing definition panel field
If the boxing definition given in the boxing definition field **exists**, then the **boxing rules panel** is placed on the screen and is used to edit the existing boxing definitions for the boxing file.
If the boxing definition does not exist exists, then nothing will happen on selecting **edit**.*

Delete button

*delete an existing boxing definition with name given by the boxing definition panel field
A **yes-no** panel confirms the deletion.*

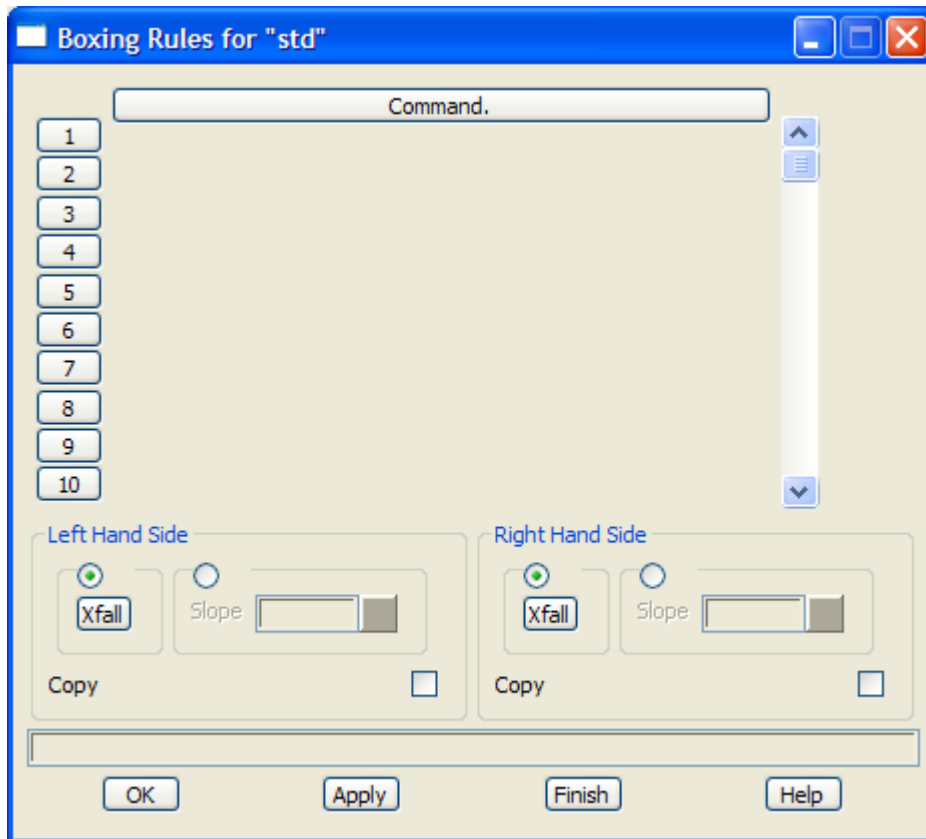
Save file button

save the boxing file with the boxing definitions to disk.

For more information on how Boxing works in 12d Model, please go to the section "Boxing".

boxing_rules_for

Selecting the **Create** or **Edit** button brings up the **Boxing Rules** panel which is used to build up the boxing definition from the rules described in the following sections.



The **Boxing Rules** panel consists of a scrolling command field, LHS and RHS xfall buttons, LHS and RHS slope fields, LHS and RHS copy tick box boxes and an **OK** or **Apply** button to record the results. The Commands and the LHS xfall and RHS xfall options will be described separately

The other fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Commands	Scrolling table		
-----------------	-----------------	--	--

commands for defining the boxing. The commands will be described in the next section.

Left Hand Side

LHS Xfall	button
------------------	--------

brings up the LHS Xfall panel which is described in the later section "LHS Xfall" .

or

LHS slope	input
------------------	-------

If non-zero, a batter with the given slope is applied to the left at the beginning of the boxing and goes until it intersects the design section. The intersection point is added as the first point in the boxing. If no intersection is made, nothing is added to the boxing. A positive slope is up and negative down.

LHS copy	tick box
-----------------	----------

if tick, then the design section from the beginning of the design section to the beginning of the boxing section is copied to the beginning of the boxing section. Hence the LHS copy flag is used to begin the boxing section with the start of the design section (a full width left side boxing section).

If not tick, nothing is done

Right Hand Side

RHS Xfall	button
------------------	--------

brings up the *RHS Xfall* panel which is described in the later section “*RHS Xfall*” .

or

RHS slope input

if non-zero, a batter with the given slope is applied to the right at the right end of the boxing and goes until it intersects the design section. The intersection point is used as the next point in the boxing. If no intersection is made, nothing is added to the boxing. A positive slope is up and negative down.

RHS copy tick box

*if tick, then the design section from the from the last boxing point to the last point on the design section is copied to the end of the boxing section. Hence the *RHS copy* flag is used to continue the boxing section from the intersection point with the design section to the end of the design section (a full width right side boxing section).*

If not tick, nothing is done

OK/Apply button

OK stores the values in the fields and removes the panel.

Apply stores the values and leaves the panel on the screen.

Notes

1. The **Left xfall** command **takes precedence over** the **Left slope** command. That is, if both commands exist then only the *Left xfall* command is used. Both *Left xfall* and *Left slope* can be missing. Similarly for the *Right xfall* and *Right slope* commands.
2. When a boxing definition is applied on the left side in the mtf, any *Right xfall*, *Right slope* or *Right copy* is ignored. Similarly, when a boxing definition is applied on the right side in a mtf, any *Left xfall*, *Left slope* or *Left copy* is ignored.

Hence a boxing definition can have all of *Left xfall*, *Left slope*, *Left copy*, *Right xfall*, *Right slope* and *Right copy* but which set is used depends on whether the boxing definition is used on the left or the right.

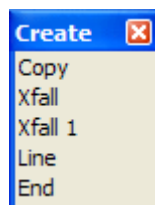
When the **Boxing** panel is used to create the boxing it is applied to a complete section at once so only one boxing definition is needed and all of the *Left xfall*, *Left slope*, *Left copy*, *Right xfall*, *Right slope* and *Right copy* commands are used.

For more information on how Boxing works in 12d Model, please go to the section “Boxing” .

[boxing_rule_create](#)

Commands for Boxing Rules Panel

If the command line is **empty**, clicking LB in the command line will bring up the Create menu which contains all the available boxing commands.



Selecting a menu item will bring up an associated panel which displays the information required for the modifier command.

When the panel is filled in and **OK** or **Apply** selected, the panel information is written out to the command line in the correct format for that modifier command.

If the command line is **not empty**, clicking LB in the command line will bring up the associated

panel for the modifier command in the command line.

The information in the panel can be changed and if **OK** or **Apply** is selected, the changed panel information is written out to the command line in the correct format for that modifier command.

Each of the panels created by selecting a command from the Create menu, will now be described. For reference purposes, the typed format of the command will be given for each panel although the typed format will not be described until later in the manual.

For documentation on the option/menus on the boxing *Create* menu:

- for *Copy*, go to the section "Copy" .
- X-fall* "Xfall - line through a point with a given crossfall" .
- X-fall 1* "Xfall 1 - line through a point with a crossfall taken from a point" .
- Line* "Line - line through two points" .
- End* "End" .

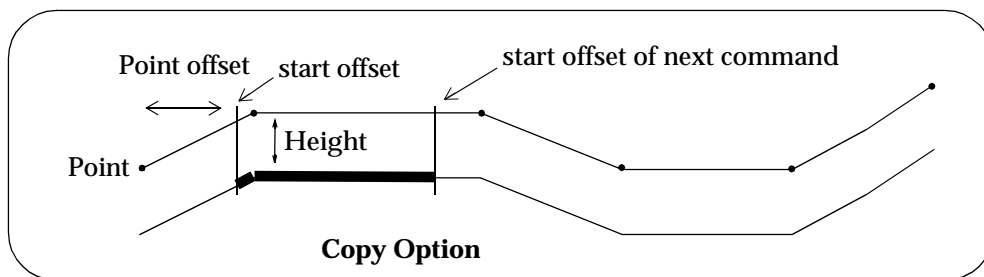
For more information on how Boxing works in 12d Model, please go to the section "Boxing" .

The text file definition of the boxing file is given in the section "Format of Boxing Definitions File"

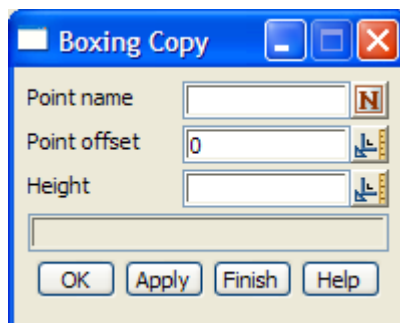
boxing_copy

Copy

The Copy command copies the links of the template (or parts of links) from the start offset (the offset of the given point plus the given **point offset** value), to the start offset of the *next* boxing command, keeping the present slope of each link but adjusting the height of each link by **height**. Height may be zero.



Selecting the copy option brings up the **boxing copy** panel



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

- Point name** input
name of the point on the cross section (when adjusted by "point offset") to start the copy at.
- Point offset** input null
offset from the point given in the point name field.
- Height** input 0
Height to adjust the links of the template being copied.
- OK/Apply** button
*OK stores the values in the fields and removes the panel.
 Apply stores the values and leaves the panel on the screen.*

The typed formats of the **copy** and **copy with height adjustment** commands created by this panel are:

- point_name + point_offsetcopy
 and
 point_name + point_offset,copy, delta_height

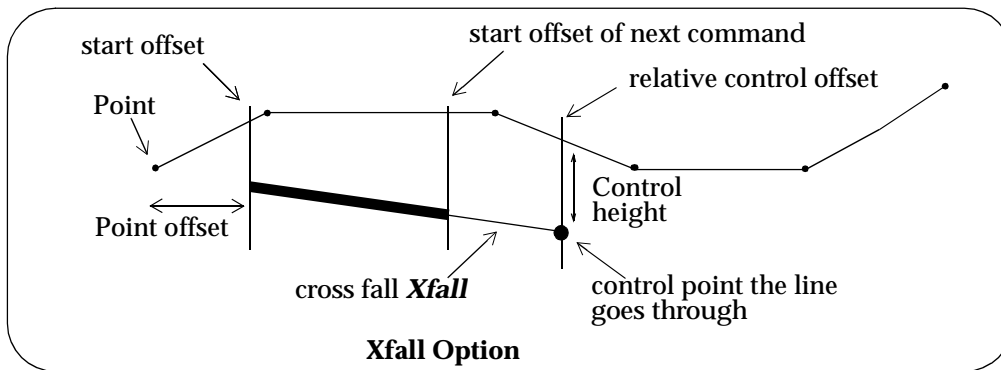
For more information on how Boxing works in 12d Model, please go to the section "Boxing" .

boxing_xfall

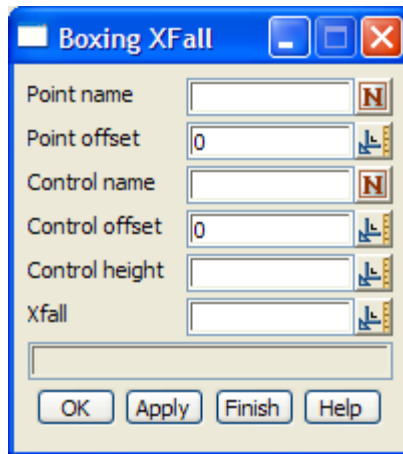
Xfall - line through a point with a given crossfall

The Xfall command creates a link from the start offset (the offset of the given point plus the given **Point offset**), to the start offset on the *next* boxing command, with a

- (a) user given cross fall (Xfall)
- (b) start height given by projecting to the start offset, the line with a given xfall and going through a given control point.



Selecting the xfall option brings up the **boxing xfall** panel



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
-------------------	------	----------	--------

Point name	input		
<i>name of the point on the cross section (when adjusted by point_offset) to start the line from.</i>			

Point offset	input	null	
<i>offset from the point given in the point name field.</i>			

Control name/offset/height	input		
<i>the control point that the line goes through has:</i>			
<i>offset of (control_name + control_offset)</i>			
<i>height of the above point on the template, + control_height</i>			

Xfall	input	0	
<i>crossfall of the line going through the control point.</i>			

OK/Apply	button		
<i>OK stores the values in the fields and removes the panel.</i>			
<i>Apply stores the values and leaves the panel on the screen.</i>			

The typed formats of the **xfall** commands created by this panel is:

point_name + point_offset, **xfall**, control_name + control_offset, control_height, xfall

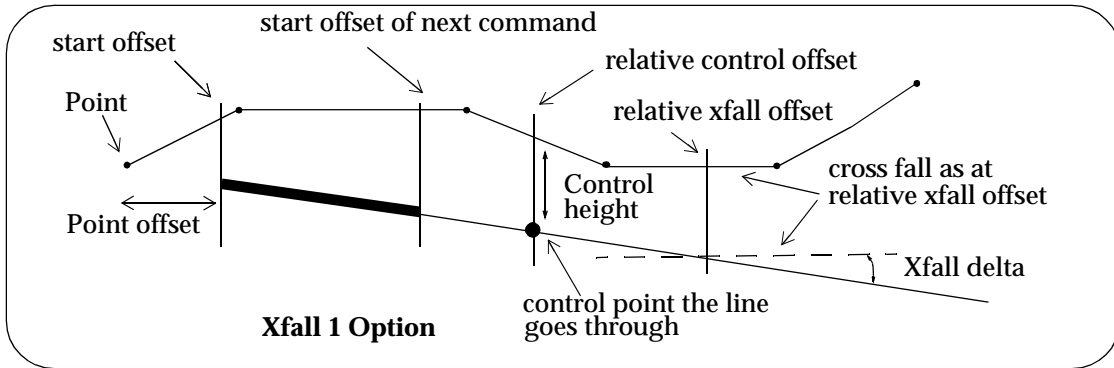
For more information on how Boxing works in 12d Model, please go to the section "Boxing" .

boxing_xfall_1

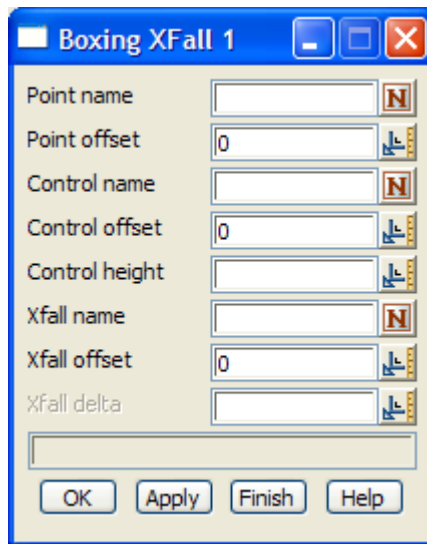
Xfall 1 - line through a point with a crossfall taken from a point

The Xfall 1 command creates a link from the start offset (the offset of the given point plus the given **Point offset**), to the start offset on the *next* boxing command, with a

- a cross fall which is the cross fall at a given point plus an additional cross fall (Xfall delta)
- start height given by projecting to the start offset, the line with the specified cross fall and going through a given control point.



Selecting the Xfall 1 option brings up the **Boxing Xfall 1** panel



The fields and buttons used in this panel have the following functions.

Field	Description	Type	Defaults	Pop-Up
Point name	name of the point on the cross section (when adjusted by point_offset) to start the line from.	input		
Point offset	offset from the point given in the point name field.	input	null	
Control name/offset/height	the control point that the line goes through has: offset of (control_name + control_offset) height of the above point on the template, + control_height	input		
Xfall name/offset	the crossfall is taken from the point on the template which has the offset of (control_name + control_offset)	input		
Xfall delta	adjust the crossfall at the xfall point by the xfall_delta.	input	0	
OK/Apply	OK stores the values in the fields and removes the panel.	button		

Apply stores the values and leaves the panel on the screen.

For more information on how Boxing works in 12d Model, please go to the section "Boxing".

The typed formats of the **xfall1** commands created by this panel is:

point_name + point_offset, **xfall1**, control_name + control_offset, control_height,
xfall_name + xfall_offset, xfall_delta

boxing_line

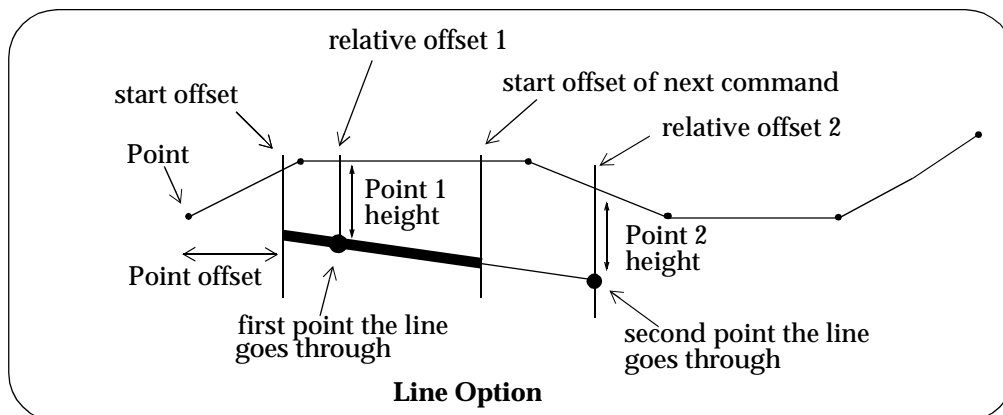
Line - line through two points

The Line command creates a line from the start offset (the offset of the given point plus the given **Point offset** value), to the start offset of the *next* boxing command, with a

- slope given by two points
- start height given by projecting to the start offset, the line through the two points.

The first point defining the line has the offset of "Point 1" plus the given "Point 1 offset" and a height given by the height of the design x-section at the offset adjusted by "Point 1 height".

The second point defining the line has the offset of "Point 2" plus the given "Point 2 offset" and a height given by the height of the design x-section at the offset adjusted by "Point 2 height".



Selecting the line option brings up the **boxing line** panel

The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Point name <i>name of the point on the cross section (when adjusted by point_offset) to start the line from.</i>	input		
Point offset <i>offset from the point given in the point name field.</i>	input	null	
Point 1 name/offset/height <i>the first point that the line goes through has: offset of (point_1 + point_1_offset) height of the above point on the template + point_1_height</i>	input		
Point 2 name/offset/height <i>the second point that the line goes through has: offset of (point_2 + point_2_offset) height of the above point on the template + point_2_height</i>	input		
OK/Apply <i>OK stores the values in the fields and removes the panel. Apply stores the values and leaves the panel on the screen.</i>	button		

For more information on how Boxing works in 12d Model, please go to the section “Boxing” .

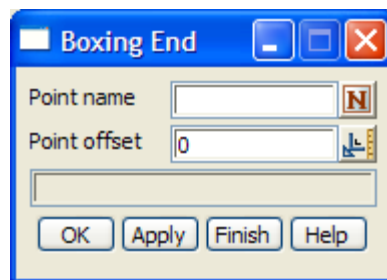
The typed format of the **line** commands created by this panel is (all on one line):

point_name + point_offset,**line**, point_1_name + point_1_offset,delta_height_1,
point_2_name + point_2_offset,delta_height_2

boxing_end

End

Selecting the end option brings up the **boxing end** panel



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Point name <i>name of the point on the cross section (when adjusted by point_offset) to finish the previous command at.</i>	input		
Point offset <i>offset from the point given in the point name field.</i>	input	null	
OK/Apply <i>OK stores the values in the fields and removes the panel. Apply stores the values and leaves the panel on the screen.</i>	button		

For more information on how Boxing works in 12d Model, please go to the section "Boxing".

The typed format of the **line** commands created by this panel is:

point_name + point_offset, **end**

boxing_lhs_xfall_for

LHS Xfall

The LHS Xfall command creates a line from the left hand end of the boxing already defined and then batters to the **left** at a specified cross fall until it intersects the design surface. The cross fall of the batter is defined as

(a) the cross fall at the *relative xfall offset* (the offset at the given point "Point name" plus "Xfall offset")

plus

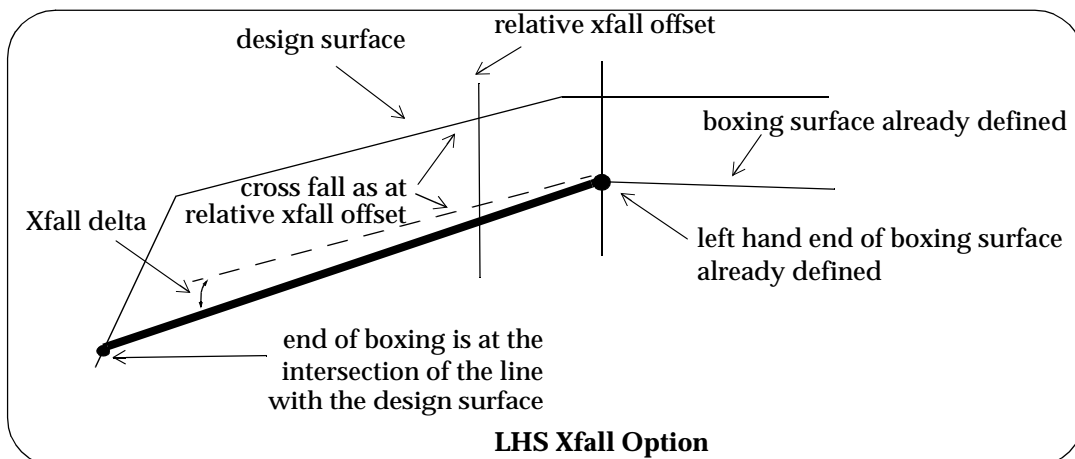
(b) the additional cross fall value "Xfall delta"

If the design surface is not intersected, then no extra line is created.

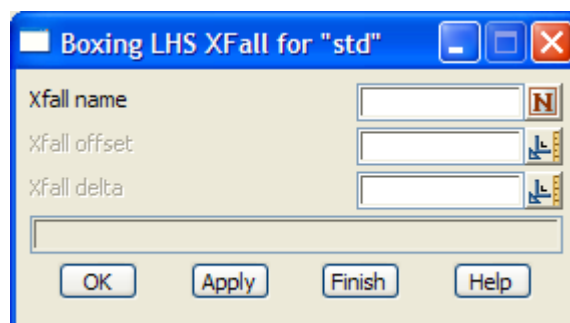
If *Copy* is toggle on in the *Left Hand Side* section of the **Boxing Rules** panel, then the part of the design section from beginning of the design section to the LHS cross fall intersection point is copied to the start of the boxing section.

In the left xfall command, the xfall is percent cross-fall and a positive xfall is up and negative down.

Note that the LHS xfall command creates a line at the **beginning** of the boxing. It is actually applied after all the other boxing commands have been run.



Selecting the LHS xfall button on the **boxing rules** panel brings up the **Boxing LHS Xfall** panel



The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Xfall name/offset	input		
<i>the crossfall is taken from the point on the template which has the offset of Xfall_name + xfall_offset</i>			
Xfall delta	input	0	
<i>adjust the crossfall at the xfall point by the value Xfall_delta.</i>			
OK/Apply	button		
<i>OK stores the values in the fields and removes the panel.</i>			
<i>Apply stores the values and leaves the panel on the screen.</i>			

For more information on how Boxing works in 12d Model, please go to the section "Boxing" .

The typed formats of the **left_xfall** commands created by this panel is:

left_xfall, xfall_name + xfall_offset, xfall_delta

boxing_rhs_xfall_for

RHS Xfall

The RHS Xfall command creates a line beginning at the right hand end of the boxing already defined and then batters to the right at a specified cross fall until it intersects the design surface. The cross fall of the batter is defined as

(a) the cross fall at the *relative xfall offset* (the offset at the given point "Point name" plus "Xfall offset")

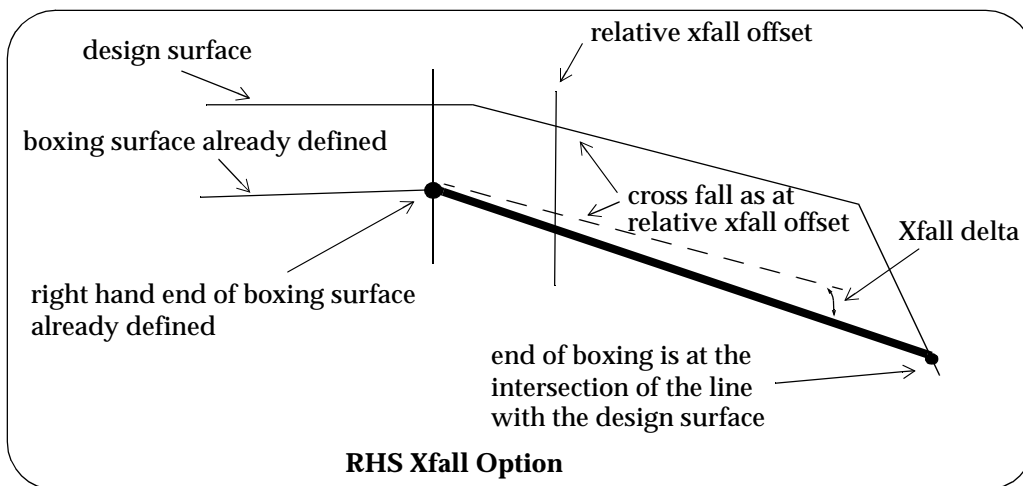
plus

(b) the additional cross fall value "Xfall delta"

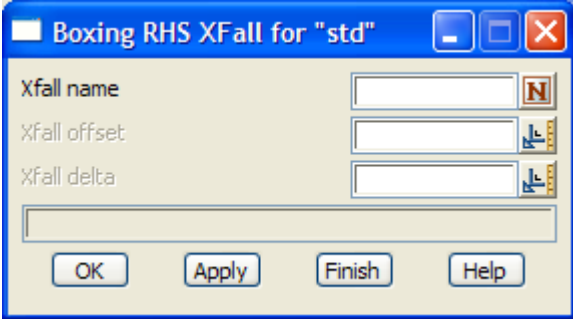
If the design surface is not intersected, then no extra line is created.

If *Copy* is toggle on in the *Right Hand Side* section of the **Boxing Rules** panel, then the part of the design section from the RHS cross fall intersection point to the last point of the design section is copied to the end of the boxing section.

In the right xfall command, the xfall is percent cross-fall and a positive xfall is up and negative down.



Selecting the RHS xfall button on the **boxing rules** panel brings up the **Boxing RHS Xfall** panel



The fields and buttons used in this panel have the following functions.

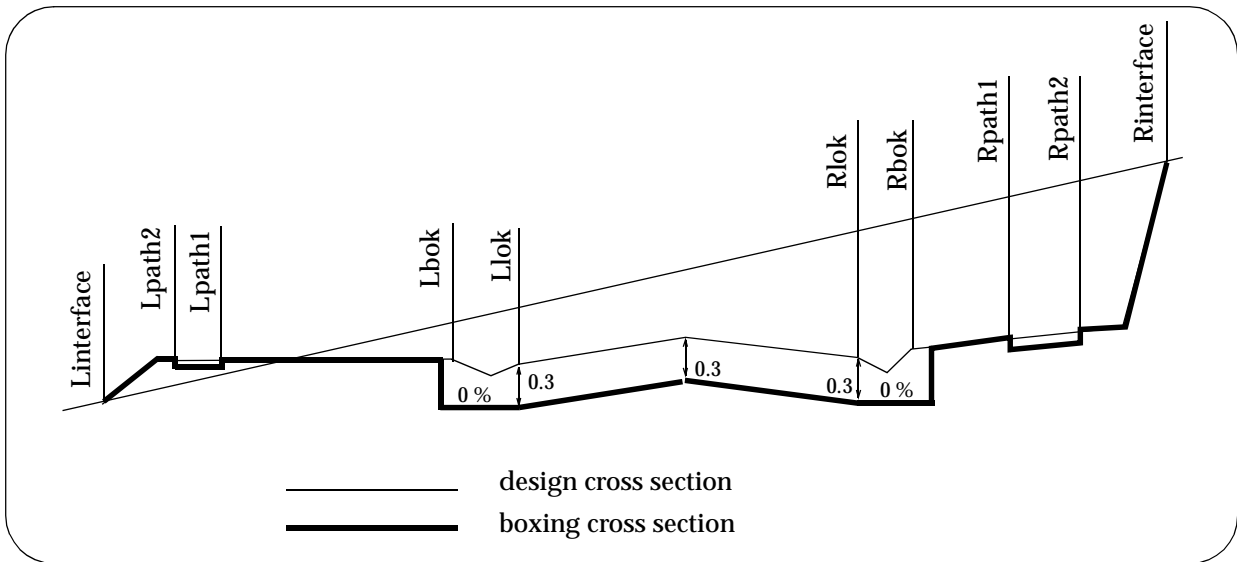
Field Description	Type	Defaults	Pop-Up
Xfall name/offset <i>the crossfall is taken from the point on the template which has the offset of Xfall_name + xfall_offset</i>	input		
Xfall delta <i>adjust the crossfall at the xfall point by the value Xfall_delta.</i>	input	0	
OK/Apply OK stores the values in the fields and removes the panel. Apply stores the values and leaves the panel on the screen.	button		

For more information on how Boxing works in 12d Model, please go to the section "Boxing" .

The typed formats of the **right_xfall** commands created by this panel is:

right_xfall, xfall_name + xfall_offset, xfall_delta

Boxing Definitions Examples



boxing "1" {

```

"Linterface",      copy                                // line 1
"Lpath2",         copy,      -0.075                // line 2
"Lpath1",         copy                                // line 3
"Lbok" - 0.15,    xfall,    "Llok",    -0.3,    0      // line 4
"Llok",           copy,      -0.3                    // line 5
"Rlok",           xfall,    "Rlok",    -0.3,    0      // line 6
"Rbok" + 0.15,    copy                                // line 7
"Rpath1",         copy,      -0.095                // line 8
"Rpath2",         copy                                // line 9
"Rinterface",     end                                  // line 10
}

```

Description

Line 1 copy from "Linterface" to "Lpath2"
 Line 2 copy and drop by 0.075 from "Lpath 2" to "Lpath 1"
 Line 3 copy from "Lpath1" to 0.15 before "Lbok"
 Line 4 go from 0.15 before "Lbok" to "Llok" at depth 0.3 below "Llok", with cross fall 0
 Line 5 copy and drop by 0.3 from "Llok" to "Rlok"
 Line 6 go from "Rlok" to 0.15 past "Rbok" at depth 0.3 below "Rlok", with cross fall 0
 Line 7 copy from 0.15 past "Rbok" to "Rpath1"
 Line 8 copy and drop by 0.095 from "Rpath1" to "Rpath2"
 Line 9 copy from "Rpath2" to "Rinterface"

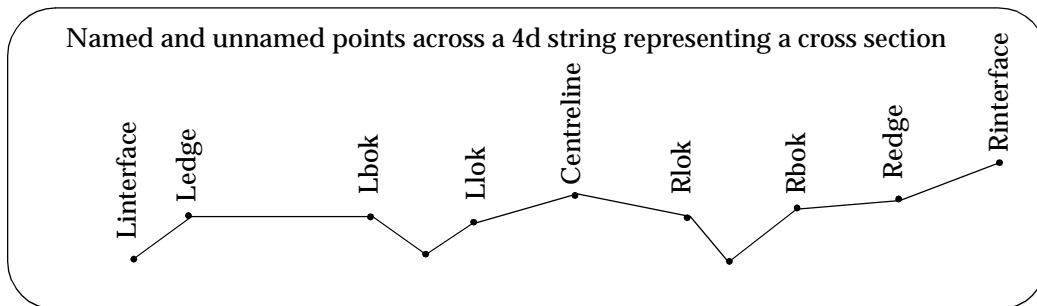
```
boxing "left narrow" { // boxing defined from just before lkerb to m001
    "lkerb" - 0.7 ,      copy
    "m001" - 1.0,      copy ,   -0.6
    "m001",            end
}
boxing "left" { // boxing defined from the left start of the section to m001 (the centreline say)
    "lkerb",    copy,    -0.6
    "m001",    end
    left_slope  5.0
    left_copy   1
}
boxing "right" { // boxing defined from m001 to the far right of the section
    "m001",    copy,    0.6
    "rkerb",    end
    right_slope  5.0
    right_copy  1
}
boxing "full" { // a full width boxing - defines the entire boxing going from left to right
    "lkerb",    copy,    -0.6
    "rkerb",    end
    left_slope  5.0
    left_copy   1
    right_slope -5.0
    right_copy  1
}
```

Format of Boxing Definitions File

The interactive editor for creating the boxing definition file has been given in the previous sections “Edit Boxing File” .

This section will describe the layout of the text boxing file.

Boxing is defined by a series of commands going from **left to right** across the points of a cross section. (Cross sections are generated as 4d strings by options such as **apply** and **cuts**).



The definitions of boxing cross sections are set up in a file ending in **.bf** (called the boxing file) and any number of boxing definitions can be placed in the boxing file as long as each boxing definition is given a unique name.

In the boxing file, a boxing definition with name **boxing_name** is set out as

```
boxing    boxing_name {
                                boxing commands
}
```

The boxing commands apply from the offset specified at the beginning of that command (**start offset** for the command) to the start offset of the **next** command in the file (like chainages and templates in the apply many file). Hence the **end offset** for a command is the start offset of the following command in the file.

For example, in the sequence

```
offset1,    command1
offset2,    command2
```

command1 goes from offset1 (the start offset for command1) to offset2 (the end offset for command1).

The **offsets** can be **fixed** values or can be specified **relative** to a point name on the 4d string representing the x-section. One restriction is that all the points mentioned in a boxing definition, must be present in each x-section the boxing definition is applied to.

The notation used to specify an actual offset, or offset relative to a point name is

```
offset_value
or      "point_name"
or      "point_name" +/- offset_value
```

and means in the first case

take the specified **offset** value (offset_value can be positive or negative).

and for the other two relative cases

take the **offset** at the string or 4d point called **point_name** and add **offset_value** to it (offset_value can be positive or negative).

Hence the offset can be specified as either a value or given **relative to point_name** (relative

offset). For convenience, the offset will be denoted by **rel_off**.

The major advantage of defining boxing in terms of point names is that whenever the points are modified using template modifiers, the boxing across the section is also automatically modified.

Since the offset part of a command can consist of text plus or minus a number, commas are used to separate each field of the command.

A boxing definition may be used in either a `left_boxing` or `right_boxing` mtf command (see the section, creating boxing), however unlike the case for templates, the boxing definition is applied to the point names going from left to right regardless of whether the boxing definition is used on the left or the right.

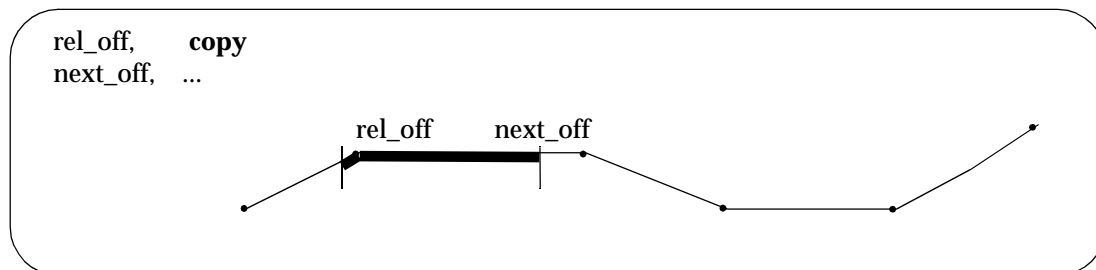
In practice, the definitions for left and right boxing are usually different because of the necessity of having unique point names across the entire cross section.

The commands in the boxing definition are

Copy

`rel_off, copy`

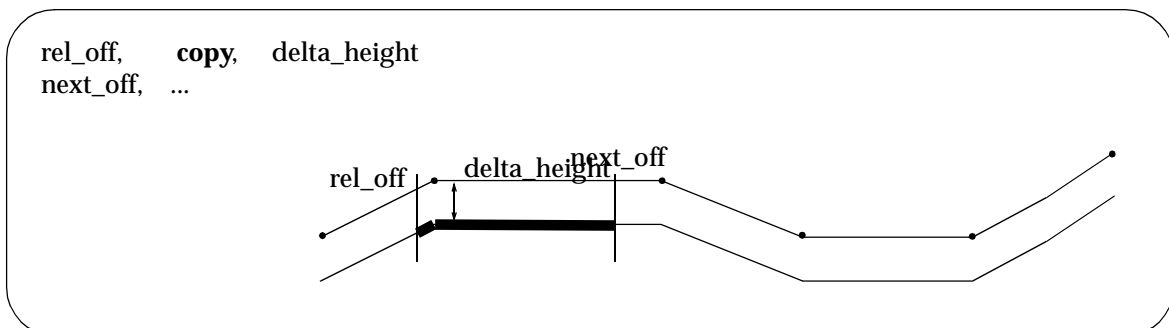
This copies the links (or parts of links) from the start offset **rel_off** to the offset on the next line, keeping the present crossfall and height of each link



Copy with Height Adjustment

`rel_off, copy, delta_height`

This copies the links (or parts of links) from the start offset **rel_off** to the offset on the next line, keeping the present slope of each link but adjusting the height of each link by **delta_height**.



Line Through Two Given Points

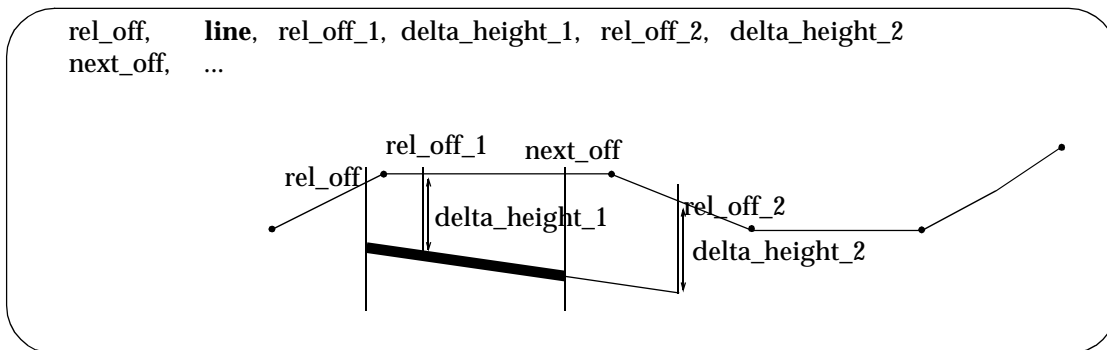
rel_off, **line**, rel_off_1, delta_height_1, rel_off_2, delta_height_2

This creates a link from the start offset **rel_off** to the offset on the next line, with a

- (a) slope given by two points
- (b) start height given by projecting to the start offset, the line through the two points.

The first point defining the line has an offset **rel_off_1** and a height given by the height of the design x-section at offset **rel_off_1** adjusted by **delta_height_1**.

The second point defining the line has an offset **rel_off_2** and a height given by the height of the design x-section at offset **rel_off_2** adjusted by **delta_height_2**.



Xfall - Line Through a Given Point with a Given Crossfall

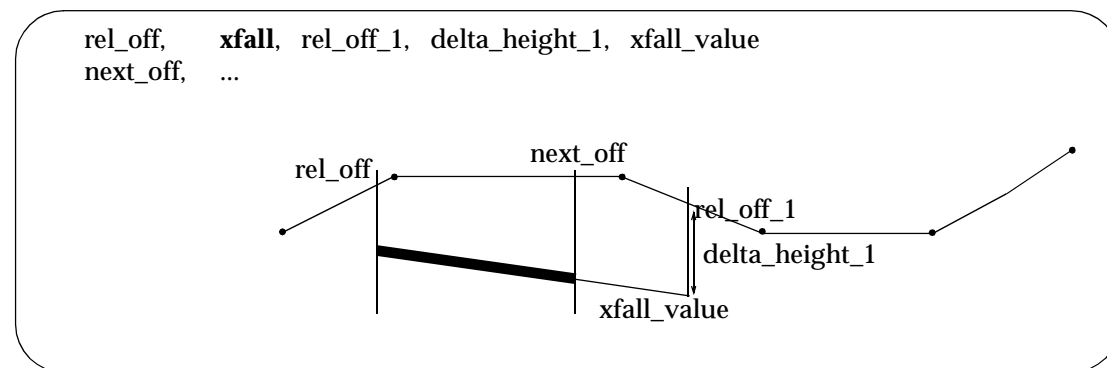
rel_off, **xfall**, rel_off_1, delta_height_1, xfall_value

This creates a link from the start offset to the offset on the next line, with a

- (a) user given xfall
- (b) start height given by projecting to the start offset, the line with a given xfall and going through a given point.

The point defining the line has an offset **rel_off_1** and a height given by the height of the design x-section at offset **rel_off_1** adjusted by **delta_height_1**.

The crossfall of the line is given by **xfall_value**



Xfall1 - Line Through a Given Point with Crossfall Taken from a Point

rel_off, **xfall1**, rel_off_1, delta_height_1, rel_off_2, delta_xfall

This creates a link from the start offset **rel_off** to the offset on the next line, with a

(a) xfall which is the xfall at a given offset plus an addition given xfall

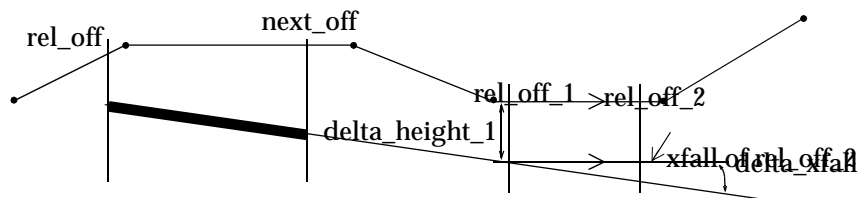
and

(b) start height given by projecting to the start offset, the line with the given xfall and going through a given point.

The point defining the line has offset **rel_off_1** and a height given by the height of the design x-section at offset **rel_off_1** adjusted by **delta_height_1**

The xfall of the line is **delta_xfall** added to the xfall on the design x-section at the offset **rel_off_2**

rel_off, **xfall1**, rel_off_1, delta_height_1, rel_off_2, delta_xfall
next_off, ...



End

rel_off, **end**

This command is used to give an end offset for any of the above commands when no command follows to use for the end offset. That is, the offset **rel_off** is used as the **end offset** for the **previous command**.

end doesn't begin another command and none of the above commands can follow an **end** command.

All of the above boxing commands are known as **standard** commands. Hence the **end** command is the **last** standard command.

Right_Xfall - Batter off Right End of Boxing with Crossfall Taken from a Point

The **right_xfall** command has two versions - providing a fixed cross fall or using the crossfall from part of the design x-section.

right_xfall rel_off, delta_xfall

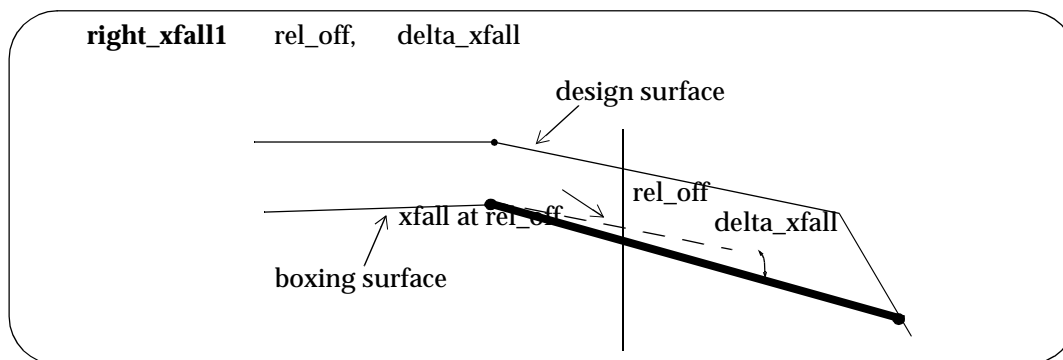
right_xfall xfall_value

For the first case, the **right_xfall** command batters off the right end of the boxing using the xfall from the design section at a given offset *rel_off* plus an additional given xfall *delta_xfall*, until the design section is intersected. The intersection point is used as the next point in the boxing.

Hence the xfall of the batter is **delta_xfall** added to the xfall on the design x-section at the offset **rel_off**

For the second case, the **right_xfall** command batters off to the right end of the boxing at the given xfall **xfall_value** until the design section is intersected. The intersection point is used as the next point in the boxing.

In the **right_xfall** command, the xfall is percent cross-fall and a positive xfall is up and negative down.



Right_slope - Batter Off the Right End of Boxing with a Given Crossfall

right_slope slope_value

The **right_slope** commands batter off to the right end of the boxing at the given slope **slope_value** until the design section is intersected. The intersection point is used as the next point in the boxing. In this command, a positive slope is up and negative down.

Right_copy - Copy from the Last Boxing Point to the end of Design Section

right_copy value

If value is non-zero, the **right_copy** command copies from the last boxing point to the last point on the design section. Hence the **right_copy** command is used to continue the boxing section from the intersection point with the design section to the end of the design section (a full width boxing section).

Note

The **right_xfall** command **takes precedence over** the **right_slope** command. That is, if both commands exist then only the **right_xfall** command is used.

Left_xfall

left_xfall rel_off, delta_xfall
left_xfall xfall_value

The `left_xfall` is identical to the `right_xfall` command except that it is applied at the beginning of the boxing definition and batters off to the left rather than to the right.

In the `left_xfall` command, the `xfall` is percent cross-fall and a positive `xfall` is up and negative down.

Left_slope

left_slope slope_value

The `left_slope` is identical to the `right_slope` command except that it is applied at the beginning of the boxing definition and batters off to the left rather than to the right. In this command, a positive slope is up and negative down.

The `left_slope` and `left_copy` are identical to the `right_slope` and `right_copy` except that they are applied at the beginning of the boxing definition and batter off and copy to the left rather than to the right. In this command, a positive slope is up and negative down.

The `left_copy` command must come before the `left_slope` command but they both come after all of the standard commands.

Note

The `left_xfall` command **takes precedence over the `left_slope`** command. That is, if both commands exist then only the `left_xfall` command is used.

Left_copy

left_copy value

The `left_copy` is identical to the `right_copy` except that it is applied at the beginning of the boxing definition and copies to the left rather than to the right.

If *value* is non-zero, the `left_copy` command copies from the last boxing point to the last point on the design section. Hence the `left_copy` command is used to continue the boxing section from the first boxing point to the start of the design section (a full width boxing section).

Note

The `left_xfall`, `left_slope`, `left_copy`, `right_xfall`, `right_slope` and `right_copy` commands should come after all of the standard commands.

When a boxing definition is applied on the left side, any `right_xfall`, `right_slope` or `right_copy` is ignored. Similarly, when a boxing definition is applied on the right side, any `left_xfall`, `left_slope` or `left_copy` is ignored.

Hence a boxing definition can have a `left_xfall`, `left_slope`, `left_copy` and a `right_xfall`, `right_slope`, `right_copy` but which set is used depends on whether the boxing definition is used on the left or the right.

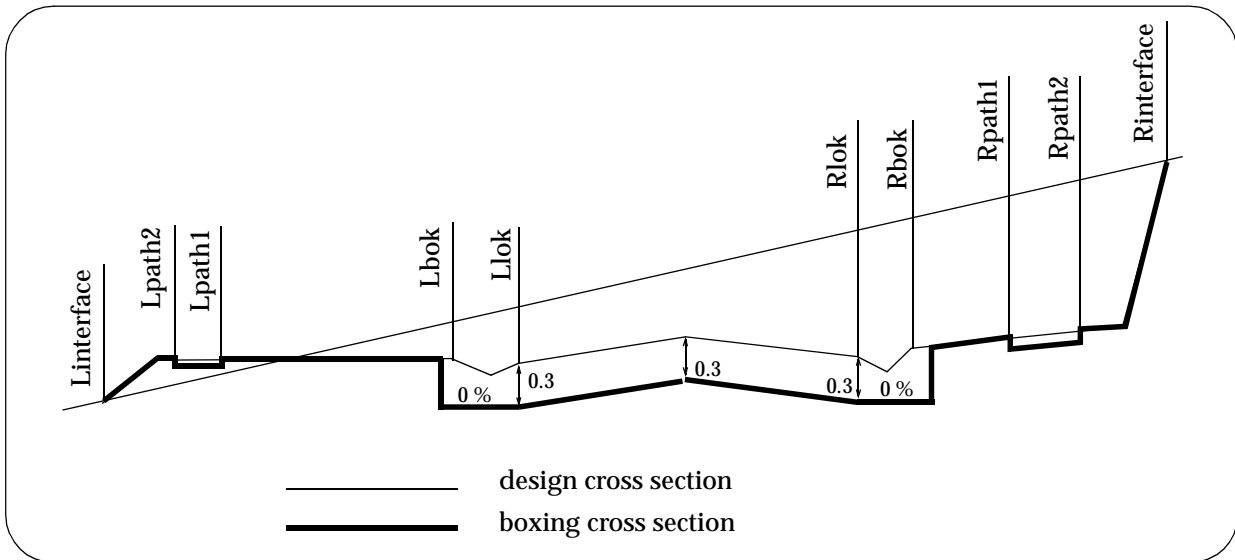
When the **boxing** panel is used to create the boxing, only one boxing definition is needed and all of the `right_xfall`, `right_slope`, `right_copy`, `left_xfall`, `left_slope` and `left_copy` commands are used.

Vertical Walls

If a boxing definition creates two different height values at the one offset (i.e. a wall), then extra offset points are automatically inserted into the boxing x-section (at 0.1 mm from the previous point) so that no points are on top of each other.

So in effect a vertical wall is created but since no points are created that are directly above each other, the data can be triangulated.

Boxing Definitions Examples



boxing "1" {

```

"Linterface",      copy                               // line 1
"Lpath2",         copy,      -0.075           // line 2
"Lpath1",         copy                               // line 3
"Lbok" - 0.15,    xfall,      "Llok",      -0.3,      0       // line 4
"Llok",           copy,      -0.3            // line 5
"Rlok",           xfall,      "Rlok",      -0.3,      0       // line 6
"Rbok" + 0.15,    copy                               // line 7
"Rpath1",         copy,      -0.095          // line 8
"Rpath2",         copy                               // line 9
"Rinterface",     end                               // line 10
    }
```

Description

Line 1 copy from "Linterface" to "Lpath2"
 Line 2 copy and drop by 0.075 from "Lpath 2" to "Lpath 1"
 Line 3 copy from "Lpath1" to 0.15 before "Lbok"
 Line 4 go from 0.15 before "Lbok" to "Llok" at depth 0.3 below "Llok", with cross fall 0
 Line 5 copy and drop by 0.3 from "Llok" to "Rlok"
 Line 6 go from "Rlok" to 0.15 past "Rbok" at depth 0.3 below "Rlok", with cross fall 0
 Line 7 copy from 0.15 past "Rbok" to "Rpath1"
 Line 8 copy and drop by 0.095 from "Rpath1" to "Rpath2"
 Line 9 copy from "Rpath2" to "Rinterface"

```

boxing "left narrow" {           // boxing defined from just before lkerb to m001
    "lkerb" - 0.7 ,             copy
    "m001" - 1.0,              copy ,   -0.6
    "m001",                     end
}

boxing "left" { // boxing defined from the left start of the section to m001 (the centreline say)
    "lkerb",    copy,          -0.6
    "m001",     end
    left_slope  5.0
    left_copy   1
}

boxing "right" { // boxing defined from m001 to the far right of the section
    "m001",    copy,          0.6
    "rkerb",   end
    right_slope 5.0
    right_copy 1
}

boxing "full" { // a full width boxing - defines the entire boxing going from left to right
    "lkerb",    copy,          -0.6
    "rkerb",    end
    left_slope  5.0
    left_copy   1
    right_slope -5.0
    right_copy 1
}

```

Please continue to the next section "Applying Boxing" .

Applying Boxing

There are four options to apply boxing rules and hence create boxing strings and sections.

(a) Templates => Apply => Apply many

(b) Templates => Boxing => Boxing

with panel fields

model to box

boxing file

start chainage

end chainage

model for boxing

model of design x-sections

file containing one boxing definition

i.e. model for created boxing x-sections

(c) Templates => Boxing => Boxing many

with panel fields

model to box

templates file

boxing file

model for boxing

model of design x-sections

many template file, *.mtf

file of boxing definitions, *.bf

i.e. model for created boxing x-sections

(d) Templates => Boxing => Boxing many (function)

The panels for these options have been described in an earlier chapter.

When using the **boxing** option **Boxing**, only one boxing definition is used from the boxing definitions file given **boxing file** panel field.

For the **Apply many**, **Boxing many** and **Boxing many (function)** options, the application of the boxing definitions is given in the many templates file (*.mtf) and is similar in format to applying templates (except interpolating between boxing is not allowed).

In the *mtf* (**many templates file**), for the **Apply many**, there can be up to with layers of boxing and each layer is defined in two parts - the left boxing and the right boxing. If both left and right boxing are both defined at a section, then the last point of the left boxing is automatically connected to the first point of the right boxing.

Warning - the left boxing must end before the right boxing begins. If there is an overlap, the right boxing will be pushed to the end of the left boxing.

Apart from a key word specifying whether the following part of the definition is for the left or the right, the set out for the left boxing is identical to the right boxing. Hence only the left boxing will be described in detail.

The left boxing definition begins with the key words

left_boxing =

A list of chainages (in ascending order, one per line) with corresponding boxing names then follows. The list of chainages and boxing is enclosed in curly braces { }.

The chainage-boxing lists are assembled as follows

(a) to represent a boxing starting at a given chainage, the chainage value followed by the boxing name is given. The chainage and boxing name are separated by one or more spaces. For example, the boxing **left** starting at chainage 150 is represented by

150 left

The boxing is assumed to apply until the chainage given on the next line of the left_boxing definition.

- (b) if no boxing exists from a chainage, simply include the chainage with no boxing name following it. For example, if there is no boxing from chainage 250, this is represented by

```
250
```

The non-existence of boxing is assumed until the chainage given on the next line of the `left_side` definition.

If the boxing is to go to the end of the reference string, add a line with a chainage greater than or equal to the end chainage. For example

```
150      left
9999
```

When using the **apply many** option, the name of the boxing definitions file is given by a **boxing_file** command in the many templates file.

```
boxing_file =      boxing_definitions_file
```

When using the **boxing many** option, if a file name is given in the **boxing file** panel field, it is used for the boxing definitions file, otherwise the `boxing_file` command in the many templates file is used.

Note - if the boxing name includes spaces, then the name must be enclosed in quotes ". For example, "left 1".

An Applying Boxing Example

```
boxing_file = "boxing_for_client.bf"
left_boxing = {
                -999      left
                30
                70        "left narrow"
                110.5     left
                999
            }
right_boxing = {
                -999      right
                30
                70        "right narrow"
                110.5     right
                999
            }
```

Warning - no interpolation or modifiers exist for boxing.

Please continue to the next section "Boxing and Volumes".

Boxing and Volumes

For the **Apply many** option, the cut and fill areas and volumes are calculated from the bottom of the boxing to the stripped surface.

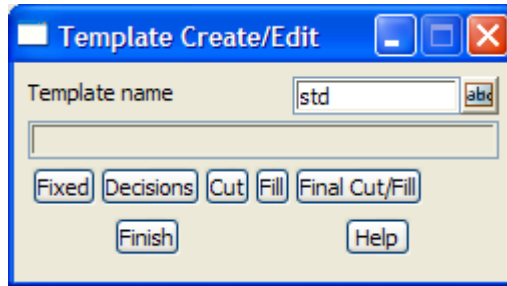
Full Definition of Template Decisions

decisions_template

12d Model supports templates with an unlimited number of fixed links, followed by either

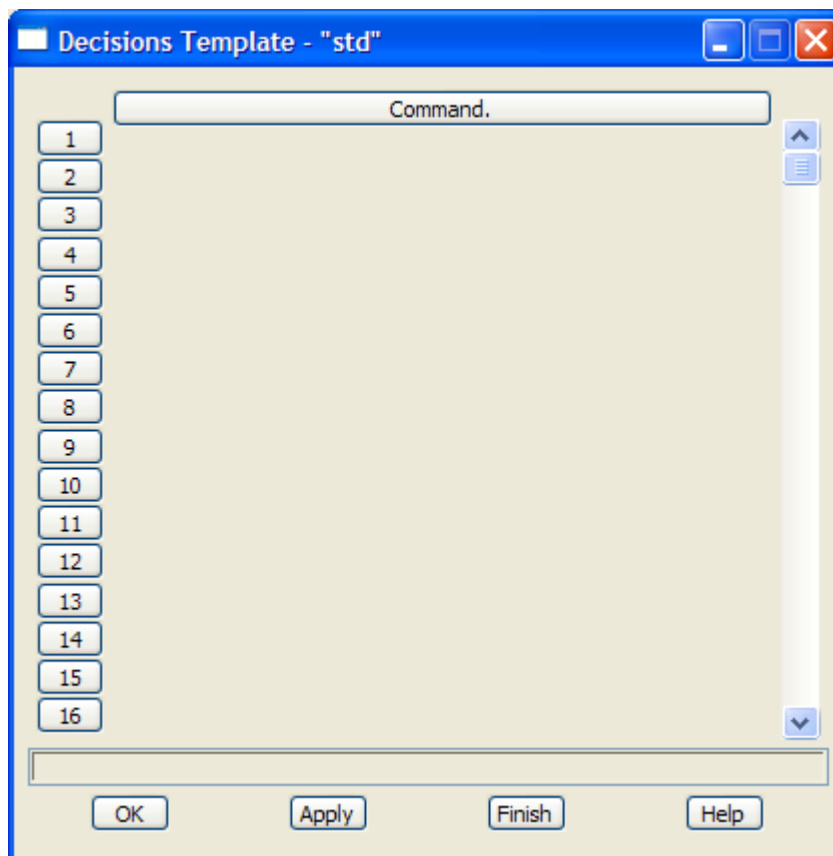
- (a) a decisions table
- or
- (b) an unlimited number of cut and fill links and a final cut/fill slope to be applied at the end of the last template link.

Templates are created and edited using the Templates=>Create/edit option which brings up the **Template Create/Edit** panel.



The description of the fields and the buttons **Fixed**, **Cut**, **Fill**, **Final Cut/Fill** in this panel were given in the chapter "Design".

The **Decisions** button and its associated panel, **Decisions Template**, which is created when the **Decisions** button is selected, will now be described.



The **Decisions Template** panel consists of scrolling command fields and a **OK** or **Apply** button to record the results.

The **width** of the command area in the **Decisions Template** panel is controlled by the environment variable `DEFAULT_TABLE_WIDTH_4D`.

The **commands** in the decision template form a simple language where the commands are processed sequentially unless control is passed to a labelled line from where sequential processing continues, or the processing is terminated by an **end** command.

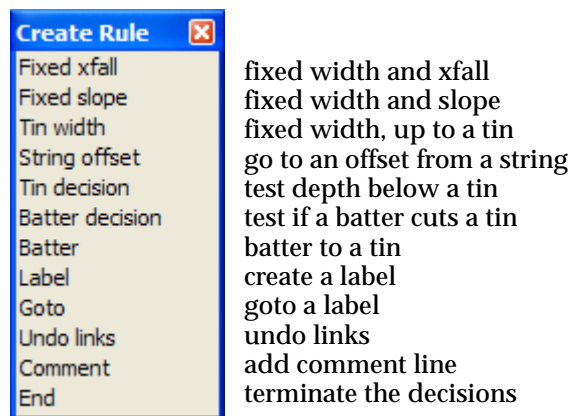
The decision template commands can:

- (a) create a fixed link - **fixed xfall** and **fixed slope**
- (b) create a link of fixed width but with a slope automatically selected so that the link reaches a given tin in the width - **tin width**
- (c) create a link that goes within an offset of a given string **string offset**
- (d) test for being between two depths below a tin, and transfer control if true - **tin decision**
- (e) test that a link would get within a given depth from a tin at a given offset, and transfer control if true - **batter decision**
- (f) create a link of set slope that batters to a depth below a tin at a given offset - **batter**
- (g) create a label which can have processing passed to - **label**
- (h) transfer processing to a given label - **goto**
- (i) end the processing of commands - **end**

decision_create_rule

The template decision commands can be typed into an text (ascii) file defining a template (template file .tpl), or can be created and edited through panels.

If the command line is **empty**, clicking LB in the command line will bring up the Create Rule menu which contains all the available decisions commands.



Selecting a menu item will bring up an associated panel which displays the information required for the decisions command.

When the panel is filled in and **OK** or **Apply** selected, the panel information is written out to the command line in the correct format for that template decision command.

If the command line is **not empty**, clicking LB in the command line will bring up the associated panel for the template decisions command in the command line.

The information in the panel can be modified and if **OK** or **Apply** is selected, the modified panel information is written out to the command line in the correct format for that template decisions command.

If the template is written out using `File I/O=>Templates output` or `Templates=>Utilities=>Output`, the template decisions will be written out as they are displayed in the command fields.

Any of the commands in the templates file can be edited and the file read back into 12d Model.

Each of the template decision commands will now be described and the associated panels created by selecting the command from the Create Rule menu.

The format of the decision commands that are written to the panel are given, as are the typed form of the command which is used in the templates file.

For examples of a using decisions, please go to the section “Decisions Examples” .

For documentation on the option/menus on the Create Rule menu:

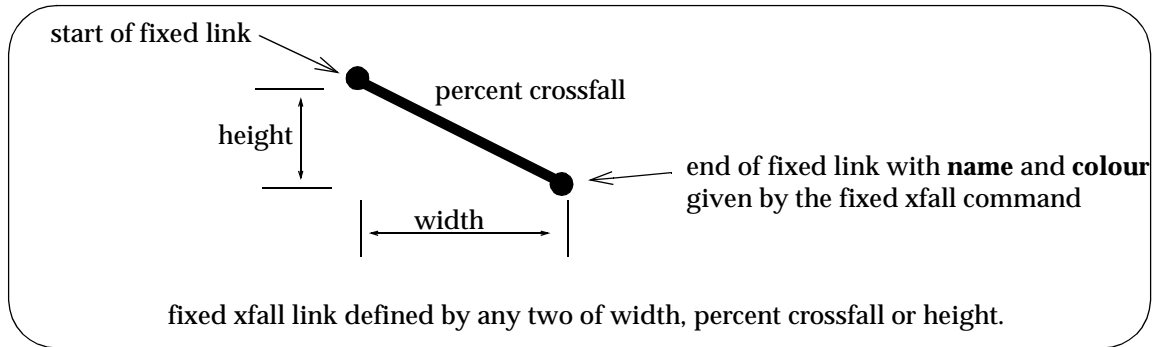
for	<i>Fixed xfall</i>	go to the section “Fixed Xfall”
	<i>Fixed slope</i>	“Fixed Slope”
	<i>Tin width</i>	“Tin Width”
	<i>String offset</i>	“String Offset”
	<i>Tin decision</i>	“Tin Decision”
	<i>Batter decision</i>	“Batter Decision”
	<i>Batter</i>	“Batter”
	<i>Label</i>	“Label”
	<i>Goto</i>	“Goto”
	<i>Undo links</i>	“Undo”
	<i>Comment</i>	“Comment” .
	<i>End</i>	“End”

Please continue to the next section “Fixed Xfall” .

Fixed Xfall

decision_fixed_xfall

Selecting Fixed xfall brings up the **Fixed Xfall** panel which is used to constructed the command for a fixed link. The fixed link is defined by specifying values for two of the three fields width, height and x-fall.



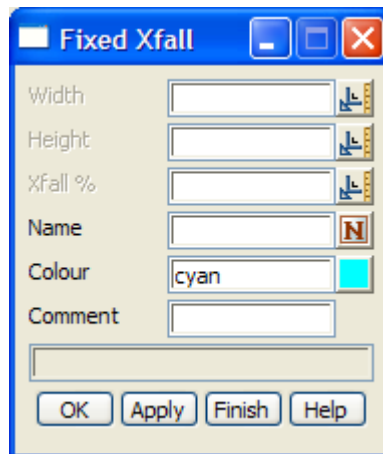
The format of the Fixed Xfall command in the panel is

Fixed Xfall Width *value* Height *value* XFall *value* Name *text* Colour *colour* // *comment*
 where only two of the three commands Width, Height and Xfall are used.

The format of the command typed into the template file is

Fixed_Xfall *width_value* *height_value* *xfall_value* *name* *colour* // **comment**
 where one of *width_value*, *height_value* or *xfall_value* is the key word *unknown*.

The panel brought up when Fixed xfall is selected from the Create Rule menu is:



The fields and buttons used in this panel have the following functions.

Field Description	Type	Default	Pop-Up
Width <i>the width for the link.</i>	input		
Height <i>the height for the link.</i>	input		
Xfall %	input		

the x-fall, in percent cross-fall, of the link. Positive is up and negative down.

Name input

the name to be used for the created point and string.

Colour input cyan available colours

the colour to be used for the created string

Comment input

user comment - for information purposes only

OK/Apply button

***OK** stores the values in the fields and removes the panel.*

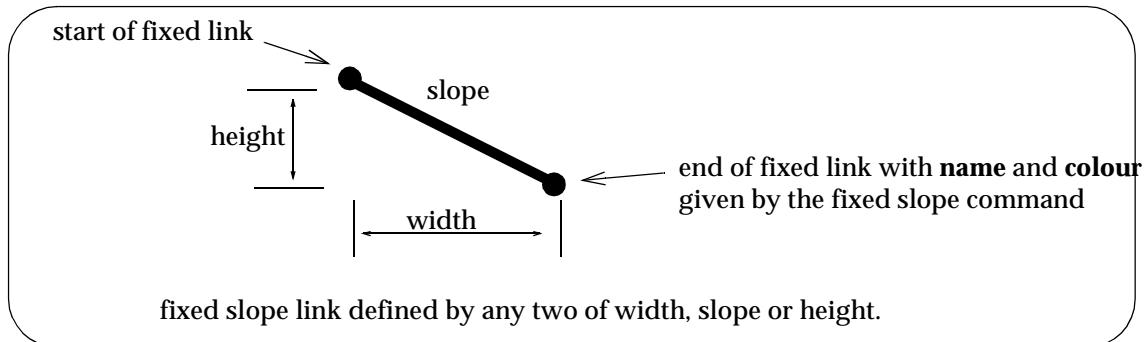
***Apply** stores the values and leaves the panel on the screen.*

Please continue to the next section "Fixed Slope" .

Fixed Slope

decision_fixed_slope

Selecting Fixed slope brings up the **Fixed Slope** panel which is used to constructed a fixed link. The fixed link is defined by specifying values for two of the three fields width, height and slope.



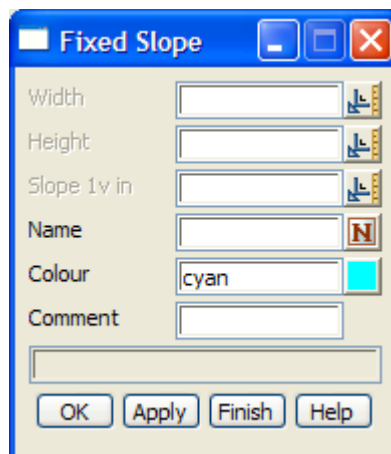
The format of the Fixed Slope command in the panel is

Fixed Slope Width *value* Height *value* Slope *value* Name *text* Colour *colour* // *comment*
 where only two of the three commands Width, Height and Slope are used.

The format of the command typed into the template file is

Fixed_Slope *width_value* *height_value* *slope_value* *name* *colour* // *comment*
 where one of *width_value*, *height_value* or *slope_value* is the key word *unknown*

The panel brought up when Fixed slope is selected from the Create Rule menu is:



The fields and buttons used in this panel have the following functions.

Field Description	Type	Default	Pop-Up
Width <i>the width for the link.</i>	input		
Height <i>the height for the link.</i>	input		
Slope 1v in	input		

the slope, in 1v in, of the link. Positive is up and negative down.

Name input

the name to be used for the created point and string.

Colour input cyan available colours

the colour to be used for the created string

Comment input

user comment - for information purposes only

OK/Apply button

OK stores the values in the fields and removes the panel.

Apply stores the values and leaves the panel on the screen.

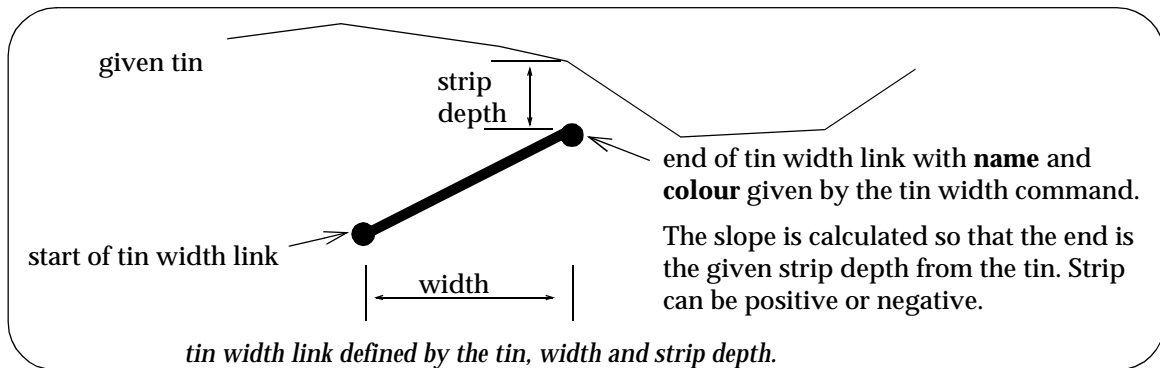
Please continue to the next section "Tin Width" .

Tin Width

decision_tin_width

Selecting Tin width brings up the **Tin Width** panel which is used to construct a link which has a given width and stops at the depth strip below the tin. Control then passes to the next line of the table.

strip can be positive (end point is below the tin) or negative (end point is above the tin).



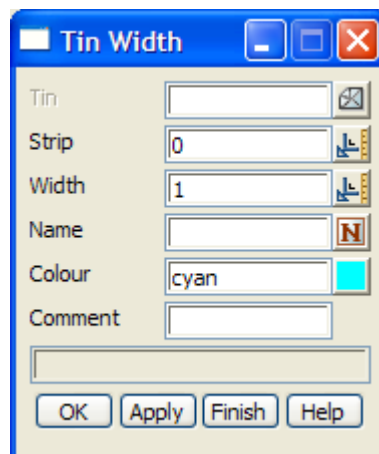
The format of the Tin Width command in the panel is

Tin Width *tin_name* Strip *value* Width *value* Name *text* Colour *colour* // *comment*

The format of the command typed into the template file is

Tin_Width *tin_name* *strip_value* *width_value* *name* *colour* // *comment*

The panel brought up when Tin width is selected from the Create Rule menu is:



The fields and buttons used in this panel have the following functions.

Field	Description	Type	Default	Pop-Up
Tin	<i>tin to batter to.</i>	input		available tins
Strip	<i>distance below the tin to stop at (strip depth). strip can be positive (point is below the tin) or negative (point is above the tin).</i>	input	0	
Width		input	1	

width of the link

Name input

the name to be used for the created point and string.

Colour input cyan available colours

the colour to be used for the created string

Comment input

user comment - for information purposes only

OK/Apply button

OK stores the values in the fields and removes the panel.

Apply stores the values and leaves the panel on the screen.

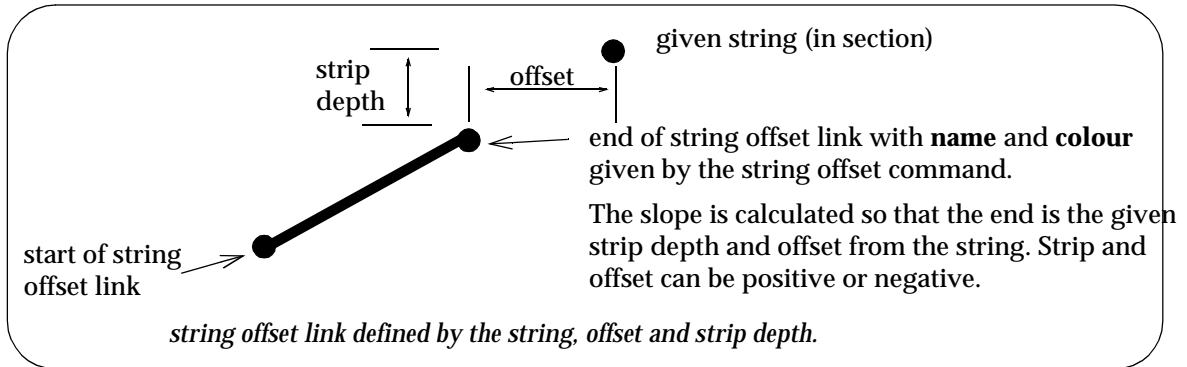
Please continue to the next section "String Offset" .

String Offset

decision_string_offset

Selecting String offset brings up the **String Offset** panel which is used to construct a link which goes to a given offset from string and stops at the depth strip below the string. Control then passes to the next line of the table.

offset and string can be positive or negative.



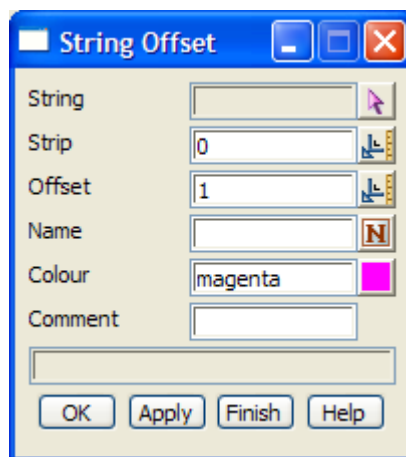
The format of the String Offset command in the panel is

String Offset *string_name* Strip *value* Offset *value* Name *text* Colour *colour* // *comment*

The format of the command typed into the template file is

String_Offset *string_name* *strip_value* *offset_value* *name* *colour* // *comment*

The panel brought up when String offset is selected from the Create Rule menu is:



The fields and buttons used in this panel have the following functions.

Field Description	Type	Default	Pop-Up
String <i>string to batter to.</i>	string select		
Strip <i>distance below the string to stop at.</i>	input	0	
Offset <i>offset from the string to stop at.</i>	input	1	

Name input
the name to be used for the created point and string.

Colour input cyan available colours
the colour to be used for the created string

Comment input
user comment - for information purposes only

OK/Apply button
OK stores the values in the fields and removes the panel.
Apply stores the values and leaves the panel on the screen.

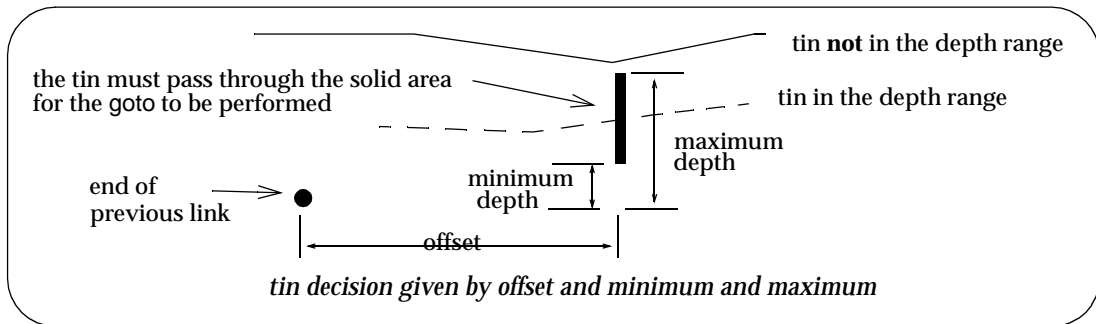
Please continue to the next section “Tin Decision” .

Tin Decision

decision_tin_decision

Selecting Tin decision brings up the **Tin Decision** panel which tests to see if the depth from the end of the previous link, offset by the amount given in the offset field, is between the two values given in the minimum depth and maximum depth fields. If the depth is between the values, then control is transferred to the line with the label given by the goto field. Otherwise, control passes to the next line of the table.

offset, minimum and maximum depth can be positive or negative.



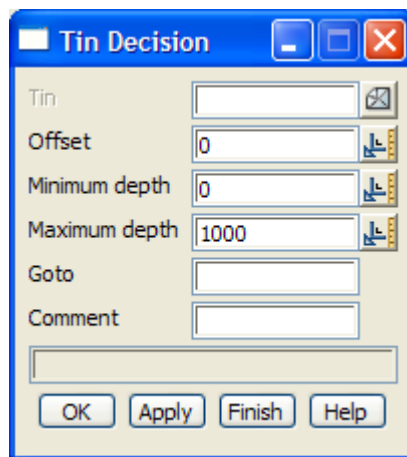
The format of the Tin Decision command in the panel is

Tin Decision *tin_name* Offset *value* Min *value* Max *value* Goto *label* // *comment*

The format of the command typed into the template file is

Tin_Decision *tin_name* *offset_value* *min_value* *max_value* *goto_label* // *comment*

The panel brought up when Tin decision is selected from the Create Rule menu is:



The fields and buttons used in this panel have the following functions.

Field Description	Type	Default	Pop-Up
Tin <i>the tin to calculate the depth to.</i>	input		available tins
Offset <i>the depth is calculate at an offset distance of offset from the end of the previous link.</i>	input	0	
Minimum depth <i>if the depth is between the minimum and maximum depth, then control is passed to the line with the</i>	input	0	

label given in the goto field, otherwise control passes onto the next line of the table.

Maximum depth input 1000

see previous field.

Goto input

label to go to if the depth is between the minimum and maximum depths.

Comment input

user comment - for information purposes only

OK/Apply button

OK stores the values in the fields and removes the panel.

Apply stores the values and leaves the panel on the screen.

Please continue to the next section "Batter Decision" .

Batter Decision

decision_batter_decision

Selecting Batter decision brings up the **Batter Decision** panel which is used to test whether a given link comes within

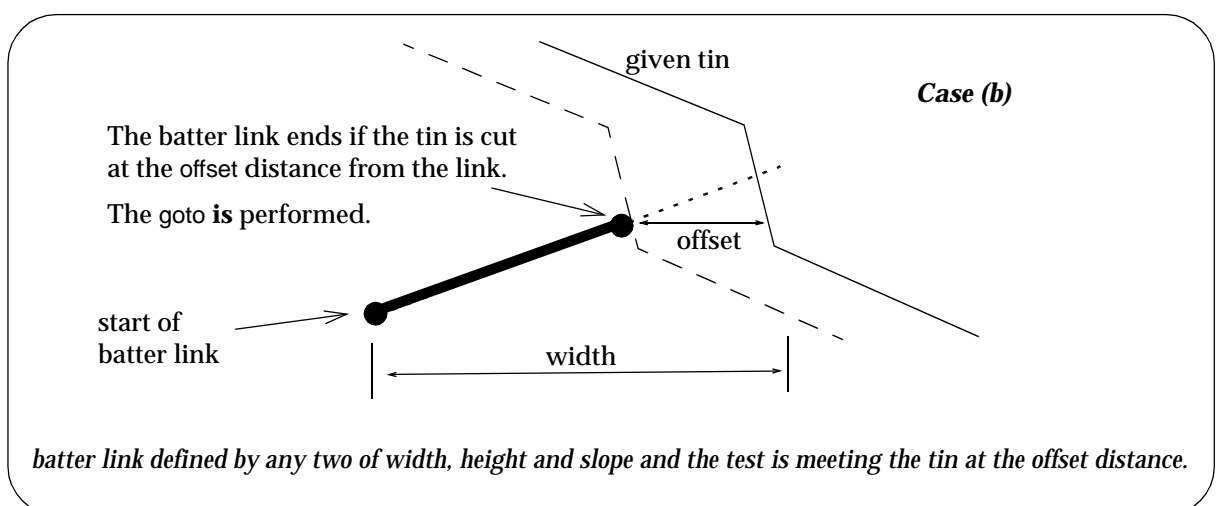
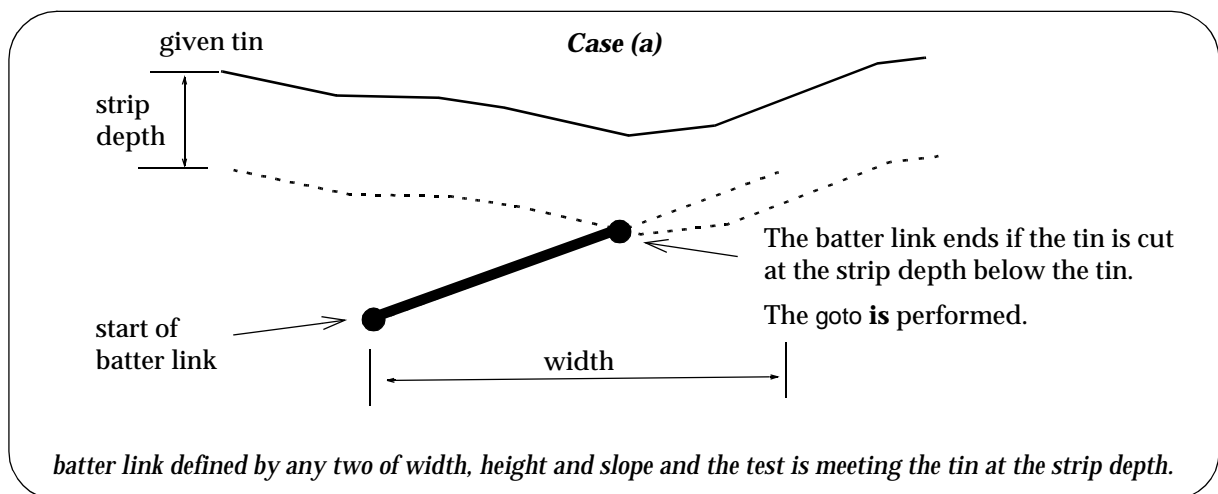
- (a) a strip depth of a tin
- (b) an offset distance from a tin.
- (c) a strip depth of a tin calculated at a given offset from the link.

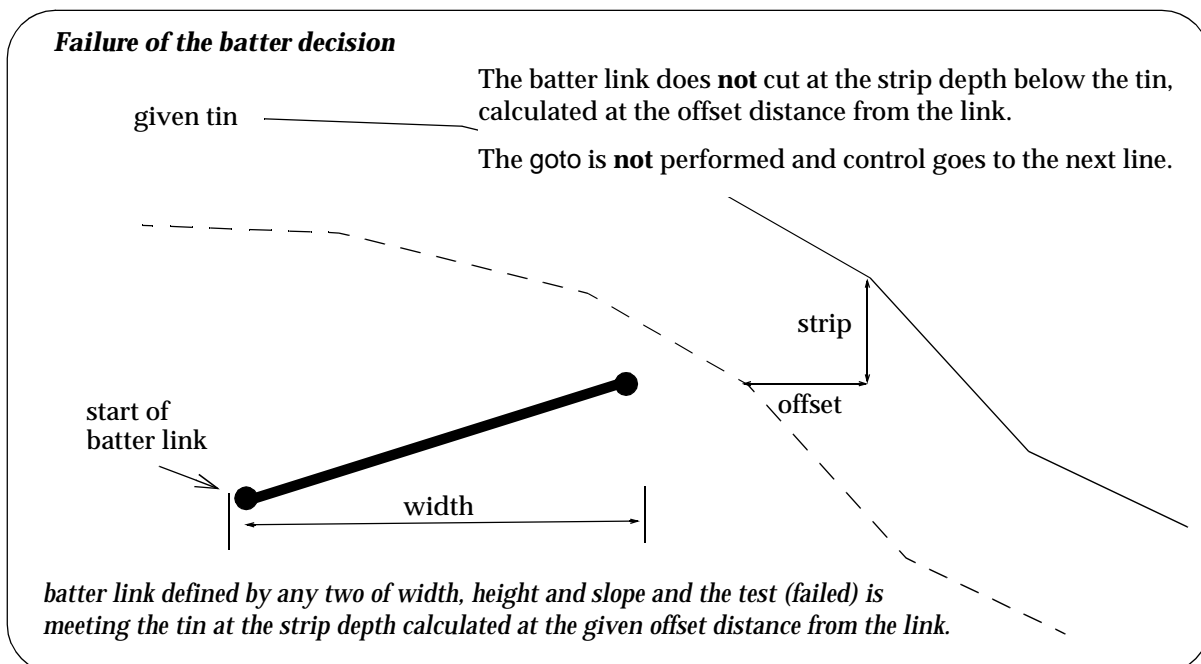
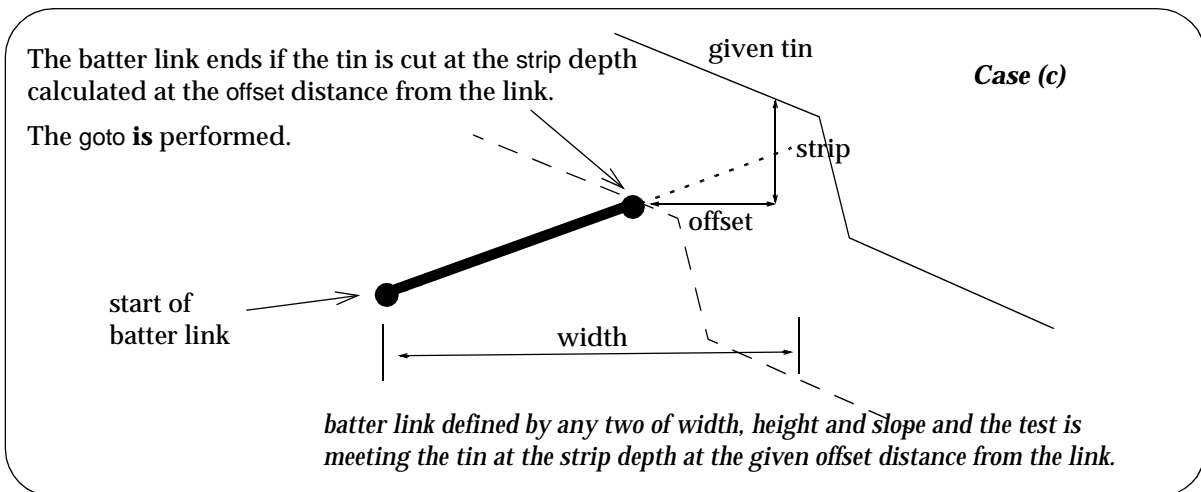
If the test is satisfied, then control is transferred via a goto, otherwise control continues onto the next line in the table.

The **test link** is defined by specifying values for two of the three fields width, height and slope.

Notes

1. no link is created, just the test is performed
2. cases (a) and (b) are just special cases of (c)
3. the batter decision is mainly used to test if a batter will stop without performing the batter.





The format of the Batter Decision command in the panel is

```
Batter Decision tin_name Strip value Offset value Width value Height value
Slope value Goto label // comment
```

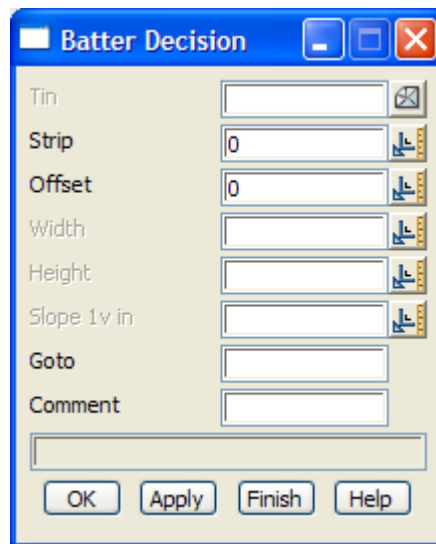
where only two of the three commands Width, Height and Slope are used.

The format of the command typed into the template file is

```
Batter_Decision tin_name strip_value offset_value width_value height_value slope_value
goto_label // comment
```

where one of *width_value*, *height_value* or *slope_value* is the key word *unknown*

The panel brought up when Batter decision is selected from the Create Rule menu is:



The fields and buttons used in this panel have the following functions.

Field Description	Type	Default	Pop-Up
Tin <i>tin to test the batter to.</i>	input		available tins
Strip <i>distance below the tin to stop at.</i>	input1	0	
Offset <i>offset distance from the link to check strip depth</i>	input1	0	
Width <i>the width for the link.</i>	input		
Height <i>the height for the link.</i>	input		
Slope 1v in <i>the slope, in 1v in, of the link. Positive is up and negative down.</i>	input		
Goto <i>label to goto if the test link comes within the strip depth of the tin at the given offset distance.</i>	input		
Comment <i>user comment - for information purposes only</i>	input		
OK/Apply	button		
<i>OK stores the values in the fields and removes the panel.</i>			
<i>Apply stores the values and leaves the panel on the screen.</i>			

Please continue to the next section "Batter" .

Batter

decision_batter

Selecting **Batter** brings up the **Batter** panel which is used to construct a link which stops if it comes within

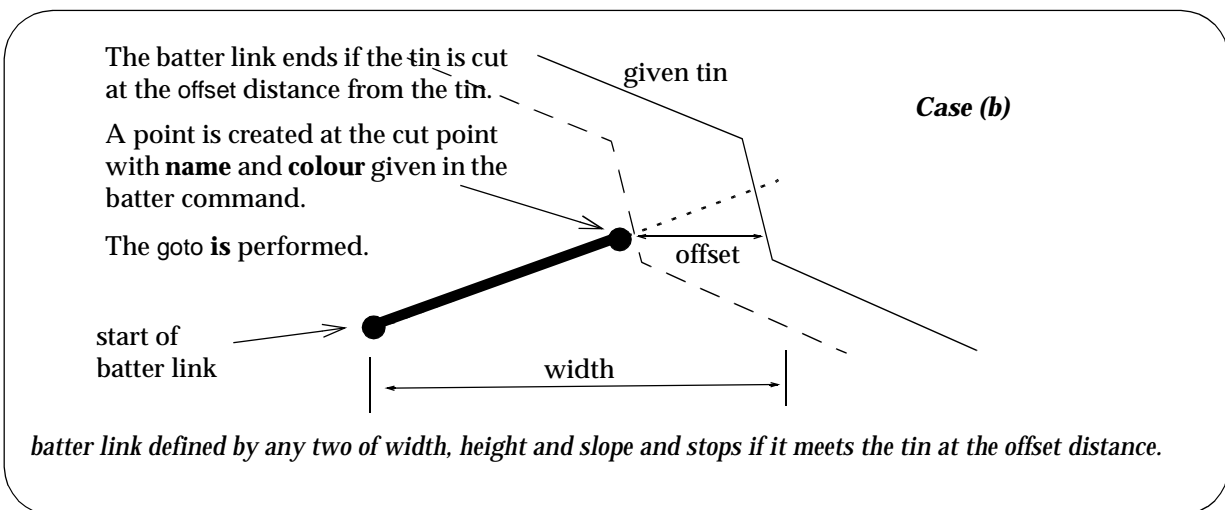
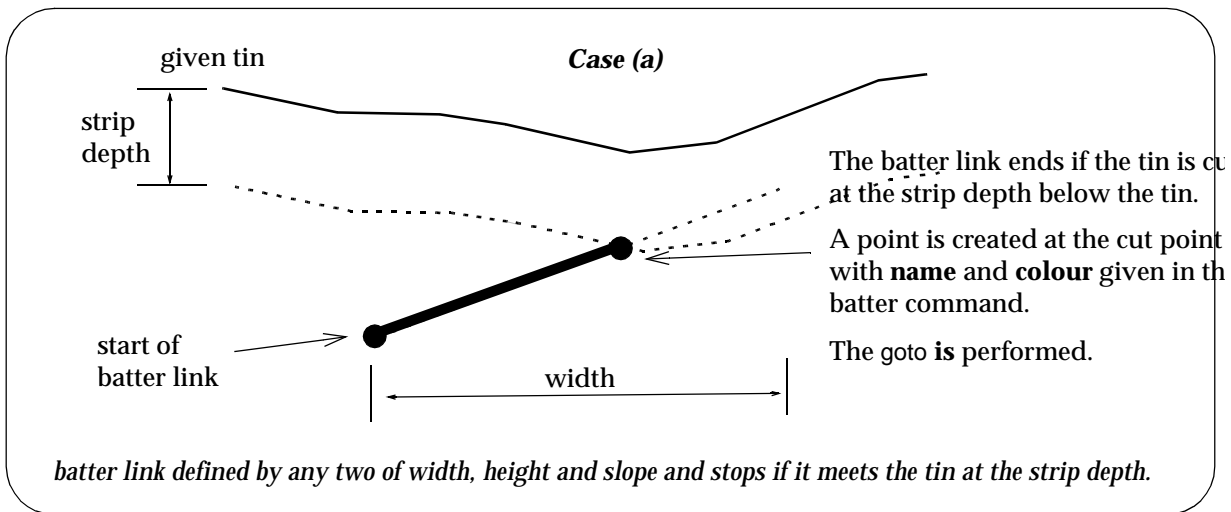
- (a) a strip depth of a tin
- (b) an offset distance from a tin.
- (c) a strip depth of a tin calculated at a given offset from the link.

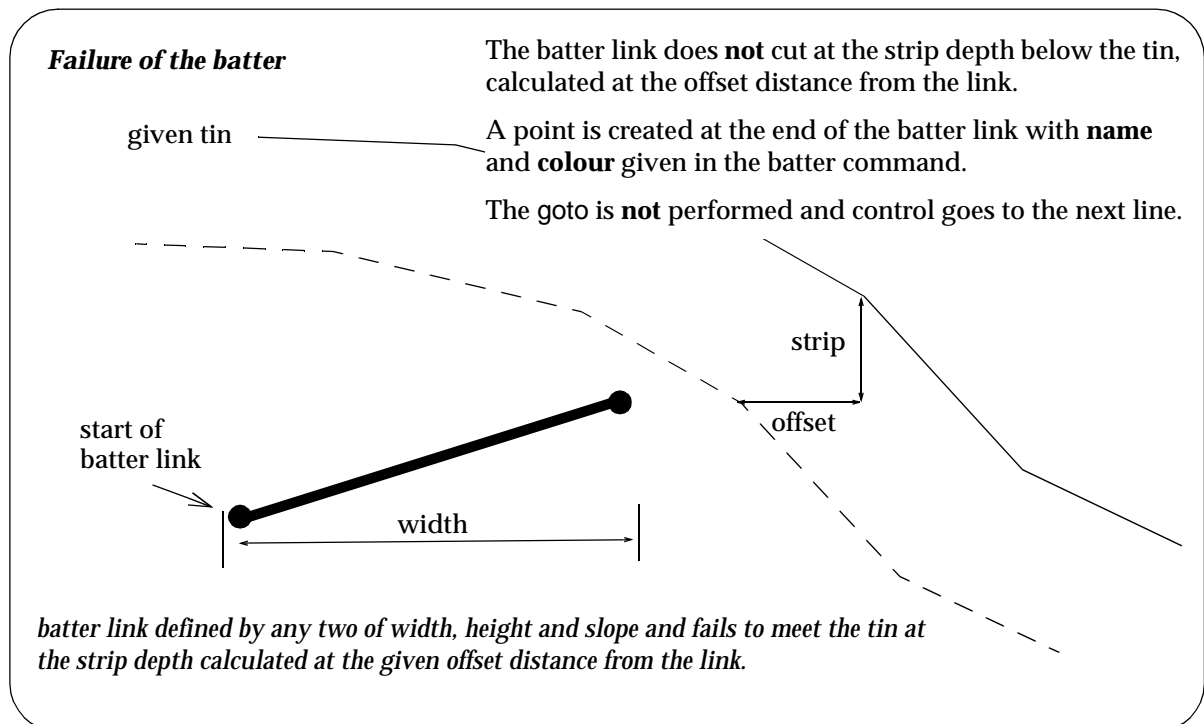
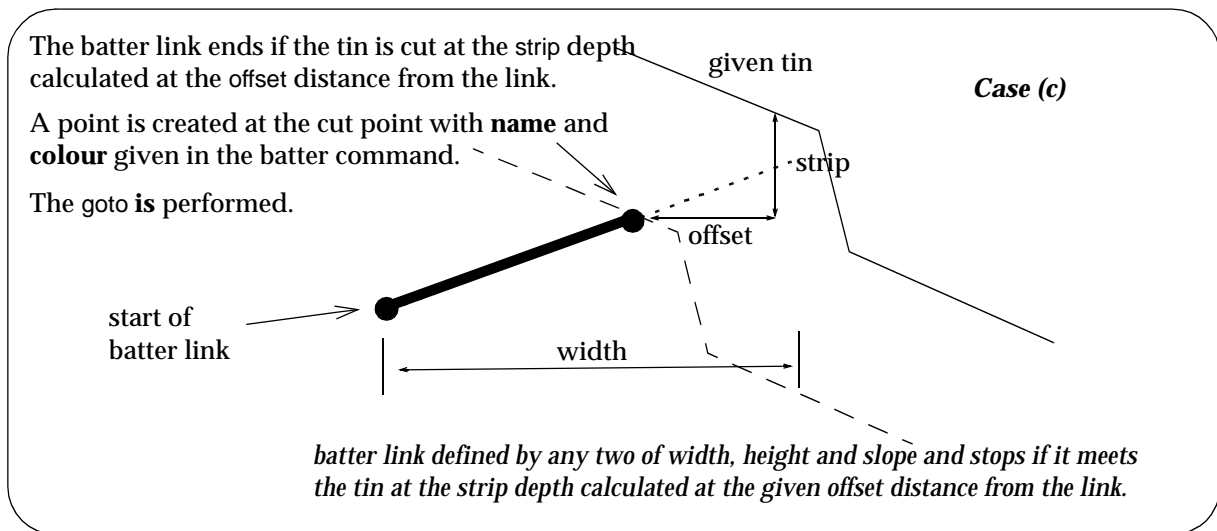
If the link does stop, control is transferred via a goto, otherwise control continues onto the next line in the table.

The batter link is defined by specifying values for two of the three fields width, height and slope.

Notes

1. cases (a) and (b) are just special cases of (c)
2. strip and offset can be used to stop the link to allow for a fixed structure (such as a drain) to be inserted so that it ends up on the tin.





The format of the Batter command in the panel is

```
Batter tin_name Strip value Width value Height value Slope value Name text
          Colour colour Goto label // comment
```

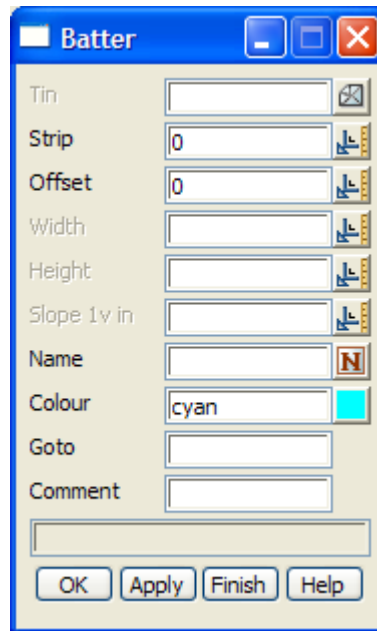
where only two of the three commands Width, Height and Slope are used.

The format of the command typed into the template file is

```
Batter tin_name strip_value width_value height_value slope_value
          name colour goto_label // comment
```

where one of *width_value*, *height_value* or *slope_value* is the key word *unknown*

The panel brought up when Batter is selected from the Create Rule menu is:



The fields and buttons used in this panel have the following functions.

Field Description	Type	Default	Pop-Up
Tin <i>tin to batter to.</i>	input		available tins
Strip <i>distance below the tin to stop at.</i>	input1	0	
Offset <i>offset distance from the link to check strip depth</i>	input1	0	
Width <i>the width for the link.</i>	input		
Height <i>the height for the link.</i>	input		
Slope 1v in <i>the slope, in 1v in, of the link. Positive is up and negative down.</i>	input		
Name <i>the name to be used for the created point and string.</i>	input		
Colour <i>the colour to be used for the created string</i>	input	cyan	available colours
Goto <i>label to goto if the batter link comes within the depth strip of the tin.</i>	input		
Comment <i>user comment - for information purposes only</i>	input		
OK/Apply	button		

OK stores the values in the fields and removes the panel.

Apply stores the values and leaves the panel on the screen.

Please continue to the next section “Label” .

Label

decision_label

Selecting Label brings up the **Label** panel which is used to define a label for the line for which control can be passed to via a goto.

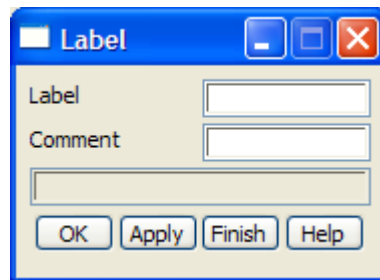
The format of the Label command in the panel is

```
Label label_name // comment
```

The format of the command typed into the template file is

```
Label label_name // comment
```

The panel brought up when Label is selected from the Create Rule menu is:



The fields and buttons used in this panel have the following functions.

Field Description	Type	Default	Pop-Up
Label <i>name of the label for the line in the table.</i>	input		
Comment <i>user comment - for information purposes only</i>	input		
OK/Apply <i>OK stores the values in the fields and removes the panel. Apply stores the values and leaves the panel on the screen.</i>	button		

Please continue to the next section "Goto".

Goto

decision_goto

Selecting Goto brings up the **Goto** panel which is used to transfer control to the line with the label given in the goto field of the panel.

The format of the Goto command in the panel is

```
Goto label_name // comment
```

The format of the command typed into the template file is

```
Goto label_name // comment
```

The panel brought up when Goto is selected from the Create Rule menu is:



The fields and buttons used in this panel have the following functions.

Field Description	Type	Default	Pop-Up
-------------------	------	---------	--------

Goto	input		
<i>name of the label to transfer control to.</i>			

Comment	input		
<i>user comment - for information purposes only</i>			

OK/Apply	button		
<i>OK stores the values in the fields and removes the panel.</i>			
<i>Apply stores the values and leaves the panel on the screen.</i>			

Please continue to the next section “Undo” .

Undo

decision_undo

Selecting **undo** brings up the **Undo Decision** panel which is used to delete a given number of points (and hence links) from the template being constructed.

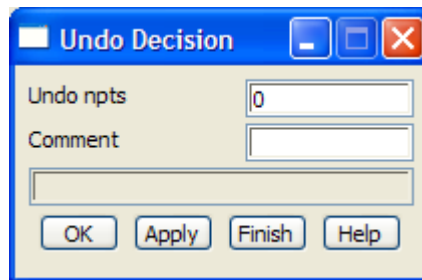
The format of the Label command in the panel is

Undo *number_of_points* // *comment*

The format of the command typed into the template file is

Undo *number_of_links* // *comment*

The panel brought up when **Undo** is selected from the Create Rule menu is:



The fields and buttons used in this panel have the following functions.

Field Description	Type	Default	Pop-Up
Undo npts <i>number of points to delete from the template.</i>	input	0	
Comment <i>user comment - for information purposes only</i>	input		
OK/Apply <i>OK stores the values in the fields and removes the panel.</i> <i>Apply stores the values and leaves the panel on the screen.</i>	button		

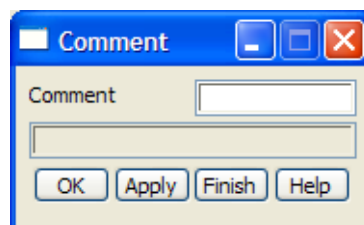
Please continue to the next section “Comment” .

Comment

decision_comment

Selecting **Comment** brings up the **Comment** panel and inserts an comment into the line of the table. Comments are ignored by the decisions calculations.

The panel brought up when **Comment** is selected from the Create Rule menu is:



The fields and buttons used in this panel have the following functions.

Field Description	Type	Default	Pop-Up
Comment <i>user comment - for information purposes only</i>	input		
OK/Apply OK stores the values in the fields and removes the panel. Apply stores the values and leaves the panel on the screen.	button		

Please continue to the next section “End” .

End

decision_end

Selecting **End** brings up the **End** panel and inserts an end command into the line of the table. When control reaches an **end** command, the decisions calculations are terminated.

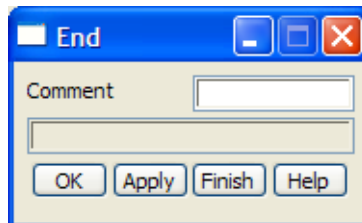
The format of the End command in the panel is

End // comment

The format of the command typed into the template file is

End // comment

The panel brought up when **End** is selected from the Create Rule menu is:



The fields and buttons used in this panel have the following functions.

Field Description	Type	Default	Pop-Up
Comment <i>user comment - for information purposes only</i>	input		
OK/Apply OK stores the values in the fields and removes the panel. Apply stores the values and leaves the panel on the screen.	button		

Please continue to the next section “Decisions Examples” .

Decisions Examples

One Tin Example

```

//From: 12D Solutions
//Date: 11/07/97
//
//Basic Decisional Template for cut in 9m depth, 5m depth, and less
//Note the Tin Used is "SURVEY"
//
//
template "std" {
  fixed {
    link 5 unknown -3 cyan "eb"
  }
  decisional {
// if at offset 1m it is below "SURVEY" then goto drain
    Tin_Decision      "SURVEY" 1 0 1000 "drain"

    Fixed_Xfall       1 unknown -3 "edgel" cyan
    Batter            "SURVEY" 0 100 unknown -3 "fill" cyan "done"

// label drain
// create a table drain
    Label              "drain"
    Fixed_Slope        1 -0.5 unknown "invert" cyan
    Fixed_Slope        1 0.5 unknown "edge" cyan

// now at end of table drain, check depth of 5, 9
    Tin_Decision      "SURVEY" 0 0 5 "smallestcut"
    Tin_Decision      "SURVEY" 0 0 9 "smallcut"

// deeper than 9m, batter to within 9m of surface
    Batter            "SURVEY" 9 100 unknown 0.75 "cut1" cyan "bench"

// label smallcut -
    Label              "smallcut"
    Batter            "SURVEY" 5 100 unknown 0.75 "small" cyan "bench2"

// label smallestcut -
    Label              "smallestcut"
    Batter            "SURVEY" 0 100 unknown 2 "smallcut" cyan "done"

// label bench
    Label              "bench"
    Fixed_Slope        3 -0.3 unknown "bench1" cyan
    Batter            "SURVEY" 5 100 unknown 1.5 "cut2" cyan "bench2"

// label bench2 -
    Label              "bench2"
    Fixed_Slope        3 -0.3 unknown "bench2" cyan
    Batter            "SURVEY" 0 100 unknown 2 "cut3" cyan "done"

// label done -

    Label              "done"
    End
  }
}

```



```

}
final {
  cut_slope na fill_slope na search_distance 100
}
}

```

Three Tins Example

```

//From: 4D Solutions
//Date: 11/07/97
//
// Example with three surfaces - rock, shale, terrain
// Assume that rock is below shale is below terrain

template "std" {
  fixed {
    link 3 unknown -3 cyan "kerb"
    link 1 unknown -4 magenta "shoulder"
    link 2 unknown -5 purple "verge"
  }
  decisional {
// test if in rock
    Tin_Decision "rock" 0 0 1000 "cut_rock"

// not in rock, test if in shale
    Tin_Decision "shale" 0 0 1000 "cut_shale"

// not in rock or shale, test if below or above terrain
    Tin_Decision "terrain" 0 0 1000 "cut_terrain"

// fill terrain - loop on creating some benches
    Label "fill_terrain"
    Batter "terrain" 0 0 8 unknown -3 "f1" blue "alldone"
    Batter "terrain" 0 0 1 unknown 0 "f2" "dark green" "alldone"
    Goto "fill_terrain"

// cut rock
    Label "cut_rock"
    Tin_Decision "rock" 0 0 0.3 "cut_rock_done"
    Batter "rock" 0.3 0 5 unknown 0.5 "r1" cyan "cut_rock_done"
    Batter "rock" 0 0 2.5 unknown 0 "r2" yellow "cut_rock_done"
    Goto "cut_rock"

// cut rock done - work on shale
    Label "cut_rock_done"
    Tin_Decision "shale" 0 0 1000 "cut_shale"
    Goto "cut_shale_done"

// cut shale
    Label "cut_shale"
    Tin_Decision "shale" 0 0 0.6 "cut_shale_done"
    Batter "shale" 0.6 0 6 unknown 1 "s1" magenta "cut_shale_done"
    Batter "shale" 0 0 3 unknown 0 "s2" "dark red" "cut_shale_done"
    Goto "cut_shale"

```

```
// cut shale done - work on terrain
Label          "cut_shale_done"
Tin_Decision   "terrain" 0 0 1000 "cut_terrain"
Goto           "alldone"

// cut terrain
Label          "cut_terrain"
Batter         "terrain" 0 0 3 unknown 1.5 "t1" red "alldone"
Batter         "terrain" 0 0 2 unknown 0 "t2" green "alldone"
Goto           "cut_terrain"

// all done - end of decisional
Label          "alldone"
}
final {
  cut_slope 1 fill_slope 2 search_distance 100
}
}
template "headwall" {
  fixed {
    link 3 unknown -3 cyan "kerb"
    link 1 unknown -4 magenta "shoulder"
    link 2 unknown -5 purple "verge"
  }
  decisional {
    Tin_Decision   "" 0 0 1000 "done" // should never happen
    Batter         "" 0 0 10 -100 unknown "int" cyan "done"
    Label          "done"
  }
  final {
    cut_slope na fill_slope na search_distance 100
  }
}
```

Placing Elements for Super Alignments

Placing a super alignment, like the alignment strings, consists of:

- (a) defining the horizontal geometry
- (b) defining the vertical geometry

Unlike the alignment which uses IP methods only, the super alignment allows the user to partially define elements making up the super alignment. The position and types of elements, and the condition that each element is tangential to the adjacent elements, may allow *12d Model* to calculate for all the unknowns in the element definitions to be solved and the super alignment be fully defined.

Horizontal elements consist of lines, arcs and transition spirals.

Normally these elements can be combined in the super alignment and defined so that adjacent elements are tangential to each other.

When placing horizontal elements, *12d Model* often only requires **some** of the information defining the element and the configuration of the elements and enforcing tangentiality of adjacent elements, allows *12d Model* to calculate the rest of the information.

Vertical elements consist of lines, parabolas and arcs.

These elements can be combined in the super alignment and defined so that adjacent elements are tangential to each other.

When placing vertical elements, *12d Model* often only requires **some** of the information defining the element and the configuration of the elements and enforcing tangentiality of adjacent elements, allows *12d Model* to calculate the rest of the information.

Horizontal IP's

No curve, go to No curve - known horizontal intersection point with no arc on it

Alignment speed, go to Alignment speed - known horizontal intersection point with arcs and spirals defined by the design parameters and default speed for the super alignment

Curve speed, go to Curve speed - known horizontal intersection point with known speed with the arcs and spirals are defined by design parameters for that speed

Curve length, go to Curve length - known horizontal intersection point with an arc of a known length

Curve radius, go to Curve radius - known horizontal intersection point with an arc of a known radius

Curve spiral, go to Curve spiral - known horizontal intersection point with an arc of a known radius and leading and trailing spirals of known lengths.

Horizontal Lines

Fixed, go to Fixed - line passes through two known points

Fixed direction, go to Fixed direction - the line passes through a known point with a known bearing. An offset is allowed.

Floating point, go to Floating point - the line passes through a known point but the bearing is unknown bearing

Floating direction, go to Floating direction - the line has a known bearing but nothing else is known

Floating end, go to Floating end - the line has a known length and goes from the end of a previous element

Free, go to Free - the line is not constrained in any way

Horizontal Arcs

Fixed, go to Fixed - the arc centre is known as well as the radius and start and end points. An offset is allowed.

Fixed 3 points, go to Fixed 3 points- the arc passes through three known points

Fixed direction, go to Fixed direction- known point, known radius and known bearing at the known point

Floating radius, go to Floating radius - the radius of the arc is known and the arc passes through a known point

Floating direction, go to Floating direction - the arc passes through a known point with a known bearing at the point

Floating 2 pts, go to Floating 2 points- the arc passes through two known points

Floating end and point, go to Floating end and point- the arc passes through one known point and is attached to either previous or next element

Floating end, radius and length, go to Floating end, radius and length- the arc has a known radius and a known length

Free radius, go to Free radius - the arc has a known radius

Free point, go to Free point - the arc passes through a known point

Free length, go to Free length - the arc has a known length

Horizontal Transitions

Free spiral, go to Free spiral - the transition spiral is unconstrained

Spiral, go to Spiral - the spiral has a known length

Back to back, go to Back to back- back to back spirals of known lengths between two fixed lines

Arc to arc, go to Arc to arc- back to back spirals between known arcs. One spiral length is needed.

Taper, go to Taper - known length and known ratio

None, go to None - no transition

3 centred, go to 3 centred - three centred curve - three arcs with given radii and offsets

2 centred, go to 2 centred - two centred curve- two arcs with given radii

Compound spiral, go to Compound spiral - compound spirals of known lengths

Compound line, go to Compound line - compound spirals with one known length with a line of known length

Compound arc, go to Compound arc - compound arcs of known radii

Vertical IP's

No VC, go to No VC - known vertical intersection point with no parabola or arc on it

Alignment speed, go to Alignment speed - known vertical intersection point with parabola defined by the design parameters and default speed for the super alignment

Speed, go to Speed - known vertical intersection point with a known speed and the parabolic curve defined by the design parameters

Length, go to Length - known vertical intersection point with a parabola of a known length

Radius, go to Radius - known vertical intersection point with a parabola of a known effective radius

K value, go to K-value - known vertical intersection point with a parabola of a known k-value

Max length, go to Max length - known vertical intersection point with a parabola of maximum length

Asymmetric, go to Asymmetric - known vertical intersection point with asymmetric parabolas of known lengths

Circular arc, go to Circular arc - known vertical intersection point with an arc of a known radius

Vertical Lines

Fixed, go to Fixed - two known points

Fixed grade, go to Fixed grade - known point and know grade

Floating point, go to Floating point - known point (unknown grade)

Floating grade, go to Floating grade - known grade (unknown point)

Free, go to Free - not constrained at all

Vertical Arcs

Fixed, go to Fixed - known centre, known radius and known start and end points of the arc

Fixed 3 points, go to Fixed 3 points- three known points on the arc

Fixed direction, go to Fixed direction- known point, known radius and known bearing at the known point

Floating radius, go to Floating radius - known point and known radius of the arc

Floating grade, go to Floating grade - known point and known tangential grade of the arc at the known point

Floating 2 points, go to Floating 2 points- two known points on the arc

Free radius, go to Free radius - known radius of the arc

Free point, go to Free point - known point on the arc

Free length, go to Free length - known length of the arc

Vertical Parabolas

Fixed 3 points, go to Fixed 3 points- three known points on the parabola

Fixed apex radius, go to Fixed apex radius- known apex point and known effective radius of the parabola

Floating 2 points, go to Floating 2 points- two known points on the parabola

Floating apex, go to Floating apex- known apex point of the parabola

Floating radius, go to Floating radius - known point and known effective radius of the parabola

Floating grade, go to Floating grade - known point and known grade at the known point

Floating k value, go to Floating k value - known point and known k value of the parabola

Free point, go to Free point - known point on the parabola

Free length, go to Free length - known length of the parabola

Free radius, go to Free radius - known effective radius of the parabola

Free rl, go to Free rl - known height of the parabola

Free k value, go to Free k value- known k value of the parabola

Free max length, go to Free max length- fit a parabola of maximum length

Free asymmetric, go to Free asymmetric- asymmetric parabolas of known lengths

Free compound, go to Free compound- compound parabolas with a percentage length of the first parabola and an optional total length

Super Alignment Horizontal Elements

Horizontal IP's

No curve - known horizontal intersection point with no arc on it

Horizontal IP's

Alignment speed - known horizontal intersection point with arcs and spirals defined by the design parameters and default speed for the super alignment

Horizontal IP's

Curve speed - known horizontal intersection point with known speed with the arcs and spirals are defined by design parameters for that speed

Horizontal IP's

Curve length - known horizontal intersection point with an arc of a known length

Horizontal IP's

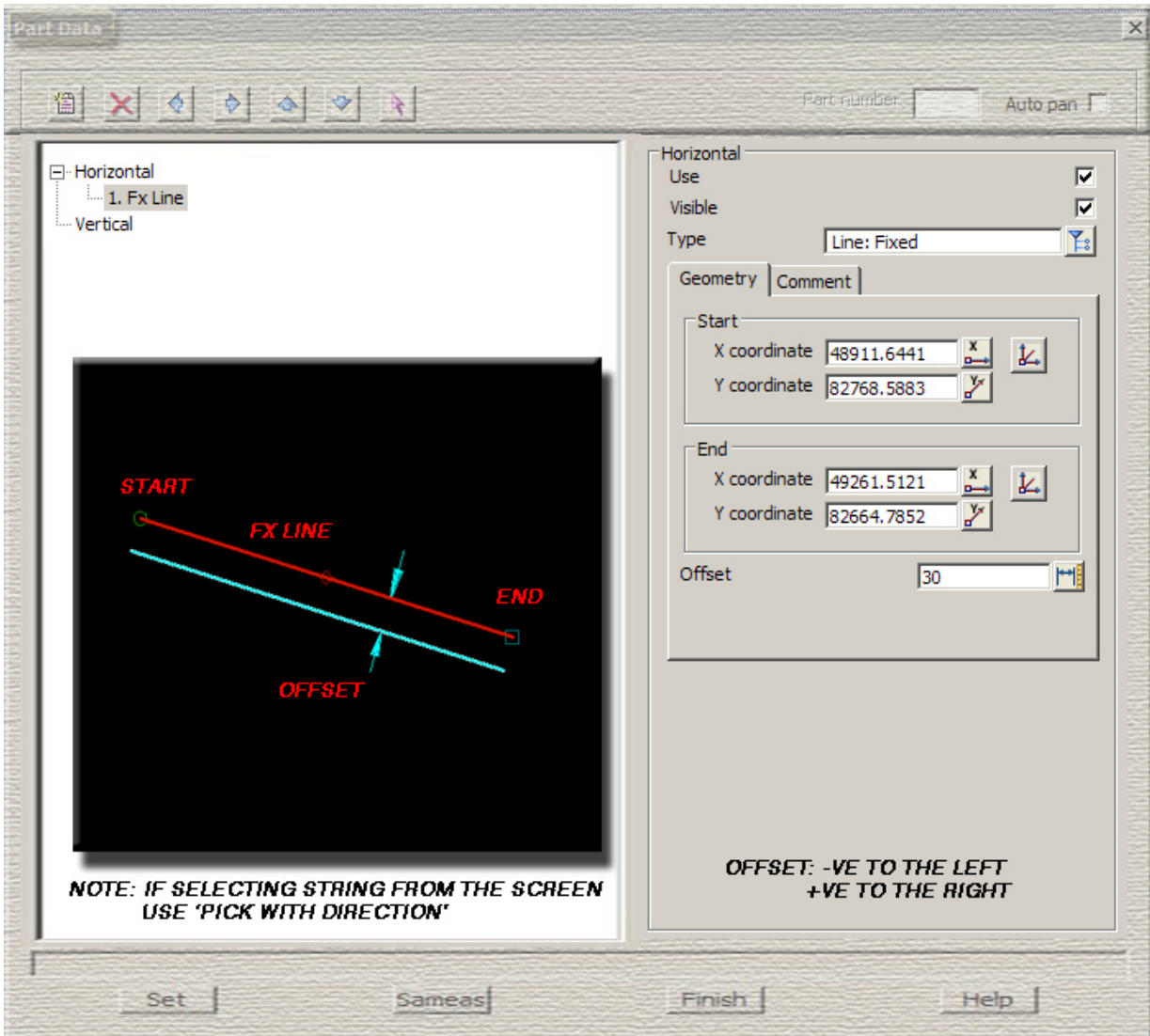
Curve radius - known horizontal intersection point with an arc of a known radius

Horizontal IP's

Curve spiral - known horizontal intersection point with an arc of a known radius and leading and trailing spirals of known lengths.

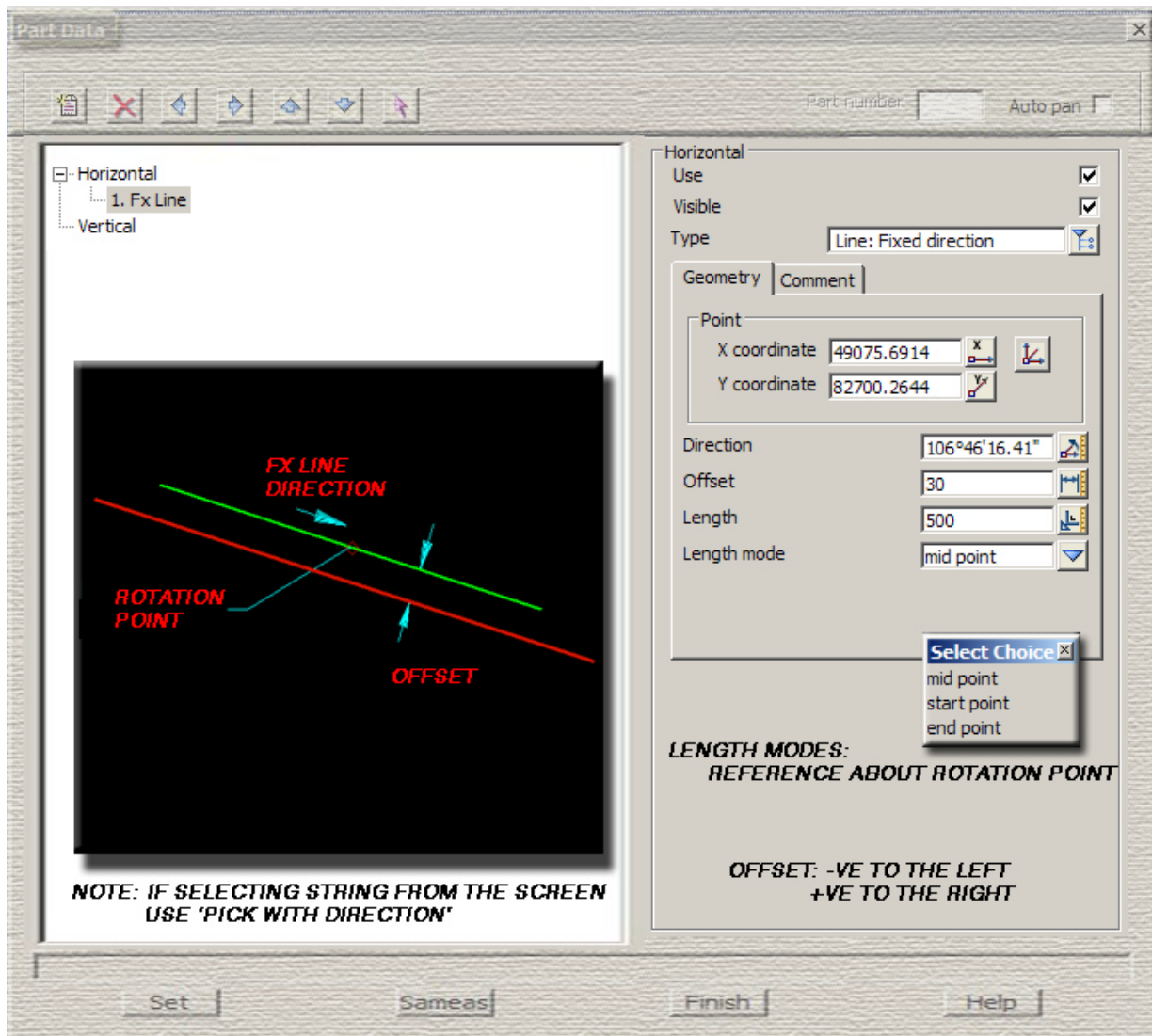
Horizontal Lines

Fixed - line passes through two known points



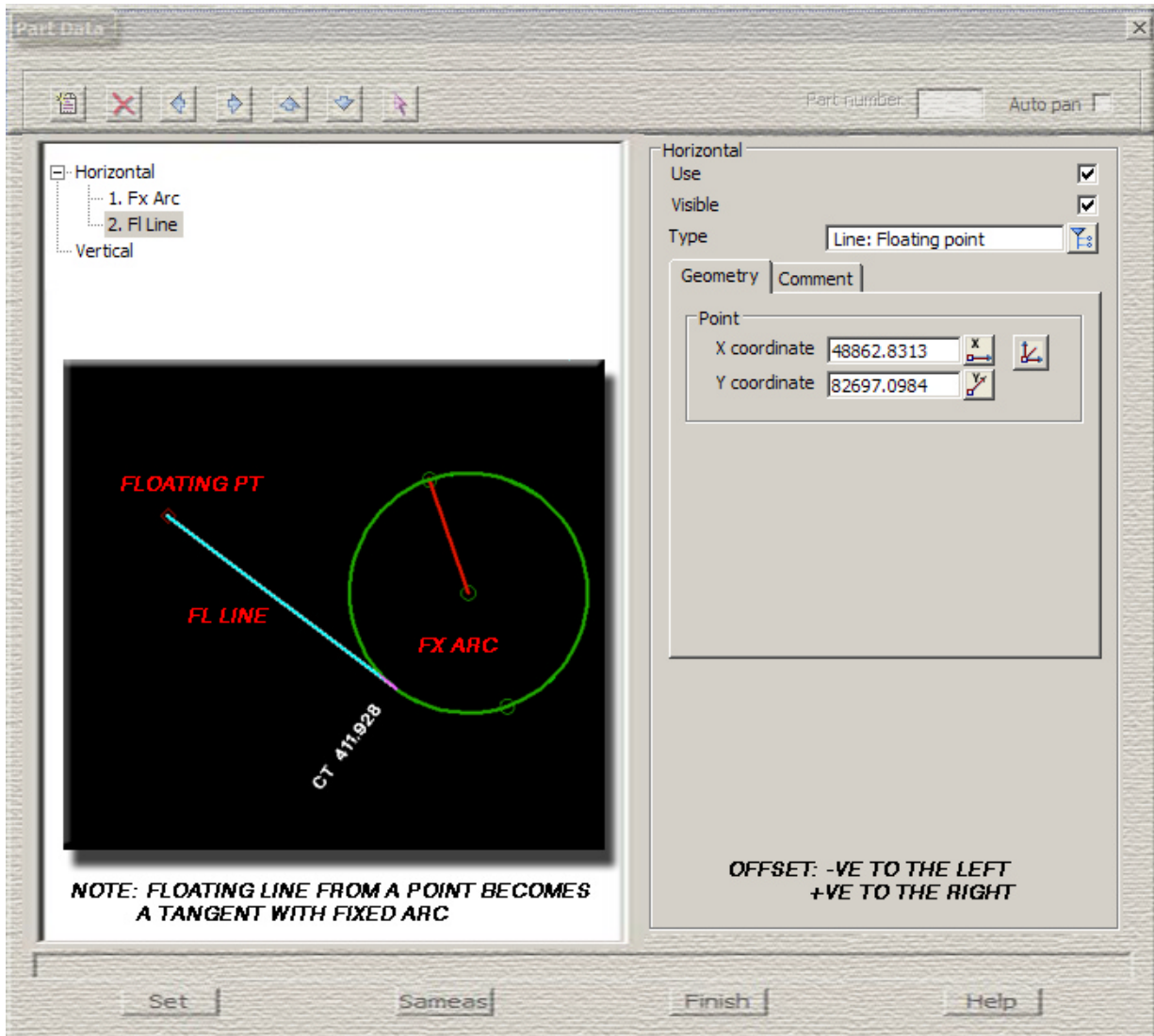
Horizontal Lines

Fixed direction - the line passes through a known point with a known bearing. An offset is allowed.



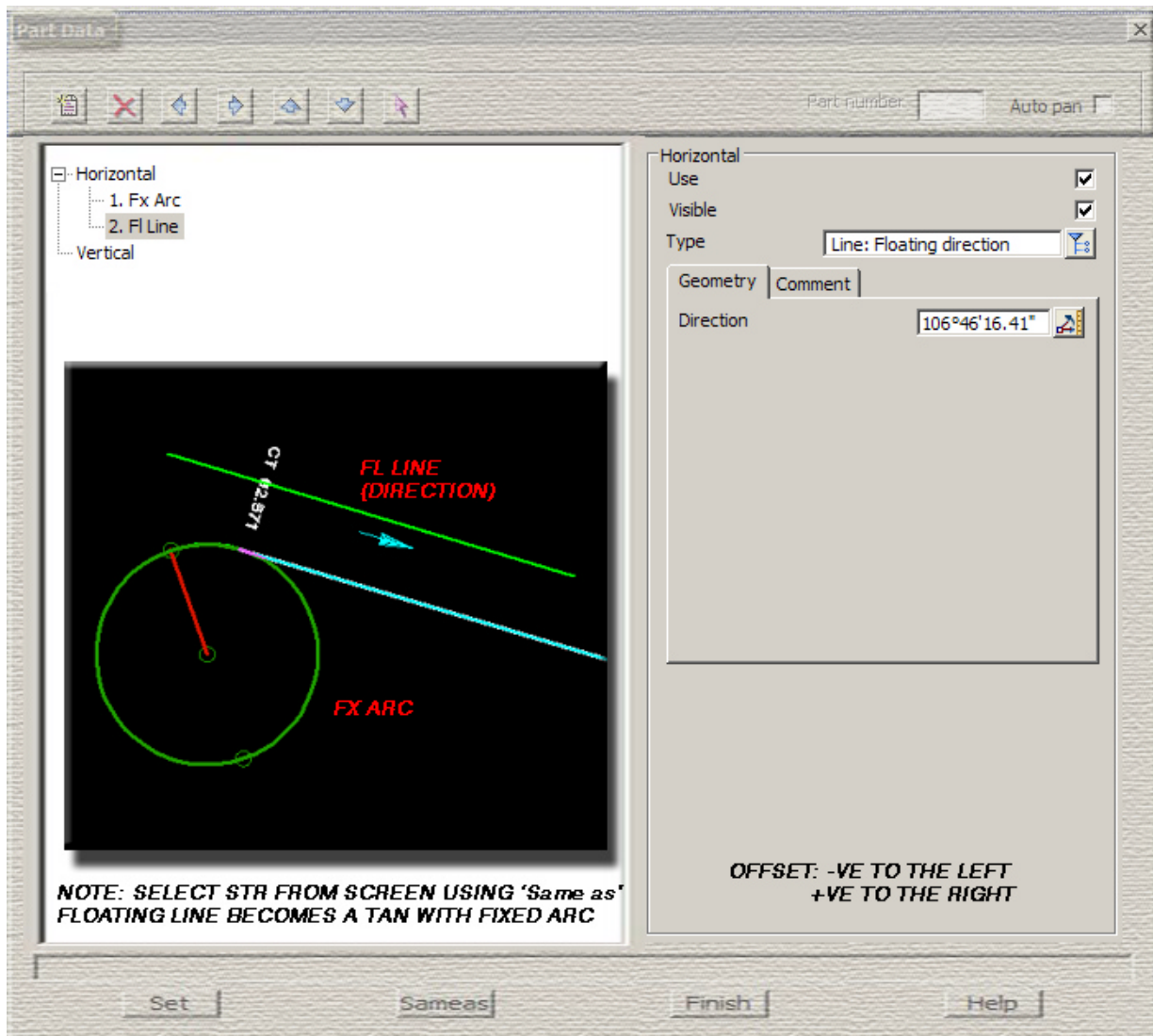
Horizontal Lines

Floating point - the line passes through a known point but the bearing is unknown bearing



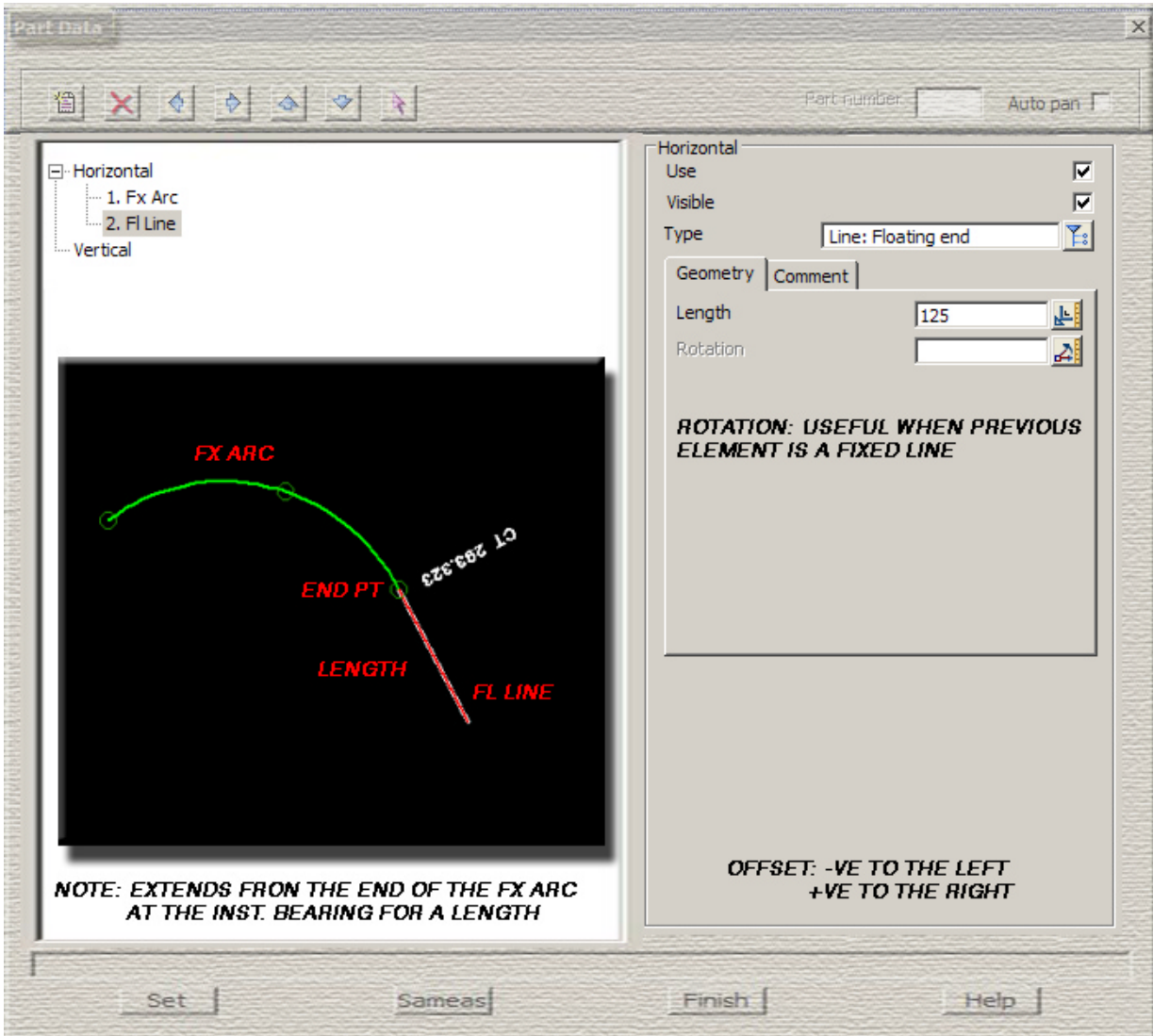
Horizontal Lines

Floating direction - the line has a known bearing but nothing else is known



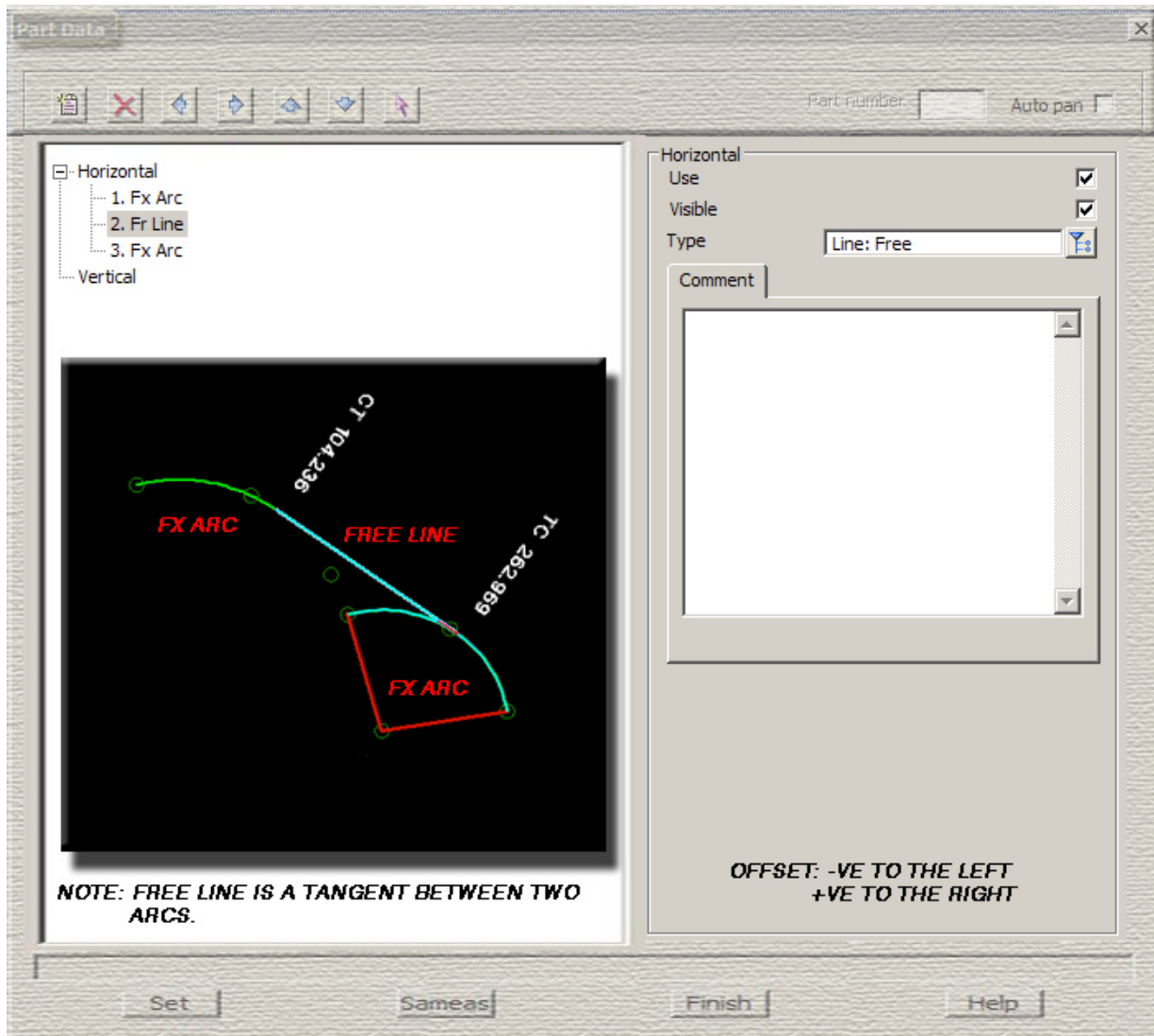
Horizontal Lines

Floating end - the line has a known length and goes from the end of a previous element



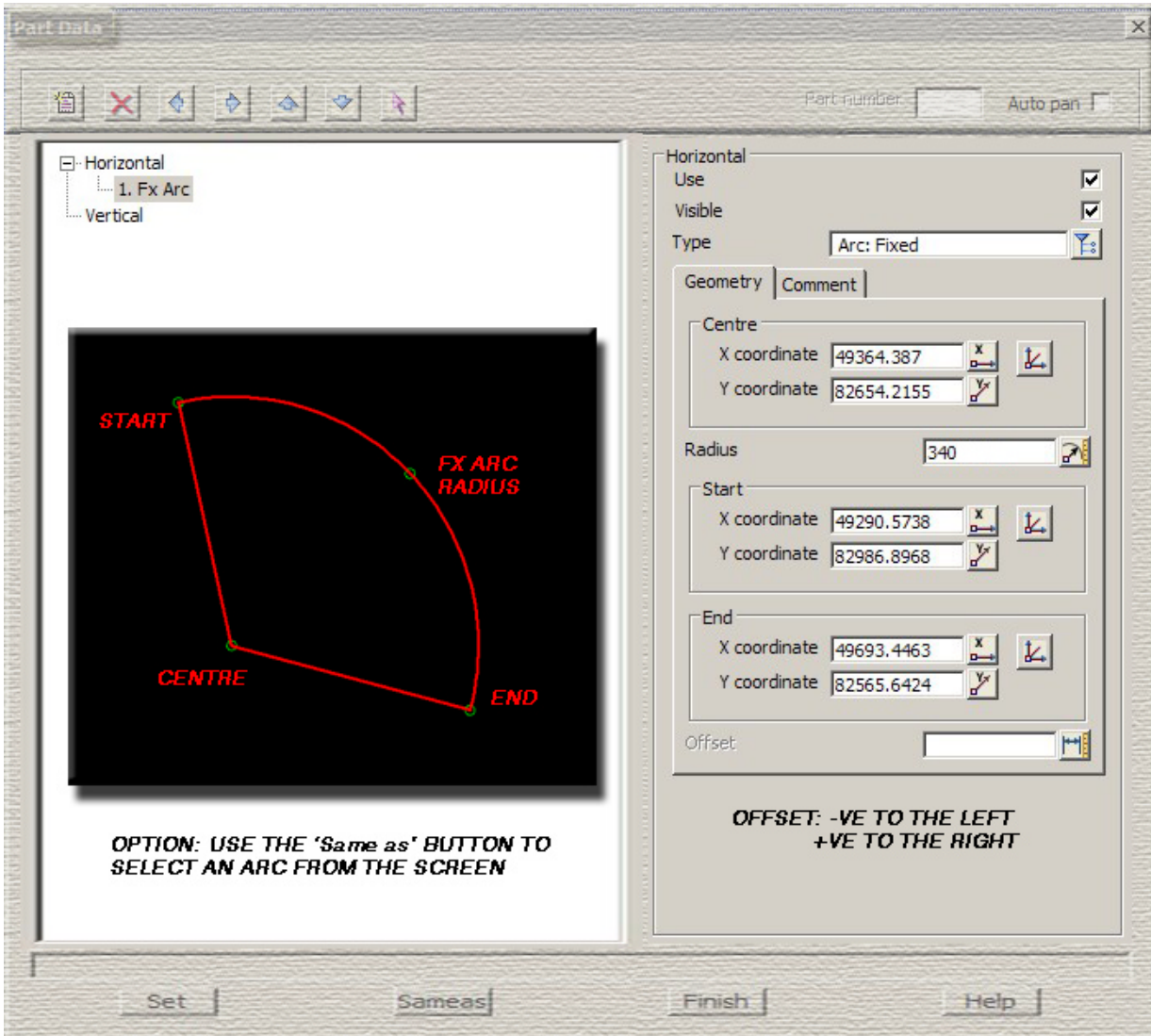
Horizontal Lines

Free - the line is not constrained in any way



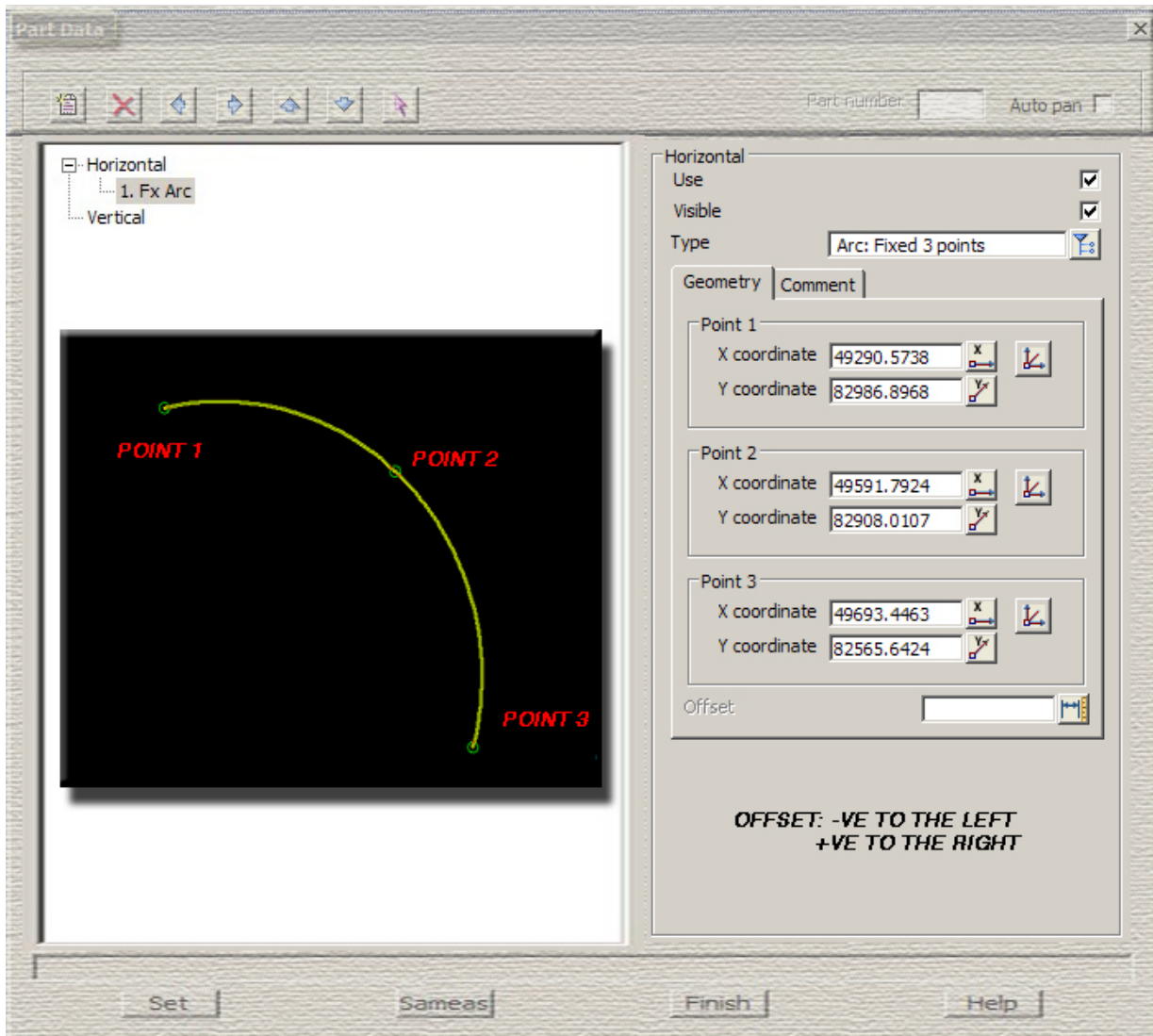
Horizontal Arcs

Fixed - the arc centre is known as well as the radius and start and end points. An offset is allowed.



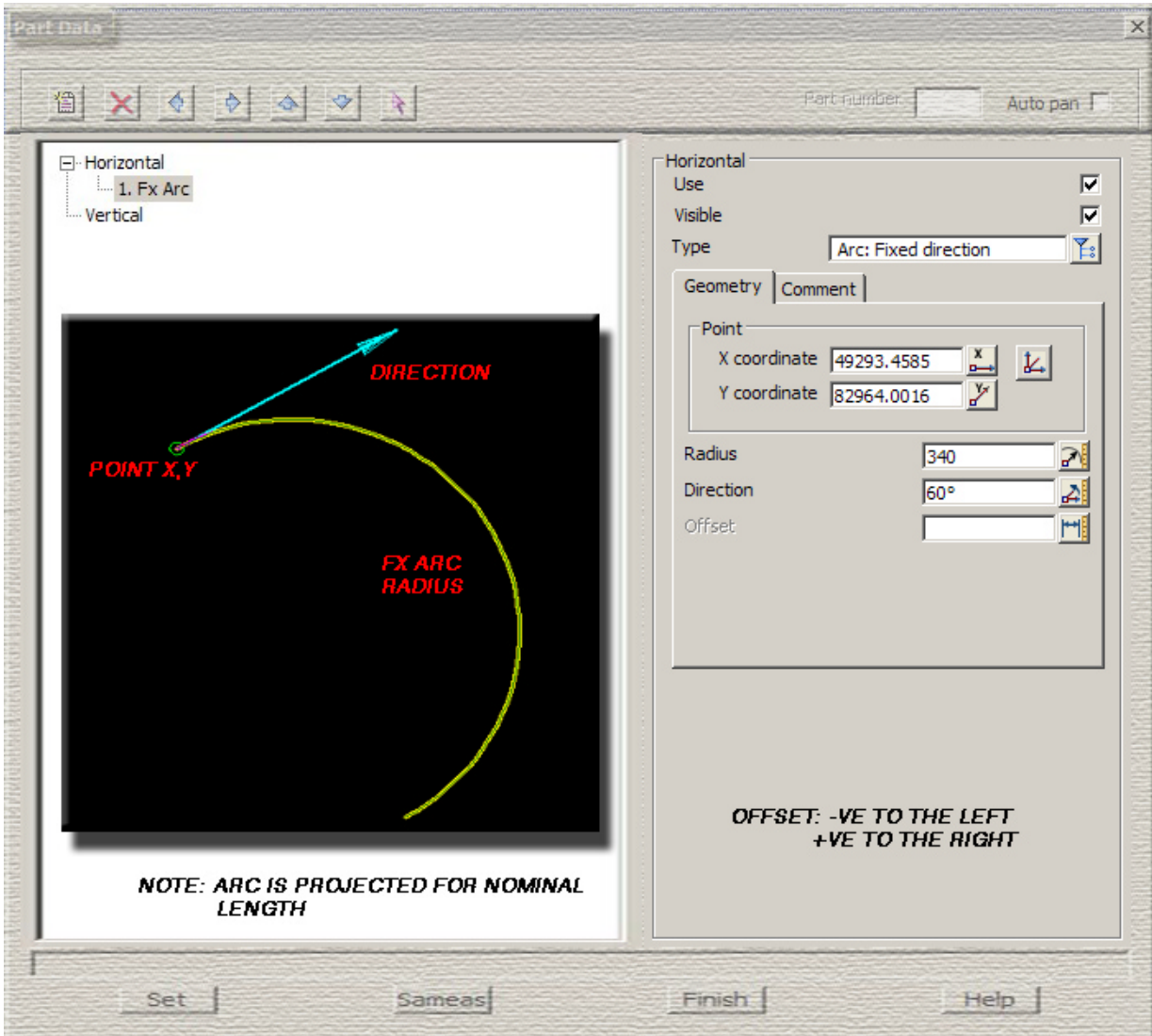
Horizontal Arcs

Fixed 3 points- the arc passes through three known points



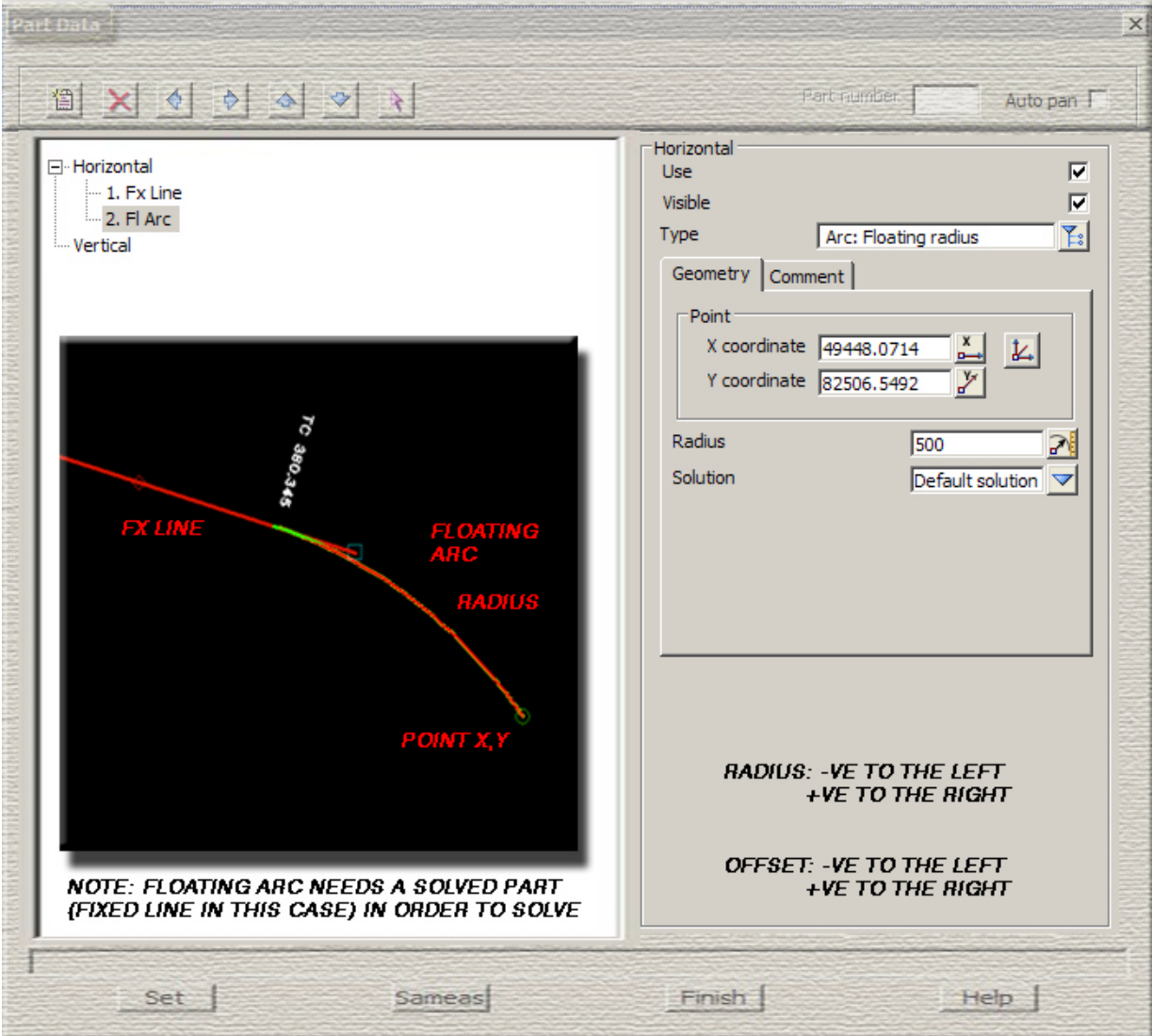
Horizontal Arcs

Fixed direction- known point, known radius and known bearing at the known point



Horizontal Arcs

Floating radius - the radius of the arc is known and the arc passes through a known point



Horizontal Arcs

Floating direction - the arc passes through a known point with a known bearing at the point

The screenshot shows the 'Part Data' window with the following elements:

- Tree View:**
 - Horizontal
 - 1. Fx Line
 - 2. Fl Arc
 - Vertical
- Diagram:** A black background showing a red line labeled 'FX LINE' transitioning into a red arc labeled 'FL ARC'. A red dot at the end of the arc is labeled 'POINT'. A dashed blue line with an arrow is labeled 'DIRECTION'. A white label 'TC 389.833' is positioned above the arc.
- Control Panel (Right):**
 - Horizontal Use:
 - Visible:
 - Type: Arc: Floating direction
 - Geometry | Comment
 - Point:
 - X coordinate: 49329.2737
 - Y coordinate: 82509.1763
 - Direction: 180°
 - Solution: Default solution
- Notes:**
 - DIRECTION: ABSOLUTE VALUES BUT RELATIVE TO THE FIXED LINE**
 - OFFSET: -VE TO THE LEFT +VE TO THE RIGHT**
- Buttons:** Set, Sameas, Finish, Help

NOTE: FLOATING ARC NEEDS A SOLVED PART (FIXED LINE IN THIS CASE) IN ORDER TO SOLVE

DIRECTION: ABSOLUTE VALUES BUT RELATIVE TO THE FIXED LINE

OFFSET: -VE TO THE LEFT +VE TO THE RIGHT

Horizontal Arcs

Floating 2 points- the arc passes through two known points

Part Data

Part number: Auto pan

Horizontal

- 1. Fx Line
- 2. Fl Arc

Vertical

Horizontal Use

Visible

Type

Geometry Comment

Start

X coordinate

Y coordinate

End

X coordinate

Y coordinate

Solution

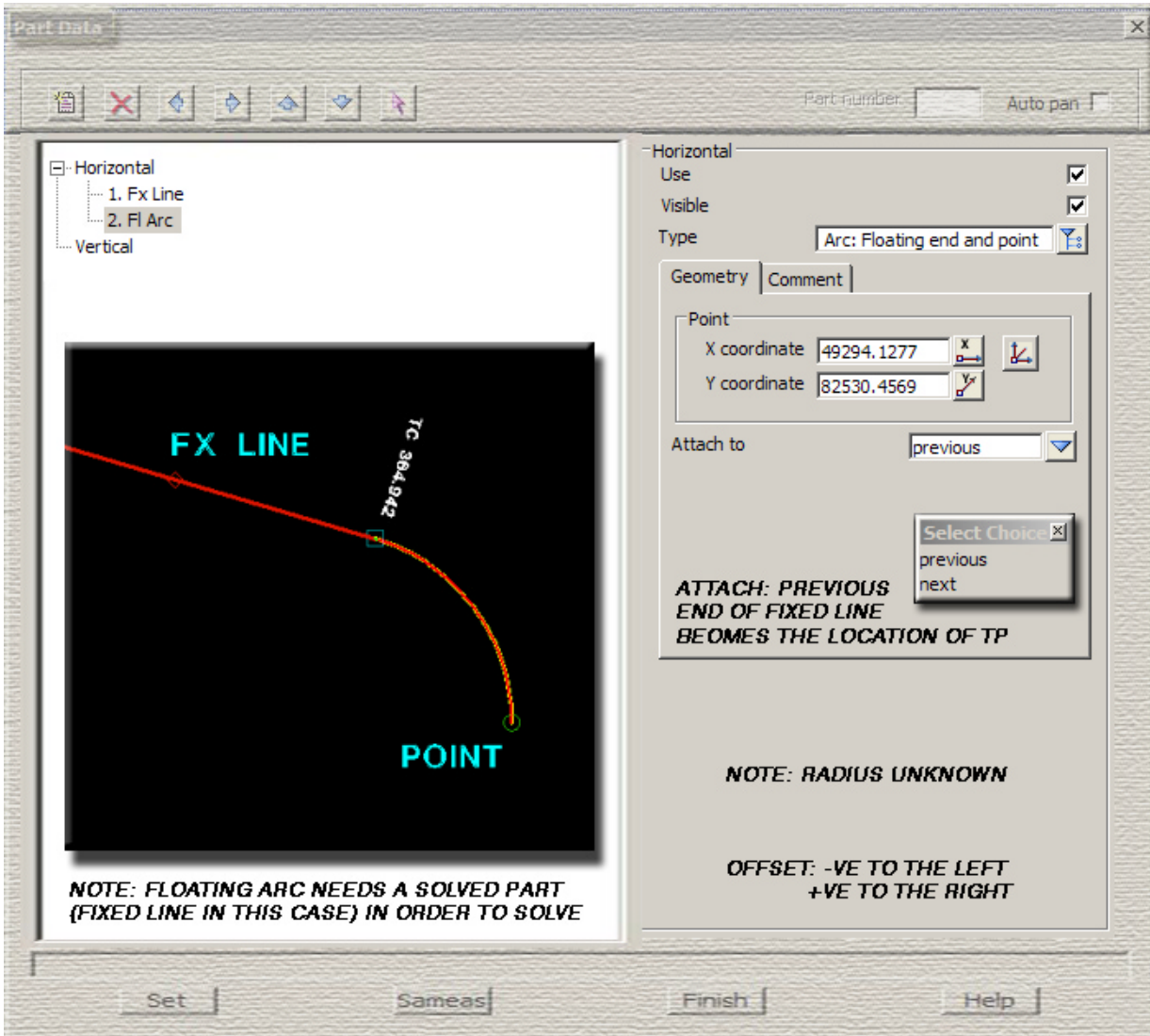
NOTE: RADIUS UNKNOWN

**OFFSET: -VE TO THE LEFT
+VE TO THE RIGHT**

Set Sameas Finish Help

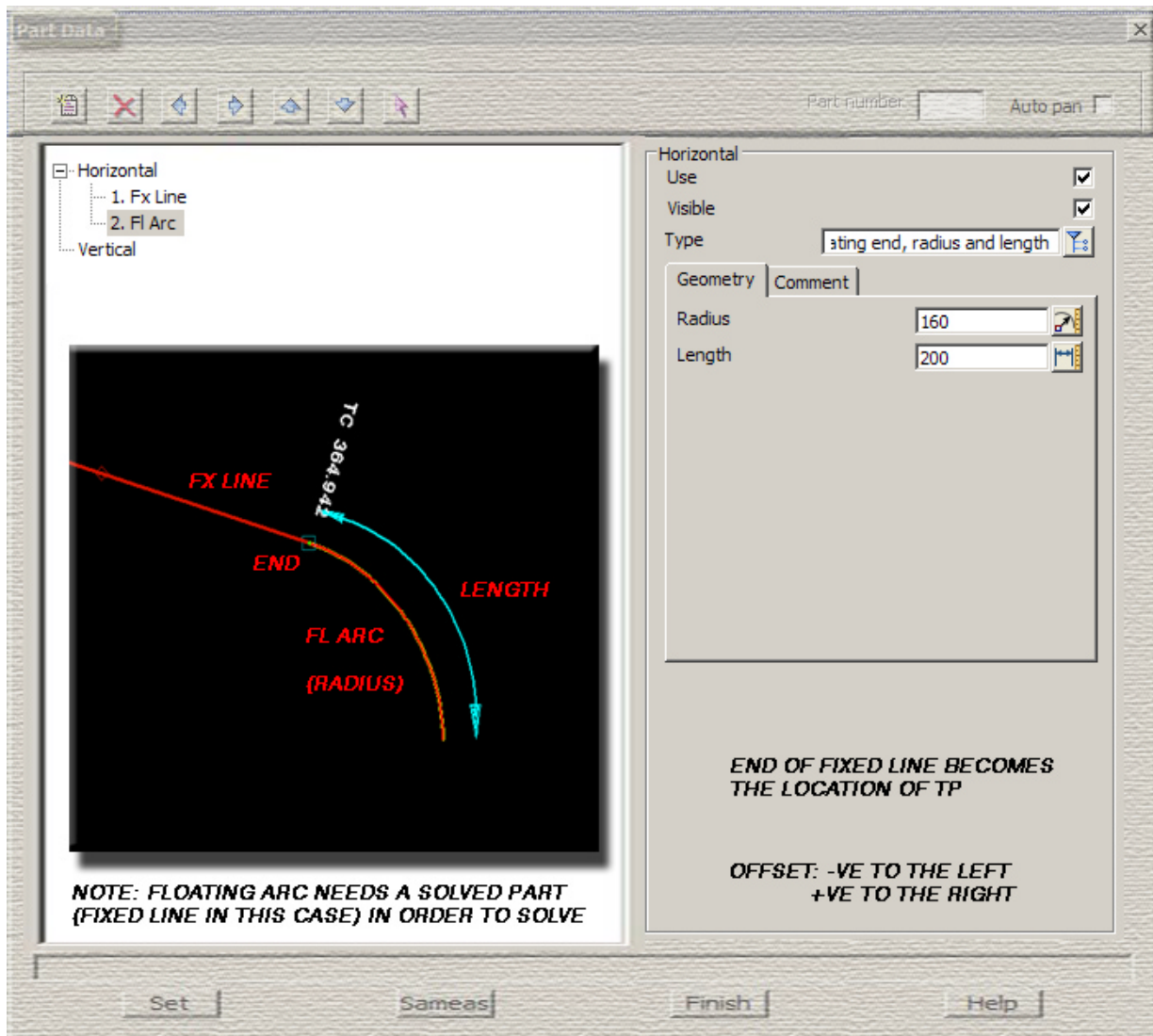
Horizontal Arcs

Floating end and point- the arc passes through one known point and is attached to either previous or next element



Horizontal Arcs

Floating end, radius and length- the arc has a known radius and a known length



Horizontal Arcs

Free radius - the arc has a known radius

Part Data

Horizontal

- 1. Fx Line
- 2. Fr Arc
- 3. Fx Line

Vertical

Horizontal

Use

Visible

Type

Geometry Comment

Radius

Solution

**RADIUS: -VE TO THE LEFT
+VE TO THE RIGHT**

**OFFSET: -VE TO THE LEFT
+VE TO THE RIGHT**

NOTE: FREE ARC NEEDS TWO SOLVED PARTS (FIXED LINES IN THIS CASE) IN ORDER TO SOLVE

Set Sameas Finish Help

Horizontal Arcs

Free point - the arc passes through a known point

Part Data

Horizontal

- 1. Fx Line
- 2. Fr Arc
- 3. Fx Line

Vertical

FX LINE

To 256.811

POINT X,Y

CT 366.000

FX LINE OFFSET

NOTE: FREE ARC NEEDS TWO SOLVED PARTS (FIXED LINES IN THIS CASE) IN ORDER TO SOLVE

Horizontal

Use

Visible

Type Arc: Free point

Geometry Comment

Point

X coordinate 49266.143

Y coordinate 82590.5517

Solution Default solution

RADIUS: UNKNOWN

**OFFSET: -VE TO THE LEFT
+VE TO THE RIGHT**

Set Sameas Finish Help

Horizontal Arcs

Free length - the arc has a known length

Part Data

Part number: Auto pan

Horizontal

- 1. Fx Line
- 2. Fr Arc
- 3. Fx Line

Vertical

FX LINE

FR ARC LENGTH

FX LINE OFFSET

TC 266.431

CT 666.431

Horizontal

Use

Visible

Type Arc: Free length

Geometry Comment

Length 300

Solution Default solution

RADIUS: UNKNOWN

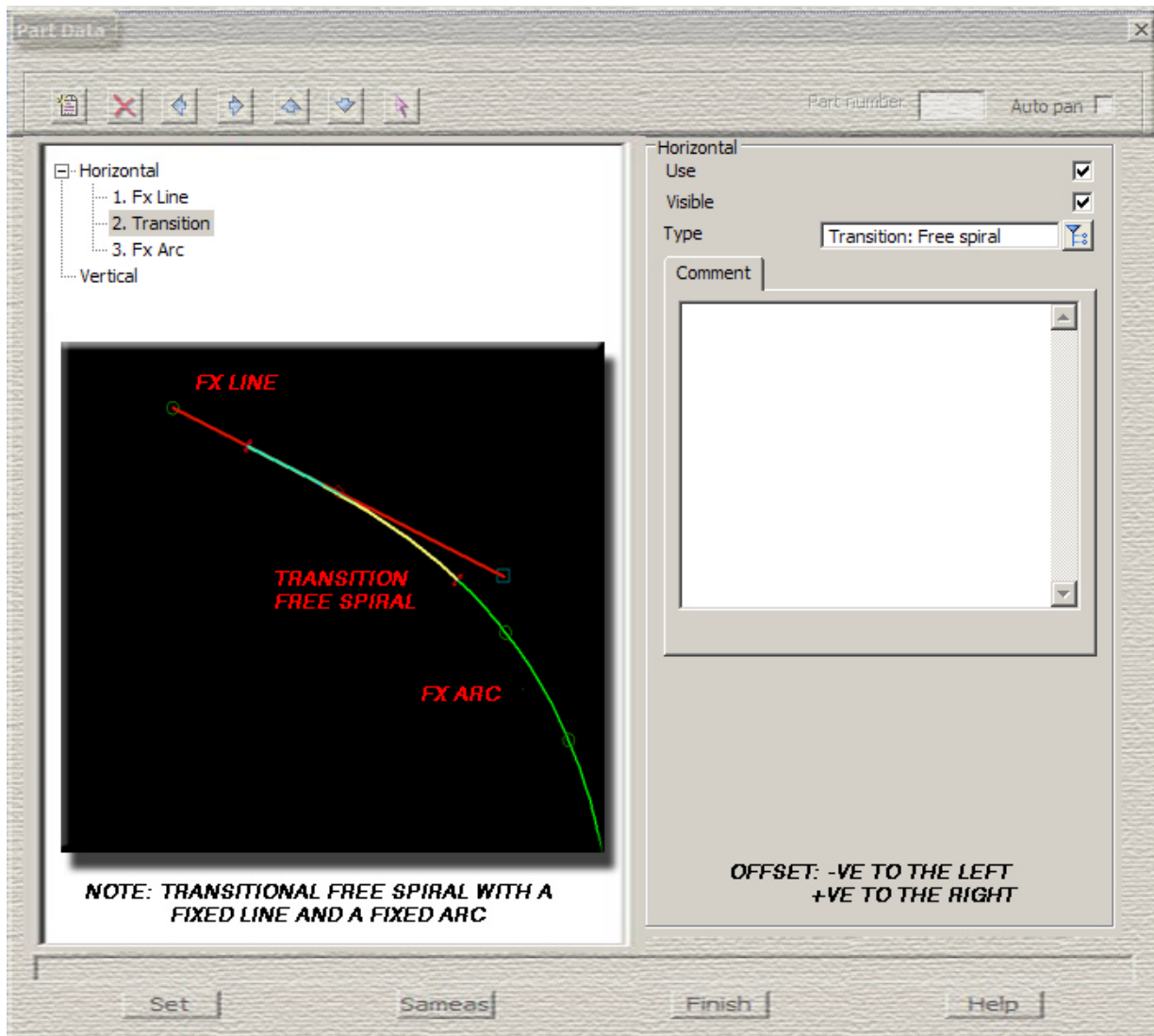
OFFSET: -VE TO THE LEFT
+VE TO THE RIGHT

Set Sameas Finish Help

NOTE: FREE ARC NEEDS TWO SOLVED PARTS (FIXED LINES IN THIS CASE) IN ORDER TO SOLVE

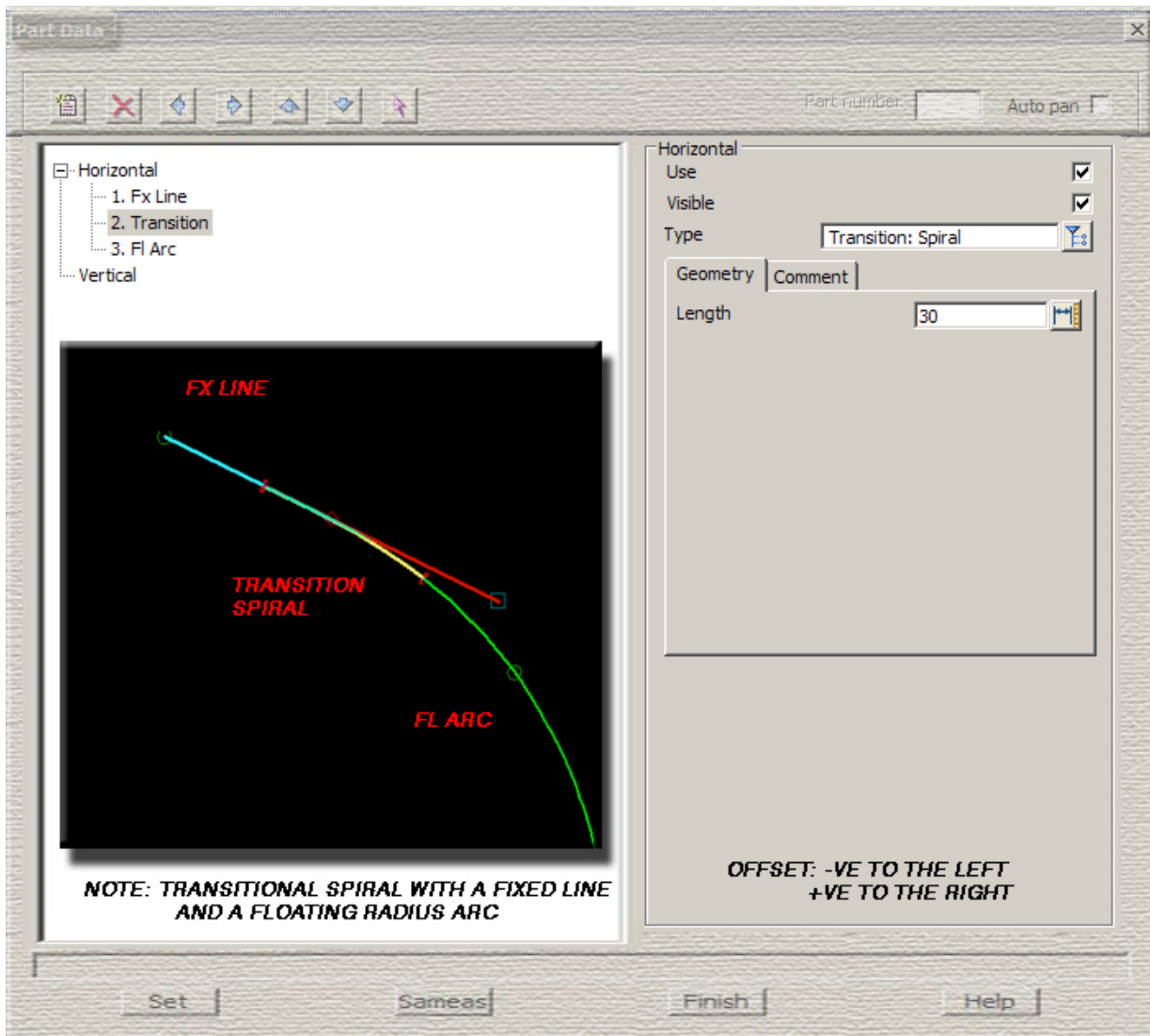
Horizontal Transitions

Free spiral - the transition spiral is unconstrained



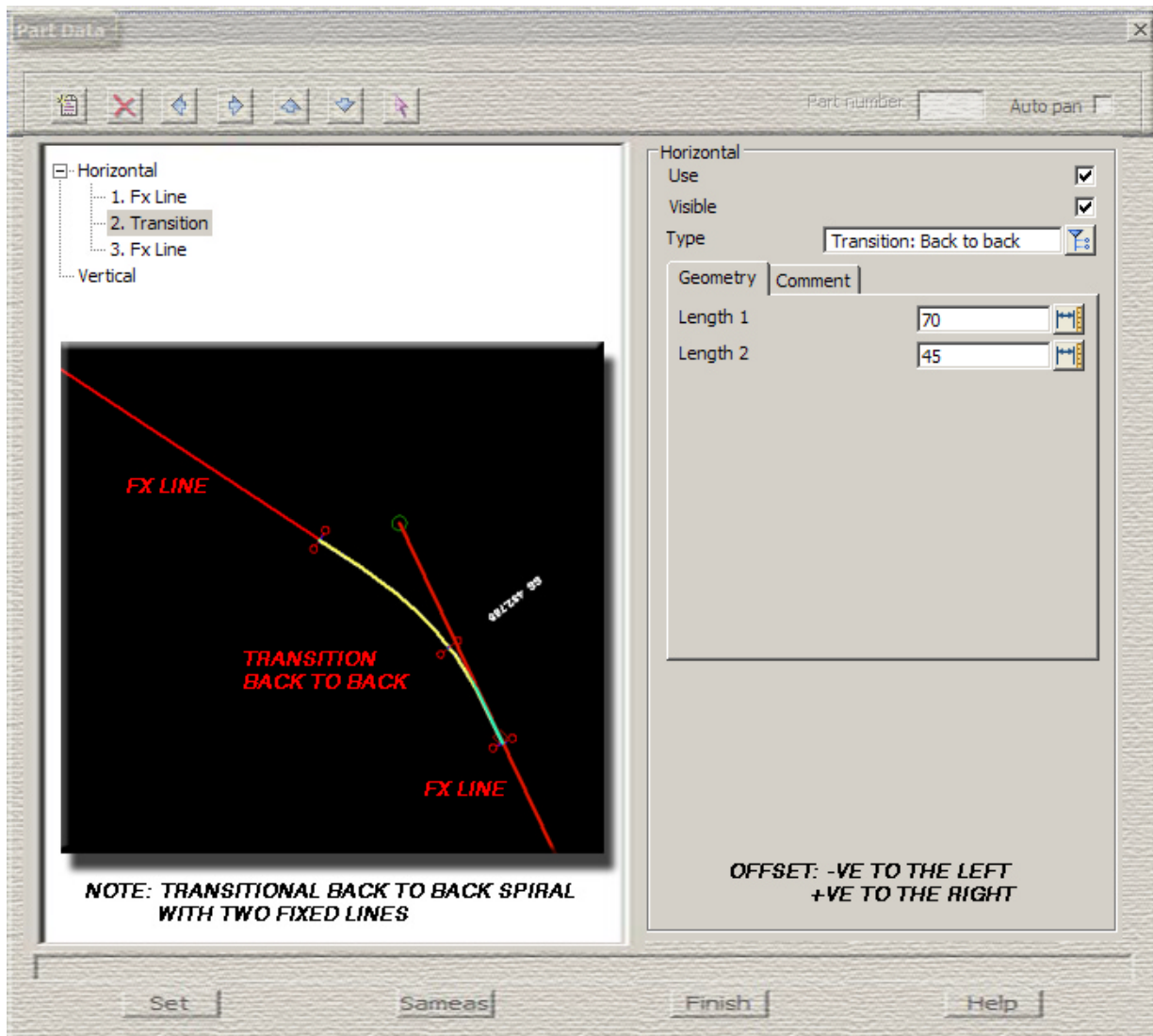
Horizontal Transitions

Spiral - the spiral has a known length



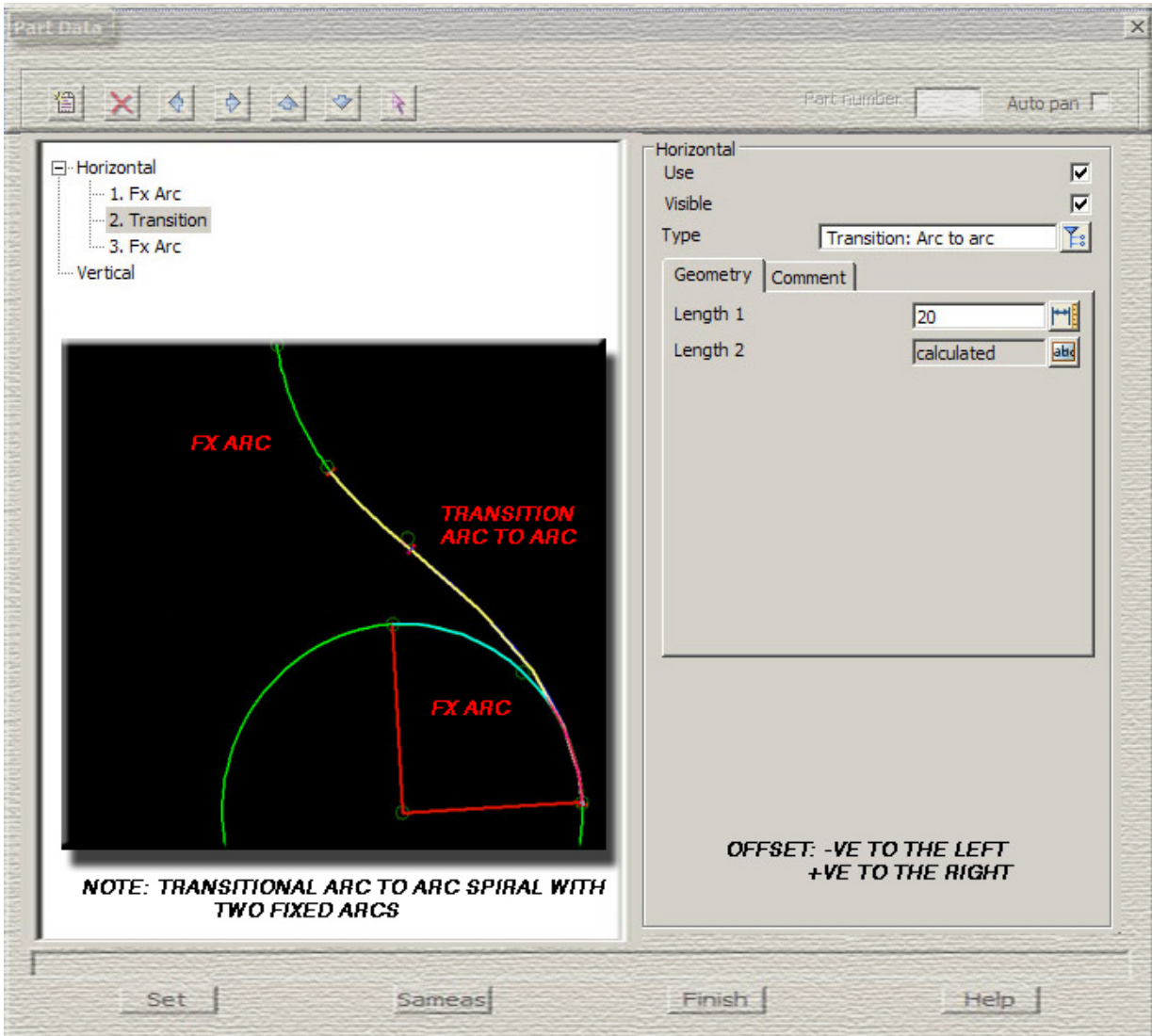
Horizontal Transitions

Back to back- back to back spirals of known lengths between two fixed lines



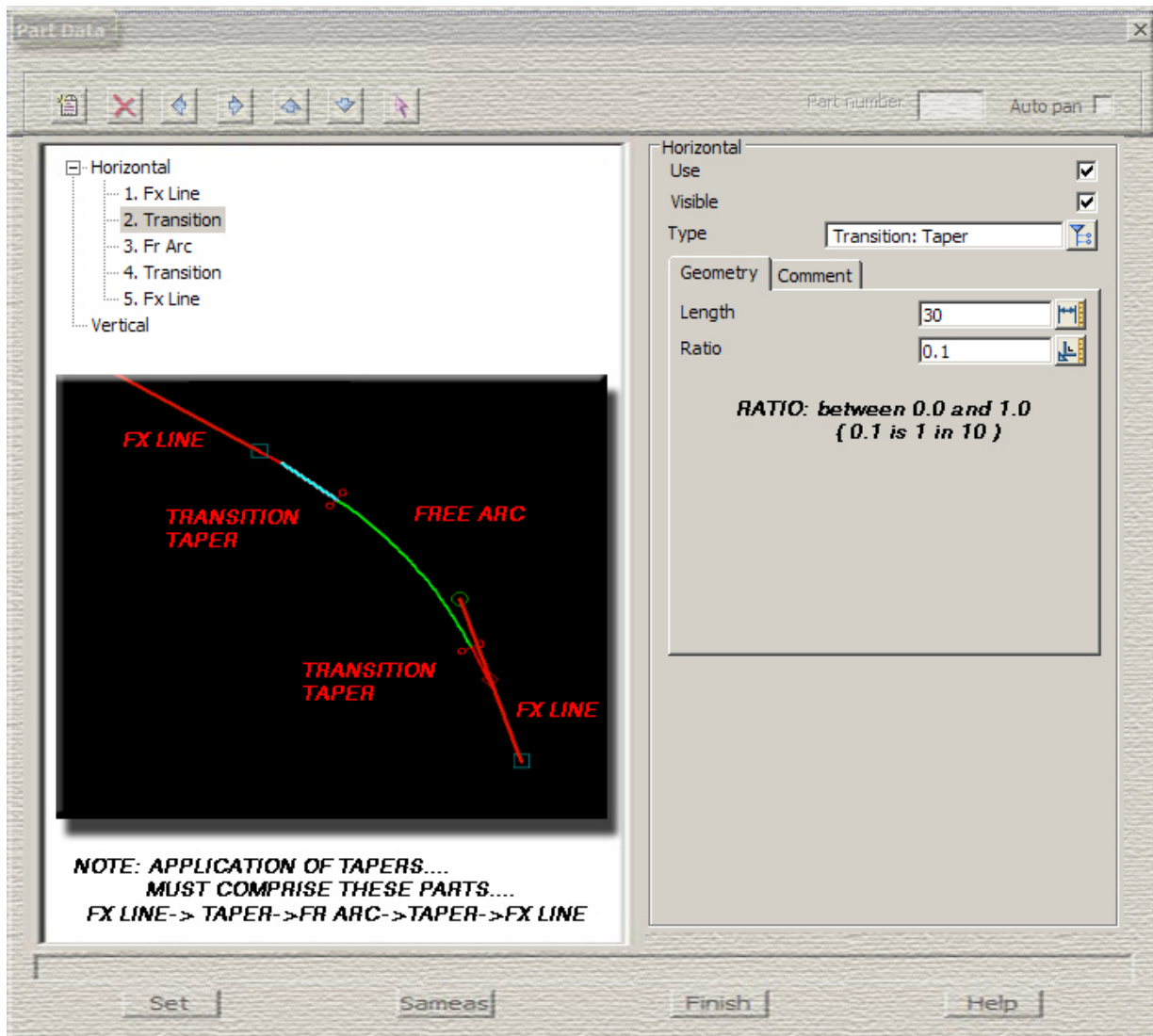
Horizontal Transitions

Arc to arc- back to back spirals between known arcs. One spiral length is needed.



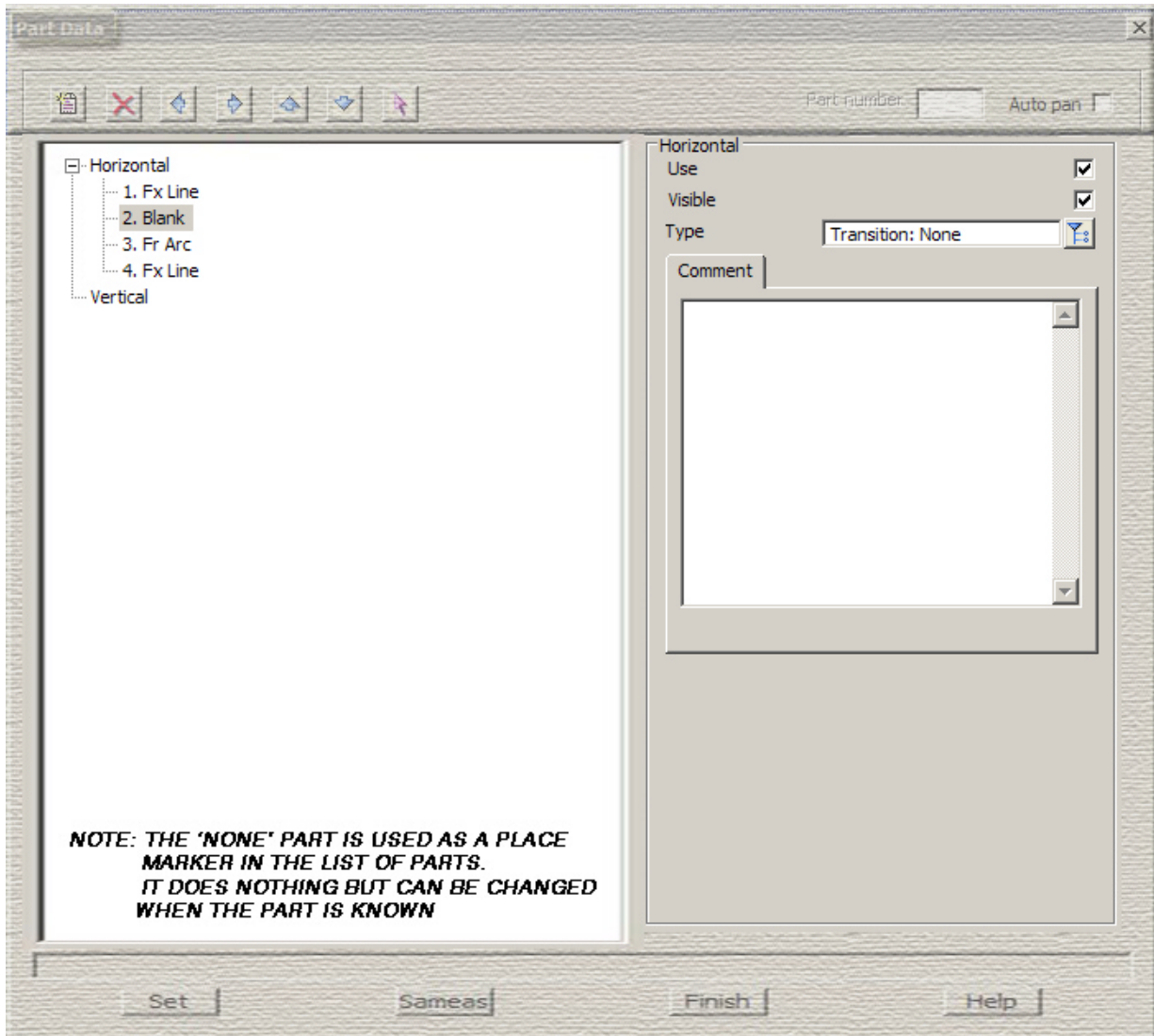
Horizontal Transitions

Taper - known length and known ratio



Horizontal Transitions

None - no transition



Horizontal Transitions

3 centred - three centred curve - three arcs with given radii and offsets

Part Data

Part number: Auto pan

Horizontal

Use

Visible

Type Transition: 3 centred

Geometry	Comment
Intermediate radius	30
Approaching radius	45
Departing radius	90
Approaching offset	1
Departing offset	1

**RADIUS: -VE TO THE LEFT
+VE TO THE RIGHT**

**PRESS 'ENTER' AFTER FILLING
OUT THE INTERMEDIATE RADIUS
FOR DEFAULTS VALUES**

**OFFSET: -VE TO THE LEFT
+VE TO THE RIGHT**

Set Sameas Finish Help

Horizontal

1. Fx Line

2. Compound

3. Fx Line

Vertical

FX LINE

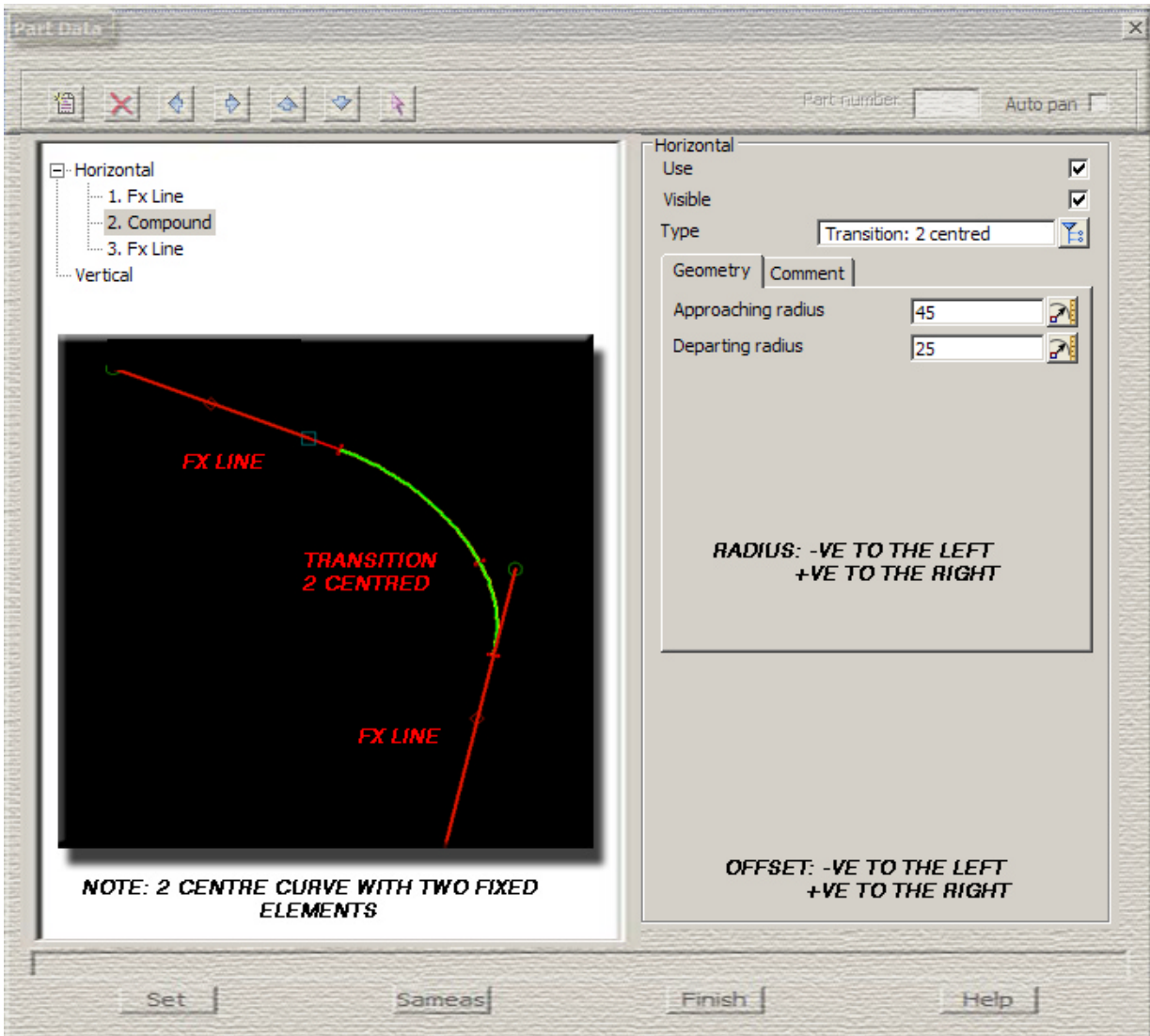
**TRANSITION
3 CENTRED**

FX LINE

**NOTE: 3 CENTRE CURVE WITH TWO FIXED
ELEMENTS**

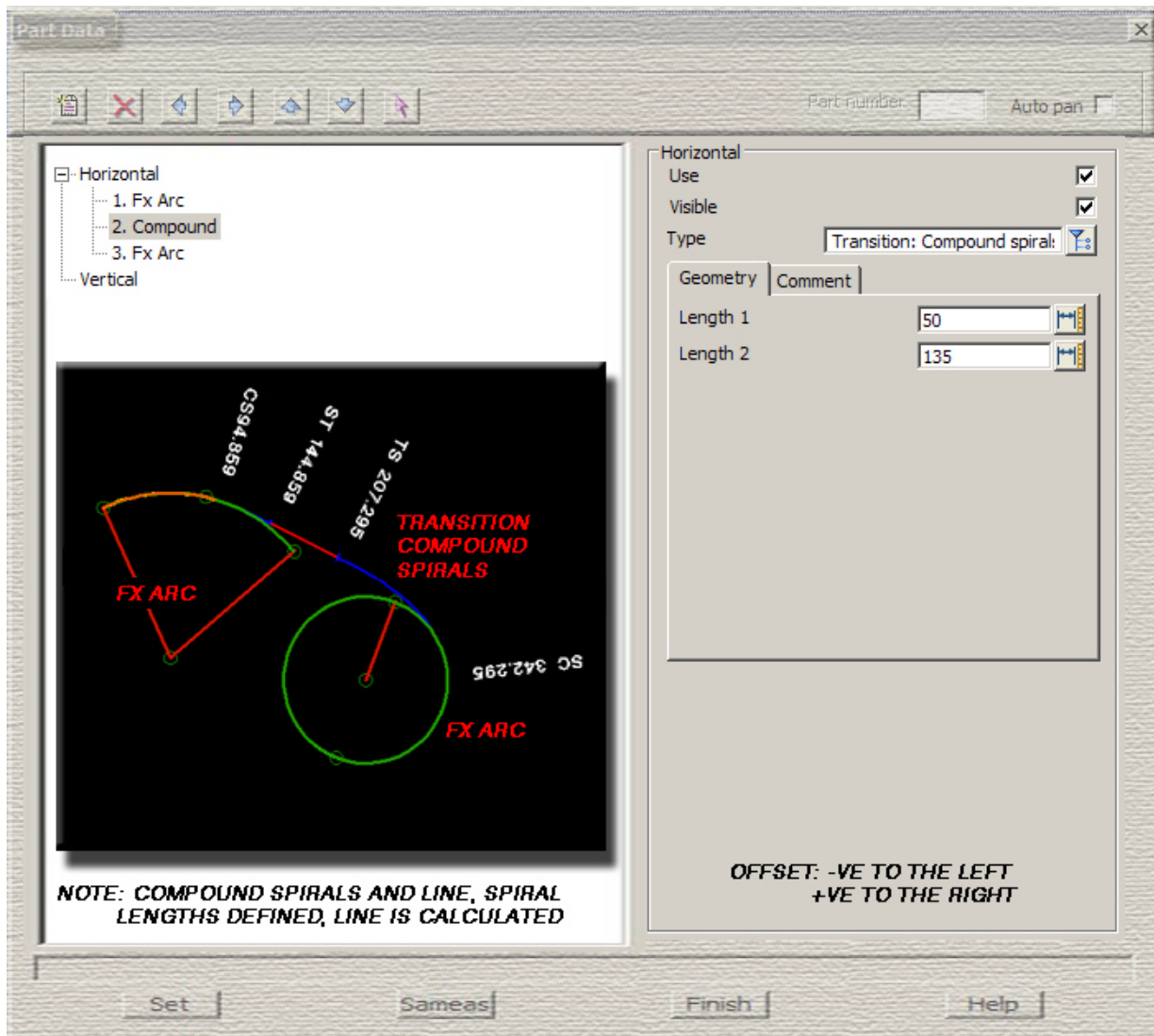
Horizontal Transitions

2 centred - two centred curve- two arcs with given radii



Horizontal Transitions

Compound spiral - compound spirals of known lengths



Horizontal Transitions

Compound line - compound spirals with one known length with a line of known length

Part Data

Part number: Auto pan

Horizontal

- 1. Fx Arc
- 2. Compound
- 3. Fx Arc

Vertical

CS 90.028
ST 140.028
TS 180.028
SC 367.588
FX ARC
TRANSITION COMPOUND LINE

Horizontal

Use

Visible

Type Transition: Compound line

Geometry Comment

1st spiral length 50

Line length 50

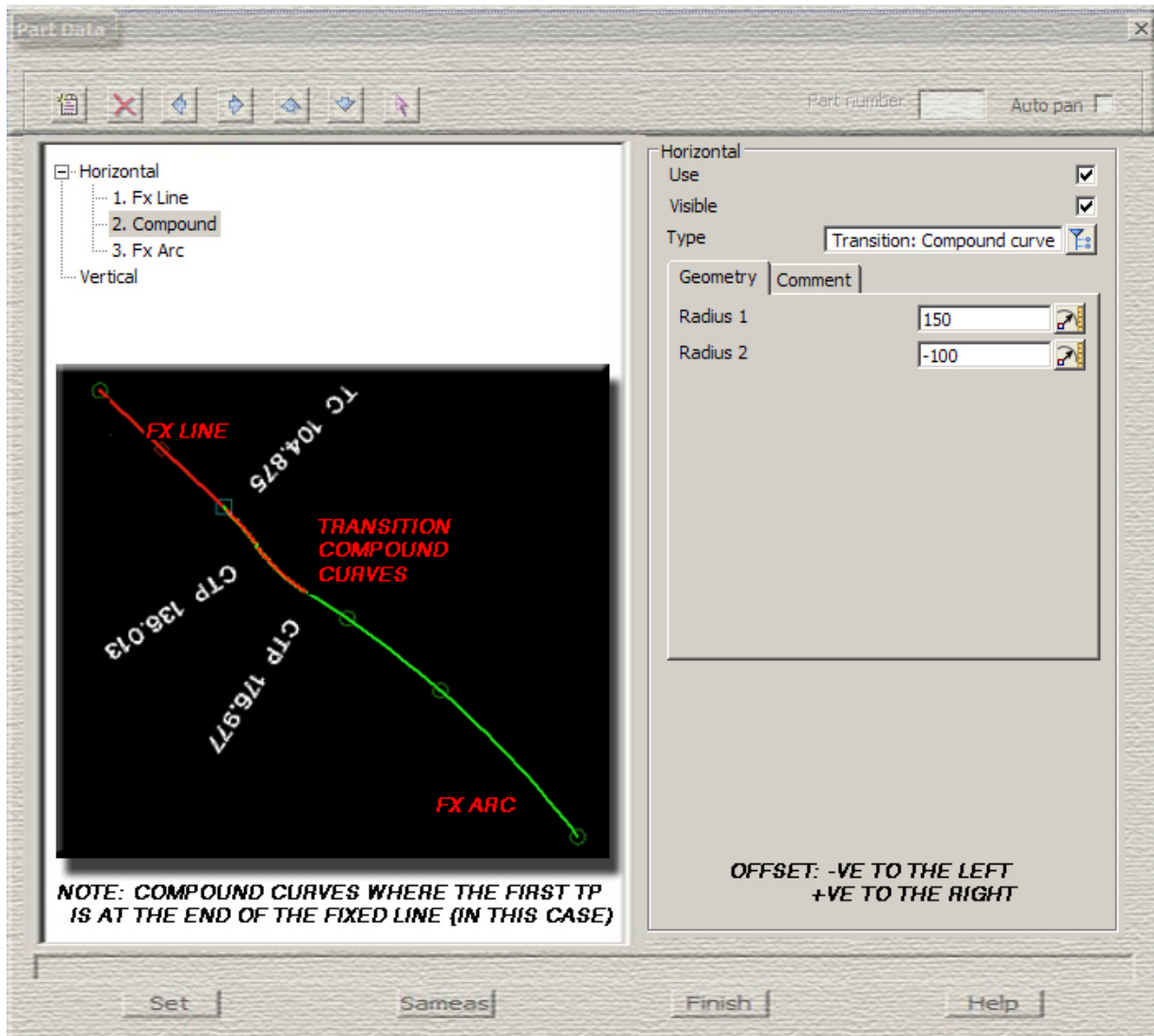
NOTE: COMPOUND SPIRALS AND LINE, SECOND SPIRAL LENGTH IS CALCULATED

OFFSET: -VE TO THE LEFT
+VE TO THE RIGHT

Set Sameas Finish Help

Horizontal Transitions

Compound arc - compound arcs of known radii



Super Alignment Vertical Element Examples

Vertical IP's

No VC - known vertical intersection point with no parabola or arc on it

Vertical IP's

Alignment speed - known vertical intersection point with parabola defined by the design parameters and default speed for the super alignment

Vertical IP's

Speed - known vertical intersection point with a known speed and the parabolic curve defined by the design parameters

Vertical IP's

Length - known vertical intersection point with a parabola of a known length

Vertical IP's

Radius - known vertical intersection point with a parabola of a known effective radius

Vertical IP's

K-value - known vertical intersection point with a parabola of a known k-value

Vertical IP's

Max length - known vertical intersection point with a parabola of maximum length

Vertical IP's

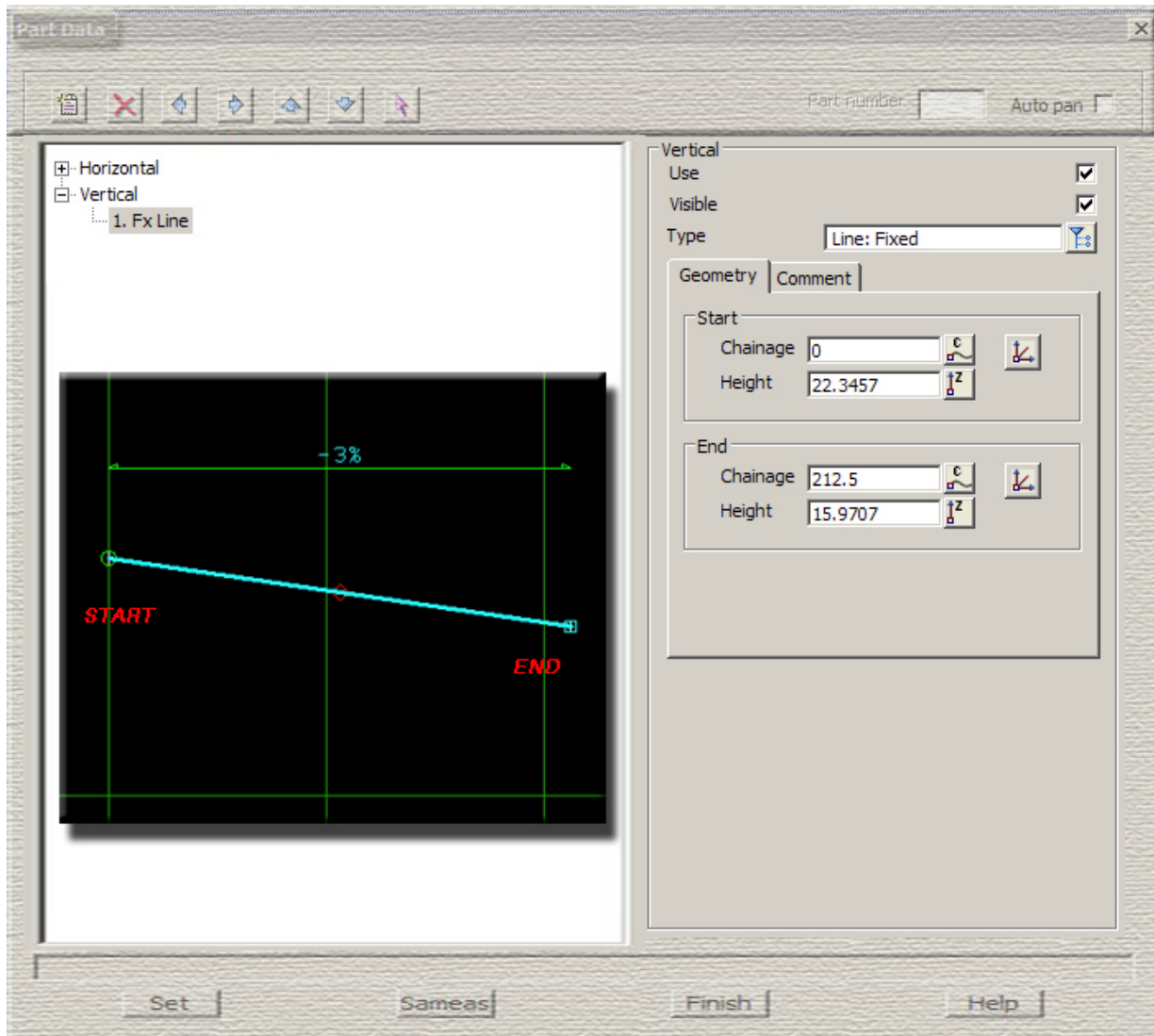
Asymmetric - known vertical intersection point with asymmetric parabolas of known lengths

Vertical IP's

Circular arc - known vertical intersection point with an arc of a known radius

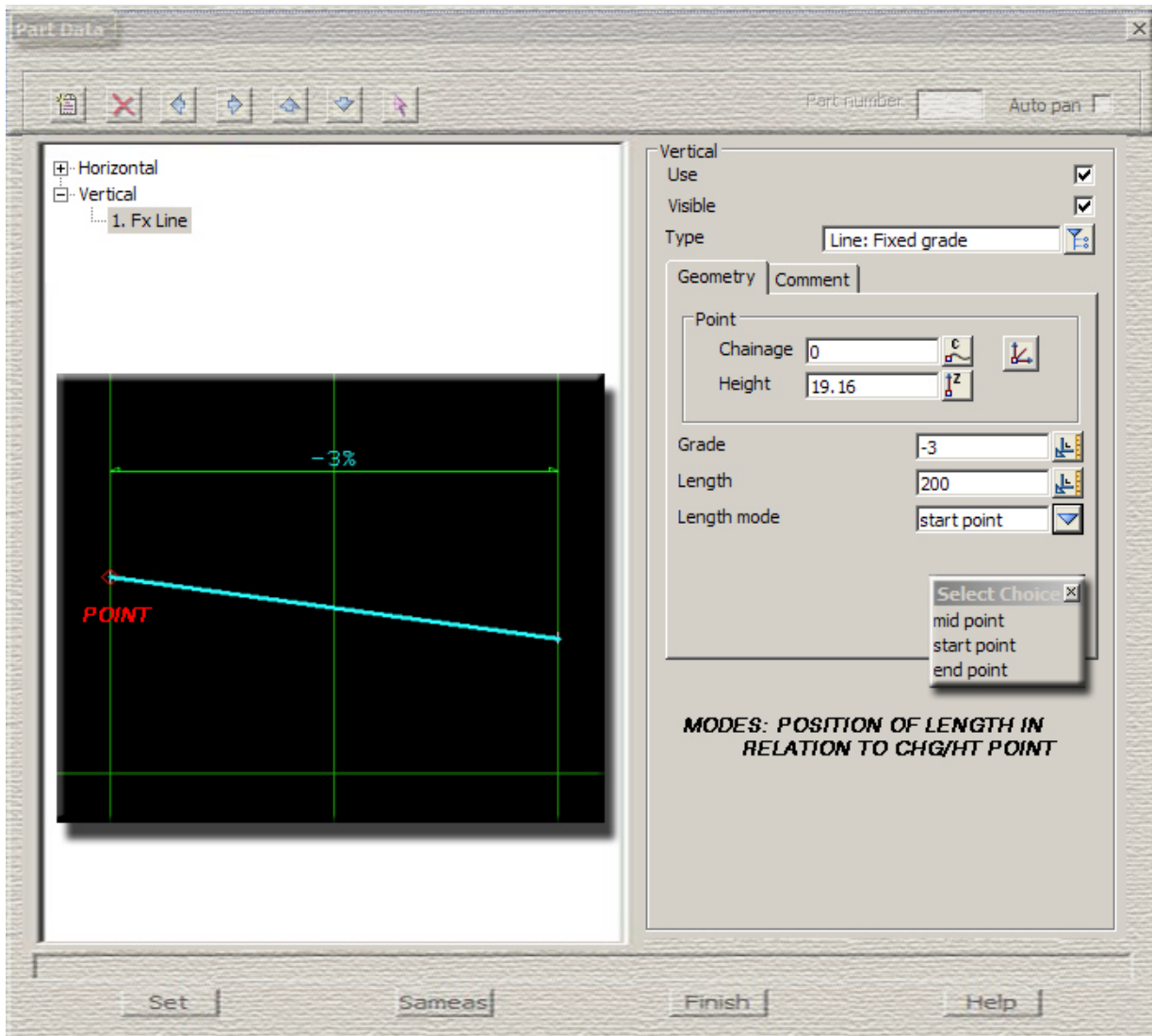
Vertical Lines

Fixed - two known points



Vertical Lines

Fixed grade - known point and know grade



Vertical Lines

Floating point - known point (unknown grade)

The screenshot displays a software window titled "Part Data" with a toolbar at the top. The main area is divided into a graph and a control panel.

Graph: A graph showing a vertical alignment design. The horizontal axis represents chainage, with a central point at 68.537L. The vertical axis represents elevation. A red line represents the "FL LINE" (Floating Line), which is a straight line segment. A blue curve represents the "FL PARABOLA" (Floating Parabola). The graph is divided into three sections: "FX LINE" (left), "FL PARABOLA" (middle), and "PT" (right). The grades are indicated as -3% on the left and 6.138% on the right. A note at the bottom of the graph reads: "NOTE: TYPICAL APPLICATION FLOATING LINE ATTACHED TO SOLVED PARABOLA".

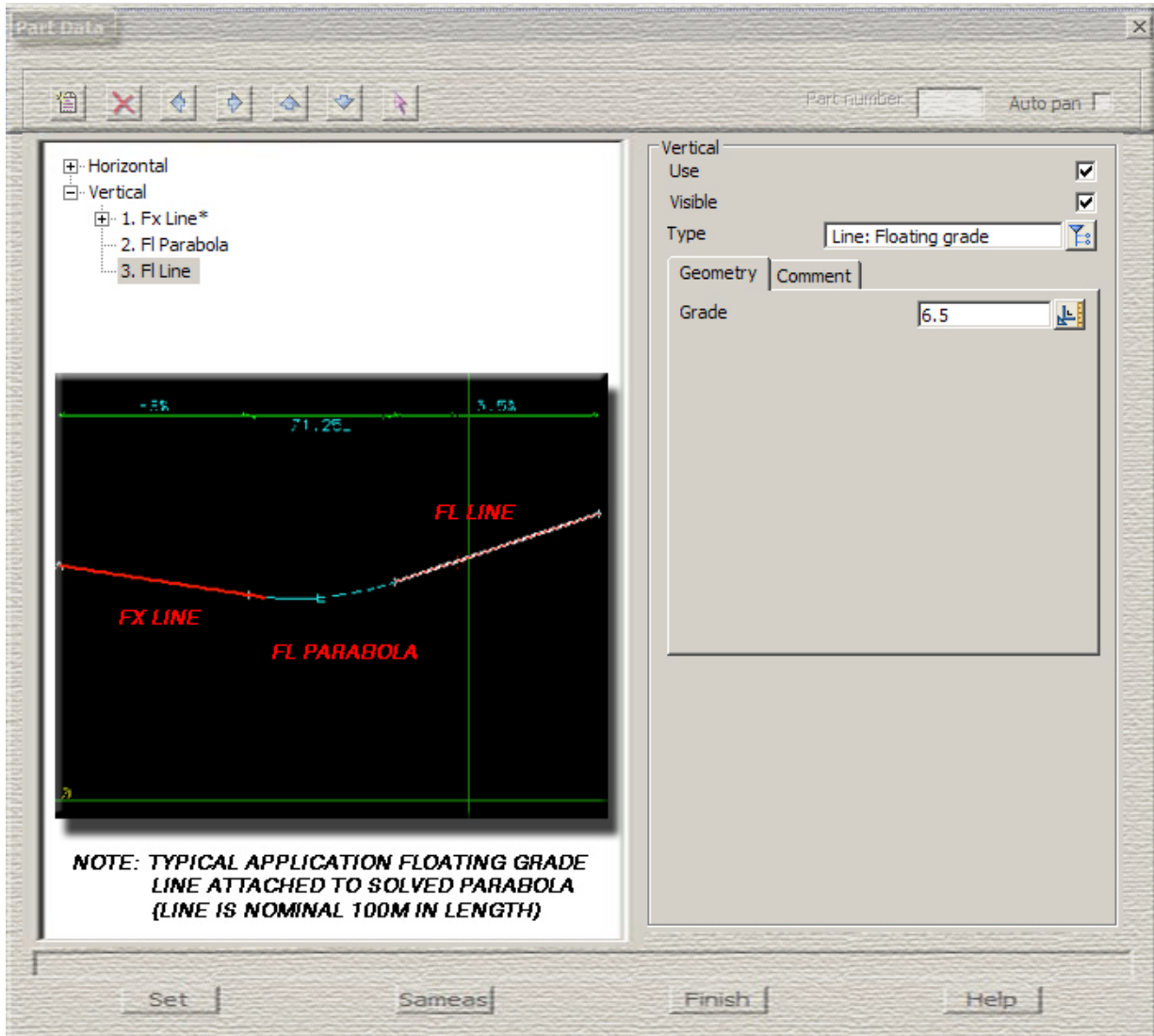
Control Panel: The right side of the window contains a control panel for the "Line: Floating point". It includes the following fields and controls:

- Vertical Use:**
- Visible:**
- Type:** Line: Floating point
- Geometry / Comment:** A tabbed interface with "Geometry" selected.
- Point:** A section with two input fields:
 - Chainage:** 194.6317
 - Height:** 22.4177

At the bottom of the window, there are four buttons: "Set", "Sameas", "Finish", and "Help".

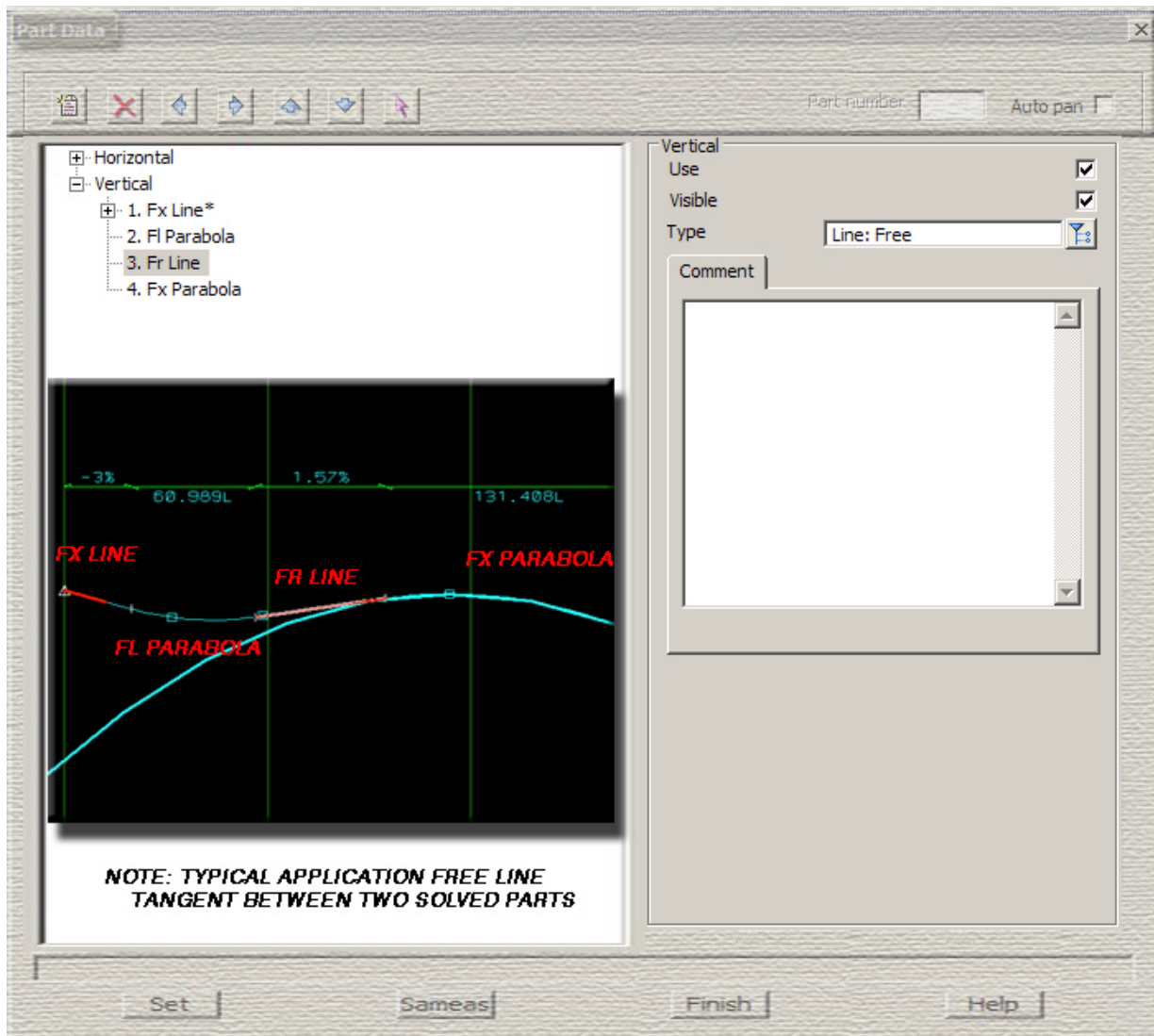
Vertical Lines

Floating grade - known grade (unknown point)



Vertical Lines

Free - not constrained at all



Vertical Arcs

Fixed - known centre, known radius and known start and end points of the arc

Vertical Arcs

Fixed 3 points- three known points on the arc

Vertical Arcs

Fixed direction- known point, known radius and known bearing at the known point

Vertical Arcs

Floating radius - known point and known radius of the arc

Vertical Arcs

Floating grade - known point and known tangential grade of the arc at the known point

Vertical Arcs

Floating 2 points- two known points on the arc

Vertical Arcs

Free radius - known radius of the arc

Vertical Arcs

Free point - known point on the arc

Vertical Arcs

Free length - known length of the arc

Vertical Parabolas

Fixed 3 points- three known points on the parabola

The screenshot shows a software window titled "Part Data" with a toolbar at the top. The main area is divided into a tree view on the left, a graph in the center, and a data table on the right.

Tree View:

- Horizontal
- Vertical
 - 1. Fl Line
 - 2. Fx Parabola
 - 3. Fl Line

Graph: A graph showing a vertical parabola (FX PARABOLA) in red, flanked by two floating grades (FL LINE) in blue. The parabola is defined by three points. The grades are labeled with slopes: -3% on the left and 3.875% on the right. A horizontal distance of 23.406L is indicated between the two grade lines.

Data Table:

Point	Chainage	Height
Point 1	52.3041	21.1278
Point 2	92.0245	19.6771
Point 3	116.8929	21.1278

Properties Panel:

- Vertical Use:
- Visible:
- Type: Parabola: Fixed 3 points

Buttons: Set, Sameas, Finish, Help

NOTE: TYPICAL APPLICATION 3 POINTS ON AN EXISTING TIN WITH TWO FLOATING GRADES

Vertical Parabolas

Fixed apex radius- known apex point and known effective radius of the parabola

Part Data

Part number: Auto pan

- Horizontal
- Vertical
 - 1. Fx Line*
 - 2. Fl Parabola
 - 3. Fr Line
 - 4. Fx Parabola

Vertical Use
 Visible
 Type

Geometry | Comment

Apex
 Chainage
 Height
 Radius

NOTE: TYPICAL APPLICATION FIXED APEX RADIUS PARABOLA (-VE CREST = VE SAG)

Set Sameas Finish Help

Vertical Parabolas

Floating 2 points- two known points on the parabola

Part Data

Part number: Auto pan

Horizontal

Vertical

1. Fx Line*

2. Fl Parabola

-3%

128.292L

FX LINE

PT

FL PARABOLA

NOTE: TYPICAL APPLICATION 2 POINT FLOATING PARABOLA WHICH REQUIRES SOLVED PART (FX LINE IN THIS CASE)

Vertical

Use

Visible

Type

Geometry Comment

Point 1

Chainage

Height

Point 2

Chainage

Height

Set Sameas Finish Help

Vertical Parabolas

Floating apex- known apex point of the parabola

Part Data

Part number: Auto pan

- Horizontal
- Vertical
 - 1. Fx Line*
 - 2. Fl Parabola

Vertical
 Use
 Visible
 Type Parabola: Floating apex

Geometry Comment

Apex
 Chainage 130.8341
 Height 18.9943

-3%
 56.159L

FX LINE
 FL PARABOLA
 APEX

NOTE: TYPICAL APPLICATION FLOATING APEX PARABOLA WHICH REQUIRES SOLVED PART (FX LINE IN THIS CASE)

Set Sameas Finish Help

Vertical Parabolas

Floating radius - known point and known effective radius of the parabola

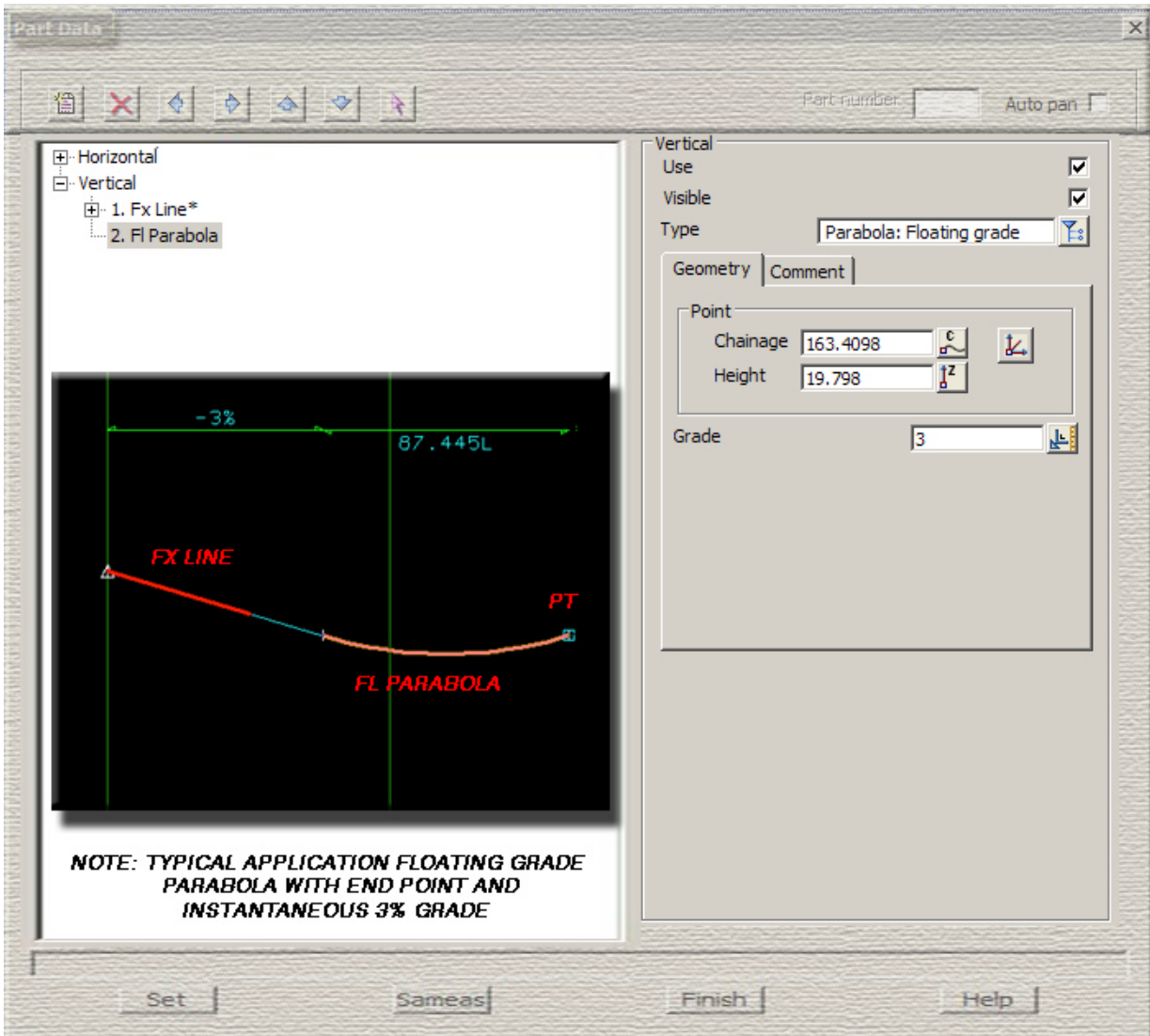
The screenshot shows the 'Part Data' dialog box for a vertical parabola. The left pane shows a tree view with 'Vertical' expanded to show '1. Fx Line*', '2. Fl Parabola', and '3. Fl Line'. The main window displays a graph with a black background. A red line labeled 'FX LINE' slopes downward from left to right. A blue line labeled 'FL LINE' slopes upward from left to right. A red parabolic curve labeled 'FL PARABOLA' is positioned between the two lines, passing through a point labeled 'PT'. The graph shows a horizontal distance of '120L' between the two lines, with a slope of '-3%' on the left and '3%' on the right. The right pane contains the following settings:

- Vertical Use:
- Visible:
- Type: Parabola: Floating radius
- Geometry tab selected
- Point:
 - Chainage: 143.3289
 - Height: 19.4727
- Radius: 2000

At the bottom of the dialog, there are buttons for 'Set', 'Sameas', 'Finish', and 'Help'. A note at the bottom of the main window reads: 'NOTE: TYPICAL APPLICATION FLOATING RADIUS PARABOLA THROUGH A POINT BETWEEN FIXED & FLOATING LINES'.

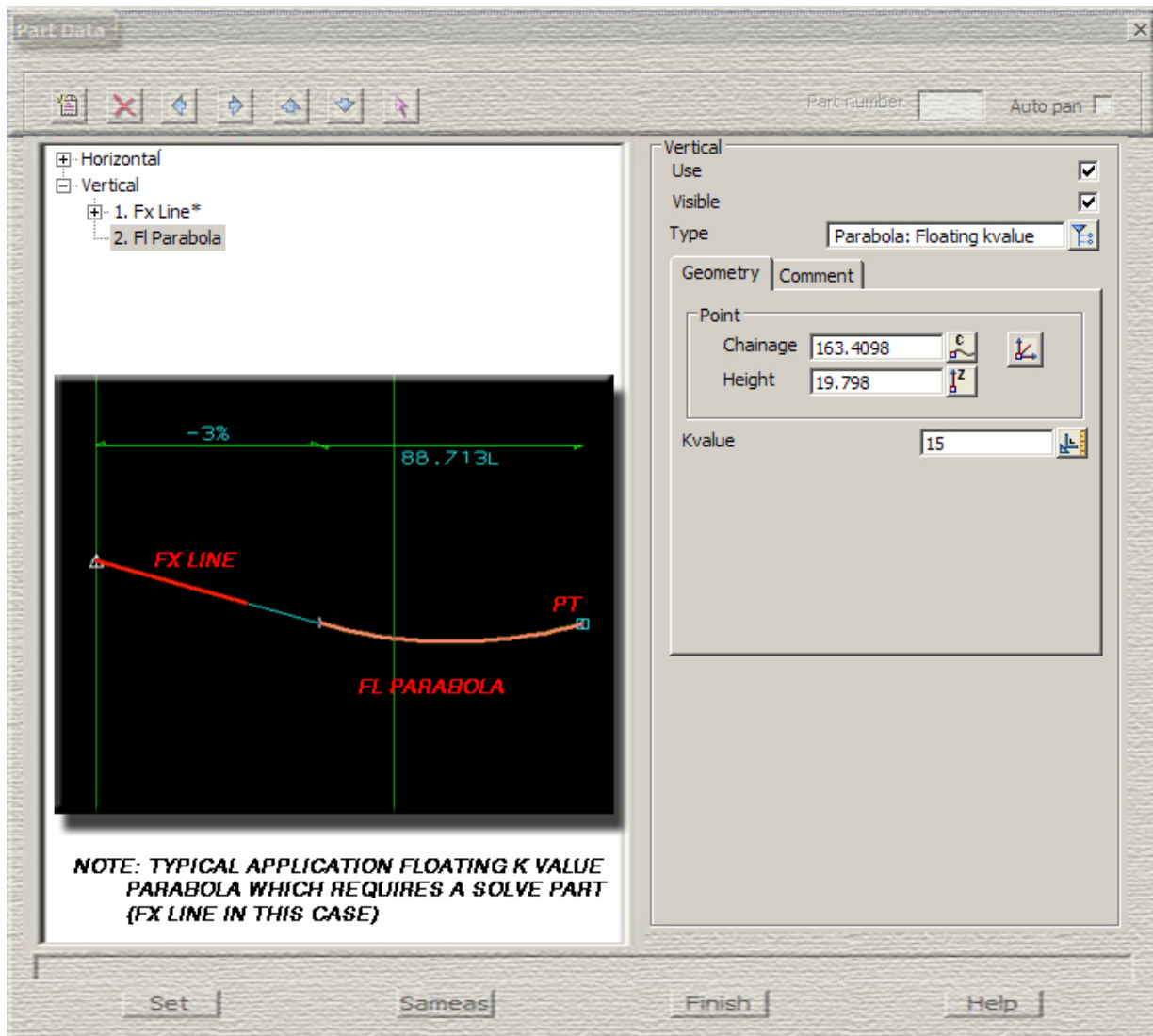
Vertical Parabolas

Floating grade - known point and known grade at the known point



Vertical Parabolas

Floating k value - known point and known k value of the parabola



Vertical Parabolas

Free point - known point on the parabola

Part Data

Part number: Auto pan

Horizontal

Vertical

- 1. Fx Line
- 2. Fr Parabola
- 3. Fx Line

-3% 96.361L 3%

FX LINE PT FREE PARABOLA

Vertical

Use

Visible

Type Parabola: Free point

Geometry Comment

Point

Chainage 76.2246

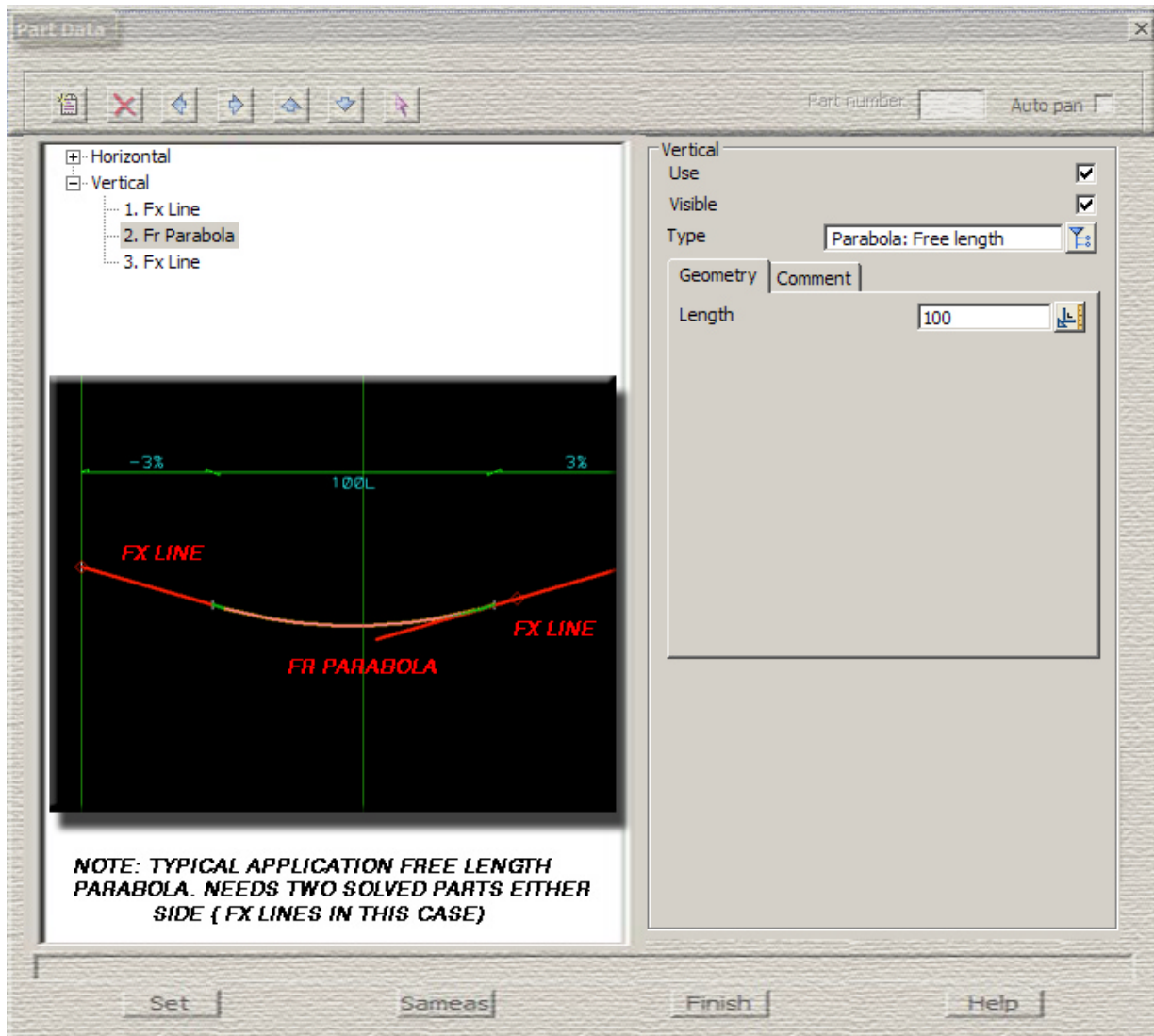
Height 23.9442

NOTE: TYPICAL APPLICATION FREE PARABOLA PASSING THROUGH A POINT. NEEDS TWO SOLVED PARTS EITHER SIDE (FX LINES IN THIS CASE)

Set Sameas Finish Help

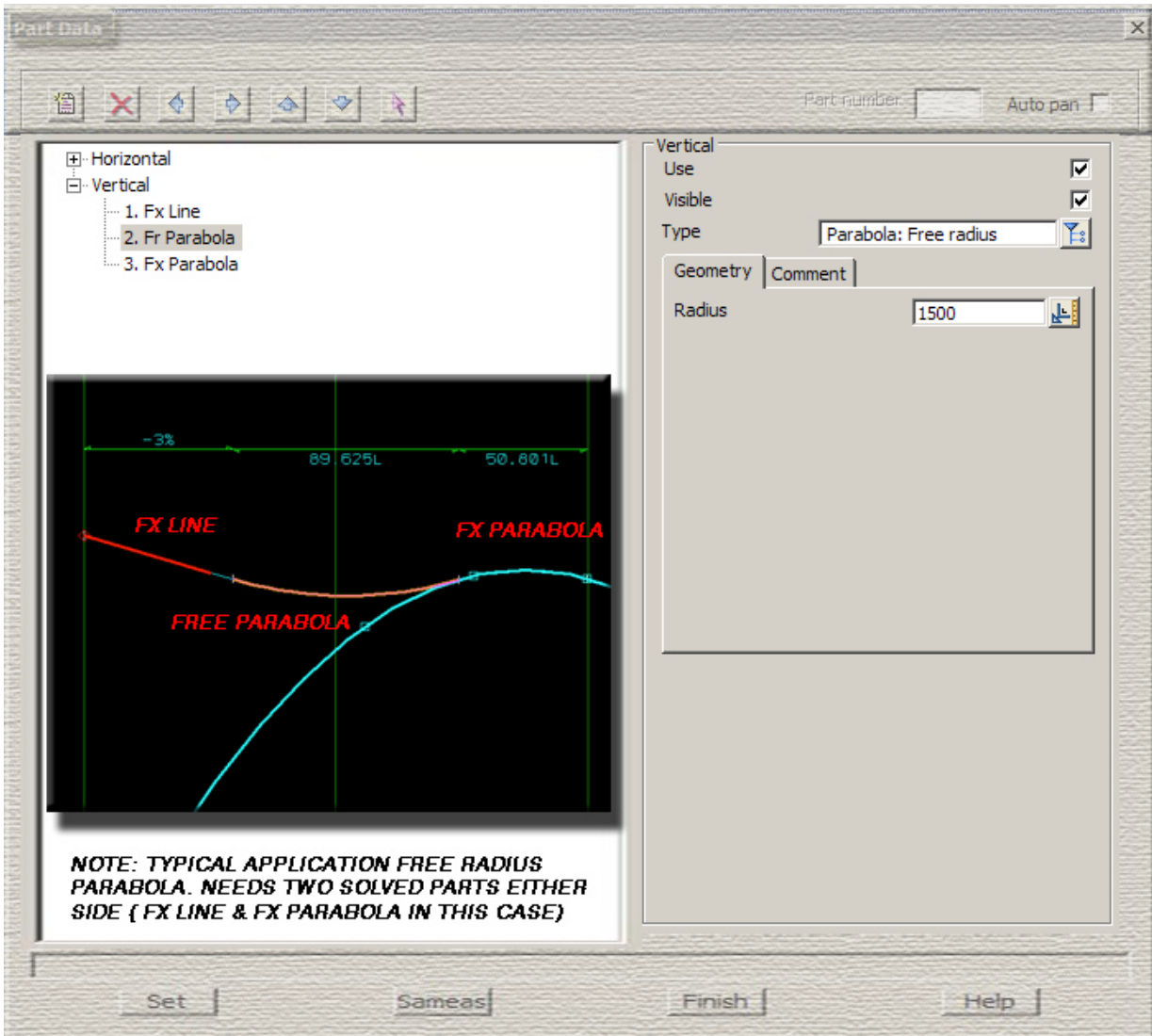
Vertical Parabolas

Free length - known length of the parabola



Vertical Parabolas

Free radius - known effective radius of the parabola



Vertical Parabolas

Free rl - known height of the parabola

The screenshot shows the 'Part Data' dialog box for a 'Parabola: Free rl' element. The tree view on the left shows the following structure:

- Horizontal
- Vertical
 - 1. Fx Line
 - 2. Fr Parabola
 - 3. Fx Parabola

The graphical preview shows a vertical alignment diagram with a black background. A red line labeled 'FX LINE' slopes downward from left to right. A cyan curve labeled 'FREE PARABOLA' starts at the end of the red line and curves upward. A red curve labeled 'FX PARABOLA' starts at the end of the cyan curve and slopes downward. Dimension lines indicate a -3% slope, a length of 80L, and a distance of 53.491L from the start of the parabola to the end of the FX parabola.

The properties panel on the right shows the following settings:

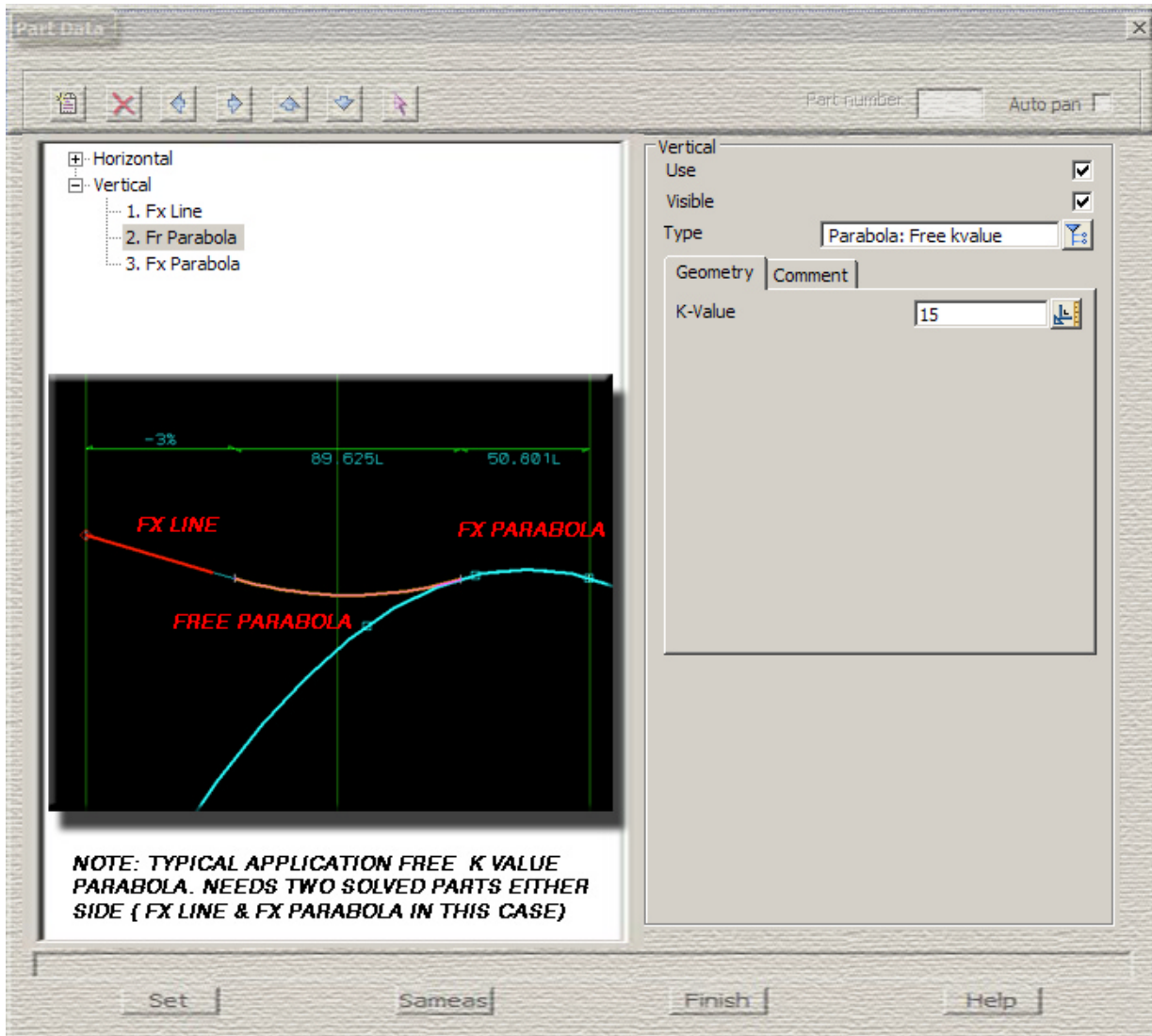
- Vertical Use:
- Visible:
- Type: Parabola: Free rl
- Geometry Comment: RL-Value: 0.8

At the bottom of the dialog, there are buttons for 'Set', 'Sameas', 'Finish', and 'Help'.

NOTE: TYPICAL APPLICATION RL PARABOLA. (LENGTH / 10) NEEDS TWO SOLVED PARTS EITHER SIDE (FX LINE & FX PARABOLA IN THIS CASE)

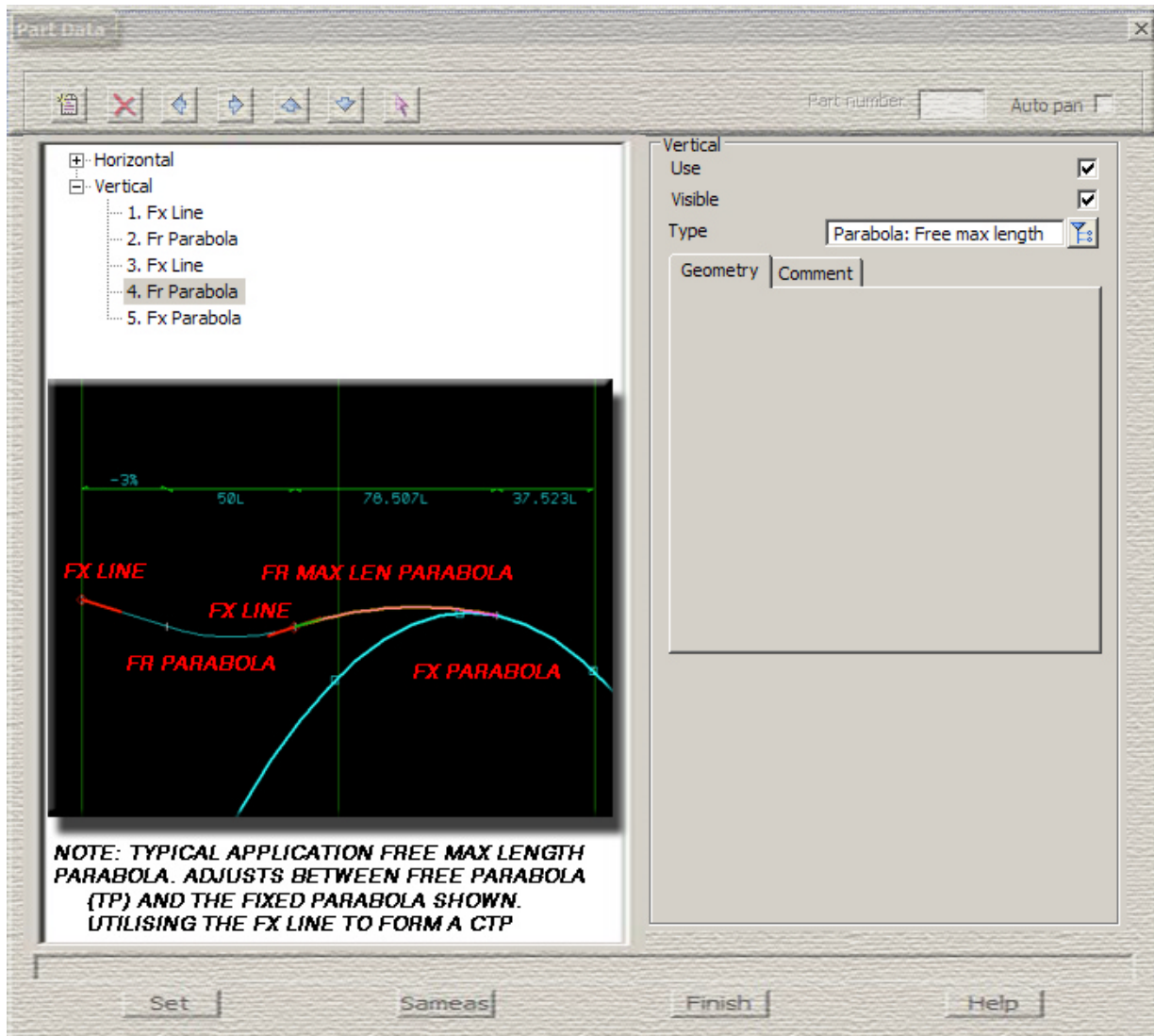
Vertical Parabolas

Free k value- known k value of the parabola



Vertical Parabolas

Free max length- fit a parabola of maximum length



Vertical Parabolas

Free asymmetric- asymmetric parabolas of known lengths

Part Data

Part number: Auto pan

Horizontal

Vertical

- 1. Fx Line
- 2. Fr Parabola
- 3. Fx Line

Vertical

Use

Visible

Type Parabola: Free asymmetric

Geometry	Comment
Length 1	20
Length 2	40

NOTE: TYPICAL APPLICATION FREE ASYMMETRIC PARABOLA. (VARIABLE LENGTH PARABOLAS) SOLUTION BETWEEN TWO SOLVED PARTS (TWO FIXED LINES IN THIS CASE)

Set Sameas Finish Help

Vertical Parabolas

Free compound- compound parabolas with a percentage length of the first parabola and an optional total length

Part Data

Part number: Auto pan

Vertical Use Visible Type Parabola: Free compound

Geometry Comment Length on 1st curve (%) 50 Total curves length

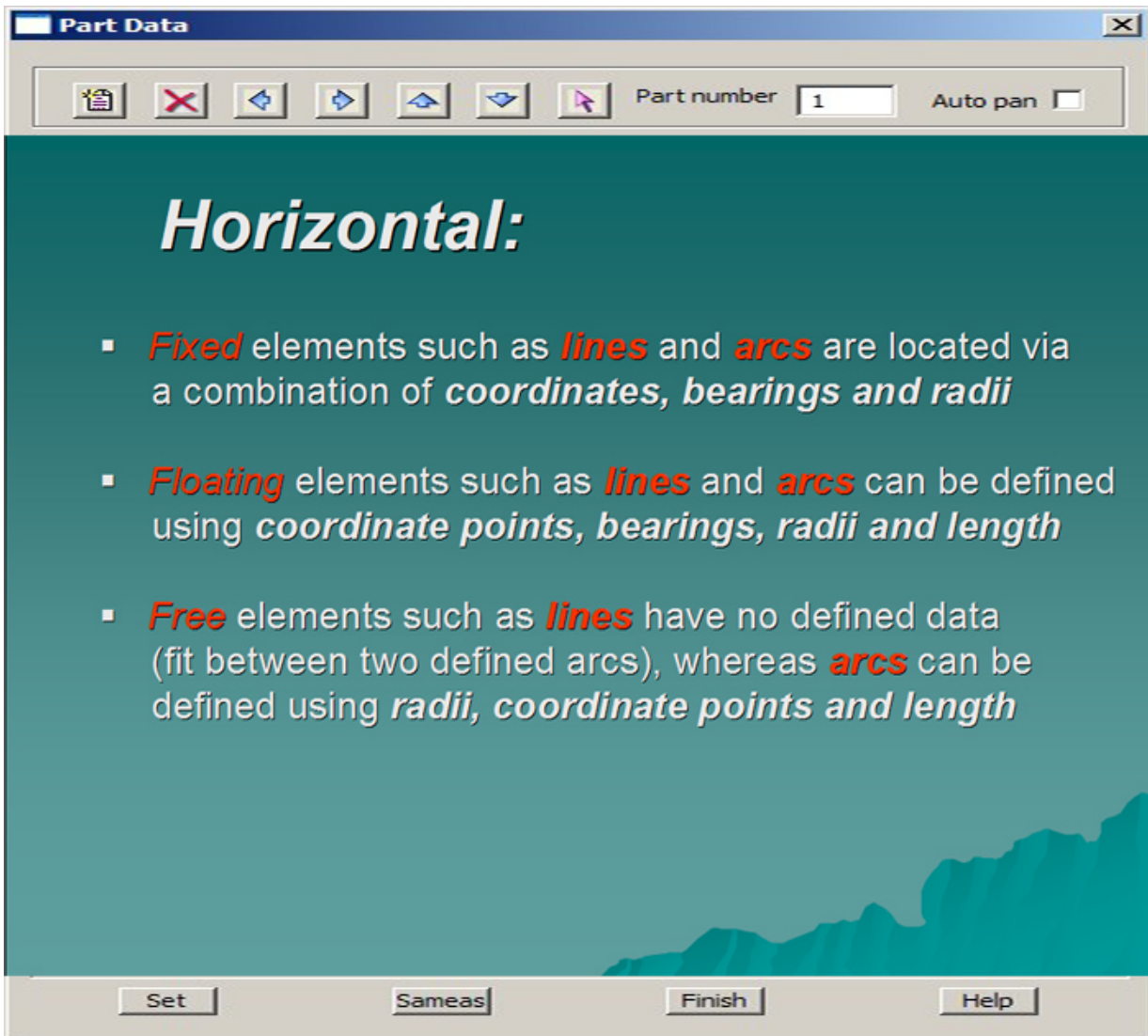
Type Parabola: Free compound

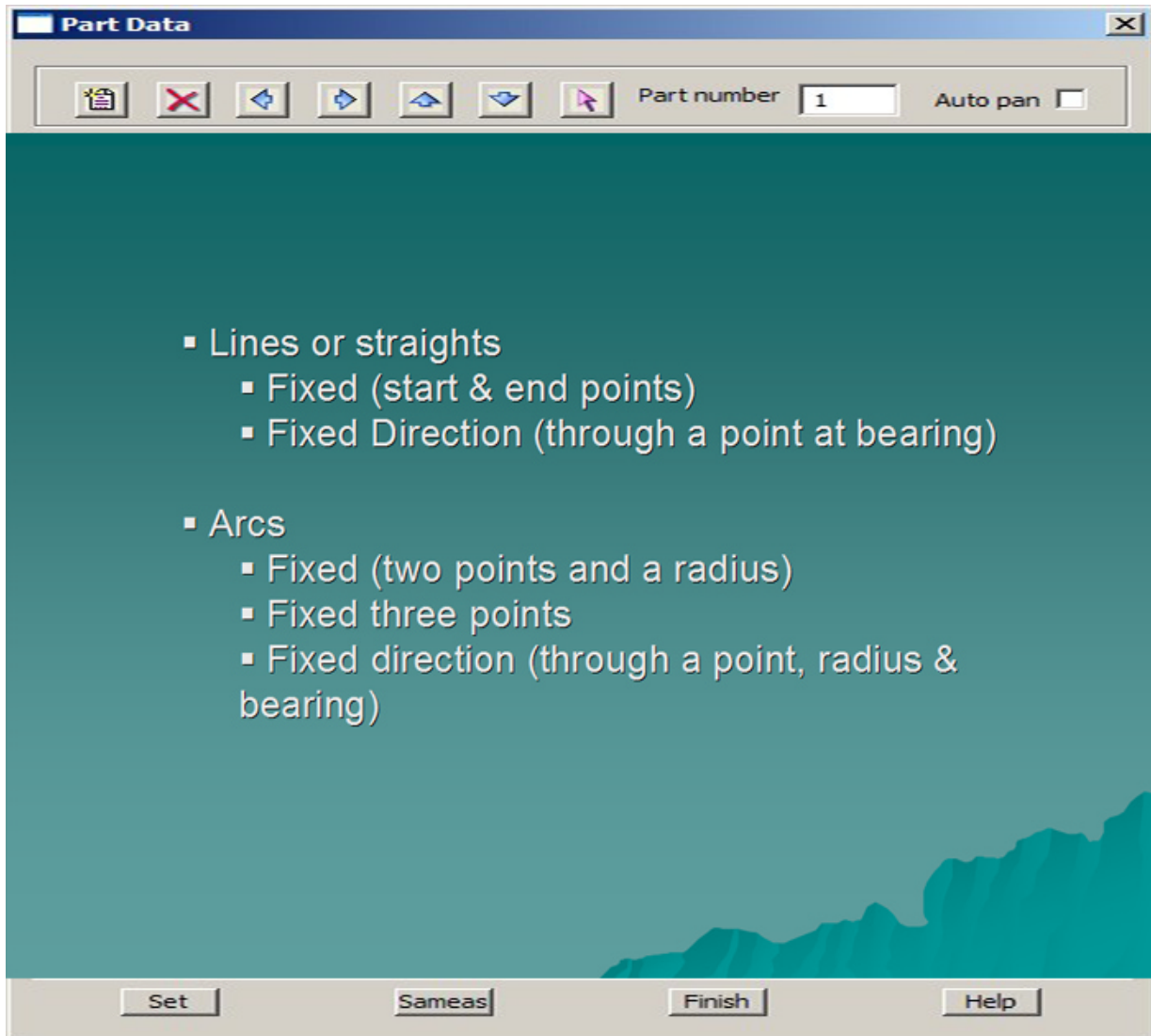
Geometry Comment Length on 1st curve (%) 50 Total curves length 40

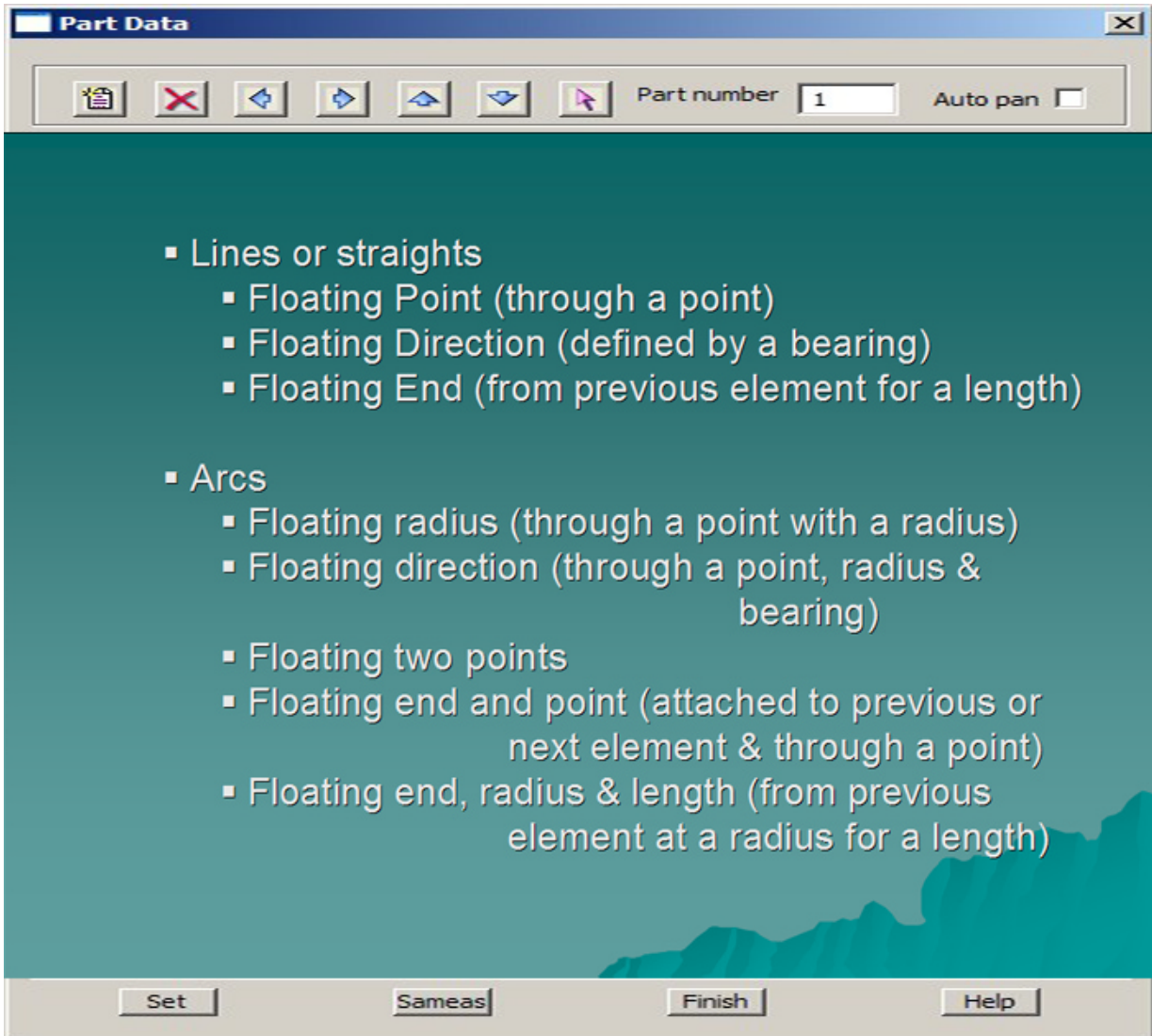
NOTE: TYPICAL APPLICATION FREE COMPOUND PARABOLA. (TOTAL CURVES LENGTH IS DIVIDED OVER THE TWO PARBOLAS AS A %). SOLUTION BETWEEN TWO SOLVED PARTS (TWO FIXED LINES IN THIS CASE)

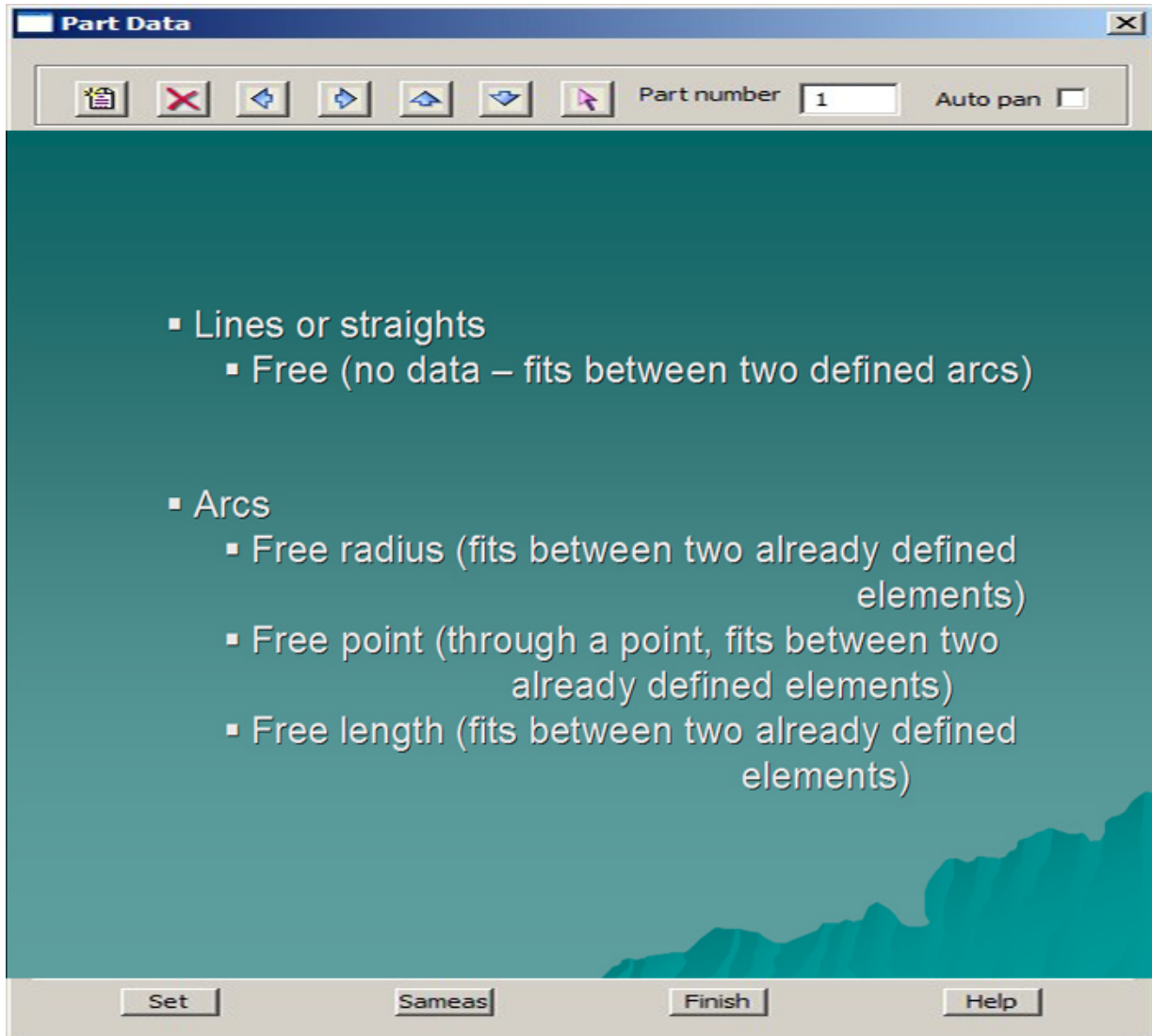
Set Sameas Finish Help

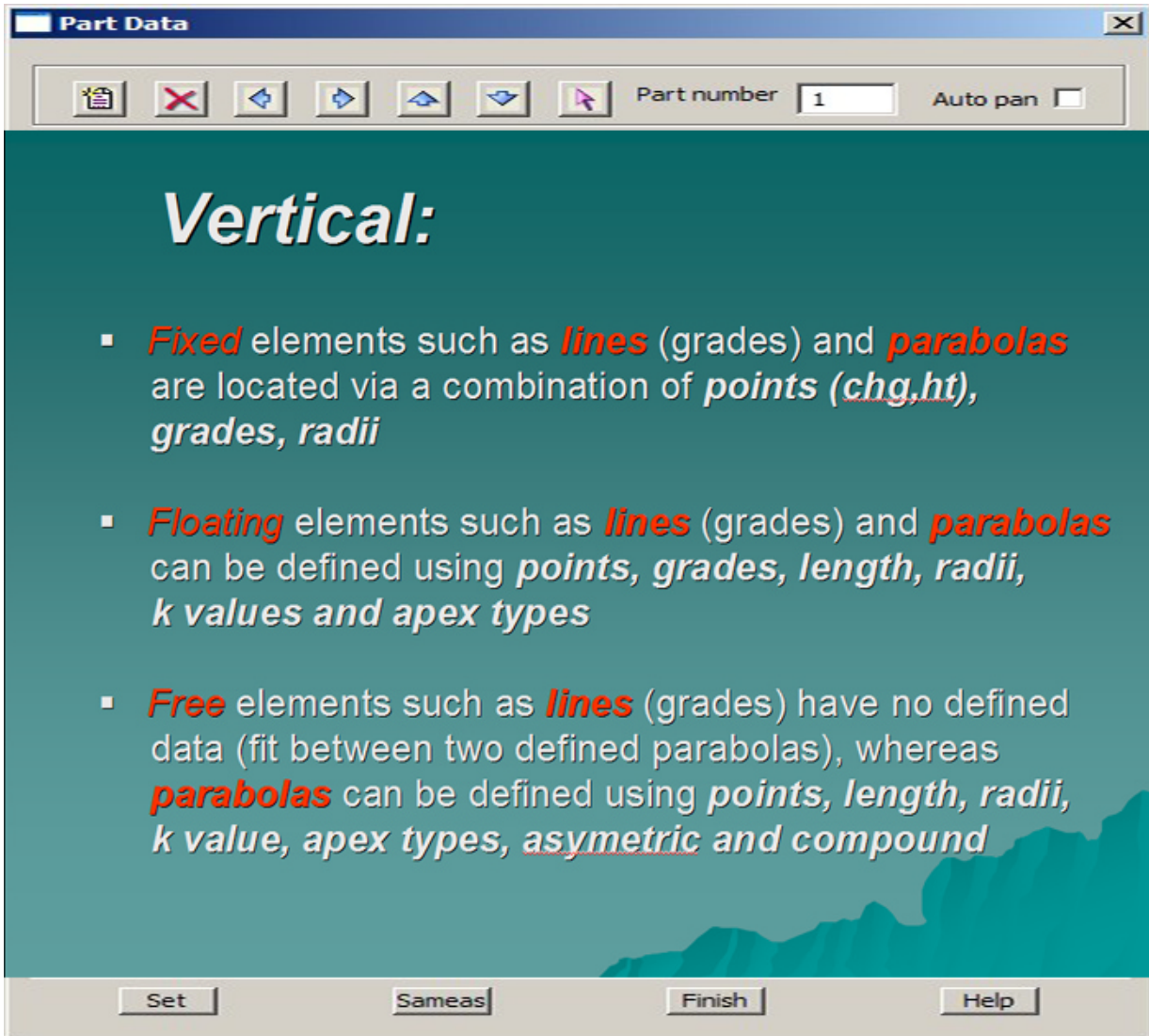
Fixed and Floating

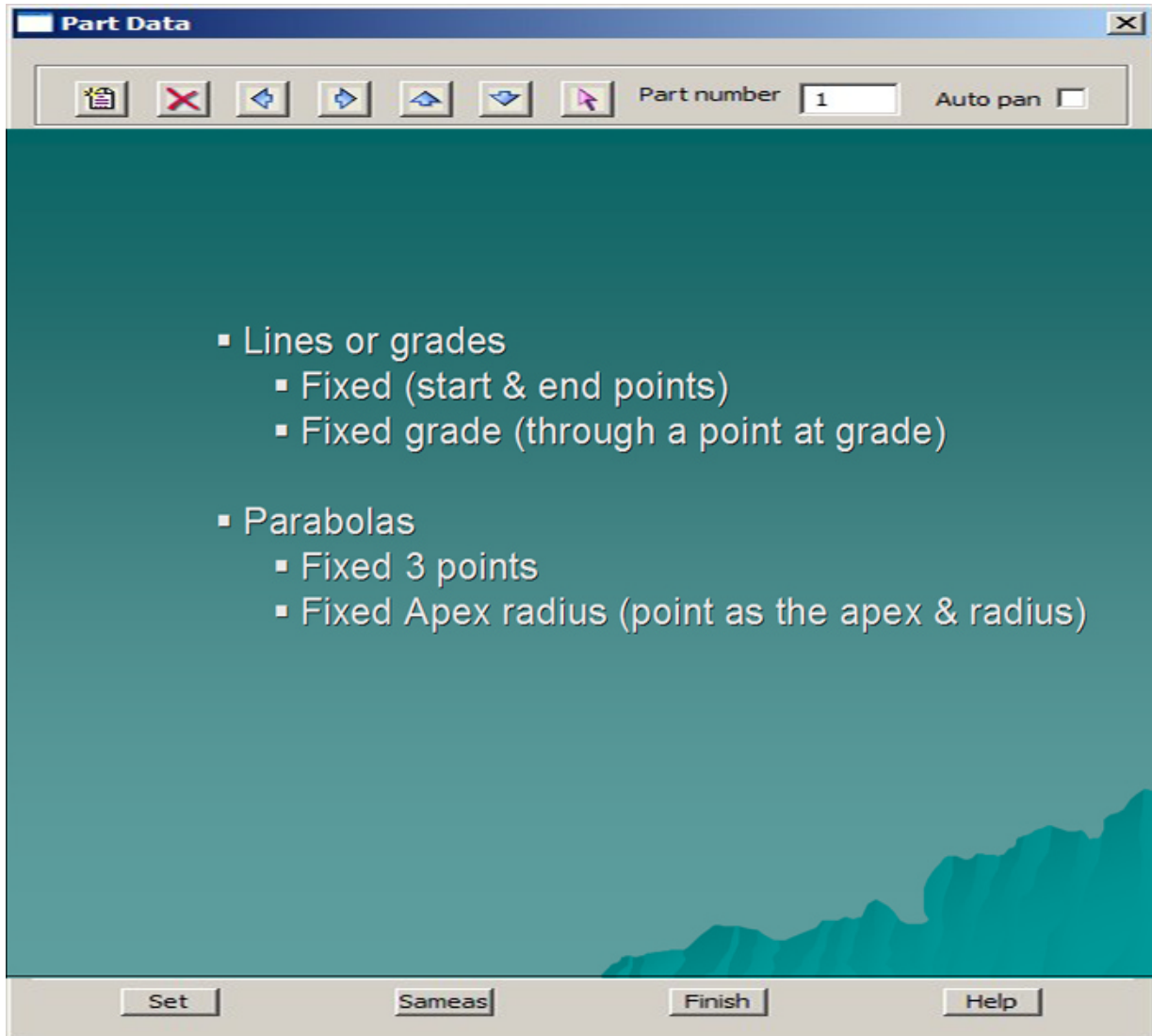


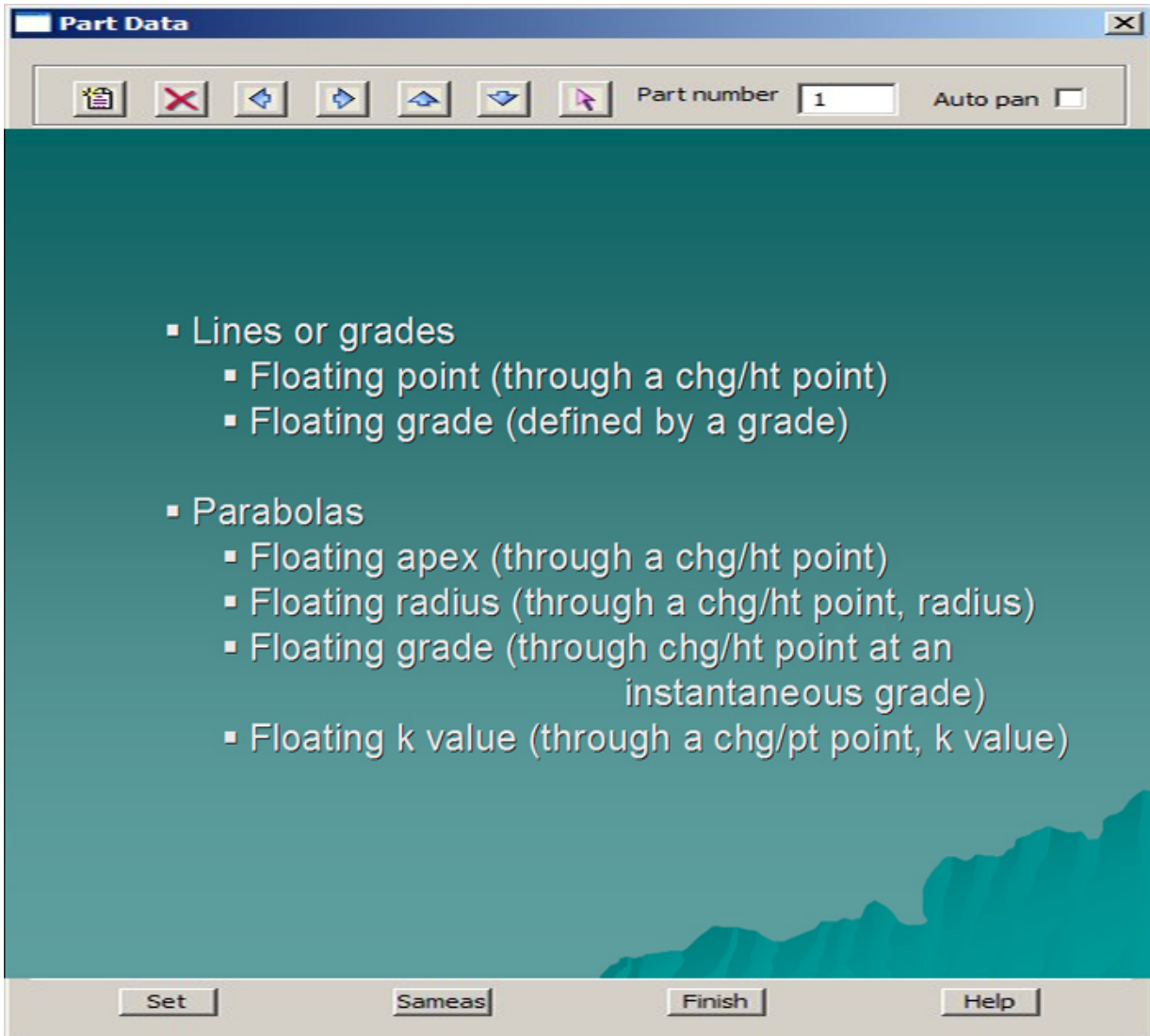


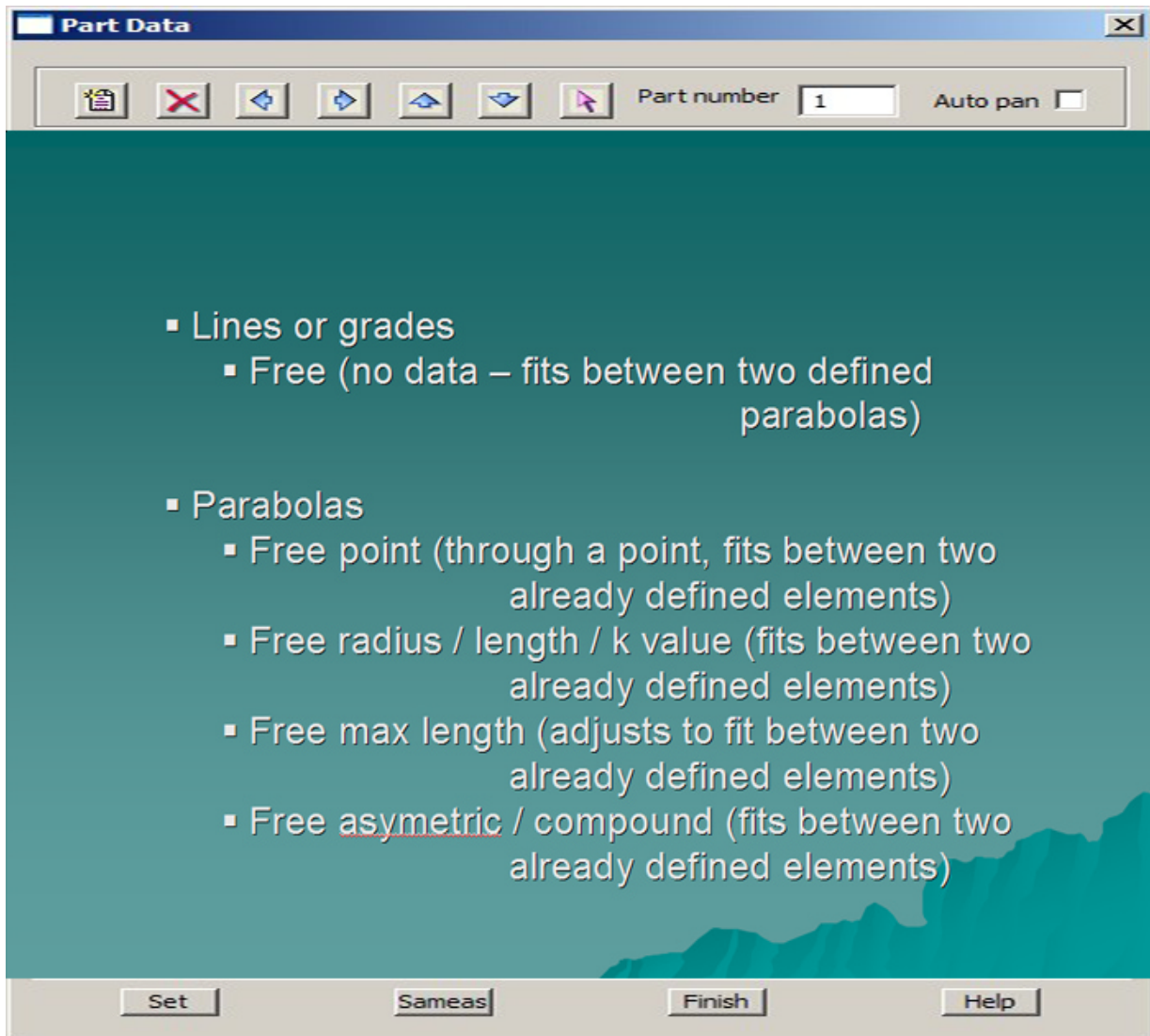












Appendices

A 12D Survey Guide

The information contained in this appendix outlines the general options, terminology, definitions and methods used by 12d Model for the purpose of the input, reduction and output of survey information. It is a general guide, with the appendices following relating to specific instruments and the interactions with 12d Model.

Please continue to the next section "Guide to Survey Reduction in 12d Model" .

Guide to Survey Reduction in 12d Model

The 12d Model survey options are used to reduce electronically recorded survey information and produce 12d Model strings, a process called **survey reduction**.

In the most general case, there are three steps involved:

1. 12d Model downloads raw data from a data collector and stores it on the computer.
2. The raw data file is converted to a standard 12d Model raw field file format, normally with extension of ".fld". For simplicity, the standard 12d Model raw field file is called the "12d field file".
3. The 12d field file is read into a 12d Model Survey Reduction function (12d Survey function) and reduced. If errors occur, the field data for 12d Survey function can be interactively and/or graphically edited. The reduction produces 12d Model super strings in one or many 12d Model models.

In some circumstances, not all steps are necessary.

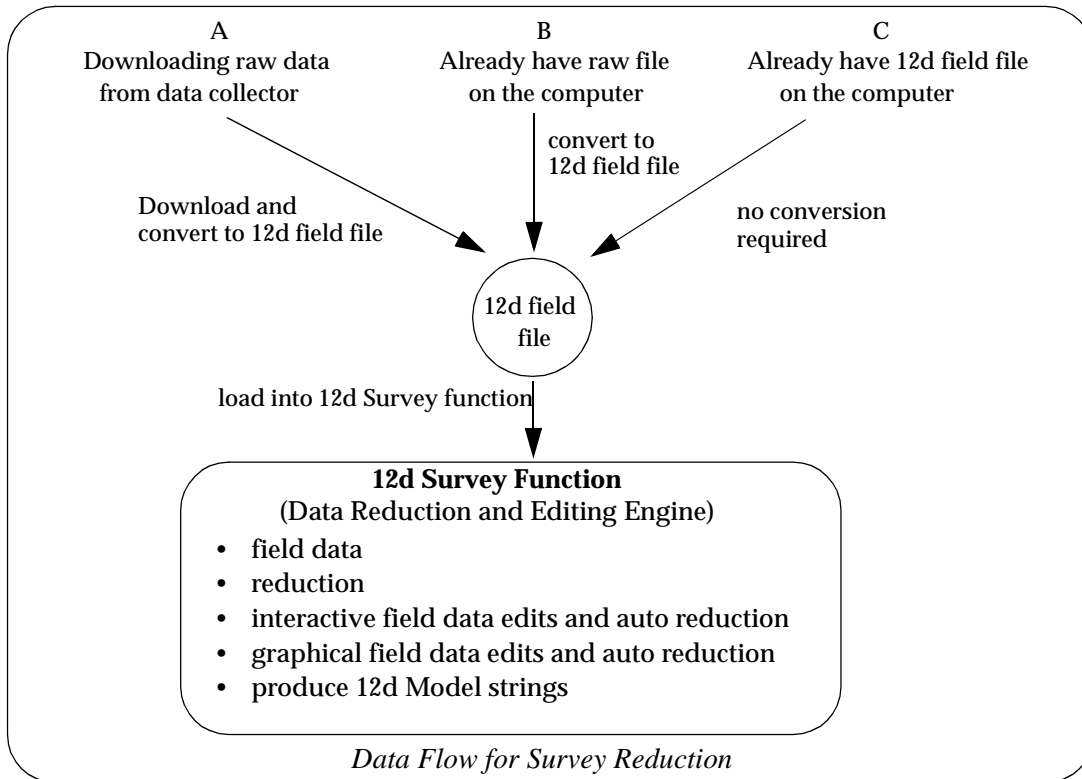
For example, Step 1 is not necessary when the raw data file is already on the computer (and hence doesn't need downloading).

This often occurs when data collectors have PCMCIA cards and PCMCIA card readers on the computer. Another example is when the raw data file has already been downloaded to the computer using another package such as HyperTerminal. Or maybe the raw data file has already been downloaded in a previous 12d Model session.

Steps 1 and 2 are not necessary when the data is already in the form of a 12d field file.

This occurs when other software packages, such as TP Setout, can produce a 12d field file. Or the 12d field file was created in a previous 12d Model session, maybe even on a different computer.

A data flow diagram for the survey reduction process is:



Please continue to the next section “Guide to Survey Coding in 12d Model” .

Guide to Survey Coding in 12d Model

At first the whole process may seem confusing because there are a multitude of methods of setting up coding in the field. Why isn't there just one way of doing things?

Firstly, each brand of survey instrument has a totally different format for recording information. Unfortunately there is no industry standard. In fact, different instruments from the same survey instrument manufacturer can have different formats for recording data.

Secondly, many of our customers were already familiar with another survey package and if possible, wished to continue field coding in the same way. Where possible, 12d Model has tried to accommodate this wish. Since 12d Model has replaced a number of survey packages, this led to yet more possible configurations.

12d Model has also been developing its own preferred method of field coding for each instrument. It is not compulsory to use the 12d method but of course it is the only way of taking advantage of features that are not available in other coding systems. For example, defining and using field templates and recording user-defined attributes on points and segments.

So to make help guide you through survey coding section:

- (a) There are field coding concepts used in 12d Model that are common to all instruments. For example, feature codes and string numbers, offset, close strings etc.
These are described in "Field Coding"
- (b) There are template field coding concepts used in 12d Model that are common to all instruments. These are described in "Field Templates"
- (c) There are shape field coding concepts used in 12d Model that are common to all instruments. These are described in "Shape field coding"
- (d) There are traverse field coding concepts used in 12d Model that are common to all instruments. These are described in "Traverse coding"
- (e) For leica instruments, the coding methods are different from most other types. These are described in "Field Coding for Leica Instruments"
- (f) For non-leica instruments, the concepts used in coding are similar for each type. These are described in "Field Coding for Non Leica Instruments"

Field Coding

EDM equipment is used to make readings of points in the field.

However, rather than just collecting points, it is usually desirable to add extra information by coding the readings in a way that can be interpreted during the data reduction process and produce more valuable information.

Unfortunately, there is no industry standard for this extra coding and it is software specific.

In 12d Model, the extra information is included in one or both of

- ▲ a *feature code* and *string number*
- ▲ extra commands called *field codes*

How the *feature codes*, *string number* and *field codes* are added in the field depends on the data collector being used and the coding convention set up by the user in 12d Model.

For example, some surveyors like to enter the *feature code* before the *string number*, others like to enter the *feature code* after the *string number*. Other surveyors don't use string numbers at all but prefer to use a *New String* command to start new strings (mainly ex SDR Map users).

In 12d Model, a particular *field coding convention* is defined by the user and stored with a **unique** name as a *data collector definition* in the file survey.4d. New data collector definitions can be created and existing ones modified using the *Survey Data Collectors* section of *Project=>Browse*.

12d Model converts all the raw data files from the different survey instruments and data recorders with different coding conventions, into the one 12d Model standard field file format before being loaded into a 12d Model Survey Reduction function and reduced. The 12d Model standard field file will simply be referred to as the 12d field file or just the field file.

The use of many of the commands allowed in the 12d field file will now be described. The complete definition of all the 12d field file commands will be described later.

The coding methodology for specific data recorders will be described in separate Sections.

Please continue to the next section "Stringing in the Field".

Stringing in the Field

In the coding convention, it is possible to specify that

- (a) *feature codes* and *string numbers* are used
- or
- (b) just *feature codes*.

Case (a) *feature codes* and *string numbers*

If *feature codes* and *string numbers* are entered with measurements in the field, a coding methodology is used so that strings are automatically created during the reduction process.

To allow this stringing, the **feature code** and **string number** are interpreted in the following manner:

During reduction, 12d Model connects measurement points with the **same feature code and string number** in the order they are measured in. That is, the feature code **and** string number determines which points are joined together to form the vertices of a super string. At the end of the reduction, the *string number* is dropped and just the *feature code* remains as the *name* for the super string.

Hence the *feature code* and *string number* combination allows any number of different super strings with the same name (feature code) to be produced.

If the *string number* is zero, then the point-line type of the super string is set to *point*. If the

string number is non-zero, the point-line type of the super string is set to *line*.

Finally, during reduction, the *feature code* can be used as the key to a mapping file to specify the name, model, colour, point-line type, linestyle, tinability and other details for the super string.

Note that the measurements of points with different feature codes and string numbers can be intertwined. That is, *not* all the points in one super string need to be measured before the points in a different super string.

Hence at the end of the reduction, 12d Model super strings are created for each unique *feature code* and *string number* combination in the input data.

Note - if the *string number* is blank, the *string number* defaults to 0

Case (b) just feature codes

If just *feature codes* are used then a *New String* command is used to start a new super string rather than giving a new string number.

During reduction, 12d Model connects measurement points with the **same** feature code in the order they are measured in until a *New String* command is found. That is, just the feature code determines which points are joined together to form a super string and the *New String* command defines when a new super string begins.

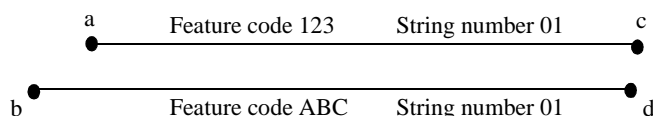
At the end of the reduction, the *feature code* remains as the *name* for the super string.

Also during reduction, the *feature code* can be used as the key to a mapping file to specify the name, model, colour, point-line type, linestyle, tinability and other details for the super string.

Note that the measurements of points with different feature codes can be intertwined. That is, *not* all the points in one super string need to be measured before the points in a different super string.

An Example of Coding to String Points Together

Two super strings are to be created, one joining points **a** and **c**, the other joining points **b** and **d**.



Points may be measured and assigned *feature codes* and *string numbers* as follows:

Measurement to point	Feature code	String Number
a	123	01
b	ABC	01
c	123	01
d	ABC	01

Alternatively, the points could have been measured in the order a, c, b, d as long as the correct

feature codes and string numbers were entered.

Measurement to point	Feature code	String Number
a	123	01
c	123	01
b	ABC	01
d	ABC	01

Because the *string numbers* are non-zero, the default *point-line* type for both super strings is *line*. Please continue to the next section “Offsets” .

Offsets

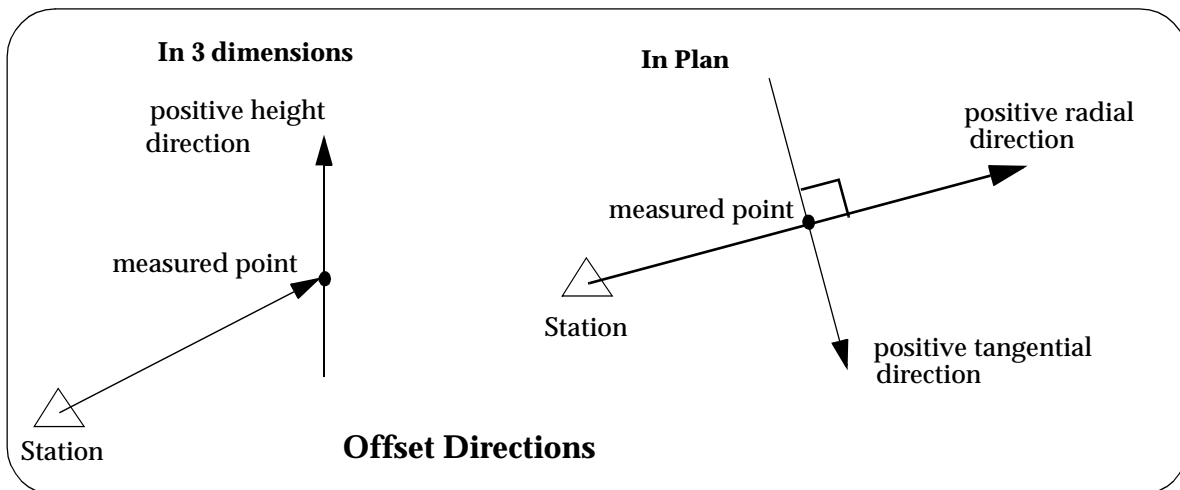
It is not always possible to measure a point directly but it may be possible to measure a point nearby and then measure an offset to adjust the measured point by and so produce the co-ordinates of the required point.

The three offsets that are allowed in the 12d field file are:

Height - The *height offset* adjusts the height of a non-null point. A positive offset adds to the height and a negative offset reduces the height.

Radial - The *radial offset* adjusts the position of the specified point by a *plan* distance from the specified points original position, along the plan line joining the current station to the specified point. A positive offset is away from the station and a negative offset is toward the station.

Tangential - The *tangential offset* adjusts the position of the specified point by a *plan* distance from the specified points original position, at rights angles to the plan line joining the current station to the specified point. A positive offset is to the right (looking from the station to the point) and a negative offset is to the left.

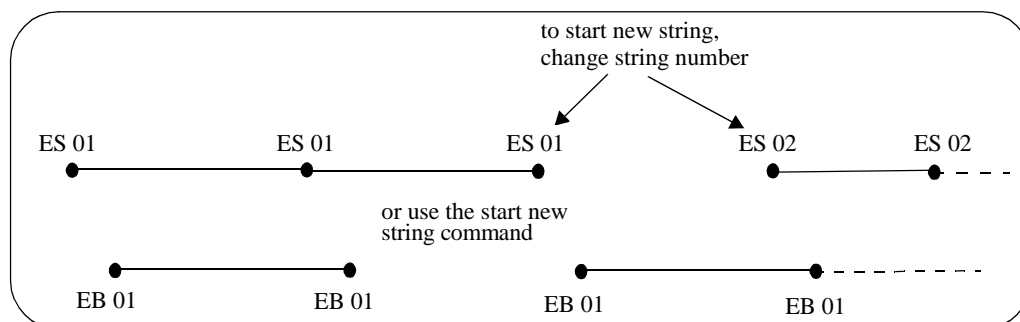


Please continue to the next section “Start New String” .

Start New String

A new string is automatically started whenever a different string number is used. However there is also a **start new string** command which begins a new super string even if the string number is the same as the string number for previous points.

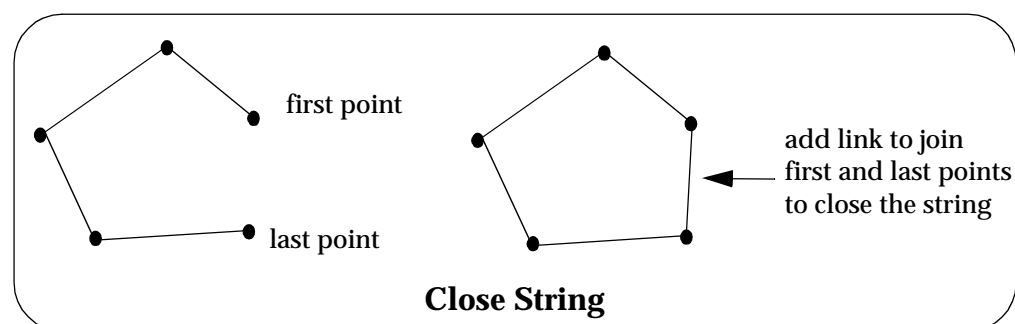
The *New String* command is particularly useful for correcting the field error of forgetting to change the string number.



Please continue to the next section "Close String".

Close String

The close string command closes a super string by joining the first and last points of the super string. If a super string is already closed, then the close has no effect. The string closed command can be given at the recording of any point of the string, and the entire string is closed.

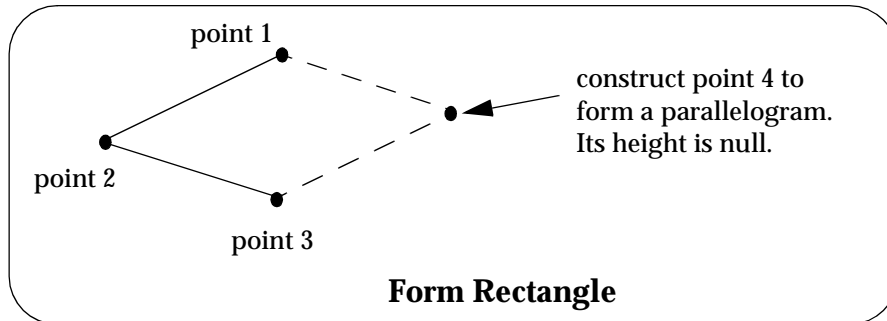


Please continue to the next section "Rectangle".

Rectangle

The rectangle command acts on last three points of a string and adds a new point after the last point to form a parallelogram (squashed rectangle). The string is then closed.

The height of the added point is set to null.

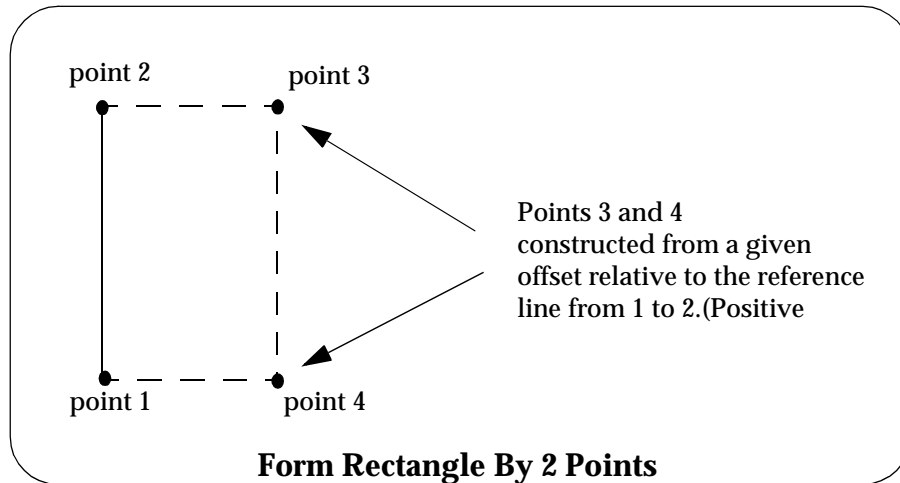


Please continue to the next section "Rectangle by 2 Points".

Rectangle by 2 Points

The rectangle by 2 pts command acts on last two points of a string and adds two new points at a given offset after the last point to form a rectangle. The string is then closed.

The height of the added points are set to null.



Please continue to the next section "Feature".

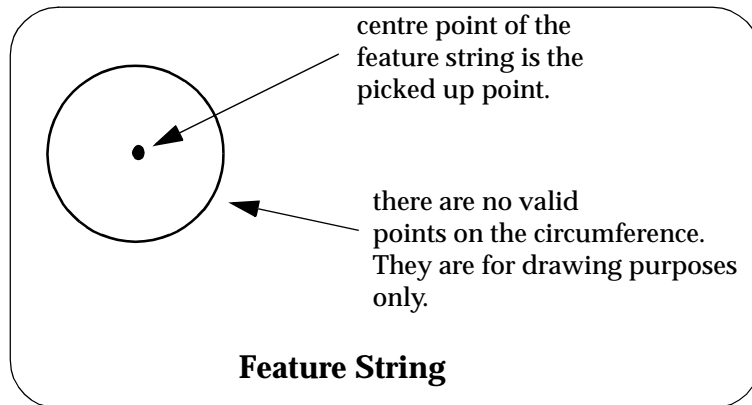
Feature

A *feature string* is a circle with a z-value at the centre but only null values on the circumference of the circle.

The feature commands creates a *feature string* with the picked up point as its centre and the radius/diameter being set by the feature command.

If a feature string is given a **world** line style, then the style is centred on the centre point of the feature string and scaled up to the radius of the feature string.

If a feature string is given a **screen** or **paper** line style, then the style is wrapped around the circumference of the feature string.



Please continue to the next section "Joining Strings" .

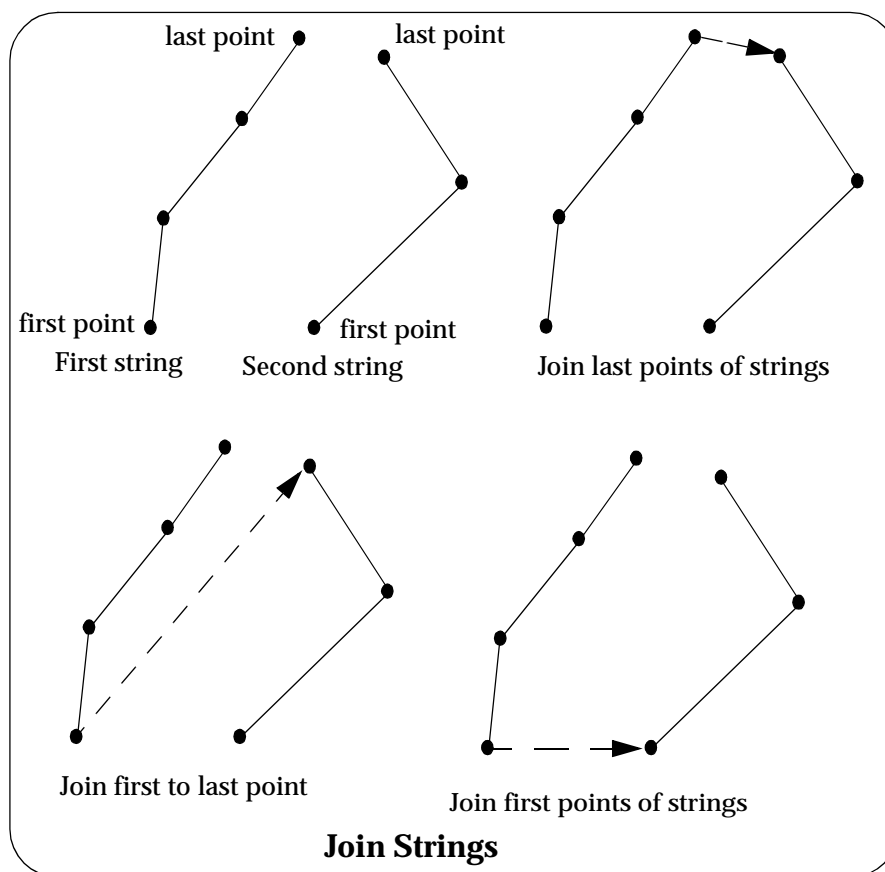
Joining Strings

There are three commands for joining two strings together.

Join last points of strings - the last point of the first string is joined to the last point of the second string. The direction of the final string is along the forward direction of the first string, across to the end of the second string and then in the reversed direction of the second string.

Join first to last points of strings - the first point of the first string is joined to the last point of the second string. The direction of the final string is in the reverse direction of the first string, across to the start of the second string and then in the forward direction of the second string.

Join first points of strings - the first point of the first string is joined to the first point of the second string. The direction of the final string is in the reverse direction of the first string, across to the start of the second string and then in the forward direction of the second string.



Please continue to the next section "Arcs Through Points".

Arcs Through Points

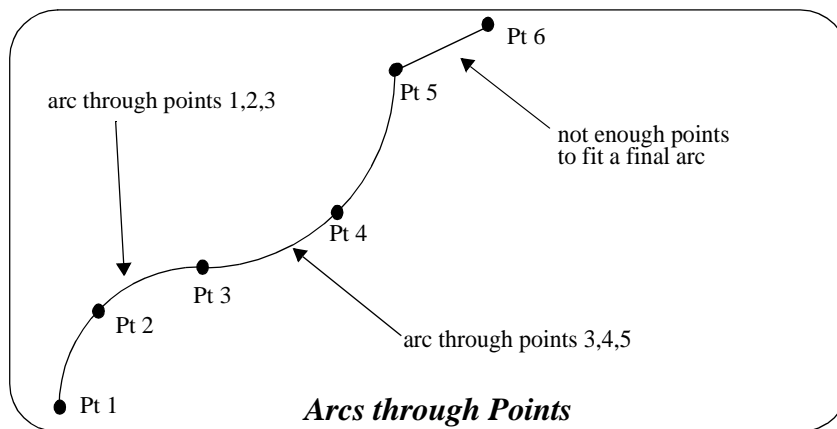
There are a number of commands to fit arcs through sequences of three or more points. Note that this is an **arc in plan**, with different z-values at each of the three points. The z-values are linearly interpolated around the arc between the points.

Hence it is a **helix** and **not** a circle in the plane containing the three points. Note that a 3d-arc in a plane not parallel to the x-y plane does **not** project onto an arc in the x-y plane.

There are arc commands to

- (a) fit an arc through the next three points
- (b) fit an arc through the previous three points.
- (c) fit arcs to sets of three points until stopped.

The first two cases need no explanation but in the final case, a arc is fitted to the first three points, and then another arc to points 3, 4 and 5 and then an arc through 5,6 and 7 and so on. If at any stage there is only one point left, then no arc can be fitted and a straight line is drawn to the final point.



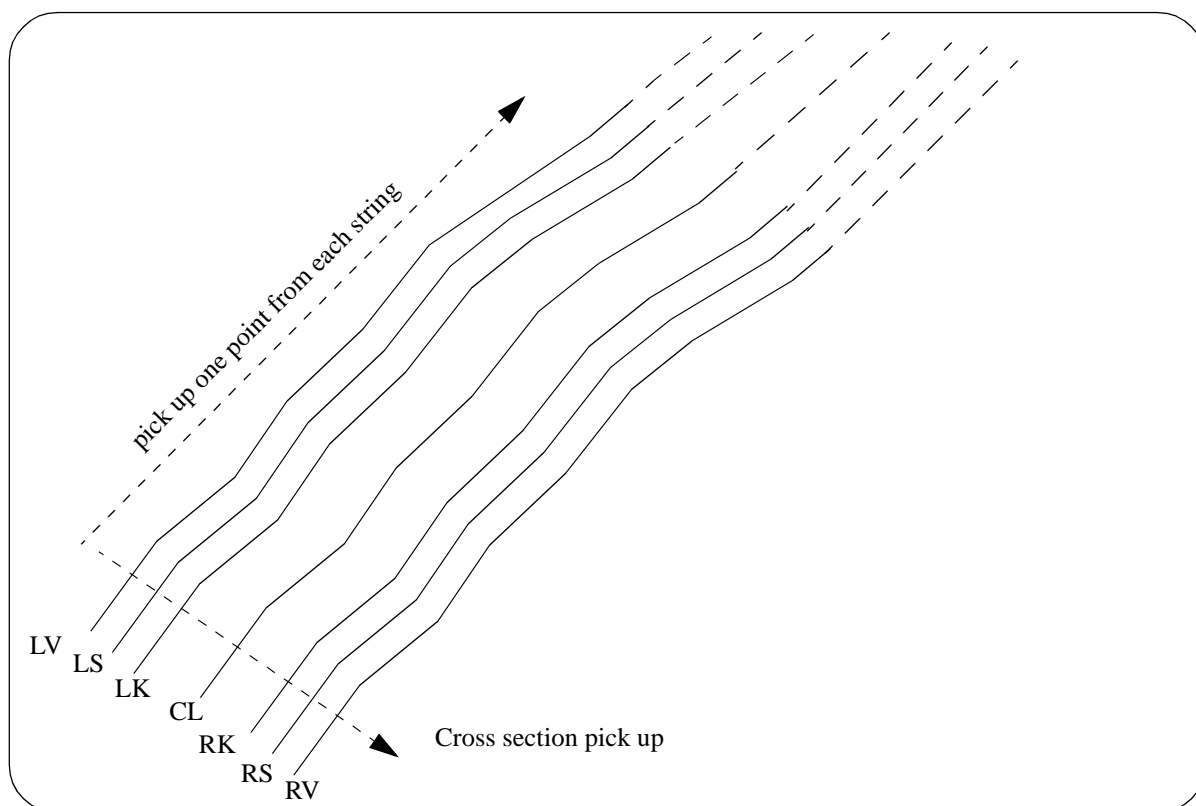
Please continue to the next section "Field Templates".

Field Templates

If a series of points are being picked up along the one string then the *feature code* and *string number* only need to be entered once since the default for a measurement is to use the last *feature code* and *string number* if no new ones are given. However it is often much more efficient to pick up one point from a number of strings before moving onto the next point of the each string (cross section pick up).

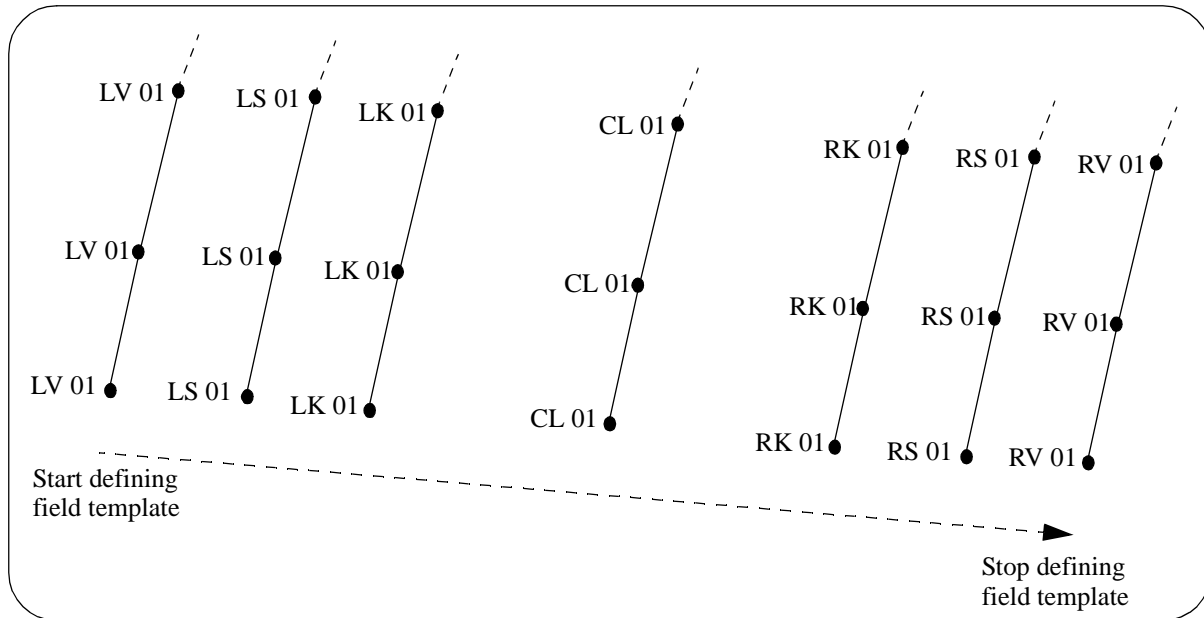
For example when picking up a road, it would be preferable to pick up the points for a section across the road and then move onto the next section rather than picking up all of one string at a time. In the diagram below, this means picking up one point from each of the strings LV, LS, LK, CL, RK, RS, RV and then moving onto the next cross section rather than picking up all of LV and then all of LS and so on.

Normally if each measurement is from a different string, then the feature code and string number would need to be re-entered with each measurement which is a very time consuming process. To simplify the coding for section pick up, 12d Model uses *field templates*.



Basically, a 12d Model *field template* consists of defining a sequence of *feature codes* and *string numbers* for the field template. The field template can be given a unique name or have no name at all.

When a field template is used, measurements are taken without entering a *feature code* and *string number* and the *feature code* and *string number* for the measurement come from the *field template definition*.



For example, a field template could be defined as the sequence:

LV 01, LS 01, LK 01, CL 01, RK 01, RS 01, RV 01

When the field template is used, measurements are taken without giving a feature code or string number and the measurements will be sequentially given the codes LV 01, LS 01, LK 01 etc.

To define a 12d Model *field template*, there is a command to *start recording* the field template. The *feature codes* and *string numbers* for the next series of measurements until the *stop recording* command is given, are stored as the field template. There are also commands to *insert* and *delete* a point in the template when picking up.

When a field template is used, the feature code and string number from the field template can be used:

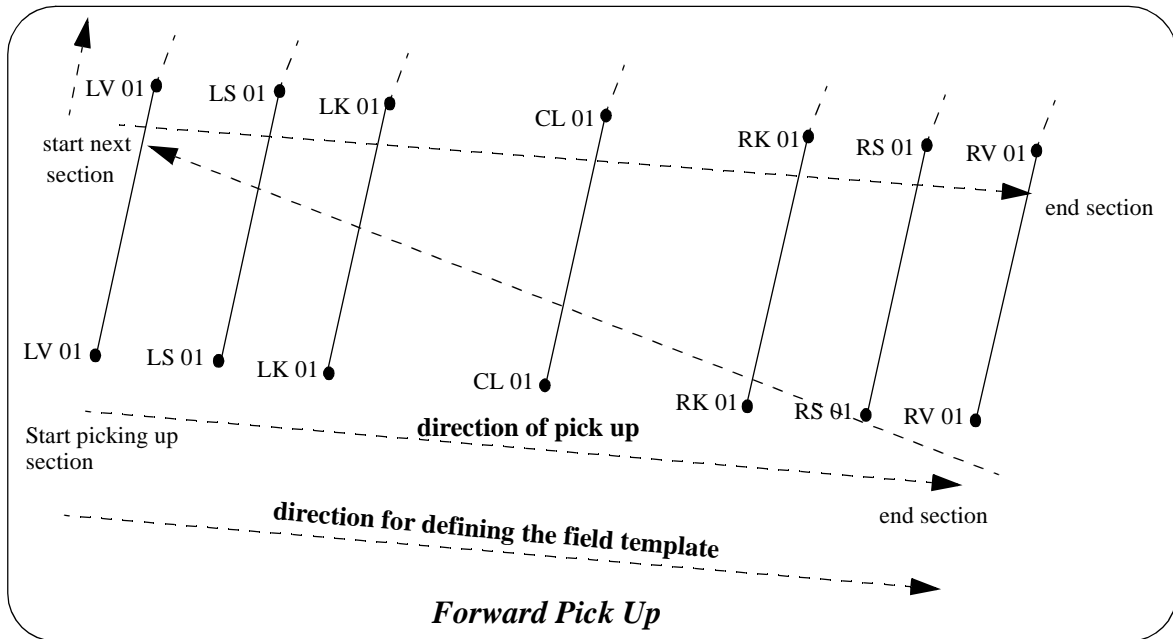
- in the same order as the codes are defined in the field template (forward direction).
- in the opposite order to how the codes are defined in the field template (reverse direction).
- in an alternating same and opposite order that the codes are defined in field template (zig-zag)

These three modes of usage of a field template will be described in the following sections.

Please continue to the next section "Forward Direction".

Forward Direction

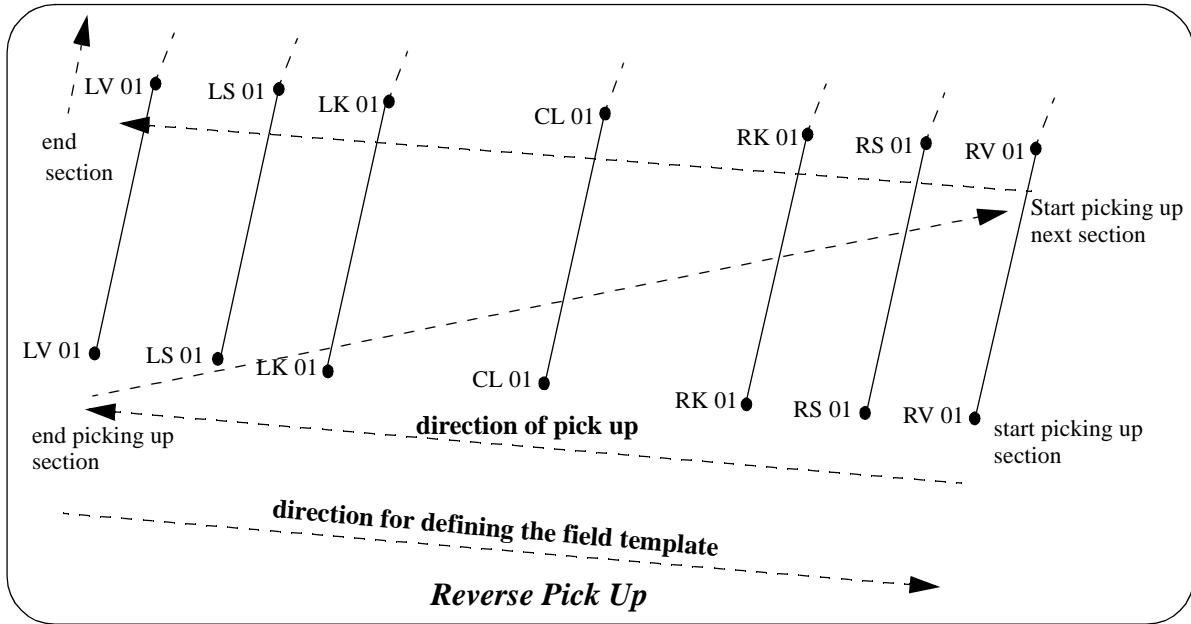
If the field template is used in the *forward* direction, then the feature codes and string numbers are used in the same order that they were defined to be in the field template. Once the end of the field template is reached, the feature codes and string numbers re-start at the beginning of the field template.



Please continue to the next section “Reverse Direction” .

Reverse Direction

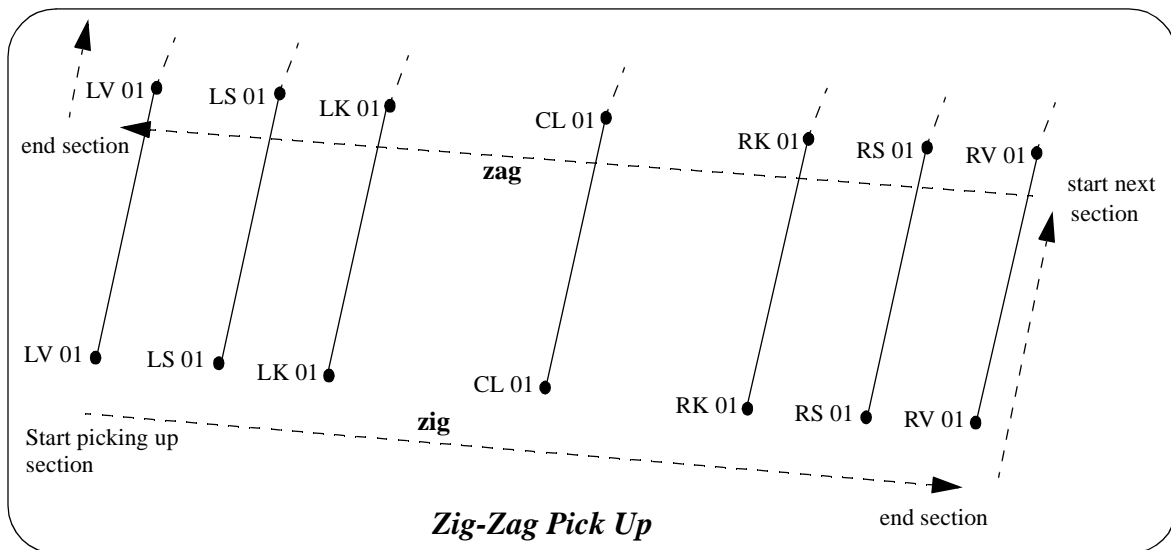
If the field template is used in the *reverse* direction, then the feature codes and string numbers are used in the reverse order to what they were defined to be in the field template. That is the feature codes and string numbers start at the *end* of the field template definition and are used in the reverse order. Once the beginning of the field template is reached, the feature codes and string numbers re-start at the end of the field template and are used in the reverse order.



Please continue to the next section "Zig-Zag".

Zig-Zag

When picking up a road in sections, it is often quickest to pick up the first section going from one side of the road to the other side, and then move onto to the next section point on the other side of the road and pick up points coming back across the road. Hence the points for the second section are in the reverse order to those in the first section. This process is known as zig-zagging.



This situation can be covered in two ways. A field template could be defined containing all the points for two sections and the field template used in the forward (or reverse) direction. For example, the field template to be used in the forward mode could be defined as:

LV 01, LS 01 LK 01, CL 01, RK 01, RS 01, RV 01, RV 01, RS 01, RK 01, CL 01, LK 01, LS 01, LV 01

However, in 12d Model it is only necessary to define the *one* section

LV 01, LS 01 LK 01, CL 01, RK 01, RS 01, RV 01

and when the field template is used, it is specified that it is being used as a *zig-zag* field template starting on either the *zig* (the forward direction of the field template) or the *zag* (the reverse direction of the field template).

Once a *zig* is completed, 12d Model automatically uses the reverse order of the field template and hence produces a *zag*. Similar, once a *zag* is completed, 12d Model uses the forward order of the field template and produces a *zig*.

Thus a *zag* automatically follows a *zig* and a *zig* follows a *zag*.

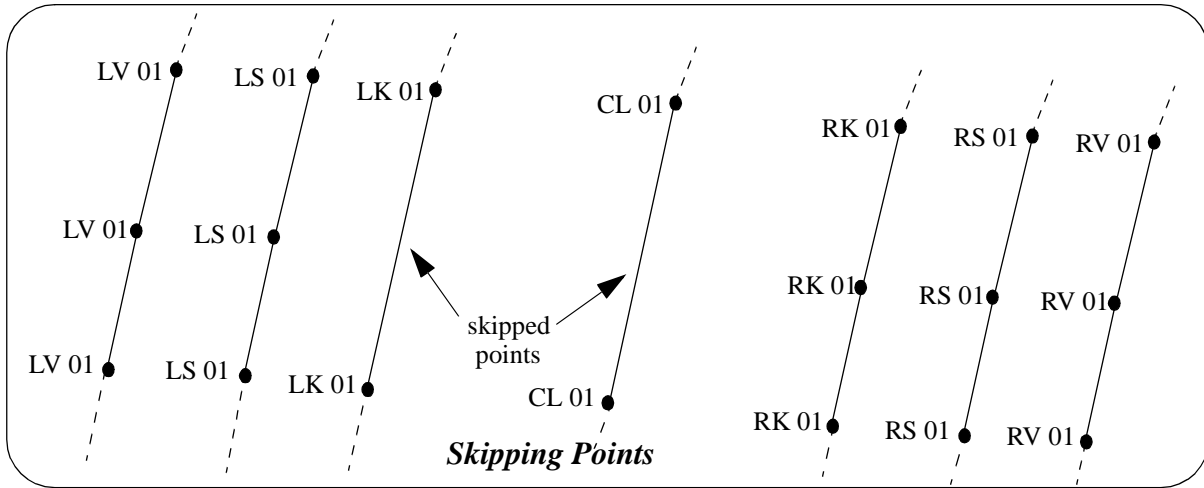
Hence if a field template is used in the *zig-zag* mode, it can be used as either:

- (a) a *zig-zag* field template starting on the *zig*
- (b) a *zig-zag* field template starting on the *zag*.

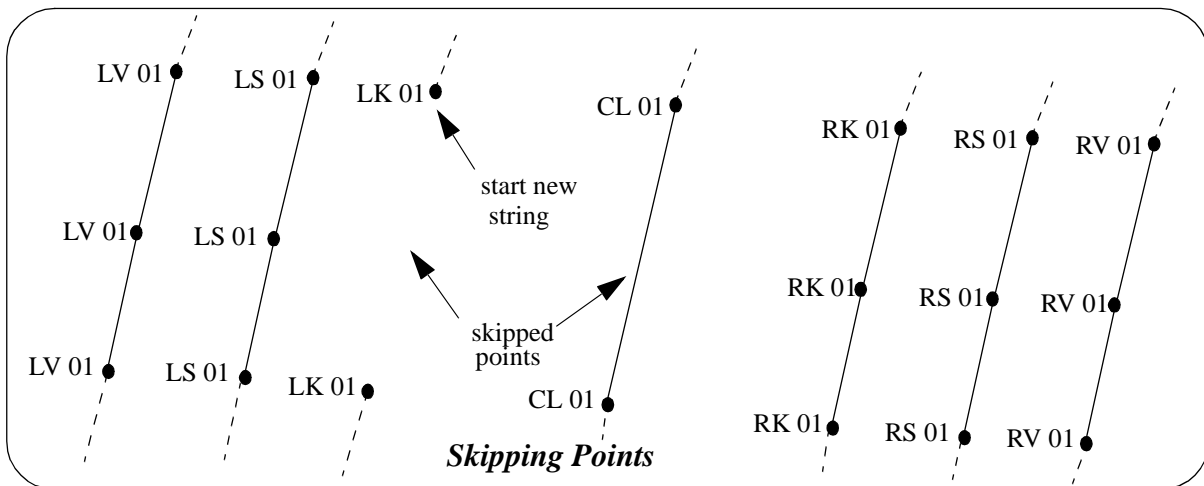
Please continue to the next section “Skipping Field Template Points” .

Skipping Field Template Points

When picking up points using a field template, 12d Model allows for one or more points to be skipped. By default, the points on the strings on either side of the skipped points will then be joined together.



By combining skipping points and start new string commands, points can be skipped and new strings started on the other side of the skipped points.



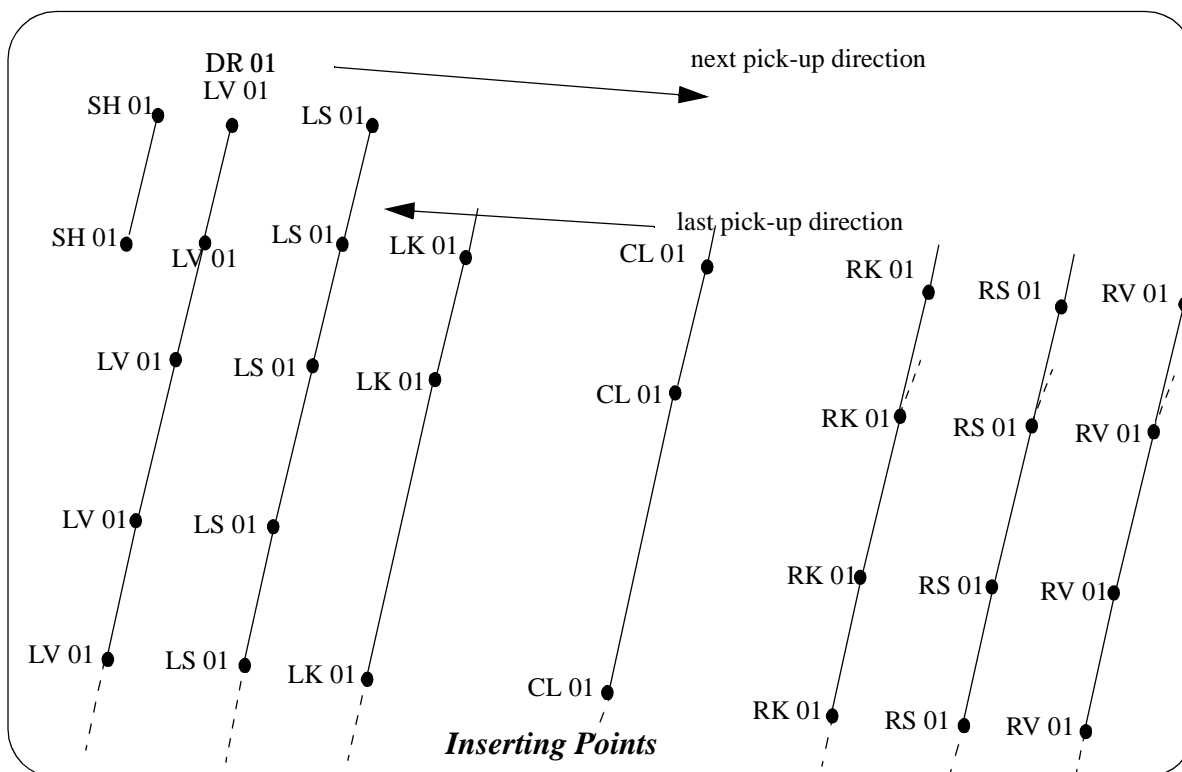
Please continue to the next section "Insert Template Points" .

Insert Template Points

When picking up points using a field template, 12d Model allows for one or more points to be inserted. The inserted points change the template from that point onwards so that extra strings can be picked up as they arise.

If the insert point command is given after the last point of a template, a flag should also be applied to specify which template pick-up the inserted point is to be added. i.e. The last series of points or the next series. This flag is called the "insert special" flag. If ticked on the insert panel or if the flag given in the offset code is 1, the point will be added to the current pick-up template. In the case shown below, the insert special flag should be set to on so that the next picked up point will be on the current template. The insert would have been made after the last LV 01 observation in the last pick-up direction. The following pick-up will use the redefined template definition.

It is also possible to multiple code points such that more than one code can be assigned to the one pick-up point. In the case shown below, an insert was made on the next pick-up direction after the LV 01 observation. The multiple code tick box or flag was set on so that the last picked up point will be assigned the extra code specified, in this case DR 01. The template will be applied to all subsequent measurements such that the observed LV_01 string will also be coded DR 01.

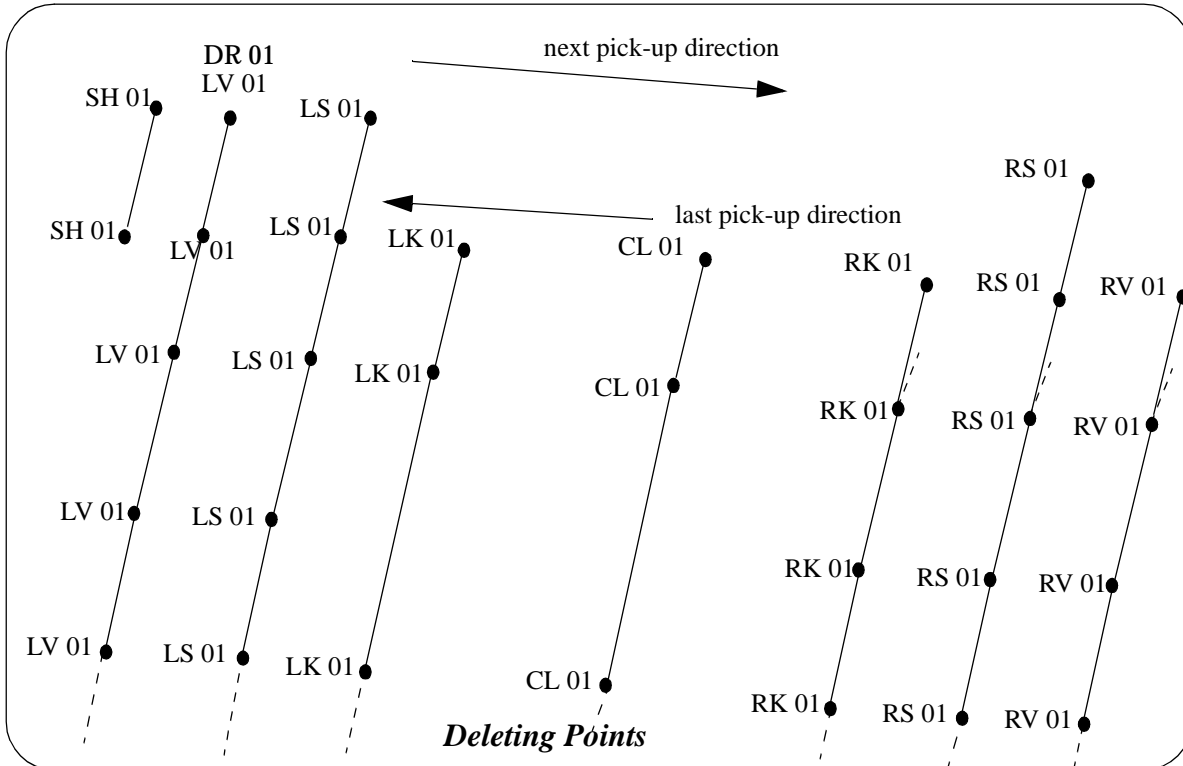


Please continue to the next section "Delete Template Points" .

Delete Template Points

When picking up points using a field template, 12d Model allows for one or more points to be deleted. The deleted points change the template from the next specified number of points inclusive of the current point. i.e. They are removed from the template.

If a template delete command was given after the LS 01 string in the next pick-up direction, and the number of specified points were 3, the template will be altered such that the next observed string will be RS 01.



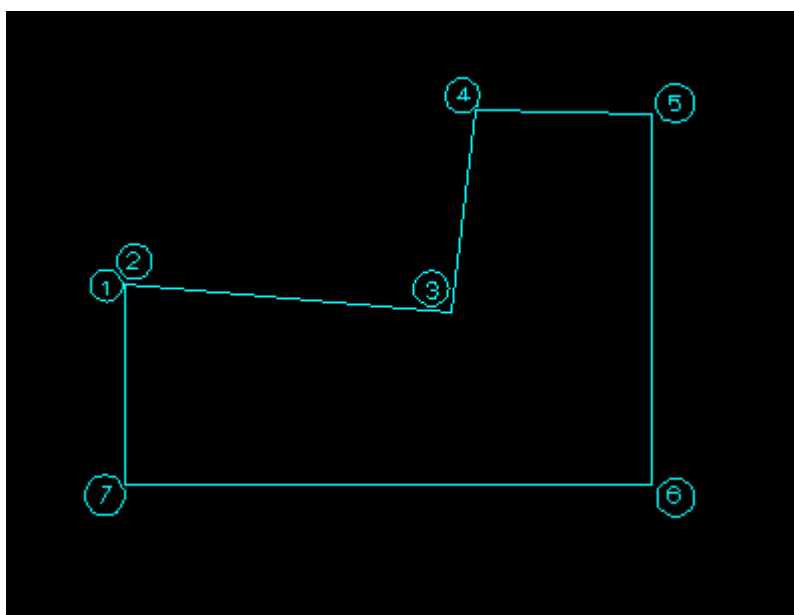
Shape field coding

If an object of a standard section is to be picked up such as a length of kerb, a shape can be defined and extruded/paralleled along a single pick-up string related to that shape.

For example, a kerb shape can be defined by observing all points on a typical section of the kerb and assigned a shape name. Then when picking up the length of kerb, only one reference string to the shape (defined when recording the shape) has to be picked up e.g. lip of kerb. On reduction, 12d can extrude or parallel the shape such that the strings/shape of the kerb are produced for the entire kerb pick-up.

Normally if each measurement is from a different string e.g. back of kerb, lip kerb etc., then the feature code and string number would need to be re-entered with each measurement which is a very time consuming process. To simplify the coding for section pick up, 12d Model uses *shape field coding*.

Basically, a 12d Model *shape* consists of observing a number of points on a given section of an object. The shape can be given a unique name or have no name at all.



For example, a shape can be defined by observations shown in order above

1- being the reference point, 2- 7 being the shape points. In this case, the 1st point of the shape pick-up coincides with the reference point.

To define a 12d Model *shape*, there is a command to *start and end the recording* of the shape. The *feature codes* and *string numbers* for the next series of measurements until the *stop recording* command is given, are stored in the final shape.

As the shape is defined, other field codes can be used in conjunction such as offset. In this example an observation may be made at 5 for the position of 6 using a vertical offset. Similarly for point 7 using the observation at a point near point 2. In addition, points 6 and 7 can be made non-tinable so that formation of a tin is constrained to the surface of the kerb.

The next step is to pick up the entire length of the kerb at the reference string position using the same *feature code* and *string number* used for the reference string in the shape pick-up. In this example the lip of kerb.

Once completed, the shape can be extruded or paralleled using the extrude or parallel

commands. The parallel command will create a number of strings according to the number of points on the shape. The extrude will create a super string with a shape defined like a pipe string.

Traverse coding

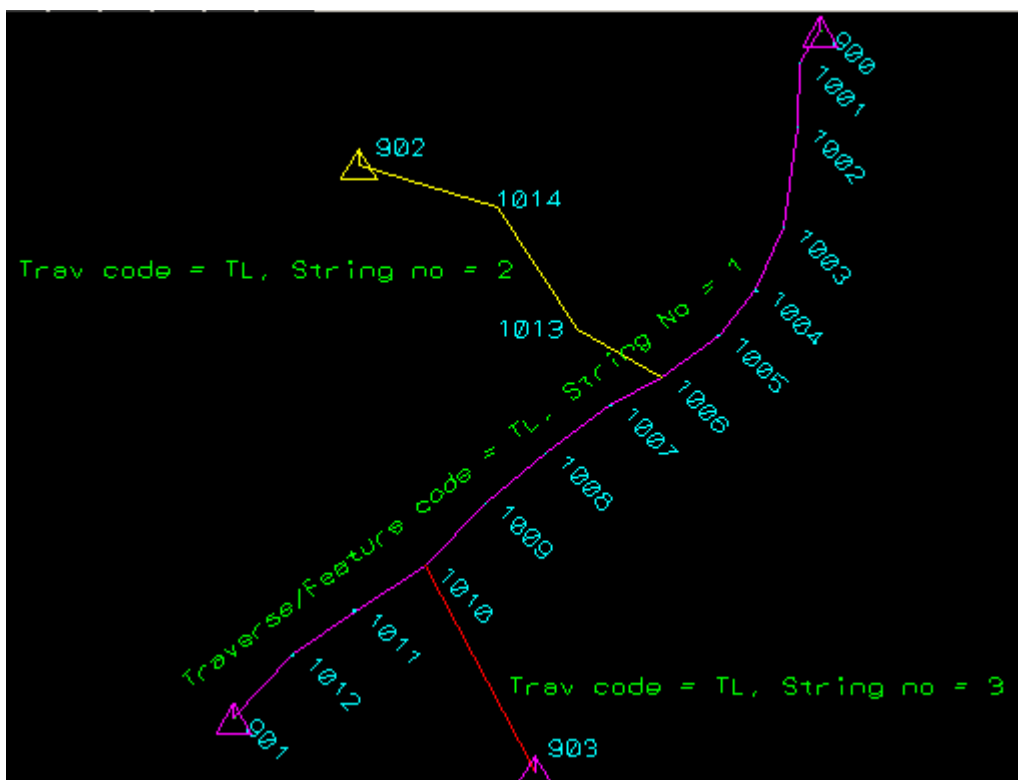
If a traverse is undertaken as part of a survey, a traverse code and string number can be coded so that 12d can extract the traverse information. The specific traverse code can be supplied in the survey reduction panel under the traverse tab. An example is shown below:

Traverse	Geodetics	Others
Do traverse calcs		<input checked="" type="checkbox"/>
Traverse code	TL	+
Adjust method		▼
Network model	traverse string	

In this case, the feature code of TL will be searched in the field file on reduction, so that a traverse string can be extracted. The user is required to nominate the foresight measurement with the TL code in this example. If they also include the TL code in a backsight to a previously defined traverse leg, a reciprocal calculation will be made. It uses the pair of observations (Foresight and Backsight observations of the same line e.g. Foresight 1001 to 1002 and backsight from 1002 to 1001). This reciprocal calculation takes the mean of the distance and vertical angles eliminating the effects of refraction.

A number of separate but interrelated traverses can be extracted using differing string numbers in the field.

The traverse code also allows for adjustments to be made between known stations. This adjustment maybe be chosen in the reduction panel. This field is optional.



Field Coding for Leica Instruments

For Leica instruments, the Leica GSI format breaks lines of data into fixed length 'words' and cannot use the same encoding method as the other instruments. The 12d Model coding system for the Leica TPS instruments is covered in the section "12D and Leica TPS Instruments" .

Field Coding for Non Leica Instruments

EDM equipment is used to make readings of points in the field.

Rather than just collecting points, it is usually desirable to add extra information by coding the readings in a way that can be interpreted during the data reduction process and produce more valuable information. Unfortunately, this extra coding is non-standard and software specific.

In 12d Model, all the raw data files from different data collectors are converted into the one standard field file format (the 12d Model field file) before being loaded into a 12d Model Survey Reduction function and reduced. Hence the method for coding information in the data collector in the field needs to be well defined so that it can be sensibly converted into a 12d Model field file (the section "The 12d Field File Format" contains the complete description of the 12d field file).

When a measurement is taken, most data collectors (Sokkia, Geodimeter, Topcon, Nikon etc.) allow the user to enter text which is then output with the measurement data. Depending on the data collector, the total number of characters of text may be strictly limited and may also be restricted to only one line of text. In 12d Model, a coding system has evolved so the text can be interpreted in a meaningful way.

Blocks and the Block (Command) Delimiter

To allow the one line of text to hold a variety of different information, the line of text is broken up into smaller blocks and each block is processed separately.

The character (or characters) used as the block separator is called the *command delimiter* or *block delimiter*.

Obviously the command delimiter can not appear in any of the commands inside a block.

What is used for the *command delimiter* is user defined in the data collector definition and is found on the *Delimiters* tab of the *Survey.4d Create/Edit* panel in the section "Data Collector Definitions".

The default command delimiter is * and this will be used in the examples in this appendix.

Hence using the command delimiter, the text line is broken into separate blocks for processing.

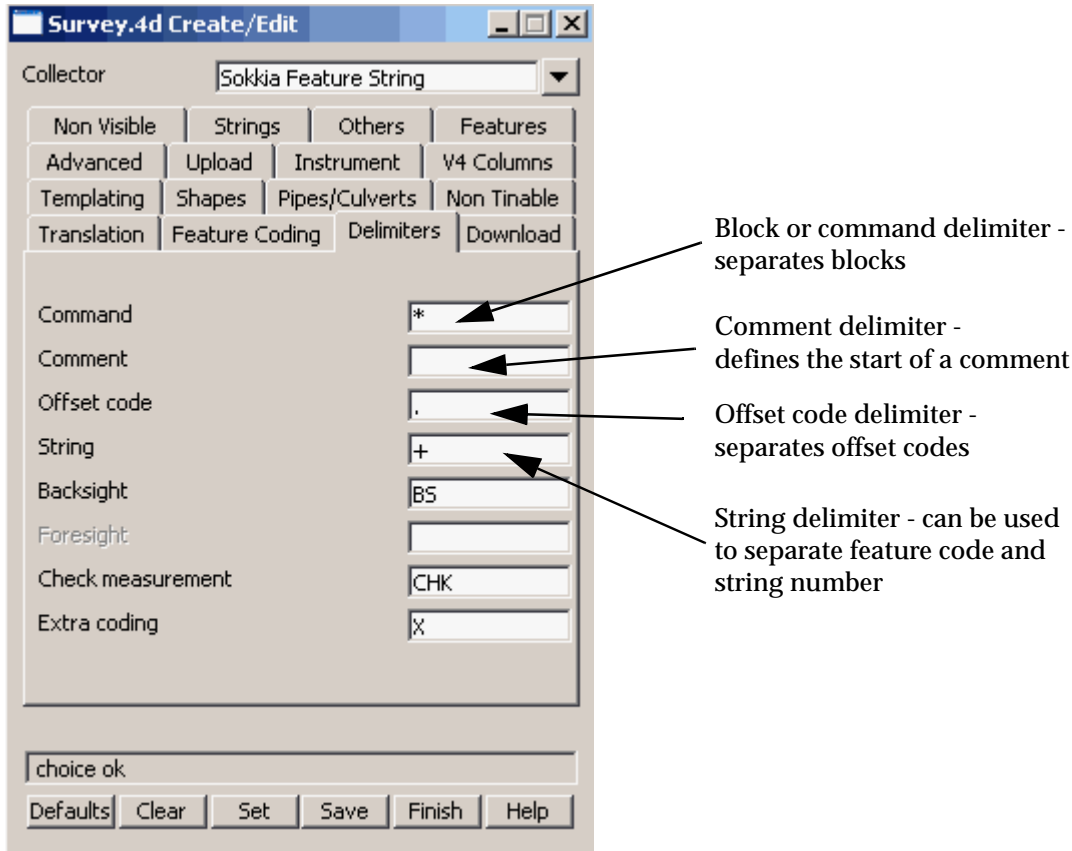
For example, the text string

EB01*XA.road

breaks into the separate blocks.

EB01

XA.road



A block can be either a **control code block** or a **feature code block**.

A **control code block** is any block that start with a valid **control code**.

Valid control codes are simply the one or more characters of text designated in the *Delimiters*, *Features*, *Templating*, *Pipes/Culverts*, *Not Tinable* and *Strings* tabs in the **Survey.4d Create/Edit** panel for the selected data collector definition.

If no control code appears at the start of the block, then the block is taken to be a **feature code block**.

For example, for the *Sokkia Feature String* data collector definition which is installed with 12d Model, the **valid control codes** are *, dot (.), space, +, BS, CHK, X, C, R, S, E, ST, XA, XB, XC, XD, XE, XF, NH, XP, XL, XN, I, O and A

Any block starting with any of above control codes is a **control code block**. Blocks that aren't control code blocks are **feature code blocks**.

Translation	Feature Coding	Delimiters	Download	Non Visible	Strings	Others	Features
Command		*		Close			C
Comment				Rectangle			R
Offset code		.		Rectangle by 2 pts			
String		+		Start arc fitting			S
Backsight		BS		End arc fitting			E
Foresight				New string			ST
Check measurement		CHK		End string			
Extra coding		X					

Non Visible	Strings	Others	Features
by radius			
by diameter			

Templating	Shapes	Pipes/Culverts	Non Tinable
Invert			I
Obvert			O
Centre			A

Templating	Shapes	Pipes/Culverts	Non Tinable
Record			XA
Start			XB
End			XC
Pause			XD
Pause after			
Continue			XE
Skip			XF
Insert			
Delete			

Templating	Shapes	Pipes/Culverts	Non Tinable
Remove height			NH
Point			XP
Previous segment			XL
Next segment			XN

Tabs on the *Sokkia Feature String* data collector definition which define Control Codes

Blocks can include *comments* and how a comment is specified is given in the next section “Comments in a Block” .

The feature code block is discussed in the section “Feature Code Blocks” .

The explanation of each control code is given in the section “Control Code Blocks” .

Please continue to the next section “Comments in a Block” .

Comments in a Block

Comments are supported in a block. There is a *Comment* delimiter and all characters after the *comment* delimiter to the **end** of the **block** are treated as a comment.

Comments are attached to the measurement point as **text**.

Hence the *measurement* will create a vertex on a super string and the *comment* will create text at that vertex of the super string.

The default for the *Comment* delimiter is / and it is defined by the *Comment* field on the *Delimiters* tab of the *Survey.4d Create/Edit* panel.

For example, if * is the command (block) delimiter and / is the comment delimiter, then in

EB01/first point of a template*XA.road

there are two blocks *EB01/first point of a template* and *XA.road*

and the text "first point of a template" in the first block is a comment and will be added to the super string as vertex text.

Another common character to use as a *comment delimiter* is a space (' '). For example, if * is the command delimiter and space is the comment delimiter, then in

EB01 first point of a template*XA.road

"first point of a template" is a comment.

The *comment* delimiter for the *Sokkia Feature String* data collector is a space

Please continue to the next section "Feature Code Blocks" .

Feature Code Blocks

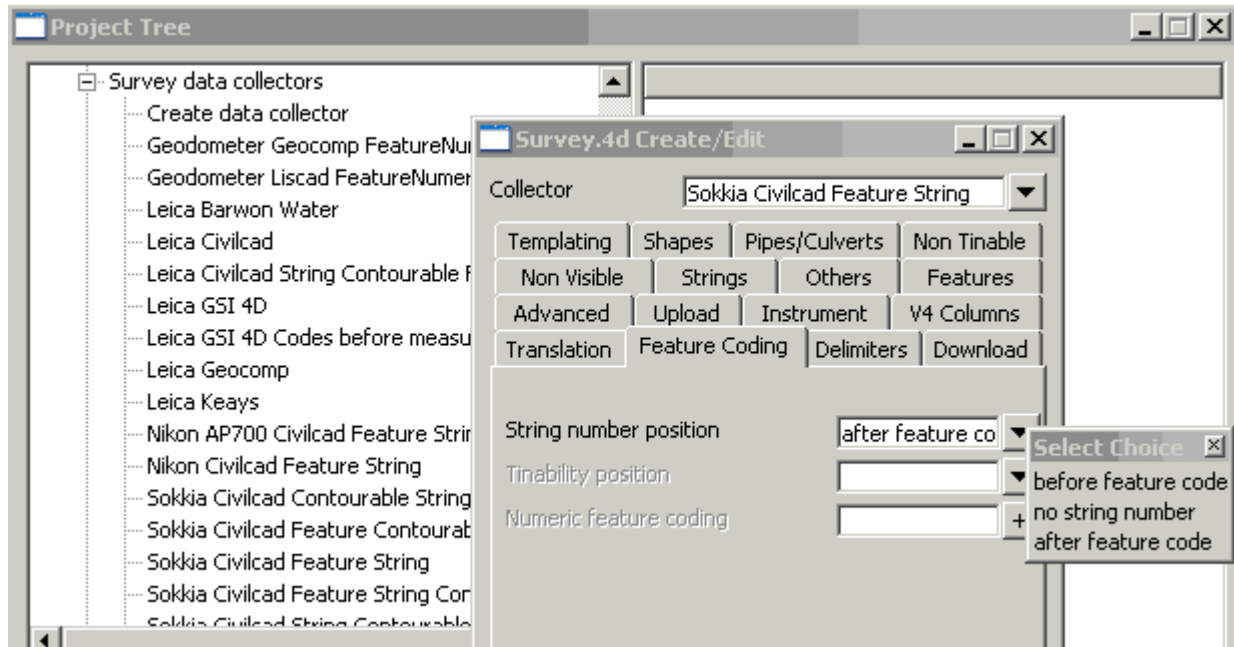
Feature Code, String Number and String Delimiter

In a feature code block, the *feature codes* and *string numbers* are given so that strings are automatically created during the reduction process.

The *feature code* and *string number* appear at the start of the feature code block and can be entered in a variety of ways.

Some surveyors like to enter the *string number* before the *feature code* and other surveyors prefer to enter the *string number after the feature code*. Some surveyors prefer to use *no string numbers* at all (SDRmap users) and use a *new string* control code to start a new string.

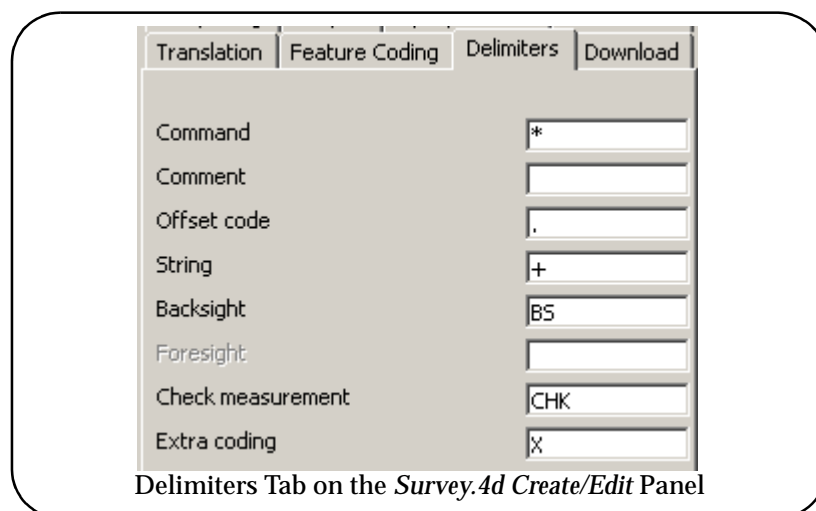
All three methods are supported in 12d. The setting is made on the *String number position* field on the *Feature Coding* tab of the *Survey.4d Create/Edit* panel. The default is 'before feature code'.



If string numbers are going to be used (either *before feature code* or *after feature code*) then there are rules for determining what is the feature code and what is the string number. Note that the *string number* is always *numeric* and can be any length.

Firstly, the *feature code* and *string numbers* can be separated by an **optional String** delimiter given by the *String* field on the *Delimiters* tab of the *Survey.4d Create/Edit* panel. The default character for the *string delimiter* is +.

For example, 20+110KVA is interpreted as string number '20' and feature code '110KVA' if the string number comes before the feature code.



If a String delimiter is not used, then there are **some restrictions** on the feature code so that the feature code and string number can be split apart. Note that the *string number* is always *numeric* and can be any length.

If a string delimiter is not used, then either

- (a) the *feature code* must be *purely alpha* and then the feature code can be of any length.

or

- (b) the *feature code* is purely numeric. Then the feature code must be the **fixed length** given by the *Numeric feature coding* field on the *Feature Coding* tab of the *Survey.4d Create/Edit* panel. If the *Numeric feature coding* field is not set and the feature code is numeric, then the whole thing is interpreted as a feature code with a string number of 0.

If a *feature code* is a **mixture of alpha and numeric**, then a **string delimiter must be used** to separate the feature code from the string number. Once a string delimiter is used, feature code can be any length.

Tinability as Part of the String Number

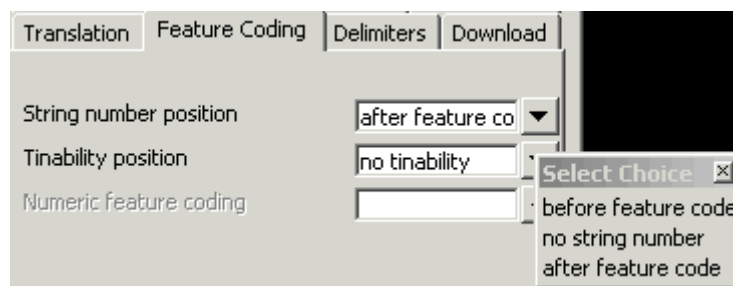
For compatibility with other software coding schemes, the tinability of a point can be included as part of the string number. This is **not normally recommended** since 12d has more flexible methods of defining tinability.

The field *Tinability position* on the *Feature Coding* tab of the *Survey.4d Create/Edit* panel controls whether it is used or not. The default is 'no tinability' as part of the string number.

If tinability is used as part of the string number, then it consists of either a **0** or a **1**.

If *Tinability position* is set to *before string*, the first character of the *string number* is stripped off and taken as the tinability flag. A value of 1 means the point is tinable and 0 is non-tinable.

If *Tinability position* is set to *after string*, the last character of the *string number* is stripped off and taken as the tinability flag. A value of 1 means the point is tinable and 0 is non-tinable.



Offset Codes

It is not always possible to measure a point directly but it may be possible to measure a point nearby and then measure an offset to adjust the measured point by and so produce the coordinates of the required point. The three offsets that are allowed in 12d Model are height, radial and tangential. See the Section "Offsets" for more information.

The three offsets height, radial and tangential have the codes H, R and T respectively.

The *offset codes* come after the feature code-string number combination and are separated by the **Offset code** delimiter whose default value is a decimal point (.) and is defined by the *Offset code* field on the *Delimiters* tab of the *Survey.4d Create/Edit* panel.

After the *offset code delimiter*, the offset code is given as either H, R or T and then a real value for the offset (with no spaces in between). The offset can be positive or negative with the sign only being recorded if negative. A second and third offset code (H, R or T) can follow the first but no offset code delimiter is used for the second or third offset codes. The offset code delimiter is only used to separate the field code-point number from the offset codes.

In the example 20+110KVA.H2.1T0.5 there is a horizontal offset of 2.1 and a tangential offset of 0.5.

Multiply Coded Points

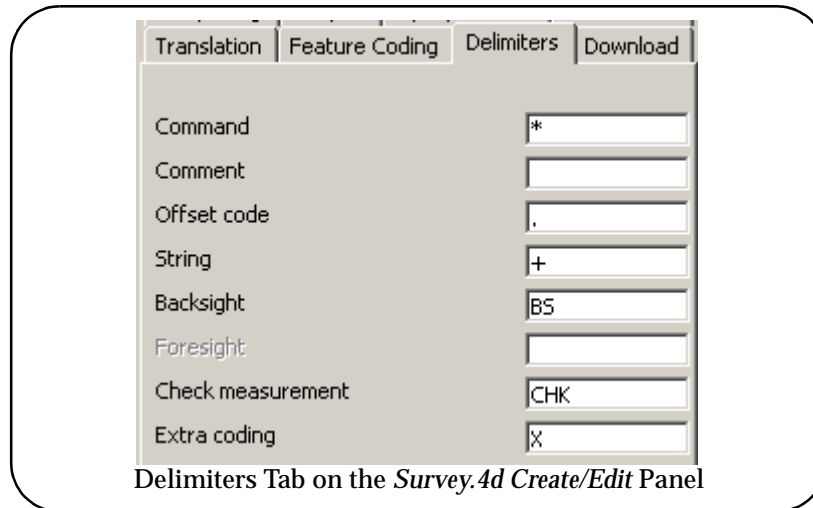
It is possible to have more than one *Feature code block* and this will create a multiply coded point.

For example, if the command delimiter is *, then EB01*PP would have the two feature code blocks 'EB01' and 'PP'.

Please continue to the next section "Control Code Blocks".

Control Code Blocks

Control Codes on the Delimiters tab



Extra Coding

This code is only for the instruments supporting the Sokkia SDR format.

The default for the *extra coding* control code is **X** and it is defined by the *Extra coding* field on the *Delimiters* tab of the *Survey.4d Create/Edit* panel.

For some instruments, extra lines of information can be entered after a measurement. For example on a Sokkia by using the note (13NM) to add more information to the previous measurement line (07).

The *extra coding* control code is used to append this additional information to the information on the measurement line. Hence it is then possible to have extra blocks of information on the line (or lines) following the measurement line.

The block containing the *extra coding* control code must be the last block on the measurement line.

For example,

```
EB01/first point of a template*XA.road*X
/ this is some extra info that happens to be a comment
```

is the same as

```
EB01/first point of a template*XA.road*/ this is some extra info that happens to be a comment
```

Note that there must be a feature code block on the measurement line otherwise a point will be created with no name.

Backsight

The default for the *backsight* control code is **BS** and it is defined by the *Backsight* field on the *Delimiters* tab of the *Survey.4d Create/Edit* panel.

The rest of the block after the *backsight control code* is the name of the station that the backsight was to, or the point number that the backsight was to.

For example, if *BS* is the backsight control code

```
BSPSM3
```

would designate a backsight to the station PSM3.

If only the backsight control code exists, the point number from the reading is taken as the point number for the backsight. This may be data collector dependent.

Warning for feature codes starting with the *backsight* control code.

If the feature codes comes before the string number, then feature codes for ordinary measurements **can not** start with the backsight control code because they would be interpreted as backsight measurements and no measurement point would be created.

If the feature codes comes after the string number, then whenever a feature codes for ordinary measurements is used that starts with the backsight control code, a string number (which may be zero for a point string) **must** be used otherwise the feature code will be interpreted as a backsight measurement and no measurement point would be created.

Foresight

There is no default for the *foresight* control code. It is defined by the *Foresight* field on the *Delimiters* tab of the *Survey.4d Create/Edit* panel.

The rest of the block after the *foresight control code* is the name of the station that the foresight was to, or the point number that the foresight was to.

For example, if *FS* is the backsight control code

FSPSM3

would designate a backsight to the station PSM3.

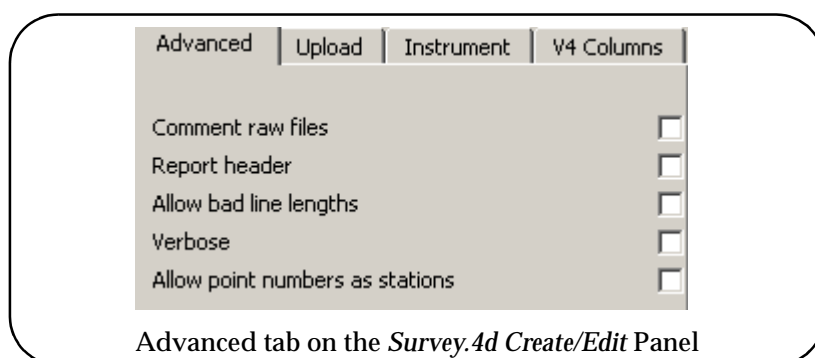
If only the foresight control code exists, the point number from the reading is taken as the point number for the foresight. This may be data collector dependent.

Warning for feature codes starting with the *foresight* control code if the *Allow point numbers as stations* flag is *not set* on the *Advanced* tab of the *Survey.4d Create/Edit* panel.

If the feature codes comes before the string number, then feature codes for ordinary measurements **can not** start with the foresight control code because they would be interpreted as foresight measurements and no measurement point would be created.

If the feature codes comes after the string number, then whenever a feature codes for ordinary measurements is used that starts with the check measurement control code, a string number (which may be zero for a point string) must be used otherwise the feature code will be interpreted as a foresight measurement.

If the *Allow point numbers as stations* flag is set on, then a point number used as a foresight will create a measurement point for that point number.



Check Measurement

The default for the *check measurement* control code is **CHK** and it is defined by the *Check measurement* field on the *Delimiters* tab of the *Survey.4d Create/Edit* panel.

The rest of the block after the *check measurement control code* is the name of the station that the

check measurement was to, or the point number that the check measurement was to.

For example, if *CHK* is the check measurement control code

CHKPSM3

would designate a check measurement to the station PSM3.

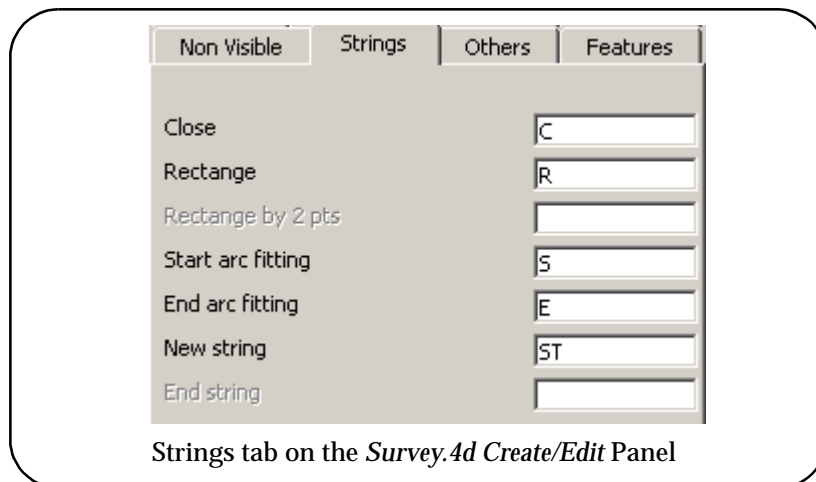
If only the check measurement control code exists, the point number from the reading is taken as the point number that the check measurement is made to. This may be data collector dependent.

Warning for feature codes starting with the *check measurement* control code.

If the feature codes comes before the string number, then feature codes for ordinary measurements **can not** start with the check measurement control code because they would be interpreted as check measurements and no measurement point would be created.

If the feature codes comes after the string number, then whenever a feature codes for ordinary measurements is used that starts with the check measurement control code, a string number (which may be zero for a point string) **must** be used otherwise the feature code will be interpreted as a check measurement and no measurement point would be created.

Control Codes on the Strings tab



Close String

The default for the *close string* control code is **C** and it is defined by the *Close* field on the *Strings* tab of the *Survey.4d Create/Edit* panel.

The *close string* control code closes the string that the measurement is a point of.

See the Section “Close String” for more information on closing a string.

Rectangle

The default for the *rectangle* control code is **R** and it is defined by the *Rectangle* field on the *Strings* tab of the *Survey.4d Create/Edit* panel.

The *rectangle* control code uses the current point and the previous two points in the same string (three points total) and creates a new point to form a parallelogram.

See the Section “Rectangle” for more information on forming a rectangle.

Rectangle by 2 Pts

A *rectangle_2* control code can be defined by the *Rectangle by 2 pts* field on the *Strings* tab of the *Survey.4d Create/Edit* panel.

The *rectangle_2* control code uses the current point, last point and an offset. The rectangle is

defined by two points (reference side) and a offset.

If a positive offset value is given, two points will be created to the right of the reference side.

If a negative offset value is given, two points will be created to the left of the reference side.

If no Description is given, the two new points will be joined to the given points in a closed rectangular string, and will have the same feature code as the points given.

If the feature code and string number exist, then a search is made for the last occurrence of two points with the same feature code and string number. If found, then these points are used to define the reference side of the rectangle.

If the point number exists, then a search is made for the last occurrence of two points with the same feature code and string number as the point given by the point number. If found, then these points are used to define the reference side of the rectangle.

Two consecutive rectangles are unable to be defined side by side. In other words if the two points given are part of string of greater than two vertices, the command will only work for sets of two points that are exclusively defined. i.e. For a 5 point string, a rectangle can be defined by points 1 and 2, and 4 and 5.

See the Section “Rectangle by 2 Points” for more information on forming a rectangle by 2 points.

Start Arc Fitting

The default for the *start arc fitting* control code is **S** and it is defined by the *Start arc fitting* field on the *Strings* tab of the *Survey.4d Create/Edit* panel.

The *start arc fitting* control code starts arc fitting with the current point.

See the Section “Arcs Through Points” for more information on arc fitting.

End Arc Fitting

The default for the *end arc fitting* control code is **E** and it is defined by the *End arc fitting* field on the *Strings* tab of the *Survey.4d Create/Edit* panel.

The *end arc fitting* control code ends arc fitting at the current point. That is, the current point is included in the arc fitting but it is the last point used in the arc fitting.

See the Section “Arcs Through Points” for more information on arc fitting.

New String

The default for the *new string* control code is **ST** and it is defined by the *New string* field on the *Strings* tab of the *Survey.4d Create/Edit* panel.

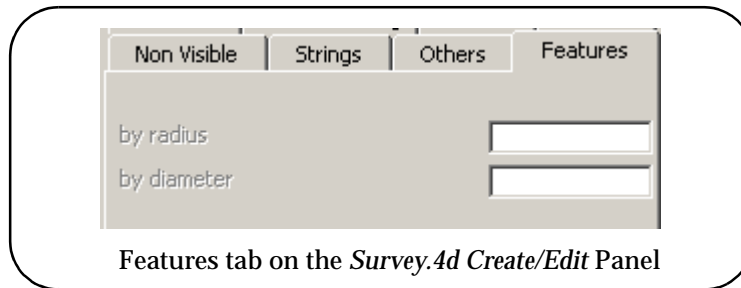
The *new string* control code starts a new string with the current point even if the feature code and string number haven't changed.

See the Section “Start New String” for more information on starting a new string.

End String

The *end string* control code ends the current string even if the feature code and string number haven't changed for the next point.

Control Codes on the Features tab



Feature by Radius

There is no default for the *feature by radius* control code. It is defined by the *by radius* field on the *Features* tab of the *Survey.4d Create/Edit* panel.

The *feature by radius* control code denotes that the feature has a given radius. For example, if RA was used then TRE*RA2 would denote a feature code TRE with a radius of 2 units.

See the Section “Feature” for more information on feature strings.

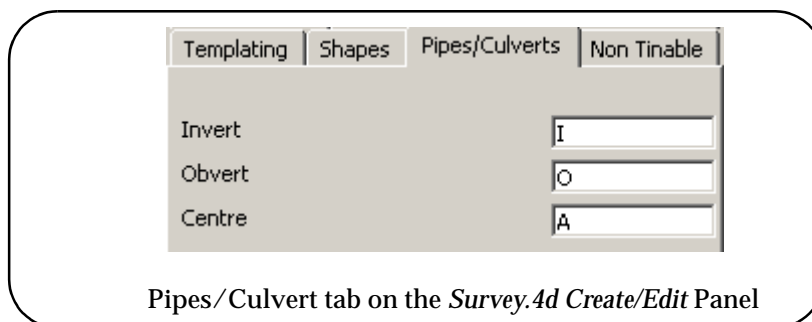
Feature by Diameter

There is no default for the *feature by diameter* control code. It is defined by the *by diameter* field on the *Features* tab of the *Survey.4d Create/Edit* panel.

The *feature by diameter* control code denotes that the feature has a given diameter. For example, if DI was used then TRE*DI2 would denote a feature code TRE with a diameter of 2 units.

See the Section “Feature” for more information on feature strings.

Control Codes on the Pipes/Culverts tab



Invert Point for Pipe or Culvert

The default for the *invert level* control code is I and it is defined by the *Invert* field on the *Pipe/Culverts* tab of the *Survey.4d Create/Edit* panel.

The *invert level* control code denotes that the point is an invert level (bottom).

The invert commands can also denote the diameter of a pipe or width and height of a culvert. For example, I.3 denotes the measurement was an invert level and it was a pipe of diameter 0.3 units. I.3x.4 denotes the measurement was an invert level and it was a box culvert of width 0.3 and height 0.4 units.

Obvert Point for Pipe or Culvert

The default for the *obvert level* control code is O and it is defined by the *Obvert* field on the *Pipe/Culverts* tab of the *Survey.4d Create/Edit* panel.

The *obvert level* control code denotes that point is an obvert level (top).

The obvert command can also define the diameter of a pipe or width and height of a culvert. For example, O.3 denotes the measurement was an invert level and it was a pipe of diameter 0.3 units. O.3x.4 denotes the measurement was an invert level and it was a box culvert of width 0.3 and height 0.4 units.

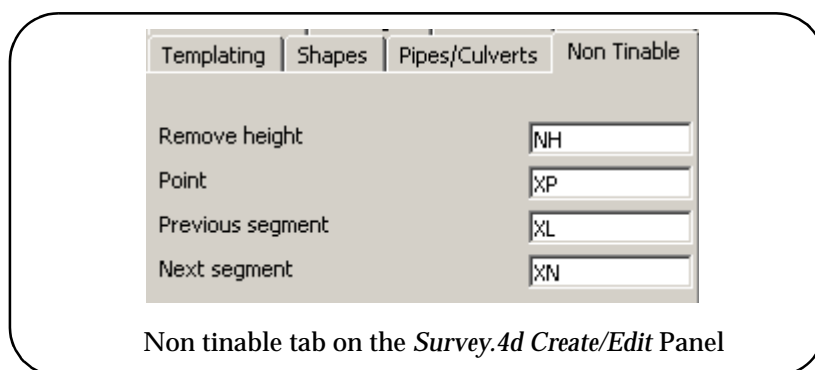
Centre Point for Pipe or Culvert

The default for the *centre level* control code is **A** and it is defined by the *Centre* field on the *Pipe/Culverts* tab of the *Survey.4d Create/Edit* panel.

The *centre level* control code denotes that point is an centre level (axial).

The centre command can also define the diameter of a pipe or width and height of a culvert. For example, A.3 denotes the measurement was an invert level and it was a pipe of diameter 0.3 units. A.3x.4 denotes the measurement was an invert level and it was a box culvert of width 0.3 and height 0.4 units.

Control Codes on the Non Tinable tab



Remove Height

The control code to set the height of the current point to null.

The default for the *remove height from point* control code is **NH** and it is defined by the *Remove height* field on the *Non-Tinable* tab of the *Survey.4d Create/Edit* panel.

Point

The default for the *make point non-tinable* control code is **XP** and it is defined by the *Point* field on the *Non-Tinable* tab of the *Survey.4d Create/Edit* panel.

The *make point non-tinable* control code makes the current point non-tinable. That is, the point is not used in tins (triangulations).

Previous Segment

The default for the *make previous segment non-tinable* control code is **XL** and it is defined by the *Previous segment* field on the *Non-Tinable* tab of the *Survey.4d Create/Edit* panel.

The *make previous segment non-tinable* control code makes the previous segment non-tinable. That is, the segment that the current point is the end of is non-tinable and hence not used as a breakline in tins (triangulations).

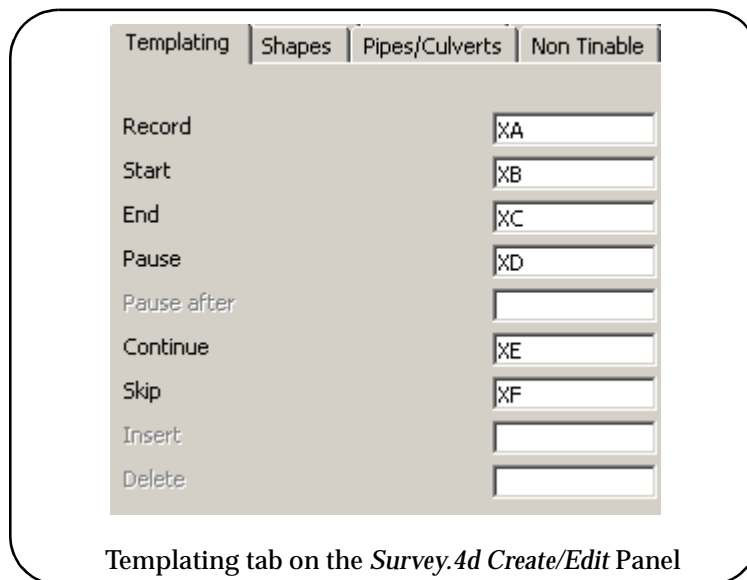
Next Segment

The default for the *make next segment non-tinable* control code is **XN** and it is defined by the *Next segment* field on the *Non-Tinable* tab of the *Survey.4d Create/Edit* panel.

The *make next segment non-tinable* control code makes the next segment point non-tinable. That is, the segment that the current point is the start of is non-tinable and hence not used as a breakline

in tins (triangulations).

Control Codes on the Templating tab



Record

The control code to denote that this is the first point of a new field template definition. The field template definition continues until the next *stop recording a field template* control code or a *start using a field template* control code.

If the field template is to have a name, then the *start recording* control code is followed by the *offset code* delimiter and then the name for the field template. If no name is given, then the field template defines the default field template.

For example, if *XA* starts recording for the default template, *XA.road* starts recording the field template called road

The default for the *start recording a field template* control code is **XA** and it is defined by the *Record* field on the *Templating* tab of the *Survey.4d Create/Edit* panel.

See the Section “Field Templates” for more information on field templates.

Start

The control code to denote that a field template is being used. This point takes the feature code and string number from the field template. If it is a named field template, then the control code is followed by the *offset code* delimiter and then the name of the field template.

The field template can also be used as a forward template, a reverse template or as a zig-zag template starting on either a zig or on a zag.

To denote using the field template as a forward template, add the *offset code* delimiter and *for*.

To denote using the field template as a reverse template, add the *offset code* delimiter and *rev*.

To denote zig-zag mode starting on a zig, add the *offset code* delimiter and *zig*.

To denote zig-zag mode starting on a zag, add the *offset code* delimiter and *zag*.

If anything other than ‘for’, ‘rev’ or ‘zag’ is given, the field template is used as a zig-zag template starting on a zig.

For example, if *XB* starts using the default template, *XB.road.zag* starts using the field template called road as a zig-zag field template starting on a zag.

The default for the *start using a template* control code is **XB** and it is defined by the *Start* field on

the *Templating* tab of the *Survey.4d Create/Edit* panel.

See the Section “Field Templates” for more information on field templates.

End

The control code to end the use of the current field template after the current point. That is, the current point uses the field template but subsequent measurements don't.

The default for the *stop using a template* control code is **XC** and it is defined by the *End* field on the *Templating* tab of the *Survey.4d Create/Edit* panel.

See the Section “Field Templates” for more information on field templates.

Pause

The control code to pause using the current field template. The current point does not use the field template.

The default for the *pause using a template* control code is **XD** and it is defined by the *Pause* field on the *Templating* tab of the *Survey.4d Create/Edit* panel.

See the Section “Field Templates” for more information on field templates.

Pause after

The control code to pause using the current field template and the current point does use the field template.

There is no default for the *pause after* control code and it is defined by the *Pause after* field on the *Templating* tab of the *Survey.4d Create/Edit* panel.

See the Section “Field Templates” for more information on field templates.

Continue

The control code to continue the use of a paused field template. The current point uses the field template.

The default for the *continuing using a field template* control code is **XE** and it is defined by the *Continue* field on the *Templating* tab of the *Survey.4d Create/Edit* panel.

See the Section “Field Templates” for more information on field templates.

Skip

The control code to skip point one or more points of the field template. The current point uses the next point *after* the skipped points from field template.

If more than one point is to be skipped then the control code is followed by the *offset code* delimiter and then number of points to be skipped.

For example, if *XF* is the skip points control code, *XF.2* skips two points. Note that just *XF* skips one point and the '.1' is not required.

The default for the *skipping field template points* control code is **XF** and it is defined by the *Skip* field on the *Templating* tab of the *Survey.4d Create/Edit* panel.

See the Section “Field Templates” for more information on field templates.

Insert

A default control code to insert a point in the field template can be added to this field. The point is inserted after the last point.

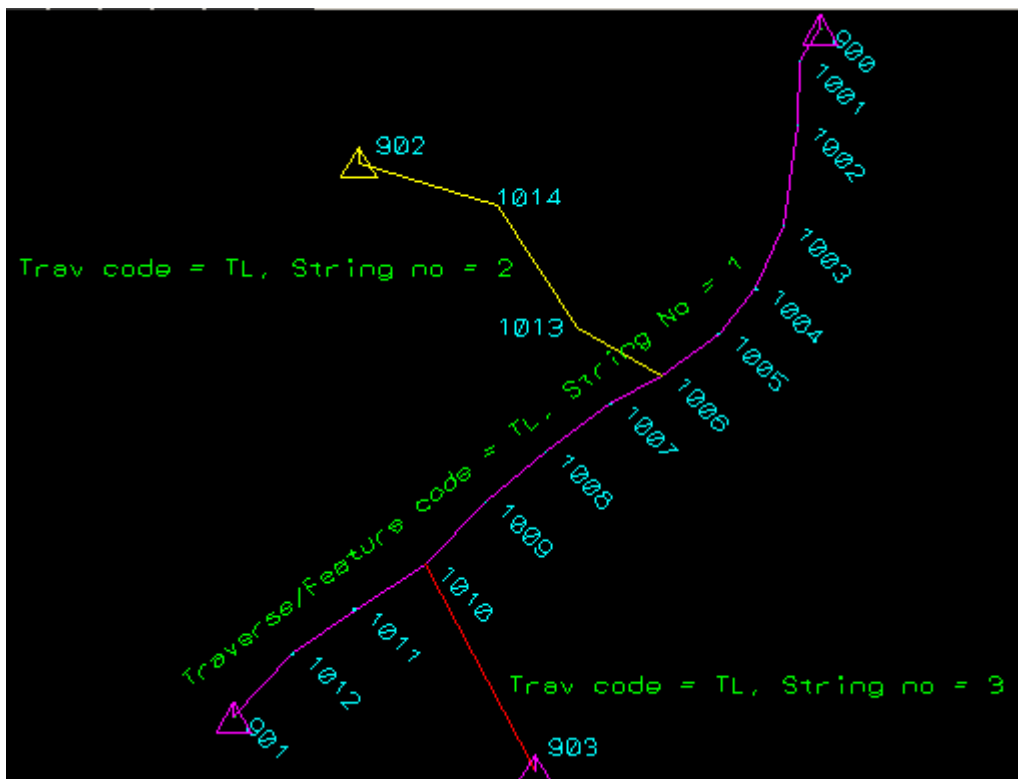
See the Section “Field Templates” for more information on field templates.

Delete

A default control code to delete a point in the field template can be added to this field. a number of points can be nominated for deletion.

See the Section “Field Templates” for more information on field templates.

Feature coding for traverse extraction (Non- Leica instruments)



In the example shown above, three distinct traverses were observed. The main traverse between stations 900 and 901 were given a feature code of TL and a string number of 1 (TL1). A typical observation description follows:

Setup on station 900. A foresight measurement was taken from 900 to 1001. A typical feature code may be:

TL1 FS1001. Where the block delimiter is a space(" ") breaking the feature code up into TL1 and FS1001. This tells the reduction that the observation was a traverse because it has a feature code of TL as specified in the traverse tab of the reduction panel. The foresight control code may be FS, telling the reduction that the observation is a foresight observation to a named point

Setup on station 1001. A backsight to station 900 was observed. A typical feature code may be:

TL1 BS900. Where BS is the backsight control code

A foresight to 1002 may be coded as:

TL1 FS1002.

And so forth.

The observation to station 1013 may be made at the same time as when observing to station 1007 from the setup station 1006. Simply changing the string number to 2 for the observation to 1013

will ensure that it is treated as a different traverse. i.e. TL2 FS1013.

The second traverse between stations 1006 and 902 were given a feature code of TL and a string number of 2 whilst the traverse between stations 1010 and 903 were given a feature code of TL and a string number of 3.

The feature code/ string number needs to be present for at least the foresight or measured leg of each of the traverse legs. If they are also present for the backsight, then foresight/backsight pairs will be grouped together and reciprocal calculations done for that leg.

Data Collector Definitions

Unfortunately, each brand of data collector has its own method of communicating with a computer and a software package.

To allow for a variety of data collectors, 12d Model lets the user create and edit data collector definitions which are simply user defined sets of data collector parameters stored under user specified names.

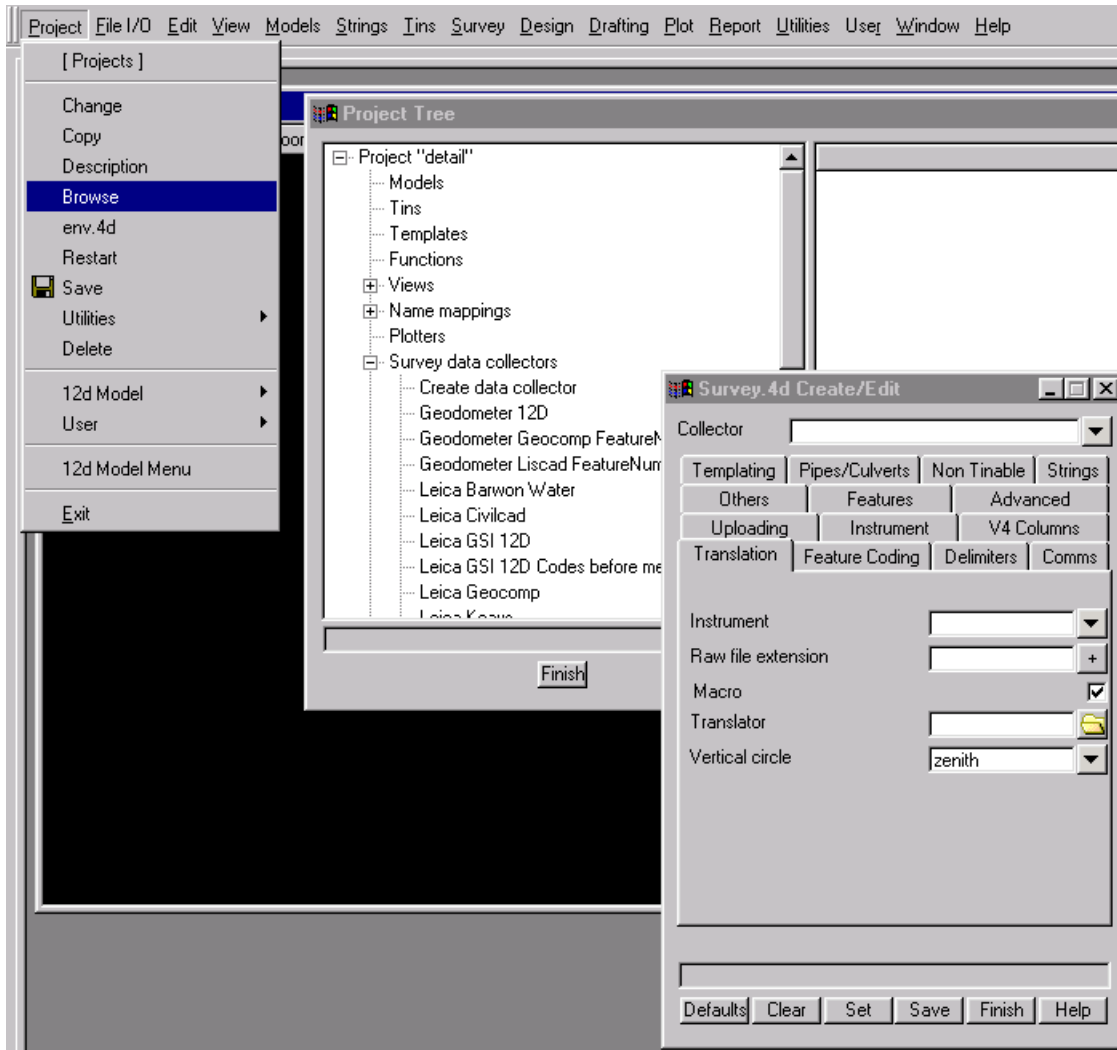
The set of data collector definitions are stored in a file but are created and edited using the 12d Model panel *Survey.4d Create/Edit*.

The *Survey.4d Create/Edit* panel is accessed via **Project => Browse**.

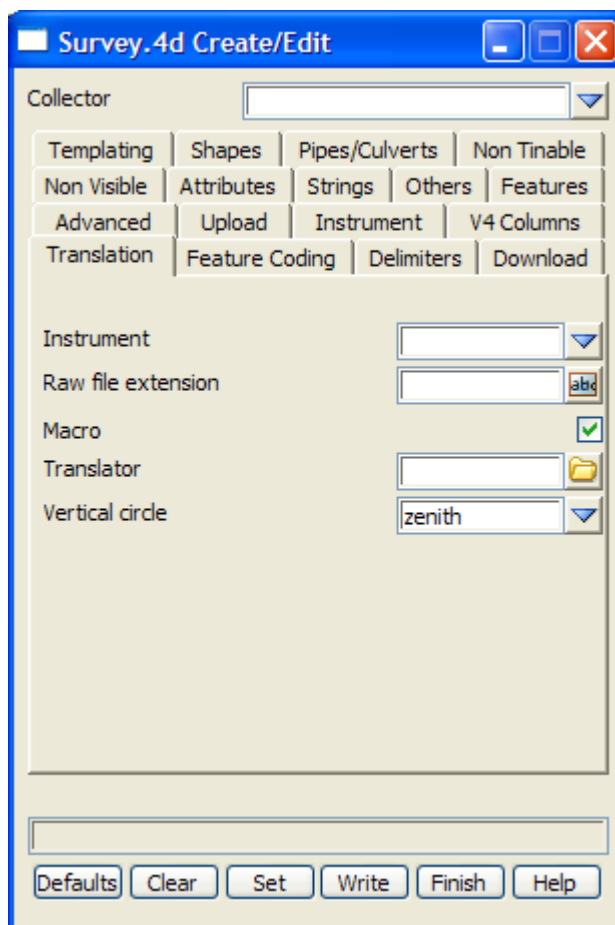
First select *Project => Browse* and then click on the + beside the Project name to expand the list of available information for the project. Then click on the + beside *Survey data collectors* to see the list of existing 12d data collector definitions.

Double click LB on *Create data collector* to create a new data collector definition, or double click LB on an existing data collector definition to examine and/or modify it.

The **Survey.4d Create/Edit** panel will then appear.



[survey_4d_create_edit](#)



The fields and buttons used in this panel have the following functions.

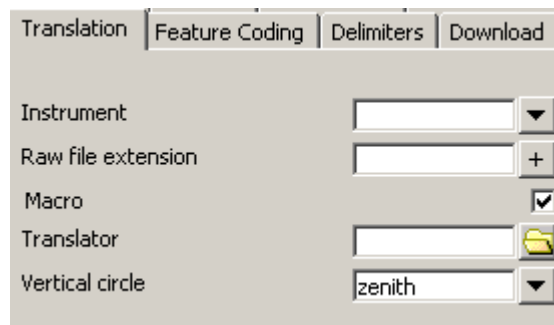
Field Description	Type	Defaults	Pop-Up
Collector <i>name of the data collector to create/edit.</i>	input		available data collectors
Defaults <i>set all the panel fields to default values.</i>	button		
Clear <i>clear the values in the panel fields in all the tabs.</i>	button		
Set <i>set the values in the panel fields for the given data collector for this session of 12d Model.</i> <i>WARNING - Set does not save the changes to the survey.4d file. To save the changes, click on the 'Save' button.</i>	button		
Save <i>store the data collector definitions to the survey.4d file.</i>	button		

For descriptions of each of the tabs on the panel, go to:

<i>Translation</i>	"Translation tab" .
<i>Feature coding</i>	"Feature Code tab" .
<i>Delimiters</i>	"Delimiters tab" .
<i>Download</i>	"Download tab" .
<i>Advanced</i>	"Advanced tab" .

<i>Upload</i>	“Upload tab” .
<i>Instrument</i>	“Instrument tab” .
<i>V4 Columns</i>	“V4 Columns tab” .
<i>Templating</i>	“Templating tab” .
<i>Shapes</i>	“Shapes tab” .
<i>Pipe/Culverts</i>	“Pipes/Culverts tab” .
<i>Non tinable</i>	“Non visible tab” .
<i>Non visible</i>	“Non visible tab” .
<i>Strings</i>	“Strings tab” .
<i>Others</i>	“Others tab” .
<i>Features</i>	“Features tab” .

Translation tab



Instrument input Geodimeter, Leica
 Nikon DR1, Nikon AP700, Sokkia 20/33
 Topcon GT700, Topcon FC5

type of data collector format.

Raw file extension input

file ending to use for the raw file when it is downloaded.

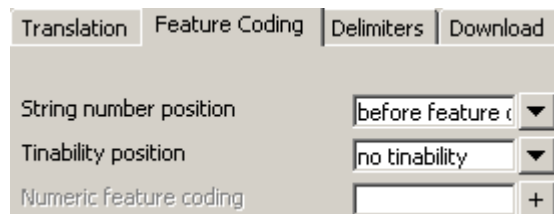
Macro tick box tick

*if tick, then the Translator pop-up list only shows 12d Model macros.
 If not ticked, then the Translator pop-up list only shows programs.*

Translator input list of translators in library
name of the macro/program to translate the raw survey file into the 12d field file format.

Vertical circle input zenith zenith, nadir
define the vertical circle zero.

Feature Code tab



String number position input before before feature code
 no string number
 after feature code

defines if the string number is before or after the feature code or is not used at all (no string number). When 'no string number' then the New string command is used to start new strings with the same feature code.

Tinability position	input	no tinability	before string no tinability after string
----------------------------	-------	---------------	--

defines the position or absence, of the tinability flag. This should only be used for compatibility with data coded for other systems such as CivilCAD. 12d has more flexible methods of defining tinability.

Numeric feature coding integer

if 'no string number' is given for String number position then Number feature coding is ignored.

If a number is given, then the feature code must be numeric and the given number is the length of the feature code (that is, the number of digits in the feature code).

If no number is given, then feature codes are alphabetical characters only except when a String code is used to separate the feature code and string number.

Delimiters tab

Translation	Feature Coding	Delimiters	Download
Command		*	
Comment		/	
Offset code		.	
String		+	
Backsight		BS	
Foresight			
Check measurement		CHK	
Extra coding		X	

Command	input	*
----------------	-------	---

defines the separator between the feature code/string number and op code commands. The delimiter characters can not be used in any other part of the command line.

Comment	input	/
----------------	-------	---

defines the separator for comments. Note that this can be a space.

Offset code	input	dot (.)
--------------------	-------	---------

defines the beginning of the offset code block. If the offset code block exists, it must come immediately after the Feature code/string number/tinability block. The offset code used R for radial, T for tangential, H for height.

String	input	+
---------------	-------	---

separates the feature code from the string number. Used when the feature code includes numbers. For example 110KVA+20 would be a feature code of 110KVA and a string number of 20.

Backsight	input	BS
------------------	-------	----

if the feature code is this control code then the measurement is to a backsight and not a point.

Foresight	input	
------------------	-------	--

if the feature code is this control code then the measurement is to a foresight and not a point.

Check measurement	input	CHK
--------------------------	-------	-----

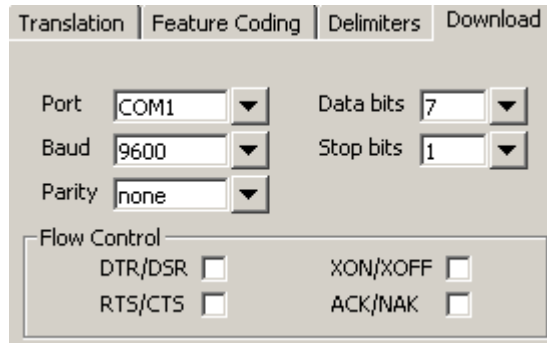
if the feature code is this control code then the measurement is a check measurement and not a point.

Extra coding	input	X
---------------------	-------	---

denotes that the information following is appended to the previous information for the measurement. This allows extra coding than may be allowed for on the measurement line. Mainly for Sokkia using the note (13NM) to add more information to the previous measurement line (07).

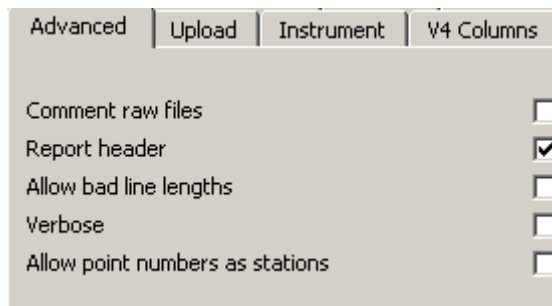
A feature code block must be on the measurement line or a measurement with no name will be created. Also a command block can't be split between two lines.

Download tab



Port	input	COM1	COM1 to COM4
	<i>port on the computer to use to communicate with the data collector for downloads.</i>		
Baud rate	input	9600	110, 300 ... 256000
	<i>baud rate to use for the computer port.</i>		
Data bits	input	7	5, 6, 7, 8
	<i>number of data bits to use.</i>		
Stop bits	input	1	0, 1, 1.5, 2
	<i>number of stop bits to use.</i>		
Parity	input	none	none, even, odd, mark, space
	<i>parity to use.</i>		
DTR/DSR, RTS/CTS, XON/XOFF, ACK/NAK	tick boxes		
	<i>flow control settings.</i>		

Advanced tab



Comment raw files	tick box
	<i>if tick, include the data from the raw survey file as comments in the 12d field file.</i>
Report header	tick box
	<i>if tick, include some header information as comments in the 12d field file.</i>
Allow bad line lengths	tick box

if tick, ignore the fact that the length of the line from the data collector is incorrect. This may lead to other errors so it should be used sparingly.

Verbose tick box

if tick, then extra information may be written to the Output window.

Allow point numbers as stations tick box

if tick, the point numbers for previous measurements can be used as stations for instrument setups, backsights, foresights and check measurements.

Note

When 12d Model starts up, it checks to see if an environment variable called DATA_COLLECTORS_4D exists and if it does, then the file it points to is used to provide the definitions for the data collectors.

If the environment variable is not set, then 12d Model searches for a file called **survey.4d** (this was **data_collectors_definitions** in V3.0) in the standard 12d Model search sequence for set up files.

Upload tab

Port	input	COM1	COM1 to COM4
			<i>port on the computer to use to communicate with the data collector for uploads.</i>
Baud rate	input	9600	110, 300 ... 256000
			<i>baud rate to use for the computer port.</i>
Data bits	input	7	5, 6, 7, 8
			<i>number of data bits to use.</i>
Stop bits	input	1	0, 1, 1.5, 2
			<i>number of stop bits to use.</i>
Parity	input	none	none, even, odd, mark, space
			<i>parity to use.</i>
DTR/DSR, RTS/CTS, XON/XOFF, ACK/NAK	tick boxes		
			<i>flow control settings.</i>
Extension	input		

ending of the file that will be uploaded. For example, typing in **sdr** means the file to upload ends in ".sdr"

CR/LF ? input cr, lf, crlf, lfcrlf, none
end of line characters - characters needed by the data recorder to denote the end of a line of data being uploaded to the data recorder.

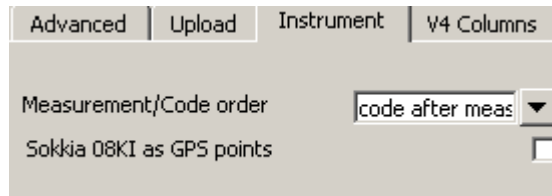
Delay 1 input
the time between sending lines of data to the data recorder.

Process input
for some data recorders after a data line is sent, a text string needs to be sent to the data recorder to make it process the data line (e.g. GRE3 used a P).

Delay 2 input
the time between sending the process string and sending the next data line.

Ignore comms errors tick box
if tick, ignore any communication errors whilst uploading to the data recorder.

Instrument tab



Measurement/code order input after measurement code before measurement code after measurement

For Leica only where the feature code/string number record is separate to the measurement record. For all other data recorders the feature code block is in the same record as the measurement.

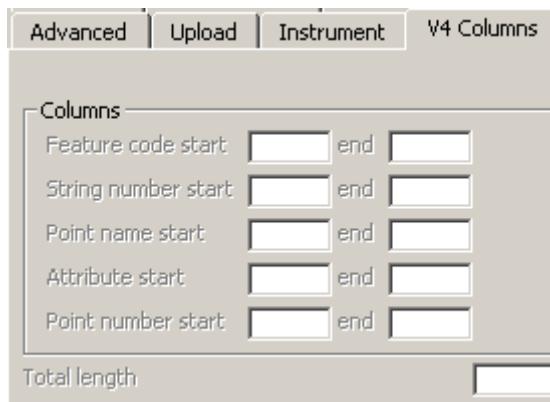
If 'code before measurement', then the feature code/ string number record for a measurement is entered before taking the measurement.

If 'code after measurement', then the feature code/ string number record for a measurement is entered after taking the measurement.

Sokkia 08KI as GPS points tick box

if tick, when converting reading an Sokkia SDR file, the "08KI" records are treated as points and no directly entered station co-ordinates.

V4 Columns tab



The V4 columns tab is for compatibility with 12d Model V4 field files which were of fixed column widths.

Feature code start/end input 1/6

the start and end column position for the feature code in the field file record.

String number start/end input 7/9

the start and end column position for the string number in the field file record.

Point name/Attribute/Point number start/endinput 22/30, 10/16, 17/20

the start and end column position for the point name/Attribute/Point number in the field file record.

Total length input

the total length of line expected.

Templating tab

Templating	Shapes	Pipes/Culverts	Non Tinable
Record			XA
Start			XB
End			XC
Pause			XD
Pause after			XDD
Continue			XE
Skip			XF
Insert			XI
Delete			XQ

Record input XA text

characters to denote the start of recording a field template. For example XA starts recording for the default template, XA.road starts recording the field template called road.

Start input XB text

characters to denote the start of using a field template. For example XB starts using the blank field template, XB.road starts using the field template called 'road'. XB.road.zig starts using 'road' a zig-zag field template and begins as a zag.

End input XC text

characters to denote stop using the current field template.

Pause input XD text

characters to denote temporarily stop using the current field template to take other measurements. The current point does not use the field template.

Pause after input XD text

characters to denote temporarily stop using the current field template to take other measurements. The current point does use the field template.

Continue input XE text

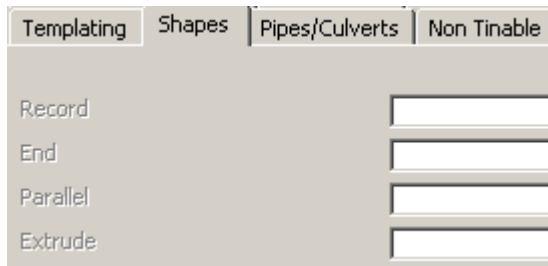
characters to denote continuing to use the current field template after a pause.

Skip input XF text
characters to denote that template points are to be skipped. For example XF means skip one field template point, XF.3 means skip three field template points.

Insert input XI text
characters to denote that template points are to be inserted. For example XI.FE01 means insert a template point of FE01 into the template after the last measured template point

Delete input XQ text
characters to denote that template points are to be deleted. For example XQ.3 means delete the next 3 pts from the template after the last measured template point

Shapes tab



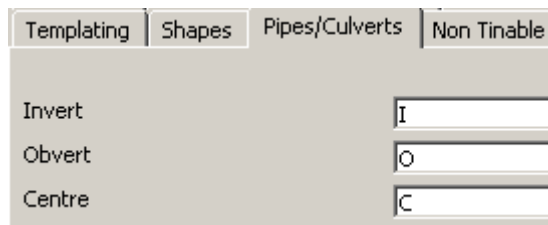
Record input text
characters to denote the start of recording a shape. For example if RS was used, the code RS starts recording for the default shape, RS.shape_name defines the recording of a shape of name shape_name.

End input text
characters to denote stop using the current shape.

Parallel input text
*characters to denote the application of a shape by parallelling to the shape reference string. The code may be LK01*PS.shape_name
 Where the Parallel command is PS, the shape reference string is LK01 and the shape name = shape_name.*

Extrude input text
*characters to denote the application of a shape by extrusion to the shape reference string. The code may be LK01*ES.shape_name
 Where the Extrusion command is ES, the shape reference string is LK01 and the shape name = shape_name.*

Pipes/Culverts tab



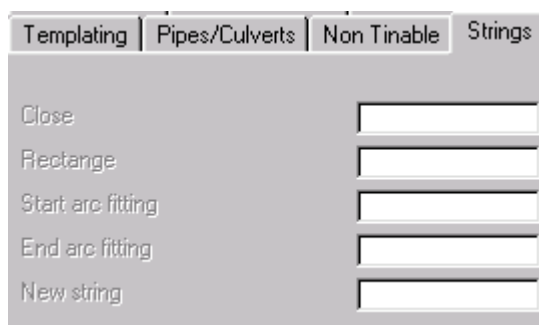
Invert input I text
characters to denote that the measurement was the an invert level.

Obvert input O text
characters to denote that the measurement was the an obvert level.

Centre input C text
characters to denote that the measurement was the a centreline level.

Note that these commands can also denote the diameter of a pipe or width and height of a culvert. For example, I.3 denotes the measurement was an invert level and it was a pipe of diameter 0.3 units. I.3x.4 denotes the measurement was an invert level and it was a box culvert of width 0.3 and height 0.4 units.

Strings tab



Close input C text
characters to denote that the string is closed. That is the current measurement is joined to the first point of the string.

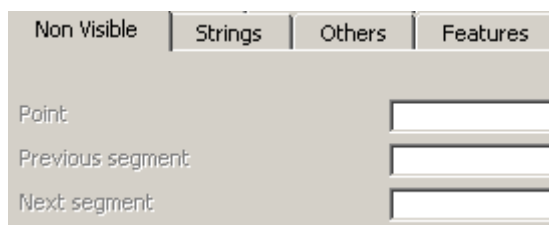
Rectangle input R text
characters to denote that the string is a rectangle. That is the current measurement and the previous two points of the string are three points of a parallelogram and the fourth point is automatically created (and given a null height).

Start arc fitting input S text
characters to denote the start of arc fitting.

End arc fitting input E text
characters to denote the end of arc fitting.

New string input ST text
characters to denote the that the current measurement is the start of a new string, even if the string number has not changed.

Non visible tab

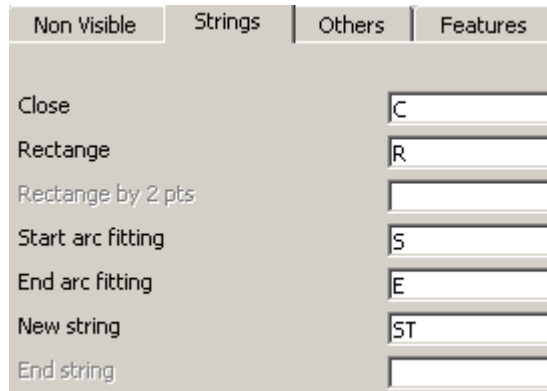


Point input text
characters to denote that the measurement is a non-visible point. That is, the point is not visible and is not included in a triangulation.

Previous segment input text
characters to denote that the measurement is the end of a non-visible segment. That is, the previous segment is not used as a breakline in a triangulation and it is not visible.

Next segment input text
characters to denote that the measurement is the start of a non-visible segment. That is, the next segment is not used as a breakline in a triangulation and is not visible.

Strings tab



Close input C text
characters to denote that the string is closed. That is the current measurement is joined to the first point of the string.

Rectangle input R text
characters to denote that the string is a rectangle. That is the current measurement and the previous two points of the string are three points of a parallelogram and the fourth point is automatically created (and given a null height).

Rectangle by 2 pts input text
characters to denote that the string is a rectangle. That is the previous two points of the string define one side and a offset defines the opposite side. Positive being to the right. The created points are given null height.

Start arc fitting input S text
characters to denote the start of arc fitting.

End arc fitting input E text
characters to denote the end of arc fitting.

New string input ST text
characters to denote the that the current measurement is the start of a new string, even if the string number has not changed.

End string input text
characters to denote the that the current measurement is at the end of a string, even if the string number has not changed on the next measurement.

Others tab

Under development

Features tab

Non Visible	Strings	Others	Features
	by radius		<input type="text"/>
	by diameter		<input type="text"/>

By radius input text

*characters to denote that the feature has a given radius. For example, if RA was used then TRE*RA2 would denote a feature code TRE with a radius of 2 units.*

There can be more than one set of characters that define 'By radius'. The sets are entered into the By radius field separated by a space. For example

RA RAD RD

would specify that RA and RAD and RD can be used to denote that the feature is defined by radius.

By diameter input text

*characters to denote that the feature has a given diameter. For example, if DI was used then TRE*DI2 would denote a feature code TRE with a diameter of 2 units.*

There can be more than one set of characters that define 'By diameter'. The sets are entered into the By diameter field separated by a space. For example

DI DIA DR

would specify that DI and DIA and DR can be used to denote that the feature is defined by diameter.

The 12d Field File Format

The detailed definition of the standardised 12d Field File will now be given. This is the file that all raw files are converted to before reduction in 12d Model.

A few definitions will be given, followed by the complete description of the 12d Field File.

The raw data files from different data collectors are all converted to the 12d field file format.

The 12d field file is ascii and has a name ending in **.fld**

Each line in the 12d field file is called a record and consists of an **operation code** (or *op code* for short) followed by zero or more tabs and pieces of information.

(a) zero fields

What actually follows the fixed header depends on the *op code*.

Hence the 12d field file record is:

op code
99

or

op code	tab	value	...	tab	value
02		abcS			fred

A number of conventions and definitions will be now given, followed by the complete description of the 12d Field File.

Important Note

Op codes are not the same as field codes. *Field codes* are entered by the surveyor in the field and may lead to one or more op codes being created in the 12d field file.

Please continue to the next section "Point Description" .

Point Description

The *feature codes* and *string numbers* are entered by the surveyor whilst surveying in the field and the *point numbers* are usually automatically created by the surveying instrument but may sometimes be entered into the instrument by the surveyor.

Other information can also be entered by the surveyor using **field codes** and associated information. How each field code and associated information is entered in the field *depends on the data recorder* and the *coding convention* being used. This is set up in the *Data Collector definitions* in 12d Model.

The data file from the instrument or data collector (raw file) is first converted in 12d Model to the 12d field file ready for loading into a 12d Model Survey Reduction function for reduction.

In most lines of the **12d field file**, a *feature code*, *string number*, *point number*, *point name* and *point text* are given and are stored next to each other separated by tabs.

The **feature code** and **string number** have already been described.

The **point number** is the EDM tacheometry measurement point number which is not normally entered by the user but is written in the raw data file by the data collector. This is stored as the point number for the vertex of the super string.

The **point name** is used to store the name of a station (see the next section on *named measurements*) and is supplied by the user with certain op codes. It is also used by some op codes that do not require an actual point name but have other special information that needs to be stored.

The **point text** is stored as vertex text for that vertex of the super string.

In the 12d field file, the *feature code*, *string number*, *point number*, *point name* and *point text* are given in this order and are separated by tabs. Each can be up to sixty-three characters in length. If the item is missing then a tab is still needed so there may be two or more sequential tabs.

For simplicity in describing the **12d field file**, the feature code, string number, point number, point name and point text are grouped together and called the **point description**.

Hence the **point description** consists of the following pieces of information separated by tabs:

- ▲ feature code (string name)
- ▲ string number
- ▲ point number
- ▲ point name
- ▲ point text

So it is convenient to think of the *point description* record as five columns of information:

feature code	string number	point number	point name	text
abc	01	1002	STN 4	freddie

Please continue to the next section “Measurements and Named Measurements” .

Measurements and Named Measurements

The **12d** field file allows five types of measurements that create points (vertices) in super strings. They are

- (a) directly entered co-ordinates measurement
- (b) EDM measurement (HA,VA,SD, + point_description.)
- (c) EDM measurement VD (HA,HD,VD + point_description.)
- (d) EDM measurement HT (HA,HD,HT, + point_description.)
- (e) three hair stadia measurement

Each type of measurement creates a new point which is appended to the previous points with the same *feature code* and *string number*.

The last such measurement is referred to as the *current measurement point* or *current point* and the string it is appended to is the *current string*.

If a *point_name* exists in the *point_description* for any of the three types of measurements, then it is called a **named measurement** and a one point super string of name *point_name* is created and mapped using the mapping file. The vertex text for the one point super string is the station prefix followed by *point_name*. The *point_name* is added to an internal list of named points for searching for co-ordinates.

Please continue to the next section “Existing Station Co-ordinates” .

Existing Station Co-ordinates

When setting up a new instrument, measuring to a backsight, doing a check measurement or manually entering a bearing to use as the bearing datum difference, the *point_name* or point number from the *point_description* is used to specify a point. The (x,y,z) co-ordinates for *point_name* are found by searching in the following order:

The difference between *point names* and *point numbers* is that *point names* are usually given by the user and should be a unique identifier for a point whilst for that same physical point a number of measurements (and hence point numbers) may be assigned (usually by the data collector). This may be particularly true of control station measurements where measurements are made to a given point name but each measurement is given a different point number by the data collector.

In most instances, a measurement to a point has a point number (from the data collector) and 12d automatically gives it the same point name as it is rare to measure a non-control point more than once (the point name can be over ridden by the user).

The names allow the reduction routine to search for the details of that point (e.g. coordinates) to allow for the reduction of further measurements. The order in which this searching takes place is as follows:

First search the Control model (if it exists):

1. A search is made of the control model for a string whose name is the same as the specified *point name*. If a string is found, the first point of the string is used for the (x,y,z) co-ordinates.
2. A search is made of the control model for a vertex of a string whose point number is the same as the specified *point name*. If a vertex is found its (x,y,z) co-ordinates are used.
3. If only a *point number* was specified, a search is made of the control model for a vertex of a string whose point number is the same as the specified *point number*. If a vertex is found its (x,y,z) co-ordinates are used.

Next search the already entered directly entered co-ordinates (DEC) in the field file:

4. A search is made of previously entered directly entered co-ordinates in the field file for a directly entered co-ordinate whose *point name* is the same as the specified *point name*. If a DEC is found, its (x,y,z) co-ordinates are used.
5. A search is made of previously entered directly entered co-ordinates in the field file for a directly entered co-ordinate whose *point number* is the same as the specified *point name*. If a DEC is found, its (x,y,z) co-ordinates are used.
6. A search is made of previously entered directly entered co-ordinates in the field file for a directly entered co-ordinate whose *point number* is the same as the specified *point number*. If a DEC is found, its (x,y,z) co-ordinates are used.

Next search the previous measurements in the field file:

7. A search is made of previous measurements in the field file for a measurement whose *point name* is the same as the specified *point name*. If a measurement is found, its (x,y,z) co-ordinates are used.
8. A search is made of previous measurements in the field file for a measurement whose *point number* is the same as the specified *point name*. If a measurement is found, its (x,y,z) co-ordinates are used.
9. A search is made of previous measurements in the field file for a measurement whose *point number* is the same as the specified *point number*. If a measurement is found, its (x,y,z) co-ordinates are used.
10. or finally, the user is asked to type in the (x,y,z) co-ordinates in a **Survey Data Define Station** panel. If a model is specified in the Add to model field of the panel, then a new one point super string is created with the name *point_name*, and as the vertex text for the point, the Station label prefix field value followed by *point_name*.

For a summary of the 12d Field File Op Codes, go to the section "Summary of 12d Field File Op Codes"

For the full description of the 12d Field File Op Codes, go to the section “Full Description of 12d Field File Op Codes”

Full Description of 12d Field File Op Codes

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The record for each *op code* allowed in the 12d field file will now be described in detail.

For each *op code* record, two lines and a paragraph of description are given:

- ▲ The first line consists of the *op code* and a short description of the purpose of the code.
- ▲ The second line gives the full syntax of the record for that *op code*.
- ▲ The paragraph gives a detailed description of the *op code* record.

Optional information is enclosed in the square brackets []

All **angles** in the 12d field file are given in **decimal** degrees.

Important Note

Op codes are not the same as field codes. *Field codes* are entered by the surveyor in the field and may lead to one or more op codes being created in the 12d field file.

Op Code	Description of Record
1	<p>Four 10 character information blocks <i>01 block1 block2 block3 block4</i></p> <p>This information is ignored.</p>
2	<p>Directly entered coordinate measurement <i>02 Point_description X Y Z</i></p> <p>A <i>measurement</i> point is created with the <i>feature code</i> and <i>string number</i> from the <i>point_description</i> and given (x, y,z) co-ordinates. No reduction is needed.</p> <p>The <i>point_number</i> and <i>text</i> from the <i>point_description</i> are recorded as the point number and text for that vertex of the super string.</p> <p>If a <i>point_name</i> exists in the <i>point_description</i>, then it is a named measurement and a 4d point string of name <i>point_name</i> is created and mapped using the mapping file. The 4d text is the station prefix followed by <i>point_name</i>. The <i>point_name</i> is added to the internal list of named points for searching for co-ordinates.</p>
3	<p>New instrument point <i>03 Point_description instrument_height</i></p> <p>Setting up an instrument at the point with name given in the <i>point_name</i> section of the <i>point_description</i>. The (x,y,z) co-ordinates for <i>point_name</i> are found by first searching the control model, then the list of previously named point in the reduction, point numbers of previous measurements and finally if <i>point_name</i> is still not found, the user is asked to type in the (x,y,z) co-ordinates. A record is written to the report file.</p>
4	<p>Measurement to backsight <i>04 Point_description horizontal_circle vertical_circle slope_distance azimuth</i></p> <p>Measurement to a backsight whose name is given in the <i>point_name</i> section of the <i>point_description</i>. If the <i>Display panel for backsights</i> field in the Survey Data Reduce panel is tick, then the Survey Data Bearing Datum Difference panel shows the <i>bearing datum difference</i> and the <i>horizontal distance</i></p>

difference. A record is written to the report file. The units for *horizontal_circle* and *vertical_circle* are decimal degrees. The azimuth may be specified where no coordinate for the backsight point exists in decimal degrees.

5 New target height

05 *Target_height*

Set a new target height.

6 Check measurement

06 *Point_description horizontal_circle vertical_circle slope_distance*

A check measurement is made to the station given in the *point_name* section of the *point_description*. A two point super string (with name *point_name*) from the instrument point to the measured point is created in the default model for the check measurement. The instrument point name, the station name and the differences between the measurement point co-ordinates and the station co-ordinates are written as text along the super string. The differences between the measurement and the known point is also written to the report file. The units for *horizontal_circle* and *vertical_circle* are decimal degrees.

7 Measurement - HA, VA, SD

07 *Point_description horizontal_circle vertical_circle slope_distance*

Measurement made by the instrument. A *measurement* point is created with the *feature code* and *string number* from the *point_description*. The units for *horizontal_circle* and *vertical_circle* are decimal degrees.

The *point_number* and *text* from the *point_description* are recorded as the point number and text for that vertex of the super string.

If a *point_name* exists in the *point_description*, then it is a **named measurement** and a 4d point string of name *point_name* is created and mapped using the mapping file. The 4d text is the station prefix followed by *point_name*. The *point_name* is added to the internal list of named points for searching for co-ordinates.

9 Scale factor for subsequent distances

09 *Scale_factor*

Scale factor to apply to subsequent slope distances.

10 Three hair stadia measurement

10 *Point_description horizontal_circle vertical_circle bottom middle top*

Manual measurement. A *measurement* point is created with the *feature code* and *string number* from the *point_description*. The units for *horizontal_circle* and *vertical_circle* are decimal degrees.

The *point_number* and *text* from the *point_description* are recorded as the point number and text for that vertex of the super string.

If a *point_name* exists in the *point_description*, then it is a **named measurement** and a 4d point string of name *point_name* is created and mapped using the mapping file. The 4d text is the station prefix followed by *point_name*. The *point_name* is added to the internal list of named points for searching for co-ordinates.

11 Measurement - HA, HD, Height

11 *Point_description horizontal_circle horizontal_distance height*

Measurement made by the instrument. A *measurement* point is created with the *feature code* and *string number* from the *point_description*. The unit for *horizontal_circle* is decimal degrees.

The *point_number* and *text* from the *point_description* are recorded as the point number and text for that vertex of the super string.

If a *point_name* exists in the *point_description*, then it is a **named measurement** and a 4d point string of name *point_name* is created and mapped using the mapping file. The 4d text is the station prefix

followed by *point_name*. The *point_name* is added to the internal list of named points for searching for co-ordinates.

12 Measurement - HA, HD, Height difference

11 *Point_description horizontal_circle horizontal_distance height_difference*

Measurement made by the instrument. A *measurement* point is created with the *feature code* and *string number* from the *point_description*. The unit for *horizontal_circle* is decimal degrees.

The *point_number* and *text* from the *point_description* are recorded as the point number and text for that vertex of the super string.

If a *point_name* exists in the *point_description*, then it is a **named measurement** and a 4d point string of name *point_name* is created and mapped using the mapping file. The 4d text is the station prefix followed by *point_name*. The *point_name* is added to the internal list of named points for searching for co-ordinates.

15 Vertical circle correction

09 *Vertical_circle_in_decimal_degrees*

The *vertical_circle_in_decimal_degrees* is **subtracted** from the vertical circle value in any measurements. The units for *vertical_circle_in_decimal_degrees* is decimal degrees.

16 Multiply coded point

16 *Point_description*

Additional coding for the current measurement point created by op codes 02, 07 or 10. A new measurement point is created at the same position as the current measurement point but with the *feature code* and *string number* from the *point_description* for this op code.

The *point_number* and *text* from the *point_description* are recorded as the point number and text for that vertex of the super string.

If a *point_name* exists in the *point_description*, then it is a **named measurement** and a 4d point string of name *point_name* is created and mapped using the mapping file. The 4d text is the station prefix followed by *point_name*. The *point_name* is added to the internal list of named points for searching for co-ordinates.

17 Arc through previous three points

17 [*Point_description*]

If no *point_description* is given, then the current measurement point and the two previous points with the same *feature code* and *string number* as the current measurement point, are joined by an arc. If there is less than three such points, no arc is fitted.

If a *point_description* exists, then either the *feature code* and *string number* or the *point number* section of the *point_description* can be used.

If the *feature code* and *string number* from the *point_description* exist, the last three previous measurement points of the same *feature code* and *string number* are joined by an arc. If the current measurement point has that *feature code* and *string number*, then it is the third of the three points used. If there is less than three points, no arc is fitted.

If *Point_number* exists, then the *feature code* and *string number* are taken from the previous measurement point **with** that point number. That point and the two measurement points previous to the predefined point of the same *feature code* and *string number*, are joined by an arc. If there is less than three points, no arc is fitted

18 Circle Feature

18 *Radius*

Creates a feature string with the given radius and centred on the current measurement point.

20 Close string*20 [Point_description]*

If no *point_description* is given, the current string is closed.

If a *point_description* exists, then either the *feature code* and *string number* or the *point number* section of the *point_description* can be used.

If the *feature code* and *string number* from the *point_description* exist, the last previous string with that *feature code* and *string number* is closed.

If the *point number* from the *point_description* exists, then the string containing that point number will be closed.

21 Join last points of strings*21 Feature_code string_number_1 string_number_2*

In the final reduction, the last point of the string with the given *feature_code* and *string_number_1* is joined to the last point of the string with given *feature_code* and *string_number_2*. The created string has the given *feature_code* (no string number is needed since it is the final phase of reduction when the string numbers are dropped).

22 Join first to last point of strings*22 Feature_code string_number_1 string_number_2*

In the final reduction, the first point of the string with the given *feature_code* and *string_number_1* is joined to the last point of the string with given *feature_code* and *string_number_2*. The created string has the given *feature_code* (no string number is needed since it is the final phase of reduction when the string numbers are dropped).

23 Join first points of strings*23 Feature code string number_1 string number_2*

In the final reduction, the first point of the string with the given *feature code* and *string number 1* is joined to the first point of the string with given *feature code* and *string number 2*. The created string has the given *feature code* (no string number is needed since it is the final reduction when the string numbers are then dropped).

28 Add text to the string name*28 [Point_description] Text*

Text is appended to the string name. For example, if 1.200 is entered, "1.200" is appended to the string name.

If no *point_description* is given, *Text* is appended to the string name of the current string.

If a *point_description* exists, then either the *feature code* and *string number* or the *point number* section of the *point_description* can be used.

If the *feature code* and *string number* exist, then the last previous string with that *feature code* and *string number* has *Text* appended to the string name.

If the *point number* exists, then the string containing that point number has *Text* appended to the string name.

29 Note or memo*29 Comments*

Any text may be entered and will be added to the check measurements model at the position of the current measurement point.

30 Remove height from a point - that is make it a null height*30 [Point_description]*

If no *point_description* is given, the height of the current measurement point is set to null.

If a *point_description* exists, then either the *feature code* and *string number* or the *point number* section of the *point_description* can be used.

If the *feature code* and *string number* exist, then the height of the last point of the previous string with that *feature code* and *string number* is set to null.

If the *point number* exists, then the height of the point with that point number is set to null.

37 **Rectangle by two points**

37 [*Point_description*] *offset_in_metres*

The rectangle is defined by two points (reference side) and a offset.

If a positive offset value is given, two points will be created to the right of the reference side.

If a negative offset value is given, two points will be created to the left of the reference side.

If no *point_description* is given, the two new points will be joined to the given points in a closed rectangular string, and will have the same feature code as the points given.

If the *feature code* and *string number* exist, then a search is made for the last occurrence of two points with the same *feature code* and *string number*. If found, then these points are used to define the reference side of the rectangle.

If the *point number* exists, then a search is made for the last occurrence of two points with the same *feature code* and *string number* as the point given by the point number. If found, then these points are used to define the reference side of the rectangle.

Two consecutive rectangles are unable to be defined side by side. In other words if the two points given are part of string of greater than two vertices, the command will only work for sets of two points that are exclusively defined. i.e. For a 5 point string, a rectangle can be defined by points 1 and 2, and 4 and 5.

38 **Make the previous segment non-tinable**

38 [*Point_description*]

If no *point_description* is given, the previous segment containing the current measurement point is set to non-tinable. That is, it will not be treated as a breakline in triangulations.

If a *point_description* exists, then either the *feature code* and *string number* or the *point number* section of the *point_description* can be used.

If the *feature code* and *string number* exist, then the last segment of the previous string with that *feature code* and *string number* is set to non-tinable.

If the *point number* exists, then the segment containing the point with that point number as an end point, is set to non-tinable.

39 **Make the next segment non-tinable**

39 [*Point_description*]

If no *point_description* is given, the next segment containing the current measurement point as a starting point is set to non-tinable. That is, it will not be treated as a breakline in triangulations.

If a *point_description* exists, then either the *feature code* and *string number* or the *point number* section of the *point_description* can be used.

If the *feature code* and *string number* exist, then the segment that is created in the future from the last point of the previous string with that *feature code* and *string number* is set to non-tinable.

If the *point number* exists, then the segment containing the point with that point number as a start point, is set to non-tinable.

40 **Make a point non-tinable**

40 [*Point_description*]

If no *point_description* is given, the current measurement point is set to non-tinable. That is, it will not

be included in triangulations.

If a *point_description* exists, then either the *feature code* and *string number* or the *point number* section of the *point_description* can be used.

If the *feature code* and *string number* exist, then the last point of the previous string with that *feature code* and *string number* is set to non-tinable.

If the *point number* exists, then the point with that point number is set to non-tinable.

41 Add additional text for the current measurement point

41 Text

The given *text* is added to the end of any existing text for the current measurement point. Any spaces from column four onwards will be part of the text.

42 Add a radial offset

42 [*Point_description*] *Radial_offset_in_metres*

The *radial_offset_in_metres* is used to adjust the position of the specified point by a plan distance from the specified points original position, along the plan line joining the current station to the specified point. A positive offset is away from the station, negative is toward the station.

If no *point_description* is given, the offset is used to adjust the position of the current measured point.

If a *point_description* exists, then either the *feature code* and *string number* or the *point number* section of the *point_description* can be used.

If the *feature code* and *string number* exist, then the last point of the previous string with that *feature code* and *string number* is adjusted.

If the *point number* exists, then the point with that point number is adjusted.

43 Add a tangential offset

43 [*Point_description*] *Tangential_offset_in_metres*

The *tangential_offset_in_metres* is used to adjust the position of the specified point by a plan distance from the specified points original position, at rights angles to the plan line joining the current station to the specified point. A negative offset is to the left (looking from the station), and positive is to the right (looking from the station).

If no *point_description* is given, the offset is used to adjust the position of the current measured point.

If a *point_description* exists, then either the *feature code* and *string number* or the *point number* section of the *point_description* can be used.

If the *feature code* and *string number* exist, then the last point of the previous string with that *feature code* and *string number* is adjusted.

If the *point number* exists, then the point with that point number is adjusted.

44 Add a height offset

44 [*Point_description*] *Height_offset_in_metres*

If the height of the specified point is not null, then the *height_offset_in_metres* adjusts the height of the point. A positive offset adds to the height, a negative offset reduces the height.

If no *point_description* is given, the offset is used to adjust the position of the current measured point.

If a *point_description* exists, then either the *feature code* and *string number* or the *point number* section of the *point_description* can be used.

If the *feature code* and *string number* exist, then the last point of the previous string with that *feature code* and *string number* is adjusted.

If the *point number* exists, then the point with that point number is adjusted.

45 Make a parallelogram from the last three measurement points*45 [Point_description]*

If no *point_description* is given, the current measurement point and the two previous points from the current string are used and a fourth point is created to form a parallelogram (squashed rectangle) and the height of the fourth point is set to null. The string is then closed.

If a *point_description* exists, then either the *feature code* and *string number* or the *point number* section of the *point_description* can be used.

If the *feature code* and *string number* exist, the last three points with that *feature code* and *string number* are used and a fourth point is created to form a parallelogram (squashed rectangle) and the height of the fourth point is set to null. The string is then closed.

If the *point number* exists, then the *feature code* and *string number* of the point with that point number are used and processed as above. Note that the point with the point number is not necessarily used.

46 Make the string a breakline or not*46 [Point_description] [mode]*

The *point_description* is used to select a string and the *mode* is used specify if the string is a breakline or not.

point_description:

If no *point_description* is given, the current string is selected.

If a *point_description* exists, then either the *feature code* and *string number* or the *point number* section of the *point_description* can be used.

If the *feature code* and *string number* exist, the last string with that *feature code* and *string number* is selected.

If the *point number* exists, then the string containing the point with that point number is selected.

mode:

If no *mode* is given, the selected string is set as a point string (that is, not a breakline).

If *mode* is given, then

if *mode* is 0, the selected string is set to a point string and hence is not a breakline.

if *mode* is 1, the selected string is set to a *line* string and is therefore a breakline

47 Start a new string using the same feature code and string number*47 [Point_description]*

If no *point_description* is given, the current string is terminated (without including the current measurement point) and the current measurement point becomes the first point of a new string with the same feature code and string number.

If a *point_description* exists, then either the *feature code* and *string number* or the *point number* section of the *point_description* can be used.

If the *feature code* and *string number* exist, then the last point of the previous string with that feature code and string number becomes the first point of a new string with the same *feature code* and *string number*.

If the *point number* exists, then the previous string containing the point with that point number is terminated *before* the point number point, and the point becomes the first point of a new string with the *same feature code* and *string number*.

48 End a string -*48 [Point_description]*

If no *Point_description* exists, the current string is terminated (including the current measurement point).

If *Feature_code* and *String_number* exist, then the last point of the previous string with that feature code and string number becomes the last point of that string.

If *Point_number* exists, then the previous string containing the point with that point number is terminated *after* the point number point

50 Specify the bearing to correct for true north - used as the bearing datum difference

50 *Point_description bearing_in_decimal_degrees*

The *bearing_in_decimal_degrees* is used as the bearing datum difference for the current instrument set up. The *point_name* in the *point_description* and the *bearing_in_decimal_degrees* are written to the report file.

51 Start using an existing field template

51 *Template_name zig_zag_mode*

Start using the field template *Template_name*. If *Template_name* is blank, the default field template is used.

If *mode* is "for", then the field template is used as a *forward* template.

"rev", then the field template is used as a *reverse* template.

"zig", then the field template is used as a *zig_zag* template and is used in the *forward* definition direction first (that is starts on a zig).

"zag", then the template is used as a *zig_zag* template and is used in the *reverse* direction first (that is, starts on a zag).

If *mode* is blank, or anything other than "for", "rev", or "zag" then the field template is used as a *zig-zag* template starting on a *zig*.

52 Finish using a field template or finish recording a field template

52

Stops using the current field template or stops recording a field template.

53 Pause using the current field template

53

Pause using the current field template or defining a field template, until a continue field template (54) or a finish field template (52) code is given.

54 Continue the current field template

54

Continue using or defining the current field template, which has been stopped by a *Pause* field template command (53). The *Continue* command only needs to be given once and applies to all following measurements until another *Pause* or *Finish* command is given.

55 Start recording a field template

55 [*Template_name*]

Start recording a field template with the name *Template_name*. If *Template_name* is blank, then it is the default field template that is defined. The *feature_code* and *string_number* of the following measurements until a *Finish* code (52) are stored as the field template. There is no limit to the number of points in a field template.

56 Skipping picking up points when using a field template

56 [*num_skipped_points*]

Allows the user to skip picking up one or more points from the field template currently being used. The next measurement takes the *feature_code* and *string_number* from the next point of the field template definition. If *num_skipped_points* is missing, then only one point is skipped otherwise *num_skipped_points* are skipped.

57 Delete points on a field template - after the measurement of last point*57 [num_points_to_delete]*

Allows the user to delete one or more points from the field template currently being used. The *next measurement* takes the *feature_code* and *string_number* from the next point of the field template definition.

58 Insert points when using a field template - after the measurement of last point*58 Feature_code String_number Multiple_code_flag Insert_special_flag*

Allows the user to insert points into the field template currently being used. The *next measurement* takes the *feature_code* and *string_number* from the next point of the field template definition.

If the *Multiple_code_flag = 1*, then the *feature code* will be added to the previous defined template point else if *Multiple_code_flag = 0* (default), it will be added to the template as a separate point.

If the insert is done at the end of a section and the *Insert_special_flag = 1* the point will be added to the end of the current template section else it will be at the start of the next section.

60 Arc through next three points*60 [Point_description]*

If no *point_description* is given, an arc is inserted through the current measurement point and the next two measured points with the same feature code and string number as the current measurement point. If there is less than three points, no arc is fitted.

If a *point_description* exists, then either the *feature code* and/or *string number* and/or the *point number* section of the *point_description* can be used.

If the *feature code* or *string number* from the *point_description* exist, a search is made for a previously defined measurement with the same feature code or string number. An arc is inserted through this previous measurement and the next two measured points following this previous measurement with the same feature code and string number, as given in *point_description*. If the current point has that feature code and string number, then it is the first of the three points. If there is less than three points, no arc fitted.

If the *point number* exists, then the *feature code* and *string number* are taken from the previous measurement point **with** that point number, and an arc is inserted through that point and the next two measurement points with the same *feature code* and *string number*. If there is less than three points, no arc is fitted

61 Start of arc through sets of three points until end of string, or a 62 occurs*61 [Point_description]*

If no *point_description* is given, arcs are inserted through the following sets of measurement points with the same feature code and string number as the current measurement point. The current measurement point is the first of the points.

The arcs are fitted as follows - the first arc is fitted through points one, two and three, the next arc through points three, four and five etc. If the current point has that feature code and string number, then it is the first of the points. If there is less than three points, then no arc is fitted.

If a *point_description* exists, then either the *feature code* and *string number* or the *point number* section of the *point_description* can be used.

If the *feature code* and *string number* exist, a search is made for a previously defined measurement with the same feature code or string number. An arc is inserted through the following measured points with the same feature code and string number as given in *point_description*. If the current point has that feature code and string number, then it is the first of the points.

If the *point number* exists, then the *feature code* and *string number* are taken from the previous measurement point **with** that point number, and arcs are inserted through that point and the following measured points with the same *feature code* and *string number*.

62 End the arcs begun by a 61 command*62 [Point_description]*

If no *point_description* is given, then the fitting of arcs through the points of the current string is stopped. The current measurement point is the last of the points used in the arc fitting.

If a *point_description* exists, then either the *feature code* and *string number* or the *point number* section of the *point_description* can be used.

If the *feature code* and *string number* from the *point_description* exist, then the fitting of arcs through the points of the previous string with the same *feature code* and *string number* is stopped. If the current measurement point has that feature code and string number, then it is the last point used in the arc fitting.

If the *point number* from the *point_description* exists, then the point with that point number is the last point used in the arc fitting.

If 12d Model encounters an *End Arcs* (62) but no *Start Arcs through sets of three points* (61) command for the string, then a *Start Arcs through sets of three points* (61) is assumed to apply at the beginning of the string and hence arc fitting will be applied to the entire string.

There are op codes for adding user defined attributes to:

- (a) the current string being measured (i.e. the string containing the current measurement point)
 - (b) the current measurement point
 - (c) the next segment from the current measurement point (i.e. the segment joining the current measurement point and the *next* measured point *of the same feature code and string number*)
- or
- (d) the previous segment to the current measurement point (i.e. the segment joining the current measurement point to the previous measured point *of the same feature code and string number*).

If there is no name for the attribute (name is just spaces or a tab), then the attribute is *unnamed*. The attributes are coded in the following way:

68 Add an integer user defined attribute to the current string*68 Name Integer*

Add an user defined integer attribute to the current string.

69 Add a real user defined attribute to the current string*69 Name Real*

Add a real (floating point) user defined attribute to the current string.

70 Add text user defined attribute to the current string*70 Name Text*

Add a text user defined attribute to the current string.

71 Add integer user defined attribute to the current point*71 Name Integer*

Add an integer user defined attribute to the current measurement point.

72 Add real user defined attribute to the current point*72 Name Real*

Add a real (floating point) user defined attribute to the current measurement point.

73 Add text user defined attribute to the current point*73 Name Text*

Add a text user defined attribute to the current measurement point.

74 Add integer user defined attribute to the next segment*74 Name Integer*

Add an integer user defined attribute to the next segment from the current measurement point.

75 Add real user defined attribute to the next segment*75 Name Real*

Add a real (floating point) user defined attribute to the next segment from the current measurement point.

76 Add text user defined attribute to the next segment*76 Name Text*

Add a text user defined attribute to the next segment from the current measurement point.

77 Add integer user defined attribute to the previous segment*77 Name Integer*

Add an integer user defined attribute to the previous segment for the current measurement point.

78 Add real user defined attribute for the previous segment*78 Name Real*

Add a real (floating point) user defined attribute to the previous segment for the current measurement point.

79 Add text user defined attribute to the previous segment*79 Name Text*

Add a text user defined attribute to the previous segment for the current measurement point.

In addition, extra codes allow special 12d Model pipe strings to be coded in the field

80 Pipe invert point (bottom of the pipe)*80 [Point_description]*

If no *point_description* is given, the current measurement point is on the invert (bottom) of a pipe. This is the default for measurements to points on pipe strings. If the point is not part of a pipe string, it is ignored.

If a *point_description* exists, then either the *feature code* and *string number* or the *point number* section of the *point_description* can be used.

If the *feature code* and *string number* exist, the last point of the previous string with the same *feature code* and *string number* as given in *point_description* is on the invert (bottom) of a pipe. If the point is not part of a pipe string, it is ignored.

If the *point number* exists, then the point with that point number is on the invert (bottom) of a pipe. If the point is not part of a pipe string, it is ignored.

81 Pipe axial point (centre of the pipe)*81 [Point_description]*

If no *point_description* is given, the current measurement point is on the axis (centre) of a pipe. If the point is not part of a pipe string, it is ignored.

If a *point_description* exists, then either the *feature code* and *string number* or the *point number* section of the *point_description* can be used.

If the *feature code* and *string number* exist, the last point of the previous string with the same *feature code* and *string number* as given in *point_description* is on the axis (centre) of a pipe. If the point is not part of a pipe string, it is ignored.

If the *point number* exists, then the point with that point number is on the axis (centre) of a pipe. If the point is not part of a pipe string, it is ignored.

82 Pipe obvert point (top of the pipe)

82 [*Point_description*]

If no *point_description* is given, the current measurement point is on the obvert (top) of a pipe. If the point is not part of a pipe string, it is ignored.

If a *point_description* exists, then either the *feature code* and *string number* or the *point number* section of the *point_description* can be used.

If the *feature code* and *string number* exist, the last point of the previous string with the same *feature code* and *string number* as given in *point_description* is on the obvert (top) of a pipe. If the point is not part of a pipe string, it is ignored.

If the *point number* exists, then the point with that point number is on the obvert (top) of a pipe. If the point is not part of a pipe string, it is ignored.

83 Start recording a shape - before the measurement

83 [*Shape_name*]

Start recording a shape with the name *Shape_name*. If *Shape_name* is non-blank, then the default field Shape is defined by the *feature_code* and *string_number* of the following measurements until a *Finish* code (84) are stored as the shape. There is no limit to the number of points in a shape.

See the Section “Field Templates” for more information on field templates.

84 Finish using a shape definition or finish recording a shape - after the measurement

Stops using the current shape or stops recording a shape.

85 Shape parallel

85 [*Shape_name*] [*Point_description*]

Takes all the points on the defined shape of *Shape_name* and parallels them the entire length of the string. Once paralleled, a number of strings are created.

If *Feature_code* and *String_number* exist, the last string with the same *feature code* and *string number* has the shape applied to the entire length of the string.

If *Point_number* exists, then the string containing that point number has the shape applied to the entire length of the string.

86 Shape extrude

86 [*Shape_name*] [*Point_description*]

Takes the defined shape of *Shape_name* and extrudes it along the entire length of the string. Once extruded, only one strings is created which contains all the shape information.

If *Feature_code* and *String_number* exist, the last string with the same *feature code* and *string number* has the shape applied to the entire length of the string.

If *Point_number* exists, then the string containing that point number has the shape applied to the entire length of the string.

92 Remove all z-values for a string (i.e. make all z-values null)

92 [*Point_description*]

If no *point_description* is given, all z-values for the current string are removed.

If a *point_description* exists, then either the *feature code* and *string number* or the *point number* section of the *point_description* can be used.

If the *feature code* and *string number* exist, the last string with the same *feature code* and *string number* has all its z-values removed.

A *point-line type* can be embedding as a 0 or 1 in the *point name* part of the *point description* field. A zero value specifies a point string, and a non-zero value specifies a line string. If the field was omitted, a line string is assumed.

The point-line type may be overridden by the mapping file.

93 Set the Point-line type

93 [*Point_description*]

A *point-line type* can be embedding as a 0 or 1 in the *point name* part of the *point description* field. A zero value specifies a point string, and a non-zero value specifies a line string. If the field was omitted, a line string is assumed.

If no *point_description* is given, the point-line type for the current string is set to *line*.

If a *point_description* exists, then either the *feature code* and *string number* or the *point number* section of the *point_description* can be used.

If the *feature code* and *string number* exist, the point-line type is set for the last previous string with the same *feature code* and *string number*.

If the *point number* exists, then the point-line type is set for the string containing that point number.

The point-line type may be overridden by the mapping file.

94 Use name library file/ mapping file for vertex text on the string - name mapping

94 [*Point_description*]

If this op code exists then during reduction, vertex text is creating using either the name library, or if the name library doesn't exist, the map file. If neither exist then the op code is ignored.

if a name library is used and the feature code of the string is found in the first column of the name library, then the entry from the second column of that row will be used as text for *all* vertices of the string that don't already have vertex text. As a default, the string is set as a point string.

if the map file is used and the feature code of the string is found in the first column of the map file, then the *string name* field of the map file is used as vertex text for all vertices that don't already have text. As a default, the string is set as a point string.

If no *point_description* is given, then name mapping is applied to the current string.

If a *point_description* exists, then either the *feature code* and *string number* or the *point number* section of the *point_description* can be used.

If the *feature code* and *string number* exist, then name mapping is applied to the last previous string with the same *feature code* and *string number*.

If the *point number* from the *point_description* exists, then name mapping is applied to the string containing that point number.

A *point-line type* can be embedding as a 0 or 1 in the *point name* part of the *point description* field. A zero value specifies a point string, and a non-zero value specifies a line string. If the field was omitted, a line string is assumed.

The point-line type may be overridden by the mapping file.

95 Pipe string

95 [*Point_description*] *diameter*

Pipe strings are always line strings and are stored with the justification of the majority of the string points. Individual pipe points are picked up either top (obvert), centre (axial) or bottom (invert) of the pipe using op codes 80, 81 and 82.

If no *point_description* is given, the current string is created as a pipe string with the given diameter.

If a *point_description* exists, then either the *feature code* and *string number* or the *point number* section of the *point_description* can be used.

If the *feature code* and *string number* exist, the last string with the same *feature code* and *string number* is created as a pipe with the given diameter.

If the *point number* exists, then the string containing that point number is created as a pipe string with the given diameter.

96 Culvert string

96 [*Point_description*] *width height*

Culvert strings are always line strings and are stored with the justification of the majority of the string points. Individual culvert points are picked up either top (obvert), centre (axial) or bottom (invert) of the culvert using op codes 80, 81 and 82.

If no *point_description* is given, the current string is created as a culvert string with the given width and height.

If a *point_description* exists, then either the *feature code* and *string number* or the *point number* section of the *point_description* can be used.

If the *feature code* and *string number* exist, the last string with the same *feature code* and *string number* is created as a culvert with the given width and height.

If the *point number* exists, then the string containing that point number is created as a culvert string with the given width and height.

99 Terminate processing

99

Stop processing the 12d field file at this line. Useful for debugging errors.

107 Make the previous segment invisible - after the measurement

107 [*Point_description*]

If no *Point_description* exists, the previous segment containing the current measurement point is set to invisible.

If the *Feature_code* and *String_number* exist, then the last segment of the previous string with that *feature code* and *string number* is set to invisible.

If *Point_number* exists, then the segment containing the point with that point number as an end point, is set to invisible.

108 Make the next segment invisible - after the measurement for the first point of the segment

108 [*Point_description*]

If no *Point_description* exists, the next segment containing the current measurement point as a starting point is set to invisible.

If the *Feature_code* and *String_number* exist, then the segment that is created in the future from the last point of the previous string with that *feature code* and *string number* is set to invisible.

If *Point_number* exists, then the segment containing the point with that point number as a start point, is set to invisible.

109 Make a point invisible - after the measurement

109 [*Point_description*]

If no *Point_description* exists, the current measurement point is set to invisible.

If *Feature_code* and *String_number* exist, then the last point of the previous string with that *feature code* and *string number* is set to invisible.

If *Point_number* exists, then the point with that point number is set to invisible.

110 Start buildings face observations - before the measurements

110 [Building_name]

Start recording a field template with the name *Building_name*. If *Building_name* is non-blank, then the default building face is defined. The *feature_code* and *string_number* of the following measurements until a *Finish* code (111) are stored as the building face. There is no limit to the number of points in a building face.

111 End building face observations

111 [Building_name]

If no *Building_name* exists, the current building face observation set is finished (including the current measurement point).

Notes

1. Arc fitting is applied *after* the Joins are processed. Hence the new joined strings are created and then curve fitting is applied according to the arc codes (start arc, end arc, fit arcs, stop fitting arcs etc.) on any vertex of the string.
2. The *point description* has several pieces of information embedded in it and has been described in the previous section. For some op codes, the *point name* section of the *point description* is used to hold other information.

For a summary of the 12d Field File Op Codes, go to the section “Summary of 12d Field File Op Codes”

Summary of 12d Field File Op Codes

Op Code	Description of Record
-2	Comment
-1	Error
01	Header Information
02	Directly entered coordinate measurement
03	New instrument setup point
04	Measurement to backsight
05	New target height
06	Check measurement
07	Measurement - HA, VA, SD
09	Scale factor for subsequent distances
10	Three hair stadia measurement
11	Measurement - HA, HD, Ht
12	Measurement - HA, HD, Ht diff
15	Vertical circle correction
16	Multiply coded point
17	Arc through previous three points
18	Circle Feature
20	Close string
21	Join last points of strings
22	Join first to last point of strings
23	Join first points of strings
28	Add text to the string name
29	Note or memo
30	Remove height from a point - that is make it a null height
37	Rectangle by two points
38	Make the previous segment non-tinable
39	Make the next segment non-tinable
40	Make a point non-tinable
41	Add additional text for the current measurement point
42	Add a radial offset
43	Add a tangential offset
44	Add a height offset
45	Make a parallelogram from the last three measurement points
46	Make the string a breakline or not
47	Start a new string using the same feature code and string number
48	String end
50	Specify the bearing to correct for true north - used as the bearing datum difference
51	Start using an existing field template
52	Finish a field template or finish recording a field template
53	Pause the current field template until a continue op code (54) or a finish template (52)
54	Continue the current field template
55	Start recording a field template
56	Skip picking up one or more points from a field template
57	Delete one or more points from a field template
58	Insert a point into a field template
60	Arc through next three points
61	Start of arc through sets of three points until end of string, or a 62 occurs
62	End the arcs begun by a 61 command
68	Add an integer user defined attribute to the current string
69	Add a real user defined attribute to the current string
70	Add text user defined attribute to the current string
71	Add integer user defined attribute to the current point
72	Add real user defined attribute to the current point
73	Add text user defined attribute to the current point
74	Add integer user defined attribute to the next segment

- 75 Add real user defined attribute to the next segment
- 76 Add text user defined attribute to the next segment
- 77 Add integer user defined attribute to the previous segment
- 78 Add real user defined attribute for the previous segment
- 79 Add text user defined attribute to the previous segment
- 80 Pipe or culvert invert point (bottom of the pipe or culvert)
- 81 Pipe or culvert axial point (centre of the pipe or culvert)
- 82 Pipe or culvert obvert point (top of the pipe or culvert)
- 83 Start recording/measuring a shape
- 84 End measuring a shape
- 85 Parallel an existing shape
- 86 Extrude an existing shape
- 92 Remove all z-values for a string (i.e. make all z-values null)
- 93 Set the Point-line type
- 94 Use name library file/ mapping file for vertex text on the string - name mapping
- 95 Pipe string
- 96 Culvert string
- 99 Terminate processing
- 107 Last segment of point invisible
- 108 Next segment of point invisible
- 109 Point invisible
- 110 Building face start recording
- 111 Building face end recording

Batch Typed Entry

Typed entry can be used to enter survey data into a 12d Field File and reduced using the Survey data Editor.

12d Model uses the following 12d field file ops code:

Op Code	Description of Record
-2	Comment
-1	Error
01	Header Information
02	Directly entered coordinate measurement
03	New instrument setup point
04	Measurement to backsight
05	New target height
06	Check measurement
07	Measurement - HA, VA, SD
09	Scale factor for subsequent distances
10	Three hair stadia measurement
11	Measurement - HA, HD, Ht
12	Measurement - HA, HD, Ht diff
15	Vertical circle correction
16	Multiply coded point
17	Arc through previous three points
18	Circle Feature
20	Close string
21	Join last points of strings
22	Join first to last point of strings
23	Join first points of strings
28	Add text to the string name
29	Note or memo
30	Remove height from a point - that is make it a null height
37	Rectangle by two points
38	Make the previous segment non-tinable
39	Make the next segment non-tinable
40	Make a point non-tinable
41	Add additional text for the current measurement point
42	Add a radial offset
43	Add a tangential offset
44	Add a height offset
45	Make a parallelogram from the last three measurement points
46	Make the string a breakline or not
47	Start a new string using the same feature code and string number
48	String end
50	Specify the bearing to correct for true north - used as the bearing datum difference
51	Start using an existing field template
52	Finish a field template or finish recording a field template
53	Pause the current field template until a continue op code (54) or a finish template (52)
54	Continue the current field template
55	Start recording a field template
56	Skip picking up one or more points from a field template
57	Delete points from a field template
58	Insert points in a field template
60	Arc through next three points
61	Start of arc through sets of three points until end of string, or a 62 occurs
62	End the arcs begun by a 61 command
68	Add an integer user defined attribute to the current string
69	Add a real user defined attribute to the current string

- 70 Add text user defined attribute to the current string
- 71 Add integer user defined attribute to the current point
- 72 Add real user defined attribute to the current point
- 73 Add text user defined attribute to the current point
- 74 Add integer user defined attribute to the next segment
- 75 Add real user defined attribute to the next segment
- 76 Add text user defined attribute to the next segment
- 77 Add integer user defined attribute to the previous segment
- 78 Add real user defined attribute for the previous segment
- 79 Add text user defined attribute to the previous segment
- 80 Pipe or culvert invert point (bottom of the pipe or culvert)
- 81 Pipe or culvert axial point (centre of the pipe or culvert)
- 82 Pipe or culvert obvert point (top of the pipe or culvert)
- 83 Start recording/measuring a shape
- 84 End measuring a shape
- 85 Parallel an existing shape
- 86 Extrude an existing shape
- 92 Remove all z-values for a string (i.e. make all z-values null)
- 93 Set the Point-line type
- 94 Use name library file/ mapping file for vertex text on the string - name mapping
- 95 Pipe string
- 96 Culvert string
- 99 Terminate processing
- 107 Last segment of point invisible
- 108 Next segment of point invisible
- 109 Point invisible
- 110 Building face start recording
- 111 Building face end recording

Users can enter text for each measurement (observation 09 record or position 08 record) which is appended to the end of the record and this is used as the text of blocks that are interpreted according to the descriptions given in the earlier section “Field Coding for Non Leica Instruments” .

The '13' record can also be used after a measurement record to add additional information to the preceding blocks using the *extra coding* control code at the end of the previous line (see “Extra Coding” in the section “Control Code Blocks”

Strictly speaking the Sokkia SDR20/33 formats use fixed length lines and if the lengths are incorrect, an error message will be written to the Output Window. For example,

'Line 248 line incorrect length. required length is 58. received length is 50.'

These messages often appear after a raw file has been manually edited because most editors remove space padding at the end of a line.

For the full description of the 12d Field File Op Codes, go to the section “Full Description of 12d Field File Op Codes”

B 12D and Sokkia Instruments (SDR Files)

This Section deals with interfacing 12d with Sokkia SDR20/33 data formats specifically with the SDR33 electronic field book (Controller). Other controllers and instruments such as the powerset range of total stations also use these formats.

A large number of instruments support the Sokkia SDR data format including (Trimble Total Station ACU), not just those from Sokkia.

For the topic:

1. Field Coding see the section “Coding For SDR Files”
2. Sending raw file from controller to 12d “Downloading SDR File To 12d”
3. Converting raw data to field file see the section “Converting SDR Raw File To Field File”
4. Creating Points upload file see the section “Creating SDR Point Upload File”
5. Creating Road upload file see the section “Creating SDR Roads Upload File”
6. Creating Tin upload file see the section “Create Tin upload file”

Coding For SDR Files

The Sokkia SDR20/33 data formats are used as raw data files by 12d Model and are converted into a 12d Field File before reduction. 12d Model uses the following Sokkia records:

01	Record header - SDR format
02	Station details
03	Target height
07	Back bearing details
08	Position - directly entered co-ordinates
09	Observation - measurement
13	Comment or continuation of blocks
15	RTK station details
16	RTK observation - measurement
57	RTK antenna height

Users can enter text for each measurement (observation 09 record or position 08 record) which is appended to the end of the record and this is used as the text of blocks that are interpreted according to the descriptions given in the earlier section “Field Coding for Non Leica Instruments” .

The '13' record can also be used after a measurement record to add additional information to the preceding blocks using the *extra coding* control code at the end of the previous line (see “Extra Coding” in the section “Control Code Blocks”

Strictly speaking the Sokkia SDR20/33 formats use fixed length lines and if the lengths are incorrect, an error message will be written to the Output Window. For example,

'Line 248 line incorrect length. required length is 58. received length is 50.'

These messages often appear after a raw file has been manually edited because most editors remove space padding at the end of a line.

To ignore such error messages, there is a setting *Allow bad line lengths* on the *Advanced* tab of the *Survey.4d Create/Edit* panel. If this is set for a data collector, then lines of incorrect length will not

be rejected.

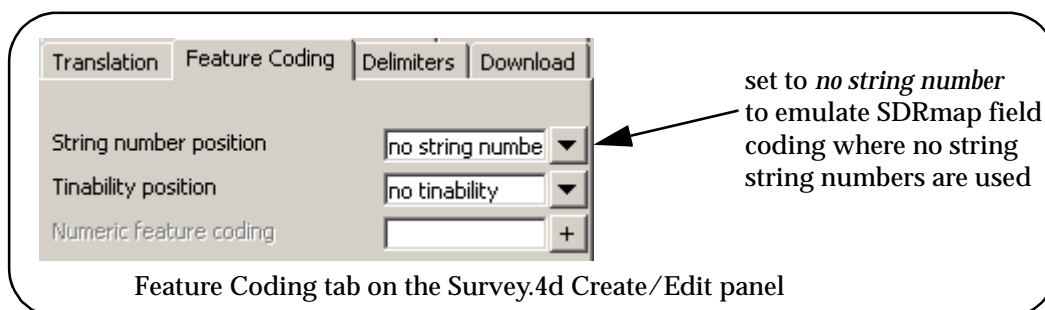
Advanced	Upload	Instrument	V4 Columns
Comment raw files			<input type="checkbox"/>
Report header			<input type="checkbox"/>
Allow bad line lengths			<input type="checkbox"/>
Verbose			<input type="checkbox"/>
Allow point numbers as stations			<input type="checkbox"/>

For non SDRmap users, please proceed to the section “Example of Sokkia SDR File” .

SDRmap users, please continue to the next section “Special Notes for SDRmap Users” .

Special Notes for SDRmap Users

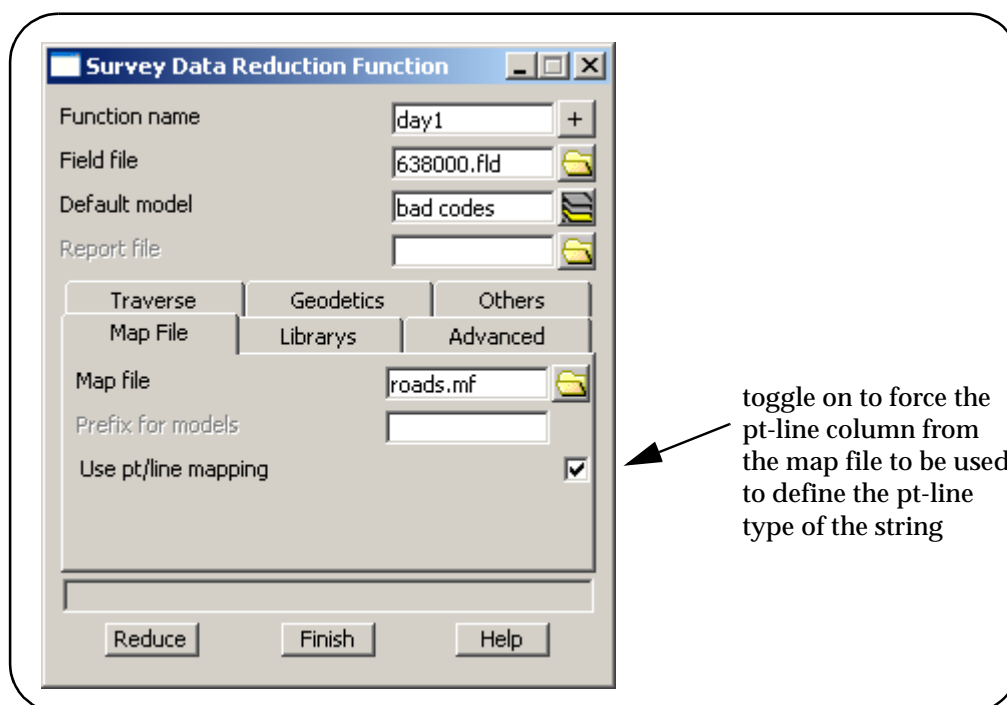
SDRmap does not use String numbers - only Feature codes are used and a *New String* command to denote the start of a new string. 12d Model supports only using a Feature code by setting the *String number position* on the *Feature Coding* tab to 'no string number'.



If *no string number* is set for the data collector (and so no string numbers are used in the field), then there is no way of telling from the field data whether the string is a *point* string or a *line* string (setting the pt-line type for the string).

For the *no string number* case, the method of defining the point-line type is to:

- (a) use a map file during the reduction
- and
- (b) have a key in the map file to match the feature code *and* have the pt-line type set for that key. If the *feature code* does not match any key in the map file, the string defaults to a *point string*.
- and
- (c) because by default the pt-string column in the map file is *ignored* during reduction (the string number usually defines the pt-line type), the *Use pt/line mapping* tick box in the Survey Data Reduction Function panel must be set to tick to *force* the pt-line column in the mapping file to be used.



Please continue to the next section "Example of Sokkia SDR File" .

Downloading SDR File To 12d

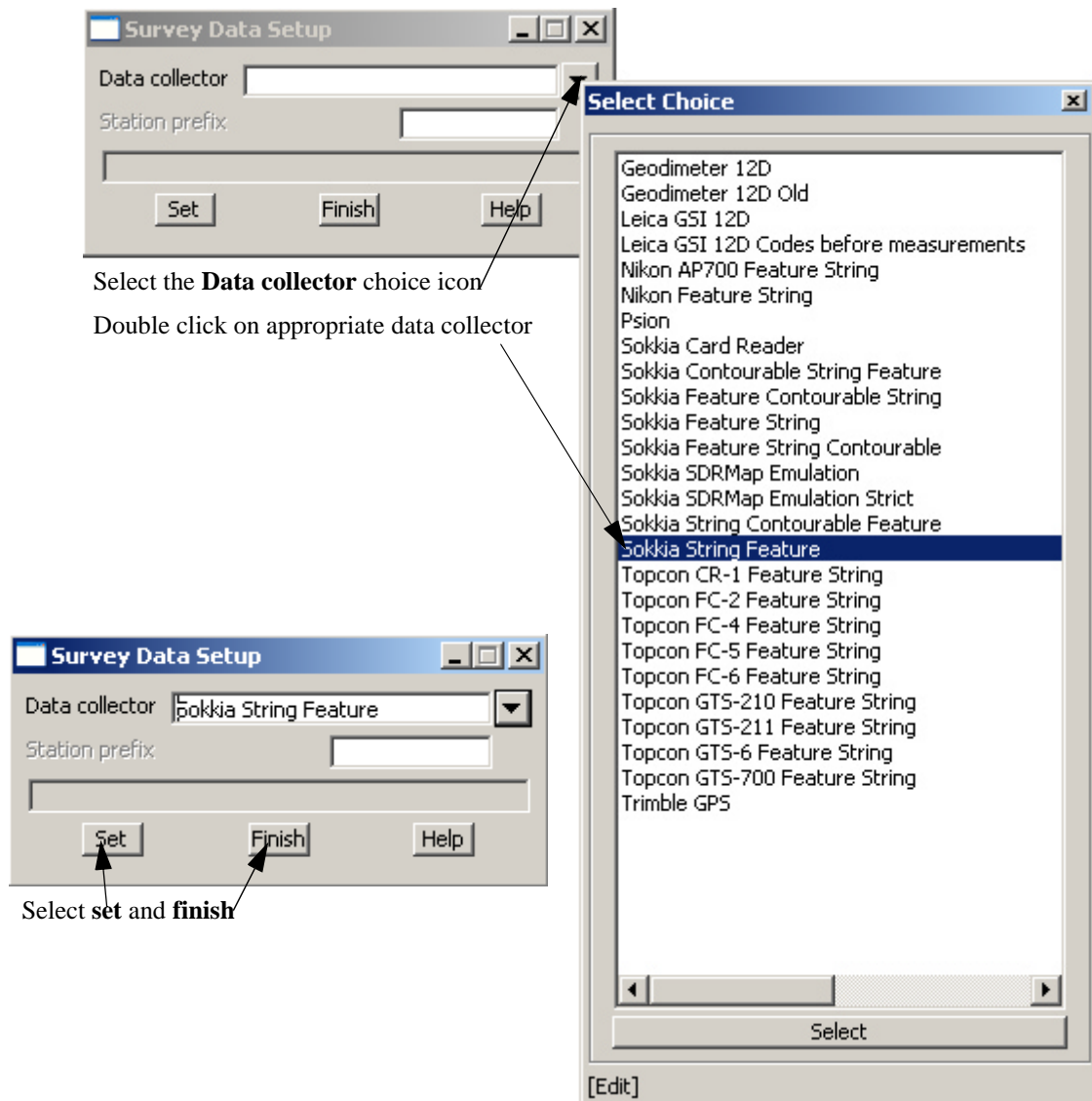
Raw SDR files can be input to 12d for reduction by two basic methods:

1. Download directly from the instrument
2. Copy the SDR file to the working folder directly from a PCMCIA card or by using a data transfer product such as "HyperTerminal" or "Wincomms" etc. For this method, see the following section "Converting SDR Raw File To Field File" .

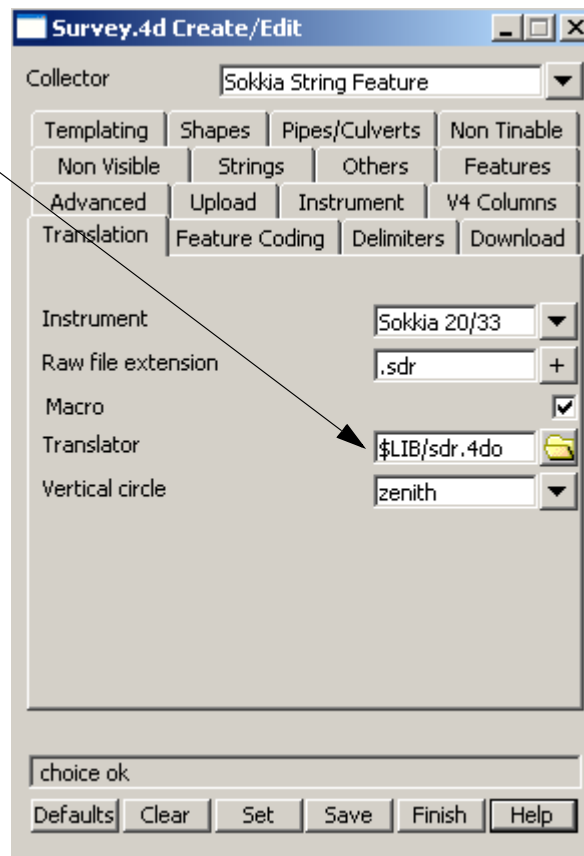
An option exists within 12d to download the raw SDR file from the instrument. This option has the added functionality that it reduces the raw propriety format (SDR file) to a 12d field file format at the same time. This conversion requires that the data collector definition be set before the download of the file is commenced.

Select the data collector type

Select option *Survey=>Setup*



The raw file will be converted to the 12d field file format using the specified translator macro

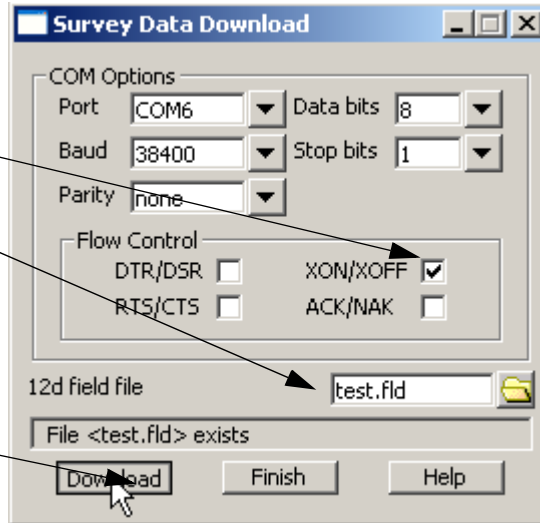


Select *Survey=>Download*

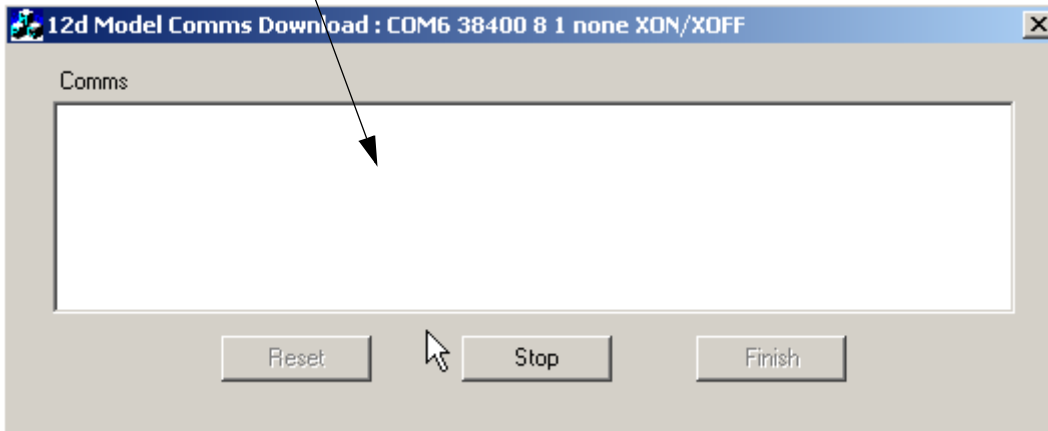
Ensure that the correct values are set for the comms settings i.e. they match the data collector parameters

Enter a name for the field file

Press **download**

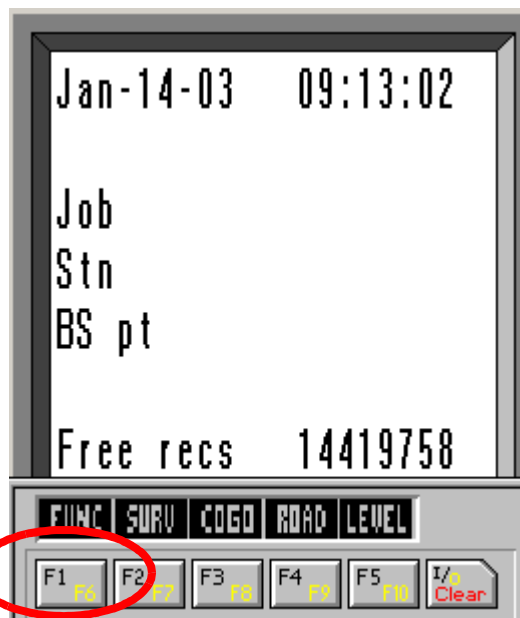


The 12d download window is shown.

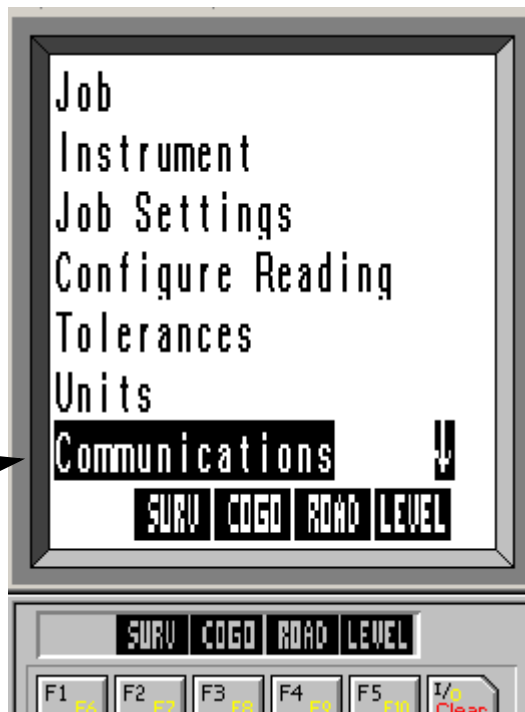


Prepare the data collector for download by connecting to appropriate port, selecting file to download etc.

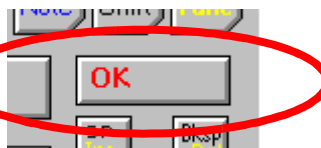
From the Data collector main menu select the **FUNC** (function) menu



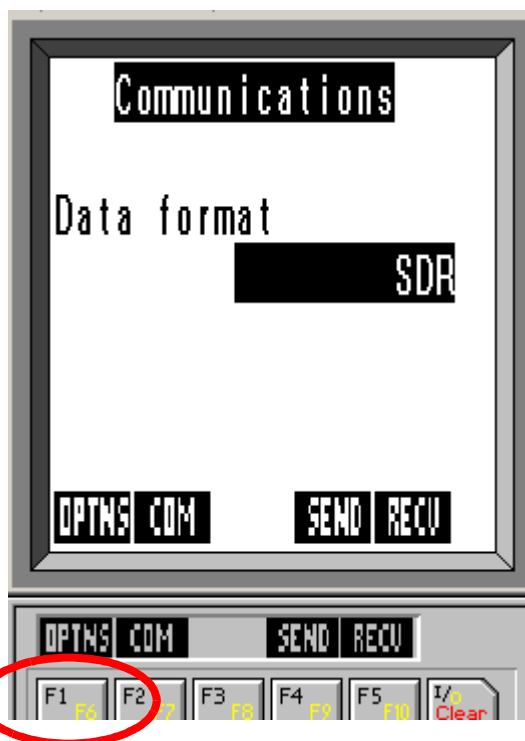
Toggle down to the
Communications menu



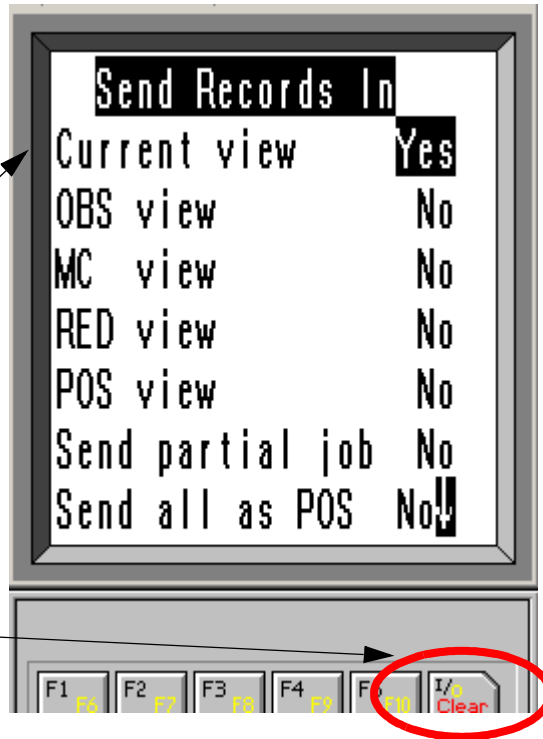
Press **OK** to select
menu



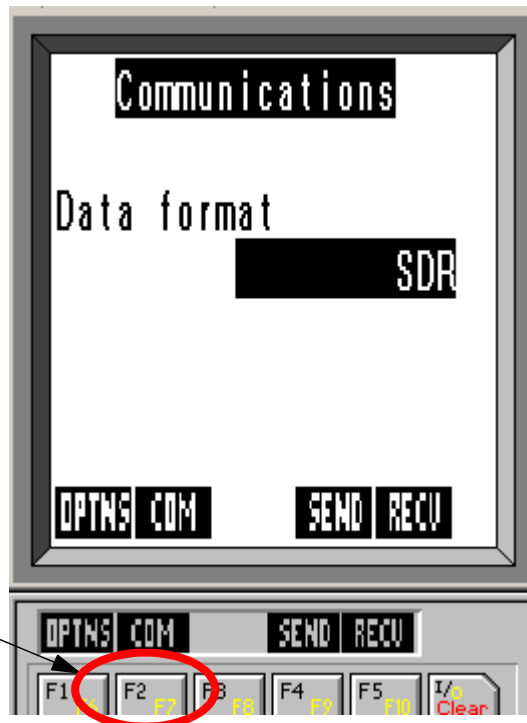
Select the **Options**
menu to view the
current settings



Select the **Current view** to **Yes** only. If the POS view were set to **Yes** also, the POS points would be sent also and eventually reduced twice in 12d (once from observations and the other from the POS record). Press **Clear** to leave menu

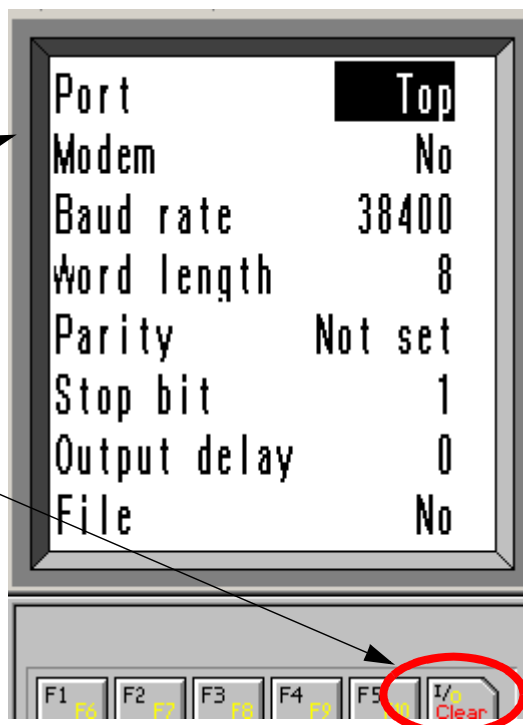


Select the **COM** menu to view the current comms settings

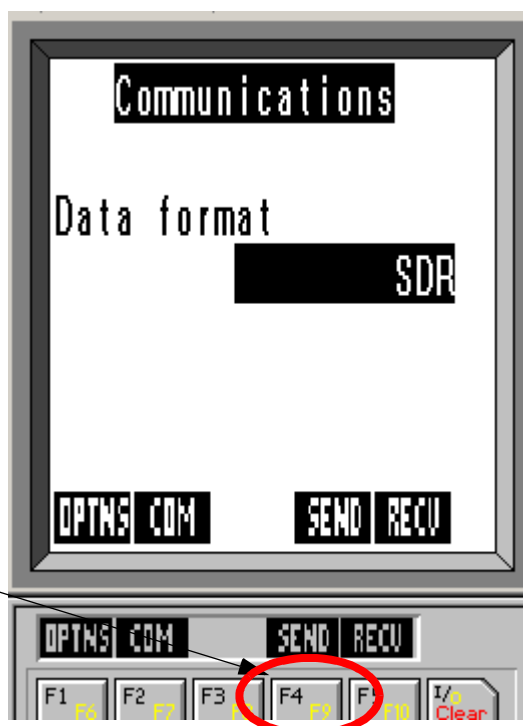


Ensure the comms settings are as per the values set in the 12d download option.

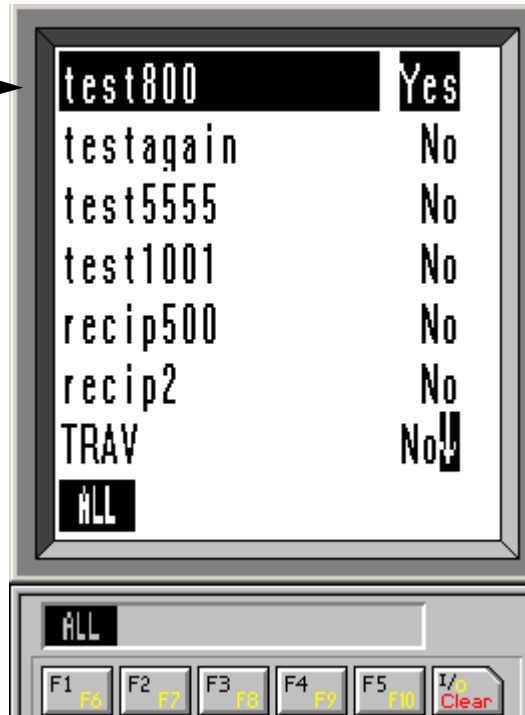
Select **Clear** to leave the menu



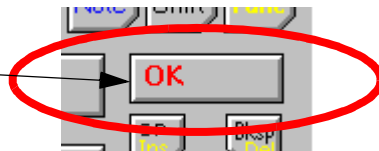
Select the **SEND** menu



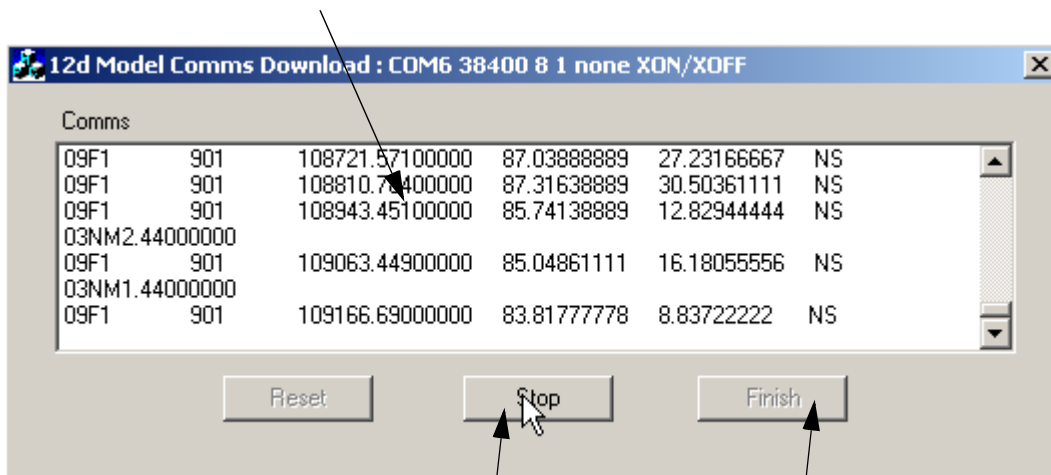
Select the file to download



Press OK to send



The file is shown downloading line by line in the 12d download window.



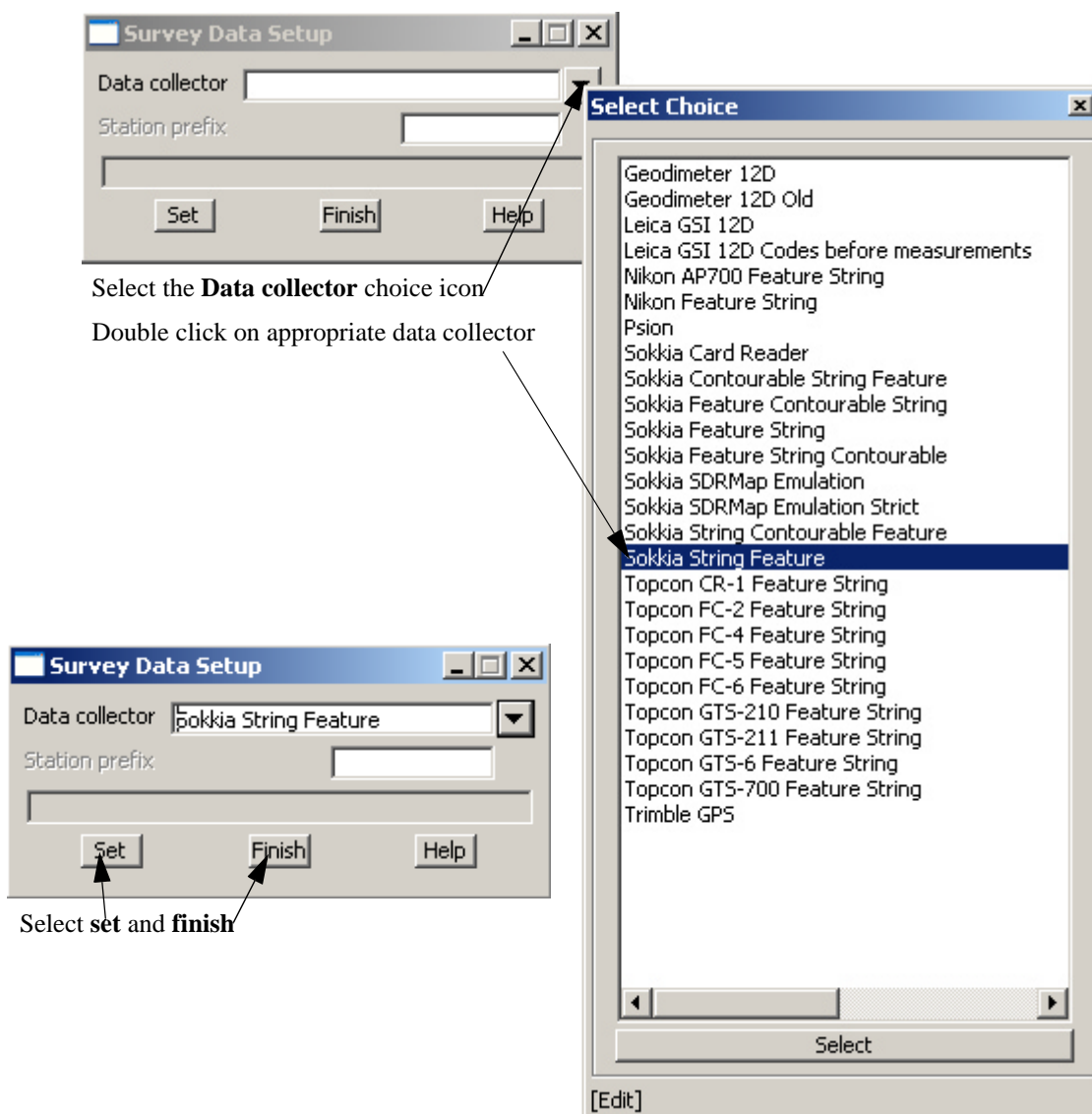
When the download is finished select the **stop** button and then **finish**

Converting SDR Raw File To Field File

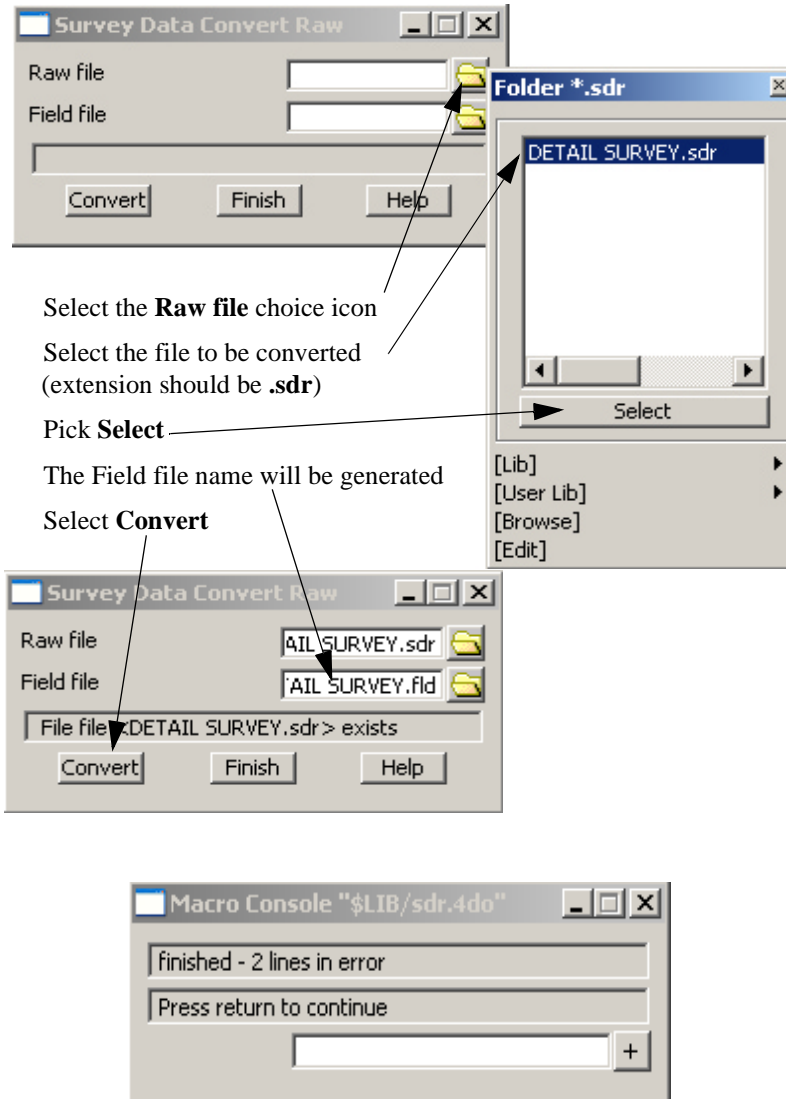
If a raw SDR file is copied to the working folder from a PCMCIA card or other means such as transferring it from a third party software package, it must be converted to a 12d field file for reduction inside 12d.

Select the data collector type

Select option *Survey=>Setup*



Select option *Survey=>Convert raw*



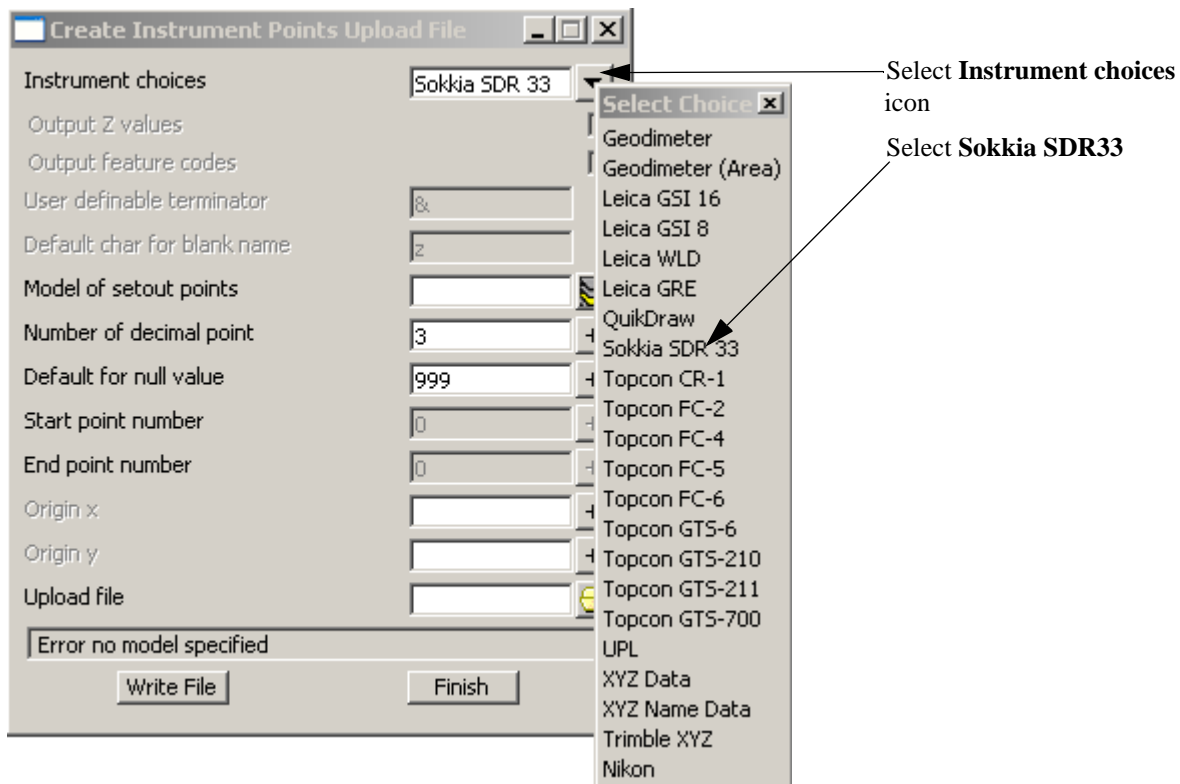
Any errors will be listed in the Output window. If the Output window is not shown, it can be opened using the option **Window=>Output Window**

Creating SDR Point Upload File

Create upload file in 12d

After creating the setout points an upload file can be created for the sdr format

Select option *Survey=>Upload=>Create points upload file*



Fill in the rest of the screen as per normal

Select **Write File**

A SDR33 file is created ready to send to the instrument directly using the upload facility or by copying the file to PCMCIA cards etc.

Loading file into controller using 12d upload facility

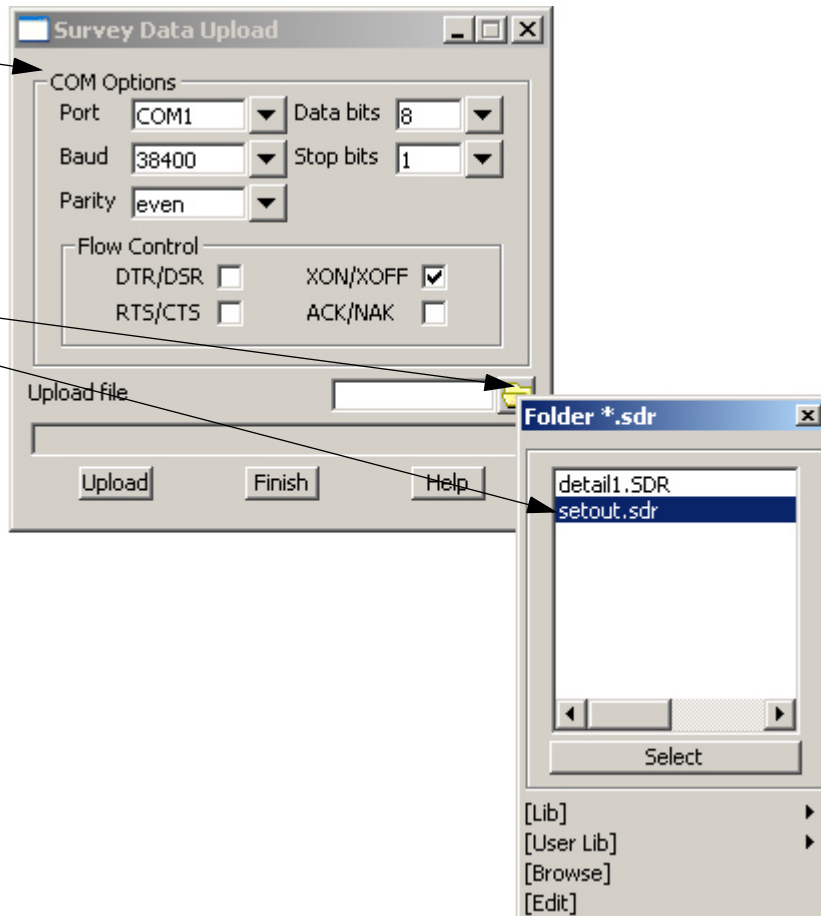
The points upload file can be transferred to the controller for setout using the upload panel.

Connect the controller to the PC

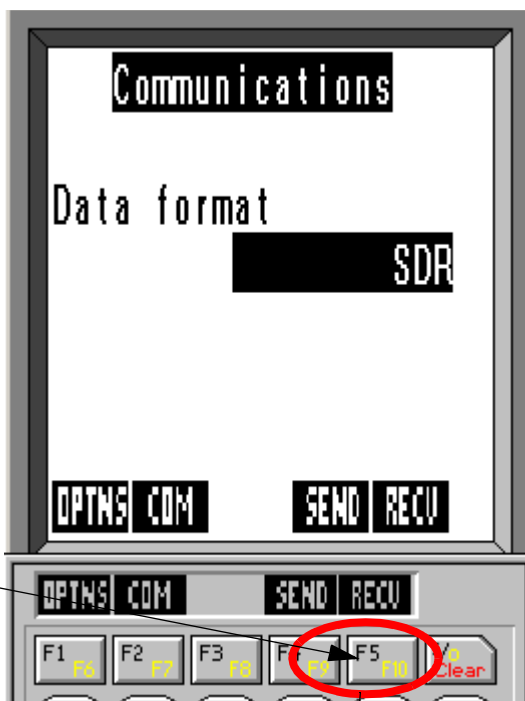
Select option *Survey=>Upload=>Upload*

Ensure that the correct values are set for the comms settings i.e. they match the data collector parameters

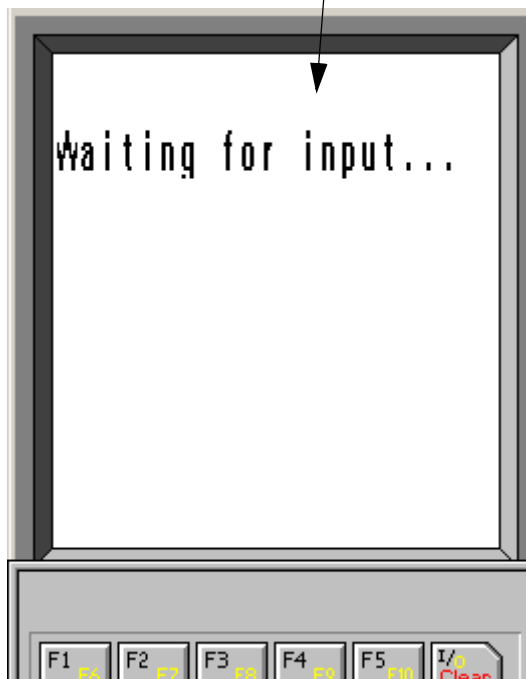
Select the upload file by selecting the folder icon and selecting the appropriate file



Prepare the data collector for uploading.

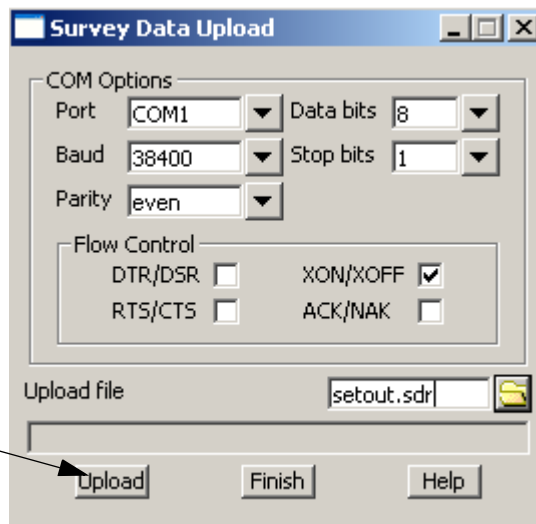


From the communication menu, select the receive button



Once the data collector is ready, the data can be sent from 12d

Select **upload** to start uploading the file

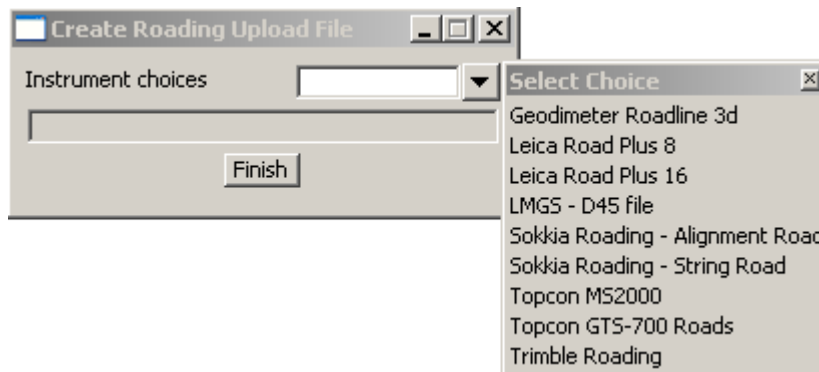


Creating SDR Roads Upload File

Create upload file in 12d

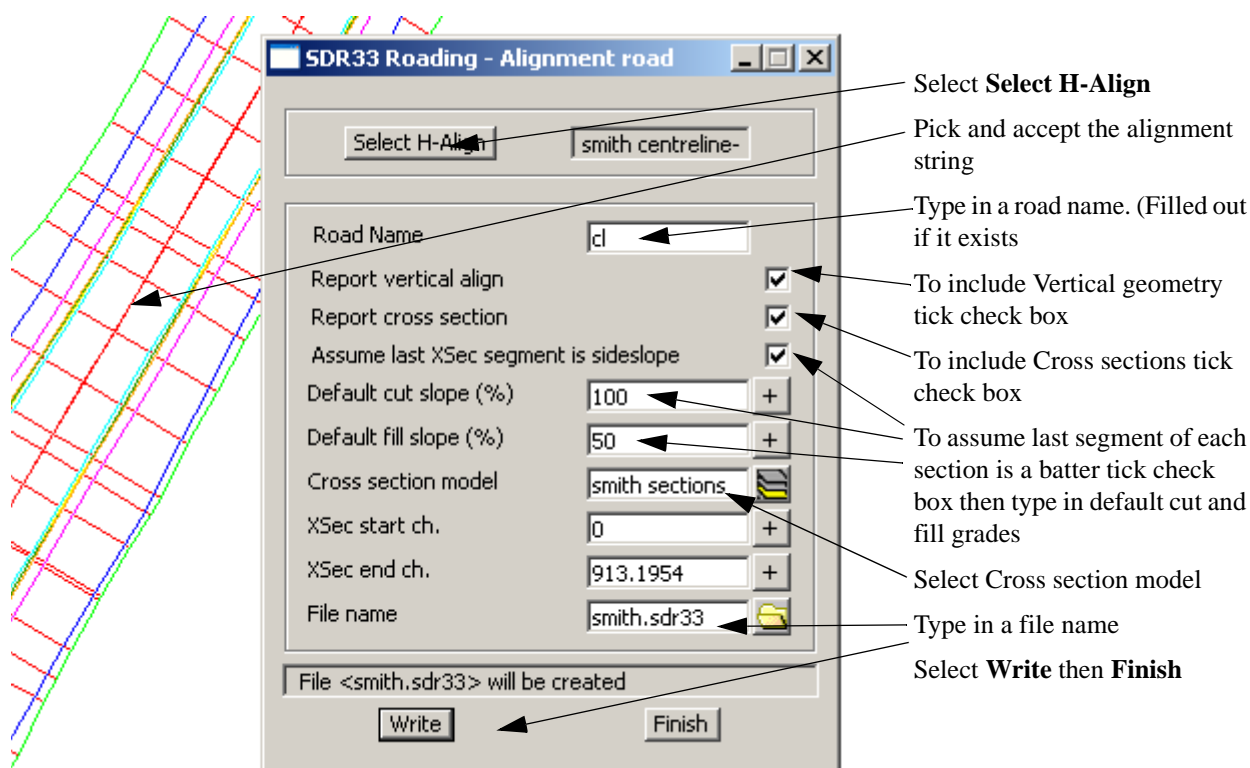
After creating the road alignment an upload file can be created for the SDR33 format

Select option *Survey=>Upload=>Create roads upload file*



Select **Instrument** choice icon

Select **Sokkia Roding - Alignment Road**

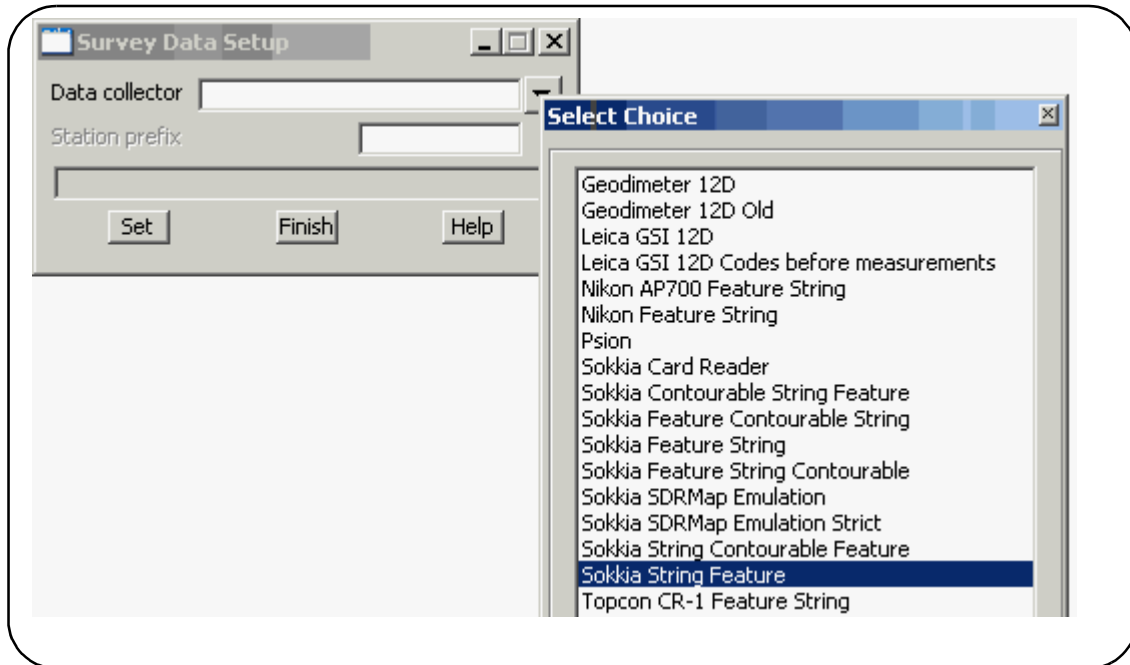


A SDR33 file is created ready to send to the instrument directly using the upload facility or by copying the file to PCMCIA cards etc. The steps involved in uploading the file to the controller using the 12d upload facility can be seen in the previous section “Loading file into controller using 12d upload facility” on page 3172.

Example of Sokkia SDR File

The raw Sokkia SDR file 'detail1.sdr' has been coded in accordance with the data collector definition *Sokkia String Feature* which is shipped with 12d Model.

The data collector *Sokkia String Feature* is set using the option *Survey=>Setup*



Translation	Feature Coding	Delimiters	Download	Non Visible	Strings	Others	Features
Command		*		Close			C
Comment				Rectangle			R
Offset code		.		Rectangle by 2 pts			
String		+		Start arc fitting			S
Backsight		BS		End arc fitting			E
Foresight				New string			ST
Check measurement		CHK		End string			
Extra coding		X					

Non Visible	Strings	Others	Features
by radius			
by diameter			

Templating	Shapes	Pipes/Culverts	Non Tinable
Invert			I
Obvert			O
Centre			A

Templating	Shapes	Pipes/Culverts	Non Tinable
Record			XA
Start			XB
End			XC
Pause			XD
Pause after			
Continue			XE
Skip			XF
Insert			
Delete			

Templating	Shapes	Pipes/Culverts	Non Tinable
Remove height			NH
Point			XP
Previous segment			XL
Next segment			XN

For the *Sokkia String Feature* data collector definition, the *string number* is given before the *feature code*.

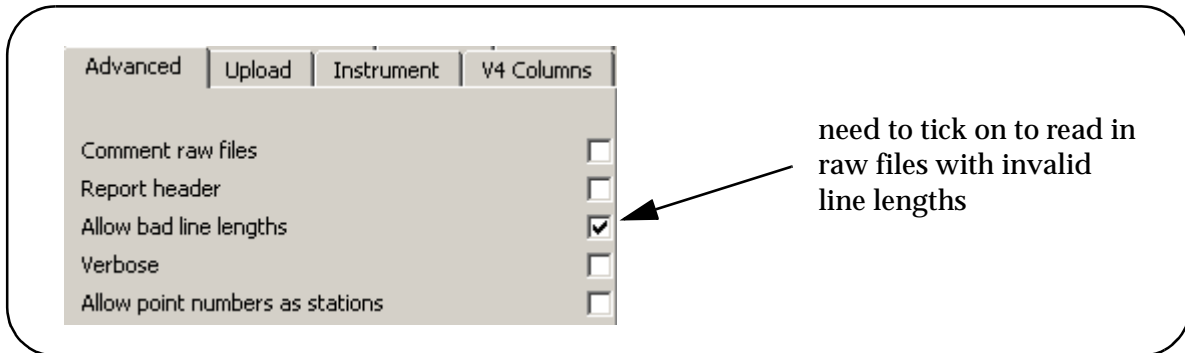
Some of the control codes defined for the *Sokkia String Feature* data collector that are used in the example are:

- * is used as the Command (Block) delimiter
- space is used as the comment delimiter
- S and E are used to start arc fitting and end arc fitting respectively
- R is the Rectangle (make a parallelogram) command
- the template commands XA, XB, XC and XD are used
- the invert I and obvert O commands are used.
- XN for the next segment to be non-tinable (that is, not a breakline).

The listing of the raw file 'Detail1.sdr' is now given, followed by a dump of a 12d Model view displaying the job. No mapping file has been used in the reduction so no line styles appear on

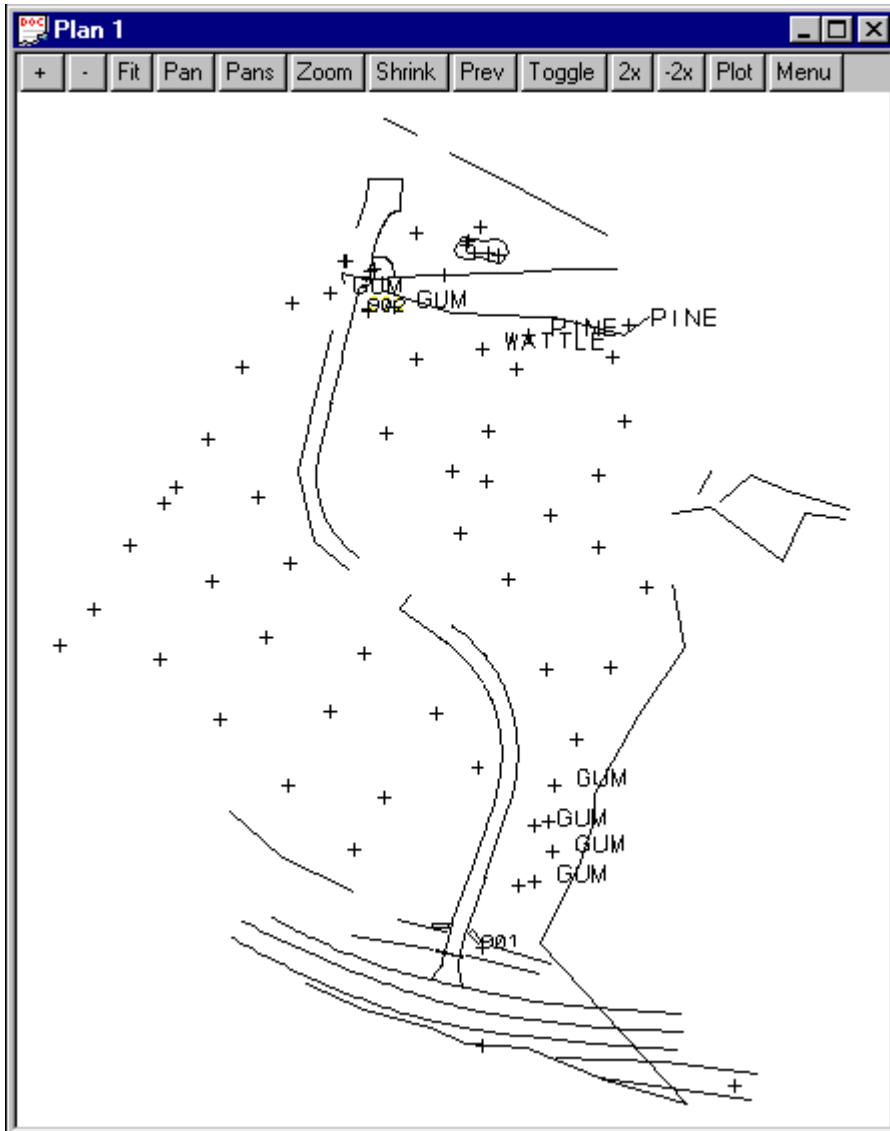
the view.

WARNING - The raw file 'Detail1.sdr' is in the Survey area of the training data but the file has been manually edited and if read in with the standard *Sokkia String Feature* data collector, will have bad line lengths and the data ignored. To read the file in, the *Allow bad line lengths* on the *Advanced* tab of the *Sokkia String Feature* data collector will need to be set before converting the raw file to a 12d field file.



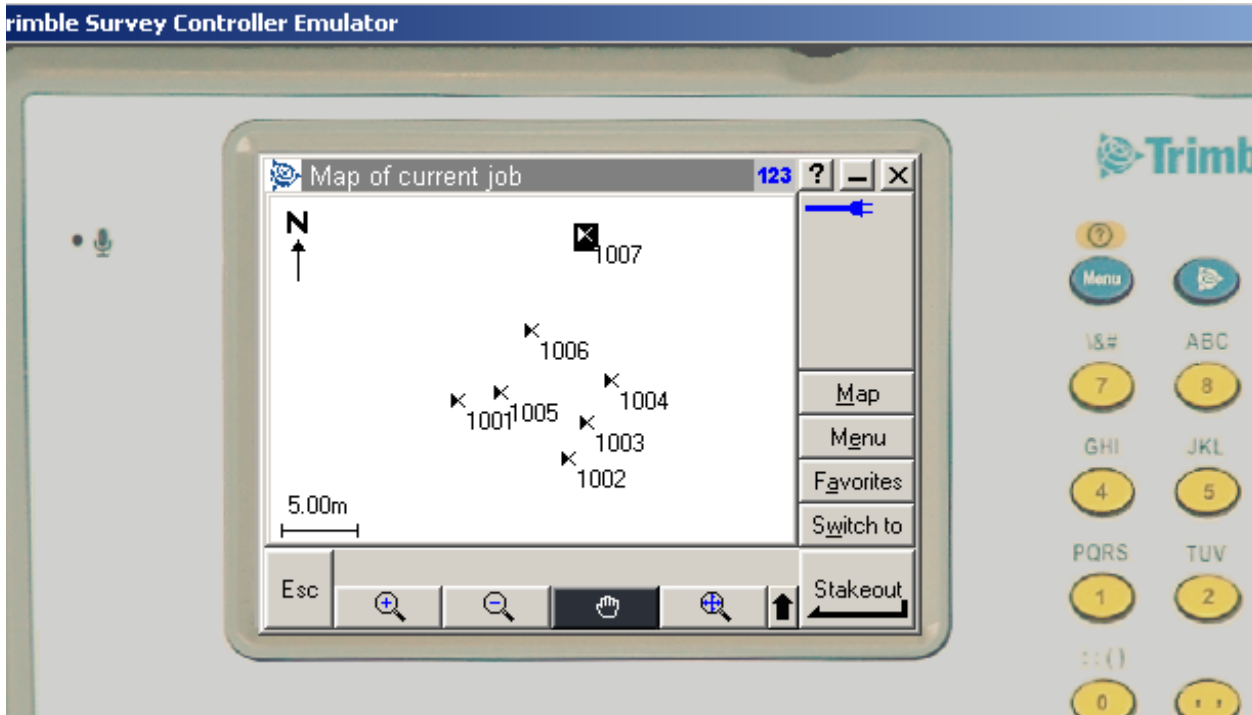
Description	Sokkia SDR 20 File
00 - SDR format	00NMSDR20 V03-05 03-Aug-00 09:00 111121 10NM1697 DETAIL 13CPSea level crn: N 13CPC and R crn: N 13CPAtmos crn: N 06NM1.00000000 13OOCcurrent view 13TS02-Aug-00 08:23 13JS10000 13TS02-Aug-00 08:25 01NM: 000000 00000031 0.00000000 13PCP.C. mm Applied: 0.000
02 - station details for pt 902	02TP09020982.770005096.700000115.7500001.7400000STN
02 - station details for pt 901	02TP09011000.000005000.000000100.000001.66500000STN
07 - back bearing from pt 901 to 902	07TP09010902349.895000349.895000
03 - target height	03NM1.44000000
check shot from pt 901 to pt 902	09F109011001099.43000081.0180555349.893611CHK902
measurement FC TBL SN 1 Pt 1003	09F109011003046.93700089.5425000119.69972201TBL
FC TBL SN 1 Pt 1003	09F109011004037.34200089.7522222125.31527701TBL 09F109011005026.44500089.9869444138.51611101TBL
FC BB SN 1 Pt 1006	09F109011006045.68200089.8705555114.79527702BB 09F109011007032.72000090.2769444122.23361102BB 09F109011008020.06200090.9736111147.16833302BB
FC ES SN 3 Pt 1009 start template	09F109011009033.47400090.0641666118.03777703ES*XA
FC CR SN 4 Pt 1010	09F109011010032.98200089.8936111113.25027704CR
FC ES SN 5 Pt 1011	09F109011011031.88200090.0369444108.80138805ES
start using template in zig mode	09F109011012022.46200090.2811111130.749722XB
using template	09F109011013021.56900090.1400000124.623055 09F109011014019.30400090.5197222118.459722 09F109011015011.35800091.0744444136.851388S 09F109011016013.58000090.5797222144.980000S 09F109011017015.06100090.5494444154.349722S 09F109011018012.79200090.7638888201.297500 09F10901101909.757000091.1033333201.376944
pause template - meas FC PP SN 0	09F109011110043.58500089.6561111118.780000PP*XD
continue with template	09F10901102006.659000092.5538888198.245000XE
start arc through 3 points	09F109011021014.70100091.2202777256.936111S
start arc through 3 points	09F109011022015.55300090.8763888248.602222S
start arc through 3 points	09F109011023018.16300090.6650000240.646111S 09F109011024027.42900090.5169444260.969444 09F109011025025.37600090.5413888266.748055 09F109011026026.05000090.6897222272.995833
end arc through 3 points	09F109011027032.16700090.5105555277.837500E
end arc through 3 points	09F109011028036.58100090.2566666276.025833E
end arc, stop template	09F109011029038.06400090.1986111272.082777E*XC
FC BB SN 6 Pt 1030	09F109011030019.76600091.8072222275.24777706BB 09F10901103107.245000093.9725000266.13777706BB
FC SWUG SN 7 Pt 1032 obv 0.225 dia	09F10901103207.044000094.6780555265.51250007SWUG*O.225
FC SWUG SN 7 Pt 1033 invert meas	09F10901103303.441000097.8750000242.44805507SWUG*I
FC BB SN 8 Pt 1034	09F10901103402.973000099.2075000239.99916608BB 09F10901103509.678000092.9816666114.81555508BB 09F109011036010.50700090.6511111104.50611109TBR 09F10901103701.155000095.167500082.357777809TBR 09F10901103805.969000090.5472222291.73500010TBR 09F109011039013.82100090.8102777288.00027710TBR
FC WA SN 11 Pt 1040	09F10901104008.206000091.0138888290.96333311WA 09F10901104108.476000091.0427777293.60750011WA

FC WA SN 11 Pt 1042	09F10901104206.213000089.7200000305.83194411WA
FC WA SN 11 Pt 1043- close string	09F10901104306.116000090.3575000300.03777711WA*C
FC WA SN 12 Pt 1044	09F10901104403.100000090.0911111314.07277712WA
FC WA SN 12 Pt 1045	09F10901104502.970000089.6530555327.17166612WA
FC WA SN 12 Pt 1046 - create rect	09F10901104600.760000099.5219444351.28472212WA*R
FC PL SN 13 Pt 1048	09F109011048027.45200090.7930555258.30333313PL
omit part of file	.omit part of file
FC TBL SN 21 Pt 1103	09F109011103021.21900088.8433333293.5322221TBL
FC TR0306 SN 0 - comment GUM	09F109011105012.69000087.209444438.3036111TR0306 GUM
FC TR0309 SN 0 - comment GUM	09F109011106017.95900086.573333336.3436111TR0309 GUM
FC TR0306 SN 0 - comment GUM	09F109011107019.97400086.607777723.2163889TR0306 GUM
FC TR0309 SN 0 - comment GUM	09F109011108026.78400086.450833323.7155556TR0309 GUM
FC TR0308 SN 0 - comment GUM	09F109011109027.38900085.6861111358.734166TR0608 GUM
02 - station details pt 902	02TP09020982.770005096.710000115.7500001.7100000STN
07 - back bearing from pt 902 to 901	07TP090209010169.895000169.895000
03 - target height	03NM1.440000000
check measurement to pt 901	09F109021201099.43000099.2611111169.893611CHK901
FN DW SN 21 Pt 1202	09F109021202038.369000100.2900000182.1266621DW*S
FC DW SN 21 Pt 1203	09F109021203033.80100099.7461111190.31638821DW
omit part of file	.omit part of file
FC FE SN 25 Pt 1346 - non tin segm	09F10902134604.867000085.22555555.8144444025FE*XN
FC FE SN 25 Pt 1347	09F109021347010.66400085.510000060.870277825FE
.omit part of file	.omit part of file
Pt 2135 FC DW SN 25 start arc	09F10902135708.003000085.01361113.5244444027DW*S*28WA
and also FC WA SN 28	
	.omit to end of file



**Plan View with of the Reduced Sokkia Data Displayed
Note that no linestyles or symbols have been turned on.**

C 12d and the Trimble Total Station ACU



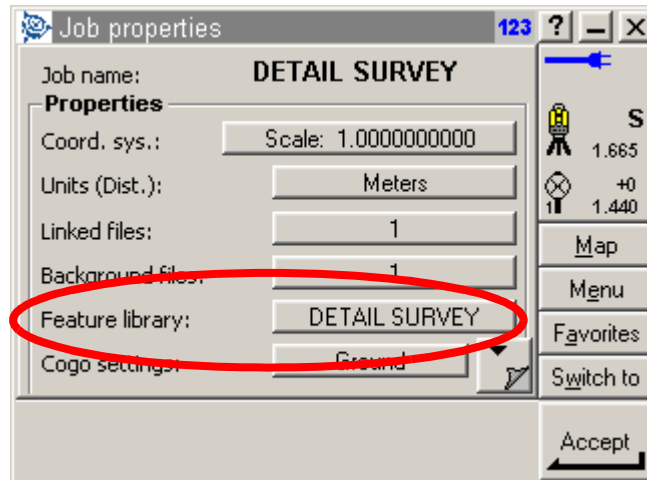
This Section deals with interfacing 12d with the Trimble Total Station ACU unit data formats

These notes are not meant to take the place of the operations manuals for the Trimble ACU but rather to act as a guide for ensuring the correct file types are used between the two systems.

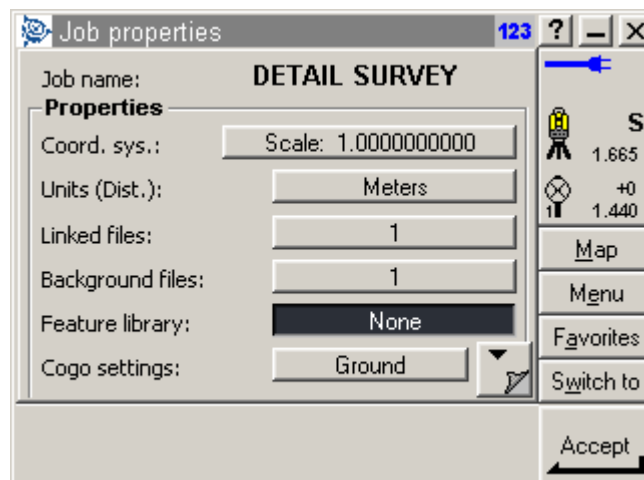
Coding

On the ACU the user can either manually type in a code for field readings or use a code library to pre-define codes which can then be selected from a list

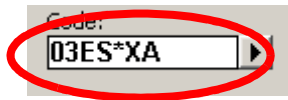
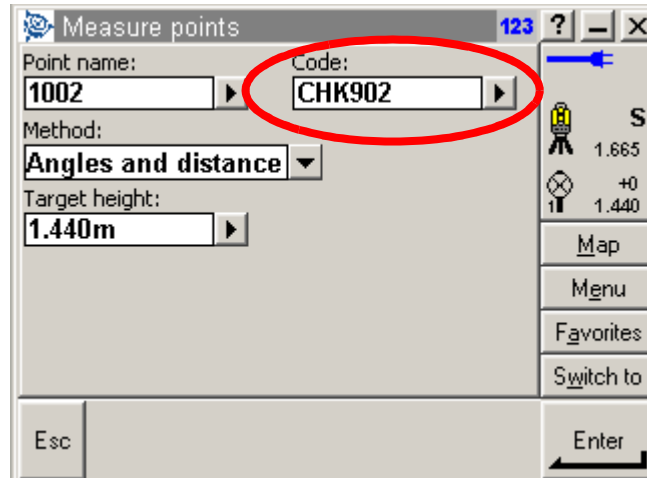
To use a code library the user should select the relevant library when creating the job



If using string numbers the Feature library can be set to *None* and the string number, feature code, field code and delimiters can be manually typed in



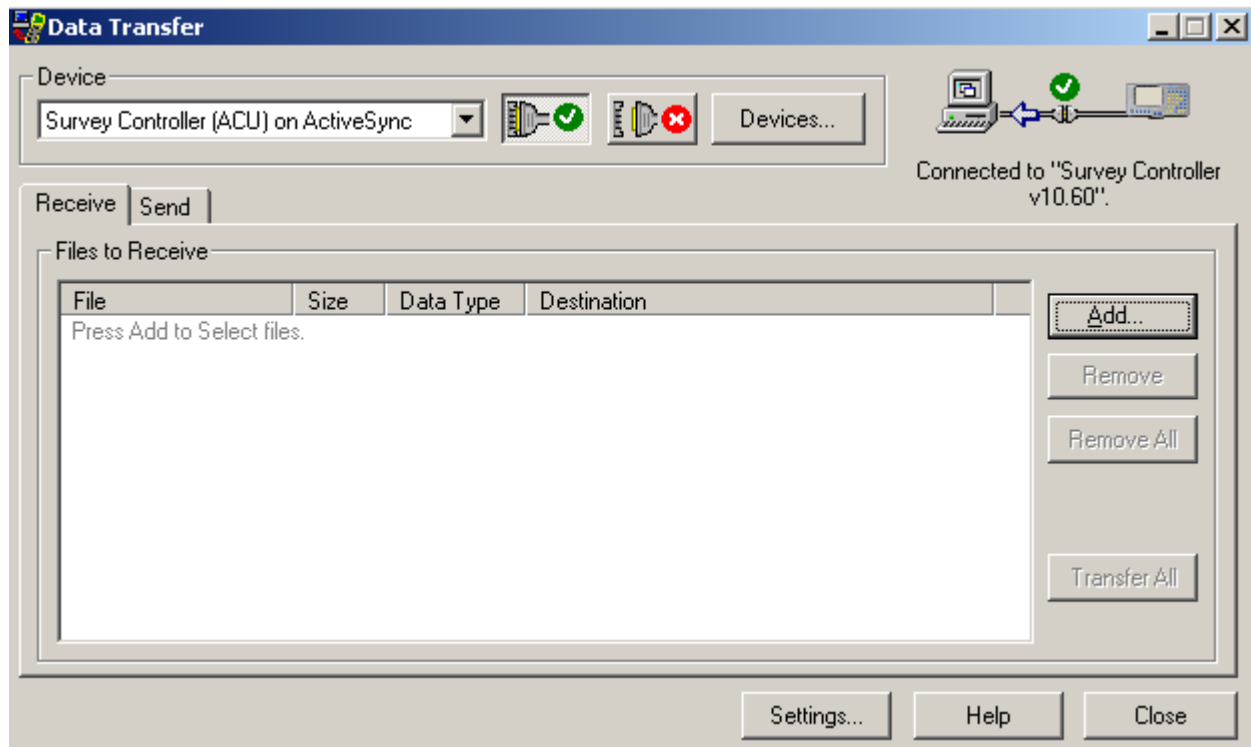
Codes are typed in to the ACU in the **MEASURE POINTS** option



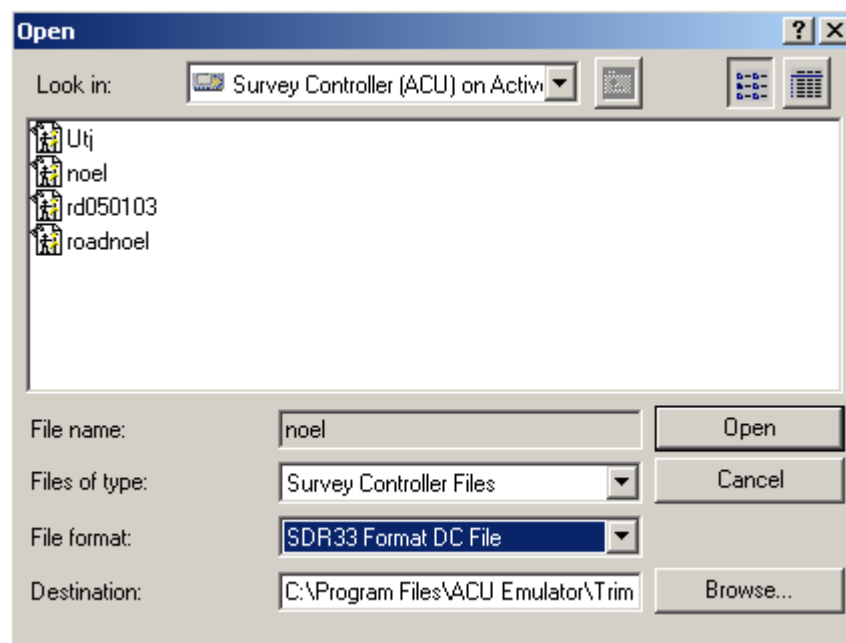
Sending Raw file to 12d

The raw file can be transferred from the ACU as a format similar to the SDR33. This is called the **SDR33 DC** file format.

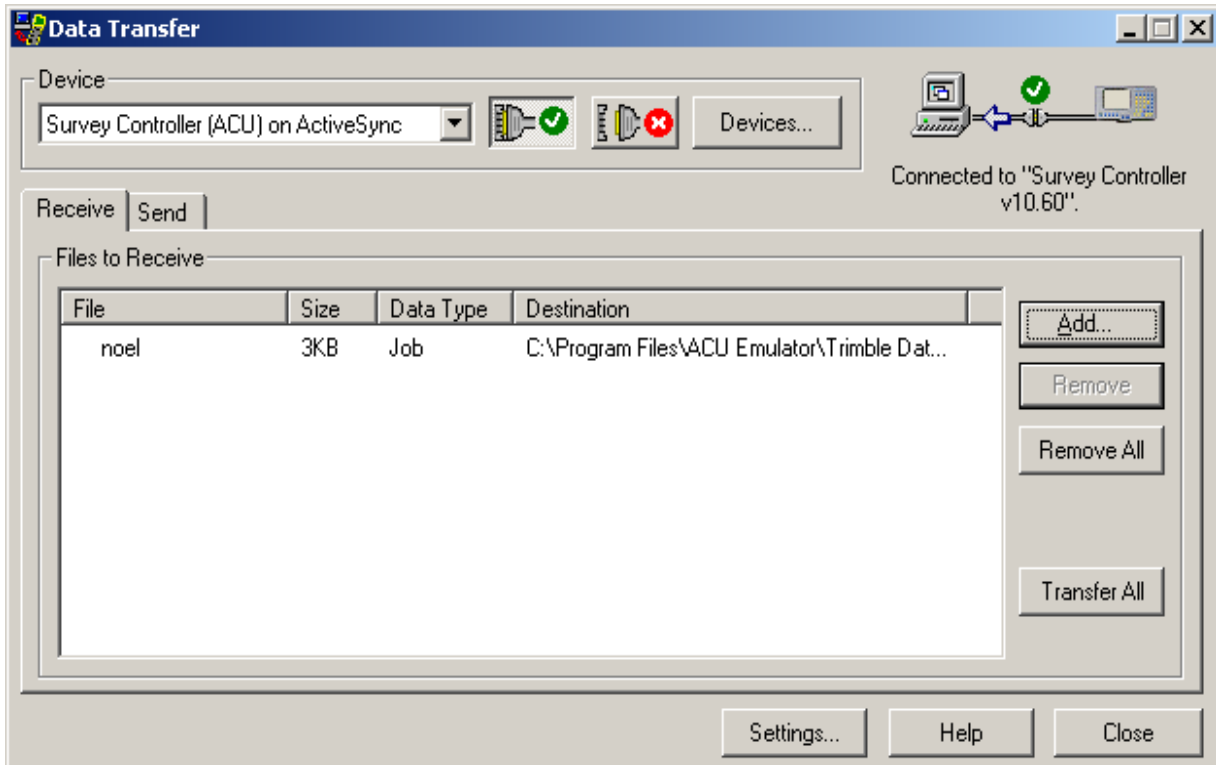
Connect the ACU to the PC using **TRIMBLE DATA TRANSFER**



Select **Receive** tab then select **Add**



Select the Job to download using the format **SDR33 FORMAT DC FILE**



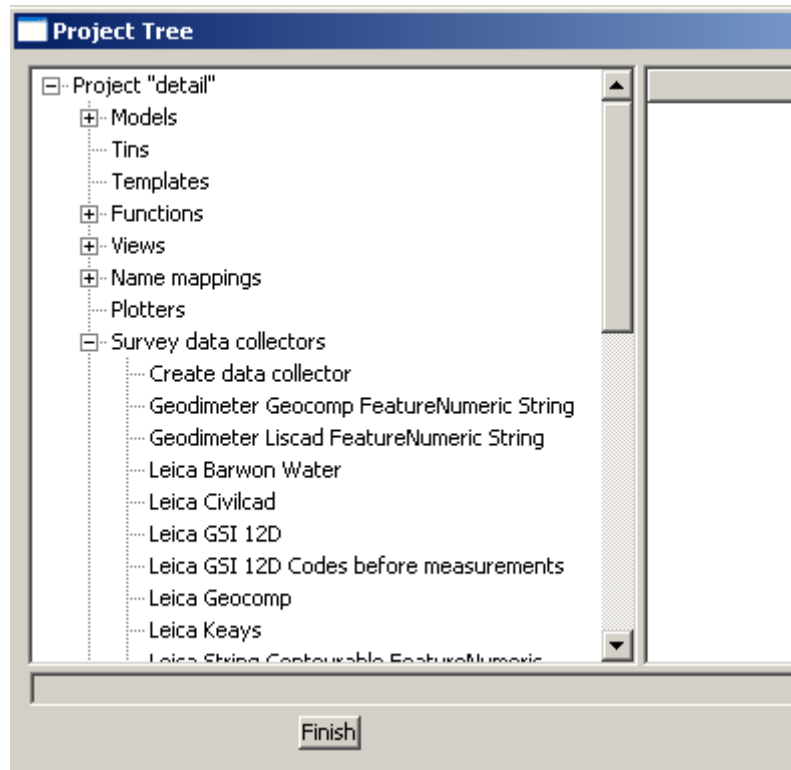
Select **Transfer All** to transfer the file

Converting raw file to field file

Create new data collector type

We will create a specific name for the Trimble data collector even though it is similar to the SDR33 format

Select **Project=>Browse**



Select the Survey data collectors branch

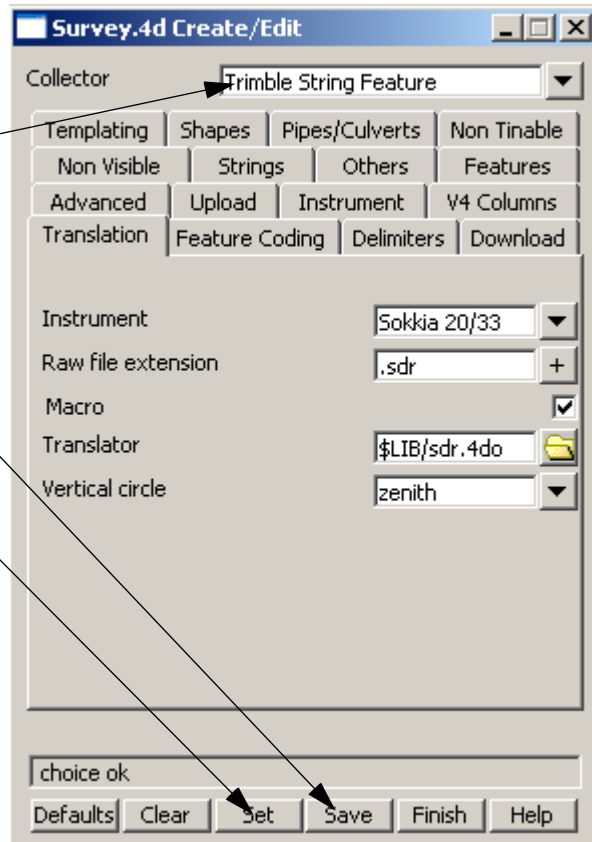
Double click on **Sokkia String Feature**

- Sokkia Keays
- Sokkia SDRMap Emulation
- Sokkia String Contourable Feature
- Sokkia String Feature
- Topcon FC5 Feature String
- Topcon GT700 Feature String
- Ubisut

This loads up the default parameters for the SDR33 format.

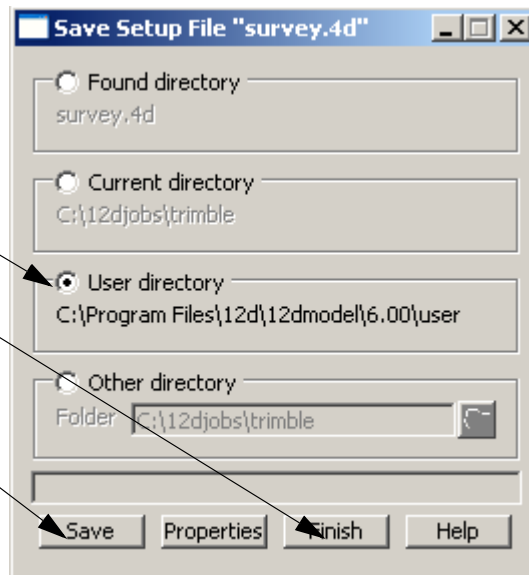
Type in the new name **Trimble String Feature**

Select **Set** then **Save**



Select **User directory**

Select **Save** then **Finish**

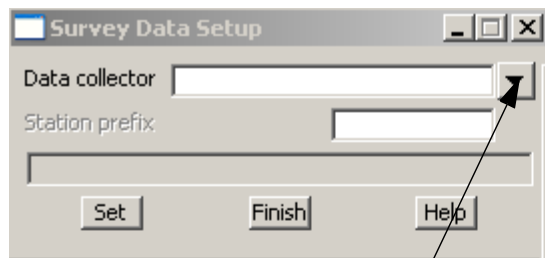


Select **Finish** back in the previous panel

To set the changes the project has to be restarted by selecting **Project=>Restart**

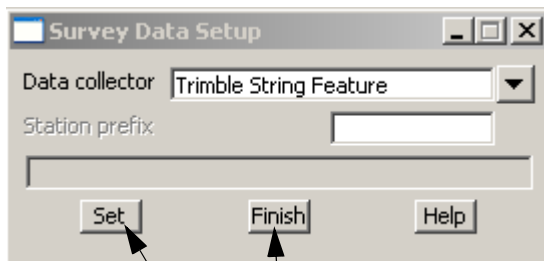
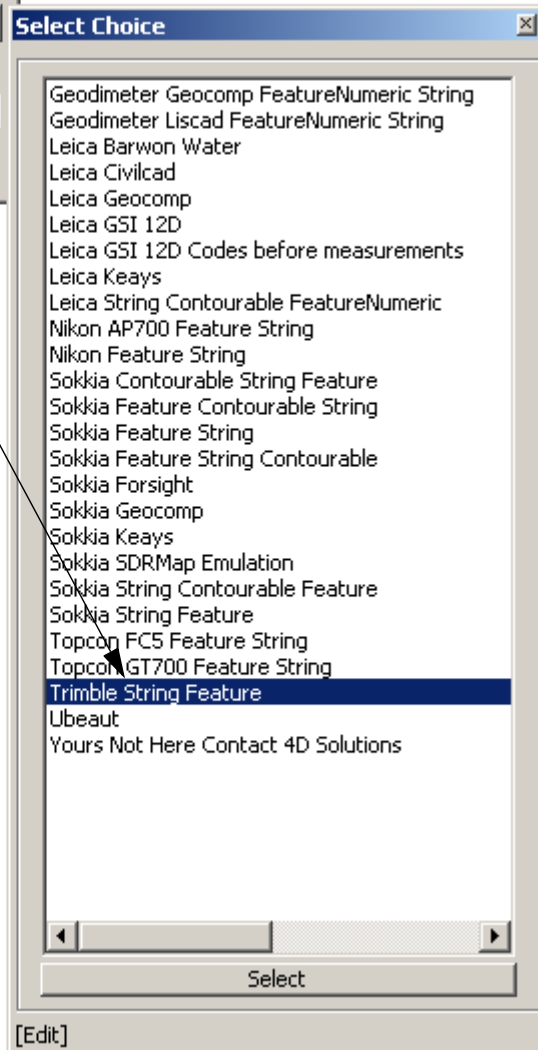
Select the data collector type

Select option *Survey=>Setup*



Select the **Data collector** choice icon

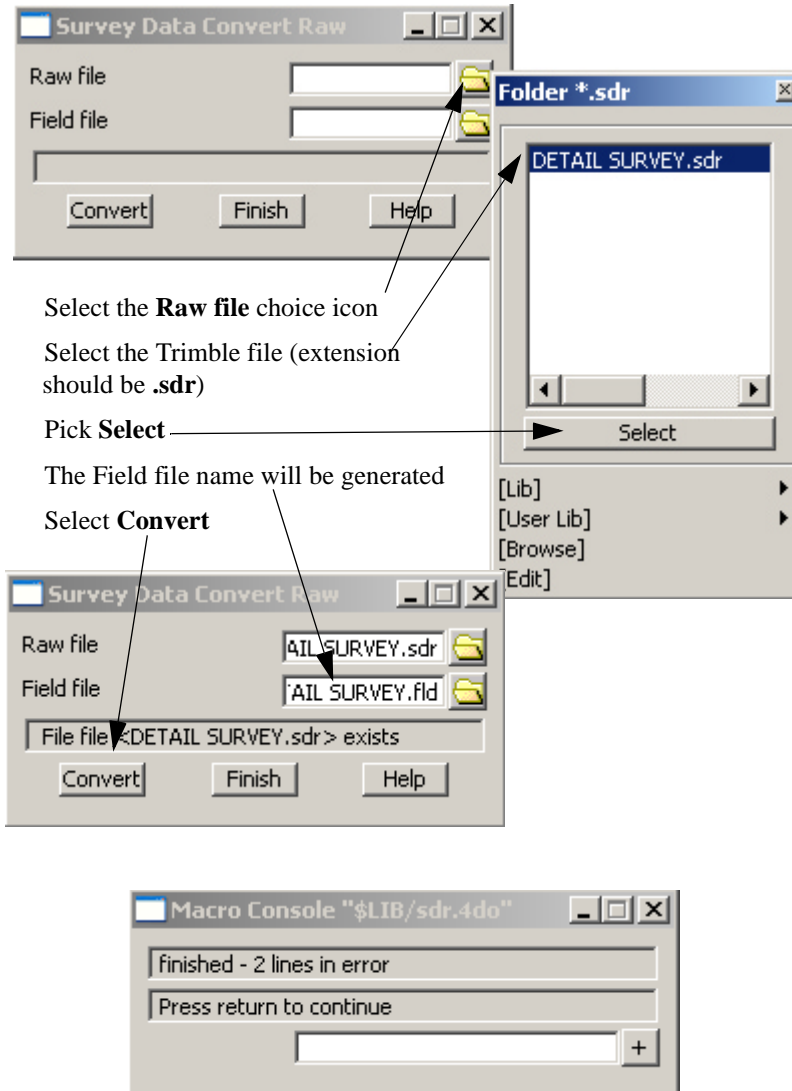
Double click on **Trimble String Feature**



Select **Set** then **Finish**

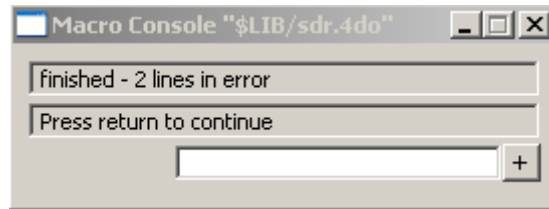
Convert raw file

To convert raw file to field file select option *Survey=>Convert raw*

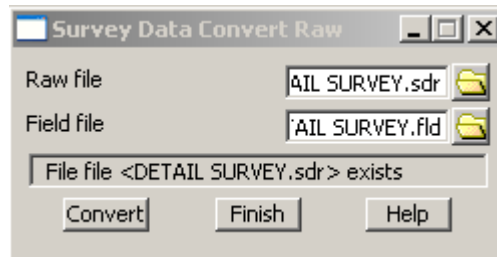


Any errors can be listed by opening the Output window using option *Window=>Output Window*

```
format = sdr33
Line 7 command not implimented <05NM          >
Line 8 non supported derivation code <02      901  5000.0000000000001000.000000000001(
Line 14 command not implimented <05NM        >
Line 15 non supported derivation code <02     901  5000.0000000000001000.000000000001
```



Close the Error panel



Select **Finish**

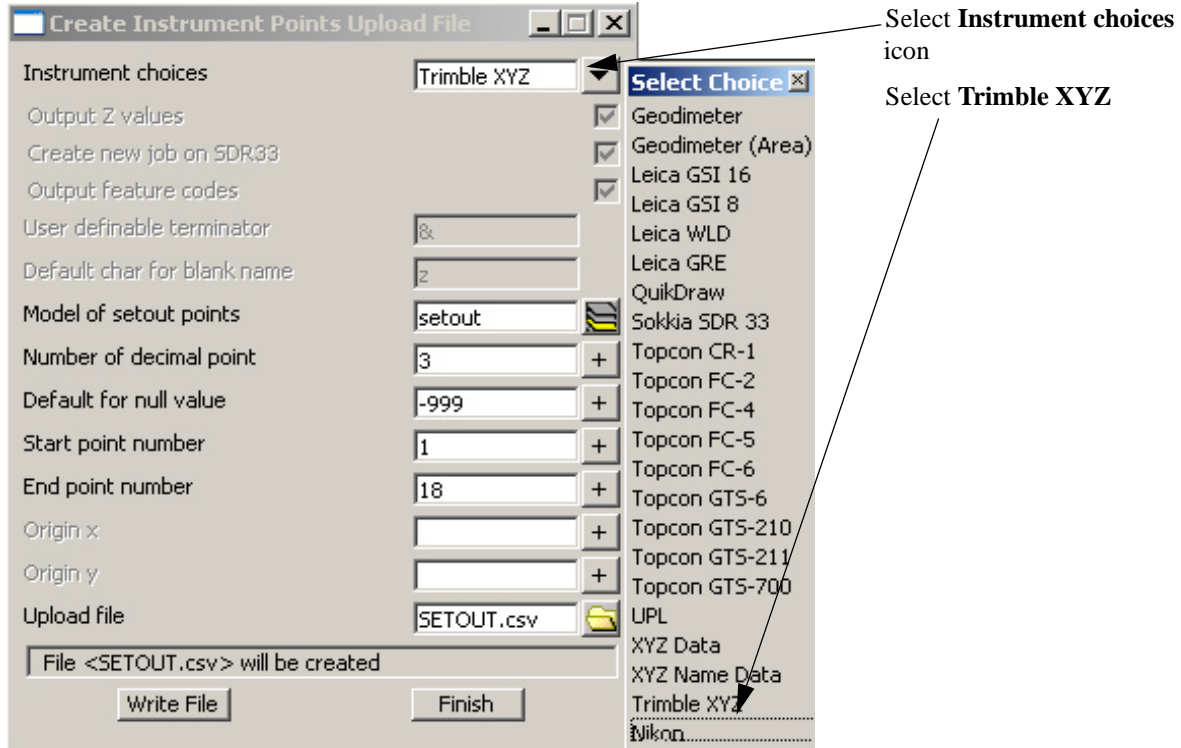
The field file can now be reduced in the normal manner

Creating point upload file

Create upload file in 12d

After creating the setout points an upload file has to be created for the trimble format

Select option *Survey=>Upload=>Create points upload file*



Fill in the rest of the screen as per normal

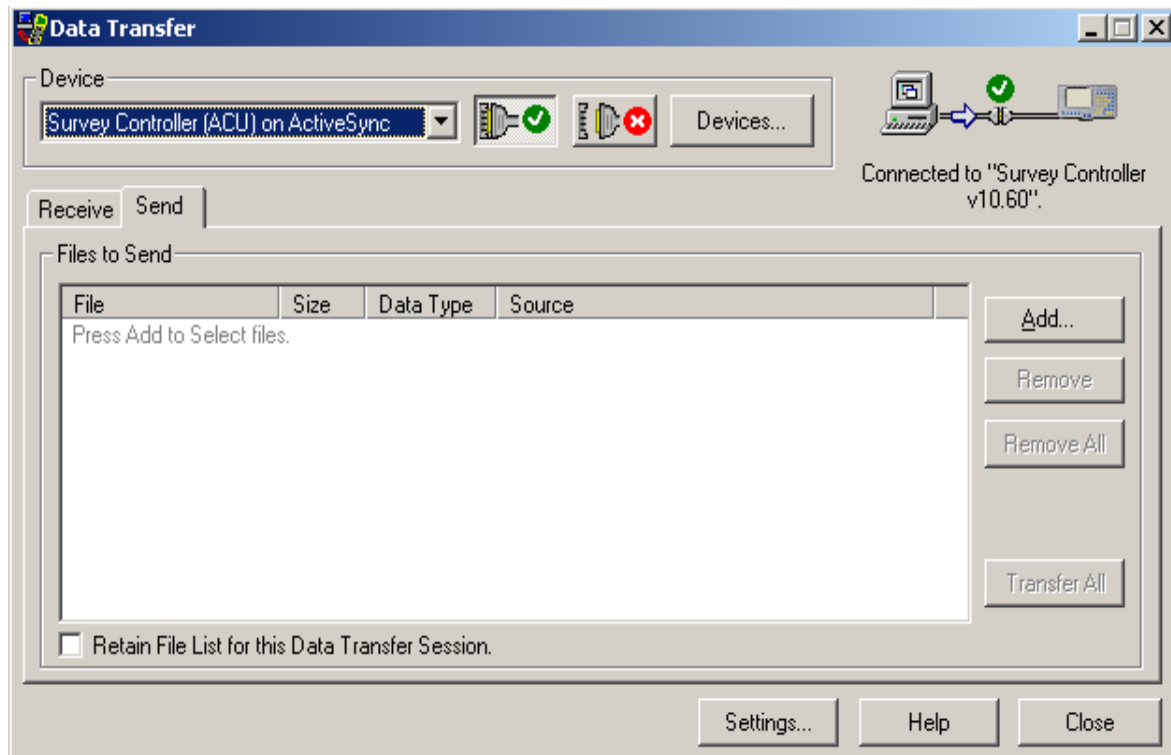
Select **Write File**

A standard comma delimited file is created ready to send to the ACU

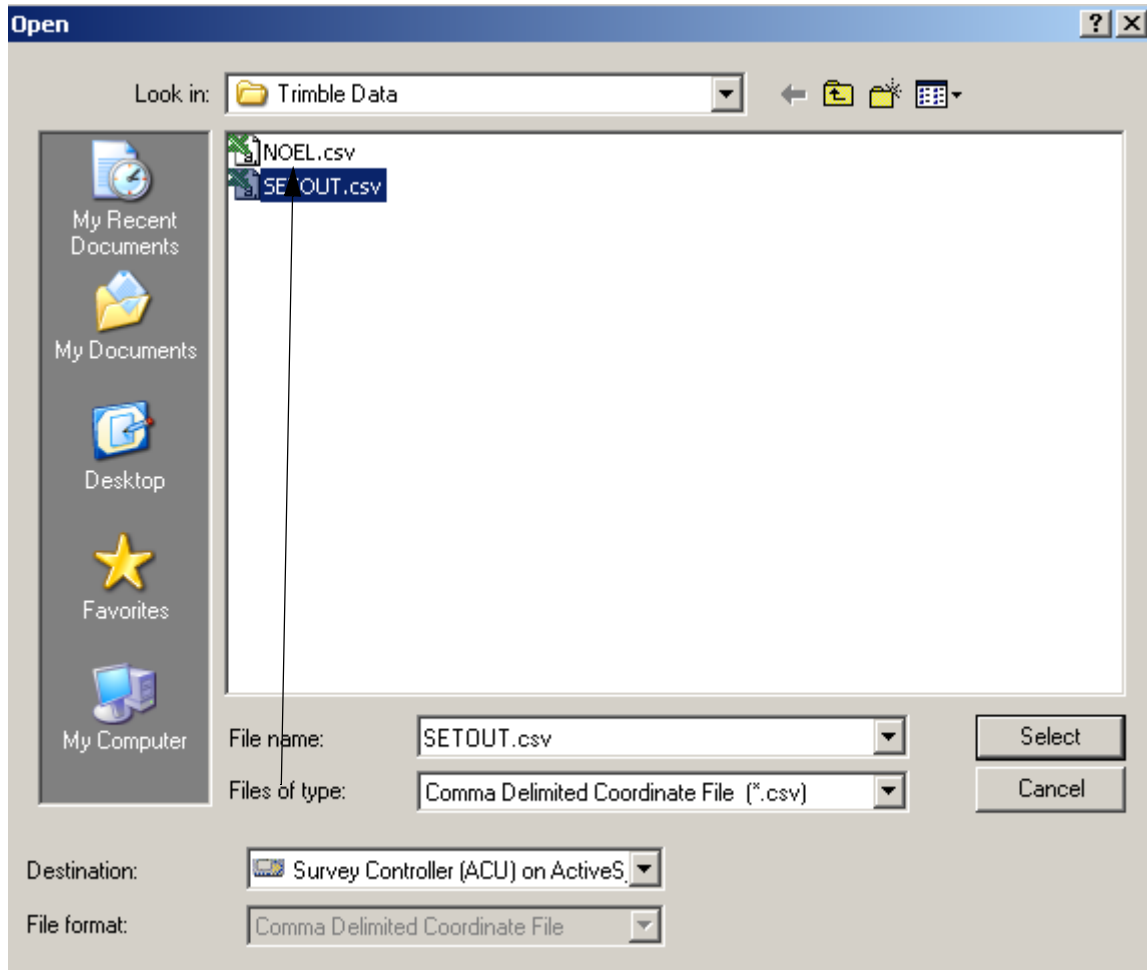
Loading file into job in ACU

The points upload file can be transferred to the ACU for setout.

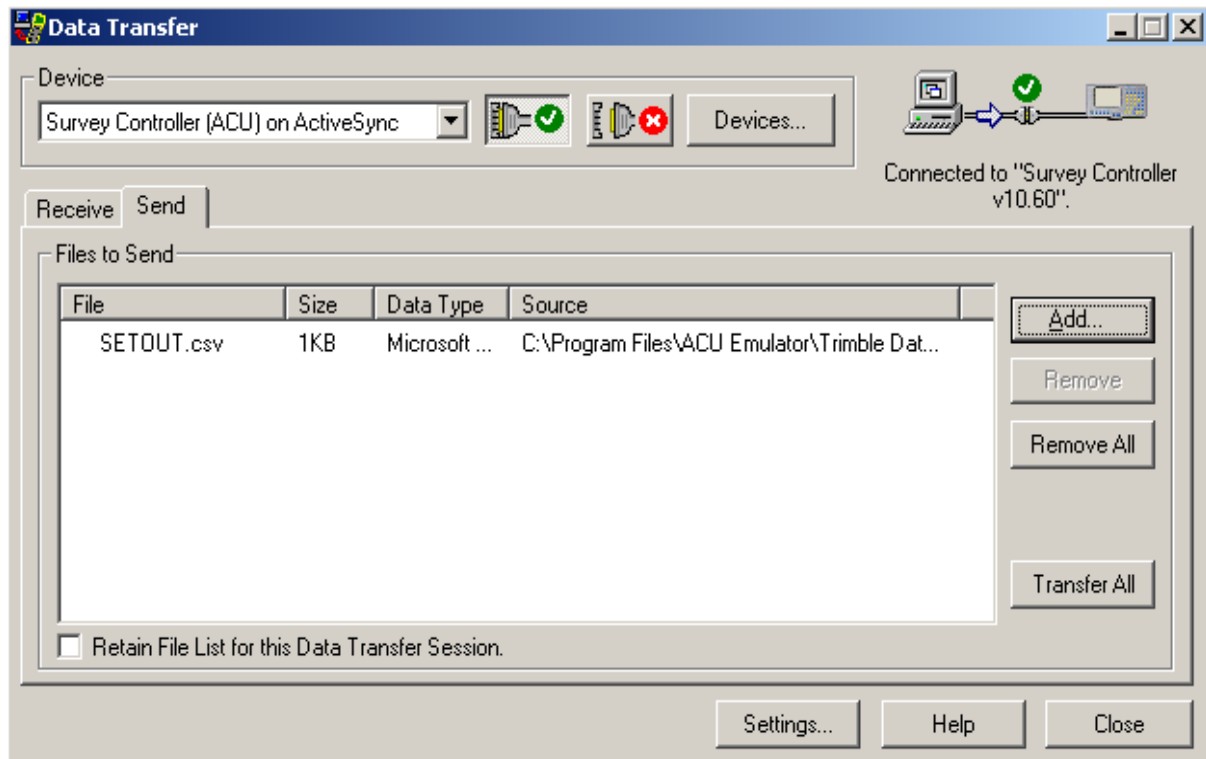
Connect the ACU to the PC using **TRIMBLE DATA TRANSFER**



Select **Send** tab then select **Add**

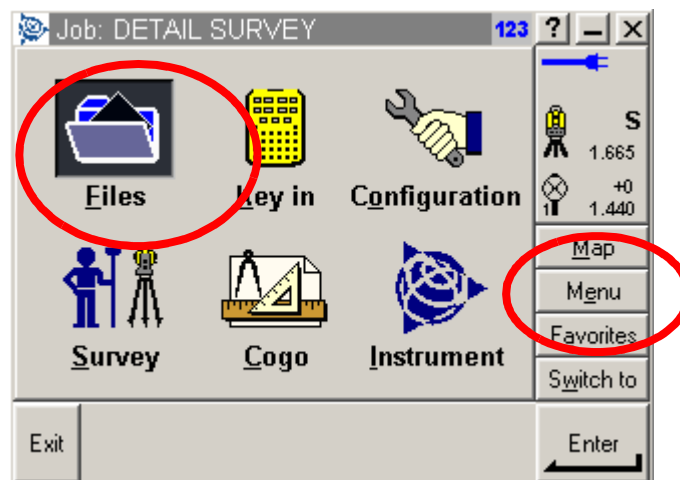


Select the file to upload using format *Comma delimited coordinate file*

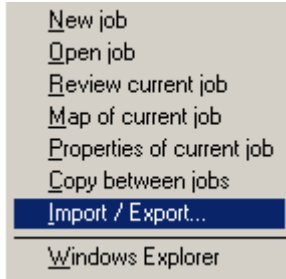


Select *Transfer All* to transfer the file

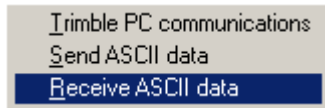
To load the file into the current job on the ACU select *Menu=>Files*



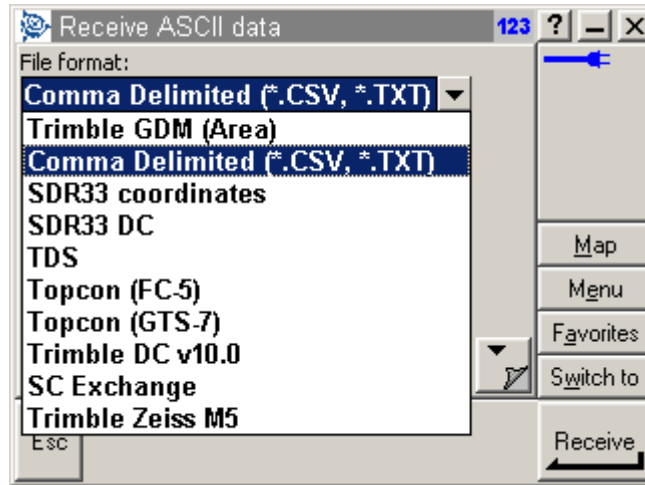
Select *Import / Export*



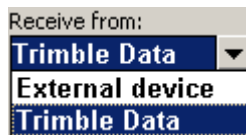
Select **Receive ASCII data**



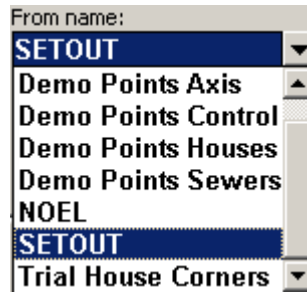
Select **File format** choice icon then pick **Comma Delimited (*.CSV, *.TXT)**



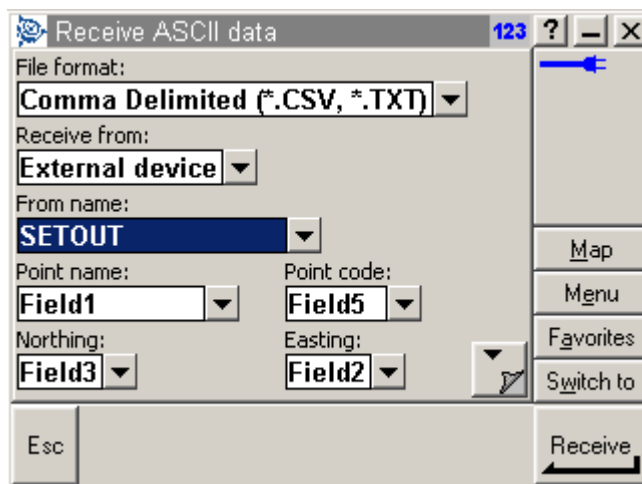
Select **Receive from** choice icon and pick **Trimble Data**



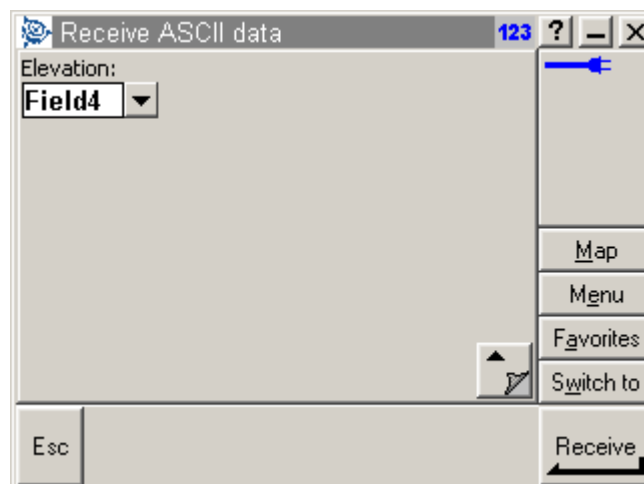
Select **From file** choice icon and select file



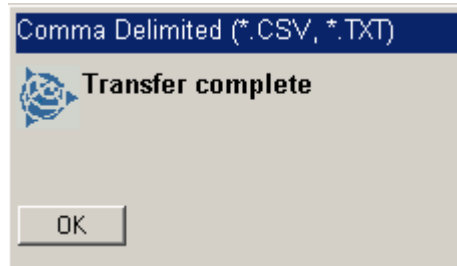
Select the field order for the file as (1) Point number, (2) Easting, (3) Northing, (4) Level and (5) Code



Select the **Next page** icon

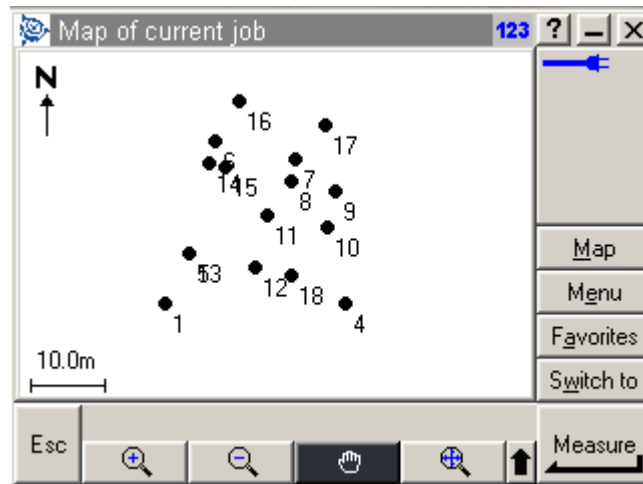


Select **Receive**



Select **OK** to finish

The points can be displayed by selecting **Map** and zooming all of the job

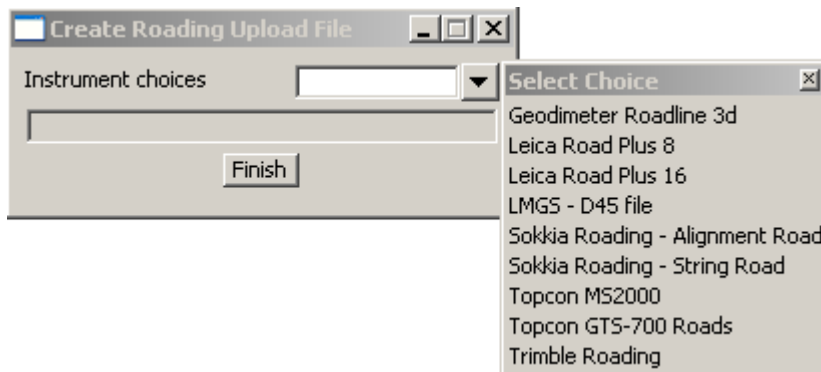


Create Roads upload file

Create upload file in 12d

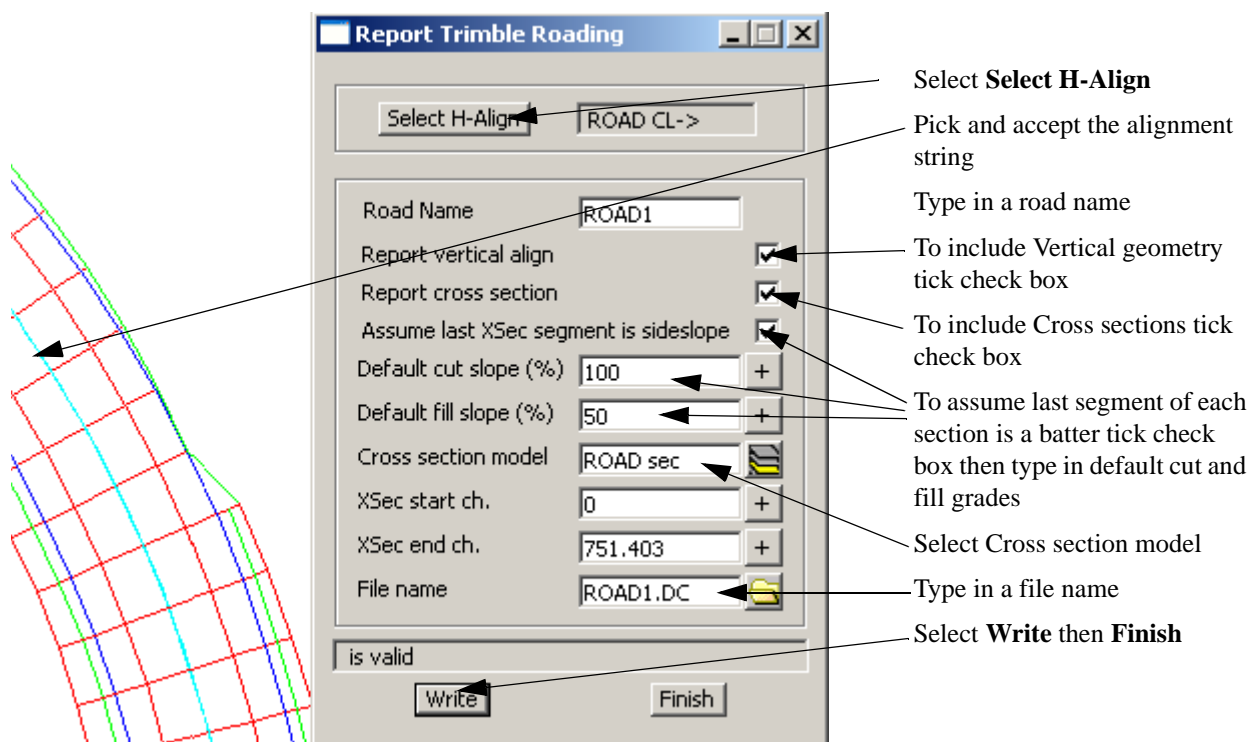
After creating the road alignment an upload file has to be created for the trimble format

Select option *Survey=>Upload=>Create roads upload file*



Select **Instrument** choice icon

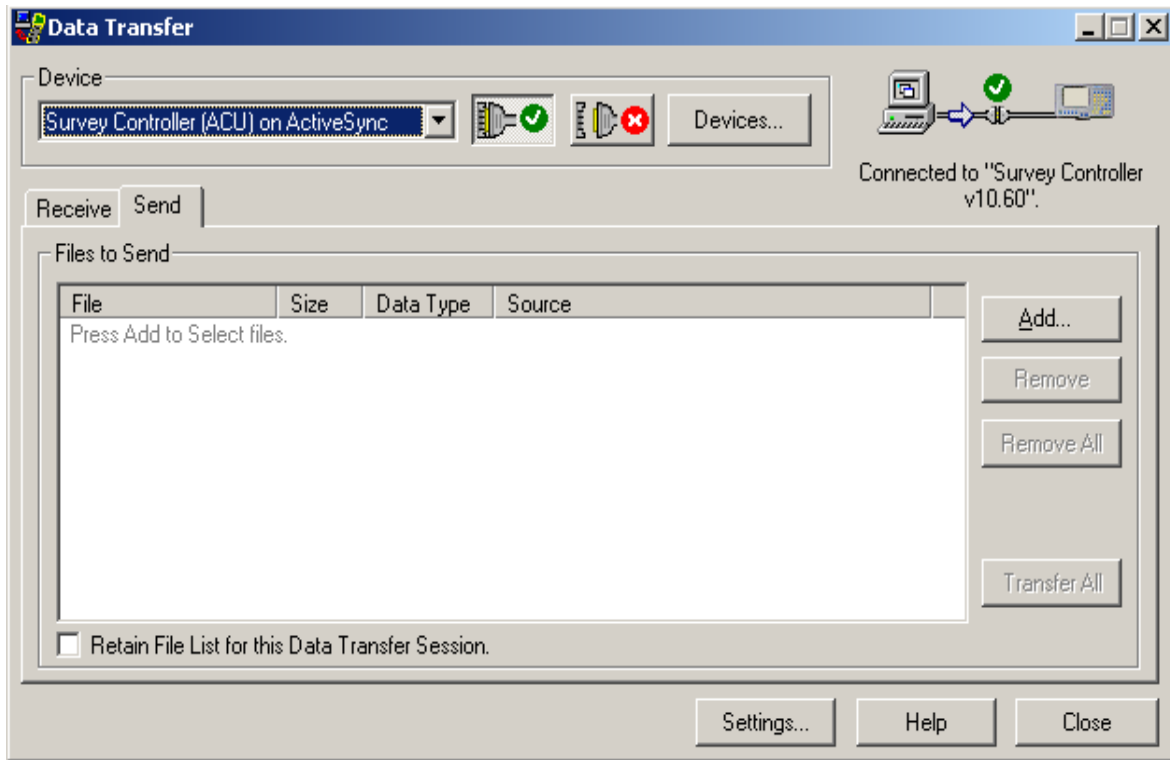
Select **Trimble Roding**



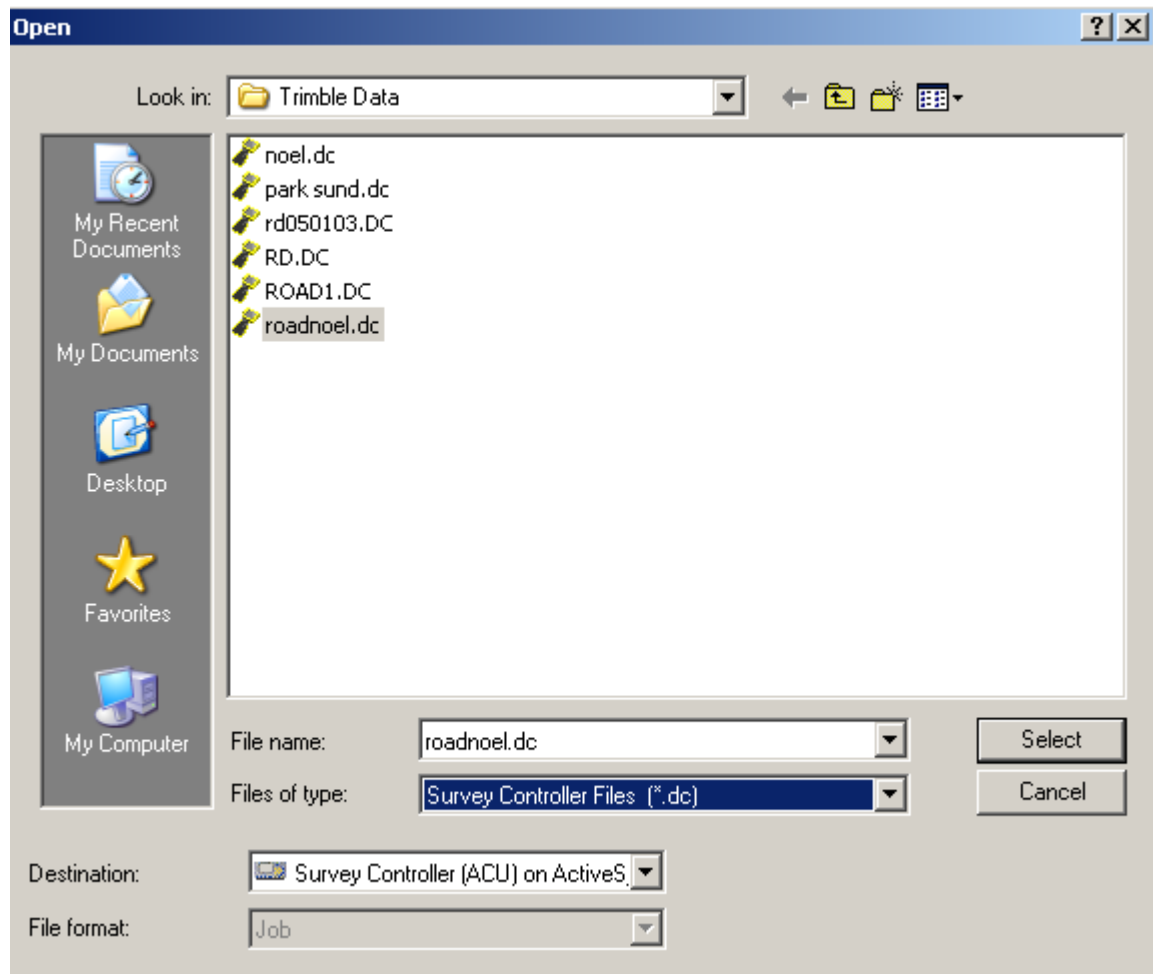
Loading file to the ACU

The road upload file can be transferred to the ACU for setout.

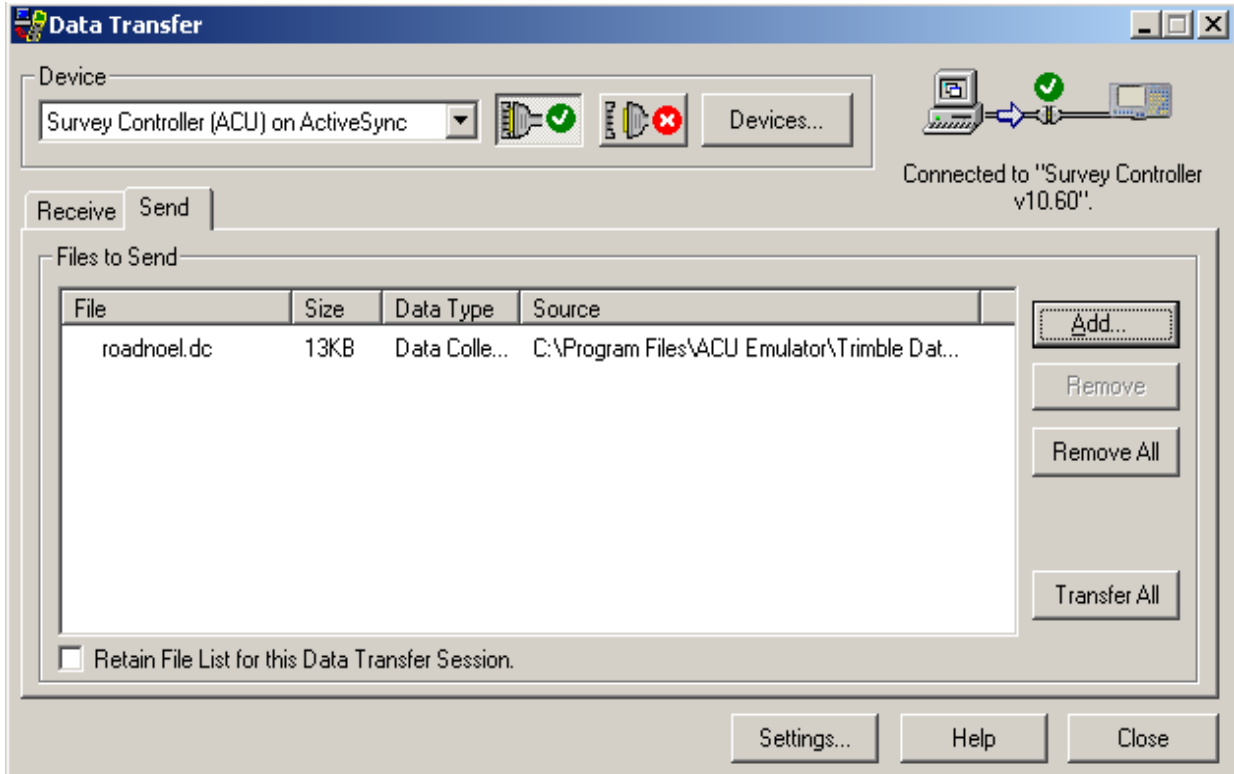
Connect the ACU to the PC using **TRIMBLE DATA TRANSFER**



Select **Send** tab then select **Add**

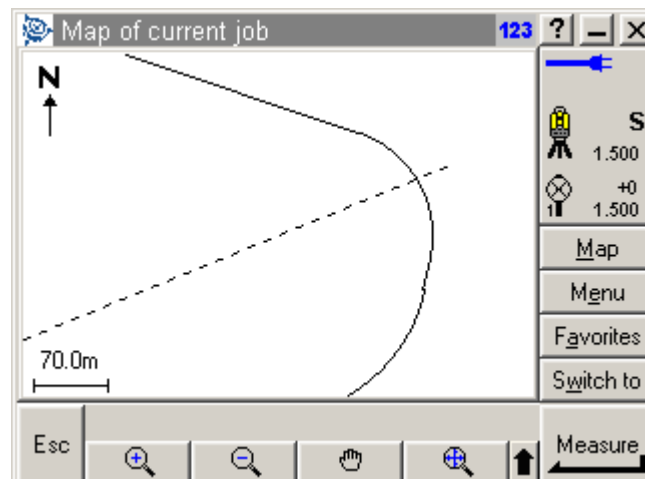


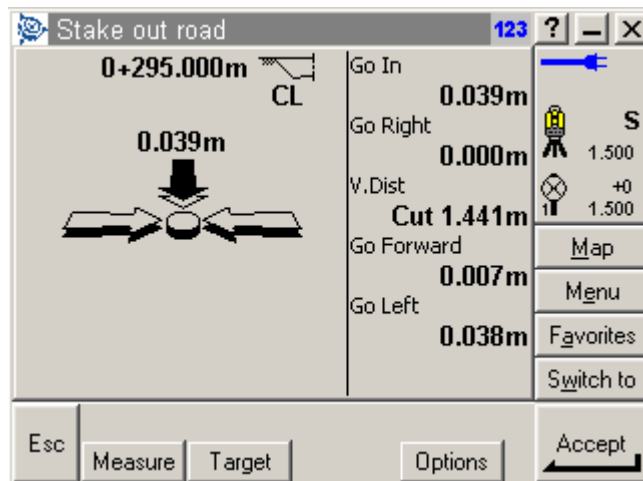
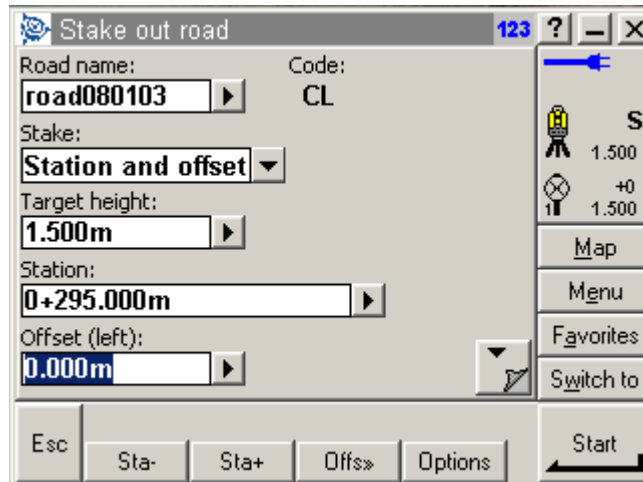
Select the road file to upload using format *Survey Controller file*



Select **Transfer All** to transfer the file

Once the road file has been copied into the ACU it can be setout using option **Survey=>Stakeout=>Roads**



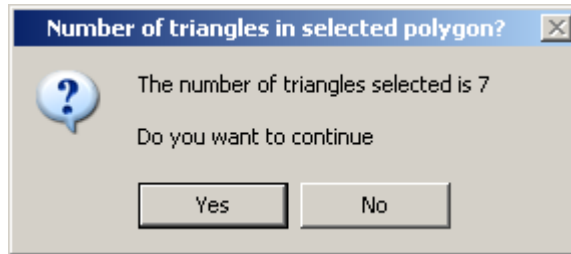
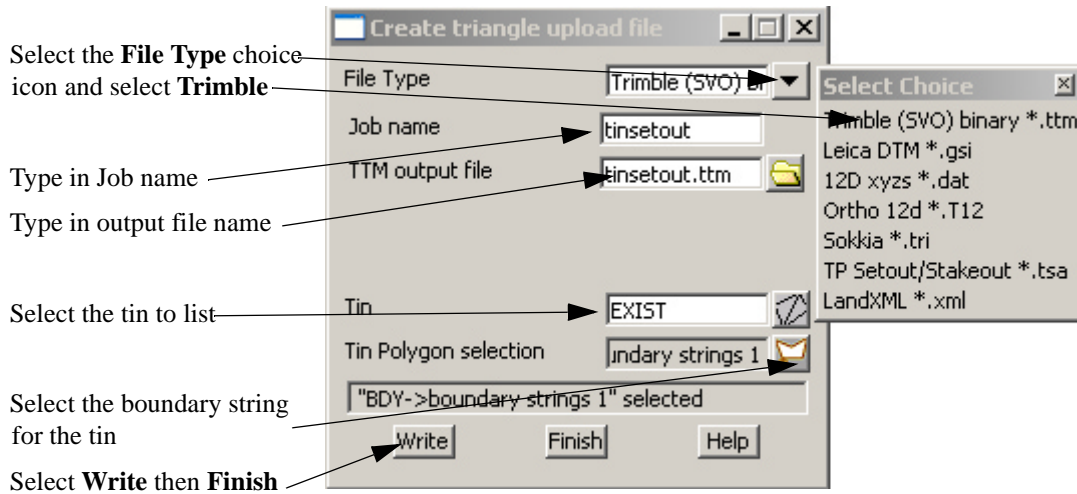


Create Tin upload file

Create upload file in 12d

After creating the triangulation an upload file has to be created for the trimble format

Select option *Survey=>Upload=>Create triangle upload file*

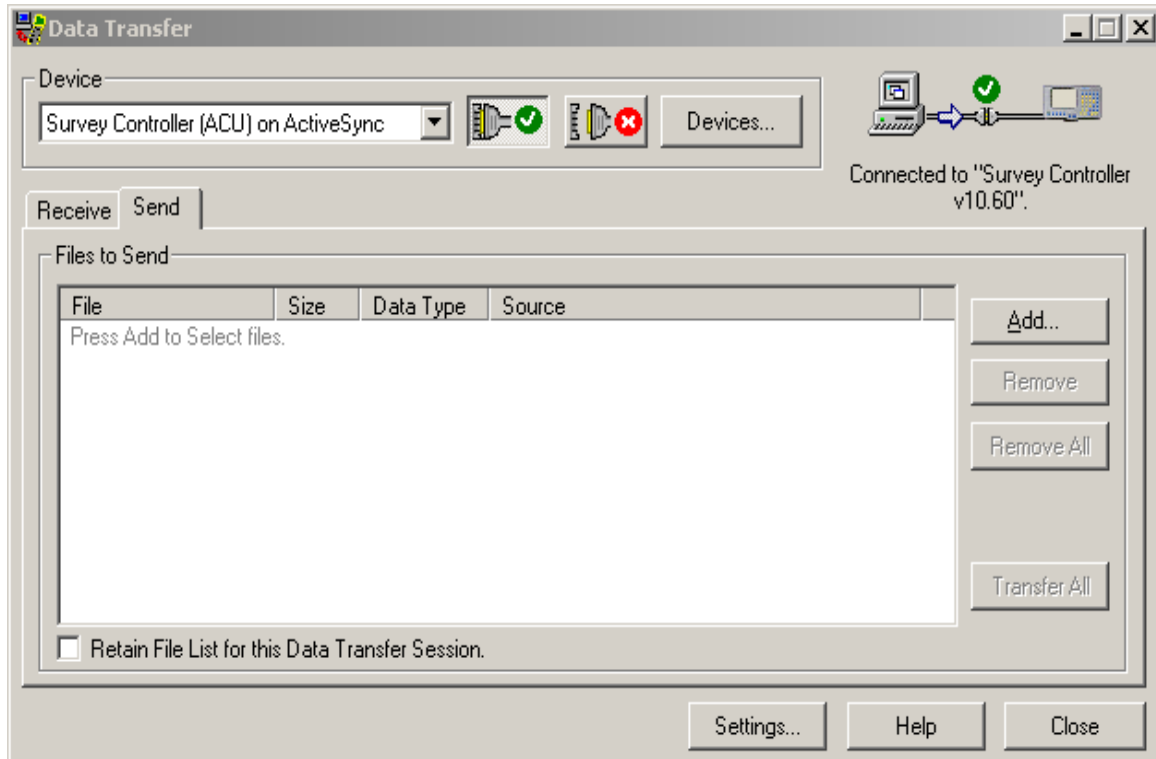


Select **Yes** to create the file

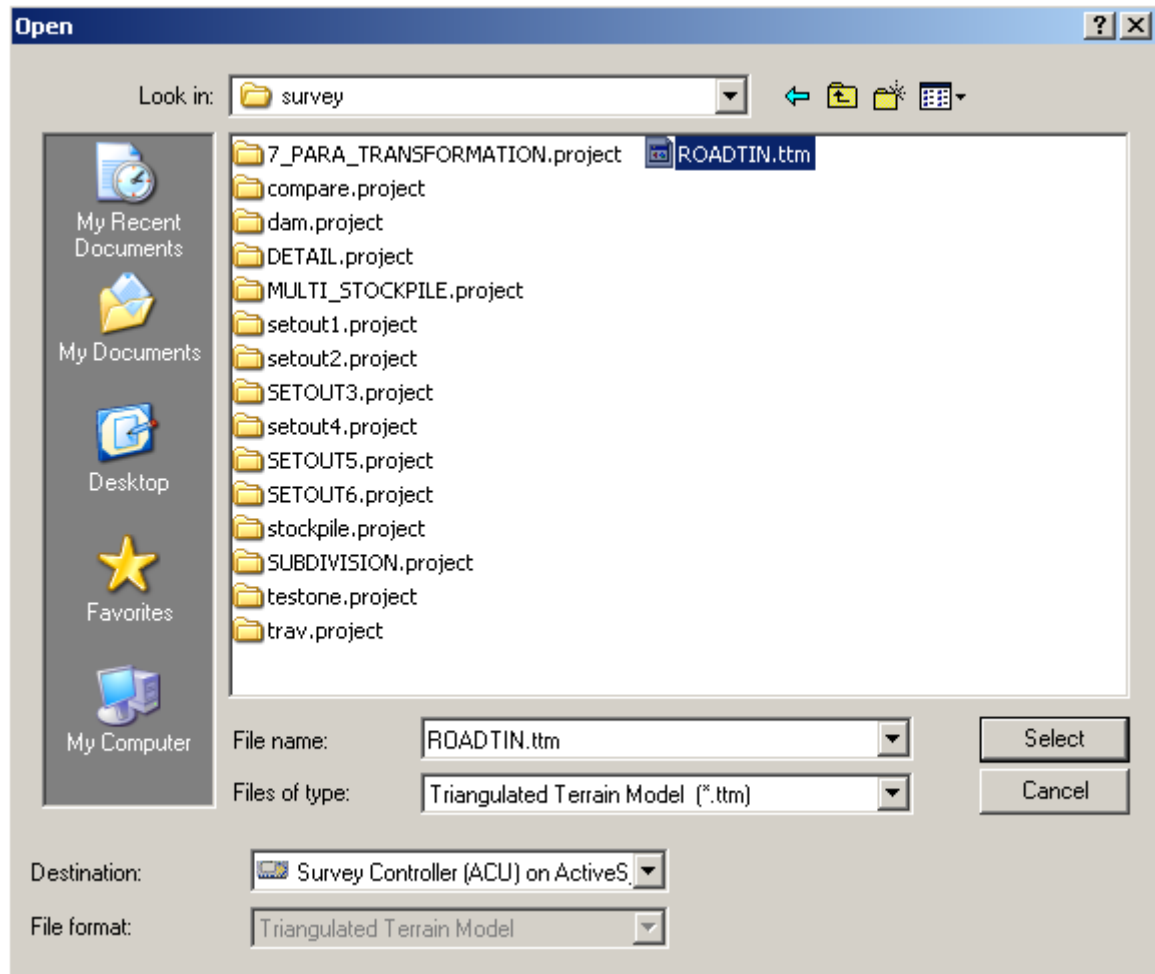
Loading and using the file in the ACU

The tin upload file can be transferred to the ACU for setout.

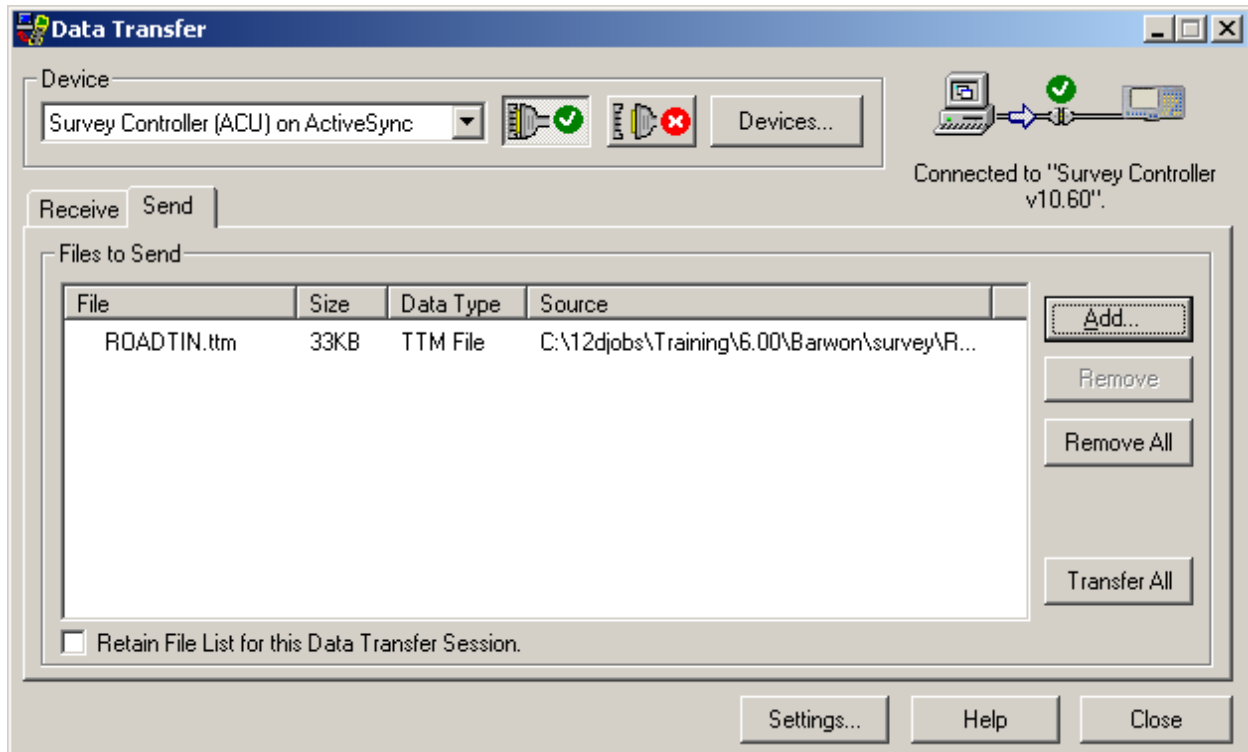
Connect the ACU to the PC using **TRIMBLE DATA TRANSFER**



Select **Send** tab then select **Add**

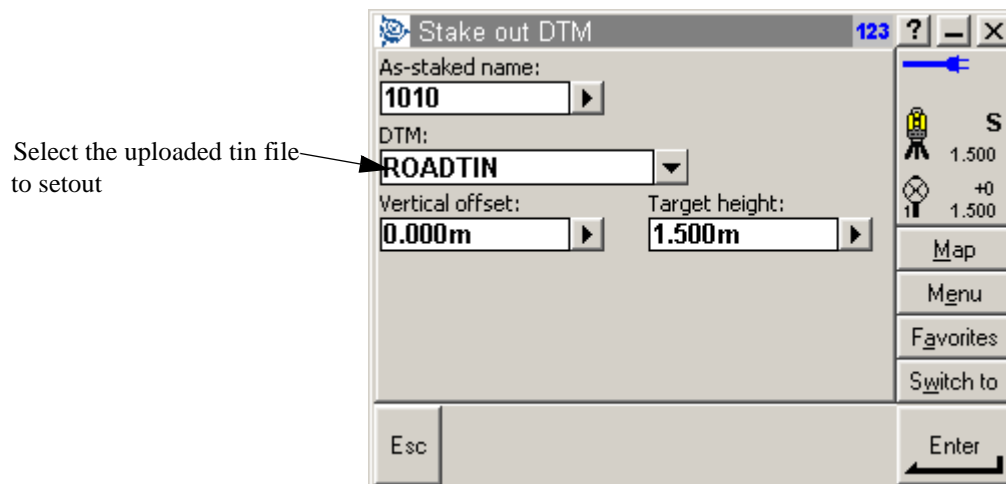


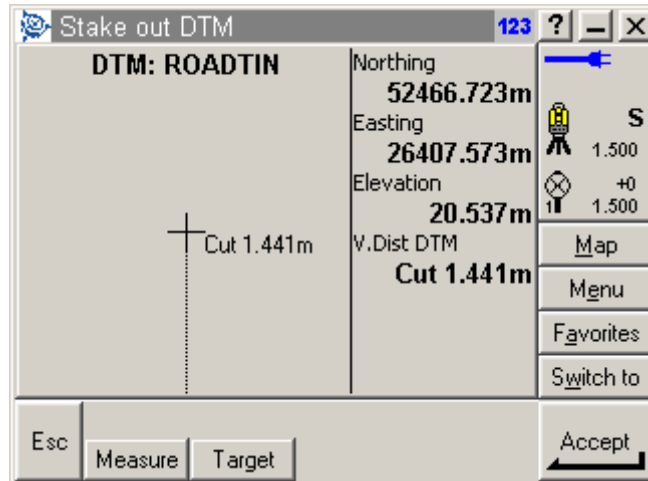
Select the tin file to upload using format *Triangulated Terrain model*



Select **Transfer All** to transfer the file

Once the tin has been copied into the ACU it can be called up when using the Stakeout option
Survey=>Stakeout=>DTM





The cut to the tin is calculated and displayed

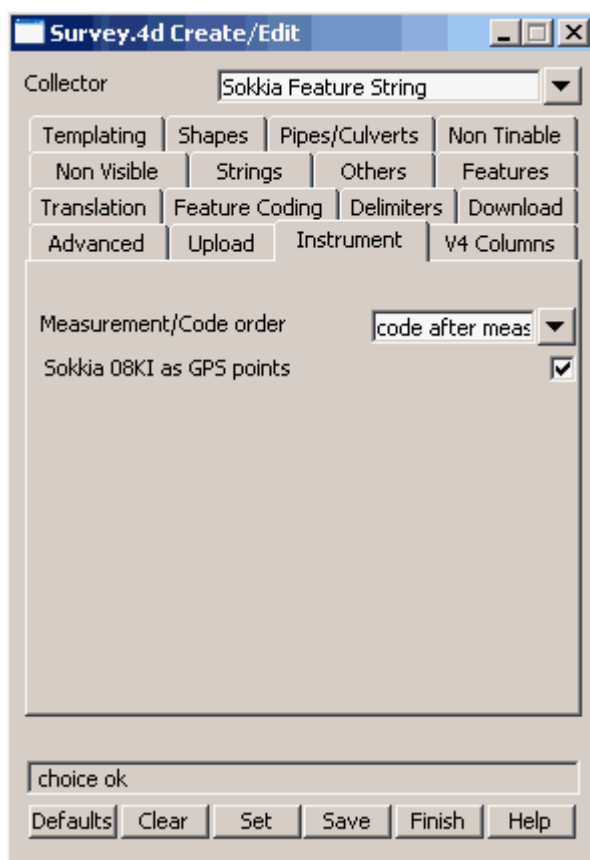
D 12D and Trimble GPS Controllers

The Trimble Geomatics Office software which comes with most Trimble GPS units can produce a Sokkia SDR file which is used by 12d Model as a raw data file.

However, the Trimble software writes out the (x,y,z) co-ordinates of GPS points as a "08KI" record which is normally treated by 12d Model as directly entered co-ordinates for a Station.

To overcome this problem, there is a flag in the data collector definitions to treat the Sokkia 08KI records as GPS points.

So before converting a Sokkia SDR file from a Trimble GPS unit, define a data collector which has a tick for the field *Sokkia 08KI as GPS points* on the *Instrument* tab of the **Survey.4d Create/Edit** panel.



This flag needs to be ticked on for reducing the SDR files created by Trimble GPS units

The code information that is entered on the Trimble in the field is appended the Sokkia 08KI record and is processed as blocks of information as given in the section "Field Coding for Non Leica Instruments" and the appendix "12D and Sokkia Instruments (SDR Files)" .

E 12D and Geodimeter Instruments

12d UDS's

The geodimeter allows the recording of information in a format specified by the user. Data for each label can be prompted for and measurements from the instrument can be registered. The user can assign a certain series of labels to a User Defined Sequence or UDS.

For 12d to reduce files from the geodimeter instruments, the recorded information from the instrument must be in a specific format that 12d can understand. A number of Geodimeter UDS files are supplied on the 12d Model Installation CD in the folder 'Other_Software\Geodimeter'.

For uploading or direct entry of UDS's to your particular instrument see you instrument manual.

*These UDS's have been set up so that 12d can convert the raw files from the instrument in a 12d field file. These UDS's should be installed **prior** to undertaking surveys that are to be reduced by 12d. The standard UDS that 12d supply is as follows:*

UDS 1 - used within UDS 8 to record 12d field op codes.

UDS 2 - prompts for additional data for a 12d field op code.

UDS 5 - job administration at the start of a job

UDS 6 - station co-ordinates entry

UDS 7 - station set up - name and instrument height

UDS 8 - data pick-up

UDS 5 is run at the beginning of the job and it runs UDS 6, which runs UDS 7 which runs UDS 8.

UDS 1 can be run as required from within UDS8 to give 12d field file op codes.

UDS 1 - used within UDS 8 to record 12d field op codes	UDS 5 - job admin at start of day	UDS 7 - station set up - name and instrument height	UDS 8 - data pick-up -----
-----	42=5	-----	42=8
42=1	43=TCC-ADMIN	42=7	43=TCC-DATA-PICKUP
43=OP-CODE-SELECT	79=10	43=TCC-STN-ID	5=4
91=1	0=1	79=10	4=8
79=7/2	53=1	3=1	6=8
-----	51=0	95=1	39=8
UDS 2 - used for additional data for 12d field ops codes	79=7/6	2=1	8=0
-----	-----	4=1	9=0
42=2	UDS 6 - station co- ordinates entry	1=1	7=0
43=OP-CODE DATA	-----	5=2	6=8
92=1	42=6	6=2	5=8
79=5	43=TCC-COORD- ENTRY	79=7/8	4=8
	79=10		38=8
	38=1		37=8
	39=1		39=8
	37=1		6=3
	79=7/7		4=3
			1=3
			90=3
			79=5

12d standard UDS's for pick-up with Geodimeter

The Geodimeter data format is used as a raw data file by 12d Model and is converted into a 12d Field File before reduction by potentially 2 different macros:

- 1) geodat4d.4do (default) for use with the 12d standard UDS's.
- 2) geodat_qmrd.4do (Specialised reduction) for use with Queensland MRD UDS's.

For the geodat4d.4do macro (default) 12d Model uses the following Geodimeter labels:

0=	Information
1=	Attributes
2=	Station name or named point
3=	Instrument height
4=	Blocks
5=	Point number
6=	Target (signal) height
7=	Horizontal angle
8=	Vertical angle
9=	Slope distance
37=	Northing (X) value
38=	Easting (Y) value
39=	Height (Z) value
51=	Date
53=	Operator
90=	End of record, flush buffer
91=	12d Model field file op code
92=	Parameters for the previous 12d op code
95=	

In particular, the Geodimeter PCode label block (4=) is used as the text of blocks that are interpreted according to the descriptions given in the earlier section “Field Coding for Non Leica Instruments” .

A new conversion macro for V6.0, geodat_qmrd.4do recognises geodimeter Program 22 and Program 32 commands **if the following setup/procedures are used:**

1. The geodimeter should be set to record program numbers. This is shown by the label **0=Pn** in the raw file, where **n** is the program number and is assigned by the instrument. To set this up on the instrument use MENU 6 1(Switches) and turn Prg_Num on.
2. For 12d to convert raw files using geodimeter programs such as P22 and P32 the data must contain a label **61=n** each time an UDS or onboard program is started (Where **n** is the program number). This allows 12d to be able to determine when one program is finished and another started. Queensland MRD have created there own UDS's which utilise the **61=** label so that it is prompted for within the UDS's. They have also set up a UDS (UDS 6) which is used to place the label at the commencement of an onboard program such as program 22.

12d Field Ops Codes

In addition to the commands accessible from the blocks, most of the 12d field file op codes are accessible directly from the Geodimeter.

The label '91=' label is used to specify a 12d field file op code and any following '92=' labels provide any additional information required by the 12d op code.

The 12d field file ops codes apply to the measurement *before* the op code.

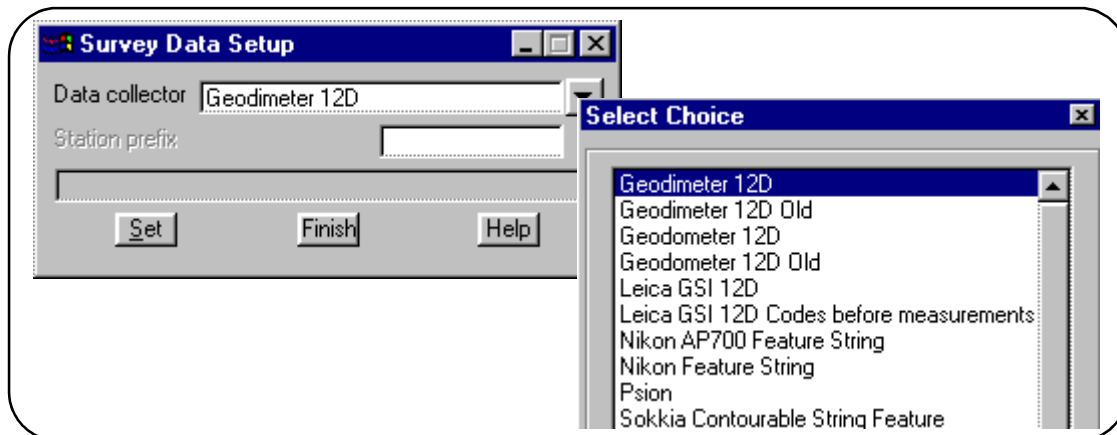
For a complete definition of the 12d Model field file and the 12d Model field file op codes, see the section “The 12d Field File Format”

Please continue to the next section “Example of Geodimeter File” .

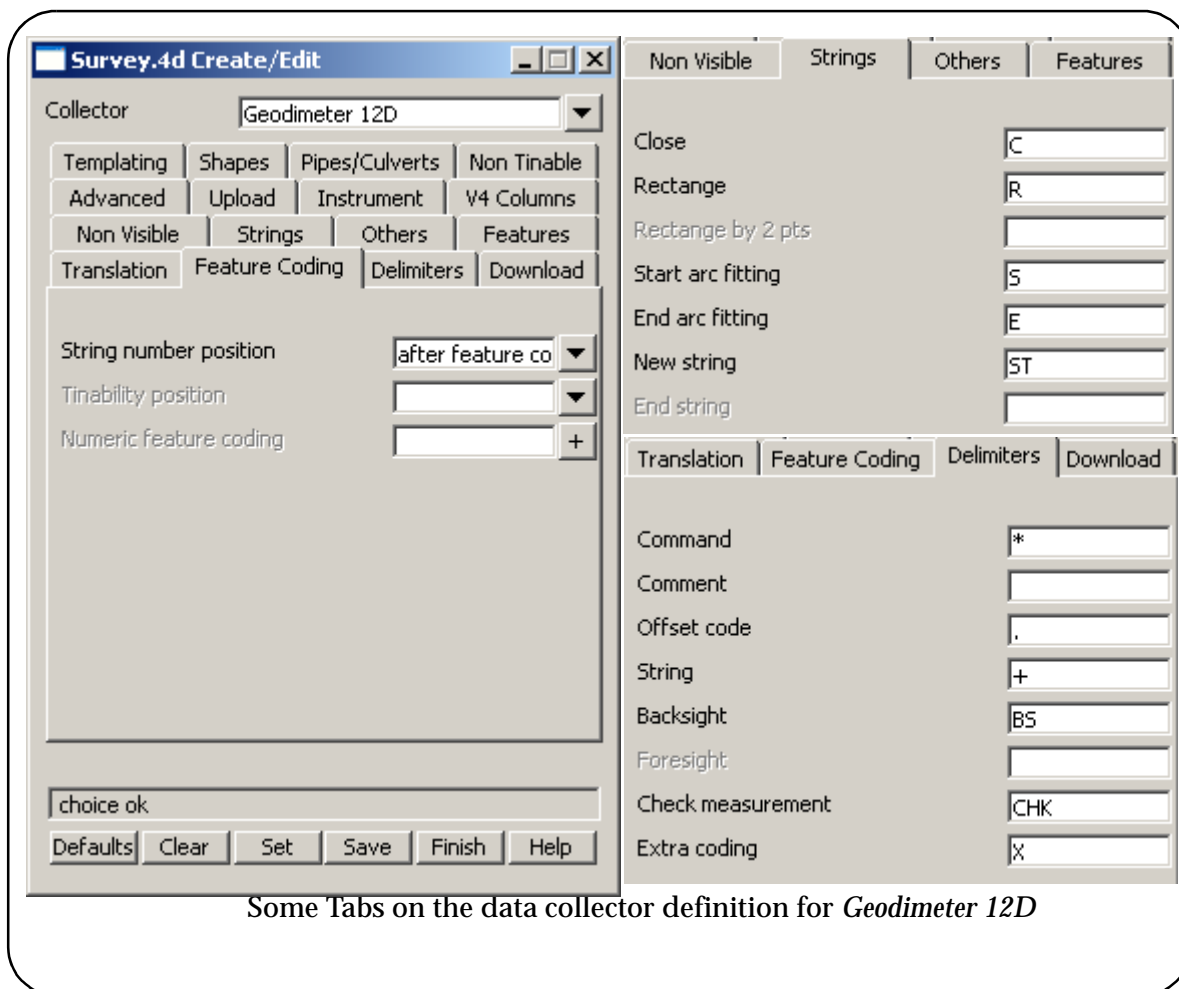
Example of Geodimeter File

The raw file 'Geodimeter.job' has been coded in accordance with the data collector definition *Geodimeter 12D* which is shipped with 12d Model. The 12d Model Geodimeter UDS's were used in the field pick-up.

The data collector *Geodimeter 12D* is set using the option *Survey=>Setup*



Some of the tabs on the *Geodimeter 12D* data collection definition as show below. Note that * is used as the Command (Block) delimiter, the *string number* is given after the *feature code*, S is used to start arc fitting and R is the Rectangle (make a parallelogram) command.



Some Tabs on the data collector definition for *Geodimeter 12D*

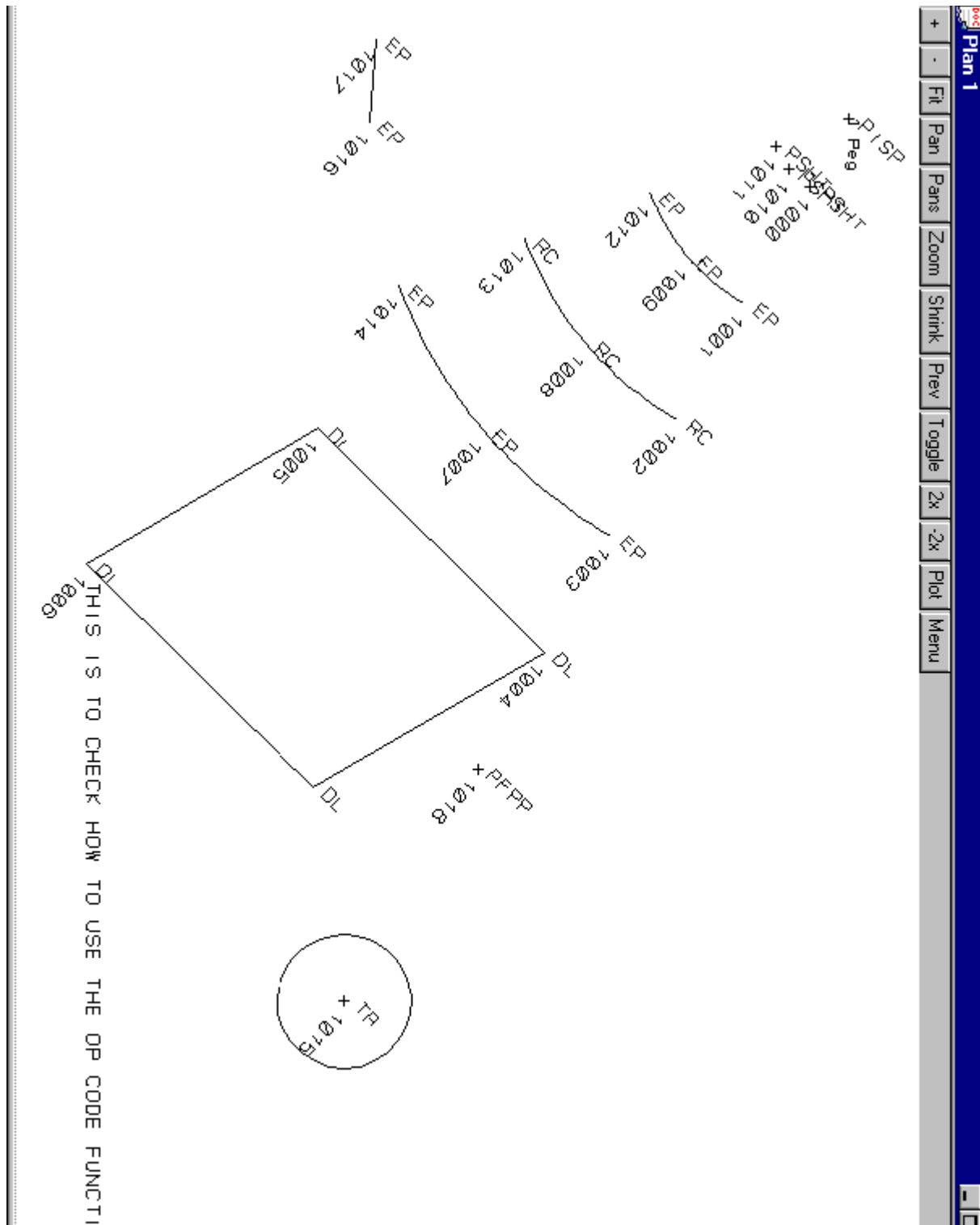
The listing of the raw file is now given, followed by a dump of a 12d Model view displaying the

job with string names (feature codes) and point numbers toggled on. The raw file 'Geodimeter.job' is in the Survey area of the training data. It can be converted into a 12d field file by using the default conversion macro geodat4d.4do.

Description	Geodimeter file	Description	Geodimeter file
run UDS 5 job name	0=OP CODE TEST	point no 1005	5=1005
operator	53=DAD	vertical angle	8=90.1203
date	51=2001.0525	slope distance	9=45.80
UDS 6 station	38=5000.000	horizontal	7=149.4706
co-ordinates	39=10.000	target height	6=1.500
	37=10000.000	FC DL SN 1	4=DL1
UDS 7 instrument ht	3=1.654		1=
	95=0		90=0
	2=1	point no 1006	5=1006
Feature code (FC) PISP	4=PISP	vertical angle	8=90.1159
	1=Peg	slope distance	9=65.80
UDS 8 point no 1000	5=1000	horizontal	7=149.4706
vertical angle	8=90.1219	target height	6=1.500
slope distance	9=5.80	FC DL SN 1	4=DL1
horizontal	7=119.4705		1=
target (signal) height	6=1.500		90=0
FC PSHT	4=PSHT	UDS 1 12d op code 45	91=45
*note that the string no.	1=	UDS 1 12d op code 41	91=41
(SN) defaults to 0	90=0	UDS 2 parameters	92=THIS IS TO CHECK
point no 1001	5=1001	for op code 45	92= HOW TO USE THE
vertical angle	8=90.1207	(additional text)	92= OP CODE FN
slope distance	9=15.80	UDS 8 point no 1007	5=1007
horizontal	7=119.4708	vertical angle	8=90.1219
target height	6=1.500	slope distance	9=35.80
FC EP SN 1 start arc	4=EP1*S	horizontal	7=139.4711
	1=	target height	6=1.500
point no 1002	90=0	FC EP SN 2	4=EP2
vertical angle	5=1002		1=
slope distance	8=90.1215	*note that 12d op code 45	90=0
horizontal	9=25.80	is 'make a parallelogram	5=1008
target height	7=119.4705	from the last three points'	8=90.1214
FC RC SN 1 start arc	6=1.500	and it applies to the	9=25.80
	4=RC1*S	measurement before the	7=139.4706
	1=	command. The rectangle	6=1.500
	90=0	R could have been	4=RC1
	5=1003	instead as part of the	1=
	8=90.1158	feature code block.	90=0
	9=35.80	That is " 4=DL1*R"	5=1009
	7=119.4705	instead of the "91=45"	8=90.1211
	6=1.500	*Also note that the 12d	9=15.80
	4=EP2	op code 41 is 'additional	7=139.4706
	1=	text' and the additional	6=1.500
	90=0	text is given by the "92="	4=EP1
	5=1004	lines. Again the op code	1=
	8=90.1209	applies to the	90=0
	9=45.80	measurement before the	
	7=119.4706	command..	continue on next page
	6=1.500		
	4=DL1		
	1=		
	90=0		

Description	Geodimeter file	Description	Geodimeter file
point no 1010	5=1010	point no 1015	5=1015
vertical angle	8=90.1209	vertical angle	8=90.1141
slope distance	9=5.80	slope distance	9=75.80
horizontal	7=139.4709	horizontal	7=119.4709
target height	6=1.500	target height	6=1.500
FC PSHT SN 0	4=PSHT	FC TR SN 1	4=TR1
	1=		1=
	90=0		90=0
	5=1011	UDS 1 12d op code 18	91=18
	8=90.1141	UDS 2 Radius 5	92=5
	9=5.80	which is 'circle feature'	5=1016
	7=159.4714	with a radius of 5	8=90.1146
	6=1.500		9=35.80
	4=PSHT		7=179.4713
	1=		6=1.500
	90=0		4=EP2
	5=1012		1=
	8=90.1138		90=0
	9=15.80		91=47
	7=159.4711		5=1017
	6=1.500		8=90.1145
	4=EP1		9=35.80
	1=		7=189.4714
	90=0		6=1.500
	5=1013		4=EP2
	8=90.1141		1=
	9=25.80		90=0
	7=159.4709	point no 1018	5=1018
	6=1.500	vertical angle	8=90.1145
	4=RC1	slope distance	9=55.80
	1=	horizontal	7=119.4713
	90=0	target height	6=1.500
	5=1014	FC PFPP SN 1	4=PFPP
point no 1014	8=90.1141		1=
vertical angle	9=35.80		90=0
slope distance	7=159.4713	UDS 1 12d op code 40	91=40
horizontal	6=1.500	which is 'make a point	
target height	4=EP2	non-tinable' This applied	
FC EP SN 2	1=	to the previous point	
	90=0	(1018)	
	91=17		
UDS 1 12d op code 17	continued in next		
which is 'arc through	column		
previous three points'			

**Plan View with of the Reduced Geodimeter Data Displayed
with Point Numbers and String Names (Feature Codes) Turned On**



The following raw field file has been taken from an QMRD Geodimeter 610 which has the QMRD UDS's installed. The file can be converted into a 12d field file by using the geodat_qmrd.4do. Note the inclusion of the activity codes (61=) that have been added to the file with the use of the UDS's. It also shows the use program 22 and the traverse extraction facility. For more information on traverse extraction see the section "Traverse coding" .

Description	Geodimeter file	Description	Geodimeter file
	50=030602		4=TL1 ROSTN1
Activity code from UDS	61=1		6=1.475
	6=1.458		7=10.1654
	54=ROGER-RANGER		8=90.2218
	STN		9=162.710
	0=OVERLAY		17=190.1657
	53=RAF		18=269.3740
	51=03-06-2002		24=10.1652
Run UDS 6 to place	61=22		25=90.2216
activity code (61=) before	0=P22		5=STN3
program 22	2=PSM45026 PBMK		4=TL1 FSSTN3
	3=1.561		6=1.486
	5=STN1		7=195.4510
foresight to STN1,	4=TL1 FSSTN1		8=90.0511
traverse line(TL), string 1	6=1.475		9=257.710
	7=213.0004		17=15.4508
	8=89.1413		18=269.5452
	9=98.297		24=195.4513
	17=33.0014		25=90.0514
	18=270.4550		61=22
	24=213.0009		0=P22
	25=89.1417		2=STN3 PISP
UDS 6 run to label	61=22		3=1.581
activity code	0=P22		5=STN2
	2=STN1 PISP		4=TL1 ROSTN2
	3=1.570		6=1.448
	5=PSM45026		7=187.1306
Backsight(RO)	4=TL1 ROPSM45026		8=89.5740
reading, trav line 1 to	6=1.468		9=257.710
PSM45026	7=32.5955		17=7.1306
	8=90.5246		18=270.0232
	9=98.300		24=187.1306
	17=212.5956		25=89.5752
	18=269.0716		5=STN4
	24=32.5955		4=TL1 FSSTN4
	25=90.5249		6=1.400
	5=STN2		7=23.1437
foresight to STN2,	4=TL1 FSSTN2		8=87.3949
traverse line(TL), string 1	6=1.448		9=173.958
	7=182.1037		17=203.1434
and so forth....	8=89.4211		18=272.2031
	9=162.715		24=23.1440
	17=2.1040		25=87.4008
	18=270.1759		61=22
	24=182.1032		0=P22
	25=89.4221		2=STN4 PISP
	61=22		3=1.546
	0=P22		5=STN3
	2=STN2 PISP		4=TL1 ROSTN3
	3=1.542		6=1.487
	5=STN1		continue on next page

Description	Geodimeter file	Description	Geodimeter file
	7=199.0404		0=P22
	8=92.2432		2=STN6 PISP
	9=173.963		3=1.591
	17=19.0353		5=STN5
	18=267.3552		4=TL1 ROSTN5
	24=199.0414		6=1.458
	25=92.2456		7=179.5456
	5=STN5		8=90.0633
	4=TL1 FSSTN5		9=179.821
	6=1.457		17=359.5457
	7=34.4057		18=269.5333
	8=88.1846		24=179.5456
	9=151.526		25=90.0639
	17=214.4059		5=STN7
	18=271.4140		4=TL1 FSSTN7
	24=34.4055		6=1.453
	25=88.1912		7=7.5532
	61=22		8=91.2051
	0=P22		9=149.687
	2=STN5 PISP		17=187.5533
	3=1.552		18=268.3914
	5=STN4		24=7.5531
	4=TL1 ROSTN4		25=91.2056
	6=1.452		61=22
	7=184.4113		0=P22
	8=91.4601		2=STN7 PISP
	9=151.527		3=1.547
	17=4.4111		5=STN6
	18=268.1402		4=TL1 ROSTN6
	24=184.4114		6=1.496
	25=91.4603		7=196.4115
	5=STN6		8=88.4357
	4=TL1 FSSTN6		9=149.679
	6=1.496		17=16.4116
	7=19.0418		18=271.1600
	8=89.5731		24=196.4115
	9=179.824		25=88.4353
	17=199.0420		5=STN8
	18=270.0229		4=TL1 FSSTN8
	24=19.0416		6=1.478
	25=89.5730		7=8.1420
	61=22		8=91.5307
	continued in next column		9=205.948
			continue on next page

Description	Geodimeter file	Description	Geodimeter file
	17=188.1422		5=STN10
	18=268.0657		4=TL1 FSSTN10
	24=8.1418		6=1.400
	25=91.5310		7=345.0918
	61=22		8=86.2903
	0=P22		9=221.043
	2=STN8 PISP		17=165.0917
	3=1.574		18=273.3103
	5=STN7		24=345.0920
	4=TL1 ROSTN7		25=86.2908
	6=1.453		61=22
	7=181.1643		0=P22
	8=88.1026		2=STN10 PISP
	9=205.939		3=1.583
	17=1.1647		5=STN9
	18=271.4934		4=TL1 ROSTN9
	24=181.1638		6=1.517
	25=88.1026		7=165.4152
	5=STN9		8=93.3413
	4=TL1 FSSTN9		9=221.053
	6=1.517		17=345.4122
	7=359.0523		18=266.2600
	8=89.1311		24=165.4221
	9=199.132		25=93.3425
	17=179.0523		5=STN11
	18=270.4648		4=TL1 FSSTN11
	24=359.0523		6=1.460
	25=89.1310		7=0.2903
	61=22		8=86.1535
	0=P22		9=215.241
	2=STN9 PISP		17=180.2930
	3=1.614		18=273.4438
	5=STN8		24=0.2836
	4=TL1 ROSTN8		25=86.1548
	6=1.478		50=ERICC
	7=173.0014		61=1
	8=90.5031		6=1.443
	9=199.132		54=ROGER-RANGER
	17=353.0017		STN
	18=269.0934		0=A
	24=173.0011		53=ECB
	25=90.5037		51=04-06-2002
	continued in next column		61=22
			continue on next page

Description	Geodimeter file	Description	Geodimeter file
	0=P22		9=222.450
	2=STN11 PISP		17=0.1114
	3=1.573		18=270.4942
	5=STN10		24=180.1113
	4=TL1 ROSTN10		25=89.1113
	6=1.520		
	7=131.1633		
	8=93.4738		
	9=215.253		
	17=311.1639		
	18=266.1222		
	24=131.1626		
	25=93.4738		
	5=STN12		
	4=TL1 FSSTN12		
	6=1.465		
	7=307.3035		
	8=87.2924		
	9=191.435		
	17=127.3037		
	18=272.3034		
	24=307.3033		
	25=87.2922		
	61=22		
	0=P22		
	2=STN12 PISP		
	3=1.558		
	5=STN11		
	4=TL1 ROSTN11		
	6=1.477		
	7=11.1452		
	8=92.3416		
	9=191.448		
	17=191.1454		
	18=267.2611		
	24=11.1449		
	25=92.3443		
	5=STN13		
	4=TL1 FSSTN13		
	6=1.443		
	7=180.1114		
	8=89.1045		
	continued in next column		

F 12D and Topcon Instruments

The Topcon data format is used as a raw data file by 12d Model and is converted into a 12d Field File before reduction.

G 12D and Leica TPS Instruments

The Leica GSI data format produced by the Leica TPS is used as a raw data file by 12d Model and is converted into a 12d Field File. The contents of the recorded data can be manipulated by use of the Leica's recording masks. The setup of which is explained in the section "Setup of Leica 1100 instrument for detail pickup and use with 12d" .

Each line (data block) of the Leica GSI file consists of between 1 and 12 words, with the words containing either 16 (8 characters for data) or 24 (16 characters for data) characters. The two formats will be referred to as the 8 format and 16 format respectively.

Measurement lines in the 8 format start with 11 and code lines start with 41.

For the 16 format, measurement lines start with *11 and code lines start with *41.

For an example of a GSI file in the 8 format, go to the section "Example of Leica GSI File" .

When using a Leica, the Leica screen can be standard or controlled by using a code.hex file on the 1000 series or a Geobasic program or Leica Codelist (.crf file) on the 1100 series.

4D Solutions provide a basic code.hex, Geobasic program and various Codelists(.crf files) on the 12d Model Installation CD in the folder 'Other_Software\Leica'. These can be customised to your requirements - please contact 4D Solutions for more information.

For an example of a Leica screen with standard set-up, Codelist and Geobasic program, please go to the section "Examples of Leica Screens" .

Please continue to the next section "Feature Codes and String Numbers" .

Feature Codes and String Numbers

The *feature code* and *string number* for a measurement are entered in the Leica by giving the *feature code* in the first word and the *string number* as the second word of a code line. The feature codes and string numbers can be alpha or numeric and up to 8 (16) characters long.

For example, the feature code ABC with string number 1 is recorded as:

410003+00000ABC 42....+00000001 for the 8 format

or

*410003+00000000000000ABC 42....+0000000000000001 for the 16 format.

Some surveyors like to define the *feature code* and *string number* **before** they make a measurement. Other surveyors prefer to define the *feature code* and *string number* **after** they make a measurement.

When defining a *Data Collector setup*, 12d Model allows the user to specify whether the feature code comes before or after a measurement:

code before measurement

The given *feature code* and *string number* applies to the **next** measurement and all subsequent measurements until another *feature code* and *string number* is entered.

code after measurement

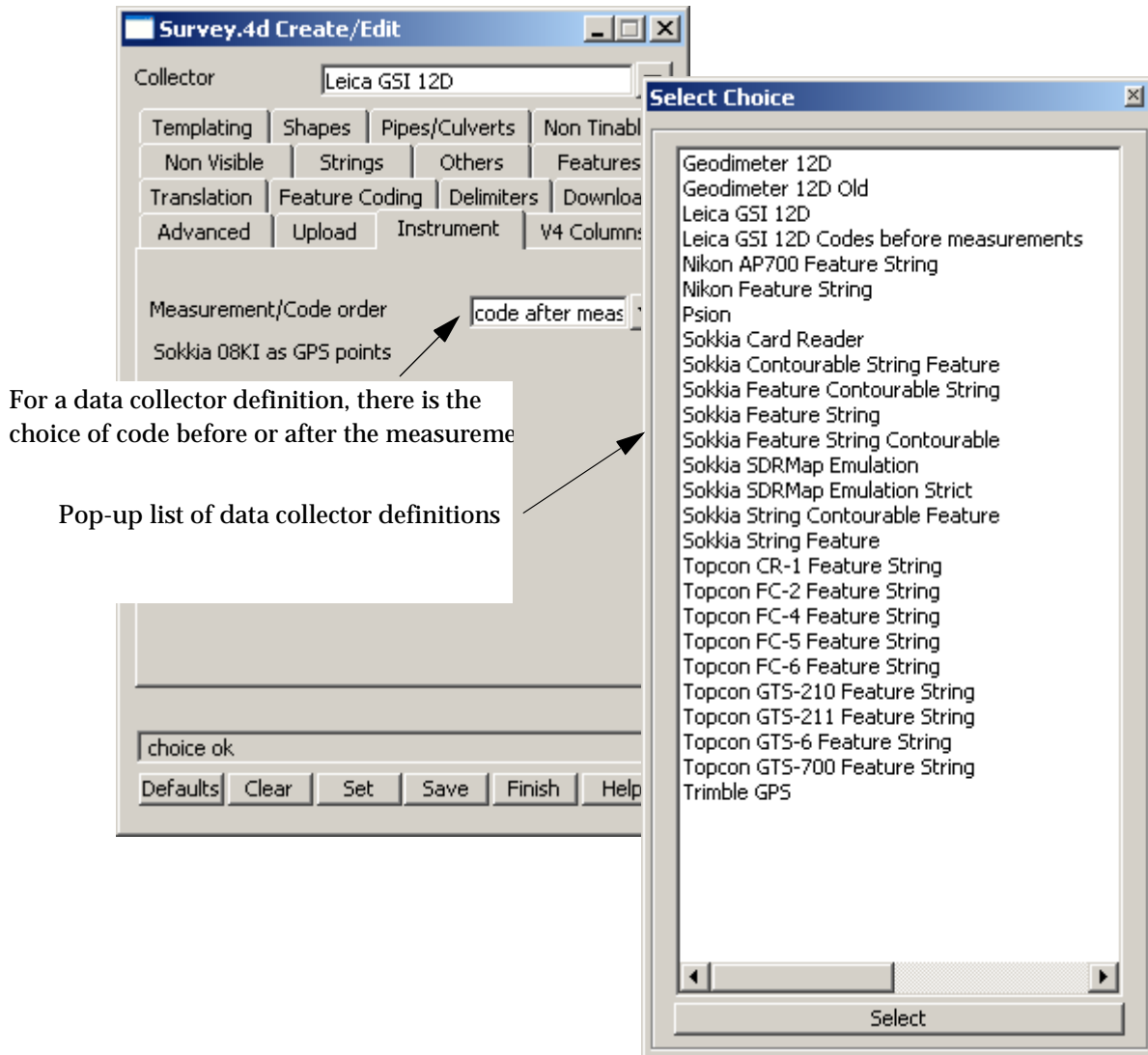
The given *feature code* and *string number* applies to the **last** measurement and all subsequent

measurements until another *feature code* and *string number* is entered.

However, for a particular data collector setup, it can be only be defined as one of the two choices. That is you can't change between having feature codes before or after measurements in the one raw file.

Summarising:

Whether feature code definitions come before or after the measurements is defined in the *Survey Data Collector* definition and is set by the *Measurement/Code order* field on the *Instrument* tab of the *Survey.4d Create/Edit* panel.



Please continue to the next section “Leica Field Codes” .

Leica Field Codes

12d Model also uses code lines to supply extra information using field codes.

All *field codes* are entered as the first word of the code line and to differentiate it from a *feature code*, the *field code* is preceded by a ".". Depending on the field code, more information may be required and it is entered in words 2 and above in the code line.

Each *field code* will now be described in detail.

For each *field code*, two lines and a paragraph of description are given:

- ▲ The first line consists of the *field code* and a short description of the purpose of the code.
- ▲ The second line gives the full syntax of the record for that *field code*.
- ▲ The paragraph gives a detailed description of the *field code*.

A **12d** Model code list containing **12d** Model field codes is available for the TPS to help coding in the field.

Field Code Conventions

In the syntax for the *field codes*, optional Words or groups of Words are enclosed in the square brackets [].

However, when the Leica TPS creates the Leica GSI format, the data in all Words is right justified and left filled with zeros. Consequently, **12d** Model strips leading zeros from all Words before processing the data.

This means that

- (a) an **optional Word** still exists in the file but its data field is simply **filled with zeros**.
- (b) any **text** in a Word **cannot start with a zero**. You would need to start with a space and then a zero.

In the *field code* descriptions, the point just measured is referred to as the **current measurement point**, the **current point** or the **last measurement point**.

The *string* that the current measurement point belongs to is called the **current string**.

For a summary of the Leica Field Codes, go to the section "Summary of Leica Field Codes"

For the full description of the Leica Field Codes, go to the section "Full Description of Leica Field Codes" .

For an example of a raw Leica file, please go to the section "Example of Leica GSI File" .

Full Description of Leica Field Codes

For a summary of the Leica Field Codes, go to the section “Summary of Leica Field Codes”

Field Code	Description of Record
------------	-----------------------

.2 Directly entered coordinates

Word 1 .2 Word 2 X Word 3 Y Word 4 Z Word 5 Feature_code

Word 6 String_number [Word 7 Point_number Word 8 Point_name]

A measurement point is created with the given feature code and string number and given (x, y, z) co-ordinates. No reduction is needed.

If a Point_name exists, then it is a **named measurement** and in the reduction, a 4d point string of name Point_name is created and mapped using the mapping file. The 4d text is the station prefix followed by Point_name. The Point_name is added to the internal list of named points for searching for co-ordinates.

Note that the Leica GSI format includes directly entered coordinates in a code line by data blocks with word indices 81, 82, 83 (Easting, Northing and Elevation).

.3 New instrument point - before the measurement

Word 1 .3 Word 2 Point_name Word 3 Instrument_height

Set up an instrument at the point with name Point_name. In the reduction, the (x, y, z) co-ordinates for Point_name are found by first searching the control model, then the list of previously named points in the reduction, point numbers of previous measurements and finally if Point_name is still not found, the user is asked to type in the (x, y, z) co-ordinates.

Note that the Leica GSI format includes setting up on a station in a measurement line by data blocks with word indices 84, 85, 86 (Station easting, Station northing and Station elevation) and 88 (Instrument height).

.4 Next measurement is a backsight - before the measurement

Word 1 .4 Word 2 Station_name [Word 3 Feature_code Word 4 String_number Word 5 Target_height]

The **next** measurement is to a backsight with name Station_name.

For traverse reduction, if the traverse code specified in the reduction panel matches the Feature code given in Word 3, the data will be included in a traverse reduction, string number can also be specified. Also the target height to the backsight can be given in the backsight command.

.5 New target height for subsequent measurements - before the measurement

Word 1 .5 Word 2 Target_height

Set a new target height to be used for all subsequent measurement points.

Note that the Leica GSI format can include the target height on each measurement line (word index 97).

.6 Next measurement is a Check measurement - before the measurement

Word 1 .6 Word 2 Station_name

The **next** measurement is a check measurement made to the station Station_name.

During reduction a two point super string (with name Station_name) from the instrument point to the measured point is created in the default model for the check measurement. The instrument point name, the station name and the differences between the measurement point co-ordinates and station co-ordinates are written as text along the super string. The differences between the measurement and the known point is also written to the report file.

.9 Scale factor for subsequent distances

Word 1 .9 Word 2 Scale_factor

Scale factor to apply to subsequent slope distances.

.11 Next measurement is to a named station - before the measurement

Word 1 .11 Word 2 Station_name [Word 3 Feature_code Word 4 String_number Word 5 Target_height]

This field code gives a name to a measurement so that it can be used in other field codes for setting up an instrument on, backsighting to or doing a check measurement to.

The *next* measurement locates a new instrument station with the name *Station_name*. A point with vertex text of *Station_name* is created. The *Station_name* is added to the internal list of named points for searching for co-ordinates.

If *Feature_code* exists, the point is given that *Feature_code*, otherwise the current feature code is used.

For traverse reduction, if the traverse code specified in the reduction panel matches the Feature code given in Word 3, the data will be included in a traverse reduction, string number can also be specified. Also the target height to the foresight can be given in this command.

.14 Feature code and string number - before or after measurement depends on the data collector definition

Word 1 .14 Word 2 Feature_code Word 3 String_number [Word 5 text Word 6 text] ...

A field code for entering the feature code and string number rather than using the standard method of using word 1 and word 2 This is for use with Leica quick codes which must put out a fixed first word. Any additional *text* is added to the end of any existing vertex text for the current measurement point. Any leading zeros in the text words will be ignored.

This field code is used *always before* or *always after* measurements depending on the *Measurement/code* field on the *Instrument* tab of the **Survey.4d Create/Edit** panel for the selected data collector definition.

.15 Vertical circle correction for subsequent measurements - before the measurement

Word 1 .15 Word 2 Vertical_circle_in_decimal_degrees

The *vertical_circle_in_decimal_degrees* is **subtracted** from the vertical circle value in any subsequent measurements.

.16 Additional code for point (multiply coded point) - after the measurement

Word 1 .16 Word 2 Feature_code Word 3 String_number [Word 4 Point_name] [Word 5 Point_text]

Additional coding for the current measurement point. A new measurement point is created at the same position as the current measurement point but with the *Feature_code* and *String_number* from this field code. The same point number is used as for the current measurement point.

If *Point_text* exists, it is used as the vertex text for that vertex of the super string.

If *Point_name* exists, then it is a **named measurement** and during reduction, a 4d point string of name *Point_name* is created and mapped using the mapping file. The 4d text is the station prefix followed by *Point_name*. The *Point_name* is added to the internal list of named points for searching for co-ordinates.

.17 Arc through previous three points - after the measurement of last point of arc

Word 1 .17 [Word 2 Feature_code Word 3 String_number] [Word 4 Point_number]

If only Word 1 exists, then the current measurement point and the two previous points with the same feature code and string number as the current measurement point, are joined by an arc. If there is less

than three such points, no arc is fitted.

If the *Feature_code* and *String_number* exist, the last three previous three measurement points of the same *feature code* and *string number* are joined by an arc. If the current measurement point has that feature code and string number, then it is the third of the three points used. If there is less than three points, no arc is fitted.

If *Point_number* exists, then the *feature code* and *string number* are taken from the previous measurement point **with** that point number, and that point and the two measurement points previous to the pre-defined point of the same *feature code* and *string number*, are joined by an arc. If there is less than three points, no arc is fitted

See the Section “Arcs Through Points” for more information on arc fitting.

.18 Circle Feature - after the measurement

Word 1 .18 *Word 2* *Radius* [*Word 2* *Radius ...*]

Creates a feature string with the given radius and centred on the current measurement point. If there is more than one radius, then separate feature strings are created each with one of the radii.

.20 Close string - after the measurement

Word 1 .20 [*Word 2* *Feature_code* *Word 3* *String_number*] [*Word 4* *Point_number*]

If only *Word 1* exists, the current string is closed.

If the *Feature_code* and *String_number* exist, the last previous string with that *feature code* and *string number* is closed.

If *Point_number* exists, then the string containing that point number is closed.

See the Section “Close String” for more information on closing a string.

.21 Join last points of strings

Word 1 .21 *Word 2* *Feature_code* *Word 3* *String_number_1* *Word 4* *String_number_2*

In the final reduction, the last point of the string with the given *Feature_code* and *String_number_1* is joined to the last point of the string with given *Feature_code* and *String_number_2*. The created string has the given *Feature_code* (no string number is needed since it is the final phase of reduction when the string numbers are dropped).

See the Section “Joining Strings” for more information on joining strings.

.22 Join first to last point of strings

Word 1 .22 *Word 2* *Feature_code* *Word 3* *String_number_1* *Word 4* *String_number_2*

In the final reduction, the first point of the string with the given *Feature_code* and *String_number_1* is joined to the last point of the string with given *Feature_code* and *String_number_2*. The created string has the given *Feature_code* (no string number is needed since it is the final phase of reduction when the string numbers are dropped).

See the Section “Joining Strings” for more information on joining strings.

.23 Join first points of strings

Word 1 .23 *Word 2* *Feature_code* *Word 3* *String_number_1* *Word 4* *String_number_2*

In the final reduction, the first point of the string with the given *Feature_code* and *String_number_1* is joined to the first point of the string with given *Feature_code* and *String_number_2*. The created string has the given *Feature_code* (no string number is needed since it is the final reduction when the string numbers are then dropped).

See the Section “Joining Strings” for more information on joining strings.

.28 Text appended to a string name

Word 1 .28 *Word 2* *Text* [*Word 3* *Feature_code* *Word 4* *String_number*] [*Word 5* *Point_number*]

Text is appended to the string name. For example, if 1.200 is entered, “ 1.200” is appended to the string name.

If only *Text* is given, *Text* is appended to the string name of the current string.

If the *Feature_code* and *String_number* exist, then the last previous string with that *feature code* and *string number* has *Text* appended to the string name.

If *Point_number* exists, then the string containing that point number has *Text* appended to the string name.

.29 Note or memo - after the measurement

Word 1 .29 [*Word 2 text*] [*Word 3 text*]...

Any text may be entered and will be added to the check measurements model at the position of the current measurement point.

.30 Remove height from a point - that is make it a null height - after the measurement

Word 1 .30 [*Word 2 Feature_code* *Word 3 String_number*] [*Word 4 Point_number*]

If only *Word 1* exists, the height of the current measurement point is set to null.

If *Feature_code* and *String_number* exist, then the height of the last point of the previous string with that *feature code* and *string number* is set to null.

If *Point_number* exists, then the height of the point with that point number is set to null.

.37 Rectangle by two points

Word 1 .37 *Word 2 offset_in_metres* [*Word 3 Feature_code* *Word 4 String_number*] [*Word 5 Point_number*]

The rectangle is defined by two points (reference side) and a offset.

If a positive offset value is given, two points will be created to the right of the reference side.

If a negative offset value is given, two points will be created to the left of the reference side.

If *Feature_code* and *String_number* exist, the last two points with that *feature code* and *string number* are used and a fourth points are created to form a rectangle. The height of the two new points are set to null. The string is then closed.

If *Point_number* exists, then the *feature code* and *string number* of the point with that point number are used and processed as above. Note that the point with the point number is not necessarily used.

Two consecutive rectangles are unable to be defined side by side. In other words if the two points given are part of string of greater than two vertices, the command will only work for sets of two points that are exclusively defined. i.e. For a 5 point string, a rectangle can be defined by points 1 and 2, and 4 and 5.

See the Section “Rectangle” for more information.

.38 Make the previous segment non-tinable (not a breakline) - after the measurement

Word 1 .38 [*Word 2 Feature_code* *Word 3 String_number*] [*Word 4 Point_number*]

If only *Word 1* exists, the previous segment containing the current measurement point is set to non-tinable. That is, it will not be treated as a breakline in triangulations.

If the *Feature_code* and *String_number* exist, then the last segment of the previous string with that *feature code* and *string number* is set to non-tinable.

If *Point_number* exists, then the segment containing the point with that point number as an end point, is set to non-tinable.

.39 Make the next segment non-tinable (i.e. not a breakline) - after the measurement for the first point of the segment

Word 1 .39 [*Word 2 Feature_code* *Word 3 String_number*] [*Word 4 Point_number*]

If only Word 1 exists, the next segment containing the current measurement point as a starting point is set to non-tinable. That is, it will not be treated as a breakline in triangulations.

If the *Feature_code* and *String_number* exist, then the segment that is created in the future from the last point of the previous string with that *feature code* and *string number* is set to non-tinable.

If *Point_number* exists, then the segment containing the point with that point number as a start point, is set to non-tinable.

.40 Make a point non-tinable - after the measurement

Word 1 .40 [Word 2 *Feature_code* Word 3 *String_number*] [Word 4 *Point_number*]

If only Word 1 exists, the current measurement point is set to non-tinable. That is, it will not be included in triangulations.

If *Feature_code* and *String_number* exist, then the last point of the previous string with that *feature code* and *string number* is set to non-tinable.

If *Point_number* exists, then the point with that point number is set to non-tinable.

.41 Add additional text to the current measurement point - after the measurement

Word 1 .41 Word 2 *text* [Word 3 *text*] ...

The given *text* is added to the end of any existing vertex text for the current measurement point. Any leading zeros in the text words will be ignored.

.42 Add a radial offset - after the measurement

Word 1 .42 Word 2 *Radial_offset_in_metres* [Word 3 *Feature_code* Word 4 *String_number*] [Word 5 *Point_number*]

The *Radial_offset_in_metres* is used to adjust the position of the specified point by a plan distance from the specified points original position, along the plan line joining the current station to the specified point. A positive offset is away from the station, negative is toward the station.

If only Word 1 and 2 exist, the offset is used to adjust the position of the current measured point.

If *Feature_code* and *String_number* exist, then the last point of the previous string with that *feature code* and *string number* is adjusted.

If *Point_number* exists, then the point with that point number is adjusted.

See the Section “Offsets” for more information on offsets.

.43 Add a tangential offset - after the measurement

Word 1 .43 Word 2 *Tangential_offset_in_metres* [Word 3 *Feature_code* Word 4 *String_number*] [Word 5 *Point_number*]

The *Tangential_offset_in_metres* is used to adjust the position of the specified point by a plan distance from the specified points original position, at rights angles to the plan line joining the current station to the specified point. A negative offset is to the left (looking from the station), and positive is to the right (looking from the station).

If only Word 1 and 2 exist, the offset is used to adjust the position of the current measured point.

If *Feature_code* and *String_number* exist, then the last point of the previous string with that *feature code* and *string number* is adjusted.

If *Point_number* exists, then the point with that point number is adjusted.

See the Section “Offsets” for more information on offsets.

.44 Add a height offset - after the measurement

Word 1 .44 Word 2 *Height_offset_in_metres* [Word 3 *Feature_code* Word 4 *String_number*] [Word 5 *Point_number*]

If the height of the specified point is not null, then the *Height_offset_in_metres* adjusts the height of the point. A positive offset adds to the height, a negative offset reduces the height.

If only Word 1 and 2 *exist*, the offset is used to adjust the position of the current measured point.

If *Feature_code* and *String_number* exist, then the last point of the previous string with that *feature code* and *string number* is adjusted.

If *Point_number* exists, then the point with that point number is adjusted.

See the Section “Offsets” for more information on offsets.

.45 Make a parallelogram from the last three measurement points - after the measurement

Word 1 .45 [Word 2 *Feature_code* Word 3 *String_number*] [Word 4 *Point_number*]

If only Word 1 *exists*, the current measurement point and the two previous points from the current string are used and a fourth point is created to form a parallelogram (squashed rectangle) and the height of the fourth point is set to null. The string is then closed.

If *Feature_code* and *String_number* exist, the last three points with that *feature code* and *string number* are used and a fourth point is created to form a parallelogram (squashed rectangle) and the height of the fourth point is set to null. The string is then closed.

If *Point_number* exists, then the *feature code* and *string number* of the point with that point number are used and processed as above. Note that the point with the point number is not necessarily used.

See the Section “Rectangle” for more information on forming a parallelogram.

.46 Make the entire string a breakline or not (tinable or non-tinable)

Word 1 .46 [Word 2 *Breakline_type*] [Word 3 *Feature_code* Word 4 *String_number*]
[Word 5 *Point_number*]

Word 2: *Breakline_type*:

If *Breakline_type* is 0, the selected string is set to a point string and hence is not a breakline (non-tinable).

If *Breakline_type* is 1, the selected string is set to a *line* string and is therefore a breakline (tinable).

Words 3, 4, and 5:

If none of Words 3, 4 and 5 exist, the *Breakline_type* is applied to the current string.

If *Feature_code* and *String_number* exist, the *Breakline_type* is applied to the last string with that *feature code* and *string number*.

If *Point_number* exists, then the *Breakline_type* is applied to the string containing the point with that point number.

.47 Start a new string using the same feature code and string number - after the measurement of the first point of the new string

Word 1 .47 [Word 2 *Feature_code* Word 3 *String_number*] [Word 4 *Point_number*]

If only Word 1 *exists*, the current string is terminated (without including the current measurement point) and the current measurement point becomes the first point of a new string with the same feature code and string number.

If *Feature_code* and *String_number* exist, then the last point of the previous string with that feature code and string number becomes the first point of a new string with the same *feature code* and *string number*.

If *Point_number* exists, then the previous string containing the point with that point number is terminated *before* the point number point, and the point becomes the first point of a new string with the *same feature code* and *string number*.

.48 End a string

Word 1 .48 [Word 2 *Feature_code* Word 3 *String_number*] [Word 4 *Point_number*]

If only Word 1 *exists*, the current string is terminated (including the current measurement point).

If *Feature_code* and *String_number* exist, then the last point of the previous string with that feature

code and string number becomes the last point of that string.

If *Point_number* exists, then the previous string containing the point with that point number is terminated *after* the point number point

.50 Specify the bearing to correct for true north - used as the bearing datum difference

Word 1 .50 Word 2 *Bearing_in_decimal_degrees* [Word 3 *Text*]

The *Bearing_in_decimal_degrees* is used as the bearing datum difference for the current instrument set up. The *Text* and the *Bearing_in_decimal_degrees* are written to the reduction report file.

.51 Start using an existing field template - before the measurement

Word 1 .51 Word 2 [*Template_name*] [*mode*]

Start using the template *Template_name*. If *Template_name* is blank, the default template is used. If *mode* is "for", then the field template is used as a *forward* template.

"rev", then the field template is used as a *reverse* template.

"zig", then the field template is used as a *zig_zag* template and is used in the *forward* definition direction first.

"zag", then the field template is used as a *zig_zag* template and is used in the *reverse* direction first

If *mode* is blank, or 0, or anything other than "for", "rev", or "zag", then the field template is used as a *zig-zag* field template starting on a *zig*.

See the Section "Field Templates" for more information on field templates.

.52 Finish using a field template or finish recording a field template - after the measurement

Word 1 .52

Stops using the current field template or stops recording a field template.

.53 Pause using the current field template - after the measurement

Word 1 .53

Pause using the current field template or defining a field template, until a continue template (54) or a finish field template (52) code is given.

.54 Continue the current field template - before the measurement

Word 1 .54

Continue using the current field template or defining the current field template, which has been stopped by a *Pause* command (53). The *Continue* command only needs to be given once and applies to all *following* measurements until another *Pause* or *Finish* command is given.

.55 Start recording a field template - before the measurement

Word 1 .55 Word 2 [*Template_name*]

Start recording a field template with the name *Template_name*. If *Template_name* is non-blank, then the default field template is defined. The *feature_code* and *string_number* of the following measurements until a *Finish* code (52) are stored as the field template. There is no limit to the number of points in a field template.

See the Section "Field Templates" for more information on field templates.

.56 Skipping picking up points when using a field template - after the measurement of last point before skipping points

Word 1 .56 Word 2 [*num_skipped_points*]

Allows the user to skip picking up one or more points from the field template currently being used. The *next measurement* takes the *feature_code* and *string_number* from the next point of the field template definition. If *num_skipped_points* is missing, then only one point is skipped otherwise *num_skipped_points* are *skipped*.

.57 Delete points on a field template - after the measurement of last point

Word 1 .57 Word 2 [num_points_to_delete]

Allows the user to delete one or more points from the field template currently being used. The *next measurement* takes the *feature_code* and *string_number* from the next point of the field template definition.

.58 Insert points when using a field template - after the measurement of last point before inserting points

Word 1 .58 Word 2 *Feature_code* Word 3 *String_number* Word 4 *Multiple_code_flag* Word 5 *Insert_special_flag*

Allows the user to insert points into the field template currently being used. The *next measurement* takes the *feature_code* and *string_number* from the next point of the field template definition.

If the *Multiple_code_flag* = 1, then the feature code will be added to the previous defined template point else if *Multiple_code_flag* = 0 (default), it will be added to the template as a separate point.

If the insert is done at the end of a section and the *Insert_special_flag* = 1 the point will be added to the end of the current template section else it will be at the start of the next section.

.60 Start of arc through next three points - after the measurement of the first point of the arc

Word 1 .60 [Word 2 *Feature_code* Word 3 *String_number*] [Word 4 *Point_number*]

If only Word 1 *exists*, an arc is inserted through the current measurement point and the next two measured points with the same feature code and string number as the current measurement point. If there is less than three points, no arc is fitted.

If *Feature_code* and *String_number* exist, a search is made for a previously defined measurement with the same feature code or string number. An arc is inserted through the previous measurement and the next two measured points following this previous measurement with the same feature code and string number. If the current point has that feature code and string number, then it is the first of the three point. If there is less than three points, no arc is fitted.

If *Point_number* exists, then the *feature code* and *string number* are taken from the previous measurement point **with** that point number, and an arc is inserted through that point and the next two measurement points with the same *feature code* and *string number*. If there is less than three points, no arc is fitted

See the Section "Arcs Through Points" for more information on arc fitting.

.61 Start of arc through sets of three points until end of string, or a 62 occurs - after the measurement of the first point of the arc

Word 1 .61 [Word 2 *Feature_code* Word 3 *String_number*] [Word 4 *Point_number*]

The arcs are fitted as follows - the first arc is fitted through points one, two and three, the next arc through points three, four and five etc. If there is less than three points remaining at the end, then no arc is fitted to the end points.

If only Word 1 *exists*, arcs are inserted through the following sets of measurement points with the same feature code and string number as the current measurement point. The current measurement point is the *first* of the points.

If the current point has that feature code and string number, then it is the first of the points. If there is less than three points, then no arc is fitted.

If the *feature code* and *string number* exist, a search is made for a previously defined measurement with the same feature code or string number. An arc is inserted through the following measured points with the same feature code and string number as given in *point_description*. If the current point has that feature code and string number, then it is the first of the points.

If *Point_number* exists, then the *feature code* and *string number* are taken from the previous measurement point **with** that point number, and arcs are inserted through that point and the following measured points with the same *feature code* and *string number*.

If 12d Model encounters a *Start Arcs through sets of three points* but no *End Arcs* command for the string, then an *End Arcs* is assumed at the end of the string.

See the Section “Arcs Through Points” for more information on arc fitting.

.62 End the arcs begun by a 61 command - after the measurement of the last point of the arcs

Word 1 .62 [Word 2 Feature_code Word 3 String_number] [Word 4 Point_number]

If only *Word 1* exists, then the fitting of arcs through the points of the current string is stopped. The current measurement point is the *last* of the points used in the arc fitting.

If *Feature_code* and *String_number* exist, then the fitting of arcs through the points of the previous string with the same *feature code* and *string number* is stopped. If the current measurement point has that feature code and string number, then it is the last point used in the arc fitting.

If *Point_number* exists, then the point with that point number is the last point used in the arc fitting.

If 12d Model encounters an *End Arcs* (62) but no *Start Arcs through sets of three points* (61) command for the string, then an *Start Arcs through sets of three points* (61) is assumed to apply at the beginning of the string and hence arc fitting will be applied to the entire string.

See the section “Arcs Through Points” for more information on arc fitting.

There are field codes for adding user defined attributes to:

- (a) the current string being measured (i.e. the string containing the current measurement point)
 - (b) the current measurement point
 - (c) the next segment from the current measurement point (i.e. the segment joining the current measurement point and the *next* measured point of the same feature code and string number)
- or
- (d) the previous segment to the current measurement point (i.e. the segment joining the current measurement point to the previous measured point of the same feature code and string number).

The attributes can be named or unnamed and are coded in the following way:

If *Word 2* is missing (i.e. all zeros), then the attribute is an un-named attribute and the rest of the Words on the line is the attribute value. The attribute is given the special name "unnamed attribute n" for n=1, 2,

.68 Add an integer user defined attribute to the current string

Word 1 .68 [Word 2 Name] Word 3 Integer

Add an user defined integer attribute to the current string.

.69 Add a real user defined attribute to the current string

Word 1 .69 [Word 2 Name] Word 3 Real

Add a real (floating point) user defined attribute to the current string.

.70 Add text user defined attribute to the current string

Word 1 .70 [Word 2 Name] Word 3 Text [Word 4 Text] ...

Add a text user defined attribute to the current string.

.71 Add integer user defined attribute to the current point

Word 1 .71 [Word 2 Name] Word 3 Integer

Add an integer user defined attribute to the current measurement point.

.72 Add real user defined attribute to the current point

Word 1 .72 [Word 2 Name] Word 3 Real

Add a real (floating point) user defined attribute to the current measurement point.

.73 Add text user defined attribute to the current point

Word 1 .73 [Word 2 Name] Word 3 Text [Word 4 Text] ...

Add a text user defined attribute to the current measurement point.

.74 Add integer user defined attribute to the next segment

Word 1 .74 [Word 2 Name] Word 3 Integer

Add an integer user defined attribute to the next segment from the current measurement point.

.75 Add real user defined attribute to the next segment

Word 1 .75 [Word 2 Name] Word 3 Real

Add a real (floating point) user defined attribute to the next segment from the current measurement point.

.76 Add text user defined attribute to the next segment

Word 1 .76 [Word 2 Name] Word 3 Text [Word 4 Text] ...

Add a text user defined attribute to the next segment from the current measurement point.

.77 Add integer user defined attribute to the previous segment

Word 1 .77 [Word 2 Name] Word 3 Integer

Add an integer user defined attribute to the previous segment for the current measurement point.

.78 Add real user defined attribute for the previous segment

Word 1 .78 [Word 2 Name] Word 3 Real

Add a real (floating point) user defined attribute to the previous segment for the current measurement point.

.79 Add text user defined attribute to the previous segment

Word 1 .79 [Word 2 Name] Word 3 Text [Word 4 text] ...

Add a text user defined attribute to the previous segment for the current measurement point.

In addition, extra codes allow **12d** Model pipe strings to be coded in the field.

.80 Pipe invert point (bottom of the pipe) - after the measurement

Word 1 .80 [Word 2 Feature_code Word 3 String_number] [Word 4 Point_number]

If only Word 1 *exists*, the current measurement point is on the invert (bottom) of a pipe. This is the default for measurements to points on pipe strings. If the point is not part of a pipe string, it is ignored.

If *Feature_code* and *String_number* exist, the last point of the previous string with the same *feature code* and *string number* is on the invert (bottom) of a pipe. If the point is not part of a pipe string, it is ignored.

If *Point_number* exists, then the point with that point number is on the invert (bottom) of a pipe. If the point is not part of a pipe string, it is ignored.

.81 Pipe axial point (centre of the pipe) - after the measurement

Word 1 .81 [Word 2 Feature_code Word 3 String_number] [Word 4 Point_number]

If only *Word 1* exists, the current measurement point is on the axis (centre) of a pipe. If the point is not part of a pipe string, it is ignored.

If *Feature_code* and *String_number* exist, the last point of the previous string with the same *feature code* and *string number* is on the axis (centre) of a pipe. If the point is not part of a pipe string, it is ignored.

If *Point_number* exists, then the point with that point number is on the axis (centre) of a pipe. If the point is not part of a pipe string, it is ignored.

.82 Pipe obvert point (top of the pipe) - after the measurement

Word 1 .82 [*Word 2 Feature_code Word 3 String_number*] [*Word 4 Point_number*]

If only *Word 1* exists, the current measurement point is on the obvert (top) of a pipe. If the point is not part of a pipe string, it is ignored.

If *Feature_code* and *String_number* exist, the last point of the previous string with the same *feature code* and *string number* is on the obvert (top) of a pipe. If the point is not part of a pipe string, it is ignored.

If *Point_number* exists, then the point with that point number is on the obvert (top) of a pipe. If the point is not part of a pipe string, it is ignored.

.83 Start recording a shape - before the measurement

Word 1 .83 [*Word 2 Shape_name*]

Start recording a shape with the name *Shape_name*. If *Shape_name* is non-blank, then the default field Shape is defined by the *feature_code* and *string_number* of the following measurements until a *Finish* code (84) are stored as the shape. There is no limit to the number of points in a shape.

See the Section "Field Templates" for more information on field templates.

.84 Finish using a shape definition or finish recording a shape - after the measurement

Word 1 .84

Stops using the current shape or stops recording a shape.

.85 Shape parallel

Word 1 .85 *Word 2 Shape_name* [*Word 3 Feature_code Word 4 String_number*] [*Word 5 Point_number*]

If *Feature_code* and *String_number* exist, the last string with the same *feature code* and *string number* has the shape applied to the entire length of the string.

If *Point_number* exists, then the string containing that point number has the shape applied to the entire length of the string.

Parallelling the shape will produce separate strings for each point of the shape.

.86 Shape extrude

Word 1 .86

Word 1 .85 *Word 2 Shape_name* [*Word 3 Feature_code Word 4 String_number*] [*Word 5 Point_number*]

If *Feature_code* and *String_number* exist, the last string with the same *feature code* and *string number* has the shape applied to the entire length of the string.

If *Point_number* exists, then the string containing that point number has the shape applied to the entire length of the string.

Extruding the shape will produce a single string for the shape.

.92 Remove all z-values for a string (i.e. make all z-values null) - after the measurement

Word 1 .92 [Word 2 Point_line_type] [Word 3 Feature_code Word 4 String_number] [Word 5 Point_number]

If only Word 1 exists, all z-values for the current string are removed.

If *Feature_code* and *String_number* exist, the last string with the same *feature code* and *string number* has all its z-values removed.

If *Point_number* exists, then the string containing that point number has all its z-values removed.

If *Point_line_type* is 0, the selected string is set to a point string.

If *Point_line_type* is 1, the selected string is set to a *line* string.

.93 Set the Point-line type - after the measurement

Word 1 .93 [Word 2 Point_line_type] [Word 3 Feature_code Word 4 String_number] [Word 5 Point_number]

If only Word 1 exists, the current string is created as a point string.

If *Feature_code* and *String_number* exist, the last previous string with the same *feature code* and *string number* has its point-line type modified.

If the *point number* exists, then the string containing that point number has its point-line type modified.

If *Point_line_type* is 0, the selected string is set to a point string.

If *Point_line_type* is 1, the selected string is set to a *line* string.

.94 Use name library/mapping file for vertex text on the string - name mapping - after the measurement

Word 1 .94 [Word 2 Point_line_type] [Word 3 Feature_code Word 4 String_number] [Word 5 Point_number]

If this field code exists then during reduction, vertex text is creating using either the name library, or if the name library doesn't exist, the map file. If neither exist then the field code is ignored.

if a name library is used and the feature code of the string is found in the first column of the name library, then the entry from the second column of that row will be used as text for *all* vertices of the string that don't already have vertex text. As a default, the string is set as a point string.

if the map file is used and the feature code of the string is found in the first column of the map file, then the *string name* field of the map file is used as vertex text for all vertices that don't already have text. As a default, the string is set as a point string.

If only Word 1 exists, then name mapping is applied to the current string.

If *Feature_code* and *String_number* exist, then name mapping is applied to the last previous string with the same *feature code* and *string number*.

If *Point_number* exists, then name mapping is applied to the string containing that point number.

If *Point_line_type* is 0, the selected string is set to a point string.

If *Point_line_type* is 1, the selected string is set to a *line* string.

.95 Circular Pipe string - after the measurement

Word 1 .95 Word 2 Diameter [Word 3 Feature_code Word 4 String_number] [Word 5 Point_number]

Pipe strings are always line strings and are stored with the justification of the majority of the string points. Individual pipe points are picked up either top (obvert), centre (axial) or bottom (invert) of the pipe using field codes 80, 81 and 82.

If only Word 1 and 2 exists, the current string is created as a pipe string with the given diameter.

If *Feature_code* and *String_number* exist, the last string with the same *feature code* and *string number* is created as a pipe with the given diameter.

If *Point_number* exists, then the string containing that point number is created as a pipe string with the given diameter.

.96 Box Culvert string - after the measurement

Word 1 .95 Word 2 Width Word 3 Height [Word 4 Feature_code Word 5 String_number] [Word 6 Point_number]

Culvert strings are always line strings and are stored with the justification of the majority of the string points. Individual culvert points are picked up either top (obvert), centre (axial) or bottom (invert) of the culvert using field codes 80, 81 and 82.

If only *Word 1, 2 and 3 exists*, the current string is created as a culvert string with the given width and height.

If *Feature_code* and *String_number* exist, the last string with the same *feature code* and *string number* is created as a culvert with the given width and height.

If *Point_number* exists, then the string containing that point number is created as a culvert string with the given width and height.

.99 Terminate processing

Word 1 .99

Stop processing the field file at this line. Useful for debugging errors.

.107 Make the previous segment invisible - after the measurement

Word 1 .107 [Word 2 Feature_code Word 3 String_number] [Word 4 Point_number]

If only *Word 1* exists, the previous segment containing the current measurement point is set to invisible.

If the *Feature_code* and *String_number* exist, then the last segment of the previous string with that *feature code* and *string number* is set to invisible.

If *Point_number* exists, then the segment containing the point with that point number as an end point, is set to invisible.

**.108 Make the next segment invisible - after the measurement for the first
point of the segment**

Word 1 .108 [Word 2 Feature_code Word 3 String_number] [Word 4 Point_number]

If only *Word 1* exists, the next segment containing the current measurement point as a starting point is set to invisible.

If the *Feature_code* and *String_number* exist, then the segment that is created in the future from the last point of the previous string with that *feature code* and *string number* is set to invisible.

If *Point_number* exists, then the segment containing the point with that point number as a start point, is set to invisible.

.109 Make a point invisible - after the measurement

Word 1 .109 [Word 2 Feature_code Word 3 String_number] [Word 4 Point_number]

If only *Word 1* exists, the current measurement point is set to invisible.

If *Feature_code* and *String_number* exist, then the last point of the previous string with that *feature code* and *string number* is set to invisible.

If *Point_number* exists, then the point with that point number is set to invisible.

.110 Start buildings face observations - before the measurements

Word 1 .110 Word 2 [Building_name]

Start recording a field template with the name *Building_name*. If *Building_name* is non-blank, then the default building face is defined. The *feature_code* and *string_number* of the following measurements until a *Finish* code (111) are stored as the building face. There is no limit to the number of points in a

building face.

.111 End building face observations

Word 1 .111 *Word 2* [*Building_name*]

If only Word 1 *exists*, the current building face observation set is finished (including the current measurement point).

Notes

1. Arc fitting is applied *after* the Joins are processed. Hence the new joined strings are created and then curve fitting is applied according to the arc codes (start arc, end arc, fit arcs, stop fitting arcs etc.) on any vertex of the string.

For a summary of the Leica Field Codes, go to the section “Summary of Leica Field Codes”

Summary of Leica Field Codes

Most of the field codes are entered after the measurement is taken and they will have a (AM) after the description. Some of the field codes are entered before the measurement is taken (mainly set up codes) and will have a (BM) after the description.

Field Code	Description of Record
.2	Directly entered coordinate measurement
.3	New instrument setup point (BM)
.4	Measurement to backsight (BM)
.5	New target height (BM)
.6	Check measurement (BM)
.9	Scale factor for subsequent distances (BM)
.10	Three hair stadia measurement
.11	Measurement to a named station (BM)
.15	Vertical circle correction (BM)
.14	A field code for entering Feature code and String number - BM or AM depends on data collector definition
.16	Multiply coded point (AM)
.17	Arc through previous three points (AM of last point of arc)
.18	Circle Feature (AM)
.20	Close string (AM)
.21	Join last points of strings
.22	Join first to last point of strings
.23	Join first points of strings
.28	Add text to the string name (AM)
.29	Note or memo (AM)
.30	Remove height from a point - that is make it a null height (AM)
.37	Rectangle by two points
.38	Make the previous segment non-tinable (AM of end point of segment)
.39	Make the next segment non-tinable (AM of first point of segment)
.40	Make a point non-tinable (AM)
.41	Add additional text (AM)
.42	Add a radial offset (AM)
.43	Add a tangential offset (AM)
.44	Add a height offset (AM)
.45	Make a parallelogram from the last three measurement points (AM)
.46	Make the string a breakline or not
.47	Start a new string using the same feature code and string number (AM of first point of new string).
.48	End a string -
.50	Specify the bearing to correct for true north - used as the bearing datum difference
.51	Start using an existing field template (BM)
.52	Finish using a field template or finish recording a field template (AM)
.53	Pause the current field template until a continue op code (54) or a finish template (52)
.54	Continue the current field template (BM)
.55	Start recording a field template (BM)
.56	Skip picking up one or more points from a field template (AM of last point before skipping)
.57	Delete one or more points from a field template (AM)
.58	Insert a point into a field template (BM)
.60	Arc through next three points (AM of first point of arc)
.61	Start of arc through sets of three points until end of string, or a 62 occurs (AM of first point of arc)
.62	End the arcs begun by a 61 command (AM of last point of arcs)
.68	Add an integer user defined attribute to the current string (AM of any point of the string)
.69	Add a real user defined attribute to the current string (AM of any point of the string)
.70	Add text user defined attribute to the current string (AM of any point of the string)
.71	Add integer user defined attribute to the current point (AM)

- .72 Add real user defined attribute to the current point (AM)
- .73 Add text user defined attribute to the current point (AM)
- .74 Add integer user defined attribute to the next segment (AM of first point of the segment)
- .75 Add real user defined attribute to the next segment (AM of first point of the segment)
- .76 Add text user defined attribute to the next segment (AM of first point of the segment)
- .77 Add integer user defined attribute to the previous segment (AM of last point of the segment)
- .78 Add real user defined attribute for the previous segment (AM of last point of the segment)
- .79 Add text user defined attribute to the previous segment (AM of last point of the segment)
- .80 Pipe invert point (bottom of the pipe) (AM)
- .81 Pipe axial point (centre of the pipe) (AM)
- .82 Pipe obvert point (top of the pipe) (AM)
- .83 Start recording a shape - before the measurement
- .84 Finish using a shape definition or finish recording a shape - after the measurement
- .85 Shape parallel
- .86 Shape extrude
- .92 Remove all z-values for a string (i.e. make all z-values null) (AM of point of the string)
- .93 Set the Point-line type
- .94 Use name library file/ mapping file for vertex text on the string - name mapping
- .95 Circular pipe string with diameter (AM)
- .96 Box culvert string with dimensions (AM)
- .99 Terminate processing
- .107 Make the previous segment invisible - after the measurement
- .108 Make the next segment invisible - after the measurement for the first
point of the segment
- .109 Make a point invisible - after the measurement
- .110 Start buildings face observations - before the measurements
- .111 End building face observations

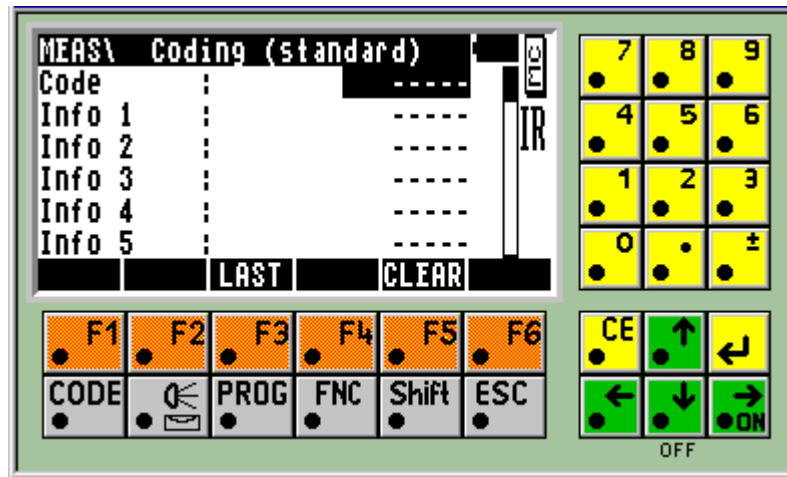
For a full description of the Leica codes, please go to the section "Full Description of Leica Field Codes" .

For an example of a raw Leica file, please go to the section "Example of Leica GSI File" .

Examples of Leica Screens

Standard Screen

When using a Leica instrument with no code.hex on the 1000 series, or Geobasic program or Codelist (.crf file) on the 1100 series, hitting the *Code* button brings up the standard Leica screen:



The information entered in *Code* goes to Word 1 of the line written to the Leica GSI file.

The information in *Info 1* to *Info 8* go to Word 2 to Word 9 respectively of the line written to the GSI file.

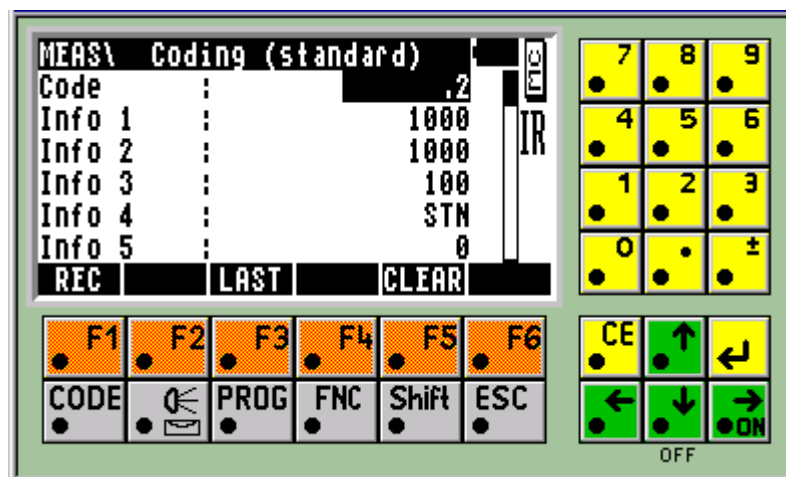
As an example, to enter a *directly entered co-ordinate* (the 2 field code),

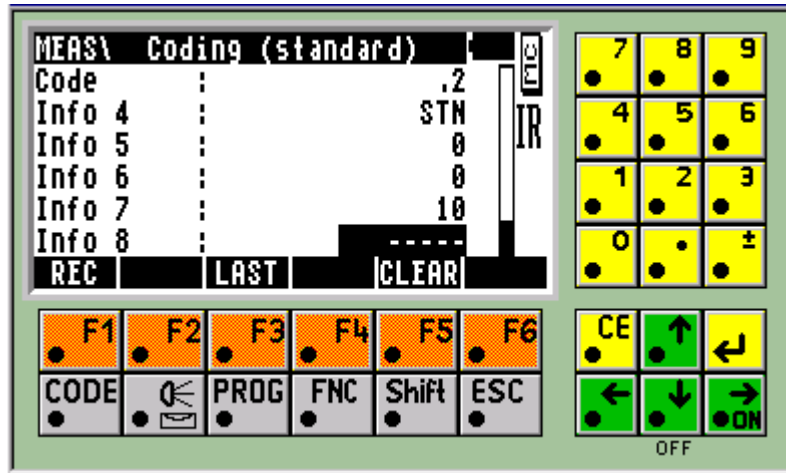
"2" is entered in the *Code* field

X, Y and Z in *Info 1*, *Info 2* and *Info 3* respectively.

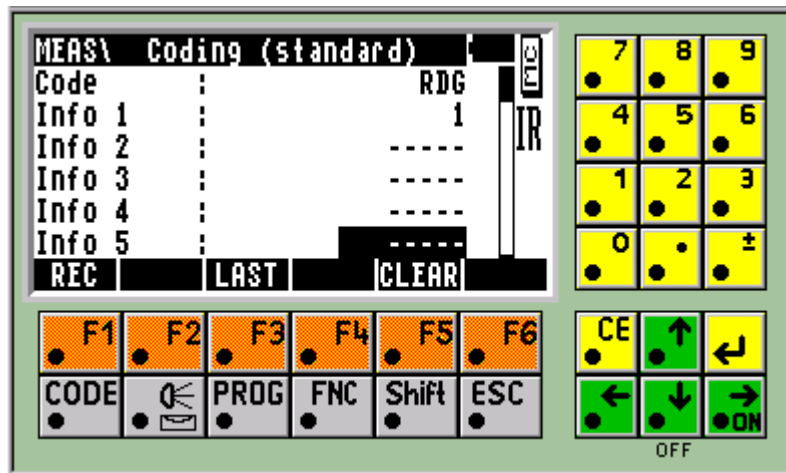
the feature code (STN) is entered into *Info 4*

the station name "10" is entered into *Info 7*





To enter a *feature code and string number* to be used for measurements
the feature code is entered into the *Code* field
the string number is entered into *Info 1*.



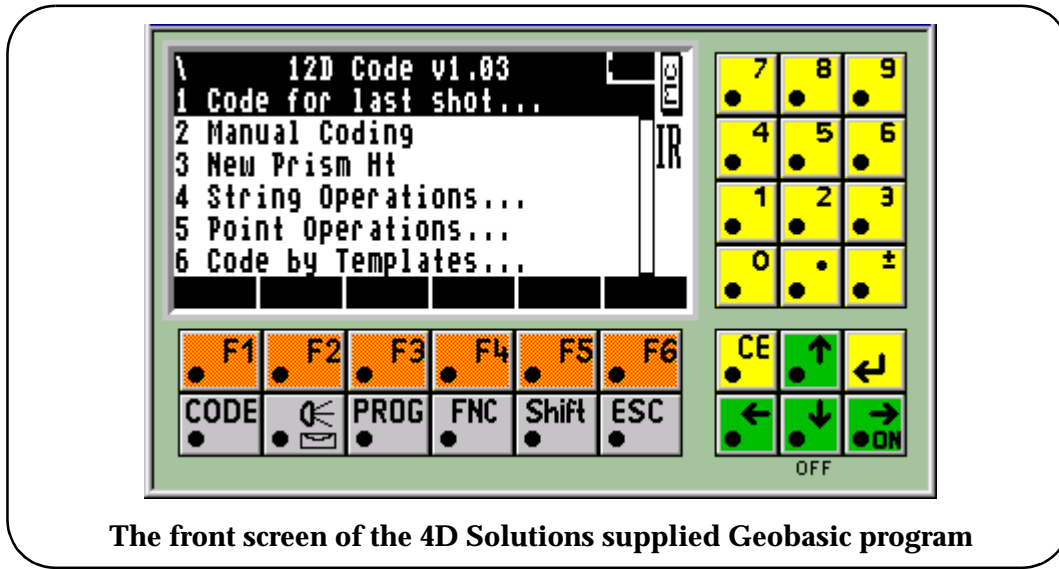
Leica Geobasic Program

A Leica Geobasic program gives the programmer full control over the Leica screen.

WARNING

Only one Geobasic program can exist on the Leica at any one time. Loading a Geobasic program will over write the existing Geobasic program on the instrument. Make sure you have a backup copy of the existing Geobasic program on your computer before loading a new one onto the instrument.

If you do not have a backup copy of the existing Geobasic program, do not load a new one.



The front screen of the 4D Solutions supplied Geobasic program

Leica Codelist

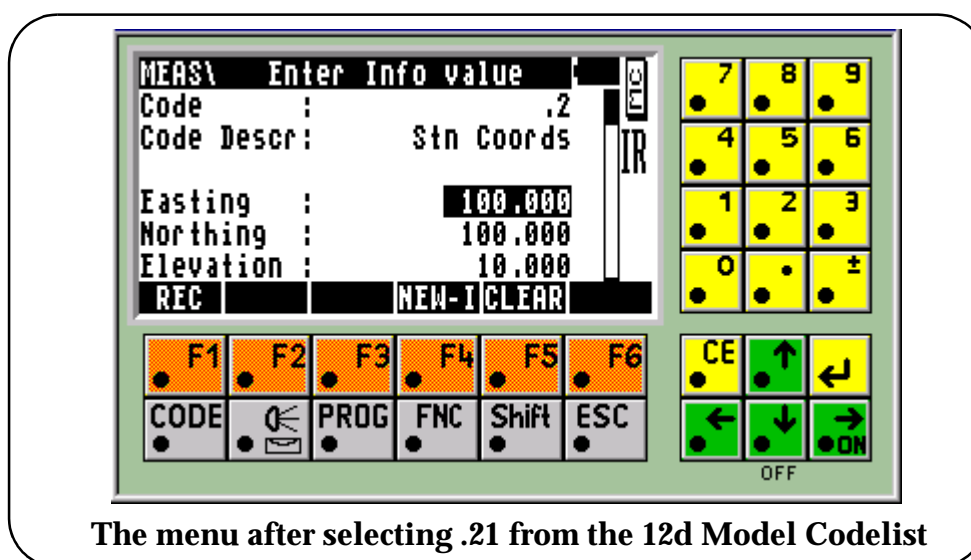
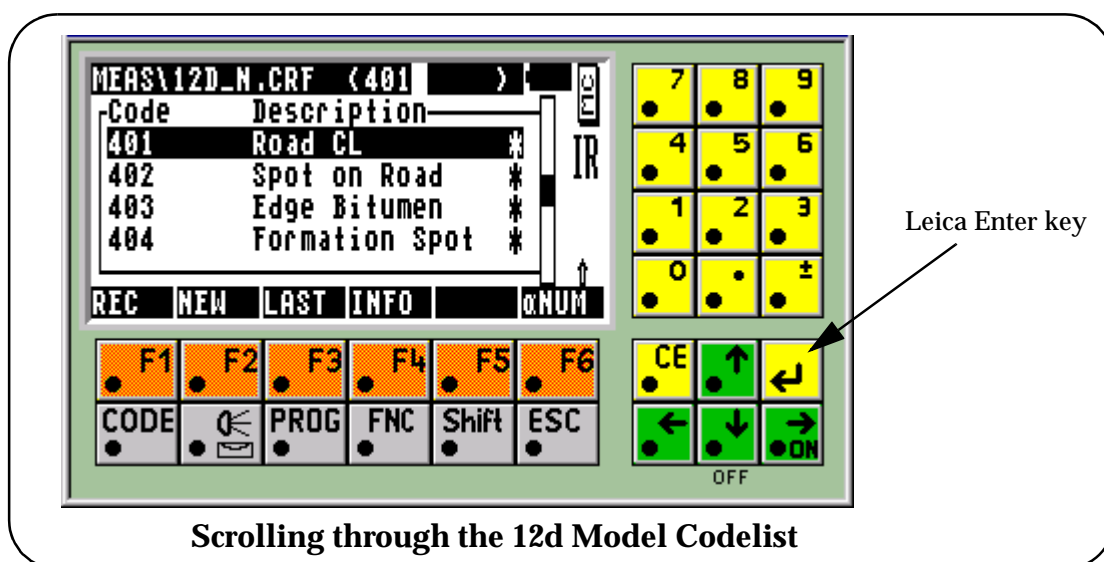
A Leica Codelist (.crf file) controls what is displayed and validated on the Leica screen and what values are recorded whenever the *Code* button is selected. For example, when using the 4D Solutions supplied Codelists, a list of defined feature codes and descriptions are displayed.

The Codelist controls what codes are displayed and whenever a code is selected, what information is required for that code. The Codelist also specifies what information is written out to the GSI file for that code.

After hitting the *Code* button, the list of codes from the Codelist is displayed in alphanumeric order. Because the 12d Model field codes start with a ".", they will appear at the top of the list.

A code can be typed in or the list can be scrolled through using the arrow keys.

The highlighted code is selected by pressing the Leica Enter Key. The menu for the selected code then appears. The line of data is written out to the GSI file when the F1 (REC) button is selected.



Setup of Leica 1100 instrument for detail pickup and use with 12d

The following relates to the setup of a Leica 1100 series instrument for topographic/detail pickup and use with 12d.

Setting up the Instrument

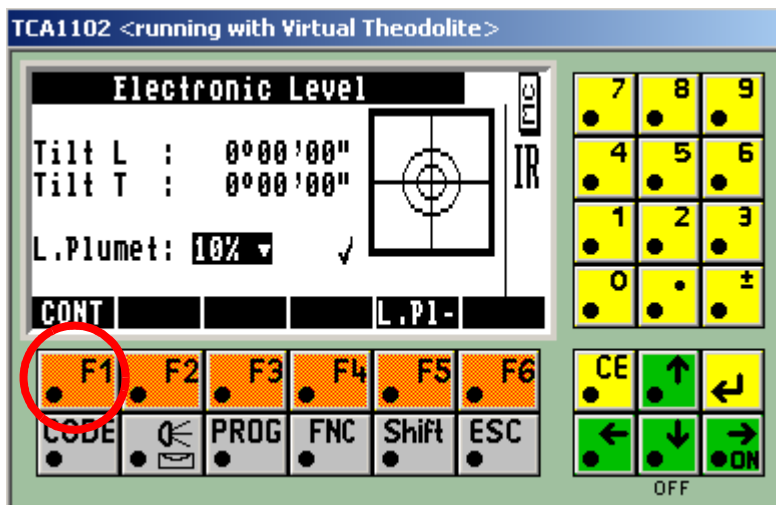
Copying the CRF file

A number of example .crf files are include on the installation CD. These can be found in the directory Other_Software\Leica\ . For the purpose of this documentation, we will use the file 12D_DS.CRF which is designed for detail pickup. This file should be copied from the 12d CD to the folder "Code" on the Leica card.

This file contains all of the field codes used in 12d model along with a sample code listing

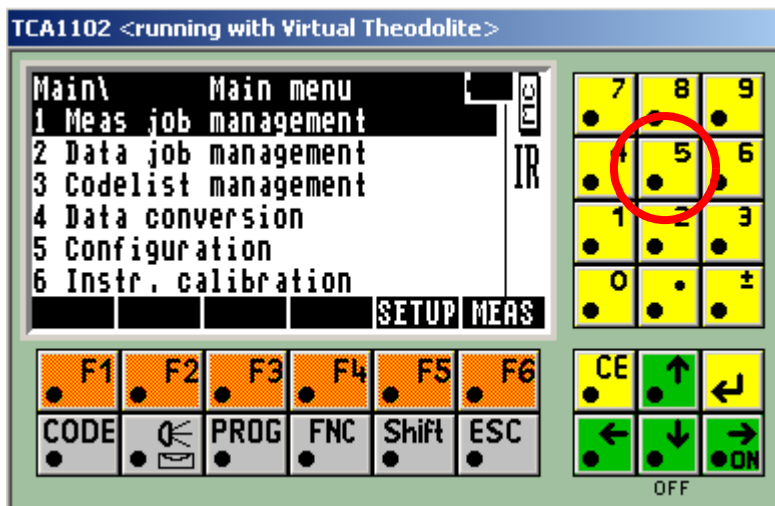
Set up the display and record masks

Turn on and level instrument

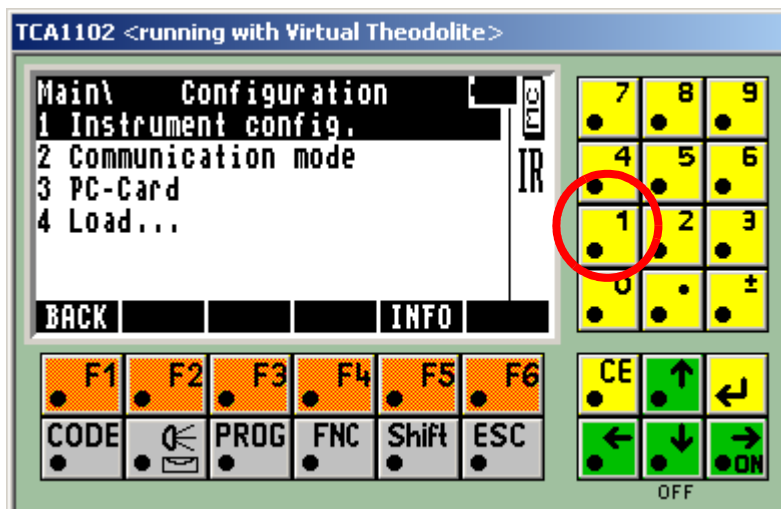


Press F1 to Continue

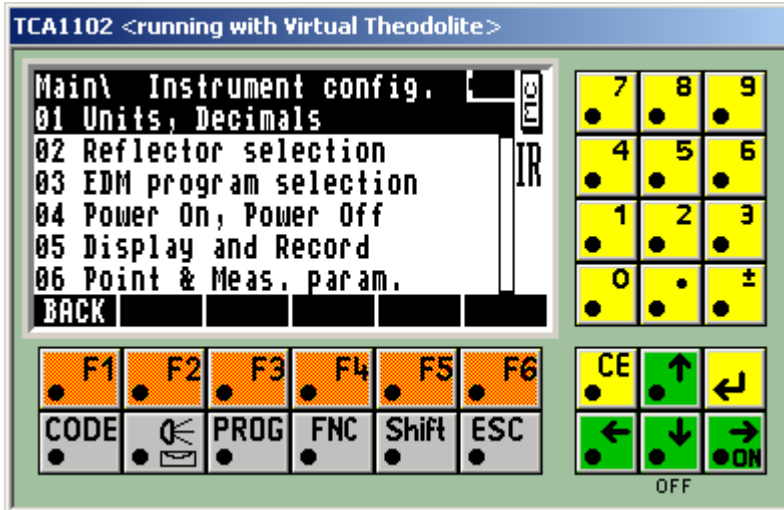
Press 5 to configure the instrument



Press 1 for instrument configuration

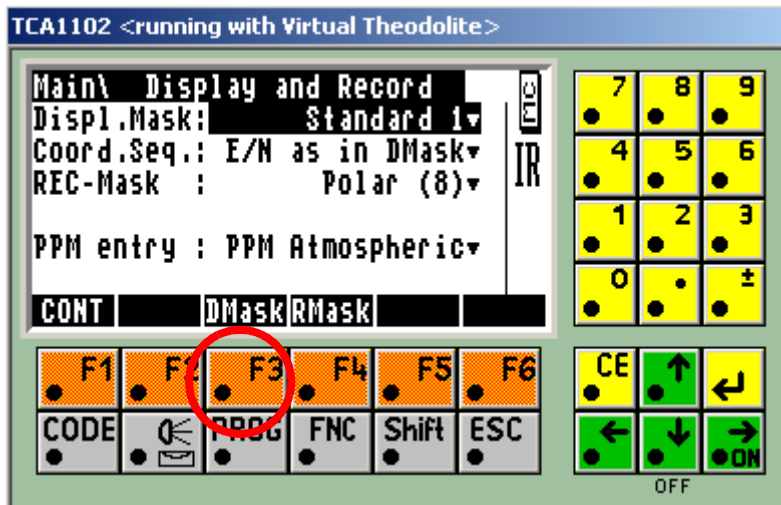


Press 05 for Display and Record mask setup

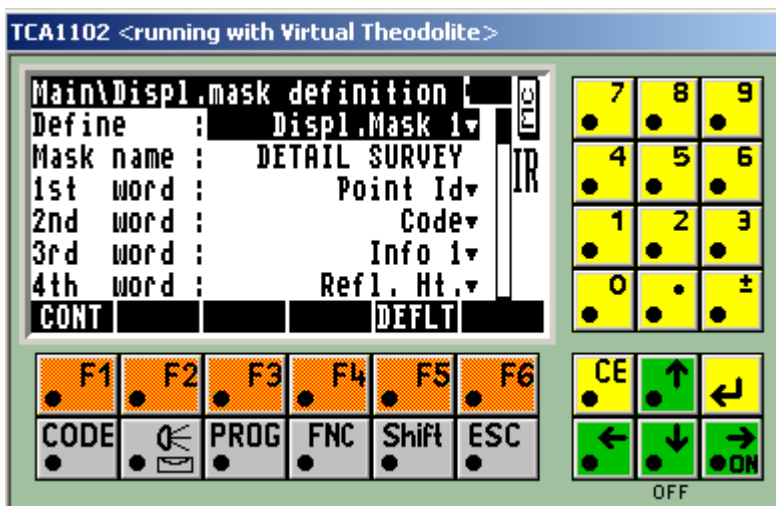


Display mask:

Press F3 to set up display mask



Type in the description **DETAIL SURVEY** for the Mask name



Select the following settings:

1st Word.....Point Id

2nd Word.....Code

3rd Word.....Info 1

4th Word.....Refl. Ht.

5th Word.....Hz

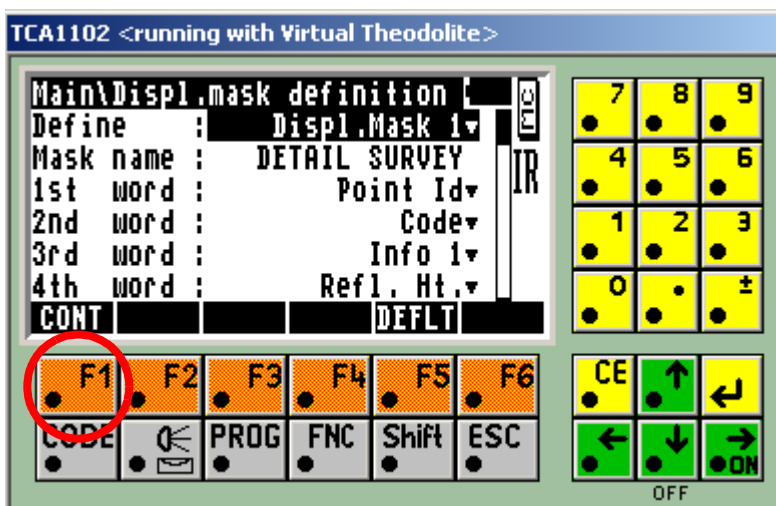
6th Word.....Horiz. Dist

7th Word.....East

8th Word.....North

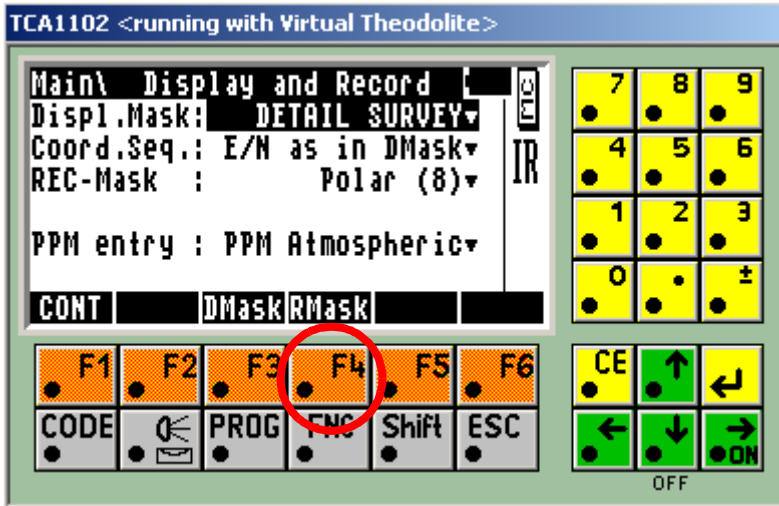
9th Word.....Elev

Press F1

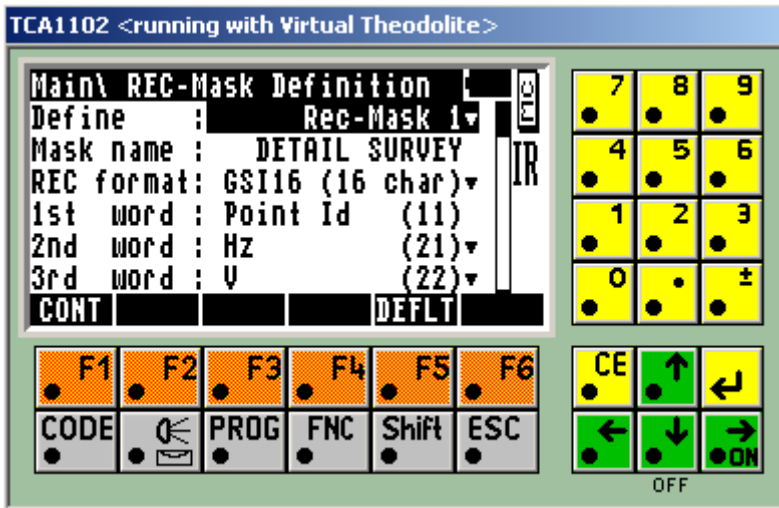


Record mask:

Press F4 to set up record mask



Type in the description DETAIL SURVEY for the Mask name

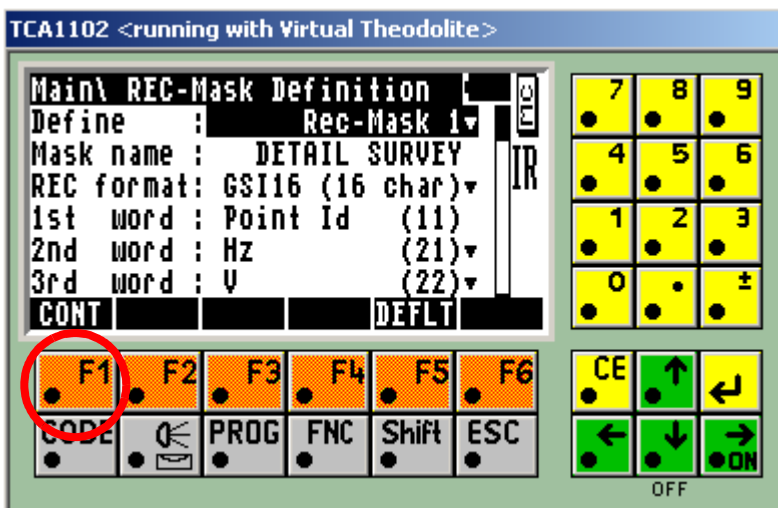


Select the following settings:

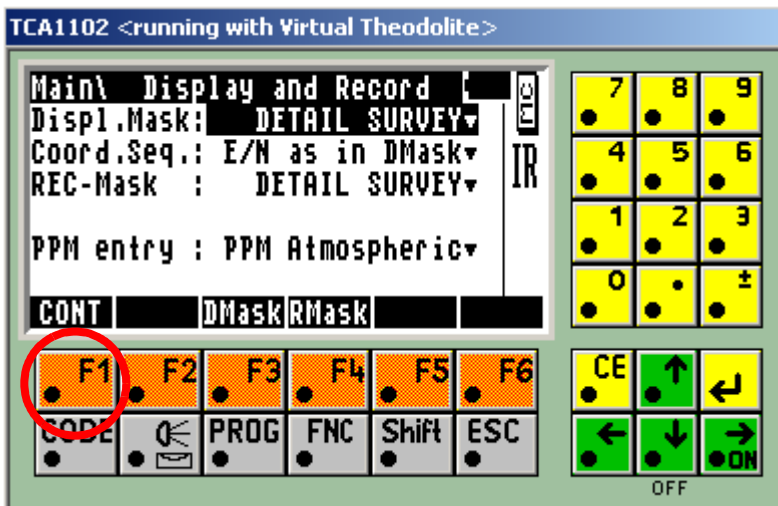
- REC format....GSI16 (16 char)
- 1st Word.....Point Id (11)
- 2nd Word.....Hz (21)
- 3rd Word.....V (22)
- 4th Word.....Slope Dist (31)
- 5th Word.....Ref. Ht. (87)
- 6th Word.....East (81)
- 7th Word.....North (82)

8th Word.....Elev (83)

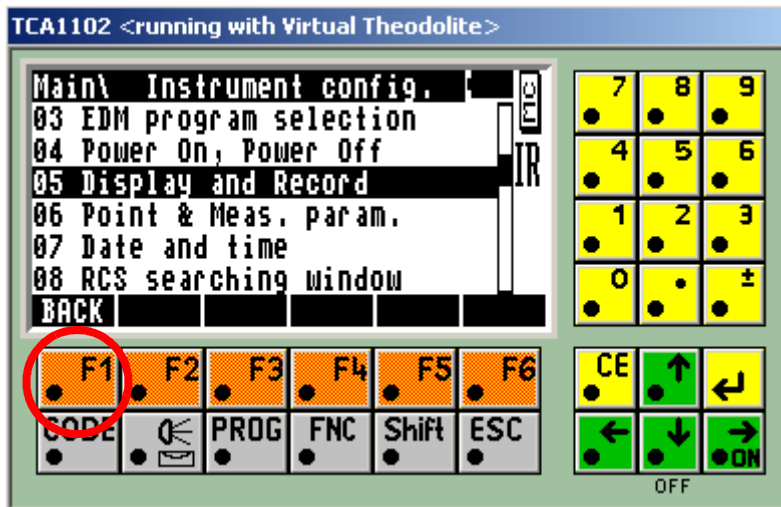
Press F1



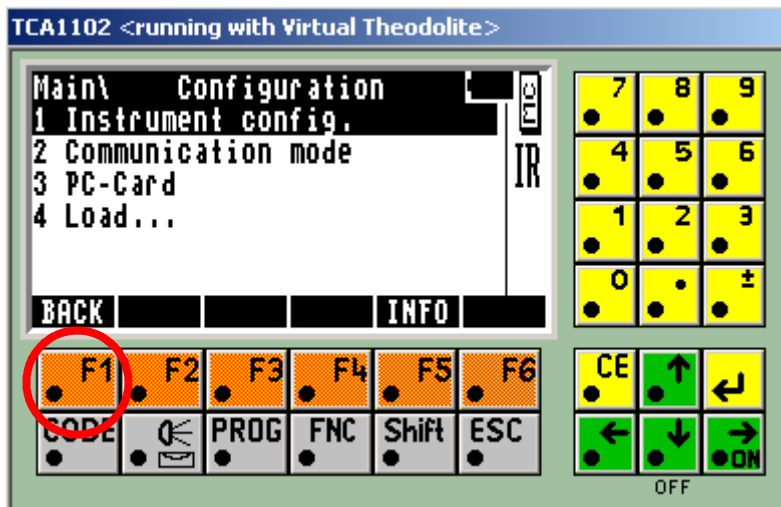
Press F1



Press F1 to exit menu



Press F1 to exit menu



Leica field codes

It is important to know when the code is entered into the instrument as some codes should precede a reading (BM) and some come after (AM). In this manual if a code is related to the current string then it is placed before the reading.

Below is a list of the commonly used codes to be used

- .2 Directly entered coordinates
- .3 New instrument station
- .4 Backsight reading (BM)
- .5 Height of target (BM)
- .6 Check measurement (BM)

.9	Scale factor (BM)
.11	Foresight station (BM)
.14	Feature code and string number (Use for Leica quick codes only)
.15	Vertical circle correction (d.dddd) (BM)
.16	Additional code for point (AM)
.17	Arc thru last 3 points (AM)
.18	Circle (AM)
.20	Close string (AM)
.29	Note (AM)
.30	Remove height from point (AM)
.37	Rectangle by two points (AM)
.38	Make last segment non tinable (AM)
.39	Make next segment non tinable (AM)
.40	Make point non tinable (AM)
.42	Add radial offset (AM)
.43	Add tangential offset (AM)
.44	Add height offset (AM)
.45	Create parallelogram from last three points (AM)
.47	Start new string with same code and string no. as previous string (AM)
.48	End string (AM)....Not generally used

Templates

.51	Start template readings (BM)
.52	Finish template readings (AM)
.53	Pause template (AM)
.54	Continue a template (BM)
.55	Start recording template (BM)
.56	Skip points on template (BM)

Arcs

.60	Arc thru next 3 points (AM).....See also .17
.61	Arc through sets of 3 points until .62 code entered (BM)
.62	End of arc from .61 (AM)

Pipes

.80	Reading taken to invert level of pipe (AM)
.81	Reading taken to centre of pipe (AM)
.82	Reading taken to obvert level of pipe (AM)
.95	Circular pipe diameter (AM)
.96	Box culvert dimensions (AM)

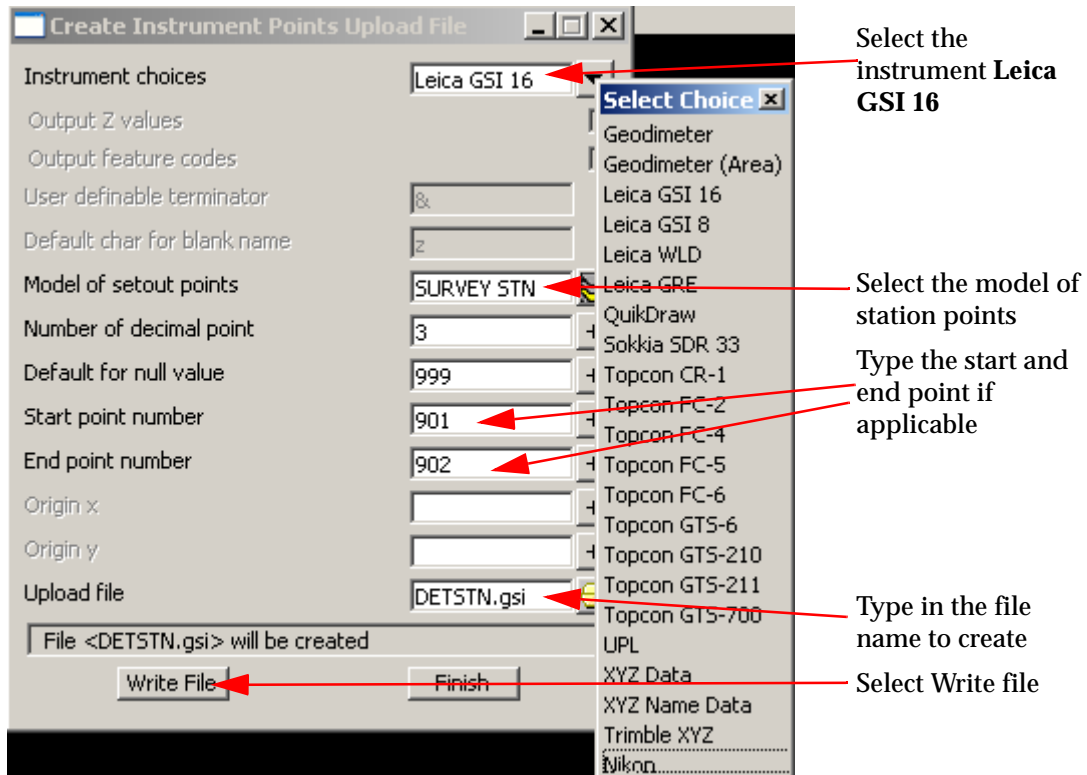
- .92 Remove heights from string (AM)
- .107 Make previous segment invisible (AM)
- .108 Make next segment invisible (AM)

Setting up files

The existing station coordinates for a pickup can be entered into the Leica by hand or they can be uploaded using 12d. The 12d upload sequence will be described here.

Uploading coordinate file

Select option **Survey=>Upload=>Create points upload file**

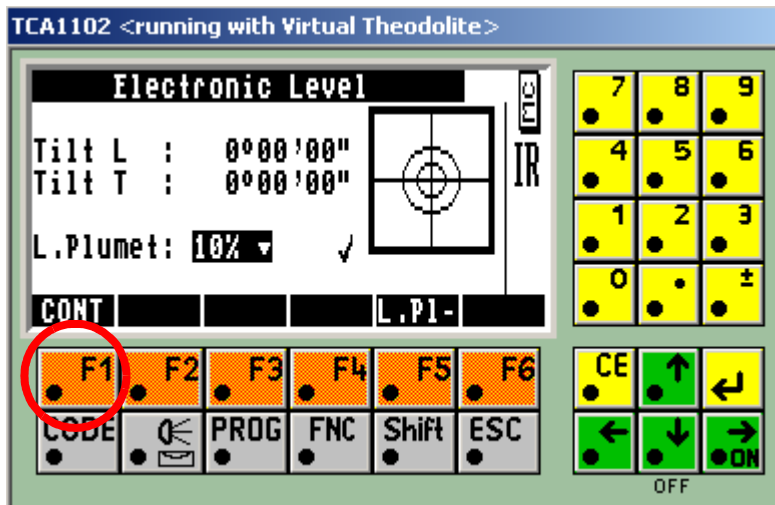


Copy the upload file

The file upload file should be copied to the folder "GSI" on the Leica card

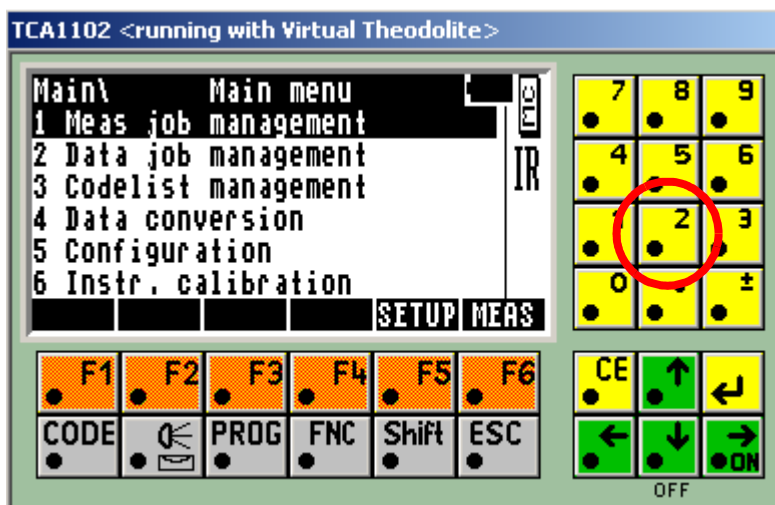
Data file setup

Turn on and level instrument



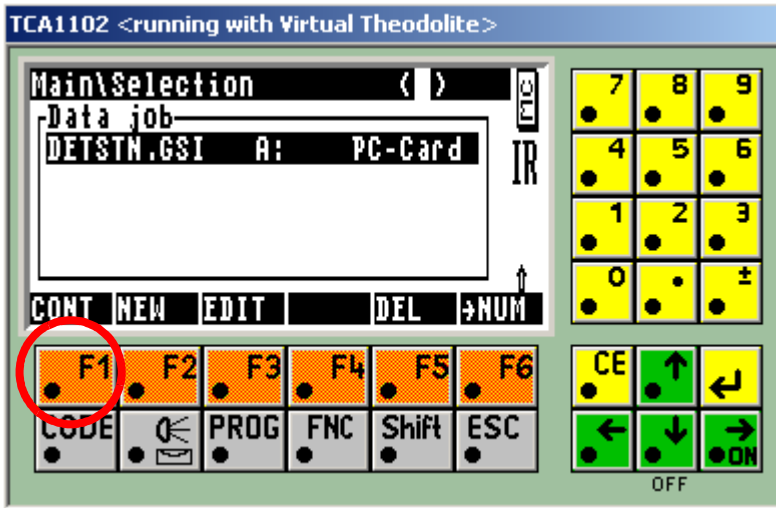
Press F1 to Continue

Press 2 to select Data job file.



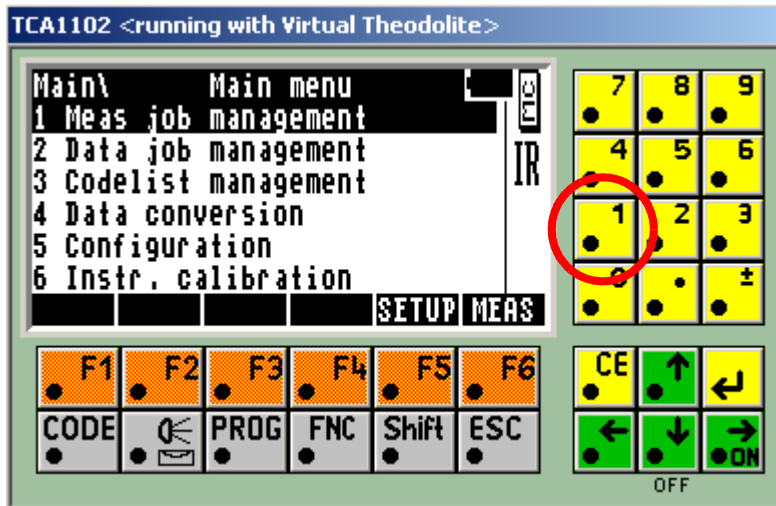
This is the file containing the control points if uploaded or if entered during the survey. Keep the file name separate from the measured data file name

Select the file to use followed by the F1 key or press F2 to create a new file



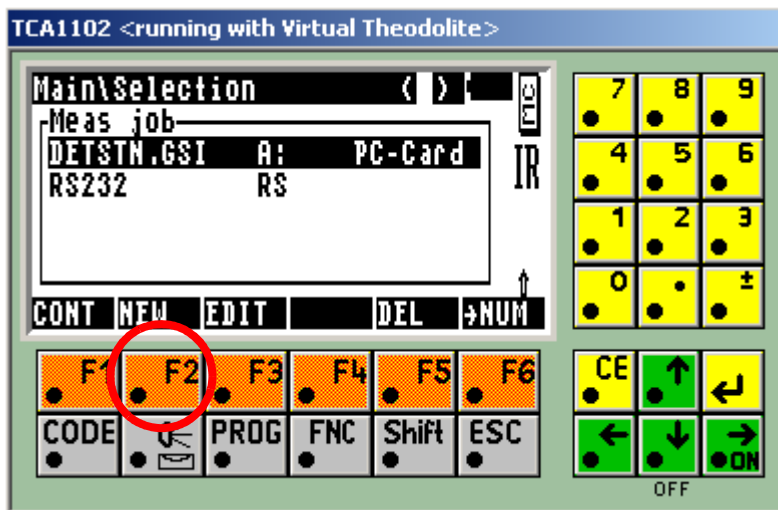
Press F1 to continue

Measured file setup

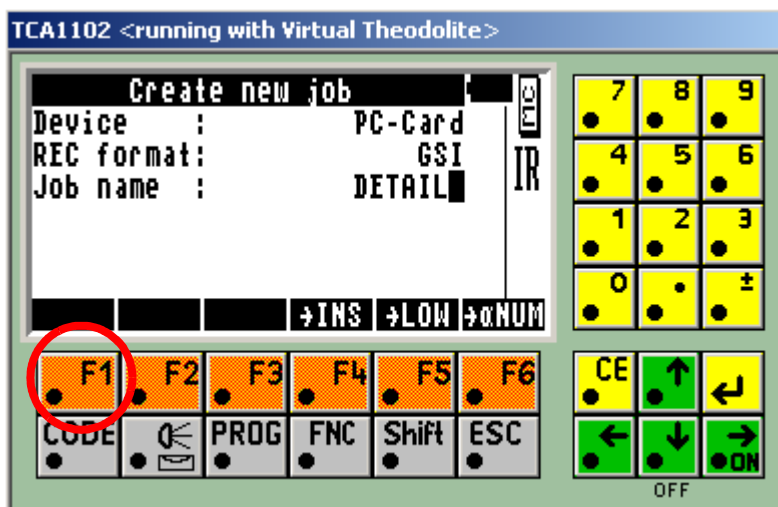


Select 1 to set up Measured job file. This is the file that will contain the detail survey readings

Select F2 to create new file

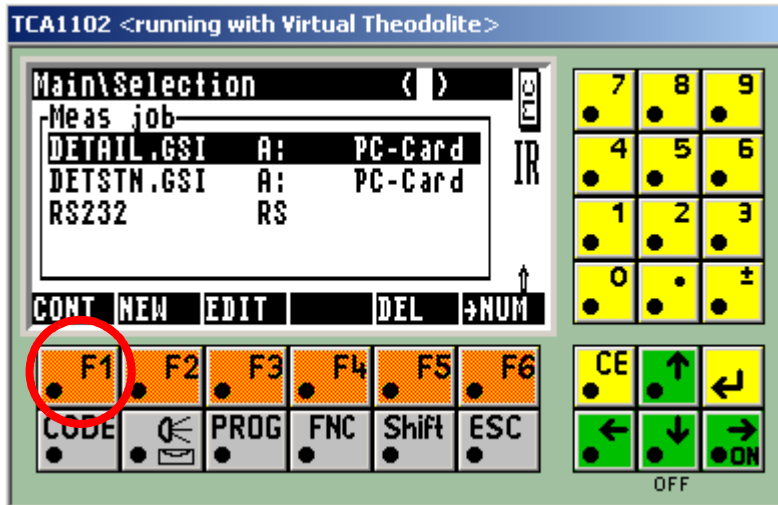


Type in new job name



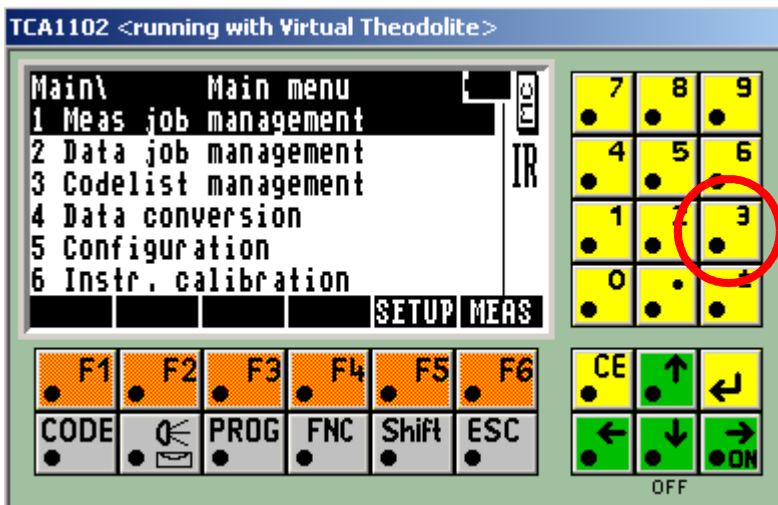
Press F1 to continue

Press F1 to continue

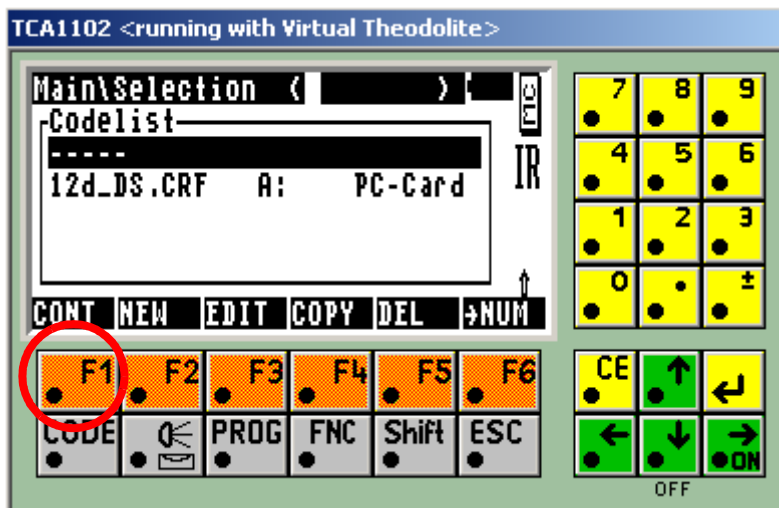


Code list selection

Press 3 to select code list



Select the code list 12D_DS.CRF



Press F1 to continue

Station setup

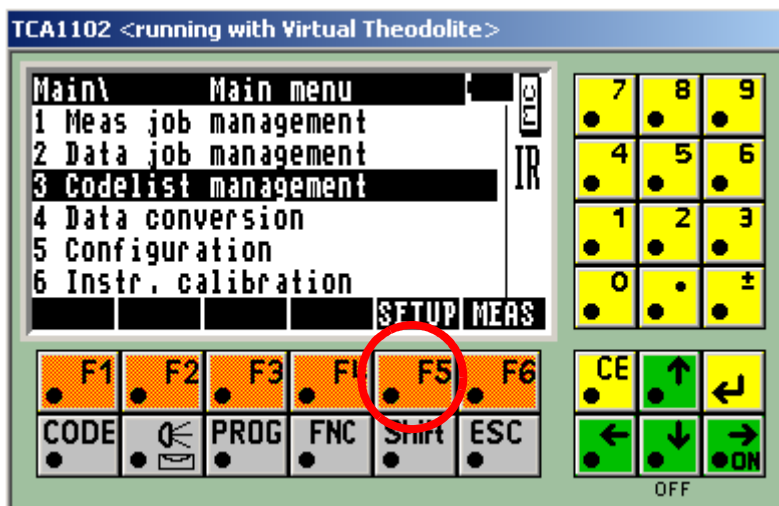
We can use Quick set (See the section "Setup using Quick set (QSET)") for the station setup or manually select the Station

The following notes assume that the data file contains station coordinates

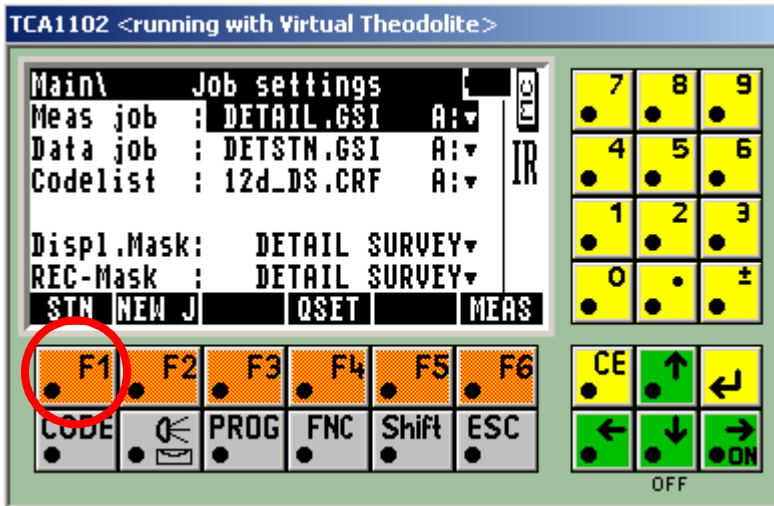
If not the user will have to follow prompts to insert the coordinates

Manual setup

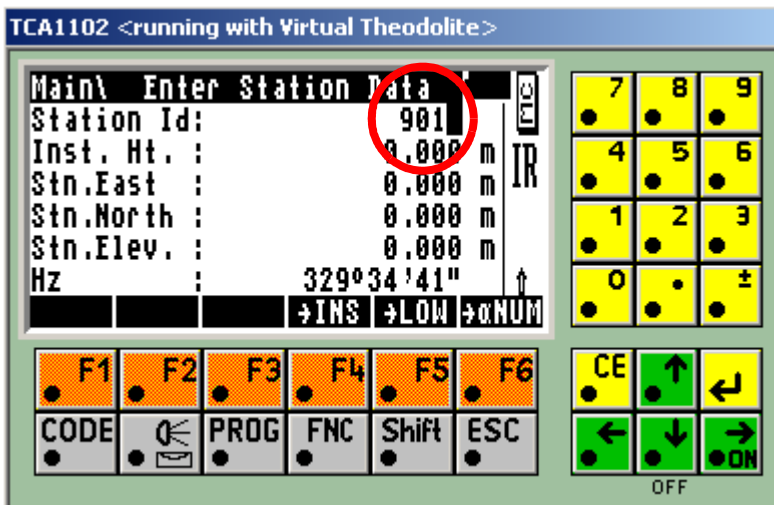
Press F5 for set up



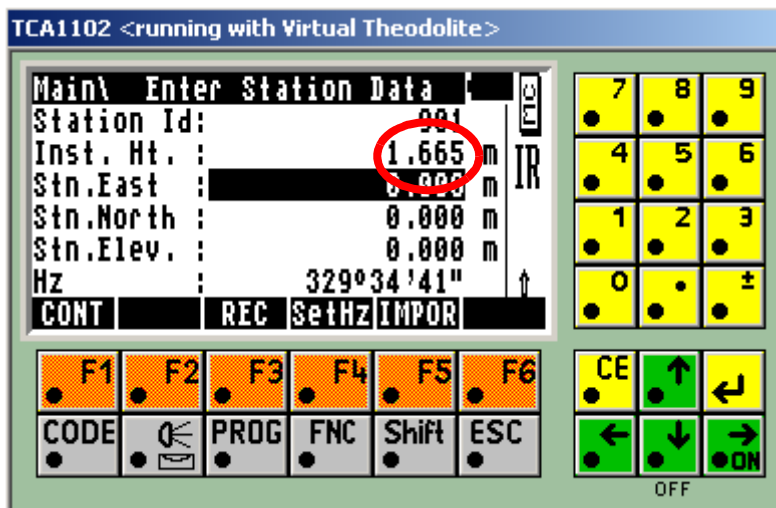
Press F1 to select station



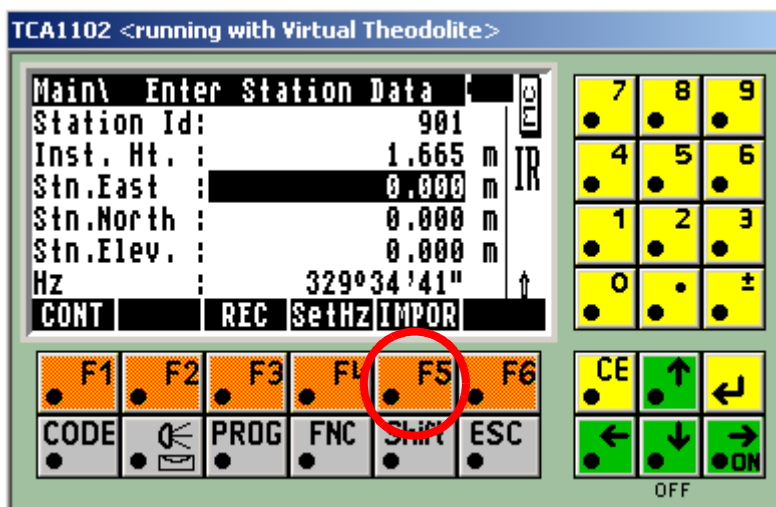
Type in setup station number



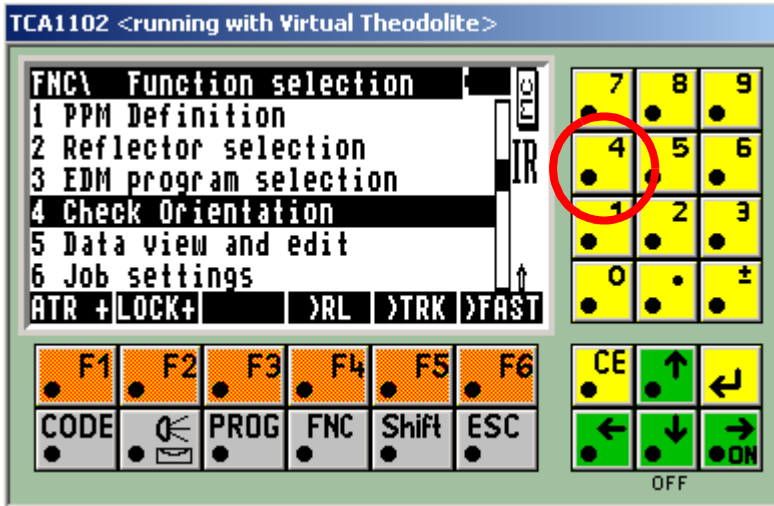
Type in the instrument height



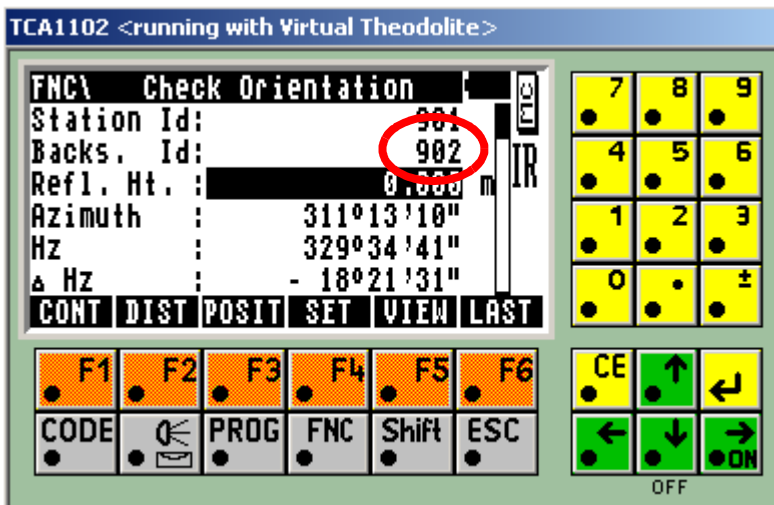
Press F5 to read the coordinates from the data file



To view the bearing between the setup station and backsight station select FNC
 Press 4 to check orientation



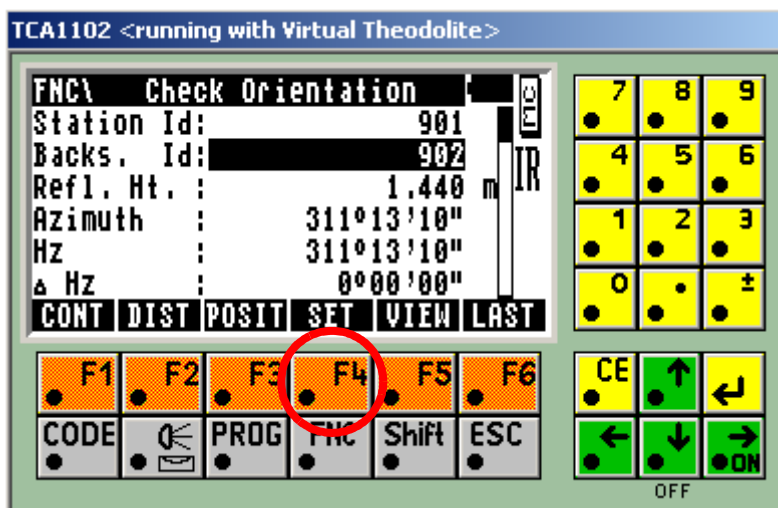
Type in the backsight station number



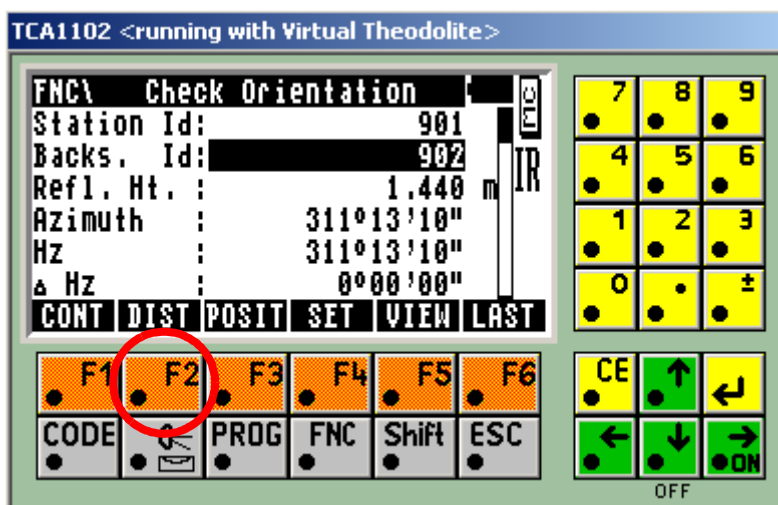
The Azimuth is displayed

Type in the reflector height of the backsight

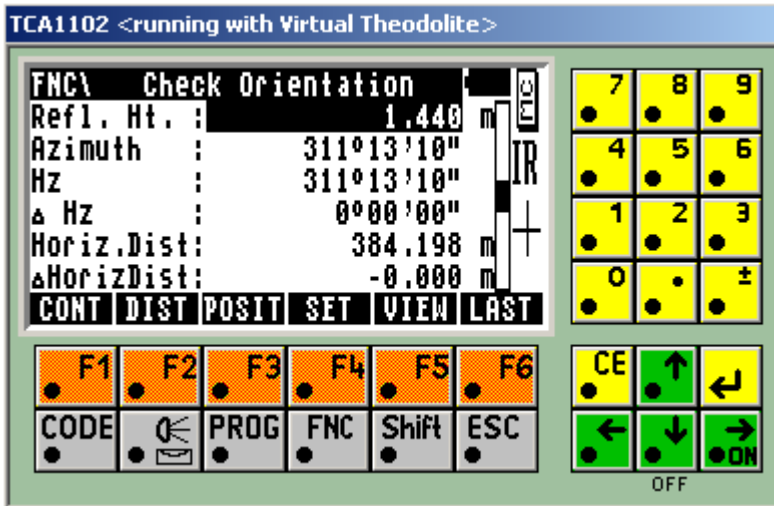
Sight to the backsight station and press F4 to set the bearing



The Bearing is set. Notice that the Azimuth and HZ values are set to the same value. Press F2 to take a distance to the backsight station

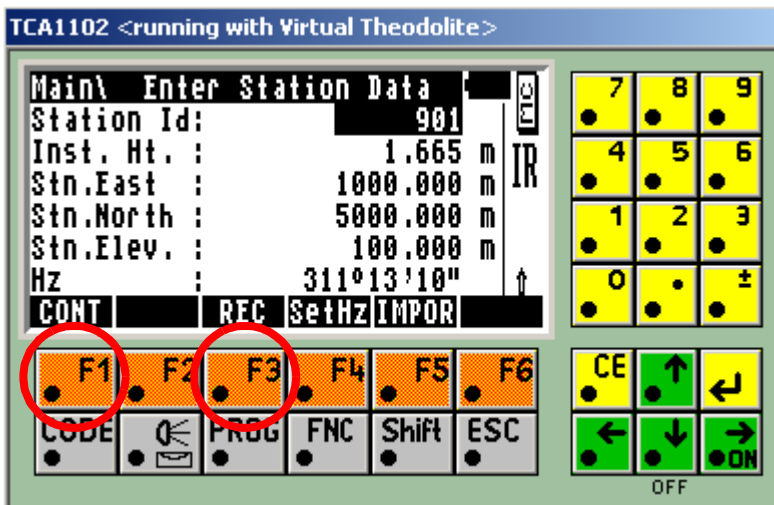


Arrow down to view the distance error



If acceptable press F1 to continue

To save the station information press F3 then F1 to continue

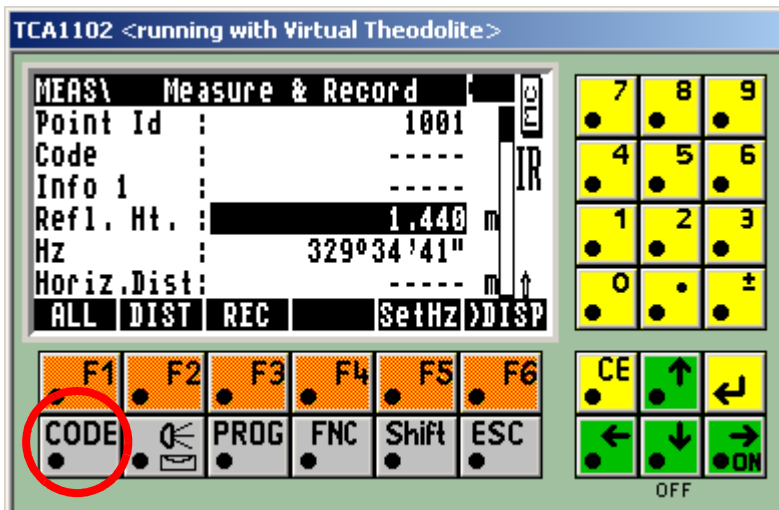


Take Backsight reading:

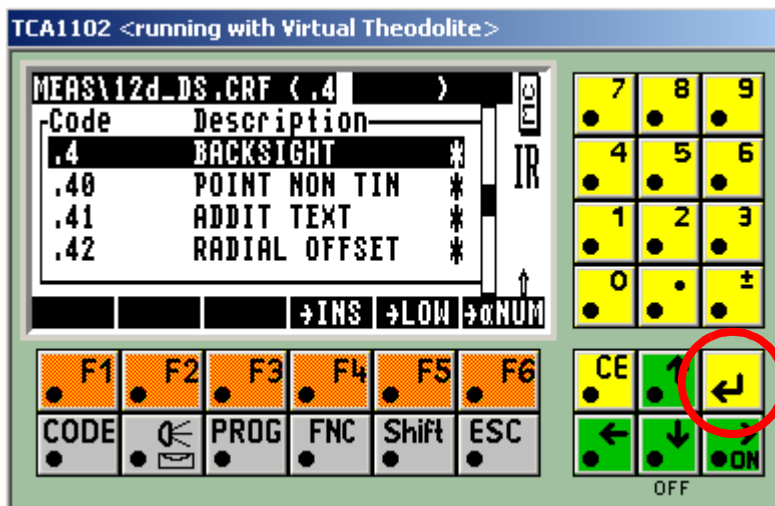
Type in the start point number of the survey

Type in the reflector height. This can also be done as part of the backsight measurement as shown below.

Select CODE

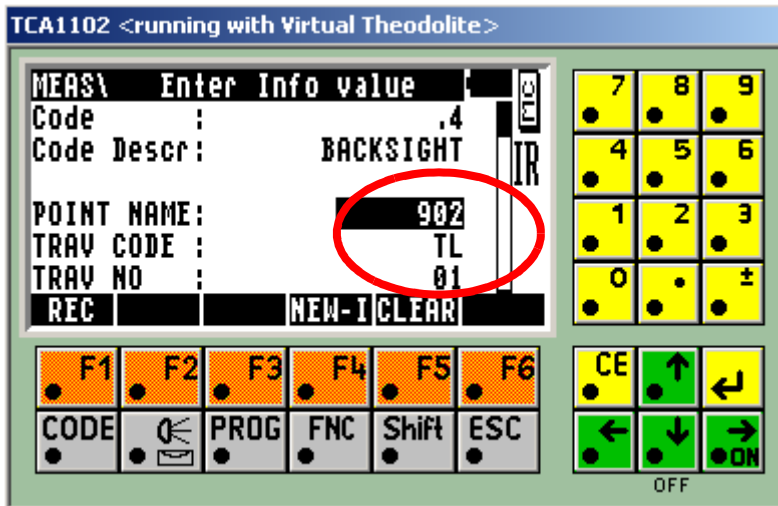


Type in .4 for backsight code followed by the enter key

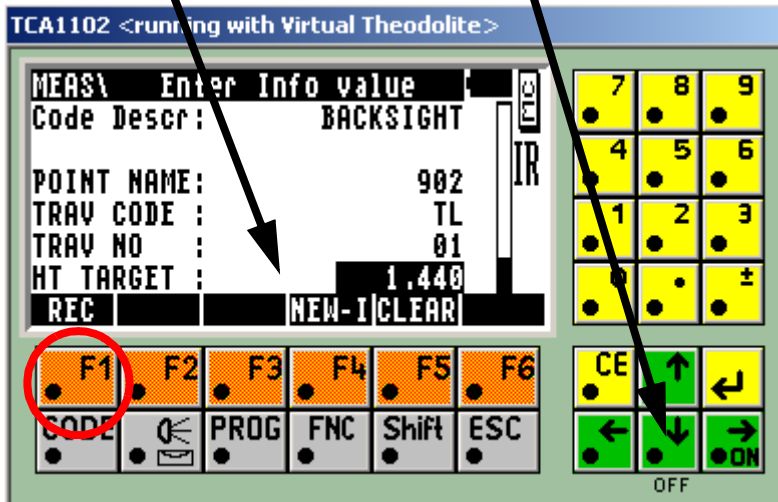


Type in backsight station number

Type in traverse code and traverse no. string number if using traverse coding. For more information about traverse coding see the section "Traverse coding".

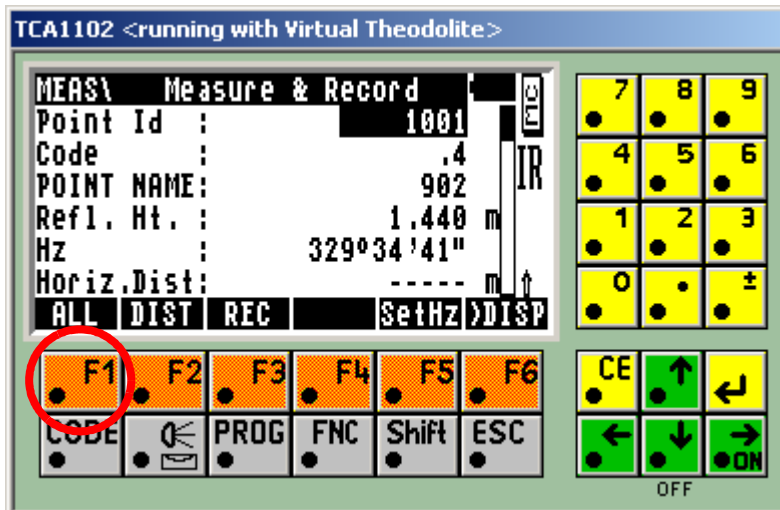


Scroll down using the arrow keys to show other parameters



Press F1 to record the code

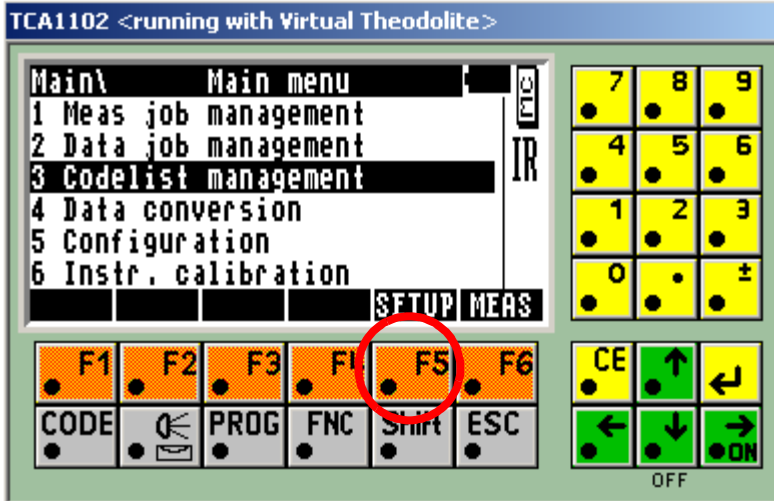
Point to backsight station and press F1 to take and record reading



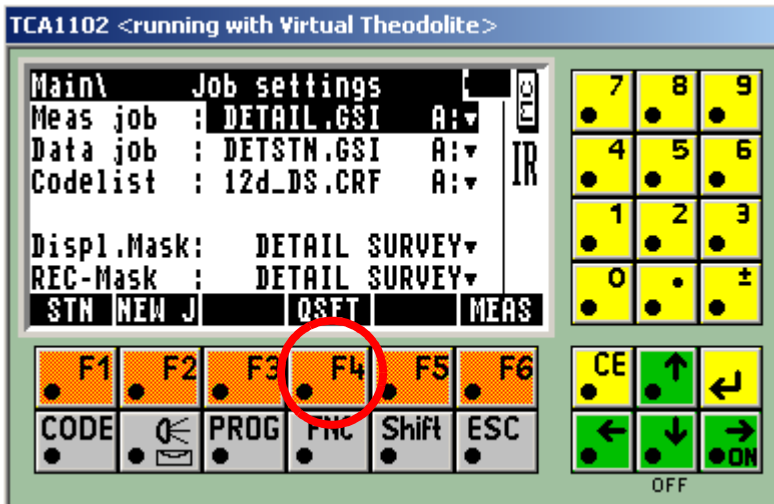
Setup using Quick set (QSET)

IMPORTANT NOTE: If using QSET, you MUST take a check reading to your backsight station as described below.

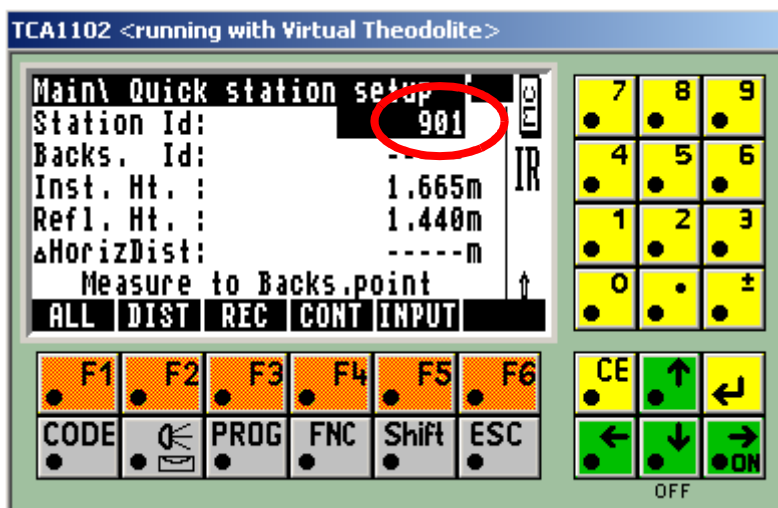
Press F5 for set up



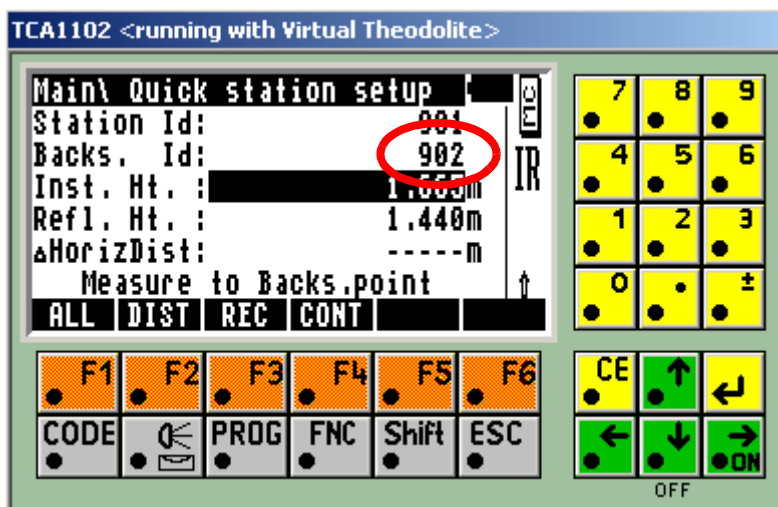
Press F4 for Quick set



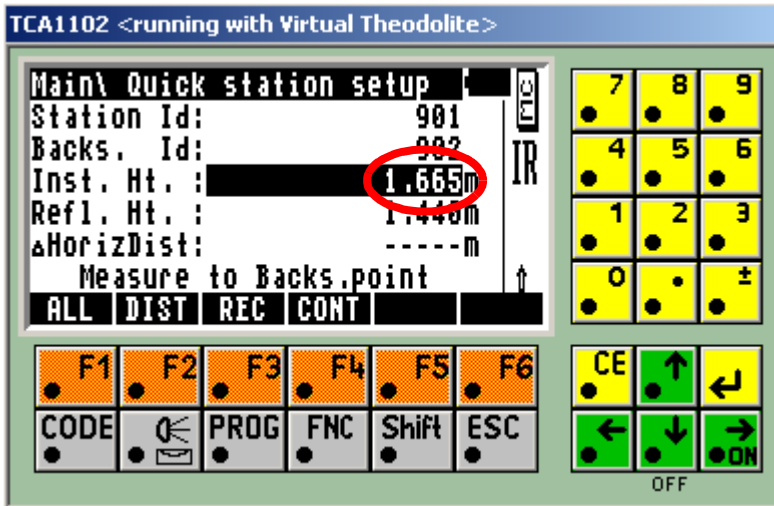
Type in setup station number



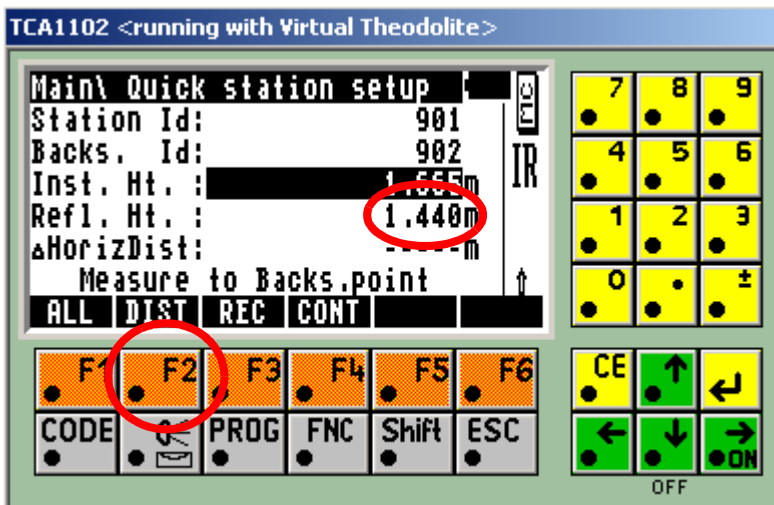
Type in the backsight station number



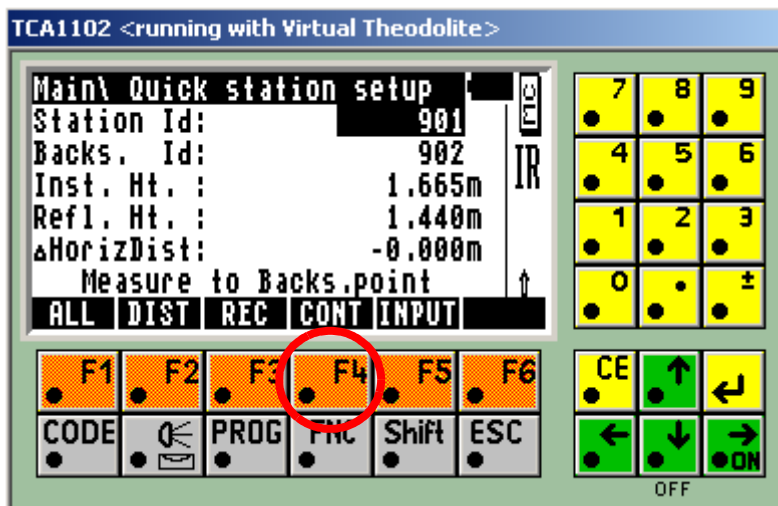
Type in instrument height



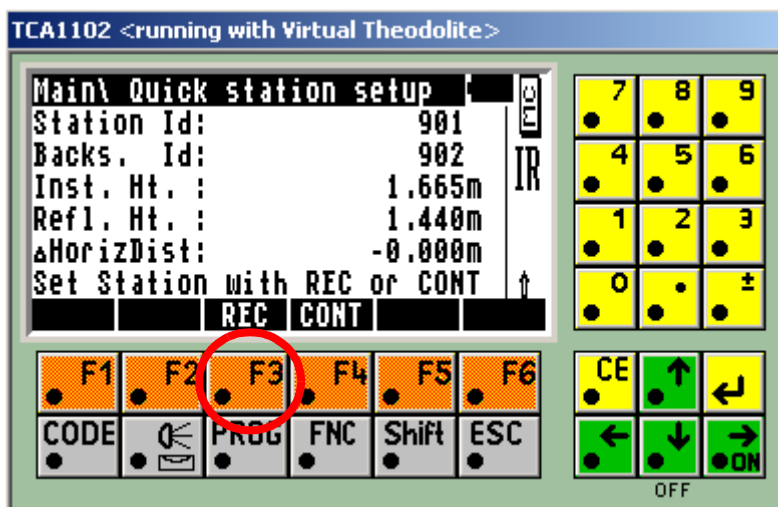
Type in height of target then Press F2 to take reading to backsight to initialise the QSET function.



Press F4 to continue



Press F3 to record the station setup information.

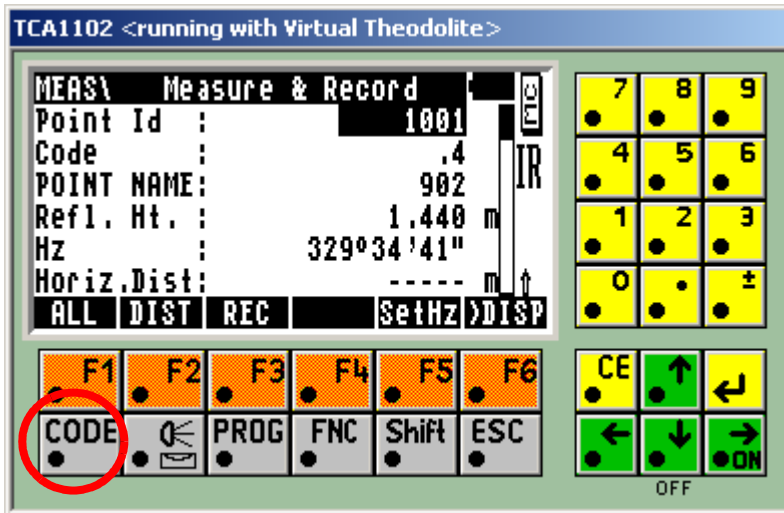


IMPORTANT NOTE: If using QSET, you MUST take a check reading to your backsight station as described below.

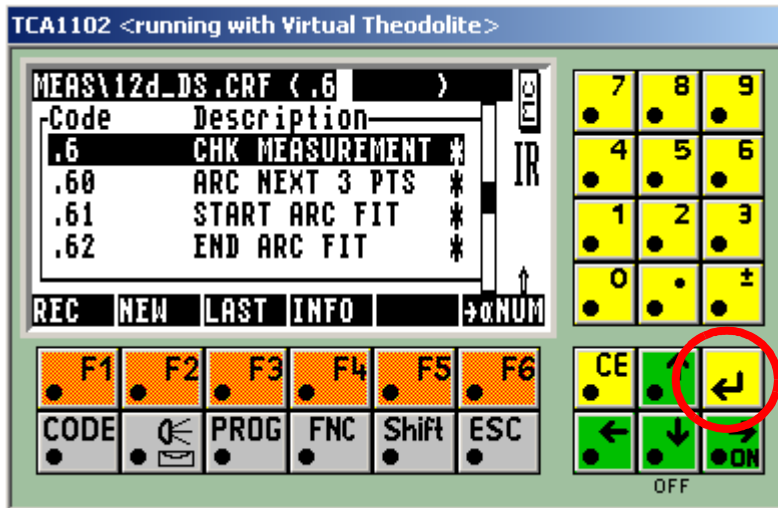
Take Check reading (Mandatory):

Type in reflector height

Select CODE

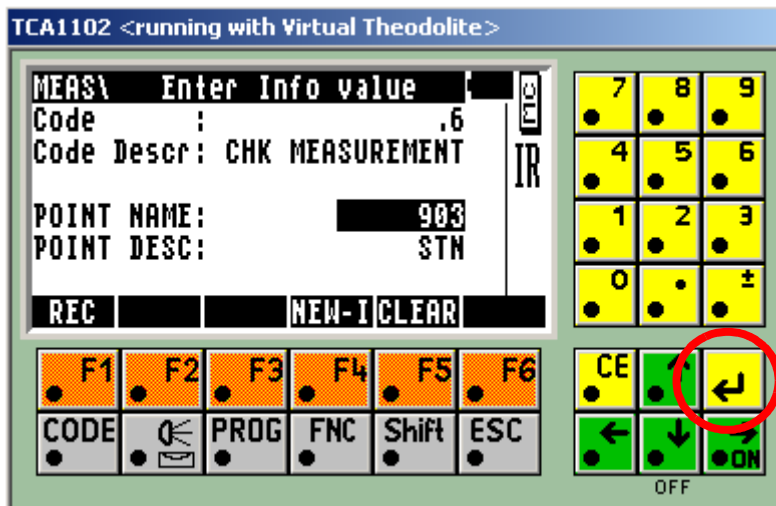


Type in .6 for check measurement code followed by the enter key

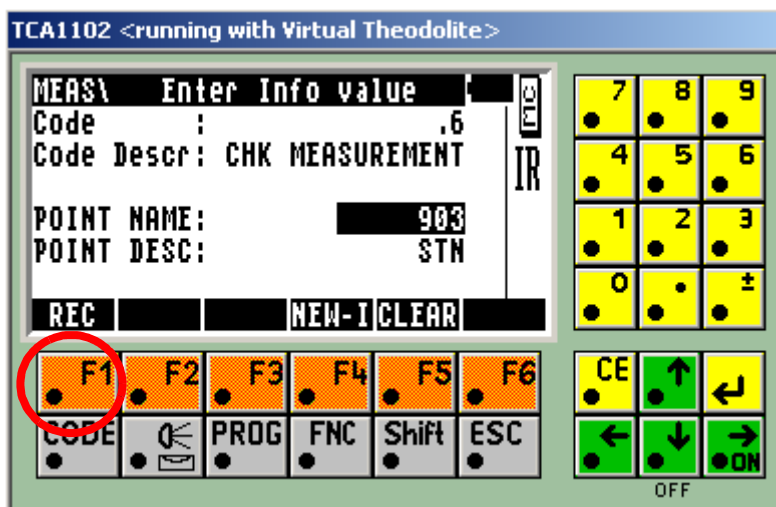


Type in the check station number

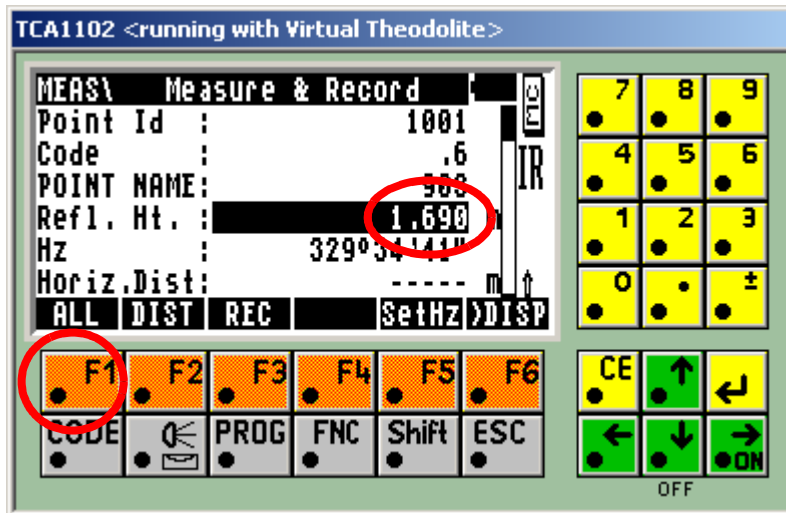
Type in the description



Press F1 to record code



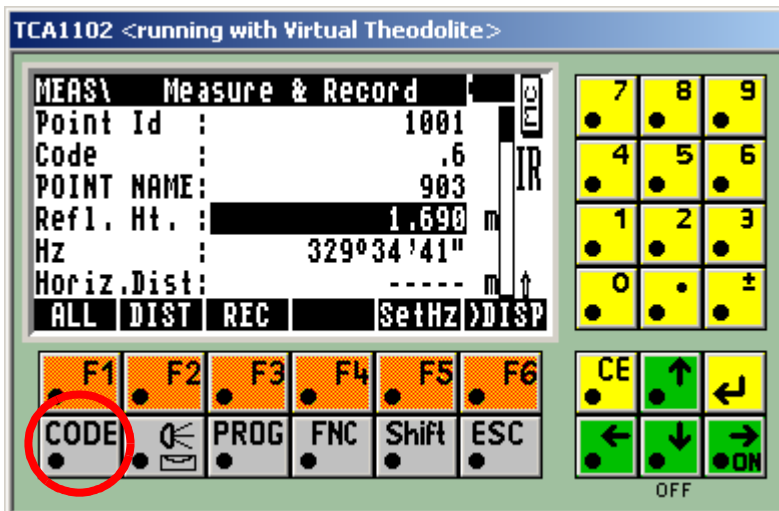
Type in the reflector height



Select F1 to take reading

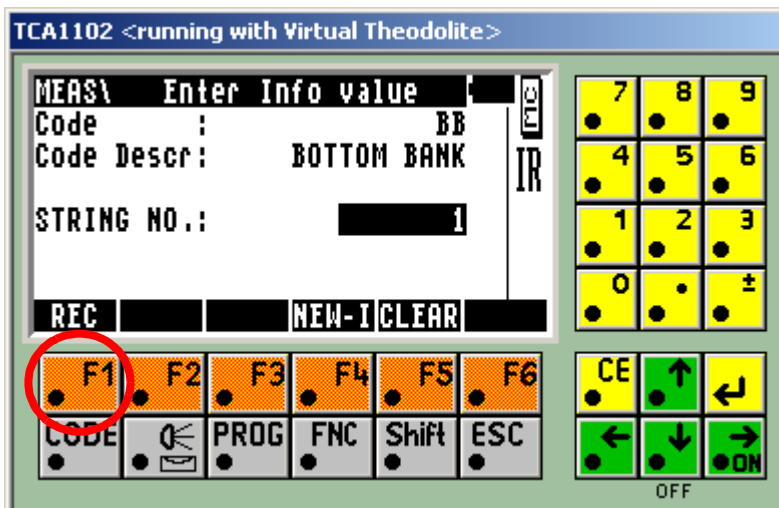
Normal readings

Always change the code prior to starting a new feature and ensure the reflector height is correct



Select Code

Type in the required code and string number

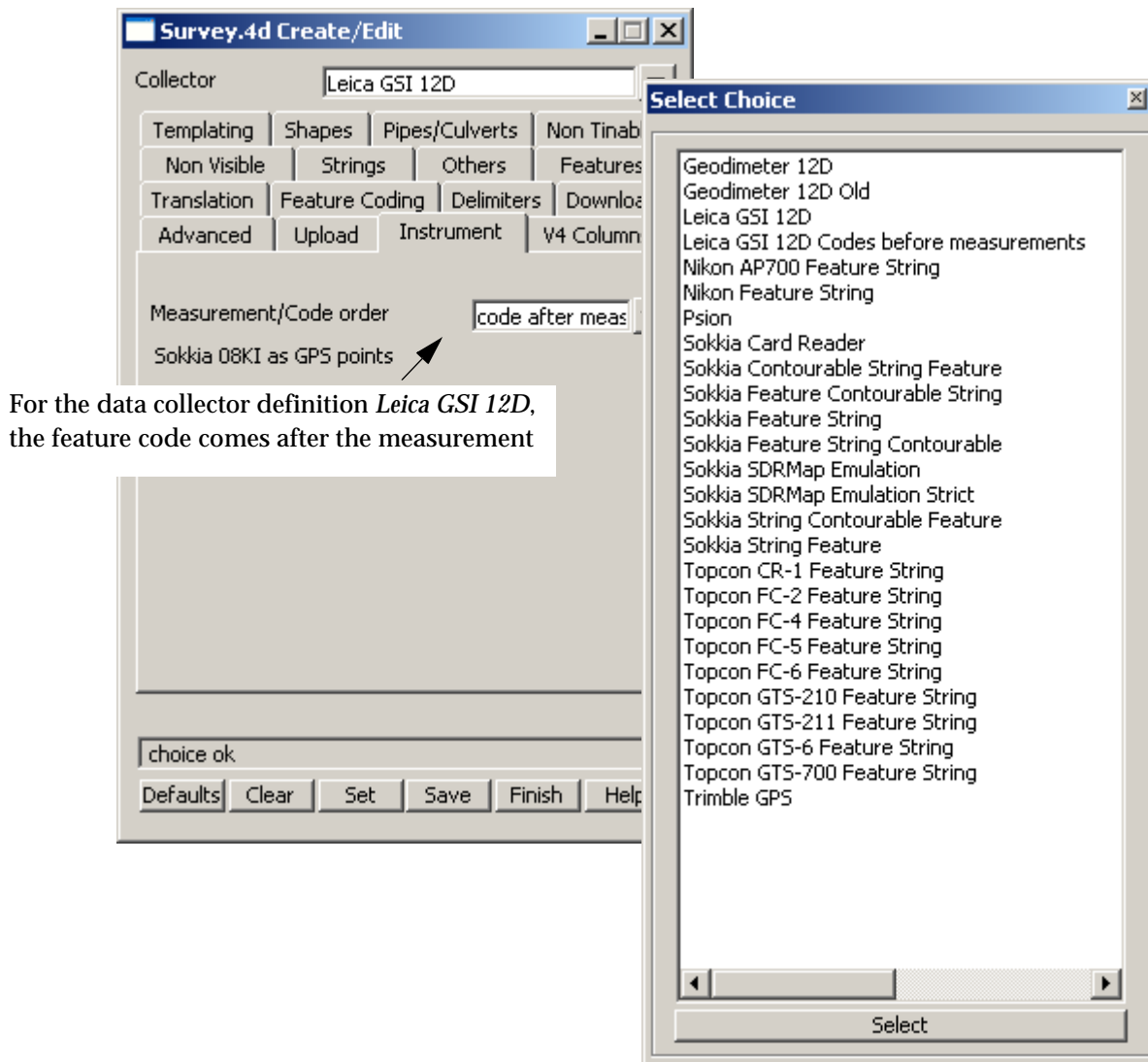


Press F1

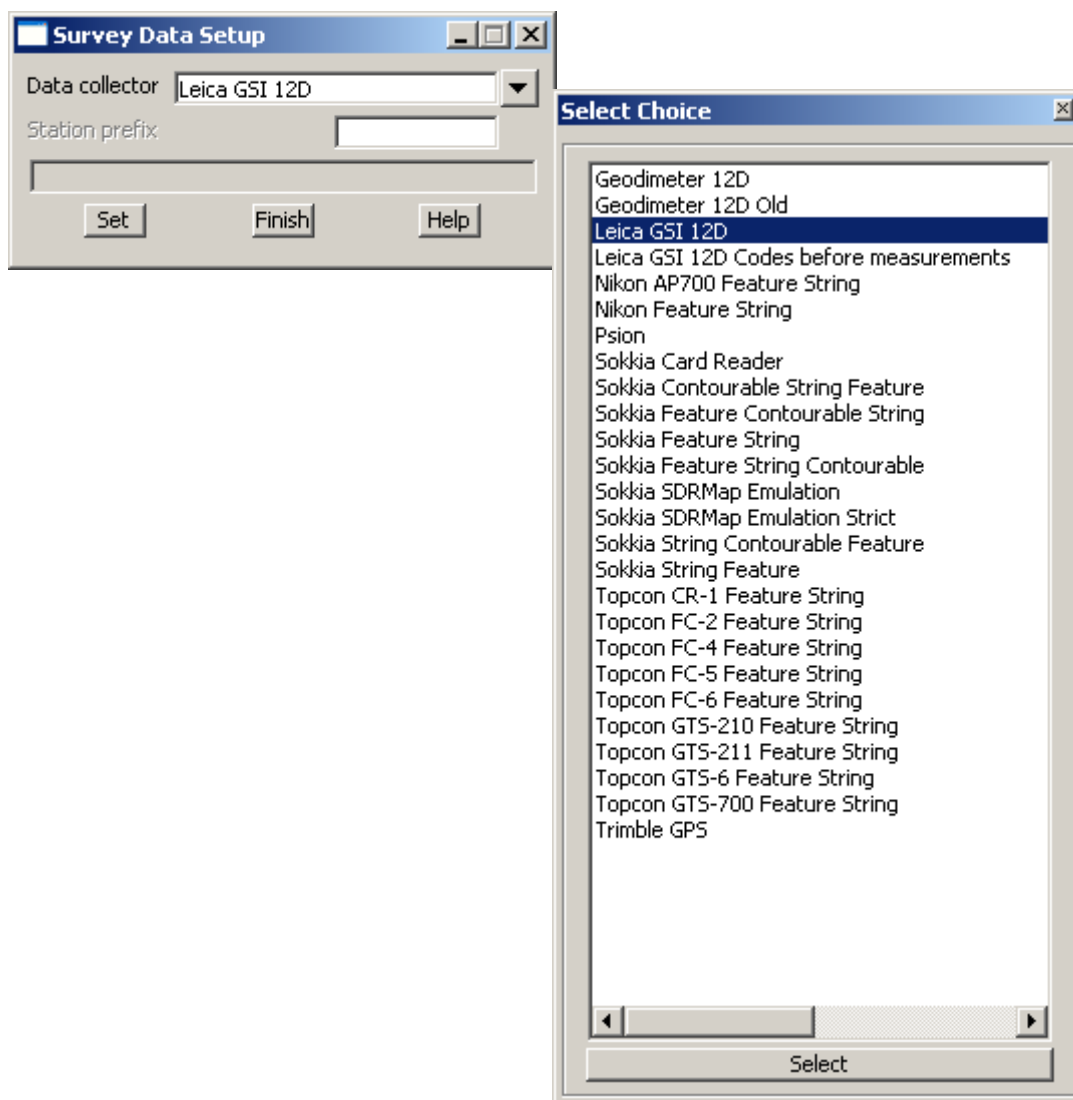
Example of Leica GSI File

The following GSI file has been coded with the Feature Code being recorded after the measurement. The Feature code definition is then applied to all subsequent measurements until another measurement with a following Feature Code definition is found.

The data collector definition *Leica GSI 12D* which is shipped with 12d Model, is an appropriate data collector definition for converting the example GSI file to a 12d Field File ready for processing.



The data collector definition *Leica 12D* which is shipped with 12d Model is selected using the option *Survey=>Setup*



Description**Leica GSI File in 8 Format using 12d Model Field Coding and Giving Feature Codes After a Measurement**

Directly entered co-ords for station 10	410001+000000.2 42....+10000000 43....+10000000 44....+00010000 45....+00000STN 46....+00000000 47....+00000000 48....+00000010
Instrument set-up on 10 with instrument height of 1.715	410002+000000.3 42....+00000010 43....+0001.715
Next measurement is backsight to 931	410003+000000.4 42....+00000931
Measurement to backsight - has point number 1765	110004+00001765 21.324+19135130 22.324+09010170 31..00+00091100 51..1.+0007+000
New target height of 1.338	410005+000000.5 42....+0001.338
Measurement FC DHW SN 0 - Pt no 1766 (the FC and SN is given on the next line)	110006+00001766 21.324+19316250 22.324+08955240 31..00+00074468 51..1.+0007+000
Set feature code DHW string number 0	410007+00000DHW 42....+00000000
Measurement - FC RDG SN 1 has point number 1767	110008+00001767 21.324+21458540 22.324+09150580 31..00+00019501 51..1.+0007+000
Set feature code RDG string number 1	410009+00000RDG 42....+00000001
Measurement - FC RDG SN 1 has point number 1768	110010+00001768 21.324+21820190 22.324+09137140 31..00+00020397 51..1.+0007+000
Measurement - FC RDG SN 1 has point number 1769	110011+00001769 21.324+22104470 22.324+09155360 31..00+00019241 51..1.+0007+000
Measurement - FC RDG SN 1 has point number 1770	110012+00001770 21.324+21747290 22.324+09208580 31..00+00018299 51..1.+0007+000
Close the previous string RDG	410013+00000.20

H Geodetics Summary

Various options in **12d** Model version 7.0, use geodetic calculations to present and change data. These options use terminology that are common to the field of geodetics, which will be defined here.

Most of the terminology adopted follows definitions given in the Australian “**GDA Technical Manual**” which is published by the Intergovernmental Committee on Surveying and Mapping (ICSM). This publication is a valuable reference document and the reader is encouraged to obtain a copy for a full understanding of the topic. The document can be accessed on the internet at the following address <http://www.anzlic.org.au/icsm/gdatm/>

Please continue to the next section “Shape Of The Earth” .

Shape Of The Earth

The determination of the Earth's shape is a science known as **Geodesy**. Today, it is widely accepted that the Earth's shape best approximates an **ellipsoid** that has been revolved around the Earth's polar axis. Put another way, the shape is a sphere that has been squashed at the north and south poles. The non-spherical shape is due to gravity.

A number of ellipsoids have been calculated to best approximate the Earth's shape at local locations and the earth as a whole. The best fit is concerned with matching the Earth's equipotential gravity field (the **Geoid** that is best approximated by Mean Sea Level), to a geometric ellipsoid shape. As such, there a wide number of definitions.

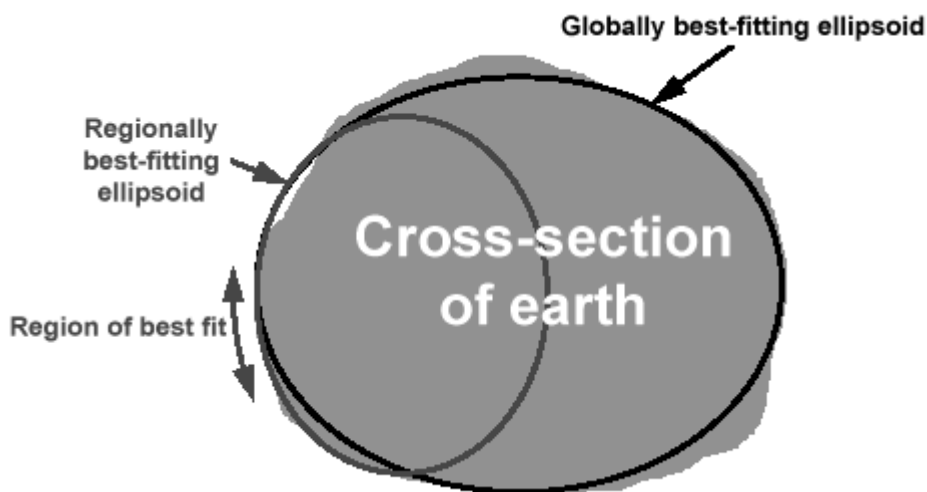
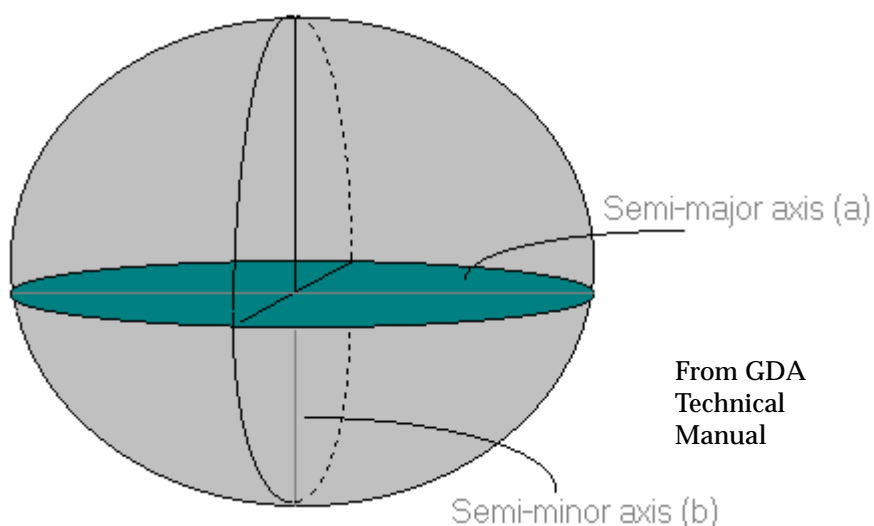


Diagram from: A guide to coordinate systems in Great Britain.
See <http://www.gps.gov.uk/guidecontents.asp>

The most common way of defining an ellipsoid is by describing the **semi-major axis** value and an **inverse flattening** value (this parameter describes the “squashing” of the ellipse).



From GDA
Technical
Manual

Some commonly used ellipsoids are:

Ellipsoid	Semi-major axis	Inverse flattening
GRS80	6,378,137.0	298.257222101

This ellipsoid is used for Australia's GDA definition (Geocentric Datum of Australia GDA 94) used for MGA (Map Grid of Australia) calculations, New Zealand's NZGD2000 datum as well as other geocentric earth model datums around the world.

Ellipsoid	Semi-major axis	Inverse flattening
ANS	638160	298.25

This was the ellipsoid used to define the Australian Geodetic datum (AGD 84) used for AMG (Australian Map Grid) calculations and ISG (Integrated Survey Grid) co-ordinates.

Ellipsoid	Semi-major axis	Inverse flattening
NZ Geodetic 49	6378399.065	297.0

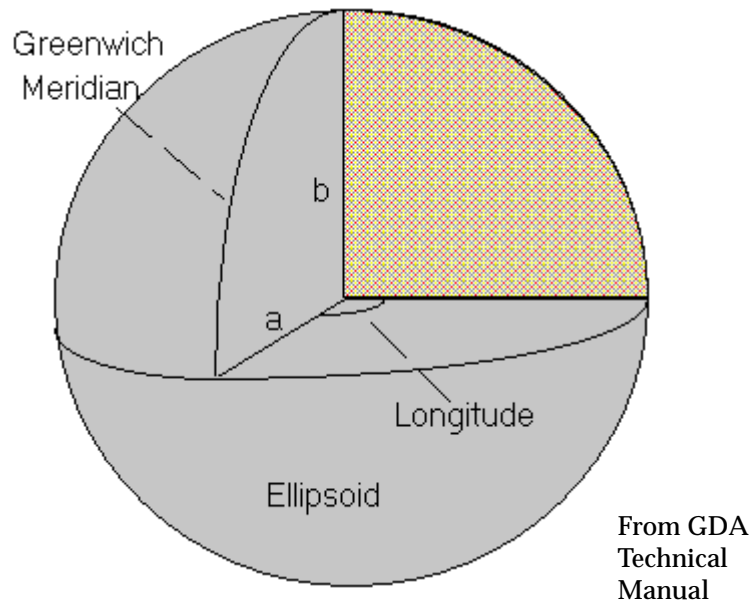
This was the ellipsoid used to define the NZ 1949 Geodetic datum. The semi-major axis given here has been adjusted to compensate for errors in units conversion from links to meters.

Please continue to the next section "Geodetic Coordinates" .

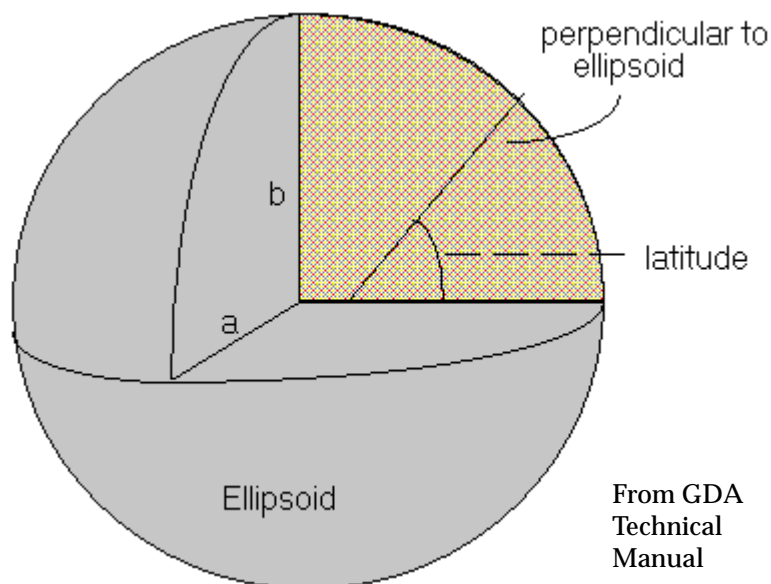
Geodetic Coordinates

Once an ellipsoid or **Geodetic Datum** is defined, a position on the earth's surface can be described in terms of Geodetic coordinates. These coordinates are **Longitude**, **Latitude** and **Ellipsoid height**.

Longitude is an angular quantity measured from the Greenwich meridian. It is most commonly described in terms of degrees, minutes, seconds East or west of the Greenwich meridian.



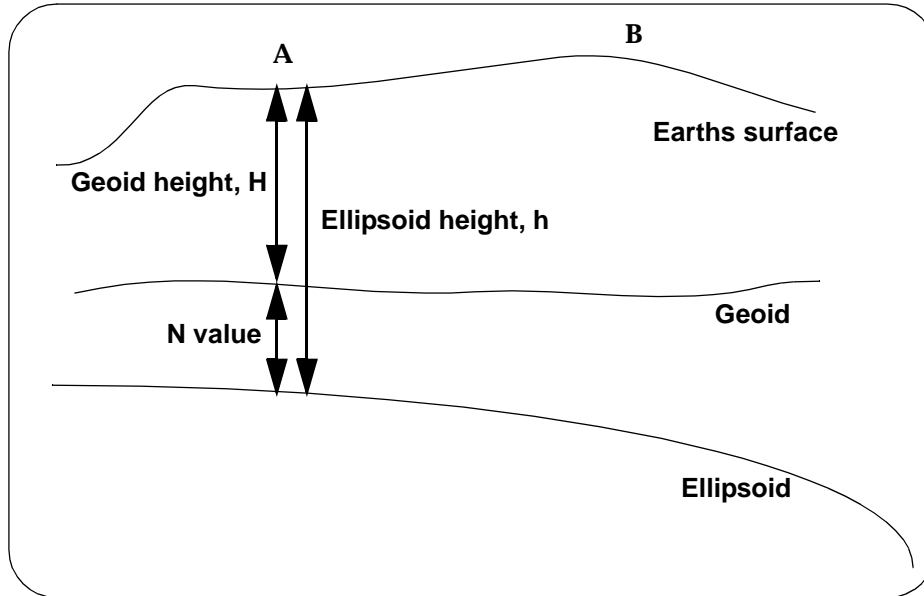
Latitude is an angular quantity measured from the equatorial plane, to the plane defined by the point position and the plumb line to the ellipsoid surface. It is most commonly described in terms of degrees, minutes, seconds South or North to the equator.



The **ellipsoid height**, h is the height above the reference ellipsoid.

Most height datums are not based on ellipsoid height but are based on the **geoid**, e.g. AHD in Australia.

As such, levels from GPS observations (which are **ellipsoid** heights) need to be corrected to a geoidal or orthometric height. To do this, we require the separation or gap distance between the two different surfaces. This separation is known as the **N value**.



The Ellipsoid height = Geoid height + N value, or

$$h = H + N$$

N values can be defined in a geoidal model such as Ausgeoid98 which represents grids of N values over all of Australia. For a given Geodetic coordinate, an N value can be interpolated from the model and applied to the ellipsoid height to give a geoidal height. Similarly, the N value can be used to convert a geoidal height to an ellipsoid height.

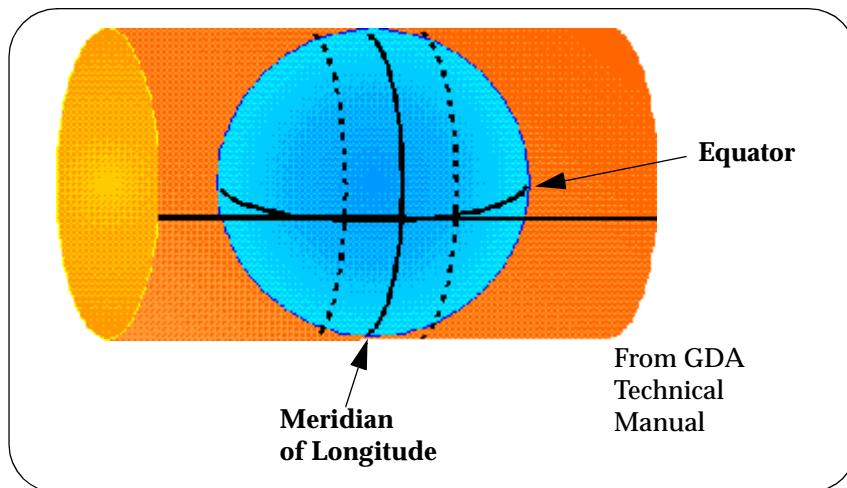
Since most geodetic calculations are made on the ellipsoid, the **ellipsoid height** is required for precise calculations.

Please continue to the next section "Projections".

Projections

In order to represent ellipsoid data on a flat surface for mapping, it is necessary to use a projection. A projection enables points on the earth's surface to be mathematically projected onto an imaginary developable surface. This surface can then be developed or "rolled flat". Typically, this surface is a cylinder or cone.

The Transverse Mercator system (TM) projects coordinates onto a cylinder that is tangent to the equator and the entire length of a meridian of Longitude.



12d Model version 6.0 and above, allows a number of projections to be specified including, Universal Transverse Mercator (UTM), Transverse Mercator (TM) and Rectified Skew Orthomorphic (RSO). There are many more available using the **General** type.

Within 12d Model, a projection can be defined that specifies both the **reference ellipsoid** and **projection type**. This then can be used for geodetic calculations.

A projection has various parameters that define it. These are specific to the projection and are clearly defined for major mapping systems. For example MGA94 zone 56 projection is defined as follows:

Set Projection

Projection name: MGA94 Zone 56

Projection type: UTM

Zone Number: 56

North/South Hemisphere: South

Use known ellipsoid:

Ellipsoid: GRS80

Semi-major axis: 6378137.0

Reciprocal flattening(1/f): 298.257222101

choice ok

Set Finish Help

Please continue to the next section “Terminology” .

Terminology

The various geodetic options in 12d Model mostly use standard geodetic terminology as defined in the Australian GDA technical manual. For clarity, they will be defined again here. For some options it is important to note that some terminology used in Australia has quite a differing meaning in other countries.

Ellipsoid Distance

The **ellipsoid distance** is the reduced distance along the *surface* of the ellipsoid. Standard survey measurements are reduced to the horizontal but require a correction due to the height above the ellipsoid. This is usually done by a **height scale factor** which takes into account the ellipsoid height at each end of the measured line. i.e.

$$\text{HeightScaleFactor} = 1 - \frac{h_M}{R + h_M}$$

Where:

h_M = Mean terrain height (mean of the two ellipsoid heights at either end of the measured line)

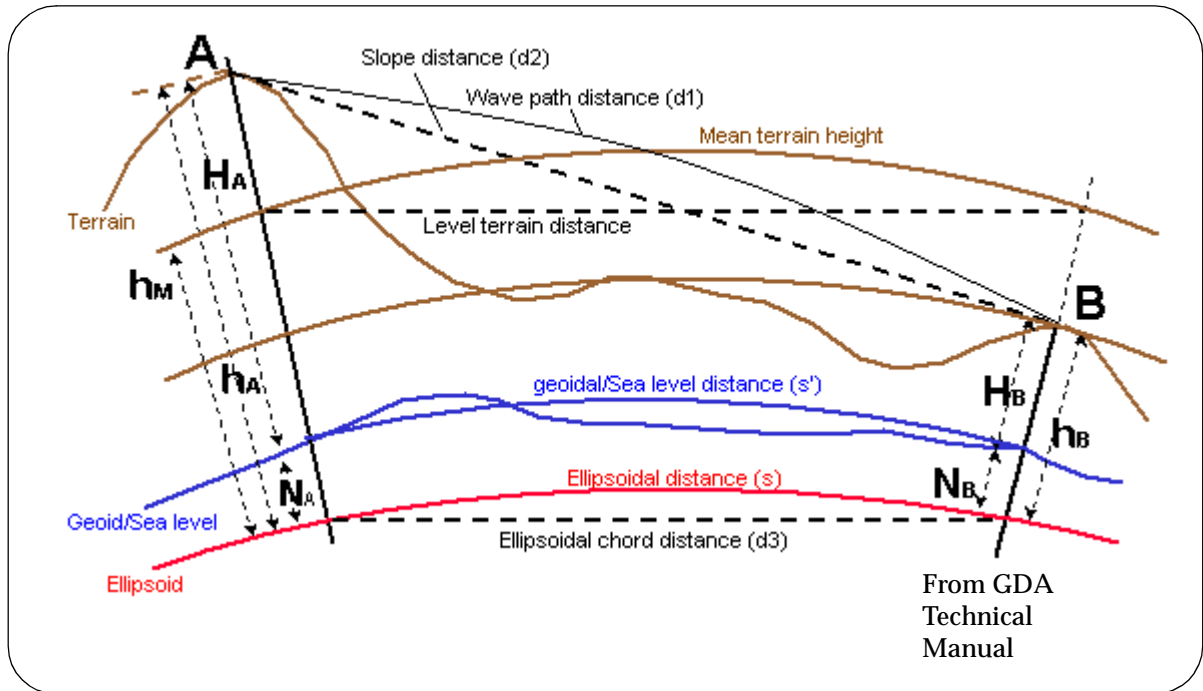
R = Radius of the earth in the azimuth of the line.

Note: An error of 60 meters in the value of **h_M** will introduce an error of 10 ppm in the reduced ellipsoid distance. With the introduction of the Australian Geocentric datums, the N values have increased markedly over Australia. So even if a survey is undertaken at sea level (Geoid height approximately 0.0), the ellipsoid heights may very well be greater than 60 meters. As The Ellipsoid height = Geoid height + N value, N values should be considered when reducing measured distances to these datums.

For older Australian ellipsoids, Mean seal level approximated the surface of the ellipsoid (i.e. N value approximately 0.0), so corrections could use geoidal heights to bring the distances down onto the reference surface.

The ellipsoid distance can be calculated using the calculated height factor:

Ellipsoid Distance = Reduced Horizontal Distance x height scale factor.



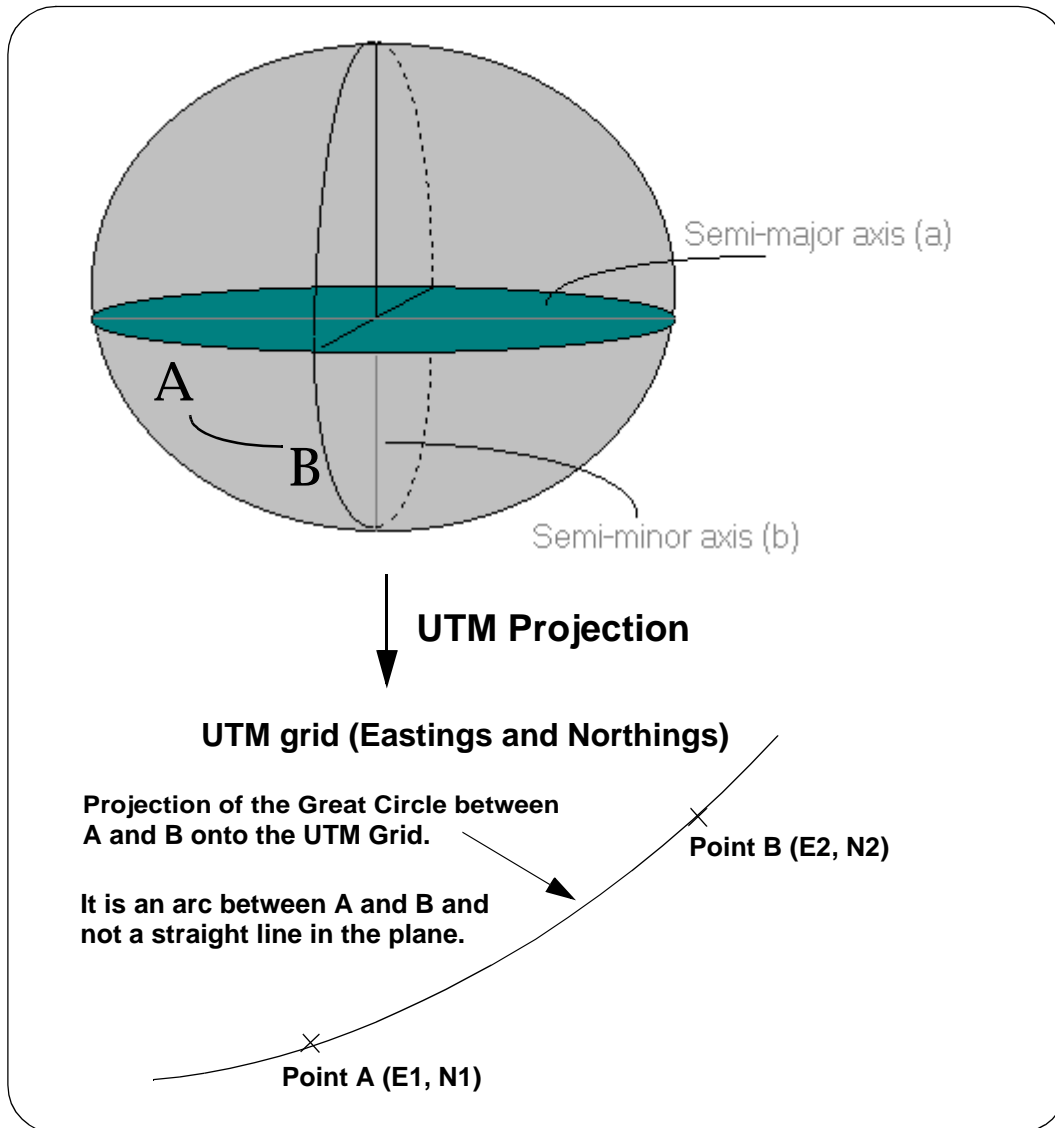
Bearings and Distances - Plane and Grid

If you have a point on an ellipsoid and a Transverse Mercator projection (such as UTM), the projection co-ordinates are known as the grid co-ordinates of the point (Easting and Northing).

On an *ellipsoid*, the **straight line** joining two points is the **Great circle** between the two points. If each point along the Great circle is projected onto the grid, the path that is traced out is an *arc* between the points.

That is, the *straight lines* on an ellipsoid project onto the TM grid as arcs.

In the diagram below, the Great circle arc through points A and B on the ellipse projects onto the arc shown through Points A and B in grid co-ordinates.



So the *straight line* joining the two points in the **plane** is *different* from the projection of the great circle (straight line on the ellipsoid) joining the two points on the ellipsoid.

Plane Bearing, Projection Bearing

If a straight line is drawn in the plane between two points on a grid, the angle between grid north and this line is equal to the **plane bearing**.

In other words, if the two point's coordinates are known, standard plane trigonometry can be used to calculate the bearing of the line.

$$\tan(\text{plane bearing}) = (E2 - E1) / (N2 - N1)$$

Projection bearing and plane bearing is used interchangeably in 12d Model.

Australian Grid Bearing, Ellipsoid Bearing

In Australia, the **grid bearing** is the angle between grid north and the *tangent* to arc at a point on the arc. e.g Point A. The grid bearing at point A is **not** equal to the reverse grid bearing from point B.

This term is also known as the **ellipsoid bearing** in some countries.

Warning: In some countries, including New Zealand and the US, the term **Grid bearing** is used for the previously defined term **Plane bearing**. However, as defined in the Australian GDA technical manual, the definition of Grid bearing is different to that of a plane bearing.

To avoid confusion, we will use the term **ellipsoid bearing**.

Plane Distance

The **plane distance** is the length in the plane of the straight line joining two points on a grid - that is, the standard distance between two points in a plane

$$\text{plane distance} = \text{square root} [(E2-E1)*(E2-E1) + (N2-N1)*(N2-N1)]$$

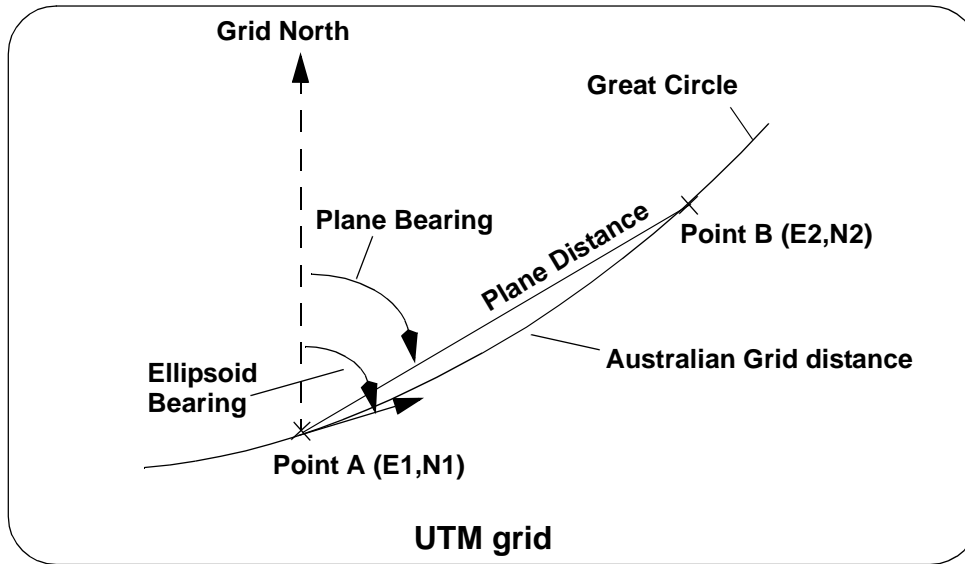
Australian Grid Distance

On an ellipsoid, the *straight line* joining two points on the ellipsoid is the Great circle between the two points. The *straight lines* on an ellipsoid project onto the UTM grid as arcs. In the diagram below, the arc shown through points A and B is the projection of the Great circle arc through points A and B on the ellipse.

In Australia, the **grid distance** is the distance on this *arc* from point A to B.

The difference between the plane distance and the grid distance is usually negligible.

Warning: In some countries, the term *grid distance* is used for the definition of plane distance here.



Datum

Within the Geodetic sections of 12d Model, the term **datum** relates to the reference ellipsoid adopted by countries/organisations for mapping projects.

For example AGD is the Australian Geodetic Datum, using the ANS ellipsoid parameters. GDA refers to the Geodetic Datum of Australia, using the GRS80 ellipsoid as the basis for defining geodetic coordinates.

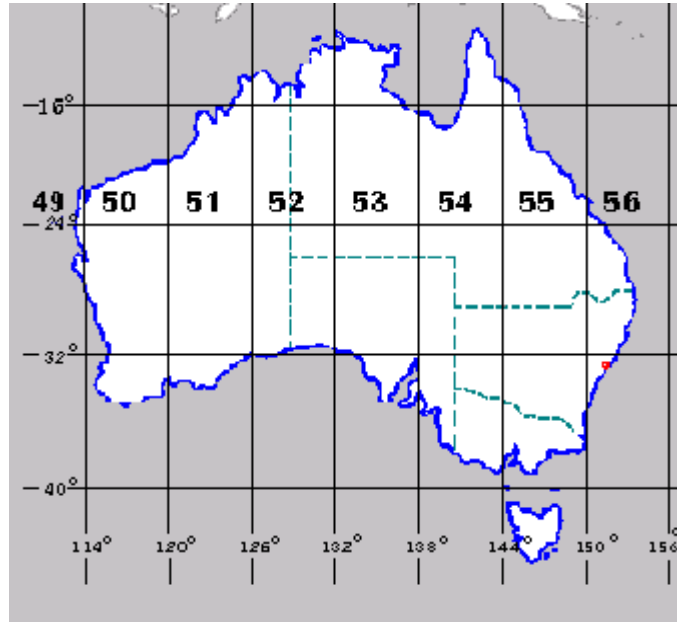
In New Zealand, the NZGD49 datum refers to the NZ Geodetic 49 ellipsoid. The NZGD2000 datum is the New Zealand geodetic datum which again refers to the GRS80 ellipsoid.

Zone

The meaning of **zone** is specific to the UTM projection type which is commonly used around the world as a mapping projection. This includes AMG and MGA in Australia.

The Universal Transverse Mercator projection splits the world into 60 zones of 6 degrees of longitude. The zone numbering starts at 180 degrees West, longitude. Each zone has a specific central meridian and range of longitude that defines it. As such, by supplying a zone number, a number of parameters about a projection can be deduced.

For example, Australia is covered by the UTM zones 49 to 56.



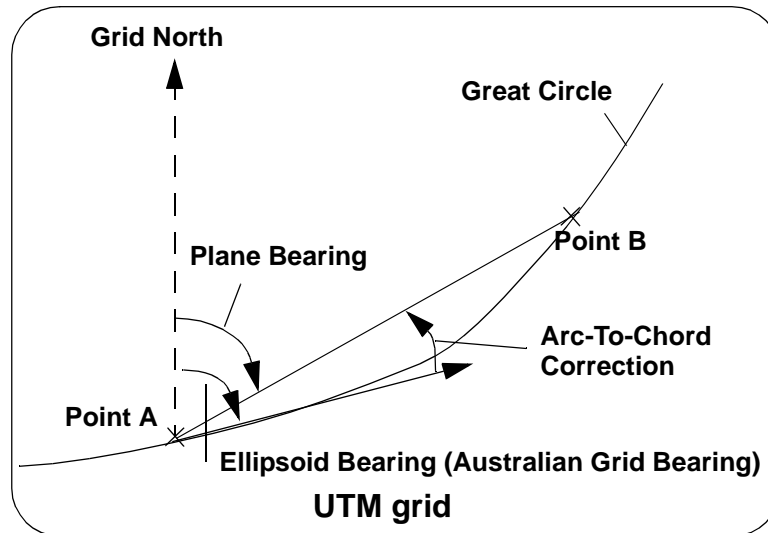
Arc-to-Chord Correction (t-T correction)

The **arc-to-chord** correction is the quantity to be added algebraically to a ellipsoid bearing (Australian grid bearing) to obtain a plane bearing.

$$\text{Plane Bearing} = \text{Ellipsoid Bearing} + \text{Arc-To-Chord Correction}$$

$$\text{Plane Bearing} = \text{Australian Grid Bearing} + \text{Arc-To-Chord Correction}$$

This correction is only really applicable for lines over 10 km but it is included in calculations for completeness. The correction shown in the example below is negative in sign but it can also be positive.



Point Scale Factor

The **point scale factor** is the ratio of an infinitesimal plan distance at a point on a grid to a corresponding ellipsoid distance.

It can be used as an approximation to convert (factor) measured ellipsoid distances to plane distances.

Line Scale Factor

The **line scale factor** is the ratio of the plane distance on a grid to a corresponding ellipsoid distance. i.e.

$$\text{LineScaleFactor} = \frac{\text{PlanDist}}{\text{EllipsoidDist}}$$

This factor can be used to calculate either the plane or ellipsoid distance given the Line Scale Factor and the other distance. i.e.

$$\text{Plane distance} = \text{Ellipsoid distance} \times \text{Line scale factor},$$

Similarly,

$$\text{Ellipsoid distance} = \text{Plane distance} / \text{Line scale factor}.$$

Combined Point Scale Factor

The **combined point scale factor** is the product of the point scale factor and the height scale factor. i.e.

$$\text{Combined Scale Factor} = \text{Point Scale Factor} \times \text{Height Scale Factor.}$$

Azimuth and Convergence

Azimuth is the horizontal angle measured from an *ellipsoidal meridian clockwise from north* and the great circle between measured points.

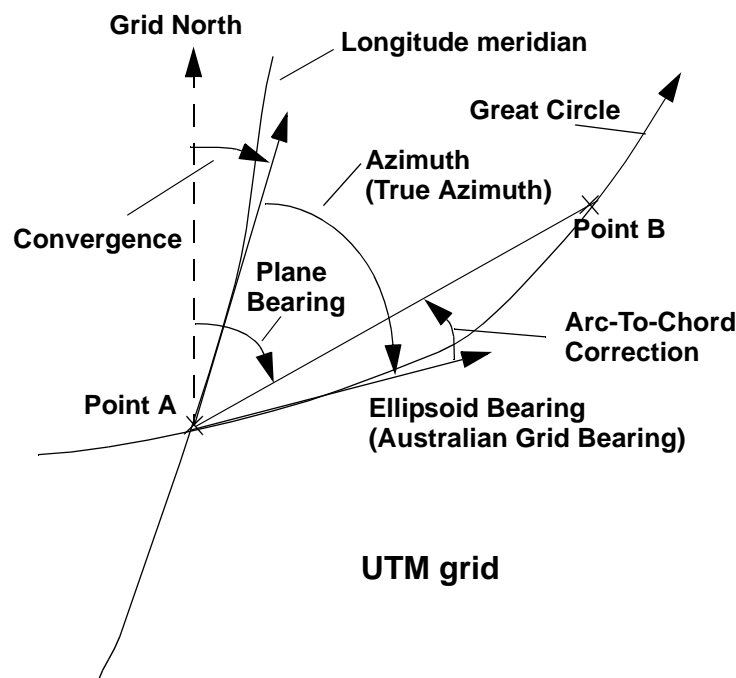
It is also known as the **True Azimuth**. In general, this value will be calculated internally in **12d** Model.

Convergence or **Grid Convergence** is the angular quantity to be added algebraically to an *Azimuth* to obtain an ellipsoid bearing (Australian grid bearing). i.e.

$$\text{Ellipsoid Bearing} = \text{Azimuth} + \text{Grid Convergence}$$

$$\text{Australian Grid Bearing} = \text{Azimuth} + \text{Grid Convergence}$$

Warning: In some countries, the *Grid Convergence* has the opposite sign.



Combining

$$\text{Ellipsoid Bearing} = \text{Azimuth} + \text{Grid Convergence}$$

$$\text{Australian Grid Bearing} = \text{Azimuth} + \text{Grid Convergence}$$

and

$$\text{Plane Bearing} = \text{Ellipsoid Bearing} + \text{Arc-To-Chord Correction}$$

Plane Bearing = Australian Grid Bearing + Arc-To-Chord Correction

produces the equation

Plane Bearing = Azimuth + Grid Convergence + Arc-To-Chord Correction

or

Azimuth = Plane Bearing - Grid Convergence - Arc-To-Chord Correction

True Azimuth = Plane Bearing - Grid Convergence - Arc-To-Chord Correction

Warning: In some countries, the *Grid Convergence* has the opposite sign.

Please continue to the next section “Converting Between AMG, ISG and MGA” .

Converting Between AMG, ISG and MGA

In Australia the ellipsoid used to represent the shape of the earth used to be defined by AGD 84 but it has now been changed to an ellipsoid that has its centre at the centre of mass of the earth (geocentric - GDA 94). See "Shape Of The Earth" .

This is to fit in with GPS because satellites orbits are centred on the centre of mass.

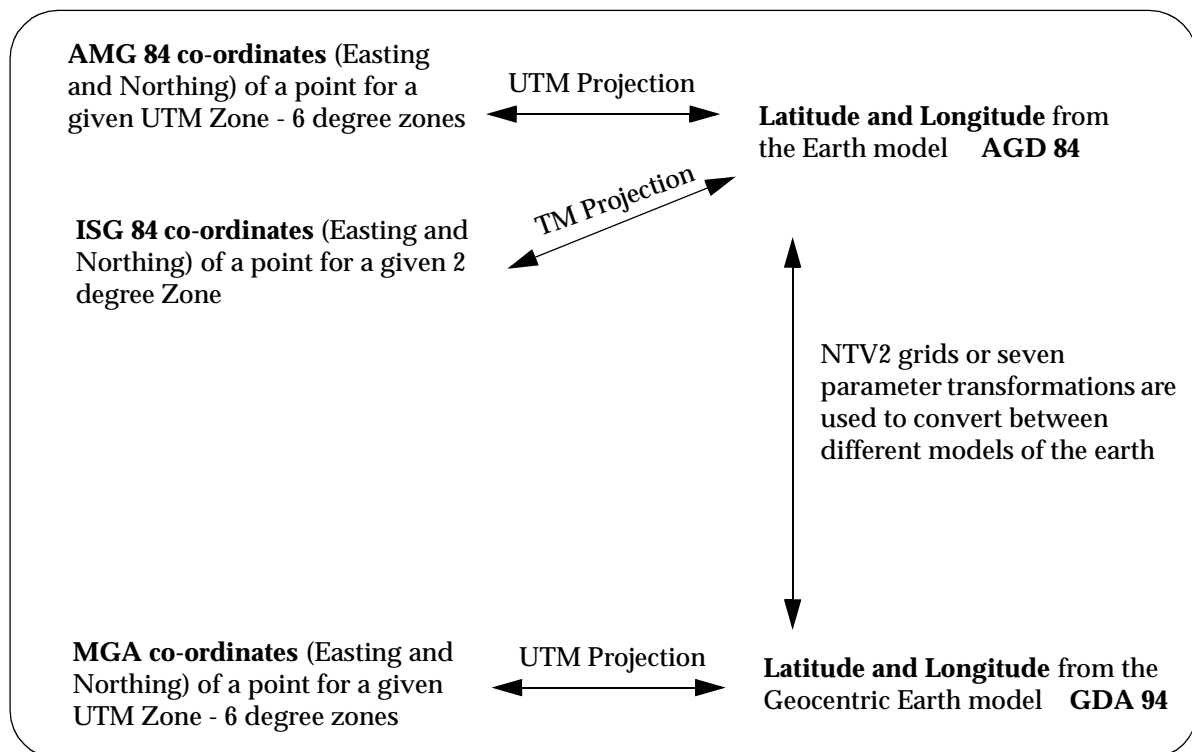
This means that the Latitude and Longitude of every point has changed.

The use of UTM projections (Universal Transverse Mercator - see "Projections") and Zones still apply but because the latitude and longitude of each point has change, its Easting and Northing for a UTM zone has also changed.

AMG 84 Zones are the co-ordinates for the UTM Projections defined for six degree zones using the ellipsoid defined by AGD 84.

MGA 94 Zones are the co-ordinates for the UTM Projections defined for six degree zones using ellipsoid define by GDA 94.

Note - ISG 84 Zones are the co-ordinates for the TM Projections defined for two degree zones using the ellipsoid defined by AGD 84.



For converting between the **different datums** AGD66/84 and GDA94 (i.e. AMG, ISG, Long Lat <-> MGA, Long Lat), use the option

Survey =>Conversions =>AGD66/84 <-> GDA94 (see "AGD66/84 <---> GDA94" in the chapter "Survey")

For converting between different AMG Zones (AMG <->AMG) or different MGA Zones (MGA<->MGA) use the option

Survey =>Conversions =>Australian conversions see "Australian Conversions"

in the chapter "Survey").

For converting between different ISG/AMG Zones (AMG,ISG <->AMG, ISG)

Survey =>Conversions =>Cartographic see "Cartographic"

in the chapter "Survey").

I 12d Ascii File Format

The 12d Ascii file format (called 4D Ascii in Version 4 and earlier) is a text file definition from 12D Solutions which is used for reading and writing out string data from 12d Model. 12d Ascii files normally end in '.12da'

This document is for the 12d Ascii file format used in *12d Model Version 7*.

General Comments about 12d Ascii File

//

Anything after // until the end of the line is ignored. This is used to place comments in the file.

Blank lines

Unless they are part of a text string, blank lines are ignored.

Spaces

Unless enclosed in quotes ("), more than one consecutive space or tab is treated as one space. Except when it is the delimiter after a //, an end of line (<enter>) is also considered a space.

Spaces and special characters in text strings

Any text string that includes spaces and any characters other than a to z, A to Z or 0 to 9 (alphanumeric), must be enclosed in double quotes. In text strings, double quotes " and backslash \ must be preceded by a \. For example, \" and \\ define a " and a \ respectively in a text string.

Names of models, tins, styles, colours and attributes

Models, tins, styles (linestyles), colours and attributes can include the characters a to z, A to Z, 0 to 9 (alphanumeric characters) and space. Leading and trailing spaces are ignored. The names can be up to 255 characters in length. If the name includes spaces, the name must be enclosed in double quotes (").

The names for models, tins, styles, colours or attributes can not be blank.

The names for models, tins, styles and colours can contain upper and lower alpha characters which are stored, but the set of model names, tin names, style names, colour names or attribute names for an object *must be unique when case is ignored*. For example, the model name "Fred" will be stored as "Fred" but "FRED" is considered to be the *same* model name as "Fred".

String names

String names can include the characters a to z, A to Z, 0 to 9 (alphanumeric characters), space, decimal point (.), plus (+), minus (-), comma (,), open and closed round brackets and equals (=). Leading and trailing spaces are ignored. String names can be up to 255 characters in length. If the string name includes anything other than alphanumeric characters, then the name must be enclosed in double quotes (").

String can contain upper and lower alpha characters which are retained but case is ignored when selecting by string name. That is, the string name "Fred" will be stored as "Fred" but "FRED" is not considered to be a different name.

String names do not have to be unique and can be blank.

Please continue to the next section "Attributes".

Attributes

Many 12d Model objects (such as individual strings, models and tins) can have an unlimited number of named **attributes** of type integer (numbers), real and text. Within an object, the attribute names must all be different.

The attributes for an object are given inside the curly braces of the **object** definition. The attributes are preceded by the **attributes** keyword followed by the *named attributes* enclosed in curly braces { and }.

The format for each named attribute is

```
attribute_type      attribute_name      attribute_value
```

where attribute_type is integer, real or text
and attribute_name is the unique attribute name for the object
and attribute_value is the either a number, a real or a text string.

That is the attributes are defined in a block:

```
attributes {  
  integer      att_name      number  
  real        att_name      value  
  text       att_name      text  
}
```

The *text* for a text attribute can be blank an if so, is defined as "".

An example of defining attributes is:

```
attributes {  
  text      "pole id"      "QMR-37"  
  text      street      "477 Boundary St"  
  real      "pole height"  5.25  
  integer   "pole wires"   3  
}
```

Please continue to the next section "Commands".

Commands

Commands consist of a *keyword* followed by a space and then a *value* (a keyword and its value is often referred to as a keyword pair). A *value* must always exist.

```
keyword    value                // a keyword pair
```

There can be more than one command keyword pair per line as long as each keyword pair is separated by a space. In fact, the *keyword* can be on one line and the *value* on the next line.

Although the names of commands are only shown in lower case in these notes, commands are case insensitive and all combinations of case are recognised as the same command. That is 'model', 'MODEL' and 'Model' are all recognised as the command 'model'.

The commands in the 12d Ascii file are:

```
model  model_name                //          system default  data
```

All strings following until the next **model** keyword are placed in the model *model_name*. This can be overridden for a string by a **model** command inside the string definition.

If the model includes attributes, the following *model* definition must be used.

```
model {
  name  model_name
  ...
}
```

All **12d** Model *models* can have an unlimited number of named **attributes** of type integer (numbers), real and text. Within a model, the attribute names must all be different.

The definition for a model with attributes is the **model** keyword followed by information enclosed in curly braces { and }. The keyword *name* followed by the *model_name* **must** be included inside the curly braces.

```
name      model_name
```

The attributes for the model are also specified inside the curly braces of the **model** definition. As described previously, the attributes are preceded by the **attribute** keyword followed by the named attributes enclosed in curly braces { and }.

Hence the *model* definition with attributes is:

```
model {
  name      model_name
  attributes {
    attribute_type  attribute_name  attribute_value
    attribute_type  attribute_name  attribute_value
    ...
    attribute_type  attribute_name  attribute_value
  }
}
```

For example:

```
model {
  name      "telegraph poles"

  attributes {
    text      "pole id"          "QMR-37"
    text      "street"          "477 Boundary St"
    real      "pole height"     5.25
    integer   "pole wires"     3
  }
}
```

```

}
colour colour_name // system default red

```

All strings following until the next **colour** keyword have colour *colour_name*. This can be overridden for a string by a **colour** command in the string definition.

```

style style_name // system default 1

```

All strings following until the next **style** keyword have style *style_name*. This can be overridden for a string by a **style** command in the string definition.

```

breakline point or line // system default line

```

All strings following that requires a breakline point-line type until the next **breakline** keyword, have this point-line type. This may be overridden for the string by a **breakline** in the string definition.

```

null value // system default -999

```

All z-values equal to *value* in strings following until the next **null** keyword, are considered to be null z-values.

```

string string_type {
  ...
}

```

The *string_type* is compulsory and must be followed by all the string information enclosed in curly braces { and }.

Thus if a string type or possibly information inside the string is not recognised, the 12d Ascii reader has a chance of being able to jump over the string by looking for the end marker }.

Inside the braces are **string commands** as keyword pairs defining some information for the string.

There can be more than one *string command* keyword pair per line as long as each keyword pair is separated by a space. In fact, the *keyword* can be on one line and the *value* on the next line.

Any unrecognized *string commands* are ignored.

The *string command keyword pairs* include **model**, **colour**, **style** and **breakline** which are all *optional* inside the string definition. However if any of them exist inside a string definition, then the *string command keyword* overrides any **model**, **colour**, **style** or **breakline commands** but only for that particular string.

For some string types (e.g. 2d, 3d, pipe) there is more data required than just the *string command* keyword pairs.

This extra data is contained in blocks consisting of a *keyword* followed by the required information enclosed in curly braces { and }. For example attributes for all string types and (x,y) data for a 2d string.

For all string types, if there is not enough recognised information to define the string, the string is ignored.

The definition of each *string type* and the allowed *string commands* and extra data for that string type will be given after the next section on string attributes.

string attributes

All 12d Model strings can have an unlimited number of named **attributes** of type integer (numbers), real and text. Within a string, the attribute names must all be different.

The attributes for a string are given inside the curly braces of the **string** definition. As described previously, the attributes are preceded by the **attributes** keyword followed by the named attributes enclosed in curly braces { and }.

Please continue to the next section "12d Ascii Definition for each String Type" .

12d Ascii Definition for each String Type

2d String

```
string 2d {
  z value chainage start_chainage
  model model_name name string_name
  colour colour_name style style_name
  breakline point or line
  data { // keyword
    x-value y-value
    " "
    " "
  }
}
```

3d String

```
string 3d {
  chainage start_chainage
  model model_name name string_name
  colour colour_name style style_name
  breakline point or line
  data { // keyword
    x-value y-value z-value
    " " "
    " " "
  }
}
```

4d String

```
string 4d {
  angle value offset value raise value
  worldsize value or papersize value or screensize value
  chainage start_chainage
  model model_name name string_name
  colour colour_name style style_name
  breakline point or line
  textstyle text slant degrees xfactor value
  justify "top/middle/bottom-left/centre/right"
  data { // keyword
    x-value y-value z-value text // text can not be blank
    " " " " // use "" for no text.
    " " " "
  }
}
```

Alignment String

In an alignment string the horizontal and vertical geometry are given separately and both can only be defined by the intersection point method (IP's).

For the horizontal geometry, the (x,y) position of the horizontal intersection points (HIPs) are given in the order that they appear in the string, plus the circular radius and left and right spirals length on each HIP.

Hence a horizontal intersection point is given by either

```
x-value y-value radius // circular curve, no spirals
or
```

```
x-value y-value radius spill left-spiral-length spil2 right-spiral-length
```

radius, left-spiral-length, right-spiral-length can be zero (meaning they don't exist).

For the vertical geometry, the (chainage,height) position of the vertical intersection points (VIPs) are given in increasing chainage order, plus either the radius of the circular arc or the length of the parabolic curve on each VIP.

Hence for a vertical intersection point is given by either

```
ch_value z-value length parabola
or
```

```
ch_value z-value radius circle
where
```

the word *parabola* is optional. *length* and *radius* can be zero, meaning that the parabola or arc doesn't exist.

```
string alignment {
  model model_name name string_name
  colour colour_name style style_name
  chainage start_chainage interval value
  draw_mode value // 1 to draw crosses at HIPs and VIPs, 0 don't draw
  spiral_type text
  hipdata { // some hips must exist and precede the VIP data
    x-value y-value radius // or
    x-value y-value radius spill left-spiral-length spil2 right-spiral-length
    " " " " " " " "
  }
  vipdata { // vips optional
    ch_value z-value parabolic-length // or
    ch_value z-value parabolic-length parabola // or
    ch_value z-value radius circle
    " " " "
  }
}
```

Arc String

```
string arc {
  model model_name  name string_name
  colour colour_name style style_name
  chainage start_chainage interval value radius value
  xcentre value ycentre value zcentre value
  xstart value ystart value zstart value
  xend value yend value zend value
}
```

Circle String

```
string circle {
  model model_name  name string_name
  colour colour_name style style_name
  chainage start_chainage interval value radius value
  zcentre value xcentre value ycentre value
}
```

Drainage String

```
string drainage {
  chainage start_chainage
  model model_name  name string_name
  colour colour_name style style_name
  breakline point or line
  attributes {
    text Tin finished_surface_tin
    text NSTin natural_surface_tin
    integer "_floating" 1/0 // 1 for floating, 0 not floating
  }
  outfall outfall_value // z-value at the outfall
  flow_direction 0/1 // 0 drainage line is defined from downstream
  // to upstream

  data { // key word - geometry of the drainage string
    x-value y-value z-value radius bulge
    " " "
    " " "
  }
  pit { // pit/manhole - one pit record for each pit/manhole
    // in the order along the string
    name text // pit name
    type text // pit type
    road_name text // road name
    road_chainage chainage // road chainage
    diameter value // pit diameter
    floating yes/no // is pit floating or not
    chainage pit_chainage // internal use only
    ip value // internal use only
    ratio value // internal use only
    x x-value // x-value of top of pit
    y y-value // y-value of top of pit
    z z-value // z-value of top of pit
  }
}
```

```

pipe {
    // one pipe record for each pipe connecting pits/manholes
    // in the order they occur along the string
    name          text          // pipe name
    type          text          // pipe type
    diameter      value         // pit diameter
    us_level      value         //
    ds_level      value         //
    us_hgl        value         //
    ds_hgl        value         //
    flow_velocity value         //
    flow_volume   value         //
}
property_control {
    name          text          // lot name
    colour        colour_name
    grade         value         // grade of pipe in units of "1v in"
    cover         value         // cover of the of pipe
    diameter      value         // diameter of the of pipe
    boundary      value         // boundary trap value
    chainage      chainage     // internal use only
    ip            value         // internal use only
    ratio         value         // internal use only
    x             x-value      // x value of where pipe connects to sewer
    y             y-value      // y value of where pipe connects to sewer
    z             z-value      // internal use only

    data {
        // key word - geometry of the property control
        x-value   y-value   z-value   radius   bulge
        "         "         "         "         "
        "         "         "         "         "
    }
}
house_connection { //warning - house connections may change in future versions
    name          text          // house connection name
    hcb           integer       // user given integer
    colour        colour_name
    grade         value         // grade of connection in units of "1v in"
    depth         value
    diameter      value
    side          left or right
    length        value
    type          text          // connection type
    material      text          // material type
    bush          text          // bush type
    level         value
    adopted_level value
    chainage      chainage     // internal use only
    ip            value         // internal use only
    ratio         value         // internal use only
    x             x-value      // x value of where pipe connects to sewer
    y             y-value      // y value of where pipe connects to sewer
    z             z-value      // internal use only
}
} // end of drainage-sewer data

```

Face String


```

string face {
  model model_name name string_name
  colour colour_name style style_name
  chainage start_chainage breakline point or line
  hatch_angle value
  hatch_distance value
  hatch_colour colour
  edge_colour colour
  fill_mode 0 or 1
  edge_mode 0 or 1
  data { // keyword
    x-value y-value z-value
    " " "
  }
}

```

Feature String

```

string feature {
  model model_name name string_name
  colour colour_name style style_name
  chainage start_chainage interval value radius value
  zcentre value xcentre value ycentre value
}

```

Interface String

```

string interface {
  chainage start_chainage
  model model_name name string_name
  colour colour_name style style_name
  breakline point or line
  data { // keyword
    x-value y-value z-value mode
    " " " " // mode = -1 cut
    " " " " //           0 surface
  } //           1 fill
}

```

Pipe String

```

string pipe {
  diameter value chainage start_chainage
  model model_name name string_name
  colour colour_name style style_name
  breakline point or line
  data { // keyword
    x-value y-value z-value
    " " "
    " " "
  }
}

```

Pipeline String

This is the same as an alignment string except that it has the additional keywords
 diameter, which gives the diameter of the pipeline in world units
 and
 length of the typical pipe making up the pipeline (used for deflections).

```
string pipeline {
  model model_name  name string_name
  colour colour_name  style style_name
  diameter diameter  length pipe-length
  chainage start_chainage  interval value
  spiral_type value
  hipdata {
    // some hips must exist and precede vips
    x-value  y-value  radius                                     // or
    x-value  y-value  radius  spill left-spiral-length  spil2  right-spiral-length
    "        "        "        "        "        "        "        "
  }
  vipdata {
    // vips optional
    ch-value  z-value  parabolic-length                                     // or
    ch-value  z-value  parabolic-length  parabola // or
    ch-value  z-value  radius  circle
    "        "        "        "
  }
}
```

Polyline String

The definition of a closed string has been refined for polyline and super strings. For other string types, closing a string simply meant having the first vertex the same as the last vertex. Hence the vertex was duplicated.

For a polyline string, being closed is a property of the string and no extra vertex is needed - the first and the last vertices are not the same and the polyline string knows there is an additional segment from the last vertex back to the first vertex.

In the 12d ascii format, there is a new *closed* flag for the polyline string:

```
closed  true  or  false
```

where *true* can be 1 or T or t or Y or y (or words starting with T, t, Y or y))
 and *false* is 0 or F or f or N or n (or words starting with F, f, N or n).

```
string polyline {
  chainage start_chainage
  model model_name  name string_name
  colour colour_name  style style_name
  breakline point or line
  closed true or false

  data {
    // keyword
    x-value  y-value  z-value  radius  bulge_flag
    "        "        "        "        "
    "        "        "        "        "
  }
}
```

Text String

```
string text {
```

```
x value y value z value
model model_name name string_name colour colour_name
text text_value
angle value offset value raise value
textstyle textstyle_name slant degrees xfactor value
worldsize value or papersize value or screensize value
justify "top/middle/bottom-left/centre/right"
}
```

Super String

Because the super string is so versatile, its 12d Ascii format looks complicated but it is very logical and actually quite simple.

In its most primitive form, the super string is simply a set of (x,y) values as in a 2d string, or (x,y,z) values as in a 3d string, or (x,y,z,radius,bulge_flag) as for a polyline string or even lines, arcs and transition spirals.

Additional blocks of information can extend the definition of the super string. For example, text, pipe diameters and visibility.

Some of the properties of the super string extend what were constant properties for the entire string in other string types. For example, *breakline* type for the string extends to *tinability* of *vertices* and *segments*. One colour for the string extends to individual colours for each segment.

Other properties such as vertex id's (point numbers), visibility and culvert data are entirely new.

For user attributes, the super string still has the standard user attributes defined for the entire string, but user attributes for each vertex and segment are also supported.

The definition of a closed string has been refined for polyline and super strings. For other string types, closing a string simply meant having the first vertex the same as the last vertex. Hence the vertex was duplicated.

For a super string, being closed is a property of the string and no extra vertex is needed. That is, the first and the last vertices are not the same for a closed super string and the super string knows there is an additional segment from the last vertex back to the first vertex.

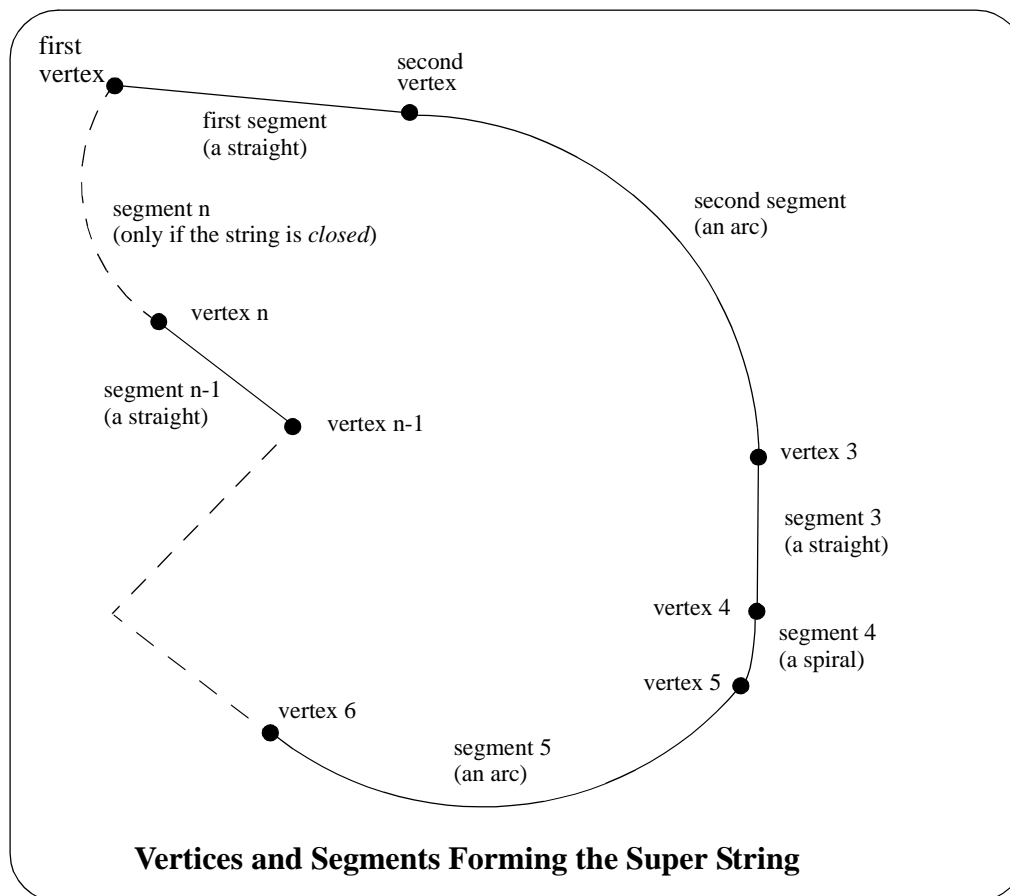
Hence in the 12d ascii format, there is a *closed* flag for the super string:

closed *true* or *false*

where *true* can be 1 or T or t or Y or y (or words starting with T, t, Y or y)) and *false* is 0 or F or f or N or n (or words starting with F, f, N or n).

Thus if a string has n vertices, then an open string has $n-1$ segments joining the vertices and a closed string has n segments since there is an additional segment from the last to the first vertex.

With the additional data for vertices and segments in the super string, the data is in vertex or segment order. So for a string with n vertices, there must be n bits of vertex data. For segments, if the string is open then there only needs to be $n-1$ bits of segment data but for closed strings, there must be n bits of data. For an open string, n bits of segment data can be specified and the n th bit will be read in and stored. If the string is then closed, the n th bit of data will be used for the extra segment.



The full 12d Ascii definition of the super string is:

```
string super {
  chainage start_chainage
  model model_name name string_name
  colour colour_name style style_name
  breakline point or line
  closed true or false
  interval {
    chord_arc value // chord-to-arc tolerance for curves
    distance value // chainage interval to break the geometry up
  }

  block of info {
  }
  block of info {
  }
  block of info {
  }
}
```

The blocks of info can be broken up into four types.

- (a) blocks defining the position of the vertices in x, y and z
data_2d or *data_3d*

- (b) blocks defining the geometry of the segments
radius_data and *major_data* or *geometry_data*
- (c) a superseded block defining vertices and segment geometry
data
- (d) extra information for the vertices and/or segments
 pipe diameters - *diameter_value* or *diameter_data*
 culvert dimensions - *culvert_value* or *culvert_data*
 pipe/culvert justification - *justify*
 colour - *colour* or *colour_data*
 vertex ids (point numbers) at each vertex- *point_data*
 tinability - *breakline* or *vertex_tinability_data* and *segment_tinability_data*
 visibility - *vertex_visible_data* and *segment_visible_data*
 vertex text and annotation - *vertex_text_data* and *vertex_annotation_data*
 segment text and annotation - *segment_text_data* and *segment_annotation_data*
 symbols at vertices - *symbol_value* or *symbol_data*
 vertex attributes - *vertex_attribute_data*
 segment attributes - *segment_attribute_data*
 extrudes
 image data
 holes

The definition for the blocks of each type now follows.

(a) Blocks Defining the Position of the Vertices

For (x, y) Values with a Constant z

If there is only (x,y) values at each vertex (like a 2d string):

```
data_2d { // keyword
    x-value  y-value
    "        "
    "        "
}
```

and if there is a non-null constant z for the string

```
z  value
```

For (x, y,z) Values

If there is (x,y,z) values at each vertex (like a 3d string):

```
data_3d { // keyword
    x-value  y-value  z-value
    "        "        "
    "        "        "
}
```

(b) Blocks Defining the Geometry of the Segments

Straights and Arcs Only for the Segments

If *data_2d* or *data_3d* was used, it is possible to add *radius* and *bulge_flag* data:

```
radius_data { // keyword
    radius for first segment
    radius for second segment
```

```

        ...
        radius for last segment
    }

major_data {                                     // keyword
    bulge flag for first segment
    bulge flag for second segment
    ...
    bulge flag for last segment
}

```

Straights, Arcs and Transitions for the Segments

If `data_2d` or `data_3d` was used, it is possible to specify if the segments are straight, arcs or spirals using a `geometry_data` block.

```

geometry_data {
    segment_info_1 {
        information on the first segment
    }
    segment_info_2 {
        information on the second segment
    }
    " "
    " "
    segment_info_n-1 {           // the last segment if it is open
        information on the (n-1) segment
    }
    segment_info_n {           // the last segment if it is closed
        information on the n-th segment
    }
}

```

where the `segment_info` blocks are from the following:

(a) Straight

No parameters are needed for defining a straight segment. The `straight` block is simply:

```

straight {                                     // no parameters are needed for a straight
}

```

(b) Arc

There are four possibilities for an arc of a given radius placed between two vertices.

We use *positive* and *negative* radius, and a flag *major* which can be set to 1 (on) or off (0) to differentiate between the four possibilities.

So the `arc` block is:

```

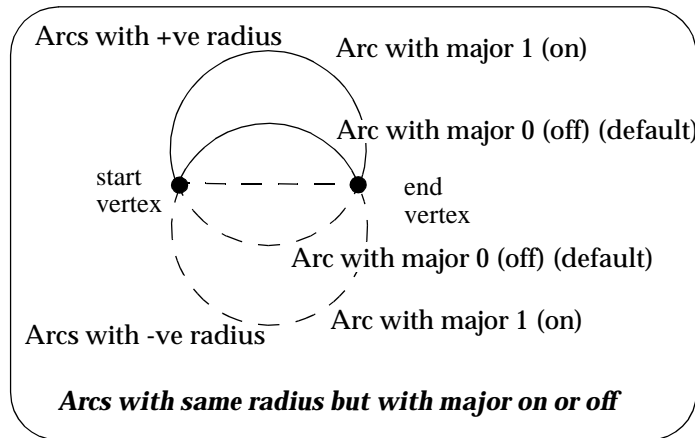
arc {
    radius value // radius of the arc (+ve is above the line connecting the vertices)
    major 0 or 1 // 0 is the smaller arc, 1 the larger arc).
}

```

(c) Spiral

There can be a partial spiral between adjacent vertices. The partial spiral is defined by the parameters

l1 length of the full spiral up to the start vertex



- r1 radius at the start vertex
- a1 angle in decimal degrees of the tangent to the spiral at the start vertex
- l2 length of the full spiral up to the end vertex
- r2 radius at the end vertex
- a2 angle in decimal degrees of the tangent to the spiral at the end vertex

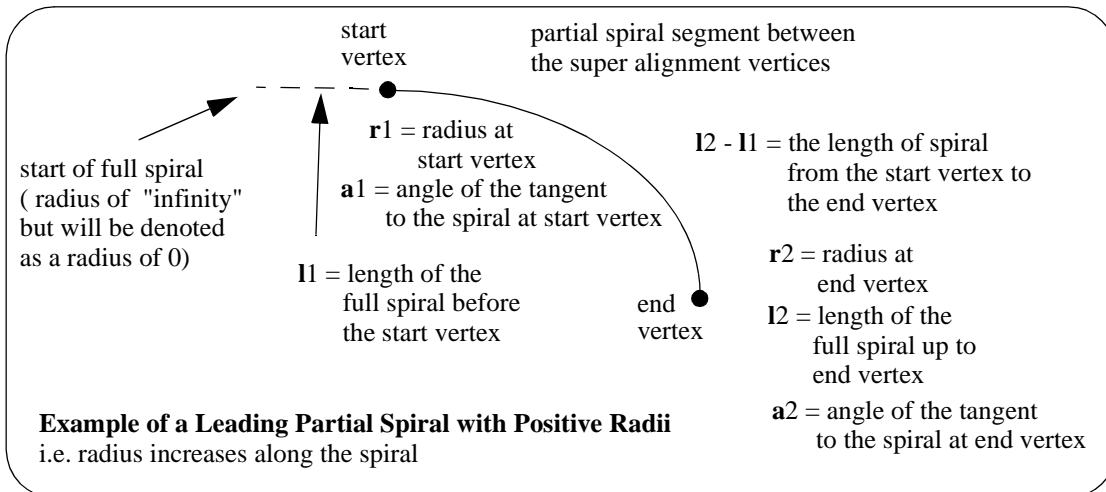
Since a radius can not be zero, a radius of infinity is denoted by *zero*.

The spiral is said to be a *leading* spiral if the absolute value of the radius is increasing along the direction of the spiral (the spiral will *tighten*). Otherwise it is a *trailing* spiral.

If a leading spiral is a full spiral then $r1 = 0$ and $l1 = 0$. Similarly if a trailing spiral is a full spiral then $r2 = 0$ and $l2 = 0$.

For a partial spiral, if the coordinates of the start of the full spiral are needed then they can be calculated from $l1, r1, a1, l2, r2, a2$ and the co-ordinates of the start and end vertices.

Note that the radii can be positive or negative. If the radii's are positive then a leading spiral will curl to the right (and will be above the line joining the start and end vertices).



The parameters for the *spiral* block are:

```

spiral {
  type      value           // any of the spirals supported in spirals.4d
  leading   1 or 0         // 1 denotes a leading spiral, 0 a trailing spiral
  l1        value         // length of the full spiral at start vertex
  r1        value         // radius at the start vertex
  a1        value         // angle in decimal degrees of the tangent to the spiral
                          // at the start vertex

```



```

l2      value           // length of the full spiral at end vertex
r2      value           // radius at end vertex
a2      value           // angle in decimal degrees of the tangent to the spiral
                        // at the end vertex
}

```

(c) Block Defining the Vertices and Segments

For compatibility with the polyline, the *data* block gives the (x,y,z,radius,bulge) values at each vertex of the string and so defines both the vertices and the geometry of the segments in the one block.

```

data {
    x-value  y-value  z-value  radius  bulge           // keyword
    "        "        "        "        "
    "        "        "        "        "
}

```

(d) Other Blocks

Pipe Diameters

There can be one pipe diameter value for the entire super string or the pipe diameter varies for each segment of the super string.

```

diameter_value value
or
diameter_data {
    pipe diameter for first segment           // keyword
    pipe diameter for second segment
    ...
    pipe diameter for last segment
}

```

Culvert Dimensions

There can be one culvert width and height for the entire super string or the culvert width and height vary for each segment of the super string.

```

culvert_value { width  value
                height value
                }
or
culvert_data { properties {width  value           // width and height for first segment
                          height value
                          }
               properties {width  value           // width and height for second segment
                          height value
                          }
               ...
               }
               properties {width  value           // width and height for last segment
                          height value
                          }
               }
}

```

Justification for Pipe or Culverts

There can be only one justification for the pipe or culvert for the entire super string.

```
justify justification           // "bottom" or "invert"
                               // "top" or "obvert"
                               // "centre" (default)
```

Colour

There can be one colour for the entire super string which is given by the `colour` command at the beginning of the string definitions (before the blocks of information) or the colour varies for each segment of the super string and is specified in a `colour_data` block.

```
colour_data {                               // keyword
    colour for first segment
    colour for second segment
    ...
    colour for last segment
}
```

Vertex Id's (Point Numbers)

Each vertex can have a vertex id (point number). This is not the order number of the vertex in the string but is a separate id which is usually different for every vertex in every string. The vertex id can be alphanumeric.

```
point_data {                               // keyword
    vertex id or first vertex              // alphanumeric
    vertex id for second vertex
    ...
    vertex id for last vertex
}
```

Tinability

For a *super string*, the concept of breakline has been extended to a property called **tinable** which can be set independently for each vertex and each segment of the super string.

If a vertex is tinable, then the vertex is used in triangulations. If the vertex is not tinable, then the vertex is ignored when triangulating.

If a segment is tinable, then the segment is used as a side of a triangle during triangulation. This may not be possible if there are *crossing* tinable segments.

```
vertex_tinable_data {                     // keyword
    tinable flag for first vertex          // 1 for tinable
    tinable flag for second vertex        // 0 for not tinable
    ...
    tinable flag for last vertex
}

segment_tinable_data {                   // keyword
    tinable flag for first segment         // 1 for tinable
    tinable flag for second segment       // 0 for not tinable
    ...
    tinable flag for last segment
}
```

Note that even if a segment is set to tinable, it can only be used if both its end vertices are also

tinable.

Visibility

For a *super string*, the concept of visibility and invisibility for vertices and segments has been introduced.

```

vertex_visible_data {
    visibility flag for first vertex // keyword // 1 for visible
    visibility flag for second vertex // 0 for invisible
    ...
    visibility flag for last vertex
}

segment_visible_data {
    visibility flag for first segment // keyword // 1 for visible
    visibility flag for second segment // 0 for invisible
    ...
    visibility flag for last segment
}

```

Vertex Text and Vertex Annotation

There can be the same piece of text for every vertex in the super string or a different text for each vertex of the super string. How the text is drawn is specified by vertex annotation values. Note that in vertex annotations, all vertices must be either worldsize or all vertices papersize. That is, worldsize and papersize can not be mixed - the first one found is used for all vertices.

```

vertex_text_value      text
or
vertex_text_data {
    text for first vertex // keyword // text string, enclose
    text for second vertex // by "" if there are any
    ... // spaces in the text string
    text for last vertex
}

vertex_annotate_value {
    angle value offset value raise value // keyword
    textstyle textstyle_name slant degrees xfactor value
    worldsize value or papersize value or screensize value
    justify "top/middle/bottom-left/centre/right"
    colour colour_name
}
or
vertex_annotate_data {
    properties { // keyword
        angle value offset value raise value
        textstyle textstyle slant degrees xfactor value
        worldsize value or papersize value or screensize value
        justify "top/middle/bottom-left/centre/right"
        colour colour_name
    }
    properties { text properties second vertex
    }
    properties { ...
    }
    properties { text properties for last vertex
    }
}

```

Segment Text and Segment Annotation

There can be the same piece of text for every segment in the super string or a different text for each segment of the super string. How the text is drawn is specified by segment annotation values. Note that in segment annotations, all segments must be either worldsize or all segments papersize. That is, worldsize and papersize can not be mixed - the first one found is used for all segments. However, vertex text and segment text do not both have to be papersize or worldsize.

```

segment_text_value      text
or
segment_text_data {
    text for first segment           // keyword
    text for second segment         // text string, enclose
    ...                             // by "" if there are any
    text for last segment           // spaces in the text string
}

segment_annotate_value {
    angle value offset value raise value // keyword
    textstyle textstyle slant degrees xfactor value
    worldsize value or papersize value or screensize value
    justify "top/middle/bottom-left/centre/right"
    colour colour_name
}
or
segment_annotate_data {
    properties { angle value offset value raise value // keyword
                textstyle textstyle slant degrees xfactor value
                worldsize value or papersize value or screensize value
                justify "top/middle/bottom-left/centre/right"
                colour colour_name
            }
    properties { text properties second segment
            }
    properties { ...
            }
    properties { text properties for last segment
            }
}

```

Symbols

There can be the same symbol (defined as a linestyle) for every vertex in the super string or a different symbol for each vertex of the super string. If a symbol does not have a colour, then it uses the string colour or the segment colour.

```

symbol_value {
    style linestyle_name colour colour_name size value // keyword
    rotation value // in dms
    offset value raise value
}
or
symbol_data {
    properties { style linestyle_name colour colour_name size value // keyword
            style linestyle colour colour size value
    }
}

```

```

        rotation value // in dms
        offset value raise value
    }
    properties { symbol and properties for second vertex
    }
    properties { ...
    }
    properties { symbol and properties for last vertex
    }
}

```

Vertex Attributes

Each vertex can have one or more user defined named attributes.

```

vertex_attribute_data { // key word
    attributes { attribute_type attribute_name attribute_value
                attribute_type attribute_name attribute_value
                ...
                attribute_type attribute_name attribute_value
    }
    attributes { named attributes for second vertex
    }
    attributes { ...
    }
    attributes { named attributes for last vertex
    }
}

```

Segment Attributes

Each segment can have one or more user defined named attributes.

```

segment_attribute_data { // keyword
    attributes { attribute_type attribute_name attribute_value
                attribute_type attribute_name attribute_value
                ...
                attribute_type attribute_name attribute_value
    }
    attributes { named attributes for second segment
    }
    attributes { ...
    }
    attributes { named attributes for last segment
    }
}

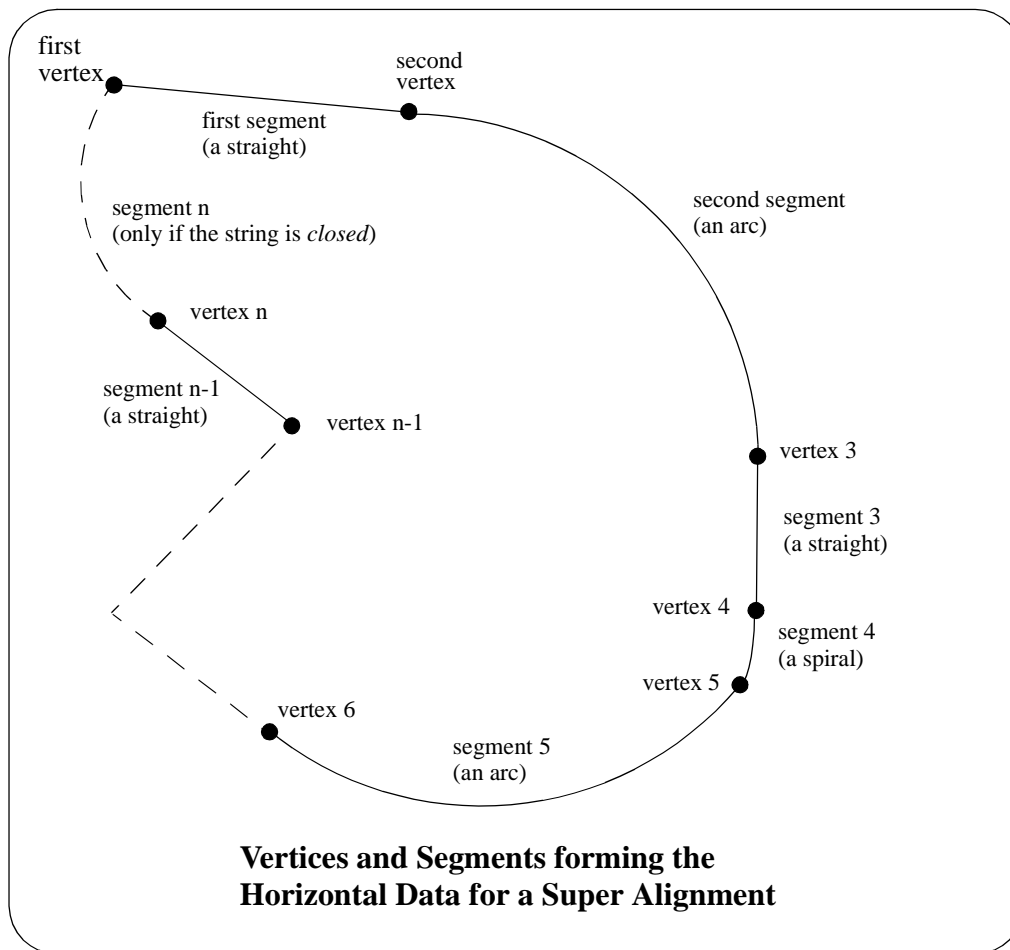
```

Super Alignment String

In an alignment string, the horizontal and vertical geometry are defined separately and only the intersection point method (IP's) could be used. The IP definition is actually a *constructive* definition and the tangents points and segments between the tangent points (lines, arcs etc.) are calculated from the IP definition. For an alignment string, only the IP definitions was included in the 12d ascii file, not the calculated segments.

For a super alignment, the horizontal and vertical geometry are also defined separately and with construction definitions but the construction definition can be much more complex than just IP's.

Unlike the alignment, the super alignment stores **both** the **constructive methods** (*parts*) and the resulting **vertices** and **segments** (lines, arcs, transitions etc.) that make up the horizontal and vertical geometry.



For many applications such as uploading to survey data collectors or machine control devices, only the horizontal data and the vertical data are required, not the *constructive* information.

Note that segments meeting at a common vertex do not have to be tangential although for most road applications, they should be.

The full 12d Ascii definition of the *super alignment* is:

```

string super_alignment {
//
    name            string_name
    chainage        start_chainage
    colour          colour_name
    style           style_name
    breakline       point or line
    closed          true or false
    spiral_type     transition_type           // currently only "Clothoid"
    valid_horizontal true or false
    valid_vertical  true or false

    block of info {
    }
    block of info {
    }
    block of info {
    }
}
// end of super alignment

```

where the block of info can be one of more of:

attributes, horizontal_parts, horizontal_data, vertical_parts, vertical_data.

The **attributes** block has been described in the earlier section “Attributes” .

The structure of the blocks *horizontal_parts*, *horizontal_data*, *vertical_parts* and *vertical_data* will now be described in more detail.

Horizontal Geometry

The horizontal geometry is described by two blocks - the **horizontal_parts** block and the *horizontal_data* block. The *horizontal_parts* block contains the **methods** to construct the horizontal geometry such as float (fillet) an arc of a certain radius between two given lines or create a transition spiral between a line and an arc.

If the horizontal construction methods are consistent, then they can be solved to form a string made up of lines, arcs and transitions. The *horizontal_data* block is simply a list of the vertices and segments (lines, arcs etc.) that make up the *solved* geometry.

If the geometry in the *horizontal_parts* can be solved and produces a valid *horizontal_data* block, then a flag *valid_horizontal* is set to *true*.

```

valid_horizontal true or false //true if the horizontal geometry can be solved and
// hence create a valid horizontal_data
horizontal_parts {/           / methods for creating the horizontal geometry
    ....
}
horizontal_data {           // the horizontal geometry
    ....
}

```

Horizontal_parts

The *horizontal_parts* block describes the methods used to construct the horizontal geometry of the

super alignment. Unless another software package supports all the construction methods allowed in 12d Model, this block should be skipped.

The *horizontal_parts* block is undocumented.

Horizontal_data

The *horizontal_data* block contains the *solved* horizontal geometry of the super alignment.

The *solved horizontal geometry* is made up of a series of (x,y) vertices given in a *data_2d* block followed by a *geometry_data* block specifying the geometry of the segments between adjacent vertices. The segment can be a straight line, an arc or a transition (e.g. spiral).

If the horizontal geometry has n vertices, then there will be (n-1) segments for an *open* super alignment or n segments if the super alignment is *closed*.

The format of the *horizontal_data* block is:

```
horizontal_data {
  name          " "
  chainage      value
  breakline     line or point
  colour        colour
  style         linestyle
  closed        0 or 1           // 0 if the string is open, 1 if it is closed

  interval {
    chord_arc   value           // chord-to-arc tolerance for curves
    distance    value           // chainage interval to break the geometry up
  }

  data_2d {
    x1-value    y1-value        // co-ordinates of the first vertex
    x2-value    y2-value        // co-ordinates of the second vertex
    "           "
    "           "
    xn-value    yn-value        // co-ordinates of the n-th vertex
  }

  geometry_data {
    segment_info_1 {
      information on the first segment
    }
    segment_info_2 {
      information on the second segment
    }
    "           "
    "           "
    segment_info_n-1 {           // the last segment if it is open
      information on the (n-1) segment
    }
    segment_info_n {           // the last segment if it is closed
      information on the n-th segment
    }
  }
}
```

where the *segment_info* blocks are from the following:

(a) Straight

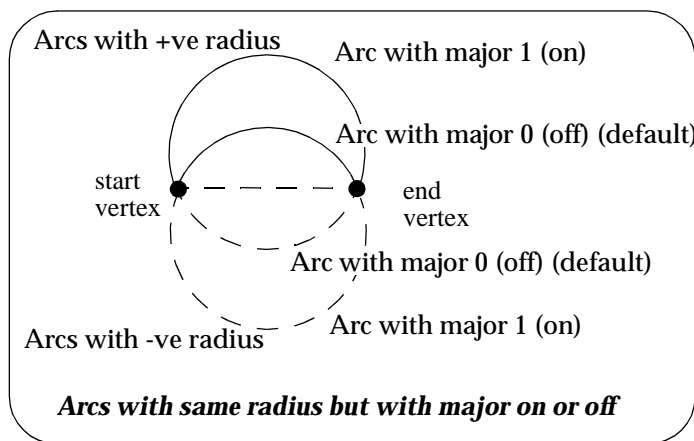
No parameters are needed for defining a straight segment. The *straight* block is simply:

```
straight {           // no parameters are needed for a straight
}
}
```


(b) Arc

There are four possibilities for an arc of a given radius placed between two vertices.

We use *positive* and *negative* radius, and a flag *major* which can be set to 1 (on) or off (0) to differentiate between the four possibilities.



So the *arc* block is:

```
arc {
  radius value // radius of the arc (+ve is above the line connecting the vertices)
  major 0 or 1 // 0 is the smaller arc, 1 the larger arc).
}
```

(c) Spiral

There can be a partial spiral between adjacent vertices. The partial spiral is defined by the parameters

- l1** length of the full spiral up to the start vertex
- r1** radius at the start vertex
- a1** angle in decimal degrees of the tangent to the spiral at the start vertex
- l2** length of the full spiral up to the end vertex
- r2** radius at the end vertex
- a2** angle in decimal degrees of the tangent to the spiral at the end vertex

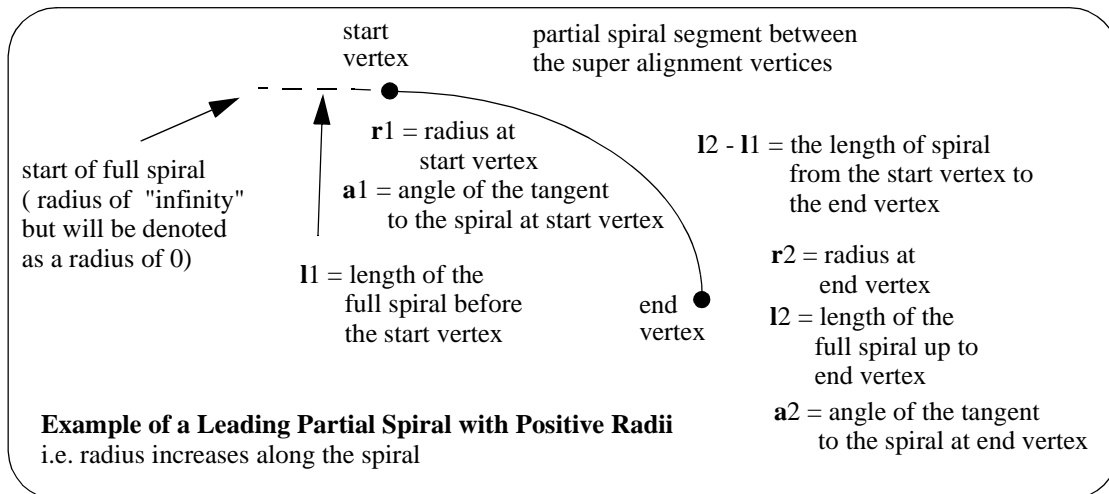
Since a radius can not be zero, a radius of infinity is denoted by *zero*.

The spiral is said to be a *leading* spiral if the absolute value of the radius is increasing along the direction of the spiral (the spiral will *tighten*). Otherwise it is a *trailing* spiral.

If a leading spiral is a full spiral then $r1 = 0$ and $l1 = 0$. Similarly if a trailing spiral is a full spiral then $r2 = 0$ and $l2 = 0$.

For a partial spiral, if the coordinates of the start of the full spiral are needed then they can be calculated from $l1, r1, a1, l2, r2, a2$ and the co-ordinates of the start and end vertices.

Note that the radii can be positive or negative. If the radii's are positive then a leading spiral will curl to the right (and will be above the line joining the start and end vertices).



The super alignment currently only supports a transition type of *clothoid spiral*, but in future releases more transition types will be supported.

The parameters for the *spiral* block are:

```

spiral {
  type      "clothoid"           // only clothoid is currently supported
  leading   1 or 0              // 1 denotes a leading spiral, 0 a trailing spiral
  l1        value               // length of the full spiral at start vertex
  r1        value               // radius at the start vertex
  a1        value               // angle in decimal degrees of the tangent to the spiral
                                   // at the start vertex
  l2        value               // length of the full spiral at end vertex
  r2        value               // radius at end vertex
  a2        value               // angle in decimal degrees of the tangent to the spiral
                                   // at the end vertex
}

```

Vertical Geometry

The *vertical* geometry is described by two blocks - the *vertical_parts* block and the *vertical_data* block. The *vertical_parts* block contains the **methods** to construct the vertical geometry such as float (fit) a parabola of a certain length between two given lines.

If the vertical construction methods are consistent, then they can be solved to form a string made up of lines, parabolas and arcs. The *vertical_data* block is simply a list of the vertices and segments (lines, parabolas and arcs) that make up the *solved* geometry.

If the geometry in the *vertical_parts* can be solved and produces a valid *vertical_data* block, then a flag *valid_vertical* is set to *true*.

```

valid_vertical  true or false // true if the vertical geometry can be solved and
                                   // hence create a valid vertical_data
vertical_parts {                    // methods for creating the vertical geometry
  ....
}
vertical_data {                      // the vertical geometry
  ....
}

```

Vertical_parts

The *vertical_parts* block describes the methods used to construct the vertical geometry of the super alignment. Unless another software package supports all the construction methods allowed in 12d Model, this block should be skipped.

The *vertical_parts* block is undocumented.

Vertical_data

The *vertical_data* block contains the *solved* vertical geometry of the super alignment.

The *solved vertical geometry* is made up of a series of (chainage,height) vertices given in a *data_2d* block followed by a *geometry_data* block specifying the geometry of the segments between adjacent vertices. The segment can be a straight line, a parabola or an arc.

If the vertical geometry has n vertices, then there will be (n-1) segments for an *open* super alignment or n segments if the super alignment is *closed*.

The format of the *vertical_data* block is:

```
vertical_data {
  name      ""
  chainage  value
  breakline line or point
  colour    colour
  style     linestyle
  closed    0 or 1           // 0 if the string is open, 1 if it is closed
  interval {
    chord_arc  value           // chord-to-arc tolerance for curves
    distance   value           // chainage interval to break the geometry up
  }

  data_2d {
    ch1-value  ht1-value       // co-ordinates of the first vertex
    ch2-value  ht2-value       // co-ordinates of the second vertex
    "          "
    "          "
    chn-value  htn-value       // co-ordinates of the n-th vertex
  }

  geometry_data {
    segment_info_1 {
      information on the first segment
    }
    segment_info_2 {
      information on the second segment
    }
    "          "
    "          "
    segment_info_n-1 {           // the last segment if it is open
      information on the (n-1) segment
    }
    segment_info_n {           // the last segment if it is closed
      information on the n-th segment
    }
  }
}
```

where the *segment_info* blocks are from the following:

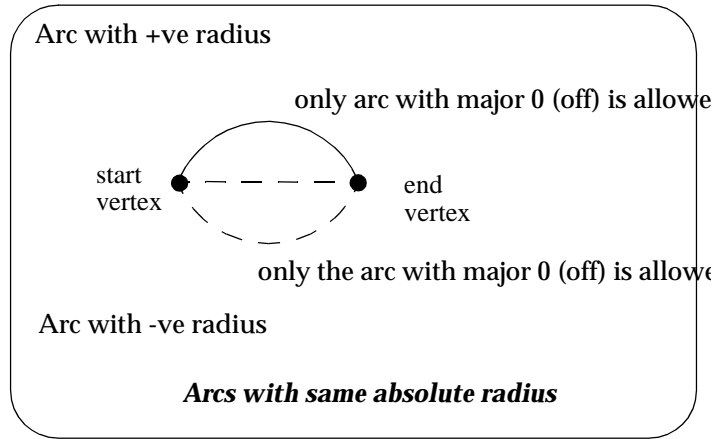
(a) Straight

No parameters are needed for defining a straight segment. The *straight* block is simply:

```
straight {           // no parameters are needed for a straight
}
}
```

(b) Arc

Since vertical geometry can't go backwards in chainage value, the majors arcs can not be used and hence there are only possibilities for an arc of a given radius placed between two vertices. We use *positive* and *negative* radius to differentiate between the four possibilities.



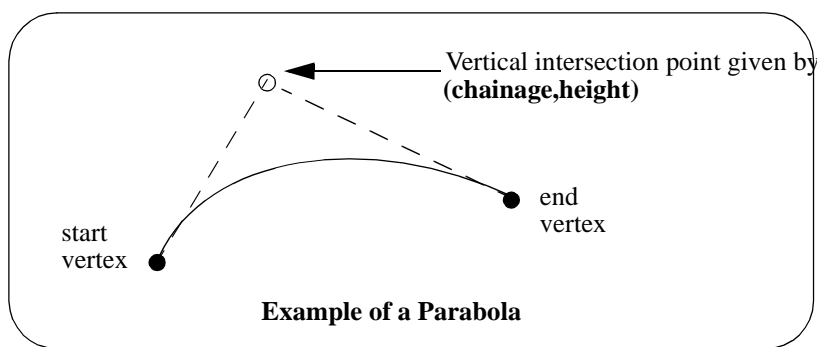
So the *arc* block is:

```
arc {
  radius value // radius of the arc (+ve is above the line connecting vertices)
  major value // this is ignored since only minor arcs are used
}
```

(c) Parabola

There can be a parabola between adjacent vertices. The parabola is defined by giving the coordinates of the vertical intersection point for the parabola

chainage chainage of the VIP of the parabola
height height of the VIP of the parabola



The parameters for the *parabola* block are:

```
parabola {
  chainage value // chainage of the VIP of the parabola
  height value // height of the VIP of the parabola
}
```

Please continue to the next section "12d Ascii Definition for Tins"

12d Ascii Definition for Tins

Tins (triangulated irregular networks) and *Super Tins* can be written out and read in from a 12d Ascii file.

Tins

```

tin {
  name  tin_name      // MANDATORY name of the tin when created in 12d Model

  time_created text           // optional - time tin first created
  time_updated text          // optional - time tin last modified

  // Attributes Block:

  // This is mainly information used by 12d Model to create the tin.
  // The attributes this block and the Attributes block itself are optional.
  // When a tin is read into 12d Model from a 12da file, the style is used
  // as the Tin style.

  attributes {
    text "style"          text           // name of line style for the tin
    integer "faces"       0/1           // 0 non triangle data, 1 triangle data
    real "null_length"    value          // values for null by angle/length
    real "null_angle"     value          // angle in radians
    real "null_combined_length" value     // angle in radians
    real "null_combined_angle" value     // angle in radians
  //      any other attributes
  }
  // end of attributes block

  // Points Block
  //
  // Co-ordinates of the points at the vertices of the triangles
  // The points are implicitly numbered by the order in the list (starting at point 1).
  //
  // The Points Block is MANDATORY

  points {
    x-value y-value z-value // x y z for each point in the tin
    " " " " " // point 1
    " " " " " // point 2
  }
  // end of points block

  // Triangles Block
  //
  // Each triangle is given as a triplet of the point numbers that make up
  // the triangle vertices (the point numbers are the implicit position of the points
  // given in the Points Block.
  // The order of the triangles is unimportant
  //
  // The Triangles Block is MANDATORY

```

```

triangles {
    T1-1  T1-2  T1-3      // points making up each triangle
    T2-1  T2-2  T-33     // point numbers of the 3 vertices of first triangle.
    "      "           // point numbers of the 3 vertices of second triangle.
    "      "           "
} // end of triangles block

// Base Colour
// The tin has a base colour that is the default colour for all triangles

colour tin_base_colour // optional - base colour of the tin

// Colours Block
//
// Triangles can be given colours other than the base colour by including
// a "colours" block. The colour for each triangle is then individually given
// (-1 means base colour). The order is the same as the order of the triangles in
// the Triangles Block.
//
// If all the triangles are the base colour, then simply omit the Colours Block

colours {
    C1  C2  C3          // colour for each triangle given in triangle order
    C4  C5  C6  C7     // colour "-1" means use the base tin colour.
    "   "   "
    "   "   "
} // end of colours block

// Input Block
//
// More information about how the tin was created by 12d Model.
// None of this information is needed when reading a tin into 12d Model.
// This block can be omitted

input {
    preserve_strings  true/false // data for reconstructing tin from strings
    remove_bubbles   true/false // if true, preserve breaklines etc.
    weed_tin         true/false //
    triangle_data    true/false
    sort_tin         true/false
    cell_method      true/false

    models {
        "model_name_1" // name of the first model making up the tin
        "model_name_2" // name of the second model making up the tin
        "  "  "  "
        "  "  "  "
    } // end of models block
} // end of input block
} // end of tin ascii definition

```

Super Tins

```

super_tin {
    name tin_name // MANDATORY name of the super tin

    time_created text // optional - time super tin first created
    time_updated text // optional - time super tin last modified

// Attributes Block:

// This is mainly information used by 12d Model to create the super tin.
// The attributes in this block and the Attributes block itself are optional.
// When a super tin is read into 12d Model from a 12da file, the style is used
// as the Super Tin style.

    attributes {
        text "style" text // name of line style for the tin
// any other attributes
    } // end of attributes block

// Super Tin Colour
// The super tin has a base colour

    colour tin_base_colour // optional - base colour of the super tin

// Tins Block
//
// This is the list of tins that make up the super tin.
// This block is MANDATORY

    tins { // list of tins for the super tin
        "tin_name_1" // name of the first tin making up the super tin
        "tin_name_2" // name of the second tin making up the super tin
        " " " "
        " " " "
    } // end of tins block
} // end of super tin ascii definition

```

Please continue to the next section “12d Ascii Definition for Plot Frames” .

12d Ascii Definition for Plot Frames

Plot frames can be written out and read in from a 12d Ascii file.

```
string plot_frame {  
  name           frame_name  
  title_file     filename  
  border         0 or 1  
  viewport       0 or 1  
  user_title_file 0 or 1  
  title_1        text  
  title_2        text  
  plot_file      filename  
  text_size      mm  
  sheet_code     text  
  width          value  
  height         value  
  scale          value  
  rotation       value  
  xorigin        value  
  yorigin        value  
  left_margin    mm  
  right_margin   mm  
  top_margin     mm  
  bottom_margin  mm  
  plotter        text  
  colour         colour  
  textstyle      textstyle_name  
}
```


J Set Ups

Set Up Files

When 12d Model fires up, it looks for special files (called set up files) to define many of its features. Hence the set up files can be used to customize 12d Model for a site or a user.

Two set up files, **setups.4d** and **defaults.4d**, are only used when creating a new project. After the project is created, the information supplied in the two set up files is stored with the project and is then modified from within the project.

Similarly the file **macros.4d** is a file of macros (one per line) that are run when a new project is created.

defaults.4d // define the defaults for a **new** project
(**Defaults** panel from the **Utilities =>Defaults** option).
Once a project is created, the defaults can be modified inside 12d Model.
The defaults are then saved with the project.

For more information go to the section “Defaults”

setups.4d // define the layout of views on the screen for a **new** project. Once a project is created, the view layout can be modified inside 12d Model. The view layout is then saved with the project.

For more information go to the section “Set Ups”

macros.4d // a file of macros (one per line) that are run when a **new** project is created.

The other set up files are searched for each time a project is opened and hence can be modified between access to the project. The complete list of set up files that 12d Model searches for each time a project is opened is:

colours.4d // sets the colour names and red, green, blue mix; also defines the default pens that the colours map to (as displayed in the panel **colours to pens**). See “Colours” .

digitize.4d // list and defines the digitizers available in 12d Model. See “Digitizer Definitions File” .

env.4d // contains values for environment variables See “Environment Variables” .

fonts.4d // defines the fonts used in text styles. See “Textstyles and Fonts” .

gui.4d // define the fonts and colours used in panels and menus, spacing between items in panels and menus and the maximum pop-up length. See “GUI” .

layout.4d // a screen layout file that is used every time a project is opened. A screen layout file can have most menus and panels in it. See “Screen Layout File” in the appendix “Special File Formats” .

linestyl.4d // defines the line styles (linestyles, worldstyles, groupstyles and twoptstyles). See “Line Styles” .

names.4d // a special mapping file which is used to fill out information such as colours, model etc. for given string names.

plotters.4d // defines the plotters that appear in the pop-up for the plotter type panel field. See “User Defined Plotters” .

pmf.4d // plotter mapping file for defining mapping of 12d Model colours to pens with thicknesses, and the rgb for the pens See “Plotter Mapping File”

sheets.4d // gives sheet sizes and names used in the pop-up for the sheet size panel field. See “Sheet Sizes”

spirals.4d // defines the transition curves (spirals). See "Spirals" .
survey.4d // lists and defines the data collectors available in 12d Model See "Survey Data Collectors"
symbols.4d // defines the symbols. See "Symbols"
textstyl.4d // defines the text styles. See "Textstyles and Fonts" .
textstyle_names.4d // defines the textstyle favourites
toolbars.4d // defines the toolbars See "User Defined Toolbars"
userkeys.4d // defines the action of function keys. See "User Defined Function Keys"
usermenu.4d // defines the user defined walk-right menus for User on 12d Model menus. See "User Defined Menus" .
xtramenu.4d // defines the 12D Solutions defined walk-right menus for User on 12d Model menus. See "User Defined Menus" .

When 12d Model creates a new project, or changes to another project, it searches for set up files in a number of set folders. For each file, these folders are searched in a specific order until the file is found. Consequently the set up files do not all have to be in the same folder.

This greatly increase the tailorability of 12d Model.

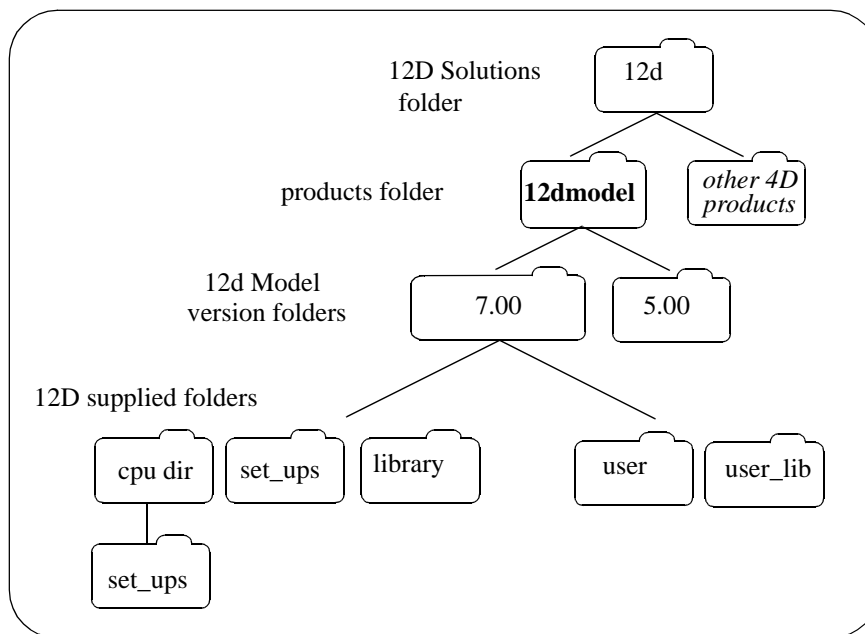
For set up files, the folders searched and their search order will now be described in the next section "Folders Searched for Set Up Files" .

Folders Searched for Set Up Files

Set_Ups

When 12d Model V7.0 is installed on a computer, it is placed in a folder called **7.00** in the folder **12d\12dmodel**.

The 12d Model installation creates a number of specific folders such as the operating system-cpu specific folder (for example **nt.x86** for Windows NT on Intel chips), and areas for set up files: namely an o/s-cpu specific **set_ups** under the o/s-specific folder and a **set_ups** under **7.00**.



User

Although users can place their site specific set up files in the **set_ups** folders, it is not recommend since they may be overwritten during future 12d Model installations.

To overcome this problem, there is a special folder (reserved for customers) called **user** which is searched **before set_ups** for any set up files. Consequently any site specific set up files should be placed in **user** and they will be used in preference to the files in **set_ups** (**user** may contain o/s-cpu specific folders). By default, **user** is under **7.00**.

When a new 12d Model version is issued (e.g. V7.0), **user** can then be copied over to the new installation area.

There is also an environment variable which can be set to point to another user defined folder which will be searched for set up files before the default **user** is searched.

```
USER_4D          folder      // users own folder for set up info
```

Note - both **user** and the folder pointed to by **USER_4D** can exist.

Current and Home

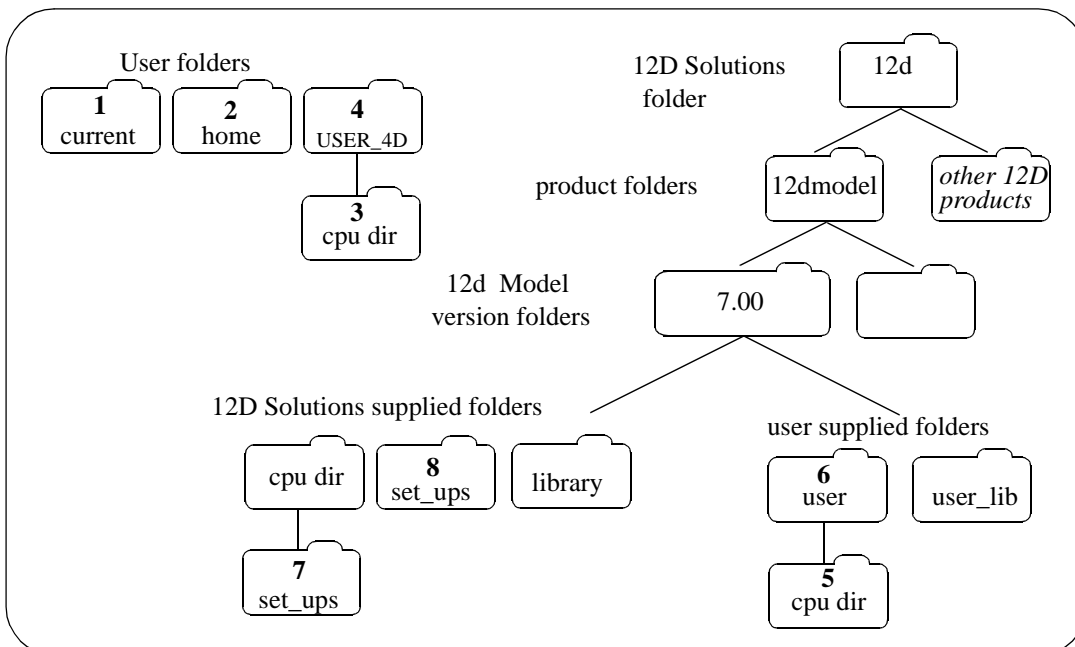
The folder that a project is in (the **current** folder) and the users **home** folder are also searched for set up files.

Searching Order for Set Up Files

When 12d Model creates a new project, or changes to another project, it searches for set up files in a number of set folders. For each file, these folders are searched in a specific order until the file is found. Consequently the set up files do not all have to be in the same folder.

The folder search order for the set up files is

0. the appropriate environment variable defining where the file is
1. the projects current folder
2. the users home folder
3. specific cpu folder in USER_4D e.g. nt.x86 for Intel
4. USER_4D
5. specific cpu folder in user
6. user
7. SET_UPS_4D
8. set_ups folder under the specific cpu folder in 7.00
9. set_ups folder under 7.00



Notes

- (a) When an **existing** project is opened by 12d Model, the set up files setups.4d and defaults.4d are not used.
- (b) The file, **eagleplt.emf**, is not pointed to by an environment variable but is searched for.

Writing Set Up Files

Most of the set up files can be created and edited totally within 12d Model using panels such as **Defaults** which is accessed via the *Utilities =>Defaults* option.

When the **Write** button is selected on the panels, a **Write Setup File** panel comes up to specify where the file is to be written out to.

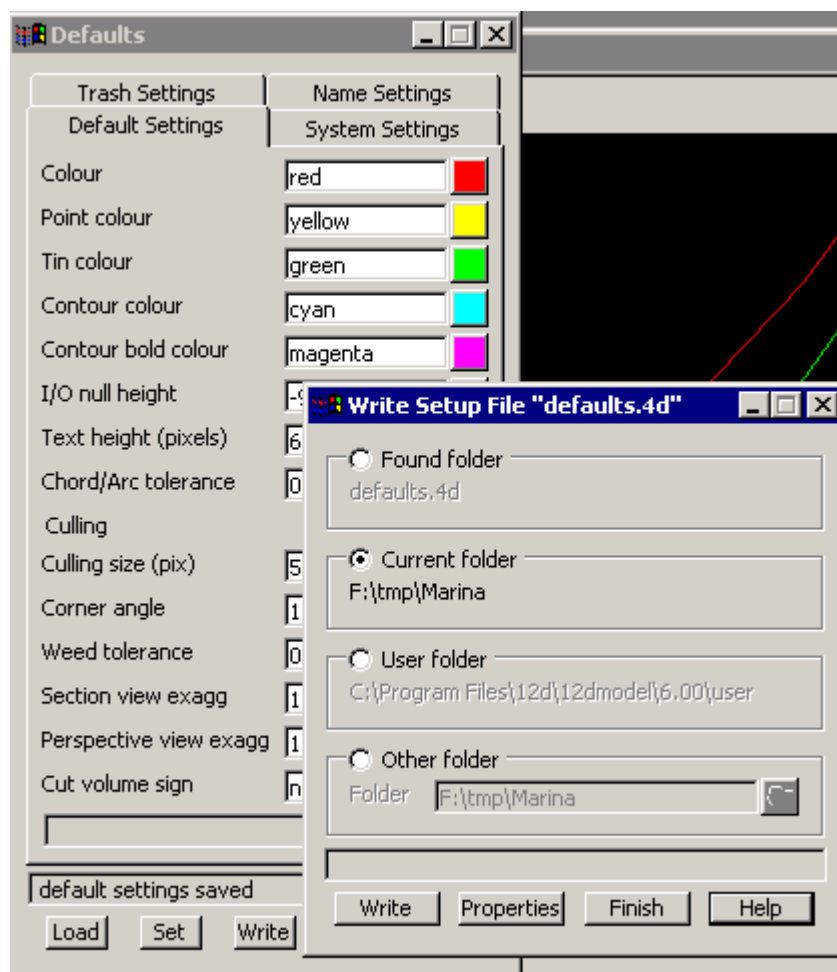
The choices on the panel allow the file to be written out to:

Found folder - the folder where the file currently being used by 12d Model resides. This will be unavailable (greyed out) if the user doesn't have access to the folder.

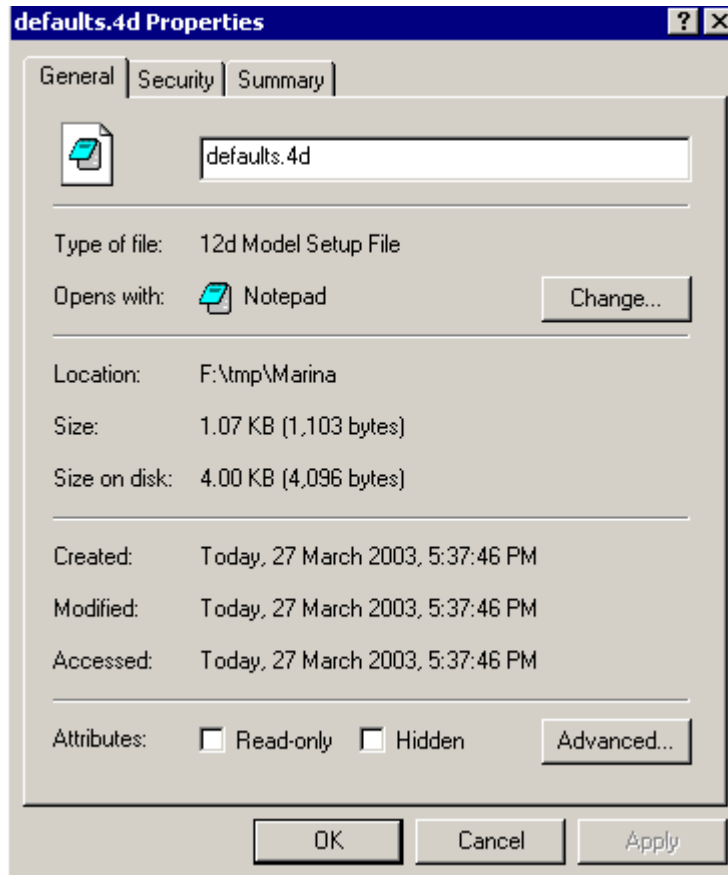
Current folder - the folder where the project currently being used by 12d Model resides. This will be unavailable (greyed out) if the user doesn't have access to the folder.

User folder - the User folder. This will be unavailable (greyed out) if the user doesn't have access to the folder.

Other folder - any folder can be selected.



If you are having problems writing to the file, click on the **Properties** button to bring up the **Properties** panel for the selected file (if it exists) and check the *Security* for the file.



Library, User Library

Apart from set up files which are only accessed when a project is opened or first created, there are two special library areas, one supplied by 12D Solutions Pty Ltd and the other for the user, which are searched for files with the appropriate file ending whenever the folder icon at the end of a panel file field is selected.

For example, clicking on the folder icon for a plot parameter file panel field would display a list of files ending in **.ppf**.

Library

The first library is the folder pointed to by the environment variable

LIB_4D

or if that doesn't exist, in a folder called **library** directly under **7.00**.

The files in **library** are listed under the [Lib] walk right of pop-ups.

Although users can place their files in the **library** folder, it is not recommend since they may be overwritten during future 12d Model installations.

Consequently there is a special user library folder called **user_lib** where user specific files should be placed.

User Library

The second library, the user library, is also a folder and is pointed to by the environment variable

USER_LIB_4D

or if that doesn't exist, in a folder called **user_lib** directly under **7.00**.

The files from the user library are listed under the [User Lib] walk right of the pop-up.

Note

1. The list of special endings for files is given in the Appendix, Special File Formats.
2. A full list of environment variables is given in the later section "Environment Variables".

Environment Variables

When 12d Model is invoked for a new or existing project, it uses environment variables to tailor the system.

In Windows, environment variables can be set for each User from the Control Panel, but a much easier method to set the environment variables used by 12d Model is to include them in a special file which is read in each time a project (new or existing) is opened by 12d Model.

The environment variables that 12d Model recognises can be broken into two types - one type where the environment variable is only a flag setting a mode, and a second type which point to a file, program or folder. For the environment variables of the second type, a default file/program is often searched for if the environment variable is not defined.

The folder search order for the default files for the type group of environment variables is given in the previous sections.

The list of environment variables will just be given in alphabetical order but it will be obvious from the documentation which type the environment variable is.

For environment variables that simply set a flag or value is (the default value is shown in bold) the documentation will be:

Variable Name	Value	Description	Default
---------------	-------	-------------	---------

For environment variables that point to a file, program or folder, and their associated default files/programs, the documentation will be:

Environment Variable Name	Type	Default
---------------------------	------	---------

Alphabetical Environmental Variables List

AUTHORIZATION_4D	full path name	HOME_4D\nodes.4d
------------------	----------------	------------------

The authorization file is normally called **nodes.4d**, and is under the folder **12d model**. However, the file name and path can be set by the user with the environment variable. The full path-name of the file is given.

The default is HOME_4D\nodes.4d.

AUTO_DELETE_WALKRIGHTS_4D	0 <i>pixels</i>	Use old method from V3.1 Distance in pixels to move past the end of the last menu before the cascade collapses	32
---------------------------	---------------------------	---	-----------

If non zero, the environment variable AUTO_DELETE_WALKRIGHTS_4D sets the distance in pixels that is used to collapse the cascade of walk-right menus when the cursor moves that distance past the end of the last walk-right menu.

The default value is 32.

AUTO_RESET_SELECT_4D	0	Don't use auto-reset reselect	
	1	Use auto-reset reselect	<i>default 1</i>

The reset mechanism for picking has ben modified for V5.0 and above. Reset is now done automatically if the cursor is moved a user specified distance (given by AUTO_RESET_TOLERANCE_4D) after a pick (without accepting), and a separate user specified distance (given by AUTO_RESET_DRAG_TOLERANCE_4D) after a directional pick (without accepting).

The default value is 1.

AUTO_RESET_DRAG_TOLERANCE_4D	<i>value</i>	Reset distance for directional picks	<i>default 50</i>
------------------------------	--------------	--------------------------------------	-------------------

If auto-reselect is set on (see AUTO_RESET_SELECT_4D) then this is the distance in pixels to move the cursor to reset the picking rejection list for a directional pick.

The default value is 50.

AUTO_RESET_TOLERANCE_4D	<i>value</i>	Reset distance for non-directional picks	<i>default 5</i>
-------------------------	--------------	--	------------------

If auto-reselect is set on (see AUTO_RESET_SELECT_4D) then this is the distance in pixels to move the cursor to reset the picking rejection list for a non-directional pick.

The default value is 5.

BISECTORS_4D	0	Don't use bisector section use two sections instead.	<i>default 0</i>
	1	Use bisector section	

When applying templates to a horizontal intersection point with a sharp change of direction, (that is, it is not an end point and the HIP has no curve on it and there is a change of direction at the HIP), either two sections can be applied at the HIP point (applied perpendicular to the line on either side of the HIP point) or just a single bisector section applied to the bisector of the change of angle through the HIP.

The default value is 0.

CIVILCAD_PATH_4D	folder	no default
------------------	--------	------------

the full path-name of the folder for CivilCAD files.

There is no default.

COLOURS_4D	filename	default colours.4d
------------	----------	--------------------

file of colour rgb definitions and names. See "Colours" .

The default is colours.4d.

CUBED_CHARACTER_4D	<i>integer (base 10)</i>	<i>default 179</i>
--------------------	--------------------------	--------------------

The integer (base 10) value of the character to use as the cubed symbol.

DATA_COLLECTOR_4D	data collect name
-------------------	-------------------

the data collector that is used if no data collector is set for a project.

There is no default.

DATA_COLLECTORS_4D	filename	default survey.4d
--------------------	----------	-------------------

file of definitions of available data collectors

The default is survey.4d.

DATA_TIPS_4D	0	Don't show data tips	<i>default 0</i>
	1	Show data tips	

When set, data tips are displayed when the cursor moves over point in a plan view.

The default value is 0.

DEFAULTS_4D	filename	default defaults.4d
-------------	----------	---------------------

file of defaults - only used for new project

The default is defaults.4d. See "Defaults" .

DEFAULT_PLAN_SCALE_4D	<i>value</i>	Value is the scale (1:value) for new plan views
-----------------------	--------------	---

If a value is given, then it is used the default scale for any new plan view created in a project. Note that the scale is only used for displaying text defined in paper units in the plan view.

DEFAULT_VIEW_COLOUR_4D	<i>colour_number</i>	<i>default 0</i>
------------------------	----------------------	------------------

The default background colour for views.

DEFAULT_TABLE_WIDTH_4D *number_of_characters* *default 32*

Gives the number of characters displayed in tables such as decisionals and mtf editor.

The default value is 32.

DEGREES_CHARACTER_4D *integer (base 10)* *default 176*

The integer (base 10) value of the character to use as the degrees symbol.

DIAMETER_LARGE_CHARACTER_4D *integer (base 10)* *default 216*

The integer (base 10) value of the character to use as the large diameter symbol.

DIAMETER_SMALL_CHARACTER_4D *integer (base 10)* *default 248*

The integer (base 10) value of the character to use as the small diameter symbol.

DIGITIZERS_4D filename default digitize.4d

file of digitizer definitions

The default is digitize.4d. See "Digitizer Definitions File" .

DISABLE_MTF_WARNINGS_4D **0** Display the mtf warnings in the text editor *default 0*
 1 Write mtf warnings to the background window

Controls whether the mtf warnings go to a file or to the output window.

The default value is 0.

DONGLE_4D parameters

used for network dongles. See the separate notes on installing a network dongle for more details.

DOUBLE_CONFIRM_DELETE_4D **0** Confirm deletes/cleans without undos once
 1 Confirm deletes/cleans without undos twice. *default 1*

Controls whether or not the user is asked once or twice to confirm that deletes and cleans that do not have undos are to be done.

The default value is 1.

DRAINAGE_4D filename default drainage.4d

file of definitions for drainage option

The default is drainage.4d.

DRAINAGE_PPF_4D *full path name of .ppf file* no default

Points to the file used as the default plot parameter file (.ppf) for the panel **New Plot Drainage Network**.

The path name to the .ppf file can contain \$LIB which expands out to the path of the library area. For example, "\$LIB/drainage.ppf" points to the file drainage.ppf in the area defined by \$LIB_4D.

DRAINAGE_FLOW_DIR_4D **0** Flow direction is in descending chainage *default 0*
 1 Flow direction is in ascending chainage

Defines the default flow direction used in the creating a drainage string.

The environment variable **DRAINAGE_FLOW_DIR_4D** specified whether the default flow direction that appears in the **Create Drainage String** panel is that the flow direction in the line is in ascending chainage (that is, the flow is in the same direction as the direction of the drainage string) or that the flow direction in the drainage line is in descending chainage (that is, the flow is in the opposite direction to the direction of the drainage string).

The default value is 0.

EDITOR_4D		script/program	7.00\cpu_area\te
the script or program that is fired up when a report is created. It usually points to an editor.			
If the parameter display reports in the panel sys default settings (given by the menu option Utilities => Default=>Sys defaults) is set to yes , the editor displays each report as it is created.			
The default is '7.00\cpu_area\te'.			
ENVIRONMENT_4D		full path name of file	default env.4d
It is possible to set all the environment variables from a file normally called env.4d . The environment variable file is searched for in the standard set up areas (local, USER_4D, user, set_ups) or is set by the environment variable ENVIRONMENT_4D.			
The default is env.4d.			
The format of the environment variable file is given in the section "Setting Environment Variables".			
EXTRA_OPTIONS_4D		file	default xtramenu.4d
Xtra menu definition			
The default is xtramenu.4d. See "User Defined Menus"			
FAST_ACCEPT_4D	0	don't use fast accept	default 0
	1	use fast accept	
Used for picking items - if fast accept is turned on (1), then when an item is picked and there is only one item in the selection list, that item is automatically selected without a MB being needed.			
The default value is 0.			
FONTS_4D		filename	default fonts.4d
font definitions			
The default is fonts.4d. See "Textstyles and Fonts"			
FUNCTION_KEYS_4D		filename	default userkeys.4d
function key definitions			
The default is userkeys.4d. See "User Defined Function Keys"			
GENIO_WILDCARD_4D	text		default "*.mos"
Sets the ending of the files selected for the pop-up list for the File field in the Read Genio Data panel.			
The default value is "*.mos".			
GUI_4D	Standard		default Standard
	Non Standard		
Defines the mouse button usage within 12d Model.			
The default value is <i>Standard</i> .			
GUI_COLOURS_4D		filename	default gui.4d
file of colour definitions used in the GUI			
The default is gui.4d. See "GUI"			
HARDWARE_ARCS_4D	1	Use hardware arcs	default 1
	0	Hardware arcs are not used	
The default value is 1.			
HEIGHT_MAX_DEFAULT_4D		integer	
set the default value to use in Plan Settings panels that have a Height max (w) field.			

The default value is 0.

HELP_4D		folder	default 7.00\help
---------	--	--------	-------------------

folder containing the 12d Model help files.

The default is '7.00\help'.

HELP_BUTTONS_4D	0	Disable help buttons on panels	<i>default 0</i>
	1	Enable help buttons on panels.	

The default value is 0.

HIMETRIC_4D	0	Printer resolution of 0.04 mm - for Win 95,98,ME	
	1	Printer resolution of 0.01 mm - for Win NT, 2000, XP	

For Windows 95, 98 and ME, the printer resolution can only be 0.04 mm when covering an A0 sheet.

Under Windows NT, 2000 and XP, no such restriction exists and the full resolution of 0.01 mm can be used so the environment variable HIMETRIC_4D allows access to the higher resolution for Windows NT, 2000 and XP.

The default value is 0.

See also WINDOWS_PRINTERS_4D for enabling access to Windows printers.

HOME_4D		folder	three folder levels up from where 12d.exe is
---------	--	--------	--

12d Model home folder

LIB_4D		folder	HOME_4D\7.00\library
--------	--	--------	----------------------

12D Solutions library folder for input files such as mapping, template and macros (4DML's).

The default is 'HOME_4D\7.00\library'.

LINESTYLES_4D		filename	default linestyl.4d
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file of linestyle definitions

The default is linestyl.4d. See "Line Styles"

LIST_POPUPS_4D	1	Pop-up lists as scrolling lists	<i>default 1</i>
	0	Pop-up lists as menus as in versions up to V3.2	

Defines the look of pop-up lists.

The default value is 1.

LOOK3D_4D	1	3D look and greenish background	<i>default 1</i>
	0	Original 12d gui colours	

The default value is 1.

LOG_DIR_4D		folder-path-name	default is local folder
------------	--	------------------	-------------------------

An error log file is created each time 12d Model is invoked. The error log name automatically created by 12d Model and has the form:

log?????.4de

where ????? is a hashed number using your login name, process id & the current time.

The **folder** that the error log file is created in is given by the environment variable LOG_DIR_4D. The full path-name of the folder is given.

If LOG_DIR_4D is not used, 12d Model tries to create the log file in the current folder, the HOME folder, the TMP folder and the TEMP folder.

If creating an error log file fails in all these ares, 12d Model does not create an error log file.

LONG_SECTION_PPF_4D	<i>path name to .ppf file</i>	no default
<p>This environment points to the file used as the default plot parameter file (.ppf) for the panel section long plot.</p> <p>The path name to the .ppf file can contain \$LIB which expands out to the path of the library area. For example, "\$LIB/long.ppf" points to the file long.ppf in the area defined by \$LIB_4D.</p>		
MACRO_INPUT_MODE_4D	0 1	Don't put current value into the console Put current value into console. <i>default 0</i>
<p>Controls whether or not the value passed down in the variable to receive the answer for any macro prompt, is actually placed into the console panel as the default answer so that it can be accepted by just typing <enter> into the console panel.</p> <p>The default value is 0.</p>		
MIDDLE_DOT_CHARACTER_4D	<i>integer (base 10)</i>	<i>default 183</i>
<p><i>The integer (base 10) value of the character to use as the squared symbol.</i></p>		
MODEL_FOR_TIN_PREFIX_4D	"pre*pos"	<i>default is "tin "</i>
<p>This environment variable is used to customize the default model for the tin in the panels for creating triangulations. Text can be defined for prepending and/or appending to tin name to create a default model name from the tin name.</p> <p>The text for prefixing and postfixing is given in a special form: "pre-text*post-text"</p> <p>If pretext only, just give the text. If post text is required, precede it by a *.</p> <p>If the environment variable is not set, the default "tin " is used.</p>		
MODEL_VIEW_WALKRIGHTS_4D	0 1	Use data source in options Walk-rights for model/view as in up to <i>default 0</i>
<p>V3.2</p> <p>Defines whether the Data source field is used instead of model/view walk-rights used in V3.2.</p> <p>The default value is 0.</p>		
MOVIE_4D	executable	default xanim
<p>X-Windows only - program for running perspective movie</p>		
MS_SEEDFILES_4D	folder	no default
<p>folder of Microstation seed files</p>		
MTF_TMP_4D	anything	not defined
<p>If defined, then the temporary files for mtf calculations go to the Windows temp folder. This is to get over a bug in Novell under Windows 95.</p>		
NAME_MAPPINGS_4D	filename	default names.4d
<p>A mapping file can be specified which is used to fill out information such as colour, model etc. for given string names.</p> <p>The mapping works in two ways. After typing part or all of a string name,</p> <p>(a) if <enter> is entered, the map file is searched for a match in the first column. If a match is found, the name, colour, model, style etc. from the other columns in the mapping file are used to fill out the panel fields.</p> <p>(b) if a <tab> is entered, the second column is searched for a list of completions (if a * is found, the first column is used for that check) which are displayed in a pop-up. When an entry is selected from the completion list, the name, colour, model, style etc. from the columns in the mapping file are used to fill out the panel fields.</p>		

NEVER_SNAP_ITSELF_4D	1	Try to stop a string snapping to itself during editing	
default			
	0	Let a string snap to itself - behaviour in V3.2	

Tries to stop a string snapping to itself during editing.

The default value is 1.

NEW_DRAINAGE_PPF_4D	<i>full path name of binary ppf file</i>		no default
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Points to the file used as the default binary plot parameter file (.drainppf) for the long section plot produced by the panel **Drainage Plot PPF Editor**.

The path name to the binary ppf file can contain \$LIB which expands out to the path of the library area. For example, "\$LIB/drainage_long.drainppf" points to the file drainage_long.drainppf in the area defined by \$LIB_4D.

NEW_DRAINAGE_MELB_PPF_4D	<i>full path name of binary ppf file</i>		no default
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Points to the file used as the default binary plot parameter file (.melbppf) for the long section plot produced by the panel **Sewer Plot Melbourne Water PPF Editor**.

The path name to the binary ppf file can contain \$LIB which expands out to the path of the library area. For example, "\$LIB/melb_water.melbppf" points to the file melb_water.melbppf in the area defined by \$LIB_4D.

NEW_DRAINAGE_PLAN_PPF_4D	<i>full path name of binary ppf file</i>		no default
--------------------------	--	--	------------

Points to the file used as the default binary parameter file (.drainplanppf) for the plan annotation produced by the panel **Drainage Plan Plot PPF Editor**.

The path name to the binary ppf file can contain \$LIB which expands out to the path of the library area. For example, "\$LIB/drainage_plan.drainplanppf" points to the file drainage_plan.drainplanppf in the area defined by \$LIB_4D.

NEW_LONG_SECTION_PPF_4D	<i>full path name of binary ppf file</i>		no default
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Points to the file used as the default binary plot parameter file (.lplotppf) for the long section plot produced by the panel **Section Long Plot PPF Editor**.

The path name to the binary ppf file can contain \$LIB which expands out to the path of the library area. For example, "\$LIB/long_section.lplotppf" points to the file long_section.lplotppf in the area defined by \$LIB_4D.

NEW_PLOT_FRAME_PPF_4D	<i>full path name of binary ppf file</i>		no default
-----------------------	--	--	------------

Points to the file used as the default binary parameter file (.plotframeppf) for the plan plot produced by the panel **Plot Frame PPF Editor**.

The path name to the binary ppf file can contain \$LIB which expands out to the path of the library area. For example, "\$LIB/plot_frame.plotframeppf" points to the file plot_frame.plotframeppf in the area defined by \$LIB_4D.

NEW_X_SECTION_PPF_4D	<i>full path name of binary ppf file</i>		no default
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Points to the file used as the default binary plot parameter file (.xplotppf) for the cross section plots produced by the panel **Section X Plot PPF Editor**.

The path name to the binary ppf file can contain \$LIB which expands out to the path of the library area. For example, "\$LIB/cross_section.xplotppf" points to the file cross_section.xplotppf in the area defined by \$LIB_4D.

PAN_MODE_4D	0	Use pan for pan, pans on views	<i>default 0</i>
	1	Use pan deltas for pan, pans on views	

Sets whether pan or pan delta is used for the pan and pans buttons on views.

The default value is 0.

PLAN_TABLE_SETTINGS_4D	0	Don't allow setting by model	<i>default 0</i>
	1	Allow setting by model	

Trial only - allow the drawing of z-values, vertices etc. on the plan view to be set by individual models rather than for all models on the view.

The default value is 0.

PLOTTER_4D	script/program	no default
------------	----------------	------------

This environment variable points to a script/program which can be fired up whenever a plot is generated. The name of the plot is given as the first script parameter of the script.

If the parameter **Send plots** on the 'System Settings' tab of the menu option **Utilities => Defaults** is set to **yes**, the plotter script is run as each plot is created.

If more than one plot is created by an option (e.g. x plot) then the script is called separately for each of the plots.

An example of a script to send the plot to port lpt1 for Windows NT would be

```
@echo off
copy %1 lpt1
```

An example for Windows NT which looks for hp files is

```
@echo off
echo.
echo -----
:next_file
if "%1" == "" goto done
echo %1 | find /I ".hp" > nul
if ERRORLEVEL 0 if not ERRORLEVEL 1 goto hp_plotter
echo Plotting file %1
shift
goto next_file
:hp_plotter
echo Plotting %1 to HP plotter
shift
goto next_file
:done
echo -----
```

PLOTTER_MAPPING_4D	filename	default pmf.4d
--------------------	----------	----------------

This points to the file which is used as the default plotter mapping file. The format for the plotter mapping file is described in the section "Mapping Colours to Plotter Pens" in the Appendix "Set Ups".

The default is pmf.4d.

PLOTTERS_4D	filename	default plotters.4d
-------------	----------	---------------------

This points to the file which contains user defined plotters. The format for the file of user defined plotters is described in the section "User Defined Plotters" in the Appendix "Set Ups".

The default is plotters.4d.

PLOT_SYMBOLS_4D	filename	default plotsymb.4d
-----------------	----------	---------------------

Points to the file used to define the symbols used in long and cross section plots.

The default is plotsymb.4d.

POLYPOLYLINES_4D	0	Don't use speed ups	<i>default 0</i>
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1	Intermediate speed ups
2	Faster speed ups.

A few experimental techniques are available for speeding up the drawing on the screen.

For some specific things such as fast contours, fast mesh and point crosses, the techniques can result in some redraws being up to three times faster.

The default value is 2.

PRINTER_4D script/program no default

Points to a script or program which can be fired up whenever a report is generated. The name of the report is given as the first parameter of the script.

If the parameter **Print reports** on the 'System Settings' tab on the menu option **Utilities => Defaults** is set to **yes**, the printer script is run as each report is created.

PROJECT_NAMES_4D 0 Use long filenames for internal files as used by all versions up to and including V3.0 *default 0*
1 Use short names

The use of long or short extension names for internal 12d Model files for items such as models, tins, templates etc. is controlled by the environment variable **PROJECT_NAMES_4D**.

Opening a new project with the short name format, project-name.4dp, will automatically create a short name project (i.e. a project using the short extension names).

The default value is 0.

RECENT_PROJECTS_4D positive integer default 20

The maximum number of accessed projects displayed when 12d Model starts up.

REPORT_HEADER_4D 0 Report files have no header page
1 Some header information is used
2 A full header page is produced. *default 2*

Controls the amount of header information in reports.

For the cases 1 and 2, the header information includes

- the 12d Model Project
- the name of the user
- the organization
- the current date
- the current report file name

The default value is 2.

RUN_MACROS_FILE_4D filename default macros.4d
file of macros (one per line) that are run when a new project is created - only for new projects
The default is macros.4d

SETUPS_FILE_4D filename default setups.4d
file setting up the initial screen layout for new projects
The default is setups.4d. See "Set Ups".

SET_UPS_4D folder HOME_4D\7.00\set_ups
folder for storing the standard set up files installed by 12D Solutions.
The default is 'HOME_4D\7.00\set_ups'.

SEWER_PPF_4D		<i>path name to .ppf file</i>	no default
	points to the file used as the default plot parameter file (.ppf) for the panel new plot sewer network .		
SHEET_SIZES_4D		filename	default sheets.4d
	For plot frames, long and x plots, the overall size of the plot sheet can be given by a pop-up containing defined sheet size.		
	The sheet size name and width and heights can be specified by the user in a file named sheets.4d which is in the normal set up areas, or is pointed to by the environment variable SHEET_SIZES_4D.		
	The default is sheets.4d. See "Sheet Sizes" .		
SHOW_PATHS_4D		anything	
	If defined, then when 12d Model fires up the actual file names defined by any environment variables are written to the output window. This is useful for debugging.		
SHOW_TITLE_VARIABLES_4D		0	Any \$variable not used is left as blank
		1	Any " not used is shown as \$variable
		2	All " are plotted with no substitution
	For debugging the title block file.		
	The default value is 0.		
SPIRALS_4D		filename	default spirals.4d
	file of spiral definitions		
	The default is spirals.4d. See "Spirals" .		
SQUARED_CHARACTER_4D		<i>integer (base 10)</i>	<i>default 178</i>
	<i>The integer (base 10) value of the character to use as the squared symbol.</i>		
STATION_PREFIX_4D			
	There is no default.		
	The default prefix to use in the Survey Data Setup panel or to use if prefix has been set for the project.		
	There is no default value.		
SUPER_STRING_4D		1	Use the super string
		0	Don't use the super string.
			<i>default 1</i>
	Controls whether the super string is accessible or not.		
	The default value is 1.		
SYMBOLS_4D		filename	default symbols.4d
	Points to the file used to define the symbols used for super strings.		
	The default is symbols.4d.		
SYSTEM_NAMES_4D		1	Only use the old longer names
		2	Only use the 8.3 file names
		3	Use short names first,
			then look for a long name.
			<i>default 3</i>
	From 12d Model V3.1 onwards, the default names for all set up files fit in with the DOS 8.3 format. For compatibility, it is possible to use both the old longer names and the new short file names.		
	The default value is 3.		
TEXTSTYLE_MAPPINGS_4D		filename	default textstyle_names.4d
	file of textstyles favourites definitions		
	The default is textstyle_names.4d		

TEXTSTYLES_4D		filename	default textstyl.4d
		file of textstyles definitions	
		The default is textstyl.4d. See “Textstyles and Fonts” .	
TICK_DRAW_CROSS_4D	0	Nothing for off	default 0
	1	Cross for off	
		The default value is 0.	
TIN_VIEWPORT_CLIP_4D	0	Drawing tins, fast contours as per V3.1	default 0
	1	A speed up for drawing tins, fast contours	
		Use some experimental techniques for speeding up the drawing of tins, fast contours.	
		The default value is 0.	
TOOLBARS_4D		filename	default toolbars.4d
		file of toolbar definitions and names	
		The default is toolbars.4d. See “User Defined Toolbars”	
TYPED_UNITS_MODE_4D	0	International units only e.g. f and F are both International feet	default 0
	1	USA units only e.g. f and F are both US feet	
	2	Mixed e.g. f is International feet and F is US feet.	
		Controls the typed input units for feet - international and/or US. The default value is 0.	
UNDO_4D	0	Don't allow undo's	
	1	Allow undo/redos.	default 1
		Undo and Redo is available for most operations from 12d Model V3.1 onwards. The availability of Undo/Redo facility is controlled by the environment variable:	
		The default value is 1.	
USAGE_LOG_4D		folder	no default
		when set, log files of the form	
		<log file folder>\(<dongle> <user> <computer> <time stamp> <process ID>.log)	
		will be created in the given folder.	
USAGE_LOGS_4D		folder	no default
		when set, log files of the form	
		<log file folder>\<dongle>\<user>\<computer>\(<time stamp> <process ID>.log)	
		will be created in the given folder.	
USER_4D		folder	HOME_4D\7.00\user
		user folder containing set up files	
		The default is 'HOME_4D\7.00\user'.	
USER_LIB_4D		folder	HOME_4D\7.00\user_lib
		user library folder for input files such as mapping, template and macros (4DML's).	
		The default is 'HOME_4D\7.00\user_lib'.	
USER_OPTIONS_4D		file	default usermenu.4d
		To help customise 12d Model, the walk-right menu User on the main 12d Model menu, can be user defined. The text for each button of User , plus the action taken when the button is selected is user specified. Any of the buttons can include further walk-right menus.	

The definition for User is given in a file with the default name usermenu.4d which is searched for in the standard set up areas (local, USER_4D, user, set_ups) or set by the environment variable USER_OPTIONS_4D.

The default is usermenu.4d. See "User Defined Menus"

VEHICLE_PATH_4D		folder	no default
Vpath is the Vehicle Turning Path program written by Main Roads Queensland and is a separate chargeable program.			
The environment variable VEHICLE_PATH_4D points to the folder where the Dos version of the Vpath executable is located. Note that WINDOWS_VEHICLE_PATH_4D points to the Windows version.			
VIEW_BITMAP_BUTTONS_4D	0	User text for view buttons	
	1	Use icons for view buttons	default 1
The default value is 1			
VIEW_BUTTONS_4D	0	No view buttons are displayed	
	1	The view buttons are displayed	default 1
The default value is 1			
WARP_CURSOR_HIDE_4D	0	Don't hide the cursor before moving it	default 0
	1	Hides the cursor before moving it	
Controls whether the cursor is hidden before moving - only needed on some computers.			
The default value is 0.			
WEB_4D		search engine web address	www.google.com
web address of the search engine that is fired up from the 12d option			
<i>Help =>12d on the Web =>Search the web.</i>			
WEED_TOLERANCE_4D	0	Don't weed	
	real	Weed tolerance	
used in Alignment and Super strings so that when arcs have been chord-to-arc'd, the resulting points are weeded so that no point is closer than the weed tolerance. Is also used in Apply and Apply Many so that no cross sections are closer than the weed tolerance.			
WINDOWS_PRINTERS_4D	0	Don't allow Windows printers	
	1	Enable Windows printers	default 1
The default value is 1.			
WINDOWS_VEHICLE_PATH_4D		folder	no default
Vpath is the Vehicle Turning Path program written by Main Roads Queensland and is a separate chargeable program.			
The environment variable WINDOWS_VEHICLE_PATH_4D points to the folder where the Windows version of the Vpath executable is located.			
WINTER_4D		path name to WINTER program	
points to the WINTER program for calculation N-values for Australia.			
WINTER_DATA_4D		folder	no default
Folder containing the Winter data of N-values for Australia.			
WRITE_ALL_PLOT_PARAMETERS_4D	0	Only write out the plot parameters that are used in the ppf.	
	1	Write out all plot parameters	
default 1			

Controls whether all plot parameters are written out or just those that have been used in the ppf file.

The default value is 1.

X_SECTION_PPF_4D *path name to .ppf file* no default

points to the file used as the default plot parameter file (.ppf) for the panel **section X plot**.

The path name to the .ppf file can contain \$LIB which expands out to the path of the library area. For example, "\$LIB/cross.ppf" points to the file cross.ppf in the area defined by \$LIB_4D.

ZOOM_ORIGIN_DYNAMIC_4D **0** The centre of the view is the zoom centre point *default 0*
1 The point you pick is the zoom centre point

Controls the origin of the dynamic zoom. If set then the point selected in the view to indicate which view to dynamically zoom (and to be the zoom in-zoom out definition point) becomes the point to dynamically zoom about. Whilst the dynamic zoom is running, another point can be selected to become the new zoom origin.

The default value is 0.

ZOOM_PAN_DYNAMIC_4D **0** *Dynamic pan is not the default* default 0
1 Dynamic pan is the default for pan

If set then dynamic pan is the default for the pan options. The middle mouse button (or 'd') is not required to place the pan option in dynamic mode. In fact, it would then toggle it off.

The default value is 0.

Notes

- (a) If any of the environment variables (pointing to files) are not set, or the file pointed to does not exist, then 12d Model searches for the default files in a number of locations. The search order is given at the beginning of this Appendix.
- (b) The eagle pen mapping file, **eagleplt.emf** is also searched for in the same order as the default files.
- (c) When an **existing** project is opened by 12d Model, the setups.4d and defaults.4d are not used.

Setting Environment Variables

The simplest method for setting the required environment used in 12d Model is to place them into a file, called the environmental file (default name env.4d).

Environment Variables File

It is possible to define a file which sets the value for one or more environment variables.

The file format consists of one line for each environment variable being set and each line contains the environment variable name, followed by one or more spaces and then the value for the environment variable:

```
environment_variable_name      value
```

The value of any environment variable given in the environment variable file **overrides** any other definition for that environment variable.

The file used as the environmental variable file is checked for in the following order - as soon as a file is found, the search terminates and that file is used:

1. as a command line argument when 12d Model is fired up. The syntax is

```
12d -env path_name
```

where path_name is the full path name of the file

2. pointed to by the environment variable ENVIRONMENT_4D

```
ENVIRONMENT_4D    file           // file of environment variables
                  // default env.4d
```

3. a file called **env.4d** which is searched for in the standard set up areas (local, USER_4D, user, set_ups).

An example of an environment variable file is

```
EDITOR_4D         te           // set the text editor used
SHOW_PATHS_4D    1           // show file names set by environment variables
SHEET_SIZES_4D   c:\standards\shfile
```

Setting Environment Variables not in a File

Environment variables can be set in **Windows NT** for a user from the *Environment* tab on the *System Properties* panel brought up by clicking on the *System* icon in the *Control Panel* of Windows.

To bring up the *Control Panel*, click on *Start* in the Windows Task bar, walk right on *Settings* and then click on *Control Panel*.

Set Ups

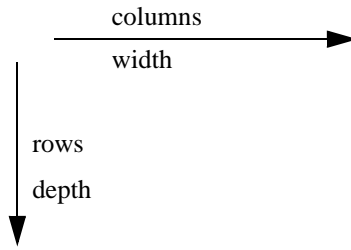
The set up file, **setups.4d**, is used to define the initial screen set-ups. It can be used for

- s the system font used for text
- s the size of the initial window
- s the position of the main menu, header menu, function menu, function recalc menu, snaps menu, volumes menu, geometry menu, sewer menu, pipeline menu
- s the position of the screen message box, xyz message box
- s the position of the **save project** panel (now redundant)
- s the position, size, name and viewing parameters for the initial views

The co-ordinate system used for specifying the position of the left hand top corner of items on the screen is by column and row. For items which include an area of the screen (such as the window and views), a width and depth are also specified.

The column value is measured from the left hand size of the screen and the row value is measured from the top of the screen.

The units for row, column, width and depth are screen pixels.



Note - If any views are defined in the set_up_file, then the position of the **screen message box** must be also be defined and it must be **before** the definition of any view.

The format of the commands in the file setups.4d is

```

WINDOW          column_value  row_value  width      depth // main window

MAIN MENU
                column_value  row_value

FUNCTION MENU
                column_value  row_value
FUNCTION RECALC MENU
                column_value  row_value
GEOMETRY MENU
                column_value  row_value
PIPELINE MENU
                column_value  row_value
SEWER MENU
                column_value  row_value
SURVEY MENU
                column_value  row_value
VOLUMES MENU
                column_value  row_value

SNAPS MENU
                column_value  row_value
SNAPS BUTTONS HORIZONTAL
                column_value  row_value
SNAPS BUTTONS VERTICAL
                column_value  row_value

PROJECT SAVE PANEL
                column_value  row_value

// Views

PLAN VIEW      column_value  row_value  width      depth      name

```

SECTION VIEW	<i>column_value</i>	<i>row_value</i>	<i>width</i>	<i>depth</i>	<i>name</i>
PERSPECTIVE VIEW	<i>column_value</i>	<i>row_value</i>	<i>width</i>	<i>depth</i>	<i>name</i>
reference point	0.0	750.0	120.0	// x y z	
view plane normal	1.0	0.0	0.0	// dx dy dz	
view up vector	0.0	0.0	1.0	// dx dy dz	
view distance	10.0			// distance	

The following parameters were used for V5.00 but are ignored for V5.0 onward:

SCREEN MESSAGE BOX	<i>column_value</i>	<i>row_value</i>
XYZ MESSAGE BOX	<i>column_value</i>	<i>row_value</i>

Colours

12d Model allows the use of up to **10,240** distinct colours for drawing in any view.

The colours are numbered from 0 to **10,239** and the user defines the red, green and blue mix (RGB) for each colour and what name is used throughout the program when referring to the colour.

The colour names and RGB mix associated with each colour number is defined in the file **colours.4d**.

The format for each line of the *colours.4d* file is:

```
red_value green_value blue_value pen_num col_name col_num pop-up_num col_group
```

Each colour is defined in terms of its red, green and blue intensity (RGB). The intensity value is between 0 and 255, where 0 represents no colour and 255 full colour. The RGB values for the colour are *red_value*, *green_value* and *blue_value*.

When plotting, the **default plotter pen number** used to plot a colour is given in the file as *pen_num*. The pen number is an integer that is positive or zero.

The actual **colour name** used to describe the colour is given in quotes after the default plotter pen number - *col_name*. Colour names can be alphanumeric although upper and lower case are considered the same. Each colour must have a unique colour name. If an underscore "_" is used in a colour name in the *colours.4d* file then a space is inserted in 12d Model. The colour name must be enclosed within quotes. For example, "dark red".

The **colour number** is what is actually stored in 12d Model and it is given after the colour name - *col_num*. A colour number is an integer that is positive or zero. Colour numbers can only occur once in the *colours.4d* file but there can be gaps in the colour numbers.

The **colour pop-up number**, *pop-up_num* is the next item in the *colours.4d* file.

The colour pop-up number is an integer that can be negative, zero or positive. Colour pop-up numbers can only occur once in the *colours.4d* file but there can be gaps in the colour pop-up numbers.

The *colour pop-up number* is used to decide which colours are should in the Colour box. If *Display colours* is set to *n* in *Utilities => Defaults*, then the colours with the *n* smallest pop-up numbers are displayed in the Colour box pop-up. So the order that the colours are chosen to appear in the colour pop-up is independent of the colour number.

The **colour group**, *col_group*, is the last item in the *colours.4d* file. The colour group is simply text and does not have to be unique. The colour group is enclosed in quotes. For example, "vis".

The colour group is not currently used in 12d Model but is expected to be used to group colours together in a colours pop-up.

The *colours.4d* file is displayed and modified by using the **Edit Colours** panel brought up from the [Edit] item on the colours pop-up, *Select Colour*. For more information, go to the section "Colours" of the Chapter "Tools and Concepts".

Defaults

The **defaults** file, **defaults.4d**, defines the initial default settings used in the 12d Model **default** and the **systems defaults** panels.

The **defaults** file can contain:

```
// general defaults

DEFAULT COLOUR                red
DEFAULT POINT COLOUR          yellow
DEFAULT TIN COLOUR            brown
DEFAULT CONTOUR COLOUR        cyan
DEFAULT CONTOUR INDEX COLOUR  magenta
DEFAULT TEXT SIZE              8

// view settings

DEFAULT CULLING OFF/ON
DEFAULT CULLING SIZE           1.0
DEFAULT SECTION VIEW EXAGGERATION 10.0
DEFAULT PERSPECTIVE VIEW EXAGGERATION 1.0

DEFAULT FAST TEXT CULL SIZE    4.5 // if not specified assumes 4.5
DEFAULT NONE TEXT CULL SIZE    2.0 // if not specified assumes 2.0

// highlighting

DEFAULT ANGLE MODE             BEARINGS/DEGREES
DEFAULT HIGHLIGHT COLOUR       white
DEFAULT HIGHLIGHT CROSS COLOUR yellow
DEFAULT HIGHLIGHT CROSS SIZE   2.0

// drawing points

DEFAULT CHORD ARC TOLERANCE    0.1
DEFAULT POINT CROSS SIZE MMS   2.0
DEFAULT POINT CROSS SIZE PIXELS 3

// trash model and mode

DEFAULT TRASH MODEL            model_name // model for trash
DEFAULT TRASH MODE              trash string // send used strings to trash
                                delete string // delete used strings
                                keep string // keep used strings

// miscellaneous

DEFAULT NAME SETTINGS          file_name // names.4d file
```

The information panel for each editor can be toggled on/off and the initial state when a new edit operation is begun is given by

```
DEFAULT EDIT INFORMATION      1 // show info panel on editor start-up
                              0 // don't show info panel
```

When output report are created, the scripts/programs pointed to by **EDITOR_4D** and **PRINTER_4D** will be run depending on the values of the defaults **display reports** and **print reports**.

```
DEFAULT DISPLAY REPORT FILES  1 // run EDITOR_4D
```

	0	// don't run "
DEFAULT PRINT REPORT FILES	1	// run PRINTER_4D
	0	// don't run "

Similarly when plots are created, the script/program pointed to by PLOTTER_4D and will be run depending on the value of the default **send plots**.

DEFAULT SEND PLOT FILES	1	// run PLOTTER_4D
	0	// don't run "

The number of minutes between displays of the **save project** yes-no box is given by

DEFAULT SAVE INTERVAL	minutes	// 0 for never
-----------------------	---------	----------------

The file defining string colours can have up to 10,240 colours in it however this number is usually inconvenient to display in the standard colour pop-up so there is a setting to set how many colours are displayed from the list.

DEFAULT POPUP COLOURS	number_of_colours	// default 16
-----------------------	-------------------	---------------

The precision for displaying real numbers in the information panel and in boxes and panel fields can be set.

DEFAULT PRECISION	integer	// info panel - default 3
DEFAULT BOX PRECISION	integer	// boxes & panels -default 4

The sign for cut areas and volumes can be positive or negative (fill is the opposite) and is given by

DEFAULT CUT VOLUME SIGN	-1	// negative for cut (default)
	1	// positive for cut

Text in text string, 4d strings and linestyles may be in pixels and must be given a millimetre size for plotting. Pixel text is multiplied by a factor to convert it to a millimetre size. The pixels to mm plot

DEFAULT PIXELS TO MM PLOT FACTOR	real	// default 1.0
----------------------------------	------	----------------

GUI

Note - this section is only for versions earlier than V4.0

The file **gui.4d** defined the colours used for screen objects (the graphical user interface objects), screen fonts, maximum pop-up length, and spacing in the menus and panels.

The gui.4d file is read every time a project (new or old) is opened.

GUI Colours

The colours associated with each screen object are given in terms of intensity values of red, green and blue. The intensity values are between 0 and 255, where 0 represents no colour and 255 full colour.

The layout for screen colours in the gui.4d file is:

```
// object                RGB values- red green blue

VIEW BACKGROUND COLOUR  0  0  0          // black
VIEW BORDER COLOUR     255 255 0        // yellow

BUTTON HIGHLIGHT COLOUR 255 255 0      // yellow
BUTTON TEXT COLOUR     127 127 127     // grey
BUTTON BACKGROUND COLOUR 60  60 200    // dark blue

MENU BACKGROUND COLOUR  150 90  0      // brown
MENU BORDER COLOUR     255 255 0      // yellow

PANEL BACKGROUND COLOUR 150 90  0      // brown
PANEL BORDER COLOUR     255 255 0      // yellow

FRONT SCREEN LOGO COLOUR 255 255 0    // yellow
FRONT SCREEN TEXT COLOUR 0  255 0     // green
FRONT SCREEN BACKGROUND COLOUR 60 60 200 // dark blue

WINDOW BACKGROUND COLOUR 1  64 128  0  // half green
WINDOW BACKGROUND COLOUR 2  0 128 196 // cyan
```

Maximum Pop-Up Length

The maximum number of items in a pop-up list before splitting into walk-right pop-ups is given by (necessary when using VGA screens on PC's)

```
POPUP LENGTH          integer      //maximum number of items in a pop-up
```

Fonts for Menus and Panels

A font can be defined for use in the menu and panel titles areas and a separate font for the rest of the text in the menus and panels.

The fonts are defined in the gui.4d file as:

```
SYSTEM TITLE FONT      font_name      // font for titles
SYSTEM FONT            font_name      // font used elsewhere
```

For X-Windows, the font_name is the name of the required font from the font list given by the command xlsfonts.

For Windows NT, the font_name is made up of the Windows font name plus zero or more parameter values for the font.

The font name and parameter values are given as one text name, font_name, by concatenating the font name and values with only a minus separating them.

If the font name consists of more than one word, the font name is enclosed in double quotes("").

Hence for NT, an example of defining fonts is:

Parameter	Possible Values
Font	font name (less than 32 characters)
Height	number
italic	
underline	
strikeout	
Weight	thin extralight light normal medium semibold bold extrabold heavy
Quality	draft proof
Pitch	default_pitch fixed_pitch variable_pitch
Family	decorative modern roman script swiss

Defaults

Height	14
Weights	fw_dontcare (family weight don't care)
Pitch	font default pitch
Family	ff_dontcare (font family don't care)
Quality	default_quality
italic	false
underline	false
strikeout	false

For example

Arial-14-bold-italic is the font Arial, of height 14 and bold and italic

"Courier New"-16-italic is the font Courier New, of height 16 and bold.

Under NT, if the font is not properly defined or doesn't exist, then the system font is used.

Under X-Windows, if the font does not exist, the font fixed is tried. If fixed does not exist, 12d Model will not start up.

Spacing for Borders and Panels

There are parameter to control the amount of space in border, between items etc. for menus and borders. These are normally set by 12D Solutions and should not need to be modified.

SCREEN TEXT BORDER X	pixels
SCREEN TEXT BORDER Y	pixels
SCREEN TEXT EXTRA X	pixels
SCREEN TEXT EXTRA Y	pixels
EDIT BOX BORDER X	pixels
EDIT BOX BORDER Y	pixels
PANEL BORDER X	pixels

PANEL BORDER Y	pixels
PANEL GAP Y	pixels
VERTICAL BORDER X	pixels
VERTICAL BORDER Y	pixels
VERTICAL GAP Y	pixels
HORIZONTAL BORDER X	pixels
HORIZONTAL BORDER Y	pixels
HORIZONTAL GAP Y	pixels
INPUT BOX BORDER X	pixels
INPUT BOX BORDER Y	pixels

Sheet Sizes

For plot frames, long and x plots, the overall size of the plot sheet can be given by a pop-up containing defined sheet size.

The sheet size names, width and heights can be specified by the user in a file named **sheets.4d** which is in the normal set up areas, or is pointed to by the environment variable

```
SHEET_SIZES_4D    file           // file of plotter sheets sizes
```

The layout of the sheet sizes file is

```
// User definition file for sheets sizes in 12d Model  
// Heights and widths are in mm.
```

```
//      sheet name           width      height  
  
      A0                    1189      841  
      A1                     841      594  
      A2                     594      420  
      A3                     420      297  
      A4                     297      210  
  
      B1                    1000      707
```

Spirals

A spiral curve can be uniquely defined in terms of a start tangent vector, a final radius of curvature (R) and a total spiral length (L).

Traditionally, the equation for this spiral is given in terms of a local co-ordinate system where the origin is at the start of the spiral and the x-direction (abscissa) is along the tangent vector at the start of the spiral. The y-direction (ordinate) is given as the offset from the x-axis of the point on the spiral.

Formulae for the local co-ordinates of a point on the spiral can then be derived in terms of the distance of the point along the spiral (the spiral length to the point) and the given constants L (the total spiral length) and R (the final radius of curvature of the spiral).

These formulae for the local co-ordinates of a point on the spiral are **polynomial series** in terms of the spiral length to that point.

For use in calculations, the local co-ordinates can be **approximated** by restricting the polynomial series to a fixed number of terms.

For example, the **cubic** spiral only uses the first term for the polynomials for x and y.

		number of terms for the		
		cubic	Westrail cubic	clothoid
abscissa	x	1	2	5
offset	y	1	1	4

In 12d Model, the names and the x and y coefficients used for spiral definitions are given in the file **spirals.4d** or in the file pointed to by the SPIRALS_4D environment variable.

The format for each spiral definition in the file is

```

spiral "spiral-name" {
  data {
    x coefficient  y coefficient for the first term
    x coefficient  y coefficient for second term
    x coefficient  y coefficient for third term
    ... for a total of up to ten terms
  }
}

```

For example,

```

spiral "westrail-cubic" {
  data {
    1.0  0.16666666666666666
    0.025  0.0
  }
}
spiral "cubic" {
  data {
    1.0  0.16666666666666666
  }
}

```

Note - the clothoid spiral is the default spiral used in 12d Model and does not have to be defined in the file.

12d Model Options Map

The **12d Model** menu map shows the menu structure for all the sub-menus on the main 12d Model menu and the menus on the views.

The map is designed to be printed out for users who wish to affix it to a wall.

The PDF file of the menu map on the 12d Model Installation CD in the folder

Documentation\12d Model menu map

Or in the *Updates* section of the web site www.12d.com

Monitoring 12d Model Usage

Overview

12d Model usage can be monitored for single-user and network licenses (or a mix of both), whether installed on a single computer, a local-area network, or a wide-area network across different time zones.

Monitoring the usage is a 3 stage procedure:

1. Generating individual .log files for each 12d Model session run.
2. Consolidating all the completed .log files into a CSV file.
3. Reporting the usage details, using the CSV file as input.

The 1st stage is achieved by setting an environment variable in your env.4d file(s).

The last 2 stages are achieved by running the supplied program: 12d_usage.exe.

Generating the .log files

By setting one of two possible environment variables in the env.4d file(s) used for your 12d Model sessions, uniquely named .log files can be generated in a specified folder on your network.

For example, by adding the lines:

```
usage_log_4d F:\12d model usage
```

or

```
usage_logs_4d F:\12d model usage
```

to your env.4d file(s), then each time a 12d Model session is run, a .log file will be created in the “F:\12d model usage” folder. This folder, referred to as the <log file folder>, can be anywhere on your network and can have any name, **but it must be created beforehand**, and all 12d Model users must have write-access to it.

In the first case, using variable “usage_log_4d”, log files will be generated in the form:

```
<log file folder>\(<dongle> <user> <computer> <time stamp> <process ID>).log
```

In the second case, using variable “usage_logs_4d”, log files will be generated within sub-folders of the form:

```
<log file folder>\<dongle>\<user>\<computer>\(<time stamp> <process ID>).log
```

Note that the <time stamp> represents the start time of the 12d Model session in GMT (also known as UTC or Zulu Time).

It does not matter which variable you decide to use, and you can even use a mix of the variables, if you have more than one env.4d file. However, regardless of which variable you use, it is recommended that the <log file folder> is the same for all 12d Model users on your network so that all 12d Model sessions can be easily included in the reports.

The .log file generated in the <log file folder> for each individual 12d Model session run on your network, contains all the information required about that session. While the session is still running, the log file will be updated at a minimum of every 75 seconds, with the time that the session has been active. At the close of the 12d Model session, the log file is again updated and is set as “completed”.

Installing 12d_usage.exe

You can put the 12d_usage.exe program wherever you like on your network. Then, simply create a shortcut to the program on your desktop, making sure the shortcut properties are set as follows:

Target: <path to program location>\12d_usage.exe
Start in: <path to Working Folder>

The Working Folder is the folder that you run the 12d_usage.exe program from (it does not have to be the same as the location of the 12d_usage.exe file). After running the program for the first time, a file named 12d_usage.defaults will be created in the Working Folder. This file is used to save your settings from the last run of the program and to load your settings for the next run of the program. In addition, you might also wish to use the Working Folder to store your 12d Model Usage report files (although you are free to store them elsewhere).

Running 12d_usage.exe

To run the 12d_usage program, simply double-click on the shortcut icon you created at install time. This will open up a DOS window from where the program's keyboard-driven menu system can be run.

From the Main menu within the 12d_usage program, your keyboard-driven menu options are:

C Bring up the Consolidate menu
R Bring up the Report menu
Q Exit (quit) the 12d_usage program

Consolidating the .log files

After a while, you should notice that a lot of .log files are being generated in your specified <log file folder>. To consolidate all these .log files into a single Comma-Separated-Variable (CSV) file, you will need to run the 12d_usage.exe program, and press the "C" key to bring up the Consolidate menu.

From the Consolidate menu, your keyboard-driven menu options are:

F Specify the <log file folder>
O Specify the output CSV file name
T Toggle whether to delete or rename consolidated log files
C **Consolidate 12d Model session log files**
Q Exit the Consolidate menu and return to the Main menu

When specifying the name of the CSV file you wish to consolidate your log files to (using the "O" key), if you want a .csv file extension (to allow the file to be easily loaded into MS[®]Excel for your own custom reports, for example), you must include the .csv in the file name. It is recommended that all users of the 12d_usage program consolidate log files to the same CSV file every time. Newly consolidated logs are always appended to an existing CSV file. If there is to be more than one user of the 12d_usage program, it might be a good idea to specify the CSV file to be in the <log file folder> or the Working Folder (or at least, some folder that all 12d_usage users can access).

You also need to specify how to tidy up the log files, after they have been consolidated, so that they are not consolidated more than once. Your options here are to rename or to delete the log files (the "T" key toggles between rename and delete). If you choose to rename them, they will be renamed with a .logc extension. If you choose to delete them, they will be lost forever, and the only record you will have of your consolidated sessions will be contained in the CSV file. As such, you should be very careful not to delete your CSV file.

Pressing the "C" key will then go ahead and consolidate the log files. Note that consolidation will only take place on "completed" log files (or on log files that have not been updated for more than 24 hours - to handle the case of a power failure, for instance).

Reporting on 12d Model Usage

After creating or adding to your consolidated CSV file, you can press the “R” key from the Main menu, in order to bring up the Report menu.

From the Report menu, your keyboard-driven menu options are:

- I Specify the input CSV file name (generated from the Consolidate menu)
- O Specify the output report file name
- M Toggle whether to overwrite or append to existing report file
- D Add/Remove Dongle constraints
- C Add/Remove Computer constraints
- U Add/Remove User constraints
- F Add/Remove Folder constraints
- P Add/Remove Project constraints
- E Add/Remove Program constraints
- V Add/Remove Version constraints
- T Specify Start and End times for report (in Local Time of 12d_usage User*)
- S Specify which summary tables you want in the report
- R Generate the 12d Model Usage report**
- Q Exit the Report menu and return to the Main menu

After generating the report (using the “R” key), you will be asked if you want to view the report file. If you answer yes (using the “Y” key), the report file will be opened using Notepad.exe as the default file editor. If you would prefer to use a different file editor, you can specify it by manually editing the 12d_usage.defaults file (see Installing 12d_usage.exe), and replacing the word “notepad” (last line of the file), with the command to start your preferred editor.

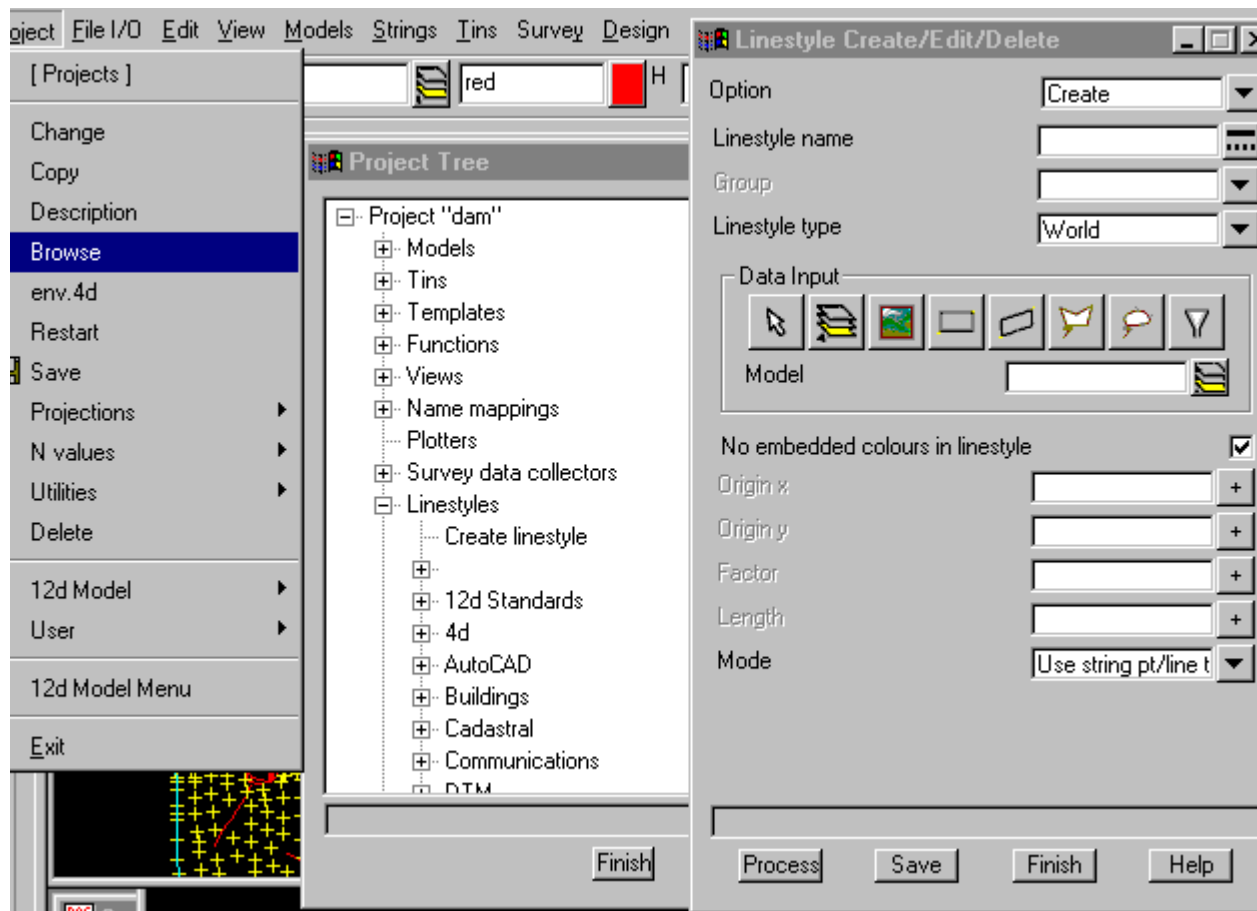
***Note:** In general, if reporting on 12d Model sessions running on a WAN across different time zones, *Local Time of 12d Model User* and *Local Time of 12d_usage User* may be different.

K Line styles, Symbols and Textstyles

Line Styles

Users can define their own line styles to use when drawing 12d Model strings. The definition of linestyles are stored in a file called **linestyl.4d**.

Linestyles in the file can be created/edited/deleted using the **Linestyle Create/Edit/Delete** panel which is brought up by double clicking on *Create linestyle* in the *Linestyles* expansion of the *Project Tree* (see "Linestyles" in the chapter "Projects") brought up by the *Project=>Browse* option.



The **Linestyle Create/Edit/Delete** panel acts as an interactive editor to a text file which contains the linestyle definitions.

The user defined line styles can be

- applied at each vertex of the string - vertex mode
- repeated along the string - continuous mode
- stretched between adjacent vertices of the string
- any combination of the above.

Each line style can be made up of lines, arcs, circles and text.

For cases (a) and (b), the units for the line style can be in pixels, millimetres or world units.

The line style with one origin is called a

linestyle if the definition of the style is given in pixel units

paperstyle if the definition of the style is given in paper units

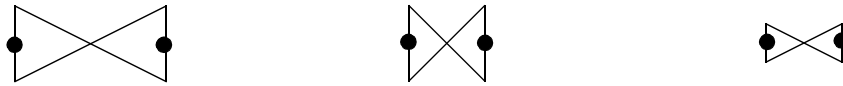
worldstyle if the definition of the style is given in world units

and line style with two origins is called a **twoptstyle**.



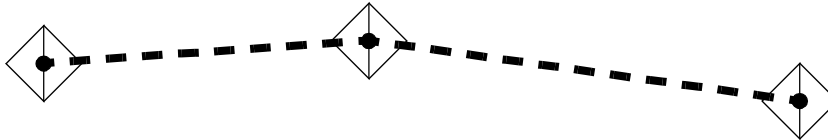
A linestyle, worldstyle or paperstyle can be drawn at each point or repeated along the string.

For case (c) the style is stretched between two adjacent points and is called a **twoptstyle** style.



A twoptstyle stretches between two points in one or both directions.

Finally, case (d) is called a **groupstyle** and is a combined style made up of one or more linestyles, paperstyles, worldstyles or twoptstyles.



A groupstyle made up of a vertex and a continuous line style.

Note:

The words **linestyle** or **line style** are often used in the manual to refer to either a linestyle, paperstyle, worldstyle, twoptstyle or groupstyle.

Defining Line Styles

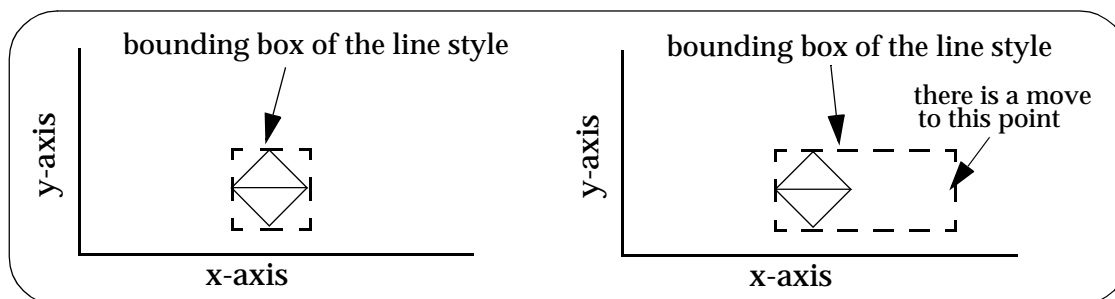
A *line style* is defined in a (x,y) co-ordinate system as a series of moves, drawn, arcs, circles and text commands.

The bounding box of the line style is the smallest rectangle parallel to the (x,y) axis which contains all the moves, draws, circles and arcs of the line style. Note that moves are included in the bounding box even if a line isn't drawn to the point.

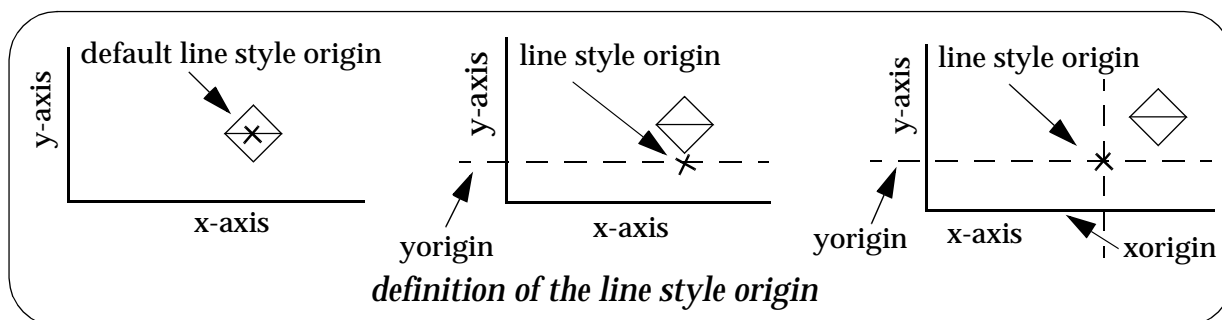
The default **origin of the line style** is defined to be the midpoint of the bounding box surrounding the line style. The bounding box includes the points moved to and drawn to, but does not automatically include (0,0). Hence the calculated origin may not be (0,0).

There are **xorigin** and **yorigin** commands to override the default origin of the line style.

If a **yorigin** is set, then it is used as the y-coordinate of the line style. If the **xorigin** isn't given, then the **xorigin** is the midpoint of the x-extent of the bounding box of the line style.

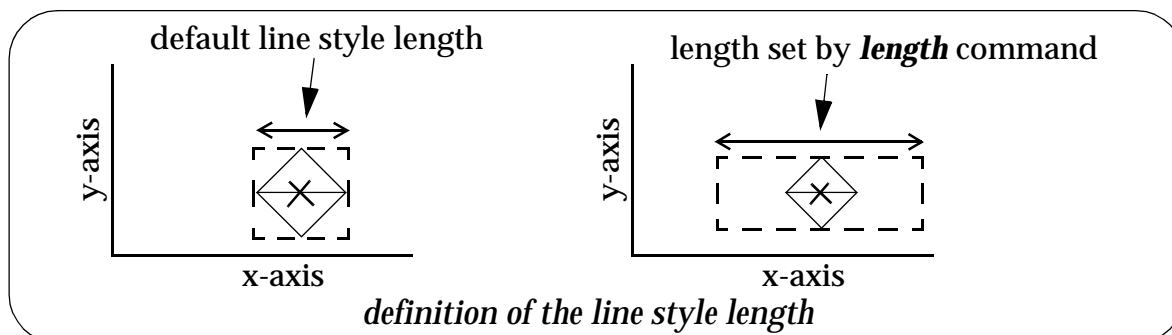


Similarly, if a **xorigin** is set, then it is used as the x-coordinate of the line style. If the *yorigin* isn't given, then the *yorigin* is the midpoint of the y-extent of the bounding box of the line style.



The default **length** of the line style is the *horizontal size* of the bounding box.

There is a **length** commands to override the default length of the line style. The *length* must always be positive but it can be larger or smaller than the line styles's calculated horizontal length.

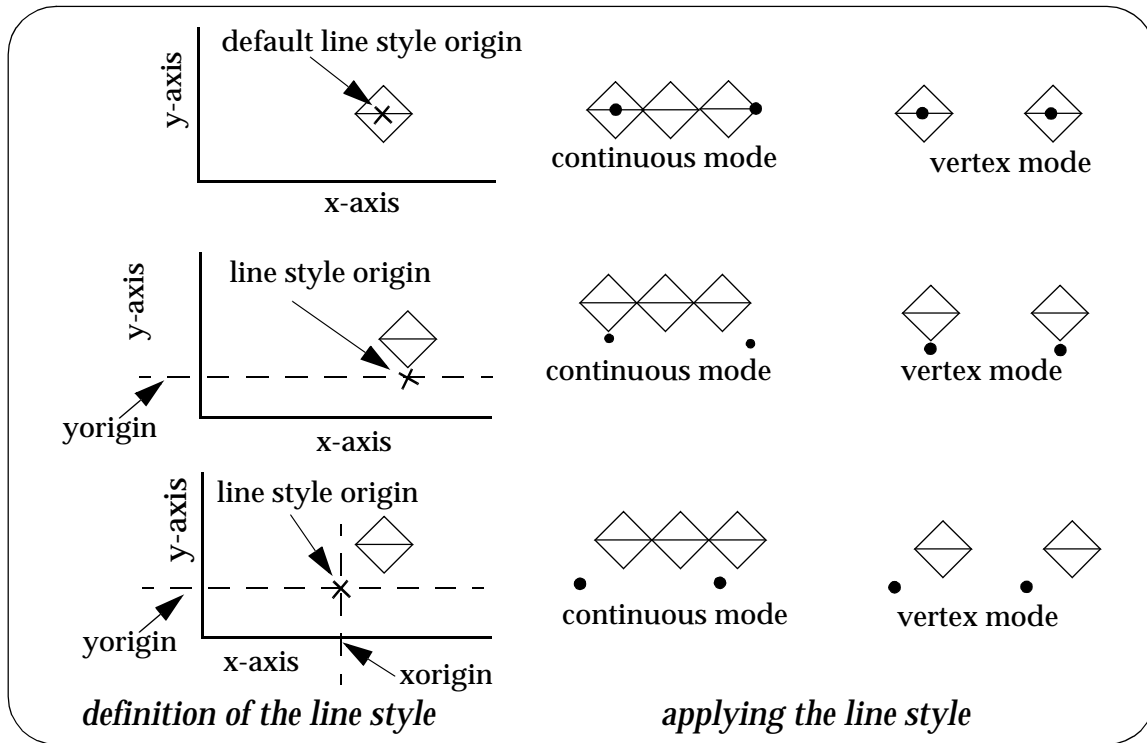


The *origin* and the *length* of the line style are both used in positioning and redrawing the line style.

For *vertex mode*, the **origin** of the line style is placed at each point of the string and the line style drawn around the **origin**.

For *continuous mode*, the **origin** of the line style is initially placed at a distance of half of the **length** of the line style along the first link in the string, and then moved the distance **length** along the string and redrawn. This is repeated along the string until the end of the string is reached.

Hence for *continuous mode*, the style is continually repeated along the string.



Linestyl.4d

The definitions for the available linestyles are normally stored in a file called **linestyl.4d** which is read in each time 12d Model opens an existing project or creates a new project. *Linestyl.4d* is searched for in the standard set up paths, or is pointed to by the environment variable

LINESYLES_4D *filename*

The definition of the line styles will be given in the following section “Line Style Definitions” .

Line Style Definitions

Linestyles, Paperstyles and Worldstyles

The line style with one origin is called a

linestyle if the definition of the style is given in *pixel* units

paperstyle if the definition of the style is given in *paper* units

worldstyle if the definition of the style is given in *world* units

and line style with two origins is called a **twoptstyle**.

The line style can be drawn at each point of a string (**vertex mode**) or redrawn regularly along the lines joining string points (**continuous mode**).

The definition of a **linestyle** of a given name *name* is

```
linestyle name {
  set_up_commands
  draw_commands
}
```

a **paperstyle** is

```
paperstyle name {
  set_up_commands
  draw_commands
}
```

and a **worldstyle** is

```
worldstyle name {
  set_up_commands
  draw_commands
}
```

where the `set_up_commands` **must** be before the `draw_commands`.

The `linestyle`/`paper`/`worldstyle` must have a name and if the name includes imbedded spaces, it must be enclosed in double quotes “”.

The line style itself is defined inside the braces where there can be zero or more `set_up_commands` from the list

```
length    value
group     name
mode      value
factor    value
xorigin   value
yorigin   value
```

followed by zero or more **draw_commands** from the list

```
move      x-value    y-value
draw      x-value    y-value
rmove     dx-value    dy-value
rdraw     dx-value    dy-value
colour    colour_name
circle    radius
arc       radius     start-angle  end-angle
```

```

text      "text"      angle  height  "justification"
text      "text"      angle  height  "justification" "textstyle"
text      "text" angle height "justification" "textstyle" xfactor slant offset_width offset_height
repeat  num_repeats{  repeat_commands repeat_draw_commands}

```

The **repeat** command is a positive integer *num_repeats* and zero or more *repeat_commands* from the list

```

xpos      x-value
ypos      y-value
rfactor   value

```

and zero or more *repeat_draw_commands* where *repeat_draw_commands* include all the *draw_commands* except **repeat**.

The **set_up** commands for linestyles, paperstyles and worldstyles will now be described. The **draw_commands** will be described after the definition of a groupstyle since they are the same for linestyles, paperstyles, worldstyles and twoptstyles.

set_up_commands for Linestyles, Paperstyles and Worldstyles

group

The **group** is used to associate line styles in pop-up menus.

If the group is not defined, the style is placed in a default (blank) group.

If the group name includes imbedded spaces, then it must be enclosed in double quotes " ".

mode

mode specifies whether the linestyle, paperstyle or worldstyle is drawn at the individual points on a string (vertex mode) or it is to be redrawn regularly along the lines joining the points on the string (continuous mode).

If the **mode** is not specified, the mode used for a string depends on the breakline type of the string and the number of points on the string.

Breakline Type	Number of Points	mode: vertex	mode: continuous	mode: not-given
point	1	vertex	cross	vertex
	>1	vertex	continuous	vertex
line	1	vertex	cross	vertex
	>1	vertex	continuous	continuous

NOTE: in early versions of 12d Model, **mode** was known as **pointline** and had the values **point** instead of *vertex*, and **line** instead of *continuous*.

factor

This command factors up/down the drawing co-ordinates, heights and radii.

xorigin, yorigin

The default **origin of the line style** is defined to be the midpoint of the bounding box of the line style. The bounding box includes the points moved to and drawn to but does not automatically include (0,0). Hence the calculated origin may not be (0,0).

The **xorigin** and **yorigin** commands are used to override the default origin of the line style.

length

If **length** is omitted, then **length** is taken to be the horizontal size of the calculated bounding box of the style.

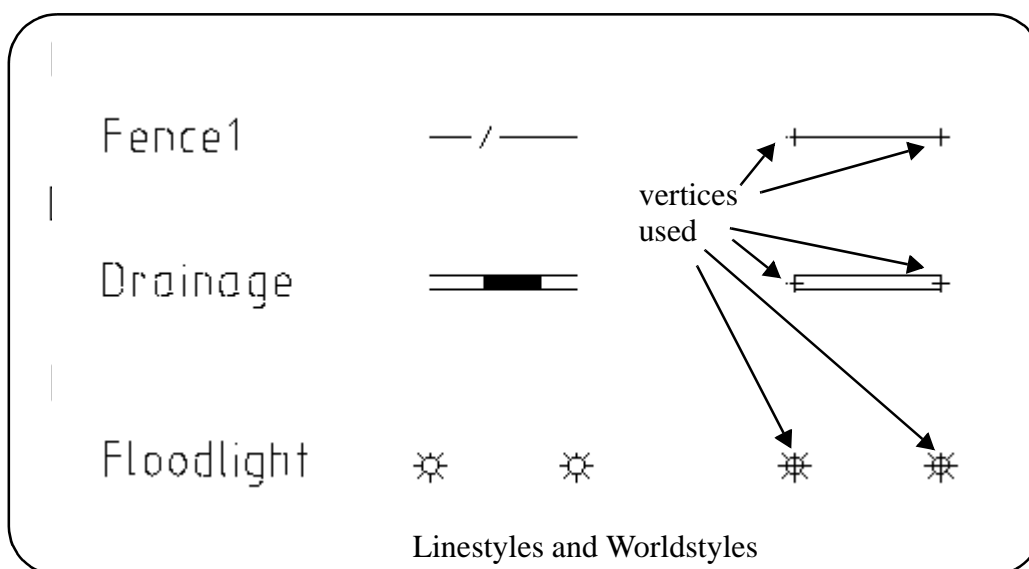
The **length** must always be positive but it can be larger or smaller than the line style's calculated horizontal size.

The origin of the line style and the length are both used in positioning and redrawing the line style.

In **vertex** mode, the origin of the line style is placed at the string points.

In **continuous** mode, the origin is initially placed at a distance of half of **length** along the first line in the string, and then moved the distance **length** along the string for each redraw.

Examples



```
// Fence1
worldstyle "FENCE1" {
  group SWCS
  factor 20
  move 0 0
  rdraw 1 0
  rmove 0.25 -0.25
  rdraw 0.25 0.50
  rmove 0.25 -0.25
  rdraw 1 0
}

// Drainage

worldstyle drainage {
  group "4d"
  factor 0.1
  colour green

  move .0 -2.0 draw 30 -2.0

  move 30 -1.5 draw 15 -1.5
  move 15 -1.0 draw 30 -1.0
  move 30 -0.5 draw 15 -0.5
```

```
    move 15 0.0 draw 30 0.0
    move 30 0.5 draw 15 0.5
    move 15 1.0 draw 30 1.0
    move 30 1.5 draw 15 1.5
    move 30 2.0 draw 0 2.0
}
// Floodlight
worldstyle FLOODLIGHT {
  group "Energex"
  mode vertex
  xorigin 0
  yorigin 0
  colour "yellow"
  circle 0.225
  move -.45 0
  draw -0.225 0
  move .45 0
  draw 0.225 0
  move 0 -.45
  draw 0 -0.225
  move 0 .45
  draw 0 0.225
  move -.159 0.159
  draw -0.318 0.318
  move 0.159 0.159
  draw 0.318 0.318
  move 0.159 -0.159
  draw 0.318 -0.318
  move -0.159 -0.159
  draw -0.318 -0.318
  move 0 0.8
  text "FL" 0 0.5 "centre-middle"
}
```

Twoptstyles

A **twoptstyle** is a line style which is stretched so that one cycle fits between consecutive points on a string (line or arc segments). This is achieved by defining **two origins** for the twoptstyle and the first and second origins are mapped to the consecutive points on the string.

Hence the mapping of the two origins defines the final size of the size in world units.

The *twoptstyle* can stretch in just the direction along the string, or both along and perpendicular to the direction of the string.

Also the *twoptstyle* can be drawn for each line/arc on the string, or for every second line/arc of the string.

For a feature/circle string, the first origin is placed at the centre of the feature/circle and the second origin is placed on the circumference of the feature/circle. Hence the size of the *twoptstyle* is determined by the radius of the feature/circle string.

The definition of a **twoptstyle** of a given name is

```
twoptstyle name {
  set_up_commands
  draw_commands
}
```

where the `set_up_commands` **must** be before the `draw_commands`.

The `twoptstyle` must have a name and if the name includes imbedded spaces, it must be enclosed in double quotes “.

The `twoptstyle` itself is defined inside the braces where there can be zero or more `set_up_commands` from the list

```
group          name
stretch_mode  value
cycle_mode    value
xorigin1      value
yorigin1      value
xorigin2      value
yorigin2      value
```

followed by zero or more `draw_commands` from the list

```
move      x-value  y-value
draw      x-value  y-value
rmove     dx-value  dy-value
rdraw     dx-value  dy-value
colour    colour_name
circle    radius
arc       radius   start-angle  end-angle
text     "text"   angle   height  "justification"
text     "text"   angle   height  "justification"  "textstyle"
text     "text"  angle  height  "justification"  "textstyle"  xfactor  slant  offset  width  offset_height
repeat  num_repeats{  repeat_commands  repeat_draw_commands }
```

The **repeat** command is a positive integer `num_repeats` and zero or more `repeat_commands` from the list

```
xpos      x-value
ypos      y-value
rfactor   value
```

and zero or more `repeat_draw_commands` where `repeat_draw_commands` include all the `draw_commands` except **repeat**.

The `set_up` commands for a `twoptstyle` will now be described. The `draw_commands` will be described after the definition of a **groupstyle** since they are the same for `linestyles`, `paperstyles`, `worldstyles` and `twoptstyles`.

set_up_commands for Twoptstyles

group

The **group** is used to associate line styles in pop-up menus.

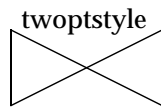
If the group is not defined, the line style is placed in a default (blank) group.

If the group name includes imbedded spaces, then it must be enclosed in double quotes “.

stretch_mode

stretch_mode controls whether the symbol stretches in just the direction along the string, or both along and perpendicular to the direction of the string

```
stretch_mode    1          // stretch in one direction only (default)
                 2          // stretch in both directions
```



A twoptstyle stretches between two points in one or both directions.

stretch in one direction



stretch in both directions



cycle_mode

cycle_mode controls whether the symbol is drawn for each line/arc on the string, or for every second line/arc of the string.

cycle_mode

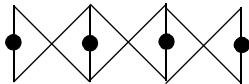
1

// draws on every line/arc (default)

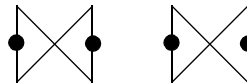
2

// draws every second line/arc

draw on every line/arc



draw on every second line/arc



A twoptstyle draws on each line/arc or every second line/arc

xorigin1, yorigin1

The point (xorigin1, yorigin1) is mapped to the first point that the *twoptstyle* is being applied to.

The default **first point of origin of the twoptstyle** is defined to be the minimum x value and the average of the minimum and maximum y values $(x_{\min}, (y_{\min} + y_{\max}) / 2)$.

The **xorigin1** and **yorigin1** commands are used to override the default first origin of the *twoptstyle*.

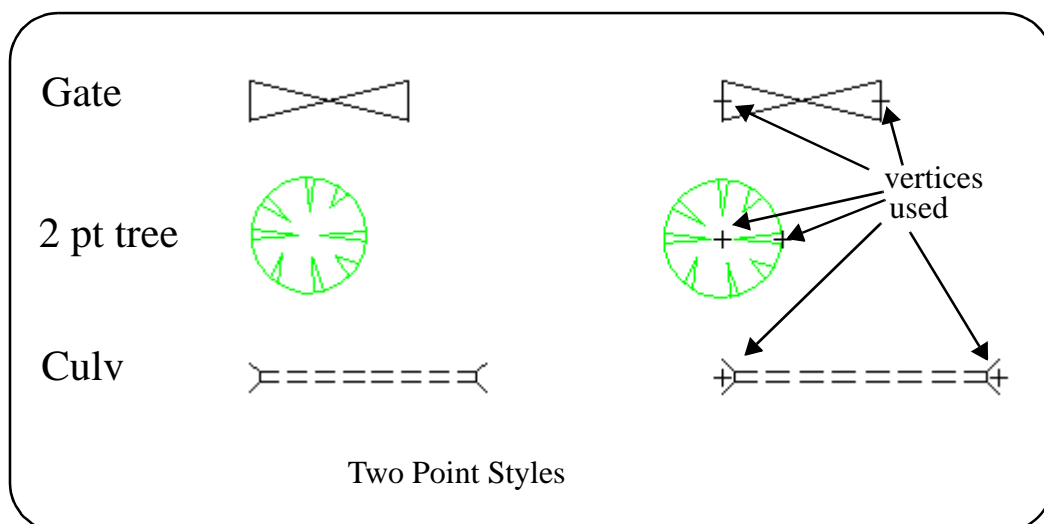
xorigin2, yorigin2

The point (xorigin2, yorigin2) is mapped to the second point that the *twoptstyle* is being applied to.

The default **second point of origin of the twoptstyle** is defined to be the maximum x value and the average of the minimum and maximum y values $(x_{\max}, (y_{\min} + y_{\max}) / 2)$.

The **xorigin2** and **yorigin2** commands are used to override the default second origin of the *twoptstyle*.

Examples



```
// Gate
twoptstyle GATE {
  group "Two Points"
  stretch_mode 2
  cycle_mode 2
  colour red
  move 100 105
  draw 140 95
  draw 140 105
  draw 100 95
  draw 100 105
}
// two point tree
twoptstyle 2PT_TREE {
  group "4d_standards"
  stretch_mode 2
  cycle_mode 2
  xorigin10
  yorigin10
  // xorigin22.5
  // yorigin2 1.25

  colour "green"
  move 0 0
  circle 2.5
  move 2.48 0.2
  draw 0.5 0
  draw 2.48 -0.2
  move 2.2 -1.2
  draw 1.2 -0.9
  draw 1.8 -1.7
  move 0.7 -2.4
  draw 0.2 -1
  draw 0.3 -2.45
  move -0.2 2.45
  draw 0 1
  draw 0.2 2.45
  move 1.2 2.2
```

```
draw 0.9 1.2
draw 1.7 1.8
move -2.48 0.2
draw -0.5 0
draw -2.48 -0.2
move -1.8 1.6
draw -0.8 0.6
draw -2.1 1.3
move -1.6 -1.9
draw -1.1 -0.8
draw -1.3 -2.1
}
// Culvert
twoptstyle CULV {
  group "Two Points"
  stretch_mode 2
  cycle_mode 2

  move 8 12
  draw 10 10
  draw 14 10
  move 16 10
  draw 20 10
  move 22 10
  draw 26 10
  move 28 10
  draw 32 10
  move 34 10
  draw 38 10
  move 40 10
  draw 44 10
  move 46 10
  draw 50 10
  move 52 10
  draw 56 10
  draw 58 12
  move 58 6
  draw 56 8
  draw 56 10
  move 10 10
  draw 10 8
  draw 8 6
  move 10 8
  draw 14 8
  move 16 8
  draw 20 8
  move 22 8
  draw 26 8
  move 28 8
  draw 32 8
  move 34 8
  draw 38 8
  move 40 8
  draw 44 8
  move 46 8
  draw 50 8
  move 52 8
  draw 56 8
```


}

Groupstyles

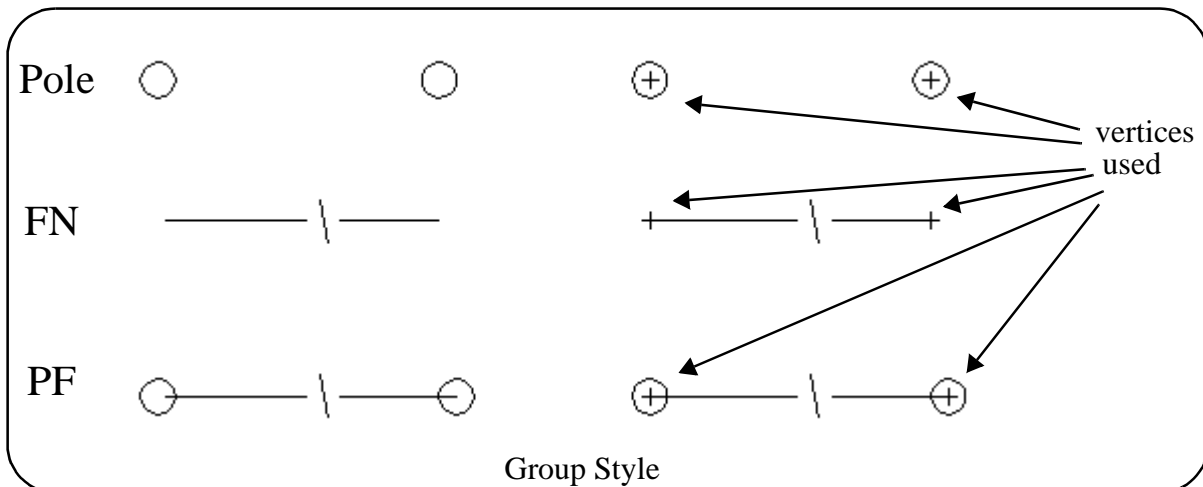
A **groupstyle** is a combined line style which is made up of one or more *linestyles*, *paperstyles*, *worldstyles* and/or *twoptstyles*.

The definition of a **groupstyle** is simply an optional **group** for the line style to belong to, and a list of *linestyle*, *paperstyles*, *worldstyle* and *twoptstyle* names which must have already been defined in the file.

```
groupstyle name {
    group name
    style_name_1
    style_name_2
    ...
}
```

If the *groupstyle* name contains spaces, then it must be enclosed in double quotes ". For example, "style 1".

Example



```
// POLE
worldstyle POLE {
    group "Electricity"
    mode vertex
    circle 0.5
}
// FN
worldstyle FN {
    group "Fences"
    length 5
    draw 4 0
    move 4.4 0.6
    draw 4.6 -0.6
}
// PF
}groupstyle "PF" {
    group "Miscellaneous"
    "POLE"
    "FN"
}
```

Description of the draw_commands

move *x-value* *y-value*

move the pen from the current pen position to the new position (x-value, y-value).

draw *x-value* *y-value*

draw from the current pen position to the new position (x-value, y-value)

rmove *dx-value* *dy-value*

move relative from the current pen position through the distance (dx-value, dy-value)

rdraw *dx-value* *dy-value*

draw relative from the current pen position through the distance (dx-value, dy-value)

colour *colour-name*

change colour (line styles can contains more than one colour).

If colour is not defined, the line style is drawn in the colour of the string that the line style is applied to. If the colour-name includes imbedded spaces, then it must be enclosed within double quotes ".

circle *radius*

draw a circle of the given radius at the current pen position.

After drawing a circle, the current pen position is left at the centre of the circle.

arc *radius* *start-angle* *end-angle*

draw an arc of the given radius from the start angle to the end angle. A positive radius denotes that the arc is drawn in a clockwise direction, a negative radius means anti-clockwise. Angles are given in degrees, minutes and seconds in the ddd.mmssfff format.

After drawing an arc, the current pen position is left at the centre of the arc.

text *text* *angle* *height* "*justification*"

text *text* *angle* *height* "*justification*" *textstyle*

or

text *text* *angle* *height* "*justification*" *textstyle* *xfactor* *slant* *offset_width* *offset_height*

the characters *text* are drawn at the current pen position with the given angle, height, justification and possibly *textstyle*, *xfactor*, *slant*, *offset_width* and *offset_height*. Angle and slant are given in degrees, minutes and seconds in the ddd.mmssfff format. Slant is between -45 and 45 degrees.

The allowed justifications are

top-left	top-centre	top-right
middle-left	middle-centre	middle-right
bottom-left	bottom-centre	bottom-right

and the value is enclosed inside double quotes (").

After drawing text, the current pen position is left where it was before the text was drawn.

repeat num_repeats { *repeat_commands* *repeat_draw_commands* }

The **repeat** command allows the set of *repeat_draw_commands* inside the braces (the *repeat-style*) to be re-drawn a number of times (*num_repeats*), and with each redraw, the size of the *repeat-style* is modified.

In the definition of *repeat*, there can be zero or more *repeat_commands* from the list

xpos *x-value*

ypos *y-value*
rfactor *value*

and zero or repeat_draw_commands where repeat_draw_commands include all draw_commands except **repeat**.

Unlike style, the repeat-style is defined in terms of a local origin at (0,0). The repeat-style is actually drawn with this origin at the position given by the values of **xpos** and **ypos**.

The repeat-style is drawn *num_repeats* times and on each redraw, the distances, heights and radii are factored by the amount

$$\text{repeat_factor} = (1 - i * \text{rfactor})$$

where $i = 0, 1, \dots, \text{num_repeats} - 1$

If rfactor is not specified, it is given the default value of $1/\text{num_repeats}$. The factor is then

$$\text{repeat_factor} = (\text{num_repeats} - i) / \text{num_repeats}$$

where $i = 0, 1, \dots, \text{num_repeats} - 1$

Examples of the Repeat Command

1. To produce circles of radius 10,9,8,...1 about the origin.

```
repeat 10 { circle 10 }
```

2. To produce circles of radius 10,9.5,9,...5.5 about the origin

```
repeat 10 { rfactor 0.05 circle 10 }
```

More Examples of Line, Paper and World Styles

1. draw a circle of radius 20. The origin of the style is (0,0)

```
worldstyle "circle" {  
  move 0 0  
  circle 20  
}
```

2. draw a circle of radius 20. The origin of the style is (100,100)

```
paperstyle "circle" {  
  move 100 100  
  circle 20  
}
```

3. draw a circle of radius 20. The origin of the style is (0,0)

```
linestyle "circle" {  
  xorigin 0  
  yorigin 0  
  move 100 100  
  circle 20  
}
```

4. draw a gate symbol as a twoptstyle.

```
worldstyle "circle" {  
  group "fences"  
  stretch_mode 1                // one direction stretch  
  cycle_mode 2                 // draw every second line  
  
  move 0 0
```

```

draw 0 0.1
draw 1 0
draw 1 0.1
draw 0 0
}

```

5. draw concentric circles of centre (0,0) inside a box

```

linestyle "dot" {
  xorigin 0
  yorigin 0
  move -5 -5
  draw -5 25
  draw 25 25
  draw 25 -5
  draw -5 -5
  repeat 10 {
    move 0 0
    circle 10
  }
}

```

6. draw an arc of absolute radius 10 in the clockwise direction from the angle 45 to the angle -45.

```

linestyle "arc" {
  move 0 0
  arc 10 45 -45
}

```

7. draw an arc of absolute radius 10 in the anti-clockwise direction from the angle 45 to the angle -45.

```

worldstyle "arc 1" {
  move 0 0
  arc -10 45 -45
}

```

8. top-left justified text with a circle centred on the actual text position

```

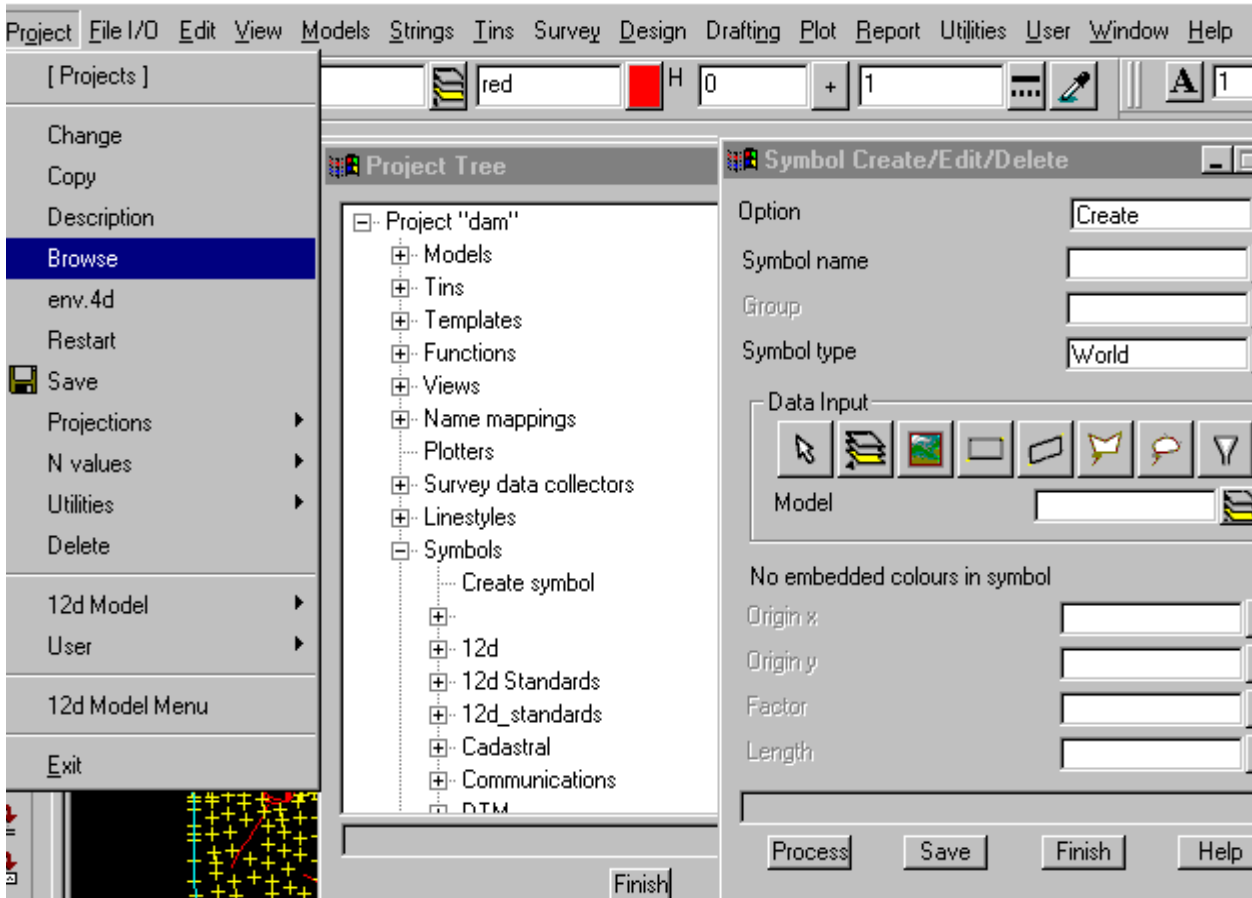
linestyle "top-left" {
  group text
  move 0 0
  circle 4
  text "<top left>" 0 10 "top-left"
}

```

Symbols

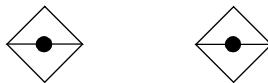
Users can define their own symbols to draw at vertices of 12d Model strings. The definition of symbols are stored in a file called **symbols.4d**.

Symbols in the file can be created/edited using the **Symbols Create/Edit/Delete** panel which is brought up by double clicking on *Create symbol* in the *Symbols* expansion of the *Project Tree* (see "Symbols" in the chapter "Projects") brought up by the *Project=>Browse* option.



The **Symbol Create/Edit/Delete** panel acts as an interactive editor to a text file which contains the symbol definitions.

The user defined symbols can be applied to each vertex of a string. Each symbol can be made up of lines, arcs, circles and text.



A symbol applied to vertices.

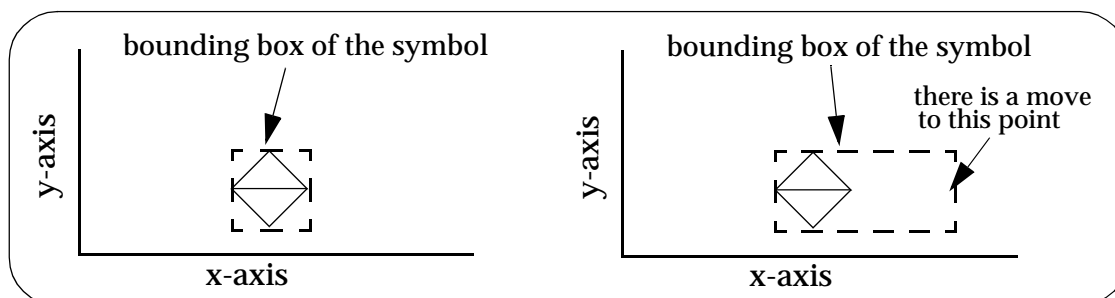
The units for the symbol can be in pixels, millimetres or world units. The symbol is called a

paperstyle if the definition of the symbol is given in paper units
worldstyle if the definition of the symbol is given in world units

Defining Symbols

A *symbol* is defined in a (x,y) co-ordinate system as a series of moves, drawn, arcs, circles and text commands.

The bounding box of the line style is the smallest rectangle parallel to the (x,y) axis which contains all the moves, draws, circles and arcs of the line style. Note that moves are included in the bounding box even if a line isn't drawn to the point.

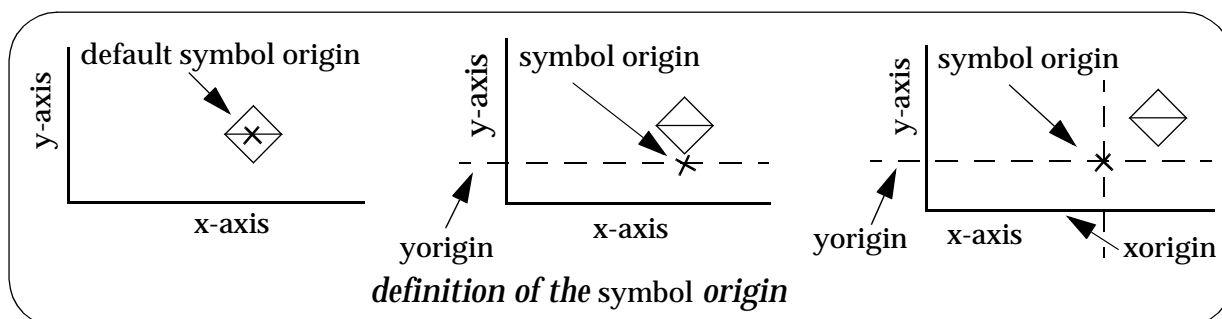


The default **origin of the symbol** is defined to be the midpoint of the bounding box surrounding the symbol. The bounding box includes the points moved to and drawn to, but does not automatically include (0,0). Hence the calculated origin may not be (0,0).

There are **xorigin** and **yorigin** commands to override the default origin of the symbol.

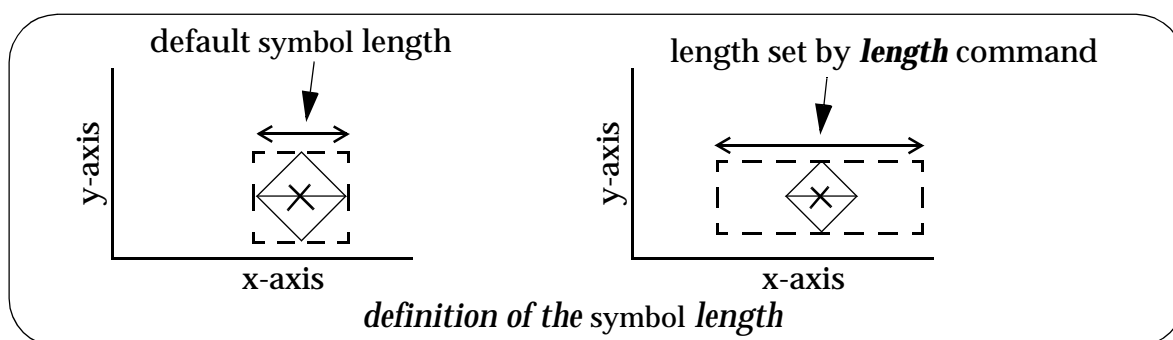
If a **yorigin** is set, then it is used as the y-coordinate of the symbol. If the **xorigin** isn't given, then the **xorigin** is the midpoint of the x-extent of the bounding box of the symbol.

Similarly, if a **xorigin** is set, then it is used as the x-coordinate of the symbol. If the **yorigin** isn't given, then the **yorigin** is the midpoint of the y-extent of the bounding box of the symbol.



The default **length** of the line style is the *horizontal size* of the bounding box.

There is a **length** commands to override the default length of the symbol. The *length* must always be positive but it can be larger or smaller than the symbols calculated horizontal length.



The *origin* and the *length* of the symbol are both used in positioning and sizing the symbol.

Symbol.4d

The definitions for the available symbols are normally stored in a file called **symbols.4d** which is read in each time 12d Model opens an existing project or creates a new project. *Symbol.4d* is searched for in the standard set up paths, or is pointed to by the environment variable

SYMBOLS_4D *filename*

The definition of the symbols will be given in the following section “Symbol Definition” .

Symbol Definition

The definition of a worldstyle **symbol** of a given name *name* is

```
worldstyle name {
    set_up_commands
    draw_commands
}
```

where the `set_up_commands` **must** be before the `draw_commands`.

The `linestyle/paper/worldstyle` must have a name and if the name includes imbedded spaces, it must be enclosed in double quotes “.”

The symbol itself is defined inside the braces where there can be zero or more `set_up_commands` from the list

```
length    value
group     name
factor    value
xorigin   value
yorigin   value
```

followed by zero or more **draw_commands** from the list

```
move      x-value    y-value
draw      x-value    y-value
rmove     dx-value    dy-value
rdraw     dx-value    dy-value
colour    colour_name
circle    radius
arc       radius     start-angle end-angle
text      "text"     angle     height    "justification"
text      "text"     angle     height    "justification" "textstyle"
text      "text"    angle     height    "justification" "textstyle" xfactor slant offset_width offset_height
repeat    num_repeats{ repeat_commands repeat_draw_commands }
```

The **repeat** command is a positive integer *num_repeats*

and zero or more `repeat_commands` from the list

```
xpos      x-value
ypos      y-value
rfactor    value
```

and zero or more `repeat_draw_commands` where `repeat_draw_commands` include all the `draw_commands` except **repeat**.

The **set_up** commands for symbols will now be described followed by the **draw_commands**.

set_up_commands for symbols

group

The **group** is used to associate symbols in pop-up menus.

If the group is not defined, the symbol is placed in a default (blank) group.

If the group name includes imbedded spaces, then it must be enclosed in double quotes “.”

factor

This command factors up/down the drawing co-ordinates, heights and radii.

xorigin, yorigin

The default **origin of the symbol** is defined to be the midpoint of the bounding box of the line style. The bounding box includes the points moved to and drawn to but does not automatically include (0,0). Hence the calculated origin may not be (0,0).

The **xorigin** and **yorigin** commands are used to override the default origin of the symbol.

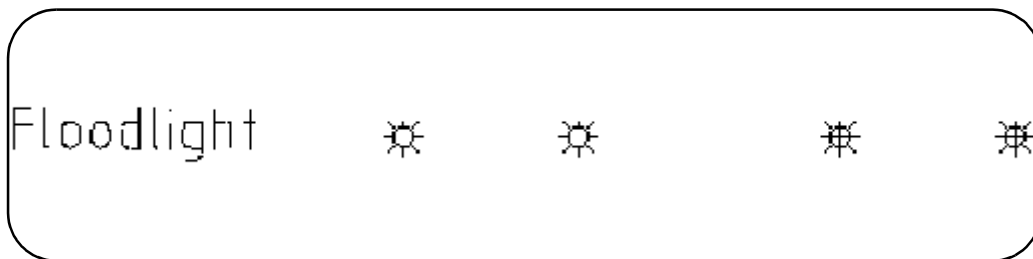
length

If length is omitted, then **length** is taken to be the horizontal size of the calculated bounding box of the symbol.

The **length** must always be positive but it can be larger or smaller than the symbols calculated horizontal size.

The origin of the symbol and the length are both used in positioning and sizing of the symbol.

Examples



```
// Floodlight
worldstyle FLOODLIGHT {
  group "Energex"
  mode vertex
  xorigin 0
  yorigin 0
  colour "yellow"
  circle 0.225
  move -.45 0
  draw -0.225 0
  move .45 0
  draw 0.225 0
  move 0 -.45
  draw 0 -0.225
  move 0 .45
  draw 0 0.225
  move -.159 0.159
  draw -0.318 0.318
  move 0.159 0.159
  draw 0.318 0.318
  move 0.159 -0.159
  draw 0.318 -0.318
  move -0.159 -0.159
  draw -0.318 -0.318
  move 0 0.8
  text "FL" 0 0.5 "centre-middle"
}
```

Description of the draw_commands

move *x-value* *y-value*

move the pen from the current pen position to the new position (x-value, y-value).

draw *x-value* *y-value*

draw from the current pen position to the new position (x-value, y-value)

rmove *dx-value* *dy-value*

move relative from the current pen position through the distance (dx-value, dy-value)

rdraw *dx-value* *dy-value*

draw relative from the current pen position through the distance (dx-value, dy-value)

colour *colour-name*

change colour (line styles can contains more than one colour).

If colour is not defined, the symbol is drawn in the colour of the string that the symbol is applied to. If the colour-name includes imbedded spaces, then it must be enclosed within double quotes ".
.

circle *radius*

draw a circle of the given radius at the current pen position.

After drawing a circle, the current pen position is left at the centre of the circle.

arc *radius* *start-angle* *end-angle*

draw an arc of the given radius from the start angle to the end angle. A positive radius denotes that the arc is drawn in a clockwise direction, a negative radius means anti-clockwise. Angles are given in degrees, minutes and seconds in the ddd.mmssfff format.

After drawing an arc, the current pen position is left at the centre of the arc.

text *text* *angle* *height* "*justification*"

text *text* *angle* *height* "*justification*" *textstyle*

or

text *text* *angle* *height* "*justification*" *textstyle* *xfactor* *slant* *offset_width* *offset_height*

the characters *text* are drawn at the current pen position with the given angle, height, justification and possibly *textstyle*, *xfactor*, *slant*, *offset_width* and *offset_height*. Angle and *slant* are given in degrees, minutes and seconds in the ddd.mmssfff format. *Slant* is between -45 and 45 degrees.

The allowed justifications are

top-left	top-centre	top-right
middle-left	middle-centre	middle-right
bottom-left	bottom-centre	bottom-right

and the value is enclosed inside double quotes (").

After drawing text, the current pen position is left where it was before the text was drawn.

repeat num_repeats { *repeat_commands* *repeat_draw_commands* }

The **repeat** command allows the set of *repeat_draw_commands* inside the braces (the *repeat-style*) to be re-drawn a number of times (*num_repeats*), and with each redraw, the size of the *repeat-style* is modified.

In the definition of *repeat*, there can be zero or more *repeat_commands* from the list

xpos *x-value*

ypos *y-value*

rfactor value

and zero or repeat_draw_commands where repeat_draw_commands include all draw_commands except **repeat**.

Unlike symbol, the repeat-style is defined in terms of a local origin at (0,0). The repeat-style is actually drawn with this origin at the position given by the values of **xpos** and **ypos**.

The repeat-style is drawn *num_repeats* times and on each redraw, the distances, heights and radii are factored by the amount

$$\text{repeat_factor} = (1 - i * \text{rfactor})$$

where $i = 0, 1, \dots, \text{num_repeats} - 1$

If rfactor is not specified, it is given the default value of $1 / \text{num_repeats}$. The factor is then

$$\text{repeat_factor} = (\text{num_repeats} - i) / \text{num_repeats}$$

where $i = 0, 1, \dots, \text{num_repeats} - 1$

Examples of the Repeat Command

1. To produce circles of radius 10,9,8,...1 about the origin.

```
repeat 10 { circle 10}
```
2. To produce circles of radius 10,9.5,9,...5.5 about the origin

```
repeat 10 { rfactor 0.05 circle 10}
```

More Examples of World Styles

1. draw a circle of radius 20. The origin of the style is (0,0)

```
worldstyle "circle" {  
  move 0 0  
  circle 20  
}
```
2. draw a circle of radius 20. The origin of the style is (100,100)

```
worldstyle "circle" {  
  move 100 100  
  circle 20  
}
```
3. draw a circle of radius 20. The origin of the style is (0,0)

```
worldstyle "circle" {  
  xorigin 0  
  yorigin 0  
  move 100 100  
  circle 20  
}
```
4. draw concentric circles of centre (0,0) inside a box

```
worldstyle "dot" {  
  xorigin 0  
  yorigin 0  
  move -5 -5  
  draw -5 25  
  draw 25 25  
  draw 25 -5
```

```
draw -5 -5
repeat 10 {
  move 0 0
  circle 10
}
```

5. draw an arc of absolute radius 10 in the clockwise direction from the angle 45 to the angle -45.

```
worldstyle "arc" {
  move 0 0
  arc 10 45 -45
}
```

6. draw an arc of absolute radius 10 in the anti-clockwise direction from the angle 45 to the angle -45.

```
worldstyle "arc 1" {
  move 0 0
  arc -10 45 -45
}
```

7. top-left justified text with a circle centred on the actual text position

```
worldstyle "top-left" {
  group text
  move 0 0
  circle 4
  text "<top left>" 0 10 "top-left"
}
```

Textstyles and Fonts

Users can define any number of textstyles and specify how they are mapped to AutoCAD style names or Microstation (DGN, Intergraph) font numbers.

There is one fixed spaced textstyle called "1" (the default) which is identical to the textstyle used in earlier versions of 12d Model.

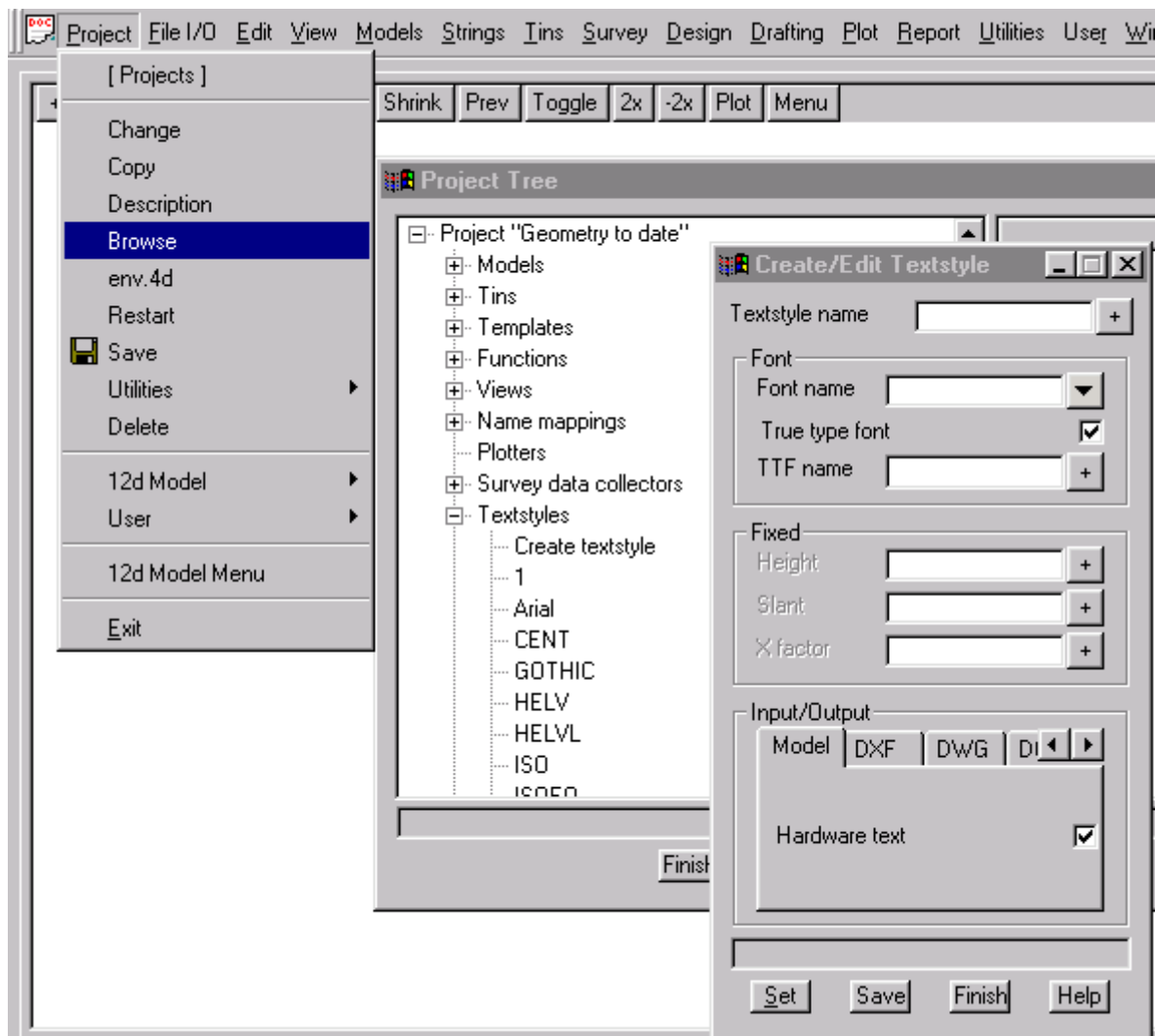
Each textstyle has a font definition (or font 1 as the default) which defines the stroking for each character in the font. True Type fonts are supported and most AutoCAD SHP files can be used to define the fonts.

Textstyles using True Type fonts or shape file which do not use arcs in their font definition, can also have a slant and a x_factor.

Textstyles can be used in text strings, 4d strings, super strings, linstyles, plots and user defined title blocks.

Textstyles Definitions File

Textstyles can be created/edited using the **Create/Edit Textstyle** panel which is brought up by double clicking on *Create textstyle* in the *Textstyles* expansion of the *Project Tree* (see "Textstyles" in the chapter "Projects") brought up by the *Project=>Browse* option.



The **Create/Edit Textstyle** panel acts as an interactive editor to a text file which contains the textstyle definitions. The full description of the text file will now be given.

The definitions for the available textstyles are normally stored in a file called **textstyl.4d** which is read in each time 12d Model opens an existing project or created a new project. *Textstyl.4d* is searched for in the standard set up paths, or is pointed to by the environment variable

```
TEXTSTYLES_4D      filename
```

Inside textstyl.4d, a textstyle of a given name is defined by

```
textstyle textstyle_name {
    textstyle commands
}
```

Each textstyle must have a **name** and if the name includes imbedded spaces, it must be enclosed in double quotes " ".

The textstyle itself is defined inside the braces where there can be zero or textstyle commands from the list

```
font_name          text
or
hardware_text_dxf
stroked_text_dxf
output_name_dxf    text
input_name_dxf     text
or
hardware_text_dgn
stroked_text_dgn
output_name_dgn    integer
input_name_dgn     integer
or
hardware_text_model
stroked_text_model
or
stroked_text
hardware_text
fixed_height       value
variable_height
fixed_slant        value
variable_slant
fixed_xfactor      value
variable_xfactor
```

The description of each command is

```
font_name          text
```

Name of the font to be used to draw the characters of the textstyle. The stroking of the font characters can be defined in the file fonts.4d. If no font_name is given, or the stroking is not given in the font file, then the standard **12d** Model font is used ("1").

```
hardware_text_dxf    or    stroked_text_dxf
```

If stroked_text_dxf appears, then any text in this textstyle written out to dxf will be stroked - that is, broken into straights, lines and curves.

If hardware_text_dxf is in the file, then any text in this textstyle sent to dxf will be given as actual dxf text (not stroked).

output_name_dxf dxf_style_name

If text is sent to dxf as hardware text, the dxf style of the text will be dxf_style_name.

input_name_dxf dxf_style_name

When reading in dxf files, any text of style dxf_style_name will be given the 12d Model textstyle name textstyle_name.

The commands for reading and writing dgn files are similar to those for dxf except that dgn has font numbers.

hardware_text_dgn or **software_text_dgn**

output_name_dgn dgn_font_number

input_name_dgn dgn_font_number

hardware_text_model or **stroked_text_model**

Similarly, when writing out to a 12d Model model. For hardware_text_model, text will be sent to text with the same textstyle.

stroked_text or **hardware_text**

If stroked_text appears in the definition and there is no other hardware_text flag set, then the text will be stroked - that is, broken into straights, lines and curves.

If hardware_text appears in the definition, then the text is written out as hardware text.

By default, the height, slant and xfactor for the text can be set when text is defined however it is possible to set each of height, slant and xfactor to a fixed value.

or **fixed_height** value
variable_height

If fixed_height and a value are specified, then all text in this textstyle is drawn at a fixed height. If fixed_height is missing or variable_height (the default) appears, then each text string in the textstyle has its own height.

or **fixed_slant** value
variable_slant

If fixed_slant and a value are specified, then all text in this textstyle is drawn at a fixed slant. If fixed_slant is missing or variable_slant (the default) appears, then each text string in the textstyle has its own slant. Slant is given in degrees, minutes and seconds in the ddd.mmssfff format and must be between -45 and 45 degrees.

or **fixed_xfactor** value
variable_xfactor

If fixed_xfactor and a value are specified, then all text in this textstyle is drawn at a fixed xfactor. If fixed_xfactor is missing or variable_xfactor (the default) appears, then each text string in the textstyle has its own xfactor.

Example of a Textstyle File

```
textstyle "1" {                    // DGN FONT 0                    ACAD FONT STANDARD
    output_name_dxf                STANDARD
    input_name_dxf                STANDARD
    input_name_dgn                "0"
    output_name_dgn                "0"
    stroked_text
    hardware_text_model
    hardware_text_dgn
    hardware_text_dxf
}
```



```

textstyle ISO {           // DGN FONT 1      ACAD FONT ISO

    font_name            ISO
    input_name_dxf       ISO
    output_name_dxf      ISO
    input_name_dgn       "1"
    output_name_dgn      "1"
    stroked_text
    hardware_text_model
    hardware_text_dgn
    hardware_text_dxf
}

textstyle MONO {         // DGN FONT 2      ACAD FONT MONO

    font_name            MONO
    output_name_dxf      MONOTXT
    input_name_dxf       MONOTXT
    input_name_dgn       "2"
    output_name_dgn      "2"
    stroked_text
    hardware_text_model
    hardware_text_dgn
    hardware_text_dxf
}

textstyle SCRIPT {      // DGN FONT 3      ACAD FONT SCRIPTC

    font_name            SCRIPT
    output_name_dxf      SCRIPTC
    input_name_dxf       SRCIPTC
    input_name_dgn       "3"
    output_name_dgn      "3"
    stroked_text
    hardware_text_model
    hardware_text_dgn
    hardware_text_dxf
}

```

Please see the next section “Fonts Definitions File” for a description of the fonts file.

Fonts Definitions File

The definition of any fonts referred to in the **textstyl.4d** file are given in the **fonts.4d** file which is searched for in the standard **12d** Model set up paths, or is pointed to by the environment variable

```

FONTS_4D      filename

```

The stroking for each character in the font (which is used when drawing the text on the screen and when required, stroking the text for outputs and plots) can be given in a separate file in the Autocad shape file format.

Inside **fonts.4d**, a font of a given name is defined by

```

font    font_name {
        font commands
    }

```

Each font must have a name and if the name includes imbedded spaces, it must be enclosed in

double quotes ".

The font itself is defined inside the braces where there can be zero or more font commands from the list

```
stroke_file      filename
proportional
or               fixed
```

The description of each command is

```
stroke_file      stroke_file_name
```

The name of the file containing the stroking for each character in the font in Autocad ascii shape file format (.shp). The stroke_file_name is searched for in the standard 12d Model set up paths.

If the stroking for a character is not defined, the standard 12d Model character is used instead.

```
proportional      or      fixed
```

If a stroke file is not given, then the font could be a fixed (mono) or proportional font.

Example of a Font File

```
font ISO {
    proportional
    stroke_file "ISO"
}
font GOTHIC {
    proportional
    stroke_file "GOTHICE.SHP"
}
font MONO {
    proportional
    stroke_file "MONOTXT.SHP"
}
```

L Functions Keys, Menus, Toolbars

User Defined Function Keys

The user can define function keys (with possible modifiers) to be used to

- (a) bring up most **12d** Model menus or panels
- (b) toggle certain snaps on or off.
- (c) start some geometry snaps
- (d) read a layout file
- (e) execute a batch file or a program (system call).
- (f) run users **12d** Model macros

The function key definitions are given in the file

userkeys.4d

which is searched for in the standard set up areas (local, USER_4D, user, set_ups etc.) or is pointed to by the environment variable

```
FUNCTION_KEYS_4D          file          // function key definitions
```

The format of the function_keys file is simply a list of function key definitions with only one per lines. Blank lines in the file are ignored and anything on a line after a // is a comment.

The function key definition is

```
MODIFIERS          FUNCTION_KEY          OPERATION
```

where MODIFIERS can be totally missing or any combination of

```
shift
control
or      alt
```

FUNCTION_KEY is one of

```
f1, f2,...f12 (f7 should be avoided since it is used in 12d Model for typed input,
               f1 & f10 should be avoided since they are reserved by Windows NT)
```

and OPERATION is one of

```
menu              menu_name          // raise a menu
panel             panel_name         // raise a panel
snap              toggle_snap        // list of toggle_snaps given below
snap              cogo_snap         // list of cogo_snaps given below
cogo_command      // list of cogo_commands given below
layout            layout_file_name   // run a screen layout file
system            batch_file         // run a batch file
system            program            // run a program
```

or for macros

```
macro      options      user_macro_name      macro_arguments
```

where the macros options are:

```
-no_console      // don't display macro console
-close_on_exit   // remove console when macro terminates
-buttons         // have buttons for finish, restart and quit on console
-allow_defaults  // allow default answers for console questions
```

The default when there are no macro options is to run the macro with a console but without buttons, and to leave the macro console on the screen when the macro terminates.

Menus and Panels

Menus and panels can be programmed by functions keys by simply giving the name of the menu and panel after the menu and panel command respectively.

For example,

```
f5          panel    "String Inquire"
f6          menu     "String Create"
```

View Menus and Panels

Menus and panels for views can be programmed by functions keys by substituting the text \$PLAN_VIEW, \$SECTION_VIEW or \$PERSPECTIVE_VIEW in place of the view name in the panel name or menu name.

For example,

```
f9          panel    "Plan Plot $PLAN_VIEW".
```

A panel for each view type can be programmed for the same modifier and function key combination. If the cursor is over the appropriate view type when the function key is selected, then the panel is fired up.

For example, the three definitions for f5

```
f5          panel    "Section Plot $SECTION_VIEW"
f5          panel    "Plan Plot $PLAN_VIEW"
f5          panel    "Perspective Plot $PERSPECTIVE_VIEW"
```

means that a panel will come up when f5 is selected over any of the three view types.

View Toggle Menus

The **toggle menus** available on each view can be set to a function key by

```
MODIFIERS  FUNCTION_KEY  menu    "Toggle $PLAN_VIEW"
MODIFIERS  FUNCTION_KEY  menu    "Toggle $SECTION_VIEW"
MODIFIERS  FUNCTION_KEY  menu    "Toggle $PERSPECTIVE_VIEW"
```

As for the view menus, the cursor must be over the appropriate view type when the function key is selected.

For example,

```
shift f8 menu "Toggle $PLAN_VIEW"
```

brings up the plan view toggle menu if shift f8 is selected when in a plan view.

Available Snaps to be Toggled

```
toggle_point_snap
toggle_line_snap
toggle_grid_snap
toggle_cursor_snap
toggle_tin_snap
toggle_input_height_snap
toggle_show_information
```

For example,

```
control f2 toggle_point_snap
```

Available Cogo Snaps

```
snap create_edit
snap line_create_edit
snap tangent_items_edit
snap fillet_3_points_edit
```

```

snap fillet_item_item_cp_edit
snap fillet_item_item_radius_cp_edit
snap locate_divide_edit
snap locate_divide_distance_edit
snap parallel_edit
snap intersect_edit
snap intersect_offset_edit
snap bearings_intersect_edit
snap between_points_edit
snap locate_edit
snap locate_chainage_edit
snap locate_offset_edit
snap locate_deflection_edit
snap locate_drop_perpendicular_edit
snap locate_projection_edit
snap locate_two_point_distances_edit

```

For example,

```
shift f1 snap locate_chainage_edit
```

Available Cogo Commands

All the new cogo commands can be activated by a function key.

```

create_edit
line_create_edit
tangent_items_edit
fillet_3_points_edit
fillet_item_item_cp_edit
fillet_item_item_radius_cp_edit
locate_divide_edit
locate_divide_distance_edit
parallel_edit
intersect_edit
intersect_offset_edit
bearings_intersect_edit
between_points_edit
locate_edit
locate_chainage_edit
locate_offset_edit
locate_deflection_edit
locate_drop_perpendicular_edit
locate_projection_edit
locate_two_point_distances_edit

```

For example,

```
f2 between_points_edit
```

Layout Files

Layout files can be called up using the **layout** command.

For example,

```
f8 layout "/temp/contours.slf"
```

System Calls

Programs and batch files can be called up using the **system** command. The directories defined by the environment variables \$LIB_4D and \$USER_4D are included in the PATH environment variables so that any batch files or executables in these areas will be accessible without including any path name in the system call.

For example,

```
f4          system    special.exe    // run the program special.exe
shift f4    system    batch.bat      // run a batch file
control f4  system    "start cmd /k dir" // do a dir in a command shell
```

Macros

User macros can be run and the macros brought up with or without buttons, and with leaving or removing the macro console when the macro has finished.

The macro command structure and options are:

```
macro      options    user_macro_name    macro_arguments
```

where the macros options are:

```
-no_console          // don't display macro console
-close_on_exit       // remove console when macro terminates
-buttons             // have buttons for finish, restart and quit on console
-allow_defaults      // allow default answers for console questions
```

The default when there are no macro options is to run the macro with a console but without buttons, and to leave the macro console on the screen when the macro terminates.

For example,

```
f8  macro -no_console -close_on_exit"/area/drape_align.4do"
f9  macro  -buttons  "/games/lots.4do"
```

For compatibility with earlier versions of 12d Model, the following macro commands are also supported:

```
macro          user_macro_name    // run macro without buttons,
// leave console panel on exit
macro_2        user_macro_name    // run macro without buttons,
// remove console panel on exit
macro_with_buttons user_macro_name // run macro with buttons,
// leave console panel on exit
macro_with_buttons_2 user_macro_name // run macro with buttons,
// remove console panel on exit
```

\$LIB and \$USER_LIB

The variable \$LIB and \$USER_LIB can be used as part of the layout_file_name and user_macro_name to pick up files from either the library or user library.

For example,

```
f7          macro    "$LIB/drape_align.4do"
f8          macro    "$USER_LIB/lots.4do"
f9          layout   "$LIB/contours.slf"
```

Note - if \$LIB_4D is not defined, then 12dmodel/6.00/library is used. If \$USER_LIB_4D is not defined, then 12dmodel/6.00/user_lib is used

Example of a User Function Key File

```
// File to define function key usage
// Note: f1, f6 & f10 are reserved by Windows NT
// f7 is reserved by 4D Solutions for typed input
// Available function key modifiers are
//
//      shift control alt
// Note: some alt key combinations are reserved by Windows NT
// Some sample lines may be
// f5          toggle_point_snap
```

```
// shift f5          toggle_line_snap
// control shift f7  toggle_input_height_snap

// Note that all function key modifiers must come before the function key itself.

// -----

// snaps

f3    toggle_point_snap
f4    toggle_line_snap
f5    toggle_grid_snap
f5    toggle_cursor_snap
f8    toggle_input_height_snap
// snaps cogo

f9    snap intersect_offset_edit
f11   snap locate_chainage_edit
f12   snap locate_drop_perpendicular_edit

// panels

f2    panel "String Inquire"
shift f1 panel "Edit String"
shift f2 panel "String Delete"
shift f3 panel "Clean Model"
shift f4 panel "Delete Model"
shift f5 panel "Strings Edit Ops"
shift f6 panel "Points Edit Ops"
shift f7 panel "String Attributes"
shift f8 panel "Toggle $PLAN_VIEW"

// layout files

control f4 layout "$LIB/tri_contour_clean.slf"

// user macros

control f5 macro -no_console -close_on_exit "$LIB/Culd.4do"

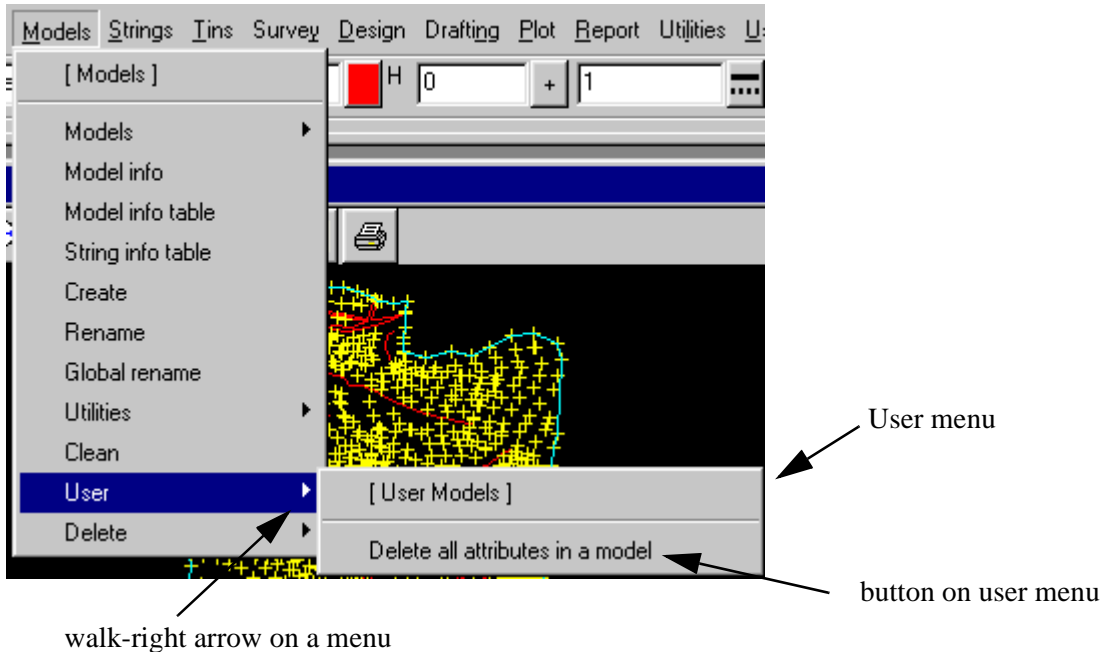
// -----
```

User Defined Menus

To help customise 12d Model, there is a pull down menu **User** on the Main menu and **User** menus on each of the pull down menus on the Main menu.

The **user menus** are made up of *buttons* which have text on them and when the left hand mouse button (LB) is pushed down and released on a button, a *command* is executed.

A button can also have a walk-right menu which appears when the left hand mouse button (LB) is moved over the arrow on the right hand side of the button. Walk-right menus can have walk-right menus.



All the **User** menus can be created by the user and are defined in the file *Usermenu.4d*. Some items on the **User** menus are supplied by 4D Solutions and these are defined in the file *Xtramenu.4d*.

The *text* for each button of **User**, plus the action taken when the button is selected is user specified. Any of the buttons can include further walk-right menus.

When a button is **selected**, the action can be to

- run a 12d Model macro
- bring up a 12d Model menu
- bring up a 12d Model panel
- read a layout file
- execute a batch file or program (system call)

Full Definition of User Menus

The definition for the **User** menus is given in a file called

Usermenu.4d

which is searched for in the standard set up areas (local, USER_4D, user, set_ups etc.) or set by the environment variable


```
USER_OPTIONS_4D          file          // User menu definition
```

In the *Usermenu.4d* file, a menu is defined by:

```
Menu menu_name {
    button_1
    button_2
    ...
    button_n
}
```

where a button can include one or both of the commands *Command* and *Walk_Right*, and the syntax for button is

```
Button button_name {
    Walk_Right          menu_name_1
and/or    Command      command_name
}
```

The *text* displayed on the button is *button_name* and the definitions of the *Walk_Right* and *Command* commands are:

Walk_Right

The *Walk_Right* command specifies that there *is* a walk-right menu for the button and gives the *name* of the menu that is displayed when LB is moved over the walk-right arrow on the button.

The *Walk_Right* command consists of the word *Walk_Right* followed by one or more spaces and then the name of the menu that is displayed when over the walk-right arrow.

```
Walk_Right          menu_name
```

where *menu_name* is the name of another menu defined elsewhere in the *usermenu.4d* file.

When the *Walk_Right* command exists, a walk-right arrow is created on the button. If there is no *Walk_Right* command, then there is no walk right arrow on the button.

The *Walk_Right* command is optional.

NOTE - walk-right menus *can* contain walk-right menus.

Command

The *Command* command defines what action occurs if LB is clicked on the button. The *Command* consists of the word *Command* followed by one or more spaces and then the name of the command and any arguments it requires.

```
Command command_name
```

The Command can bring up any one of

(a) user defined **12d** Model macro

```
Command "macro macro_options user_macro_name macro_parameters" // run macro
```

where the macros options are:

```
-no_console          // don't display macro console
-close_on_exit       // remove console when macro terminates
-buttons             // have buttons for finish, restart and quit on console
-allow_defaults      // allow default answers for console questions
```

The default when there are no macro options is to run the macro with a console but without buttons, and to leave the macro console on the screen when the macro terminates.

- (b) **12d** Model menu
Command "4d_model_menu_name"
- (c) **12d** Model panel
Command "4d_model_panel_name"
- (d) user defined layout file
Command "layout layout_file_name"
- (e) execute a batch file or program
Command "system program_or_batch_file_name"

The *Command* command is optional.

\$LIB and \$USER_LIB

The variable \$LIB and \$USER_LIB can be used as part of the layout_file_name and user_macro_name to pick up files from either the library or user library.

Note - if \$LIB_4D is not defined, then **12d**model/6.00/library is used. If \$USER_LIB_4D is not defined, then **12d**model/6.00/user_lib is used

For example, the definition of a menu called "Lots" could be:

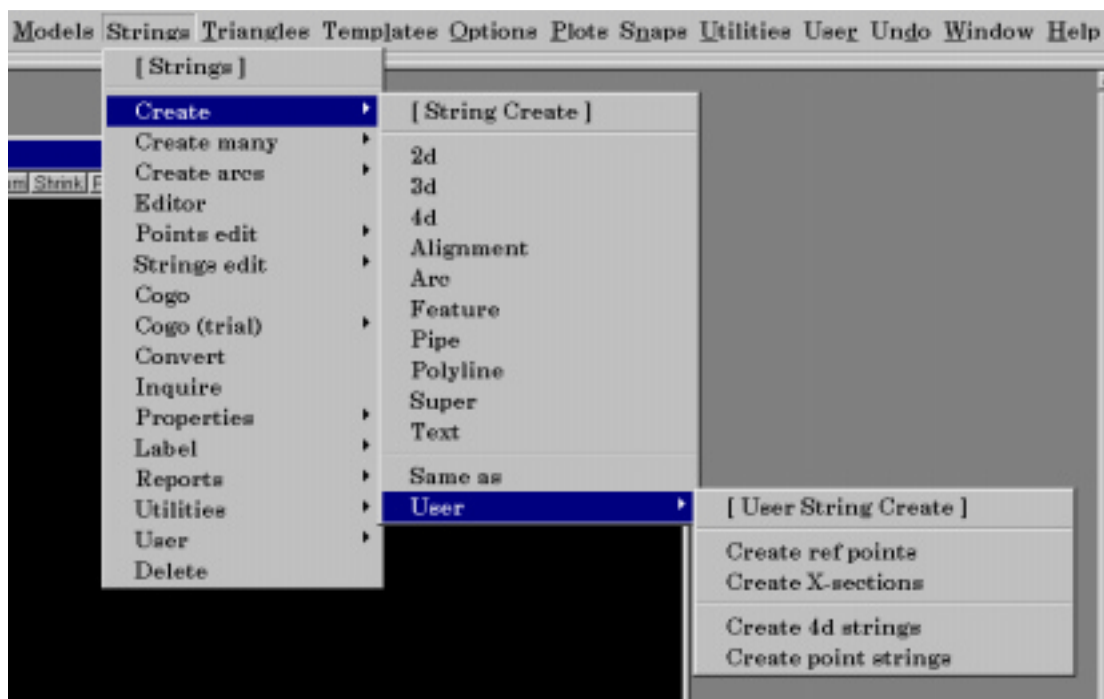
```
Menu "Lots" {
  Button "Create lots" {
    Command "macro -close_on_exit $USER_LIB/subdiv.4do" // fires up a 12d Model macro
  }
  Button "Roads" {
    Walk_Right "Roads" // walk-right menu "Roads"
    Command "layout $USER_LIB/road.slf" // button invokes a layout file if selected
  }
}
```

If a menu called **User** exists in the file, it defines the walk-right menu for **User** on the Main menu.

Since all menus and sub-menus on the **Main** menu have a unique name, it is also possible to defined a **User** menu for any of them by simply having a menu called "User menu_name" in Usermenu.4d.

For example, the menu for the option *Strings=>Create* is called **String Create** (String not Strings) so the User menu for *Strings=>Create* would be called "User String Create":

```
Menu "User String Create" {
  Button "Create 4d strings" {
    Command "macro -close_on_exit $USER_LIB/ref_points.4do"
  }
  Button "Create point strings" {
    Command "macro -close_on_exit $USER_LIB/x_sects.4do"
  }
}
```



All other menu names in Usermenu.4d are user specified and can be used to define walk-right menus.

Any menu referred to in the file Usermenu.4d must be either the name of a standard 12d Model menu, a User menu or must be defined *somewhere in the file*.

Notes

- The variables \$LIB and \$USER_LIB can be used as part of the layout_file_name and user_macro_name to pick up files from either of the libraries.
- blank lines are ignored and anything on a line after a // is a comment

Example of a User Defined Menu

```
// the definition of Main menu option "User"
Menu "User" {
  Button "Triangulate" {
    Command "Triangulate a View"
  }
  Button "Lots" {
    Walk_Right "Lots"
  }
  Button "Roads" {
    Walk_Right "Roads"
    Command "layout $LIB/road.slf"
  }
}

// the definition of the walk-right menu Lots
Menu "Lots" {
  Button "Create lots" {
    Command "macro $LIB/subdiv9.4do"
  }
  Button "Label lots" {
    Command "macro $LIB/subnum3.4do"
  }
}
```

```
    Button "Write Lot Levels" {
      Command "macro $LIB/Tinval.4do"
    }
  }

// the definition of the walk-right menu Roads

Menu "Roads" {
  Button "Roundabout" {
    Command "macro $LIB/Round.4do"
  }
  Button "Culdesac bulb" {
    Command "macro $LIB/Culd.4do"
  }
  Button "Drape alignment string" {
    Command "macro $LIB/Drape_al.4do"
  }
  Button "Create Table drain" {
    Command "macro $LIB/Table_dr.4do"
  }
}

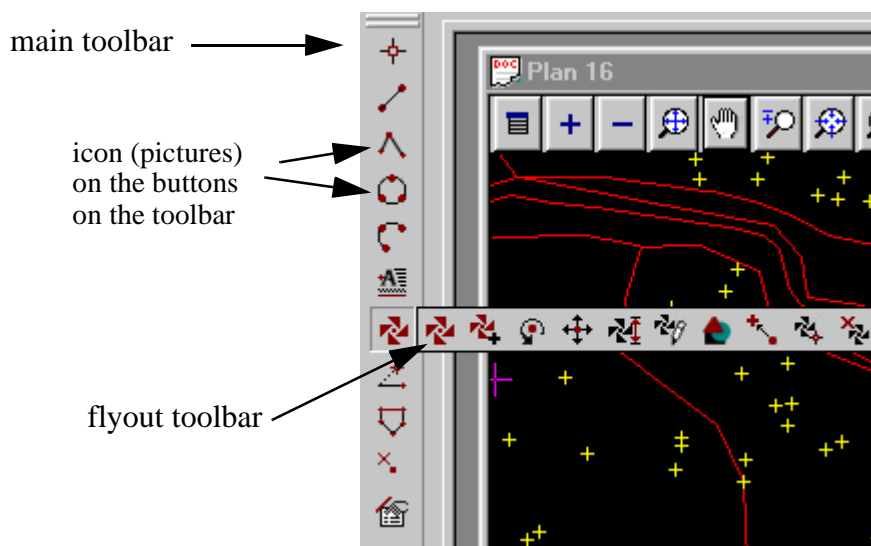
// the definition of User on the Main menu option Strings=>Create"

Menu "User String Create" { // User menu on option Strings=>Create
  Button "Create ref points" {
    Command "macro -close_on_exit $LIB/ref_points.4do"
  }
  Button "Create X-sections" {
    Command "macro -close_on_exit $LIB/x-Sects.4do"
  }
}
}
```

User Defined Toolbars

A *toolbar* is made up of buttons which can have a picture on them (icons) and when the left hand mouse button (LB) is pushed down and released on the button, a command is executed.

A button can also have a *flyout* toolbar which appears when the left hand mouse button (LB) is held down on the button (note that there can only be one level of flyouts).



The definitions for *toolbars* in 12d Model are stored in a file called *toolbars.4d*. When 12d Model is installed, *toolbars.4d* is installed in the 12d Model folder *Set_Ups*.

To customise 12d Model toolbars, a user can modify *toolbars.4d* and save the modified version in the folder *Users*.

The icon for each button on a toolbar, plus the action taken when the button is selected is user specified. A button can include a fly-out toolbar but flyouts can only be to one level (i.e. no flyouts on flyouts).

When a button is **selected**, the action can be to

- run a 12d Model macro
- bring up a 12d Model menu
- bring up a 12d Model panel
- read a layout file
- execute a batch file or program (system call)

When 12d Model starts up, any toolbars defined in *toolbars.4d* that are *not* called as flyouts by another toolbar in *toolbars.4d*, are displayed in the *main toolbar* on the left hand side of the 12d Model screen.

For 12d Model V6.0, toolbars can be moved around but the new positions are not saved with the project. Also there is no way within 12d Model to select which toolbars are used for a project - all the ones defined in *toolbars.4d* are used whenever a new or existing project is loaded into 12d Model V6.0.

Full Definition of Toolbars

The definition for **Toolbars** is given in a file called

Toolbars.4d

which is searched for in the standard set up areas (local, USER_4D, user, set_ups etc.) or set by the environment variable

```
TOOLBARS_4D           file           // Toolbars definition
```

In the *toolbars.4d* file, a *toolbar* is defined by:

```
Toolbar toolbar_name {
    button_1
    button_2
    ...
    button_n
}
```

where a button can include none or more the commands *Icon*, *Command* and *Flyout*, and the syntax for button is:

```
Button button_name {
    Icon      icon_name_1
    Command   command_name_1
    Flyout    toolbar_name_1      // only used if a flyout toolbar is required
}
```

The definitions of the *Icon*, *Command* and *Flyout* commands are:

Icon

The *Icon* command defines the bitmap that is displayed for the button in the toolbar. The format of the bitmap is a bmp file (.bmp) of size 16x16. The *Icon* command consists of the word *Icon* followed by one or more spaces and then the name of the bitmap, *icon_name*.

```
Icon icon_name
```

The *icon_name* can include a pathname but if no pathname is present, the bitmap is searched for in the folder *Images* under the folders *User* or *Set_Ups*.

If the *Icon* command is missing then a default *Icon* command is used with the *icon_name* *button_name.bmp*

```
Icon button_name.bmp
```

Command

The *Command* command defines what action occurs if LB is clicked on the button. The *Command* command consists of the word *Command* followed by one or more spaces and then the name of the command and any arguments it requires.

```
Command command_name
```

The Command can bring up any one of

- (a) user defined 12d Model macro

```
Command "macro macro_options user_macro_name macro_parameters" // run macro
```

where the macros options are:

```
-no_console           // don't display macro console
-close_on_exit       // remove console when macro terminates
-buttons             // have buttons for finish, restart and quit on console
-allow_defaults     // allow default answers for console questions
```

The default when there are no macro options is to run the macro with a console but without buttons, and to leave the macro console on the screen when the macro terminates.

- (b) 12d Model menu

```
Command "4d_model_menu_name"
```

- (c) 12d Model panel

Command "4d_model_panel_name"

(d) user defined layout file

Command "layout layout_file_name"

(e) execute a batch file or program

Command "system program_or_batch_file_name"

If the *Command* command is missing then a default *Command* is used with the command name *button_name* with no arguments

Command *button_name*

Flyout

The *Flyout* command defines what toolbar is displayed when LB is help down on the button. The *Flyout* command consists of the word *Flyout* followed by one or more spaces and then the name of the toolbar that is displayed.

Flyout *flyout_toolbar_name*

where *flyout_toolbar_name* is the name of another toolbar defined elsewhere in the toolbars file.

When the *Flyout* command exists, *Icon* and *Command* are not required and if they are present, are ignored.

The icon on the *Flyout* button is the *Icon* from the first button in the flyout toolbar.

The command executed if LB is pressed and released on the *Flyout* button is the *Command* from the first button in the flyout toolbar.

NOTE - flyouts *can not* be nested so the toolbar *flyout_toolbar_name* can not contain a *Flyout* command.

NOTE - when **12d** Model starts up, any toolbars defined in *toolbars.4d* that are *not* called as flyouts by another toolbar in *toolbars.4d*, are displayed in the *main toolbar* on the left hand side of the 12d Model screen.

Example of a User Defined Toolbar

```
// -----
// WARNING: you cannot have the same command using different icons
// ALSO: when using a flyout, the Command & Icon are ignored
//   and the details are taken from the first button
//   on the flyout
// -----
Toolbar "Cad" {
  Button "Points" {
    Command "Create Point"           // this is ignore since it is a flyout
    Icon  "Create Point.bmp"        // this is ignore since it is a flyout
    Flyout "Cad Points"
  }
  Button "Change String" {
    Flyout "Change String"
  }
}

Toolbar "Cad Points" {              // used as a flyout toolbar
  Button "Create Point" {
    Command "Create Point"
    Icon  "Create Point.bmp"
  }
  Button "Chainage" {
    Command "Locate Chainage"
    Icon  "Chainage.bmp"
  }
}
```

```
} // end of "Cad Points" toolbar

Toolbar "Change String" {                               // used as a flyout toolbar
  Button "String Close" {
    Command "String Close"
    Icon "String Close.bmp"
  }
  Button "String Reverse" {
    Command "String Reverse"
    Icon "String Reverse.bmp"
  }
  Button "String Trim" {
    Command "String Trim"
    Icon "String Trim.bmp"
  }
} // end of "Change String" toolbar
```

\$LIB and \$USER_LIB

The variable \$LIB and \$USER_LIB can be used as part of the layout_file_name and user_macro_name to pick up files from either the library or user library.

Note - if \$LIB_4D is not defined, then 12dmodel/6.00/library is used. If \$USER_LIB_4D is not defined, then 12dmodel/6.00/user_lib is used

For example, the definition of a toolbar called "Lots" could be:

```
Toolbar "Lots" {
  Button "Create lots" {                                // button called "Create lots" which
    Command "macro -close_on_exit $USER_LIB/subdiv.4do" // fires up a 12d Model macro
  }
  Button "Roads" {                                     // button with walk-right menu "Roads" and layout file
    Walk_Right "Roads"                                // walk-right menu "Roads"
    Command "layout $USER_LIB/road.slf"                // button invokes a layout file if selected
  }
}
```

Notes

- (a) The variables \$LIB and \$USER_LIB can be used as part of the layout_file_name and user_macro_name to pick up files from either of the libraries.
- (b) blank lines in the toolbars file are ignored and anything on a line after a // is a comment

Another Example of a Toolbar

```
Toolbar "Cogo" {
// in this case, the Command is assumed to be "Create Line"
// the icon is "Create Line.bmp"
// Command is normally the name of the panel/menu
  Button "Create Line" {
  }
// this is a spacer
  Button "" {
  }
}
```



```
// this is a command and also has a flyout capability
// calling the toolbar called Flyout
// flyouts cannot be nested
Button "Create Fillet by radius" {
  Command "Create Fillet by radius"
  Icon "Create Fillet by radius.bmp"
  Flyout "Flyout"
}
}
// The flyout toolbar for above (and a normal toolbar as well)
Toolbar "Flyout" {
  Button "Create Line" {
  }
  Button "" {
  }
  Button "Create Arc by Centre Radius" {
    Command "Create Arc by Centre Radius End Points"
    Icon "Create Arc by Centre Radius End Points.bmp"
  }
  Button "Create Fillet by radius" {
    Command "Create Fillet by radius"
    Icon "Create Fillet by radius.bmp"
  }
}
```


M Special File Formats

Default File Ending

In any panel pop-up requiring a file name to be displayed, default file endings are used to restrict the **names** of the files selected from the current folder and if they exist, from the library and user library areas.

Whilst a panel is up, the extension being searched for can be changed by typing say "*.xyz" into the panel field requiring a file name, and then pressing <enter>. The list of files ending in .xyz will be displayed and clicking B3 in the panel field will also bring up a list of all files ending in ".xyz". When a new panel is created, the panel fields revert to the default file ending.

A full list of the **default** files used in **12d** Model pop-ups and their endings is:

File Type	Default Ending
------------------	-----------------------

Miscellaneous Files

boxing definitions file	.bf
digitizer registration	.aff
eagle mapping	.emf
many templates	.mtf
mapping	.mf
reports	.rpt
screen layout file	.slf
templates	.tpl
text style file	.tsf

Survey Files

12d Model field file	.fld
reduction history	.rh

Input/Output Files

4D ascii	.4da
12d ascii	.12da
AutoCAD	.dxf
BCC Epson dat files	.dat
BCC Epson sur files	.sur
CivilCad V4	.asc
CivilCad V5	.as5
Eagle command	.cmd
Eagle binary	.mod
Geocomp	.pts
Keays	.trf
Microstation, Intergraph binary	.dgn
Moss	.mos
TP Setout	.pta
xyzs data	.dat

Range Files

aspect range	.arf
depth range	.drf

slope range .srf

Plot Files

AutoCAD	.dxf
CalComp	.cal
DGN (Microstation, Intergraph)	.dgn
Dogs	.par
Eagle	.mod
Frame maker	.mif
HP GL	.hp
HP 7475	.hpa
HP GL 7600	.hpm
HP GL 2 (colour)	.hpc
pcl5	.pcl5
PostScript	.ps

Display Files - dumps, movies

gif	.gif
jpeg	.jpg
Windows bitmap	.bmp
Tiff	.tif
PostScript	.ps
screen layout file	.slf

4DML's - 12D Solutions programming/macro language

macro source file	.4dm
macro object/executable	.4do
macro listing	.4dl

Note

This list is for the default files used in 12d Model panel fields. It does not include 12d Model setup files which are given in the Appendix **Set Ups**.

Special 12D Solutions File Formats

12D Solutions has a number of special file formats, most of which have already been specified. The remaining formats will now be given.

In any of the files, blank lines ignored and any information after // until the end of that line is ignored. Hence **comments** can easily be inserted into the files by preceding them by //.

Unless enclosed in quotes ("), more than one consecutive space or tab are treated as one space.

Eagle Map File

An eagle map file is a user created file consisting of a list of **12d** Model colours and the Eagle pen, dash style, pen thickness and frag to be used for the colour.

The map file is set out with one **12d** Model colour per line. The line begins with the **12d** Model colour followed by the Eagle pen number, dash style, thickness and frag to be used for the **12d** Model colour. Each item is separated by one or more spaces.

For example, if the **12d** Model colour **red** is to be mapped to Eagle pen 3, dash style 4, thickness 2 and frag 1, then the line in the eagle map file would be

```
red      3      4      2      1
```

An eagle map file can be used for writing out three dimensional data to Eagle, or when producing plots in Eagle format.

For plotting, the map file must be called **eagleplt.emf**.

When writing three dimensional data out to Eagle, a user specified file name is allowed.

In the output case, as each string is written out, the map file is searched sequentially until a colour match is made. If no match is found, the colour of the string is used as a pen number and default values used for dash, thickness and frag.

Comments can be included in the map file by preceding the comment with a double forward slash (i.e. //). Anything on the line following the // will be ignored.

An example of an Eagle map file is,

```
//12d Model colour to Eagle mapping file
//
//12d Model colour eagle pen      dash  thickness  frag

black      0      1      1      1
red        2      0      1      5
green      4      1      1      1
blue       4      2      1      11
cyan       5      1      1      1
yellow     6      1      1      1
magenta    7      1      1      1
white      1      1      1      1
orange     15     1      1      1
purple     14     1      1      1
grey       13     1      1      1
"dark green" 12     1      1      1
"dark red"  11     1      1      1
"off yellow" 4      1      1      1
"dark blue" 8      1      1      1
brown      11     1      1      1
```

Template File

The 12D Solutions Template file format is a simple ascii file definition for reading and writing out template definitions for use in the apply options in 12d Model.

The template definition begins with the key word **template** followed by the template name and then the definitions of

fixed, cut, fill and final parts of the template
 or
 fixed and decision parts
 all enclosed within curly braces { }.

```

template fred {
    fixed {
        ...
    }
    cut {
        ...
    }
    fill {
        ...
    }
    final {
        ...
    }
}

```

or

```

template fred {
    fixed {
        ...
    }
    decisional {
        ...
    }
}

```

The definition of the **fixed** part of the template begins with the key word **fixed** followed by a list of the links enclosed in curly braces {}.

The links are defined one per line in order from the centre-line. Each link begins with the keyword **link** followed by the width, percent cross-fall, colour and name for each link. For the percent cross-fall, positive means up, negative is down and zero horizontal.

For example,

```

fixed {
    link    3.5    -3    cyan    kerb
    link    1      -4    magenta shoulder
    link    2      -5    blue    verge
}

```

describes a fixed template with three links, the first of width 3.5 with a 3% cross-fall downwards, the next link of width 1 with 4% cross-fall downwards and the third link of width 2 and 5% cross-fall downwards.

The definition of the **cut** part of the template begins with the key word **cut** followed by a list of the links enclosed in curly braces {}.

The links are defined one per line in order from the end of the fixed template (or centre-line if no fixed part exists). Each link begins with the keyword **link** followed by the width, one in slope, colour and name for each link. For cut, the **one in** slope is positive for up, negative for down, and zero for horizontal.

For example,

```
cut {
  link 3      2      yellow a
  link 2      0      magenta b
  link 3     -1      yellow c
  link 2      0      magenta d
}
```

describes a cut template with four links, the first of width 3 with 1:2 slope upwards, the next link of width 2 horizontally, the third link of width 3 and 1:1 slope downwards and width 2 horizontally.

The definition of the **fill** part of the template begins with the key word **fill** followed by a list of the links enclosed in curly braces {}.

The links are defined one per line in order from the end of the fixed template (or centre-line if no fixed part exists). Each link begins with the keyword **link** followed by the width, one in slope, colour and name for each link. For fill, the **one in** slope is positive for down, negative for up, and zero for horizontal. Please note that this is the opposite to **cut**.

For example,

```
fill {
  link 5      2      yellow e
  link 1      0      magenta f
  link 10     -1      yellow g
}
```

describes a fill template with three links, the first of width 5 with 1:2 slope downwards, the next link of width 1 horizontally, and the third link of width 10 and 1:1 slope upwards.

The definition of the **final** part of the template begins with the key word **final** followed the cut slope, fill slope and search distance enclosed in curly braces {}. The key words for the three values are `cut_slope`, `fill_slope` and `search_distance`.

For example,

```
final {
  cut_slope 1 fill_slope 2 search_distance 100
}
```

describes a final cut slope of 1:1 (upwards), fill slope of 1:2 downwards and template with three links, the first of width 5 with 1:2 slope downwards, both going for a maximum distance of 100.

The definition of the **decisions** part of the template begins with the key word **decisional** followed by a list of the decision commands enclosed in curly braces {}.

The decision commands are defined one per line and have the format:

Fixed Xfall *Width value Height value XFall value Name text Colour colour*

Fixed Slope *Width value Height value Slope value Name text Colour colour*

Tin Width *tin_name Strip value width value Name text Colour colour*

String Offset *string_name Strip value Offset value Name text Colour colour*

Batter *tin_name Strip value Width value Height value Slope value Name text
Colour colour Goto label*

Tin Decision *tin_name Offset value Min value Max value Goto label*

Label *label_name*

Goto *label_name*

End

For example,

```
template "std" {
  fixed {
    link 3 unknown -3 cyan "kerb"
    link 1 unknown -4 magenta "shoulder"
    link 2 unknown -5 purple "verge"
  }
  decisional {
    Tin_Decision "rock" 0 0 1000 "cut_rock"
    Tin_Decision "shale" 0 0 1000 "cut_shale"
    Tin_Decision "terrain" 0 0 1000 "cut_terrain"
    Label "fill_terrain"
    Batter "terrain" 0 8 unknown -3 "f1" blue "alldone"
    Batter "terrain" 0 1 unknown 0 "f2" "dark green" "alldone"
    Goto "fill_terrain"
    Label "cut_rock"
    Tin_Decision "rock" 0 0 0.3 "cut_rock_done"
    Batter "rock" 0.3 5 unknown 0.5 "r1" cyan "cut_rock_done"
    Batter "rock" 0 2.5 unknown 0 "r2" yellow "cut_rock_done"
    Goto "cut_rock"
    Label "cut_rock_done"
    Tin_Decision "shale" 0 0 1000 "cut_shale"
    Goto "cut_shale_done"
    Label "cut_shale"
    Tin_Decision "shale" 0 0 0.6 "cut_shale_done"
    Batter "shale" 0.6 6 unknown 1 "s1" magenta "cut_shale_done"
    Batter "shale" 0 3 unknown 0 "s2" "dark red" "cut_shale_done"
    Goto "cut_shale"
    Label "cut_shale_done"
    Tin_Decision "terrain" 0 0 1000 "cut_terrain"
    Goto "alldone"
    Label "cut_terrain"
    Batter "terrain" 0 3 unknown 1.5 "t1" red "alldone"
    Batter "terrain" 0 2 unknown 0 "t2" green "alldone"
    Goto "cut_terrain"
    Label "alldone"
  }
}
```

Notes

- spaces in text - any text string that includes spaces or only numbers, must be enclosed in double quotes "
- comments - anything after // until the end of the line is ignored.
- blank lines - blank lines are ignored

Screen Layout File

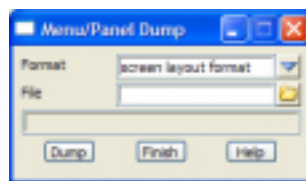
The **12d Model screen layout file** is a simple text file definition for reading and writing out the information about **12d Model** panels and menus.

The definition includes a screen position for the panel or menu, and for panels, the values for any of the panel fields.

At any time, the layout of the menus and panels on the screen in a **12d Model** session can be written out using the menu option

File i/o=>Layout output.

Also, the layout for an individual panel or menu can be created by clicking RB in the menu/view title area and selecting the dump option to bring up the **Menu/Panel Dump** panel.



An example of a screen layout file is:

```

Panel "Read x y z s Data" {
  Position      116  187
  Field "File"          "faces.dat"
  Field "Map file"      ""
  Field "Prefix for models" ""
  Field "Default line colour" "magenta"
  Field "Default point colour" "yellow"
  Field "Default model for data" "faces"
  Field "Add to view"    "1"
}
Panel "Triangulate a Model" {
  Position 397 187
  Field "Model to triangulate" "faces"
  Field "New tin name" "faces"
  Field "Tin colour" "green"
  Field "Tin style" "1"
  Field "Model for tin" "tin faces,1,2"
  Field "Preserve strings" "true"
  Field "Weed tin" "true"
  Field "Remove bubbles" "true" // for a tick-cross box
                                //case sensitive
  Field "Face data" "true" // true, false, yes,
                                // no, 0 ,1
  Run "Triangulate"
}
Menu "Triangles" {
  Position 300 400
}

```

Map File for 12d Model V4.0

Up to 12d Model V4.0, the map file format consisted of one or more lines. Each line begins with a key (entity-mask) followed by a string name, model name, colour, breakline type (point or line), and line style separated by one or more spaces. The key can contain wild cards (*) and wild

characters (?).

When a string is read in and satisfies a key, the key's corresponding string name, model, colour, breakline type and style is used for that string.

For example, any entity name beginning with **31** can be created as a **12d** Model string with the name **picket**, colour **cyan**, breakline type **line**, line style **1** and model **fences** by the map file line

```
31*      picket      fences      cyan      line      1
```

If a map file is used, as each entity is read in, the map file is searched **sequentially** until a match with a key is made and the key's name, colour etc. used. If no match is found, the default colours and model (given in the read panel) are used.

Notes

1. If the entity-name is to be used as the new string name, use an asterisk (*) in place of the string name. For example,


```
fred      *      fences      cyan      line      1
```
2. If the default model for the reader is to be used as the model name, use an asterisk in place of the model name. For example,


```
31      31      *      cyan      line      1
```
3. A * for colour, breakline type and linestyle means that if the entity has a colour, breakline style or linestyle, then it is used rather than be mapped to another one.
4. All model names used in the map file can be given an extra (common) prefix by typing the prefix into the prefix for models field in the read panel.
5. If any information includes a space, then it must be enclosed in quotes ". For example, the model name may be "trial 1" or a style "large tanks".
6. Comments can be included in the map file by preceding them with a double forward slash //. Anything on the line after the // is ignored.

An example of a **12d** Model map file is

```
// 12d Model map file
// key      name      model      colour      pt-line      linestyle

102      break      breaks      red      line      solid
305      fence      caddast      green      point      dash
998      bdry      bound      cyan      line      solid
spots      *      spot      yellow      point      1
PS*      *      *      yellow      point      1
```

Map File for 12d Model V5.0 and Above

For 12d Model V5.0, the map file was extended to allow for defining properties such as tinability, symbols at vertices, vertex and segment text and pipe and culverts.

To allow for all the different type of mapping in the one file, the map file is broken up into sections (one section for each tab of the map file editor) and each section begins with a header record which is the section name enclosed in braces ({}). For example, the symbols section has the header

```
{symbol_data}
```

Inside each section, the data is similar to the V4.0 map file with lines consisting of a key (entity-

mask) followed by the data required for that section. The key can contain wild cards (*) and wild characters (?).

The exact format for the map file is not required since they are created and edited from within **12d** Model by the option

File i/o => Map file

N Plotters and Plotting

The method of creating plots and sending them to a plotter or a Cad system such as AutoCad or Microstation, varies from site to site.

12d Model provides an array of set ups and options to enable the user to tailor the plotting system.

Since the plotting set ups and options are scattered throughout **12d** Model, the rationale behind the plotting set ups will be summarized in this chapter.

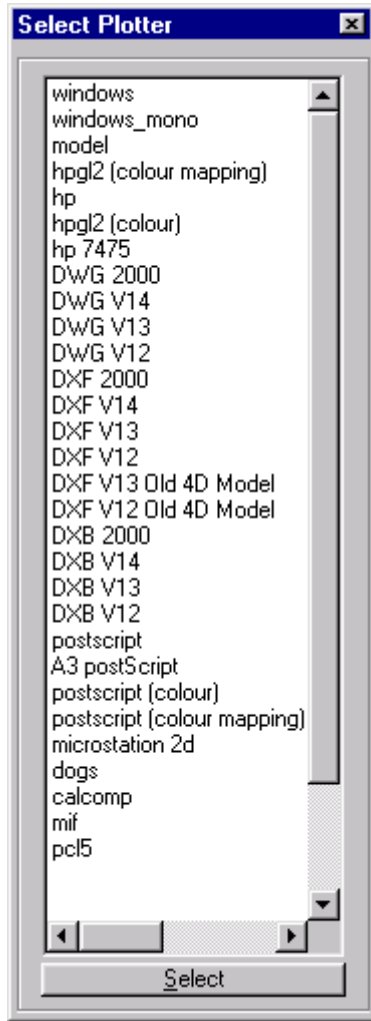
Supported Plotters

When creating a **plot**, **12d** Model can either use a Windows printer driver to plot directly, or instead of driving the plotter directly, create a computer disk file (the plot file) containing the relevant plotter instructions for producing the plot (which is then sent to the plotter), or in the case of the plotter type **model**, create a **12d** Model model.

The **plot file** can be written in a variety of formats. Currently, **12d** Model supports the formats:

windows	Windows colour printer, or grey scale on mono printers
windows_mono	Windows mono printer - uses black, not grey scale
hp	standard HPGL with all of one pen being plotted before the next pen is used
hp (no sort)	standard HPGL with no pen sorting
hp 7475	small HP plotter, common hp emulation mode for lasers
hpgl 2 7600	HPGL 2 for HP 7600 mono plotter
hpgl 2 (colour)	standard HPGL 2 for colour plotters
hpgl 2 (colour mapping)	standard HPGL 2 for colour plotters using a plotter mapping file
dxg	2d DXF file
dwg	2d DWG file
pcl5	pcl5 format
eagle single	Eagle single precision binary model (not in the base module)
eagle double	Eagle double precision binary model (not in the base module)
postscript	Postscript format (generally for laser printers)
postscript (colour)	colour postscript format (generally for laser printers)
postscript (colour mapping)	colour postscript format using a plotter mapping file
dgn 2d	Intergraph/Microstation binary model (.dgn file)
dogs	Dogs parametric format
calcomp	Calcomp plot format
mif	frame maker interface format.
model	creates a 12d Model model

By default, this list of plotters appears when RB is clicked in a **plotter panel field**



windows colour plotter
windows mono plotter
12d Model model
hpgl2 plotter using a mapping file
hp pen plotter
hp 7475 A3 plotter
AutoCAD dwg file

AutoCAD dxf file

postscript plotter
A3 postscript
postscript plotter using a mapping file
Intergraph/Microstation dgn file
DOGS file
Calcomp plotter
FrameMaker file
PCL5 printer

However, a user defined list of available plotters, with user definable names and properties, can be set up and used instead of the default list. User defined plotters will be documented later in the section "User Defined Plotters" .

Please continue to the next section "Sending Plots to a Plotter" .

Sending Plots to a Plotter

When plots are created, **12d** Model can fire up a user supplied script/program with the plot file as the first argument. By checking the plot name suffix, the script could for example, decide which plotter the plot must be sent to.

The environment variable

PLOTTER_4D *points_to_script/program*

points to the script/program which can be fired up whenever a plot is generated. The name of the plot is given as the first script parameter of the script.

If the tick box **Send plots** in the panel tab **System Settings** of the panel **Defaults** (given by the menu option **Utilities => Default**) is set to **on**, the plotter script is run as each plot is created.

If more than one plot is created by an option (e.g. x plot) then the script is called separately for each of the plots.

An example of a script to send the plot to port lpt1 for Windows NT would be

```
@echo off
copy %1 lpt1
```

An example for Windows NT which looks for hp files is

```
@echo off
echo.
echo -----
:next_file
if "%1" == "" goto done
echo %1 | find /I ".hp" > nul
if ERRORLEVEL 0 if not ERRORLEVEL 1 goto hp_plotter
echo Plotting file %1
shift
goto next_file
:hp_plotter
echo Plotting %1 to HP plotter
copy %1 \\server_name\printer_name
shift
goto next_file
:done
echo -----
```

Environment variables are fully defined in the section “Environment Variables” of the Appendix “Set Ups”

Please continue to the next section “Mapping Colours to Plotter Pens” .

Mapping Colours to Plotter Pens

12d Model uses up to 10,240 different colours and when it comes to plotting, it must be decided how these colours are mapped for the particular plotter being used.

For some plotters, colours may be used whereas for mono plotters, line thickness and linestyles may be needed.

When plotting to CAD systems such as AutoCad and Microstation, no physical plot is created but the plot image may need to be send to special colours, layers and styles in the Cad system.

For plotting to actual plotters, there are two methods of specifying the colour to pen mappings.

- (a) **pen mapping** - a simple colour to pen mapping, mainly used for pen plotters
- (b) **plotter mapping** - a colour to pen mapping plus the red, green, blue definition for colours used on the plotter. This is mainly for electrostatic, inkjet and bubblejet plotters.

Plotter mapping is an extension of pen mapping and only one of the two is used for a plot.

Pen Mapping

For all plotters types except Eagle, the Plots=>Pen mapping option can be used to define the correspondence between **12d** Model colours and plotter pens for the first sixteen colours.

The other colours are given in the **colours.4d** file. For Eagle plots, the **eagleplt.pmf** file is used to map colours to pens.

The pen mapping option is only used if a plotter mapping is **not** being used (see next section).

When starting a new project or entering an existing project, the default pen mapping table is defined by the **colours.4d** file.

Once inside the project, any pen number in the table can be modified by changing the appropriate pen field and then selecting the **set** button. The modified table is stored until **12d** Model is quit or the user changes to another project.

The pen mappings for colours above sixteen are given in the **colours.4d** file but can not be displayed or modified by the **colour to pens** panel.

Whenever a plot is created using non-eagle plotter types, the colours are mapped to the pen numbers given in the **colours to pen** table before writing out the plot file.

For Eagle plots, the **eagle_plotter.emf** file is used to map colours to pens.

Note - when **12d** Model is started up again or the user changes to a new project, the table reverts to its default settings as given in the **colours.4d** file.

Colours.4d

The **colours.4d** file defines the distinct colours for drawing in any **12d** Model view.

The **colours.4d** file is also used to define the **default plotter pen** associated with the colour.

See "Colours" in the Appendix "Set Ups"

Plotter Mapping

The **plotter mapping file** can be used use with pen plotters but is more specifically designed for electrostatic and inject plotters and allows the user to

- (a) map **12d** Model colours to particular plotter pens and also specify a width (or weight) to be used for PCL5, HPGL2, postscript and all Windows plotters.
- (b) specify the red, green and blue mix for pens on HPGL2, colour postscript and all Windows

plotters

The plotter mapping file to be used can be set using

- (a) the option Plots=>Plotter mapping
- (b) set by the environment variable PLOTTER_MAPPING_4D, or the file pmf.4d
- (c) defined for a particular plotter in the user defined plotters file.

There are also two special formats of the plotter mapping file which are used for plotting to Autocad dxf and Intergraph dgn. The special mapping files use the 12d Model colour as a key to tables which control how the information is passed to DXF and DGN.

- (d) .tbl file used with plotting to Intergraph dgn
- (e) .amf used with plotting to Autocad dxf

The plotter mapping file to be used can be set using

- (a) the option Plots=>Plotter mapping
- (b) set by the environment variable PLOTTER_MAPPING_4D, or the file pmf.4d
- (c) defined for a particular plotter in the user defined plotters file.

Plotter Mapping File

The plotter mapping file (.pmf) consists of two sections:

- (a) pen_mapping table to define the which pen a 12d Model colour is mapped to, and the weight for the pen.
- (b) pen_colour table which defines the red, green and blue values to be used for the pens on the plotter.

The format of the plotter mapping file (.pmf) is

```

pen_mapping {                                // pen mapping and weight table

//      12d      plotter      weight
//      colour   pen no      for pen

           0         1         0.15
           1         2         0.25
           3         1         0.5
//      etc.
}
pen_colours {                                // pen colours table

// plotter
// pen      red      green      blue      values 0-255
   0         0         0         0         // pen 0 is black
   1        255         0         0         // pen 1 is red
//      etc.
}

```

The **colour n** and **pen n** and the **default weight** for n=0,1...255 is used to initially fill up the 10,240 positions of the **pen_mapping** weight table.

The **pen n** and the **rgb** of the **default colour** (take its rgb from the colour_map.def file) for n=0,1...10,240 is used to fill up the 0,240 rgb positions of the **pen_colours** table before the plotter mapping file is used.

If the Plots =>Plotter mapping option is used, and the **merge colours.4d** flag is set, the rgb columns

from the colours.4d file are used to define the pen_colours (first row is pen 0, second row is pen 1 etc.), and the pen mapping number is used to construct the pen_mapping table.

The plotter mapping file is then processed and overwrites any of the above initial mapping values.

If the plotter type is **dgn** and the map file is a table file with the extension of .tbl, the plotter will use the colour being plotted as the key in the table file and so allows the mapping from the plot colour directly into dgn level, weight, style and colour. See the next section for an example of a table file.

If the plotter type is **dxg** and the map file is an AutoCAD mapping file with the extension of .amf, the plotter will use the colour being plotted as the key in the mapping file and so allows the mapping from plot colour directly into layer name, Autocad colour and linestyle. Note that if Autocad colour or linetype is BYLAYER, then 12d Model uses the correct values in Autocad. The * character means that the field is ignored. See the next section for an example of an Autocad mapping file.

User Defined Plotters

A file can be set up to define the plotters that appear in the **plotter type** panel field, and the properties of the plotters.

It is possible to customize:

- (a) the name of the plotter
- (b) the start and end sequence that is sent to the plotter
- (c) for each plotter, whether pen or plotter mapping occurs.

The full set of user defined plotters is given in a file called **plotters.4d** which is searched for in the standard set up paths, or is pointed to by the environment variable

PLOTTERS_4D filename

In the plotter file, the definition of a **plotter** of a given name *plotter_name* is set out as:

```
plotter plotter_name {  
    set_up_commands  
}
```

plotter_name must not be blank and if it includes imbedded spaces, it must be enclosed in double quotes “.

The plotter itself is defined inside the braces where there can be zero or more plotter set up commands from the list:

```
colours  
engine  
extension  
footer  
header  
map_file  
map_pens  
output_cmd
```

Description of the Plotter Set Up Commands

engine windows | dxf_4d | dxf_12 | dxf_13 | dxf_14 | dxf_2000 |
 dwg_4d | dwg_12 | dwg_13 | dwg_14 | dwg_2000
 dgn | dogs | hpgl | hpgl2 | hpgl_7475 |
 calcomp | model | mif | postscript

extension ".???"

extension added to the file name used for the plot file written out by this plotter.

map_file *plotter_mapping_file_name*

points to a plotter mapping file which is used to redirect colours for any plotter. For hpgl2 and postscript, it also defines the pen weights (widths).

If **map_file** is not set and a global mapping file is specified, then it will be used as the plotter mapping file. Otherwise the pen mapping table is used.

If the **engine** is **dgn** and the **map_file** is a table file with the extension of .tbl, the plotter will use the colour being plotted as the key in the table file. This allows the mapping from the plot colour directly into dgn level, weight, style and colour.

If the **engine** is **dxf** and the **map_file** is an Autocad mapping file with the extension of .amf, the plotter will use the colour being plotted as the key in the mapping file. This allows the mapping from plot colour directly into layer name, Autocad colour and linestyle. Note that if Autocad colour or linetype is BYLAYER, then 12d Model uses the correct values in Autocad. The * character means that the field is ignored.

map_pens true | false

if true, it uses the specified **map_file**, or if **map_file** is false, it doesn't use any mappings (**map_file**, global plotter mapping file or pen mapping table). It leaves the pen number untouched. This was used in the hpgl2 colour and postscript colour - the screen colours were preserved. This can now be done for any plotter.

This is ignored when the **map_file** is used as a tbl file (plotter engine is dgn and the **map_file** has an extension of .dgn - any mapping is occurring via the tbl file where colour is the key).

This is ignored when the **map_file** is used as a amf file (plotter engine is dxf and the **map_file** has an extension of .dxf - any mapping is occurring via the .dxf file where colour is the key).

output_cmd path to a *script* or *program*

for this plotter, the given script or program is used on the created plot file. This replaces the PLOTTER_4D definition of script or program for this plotter.

colour true | false

used in hpgl2 and postscript.

If false, then for postscript don't send the rgb for colours and for hpgl2, it doesn't send down the block of information with the number of pens and the rgb for each pen. That is, if false, it stops hpgl2 and postscript writing out the colour definition commands.

header and footer

The **header** information is placed in the plot file before any plot commands and the **footer** information is placed at the end of plot file after all the plot commands.

The format for the for the **header** of **footer** is:

```
header { // this information is placed in the plot file before any plot commands
  lines of text which can include plotter variables
}
```

```

or
  footer {      // this information is placed at the end of the plot file, after the plot commands
                lines of text which can include plotter variables
  }

```

Each line of text is surrounded by quotes. For example, "this is some stuff".

The *plotter_variables* used in the **header** or **footer** are:

```

  username
  filename
  date
  time
  sheet_width
  sheet_height
  page_number - not used
  minimum_x, minimum_y // plotter dependent
  maximum_x, maximum_y // plotter dependent

```

and are included in the text by preceding them by a + and also following them by a cross if more text follows. For example:

```
"the user is " + username+" of 4D Solutions"
```

The appropriate information is substituted for the *plotter_variables* when a plot is created.

Hence

```
"the user is " + username+" of 4D Solutions"
```

would give

```
"the user is fred of 4D Solutions"
```

A *plotter_variable* may not be appropriate for a particular plotter and if a *plotter_variable* is specified but not used for a plotter, it is substituted by *blank*.

If **header** or **footer** is not specified, then appropriate default information for the plotter is used.

The **header** and **footer** *set_up_commands* are not used by all plotters. If they are not used for a particular plotter, the **header** or **footer** command is ignored.

At present, only the plotters hpgl, hpgl2, postscript and dxf use **header** and **footer**.

minimum_x etc for postscript, it is the extent of the plot in mm
sheet_width, *sheet_height* for postscript in mm

For hpgl2

```
sheet_width, sheet_height          in mm/40.
```

Example of a Plotters.4d File

An example of a plotters.4d file is:

```
// -----  
// File:    plotters.4d  
// Date:    25 January 1997  
// Use:     User definable plotter names  
// -----  
  
plotter "Windows" {                // Windows printer drivers  
  engine windows  
  colour true  
  map_pens true  
  map_file "windows_colour.pmf"  
}  
plotter "Windows mono" {          // Windows printer drivers  
  engine windows  
  colour false  
  map_pens true  
  map_file "windows_mono.pmf"  
}  
plotter "HP Colour" {             // hp plotter using hpgl2  
  engine hpgl2  
  colour true  
  map_pens true  
  map_file "jetcolor.pmf"  
  output_cmd "print -s://melba/jet_design"  
  extension ".hp2"  
}  
  
plotter "HPGL Pen plotter" {      // hp pen plotter using hpgl  
  engine hpgl  
  map_file "jetcolor.pmf"  
  output_cmd "print -s://melba/devel_hp4v"  
  extension ".hp"  
}  
  
plotter "Model" {                 // plot to a 12d Model model  
  engine model  
  extension ""  
  map_pens false                   // don't map colours  
}  
  
plotter "DGN" {                   // output to a Microstation dgn file  
  engine dgn  
  extension ".dgn"  
}  
  
plotter "DGN with tbl" { // define a dgn plotter using an output table file  
  engine dgn  
  extension ".dgn"  
  map_pens true // ignored where the map_file is used as a tbl file  
  map_file "vicplot.tbl"  
}
```

```
plotter "DXF 2000" { // output to a dxf file
  engine dxf_2000
  extension ".dxf"
}
plotter "DXF 2000 with amf" { // output to a dxf file using an autocad map file
  engine dxf_2000
  extension ".dxf_2000"
  map_file "acadplot.amf"
}
```

Definition and Example of a .tbl File

An example of an output mapping file for use with an Microstation (Intergraph) dgn plotter:

```
// -----
// File: vicplot.tbl
// -----
// column 112d colour name      (any length - but only 1st four characters passed)
// column 2Vic roads code      (only 1st four characters passed)
// column 3AS2482 feature code
// column 4description (any length but if embedded spaces then must be quoted)
// column 5line level          (between 1 and 64)
// column 6line colour         (between 1 and 256)
// column 7line weight         (between 1 and ?)
// column 8line style
//
// notes: if column 2 is a * then the 12d name is transmitted (up to 4 characters that is)
//        columns 9 through 16 are only used for point strings which map into characters

1 PM  38010000 "Permanent Survey Mark  " 49 0 1 0
2 BM  38020000 "Bench Mark              " 49 0 1 0
3 TPEG 31000001 "Title peg              " 50 0 1 0
4 STN  38100000 "Instrument Station     " 50 0 1 0
5 SM   38000000 "Survey mark (general)  " 50 0 1 0
6 PCON 38040001 "Photo control point   " 50 0 1 0
7 CHEK 38000001 "Check profile/point   " 52 10 3 0
8 TRIG 38010000 "Trigonometric Station " 50 0 3 0
9 BMQS 38020001 "Bench Mark QS-1      " 49 11 1 0
10 BMS  38020002 "Bench Mark S-2      " 49 11 1 0
11 BMSH 38020003 "Bench Mark SH-1     " 49 11 1 0
12 RM   38000001 "Reference Mark - General " 50 11 1 0
* ROD  38000002 "Reference Mark - Rod   " 50 11 1 0 // everything else
```

Definition and Example of a .amf File

An example of an AutoCad output mapping file for use with an Autocad plotter:

```
// -----
// File: acadplot.amf
// -----
// column 1 match colour- can include wild chards * and wild characters ?
// column 2 new name - not output to DXF
// column 3 ACD layer -
// column 4 ACD colour- * for 12d Model colour (mapped to ACD),
//              BYLAYER for ACD BYLAYER
// column 5 ACD line type- * for 12d Model linestyle,
//              BYLAYER for ACD BYLAYER
// column 6 ACD text style- not yet used, * for 12d Model text style
//
// Notes:
// 1. column 5 (ACD colour) can only be a number between 0 and 256, or * or BYLAYER
// 2. The DXF file produced needs to be loaded into an existing Autocad drawing
//    which has the ACD layers and linestyles defined.
// column 1   2       3       4           5           6
//
1  CONT  ljpg1  1           1           *
2  TOP   ljpg2  2           CONTINUOUS *
3  TOP   *      3           *           *
4  TOP   ljpg4  *           BYLAYER     *
5  TOP   ljpg5  BYLAYER  DASH        *
```


Microstation (DGN) Plot Seed File

When creating dgn plot files in Microstation (Intergraph) DGN format, a Microstation (Intergraph) DGN seed file can be used.

The folder containing the seed files can be pointed to with the environment variable MS_SEEDFILES_4D:

```
MS_SEEDFILES_4D          folder
```

The Microstation seed file is set by the Plots=>DGN plot seed file option.

Sheet Sizes

For plot frames, long and x plots, the overall size of the plot sheet can be given by a pop-up containing defined sheet size.

The sheet size names, width and heights can be specified by the user in a file named **sheets.4d** which is in the normal set up areas, or is pointed to by the environment variable

```
SHEET_SIZES_4D          file          // file of plotter sheets sizes
```

The layout of the sheet sizes file is given in the section "Sheet Sizes" in the Appendix "Set Ups"

Environment variables are fully defined in the section "Environment Variables" of the Appendix "Set Ups"

Hardware Arcs

When plotting arcs, the arc can either be broken into a series of straight lines within 12d Model, or plotted using the arc command (if it exists) for the relevant plotter.

The initial default for hardware arcs is set by the environment variable HARDWARE_ARCS_4D:

```
HARDWARE_ARCS_4D      1          use hardware arcs          default
                      0          hardware arcs are not used
```

but this can be overridden by the option Plots=>Hardware arcs.

Environment variables are fully defined in the section "Environment Variables" of the Appendix "Set Ups"

Interface Colours

When drawing interface strings in 12d Model, cut areas are denoted in red, fill areas in green and sections on the surface in yellow.

However, when plotting it is convenient to be able to map the interface colours to other colours.

This panel is used to define new colours for the interface colours, and the new colours are then mapped to pens using the pen mapping table or plotter mapping file.

The colours used for plotting the interface colours is set from the option `plots=>interface colours`

Text Units

Text occurs in 12d Model plots in a number of ways -

- ▲ plotting **text strings** and **4d strings**
- ▲ automatic text such as grid values, x-section and long-section plot annotation.
- ▲ text within linestyles.

The most difficult thing about text is that because of the different uses of text, there needs to be more than one systems of **units** to define text heights.

The height of text for a given textstyle is defined to be the height of a capital A. However, in 12d Model, there are three methods of defining the units for measuring this height.

- ▲ world units - the units used for data
- ▲ screen units - pixels (the screen is 1000 pixels wide)
- ▲ plot paper units - millimetres.

World Units

World units are the units of user data. For most users, the base unit for user data is metres. However 12d Model is a dimensionless system and the base unit is totally dependent on the user.

The height of world text when displayed in a view depends upon on the text height and the scale of the view.

When plotted, the height that world text appears on a plot sheet is the same as for any data defined in world units - the height depends on the **scale** used for the plot.

Text heights that are only given in world units have **(w)** after them.

For some text, the choice of units is either world or pixels. The text parameters then have a **(u)** after them.

Screen Units - pixels

When screen units (pixels) are used, the text is a fixed height on the screen. If the user zooms in on text given in pixels, the text remains the same height.

To have a height on a plot, screen unit text needs a height defined in millimetres.

For some screen text, both a pixel and a millimetre height is supplied when the text is defined.

For text with only a pixel height, there is a plotting multiplication parameter called **pixels-to-millimetres** which is used to convert pixel heights to plot paper heights. The value of pixels-to-millimetres is set using the `plots=>pixels to mm` option and is stored for the project.

Text heights that are only given in pixels have a **(pix)** or **(p)** after them.

For some text, the choice of units is either world or pixels. These text parameters then have a **(u)**

after them.

Plot Paper Units - millimetres

Text defined in plot paper units (millimetres) has a well defined height on a plot sheet.

Text heights that are only given in millimetres have **(mm)** after them.

Pixels to mm

To allow text and linestyles with only a pixel size to be plotted, a factor to convert pixels to millimetres is used.

When plotting, any text and linestyle defined **only** in pixel units is **multiplied** by the pixels-to-millimetre factor to determine its size in the plot.

For a new project, the initial value is loaded from the **defaults** file and is defined in this file by

```
PIXELS TO MM PLOT FACTOR      value
```

See “Defaults” in the Appendix “Set Ups”

The pixels-to-mm factor can be modified by the Plots=>Pixel to mm option.

The pixel-to-millimetres value is stored for the project

Environment variables are fully defined in the section “Environment Variables” of the Appendix “Set Ups” .

O Plot Parameters

Plot Frame Plot Parameter File

The plot frame section plot parameters are placed in a file with ending **.ppf**

Each parameter consists of a parameter name followed by one or more spaces and then the parameter value. There is only one parameter per line.

Anything on a line after a double forward slash // is considered to be a comment.

The set of all parameters for the plot frame plot is enclosed within a set of curly brackets { } with the header

```
plot_frame_plot "plot set name"
```

before the curly brackets.

That is,

```
plot_frame_plot "plot set name" {
    plot parameters
    one per line
}
```

If there is more than one `plot_frame_plot` parameter set in the file, only the first set is used.

There may also be parameter sets for other plot types such as `section_long_plot` in the same file. The other sets will be ignored when doing plot frame plots.

The only parameters not connected with title block file are

<code>view_name</code>	<code>view_name</code>	// name of view used for information // on the plot
<code>single_frames</code>	<code>frame_name</code>	// name of plot frame to be plotted
<code>model_of_frames</code>	<code>model_name</code>	// model of plot frames which may be // plotted as a group

Both these parameters exist in the **plot frames plot** panel and when the parameter file is first read, if either of these parameters exist in the plot parameter file then they will be used to replace the corresponding parameters in the panel.

However, if the parameters are subsequently modified in the panel, the new panel value will be the value used for plotting.

Title Block Information

A plot frame plot can have a standard 12d Model title block or a user defined title block.

For a user defined title block, the title block drawing commands are kept in a file whose name is given by the user when setting up the plot frame. The title block drawing commands are almost identical to the linestyle drawing commands.

If a user defined title block has been set for the plot frame, plot frame parameters can be used to pass information though to the title block.

User Title Block

Some of the plot parameters are used to pass information down to variables in a user defined title block specified in the plot frame.

The parameters are:

<code>time_format</code>	<i>text</i>	// format for \$time
<code>title_1</code>	<i>text</i>	// passed down to \$title_1
<code>title_2</code>	<i>text</i>	// passed down to \$title_2
<code>user_text_n</code>	<i>text</i>	// where n = 1,2,... 1000 // passed down to \$user_text_n
<code>start_page_number</code>	<i>integer</i>	// used as the starting value for \$page_number. // if missing, \$page_number starts at 1.
<code>start_drawing_number</code>	<i>integer</i>	// added to \$drawing_number in title block file // if missing, \$drawing_number starts at 1.
<code>drawing_number_prefix</code>	<i>text</i>	// passed down to \$drawing_number_prefix
<code>drawing_number_postfix</code>	<i>text</i>	// passed down to \$drawing_number_postfix

Notes

1. A warning is given if the keyword in a plot parameter file does not exist.
2. A warning is also given if the key word pair is defined more than once in a ppf.

Cross Section Plot Parameter File

The cross section plot parameters are placed in a file with ending **.ppf**

Each parameter consists of a parameter name followed by one or more spaces and then the parameter value. There is only one parameter per line.

Anything on a line after a double forward slash // is considered to be a comment.

The set of all parameters for the cross section plot is enclosed within a set of curly brackets { } with the header

```
section_x_plot "plot set name"
```

before the curly brackets.

That is,

```
section_x_plot "plot set name" {
    plot parameters
    one per line
}
```

If there is more than one section_x_plot parameter set in the file, only the first set is used.

There may also be parameter sets for other plot types such as section_long_plot in the same file. The other sets will be ignored when doing cross section plots.

The plot parameters are documented in following groups:

For the *Plot Sheet layout*, please continue to the section "Plot Sheet Layout".

Boxes and datum area, please continue to the section "Boxes and Datum Area".

Only for the Centre line case:

Datum area, please continue to the section "Datum Line".

Labelling the centreline, style etc., please continue to the section "Labelling the Centreline Chainage".

Only for the Boxes case:

Datum area, please continue to the section "Datum Line".

Labelling the centreline chainages, please continue to the section "Labelling the Centreline Chainage".

Defining boxes and what is labelled in them, please continue to the section "Defining Boxes".

For Both the Centre Line and Boxes case:

Graph area parameters, please continue to the section "Graph Area".

Grade labelling, please continue to the section "Grade Labelling".

Labelling points on x-sections, please continue to the section "Labelling Points of the X-Sections".

Labelling cuts, please continue to the section "Labelling Cuts of X-Sections Through Strings in a Model".

Hatching cut/fill, please continue to the section "Hatching Cut and Fill Areas".

Drawing extra x-sections, please continue to the section "Extra Models of X-Sections".

Sorting x-sections, please continue to the section "Sorting X-Sections by Chainage".

Title block information, please continue to the section "Title Block Information".

Panel modifying parameters, please continue to the section "Parameters that Modify Fields In the Cross Plot Panel".

Example, please continue to the section "Example of a Cross Section Plot Parameter File".

Plot Sheet Layout

X-sections are normally generated at chainages along a given centreline. This centreline chainage is stored with each x-section string.

The chainages of the actual x-sections are referred to as **offsets** from the centreline position rather than x-section chainages. The offsets of the x-section are set up so that the zero offset occurs where the x-section crossed the centreline string.

The x-sections along the centreline are stored in the one model (the primary model) which is then used to generate the cross section plot.

```
model_to_plot          text          // name of the model of x-sections
```

Each x-section from the primary model of x-sections generates its own sub-plot for which the x-section is the primary string. Hence the cross section plot consists of many individual plots drawn on one or more plot sheets.

Each plot sheet is considered to have only positive co-ordinates with the origin (0,0) in the left hand corner. The units for the plot are millimetres.

The overall size of the plot sheet is given by either a defined sheet size, or by the width and height of the plot given in millimetres and separated by one or more spaces.

```
sheet_size            text          // sheet name, or
                    "mm mm"       // sheet size: width height
```

The sheet size name, width and heights can be specified by the user in a file named **sheets.4d** which is in the normal set up areas, or is pointed to by the environment variable

```
SHEET_SIZES_4D       file          // file of plotter sheets sizes
```

The plotting area is restricted to within the plot sheet by giving margins which are:

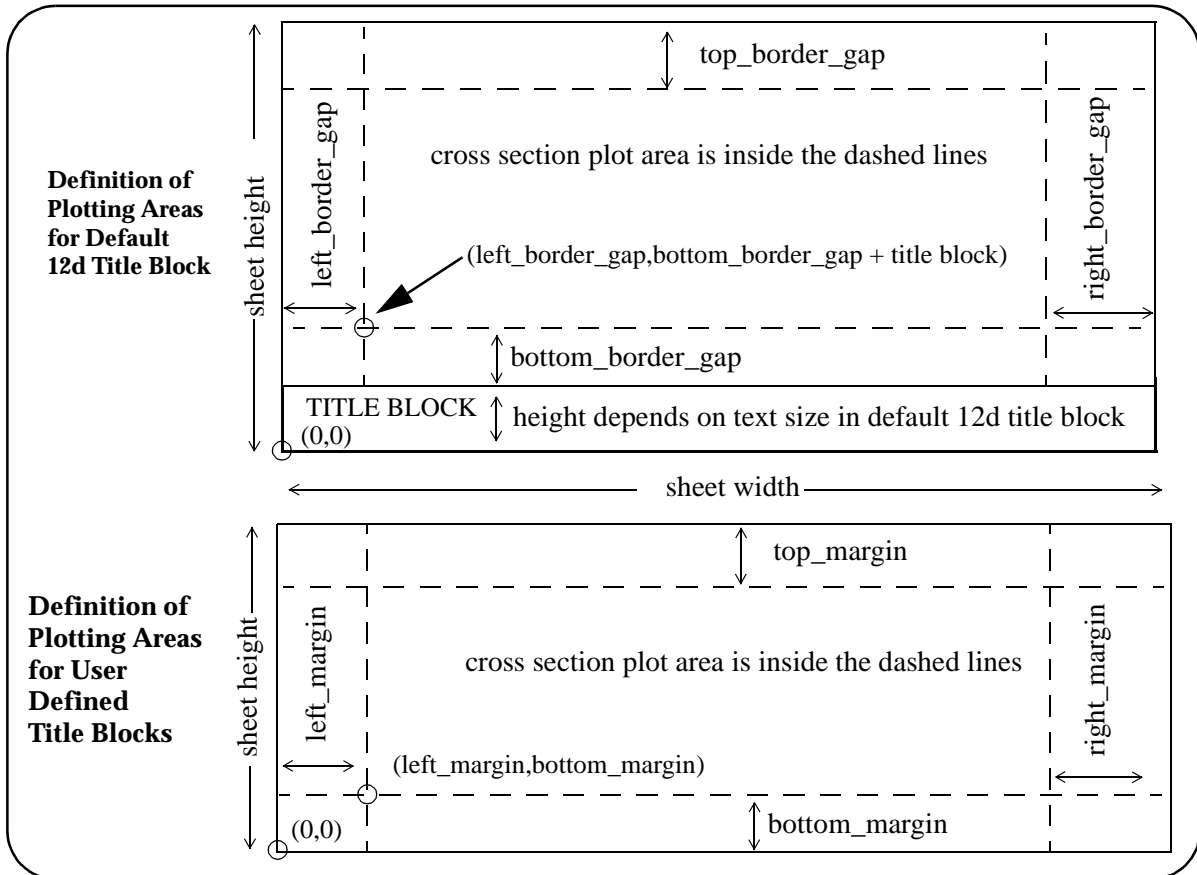
If a *User Defined Title Block* is used:

```
left_margin          mm
right_margin         mm
top_margin           mm
bottom_margin        mm
```

If the *default 12d title block* is used, then the size of the bottom of title block depends on the text size. The following parameters are used in the default title block case and the *bottom_border_gap* is added to the calculated height of the bottom of the title block.

```
left_border_gap      mm
right_border_gap     mm
top_border_gap       mm
bottom_border_gap    mm
```

Because the user can easily select from the plotting panel whether a User Defined Title Block or the default 12d title block is used, both sets of margin and gap parameters can exist in the one plot parameter file.



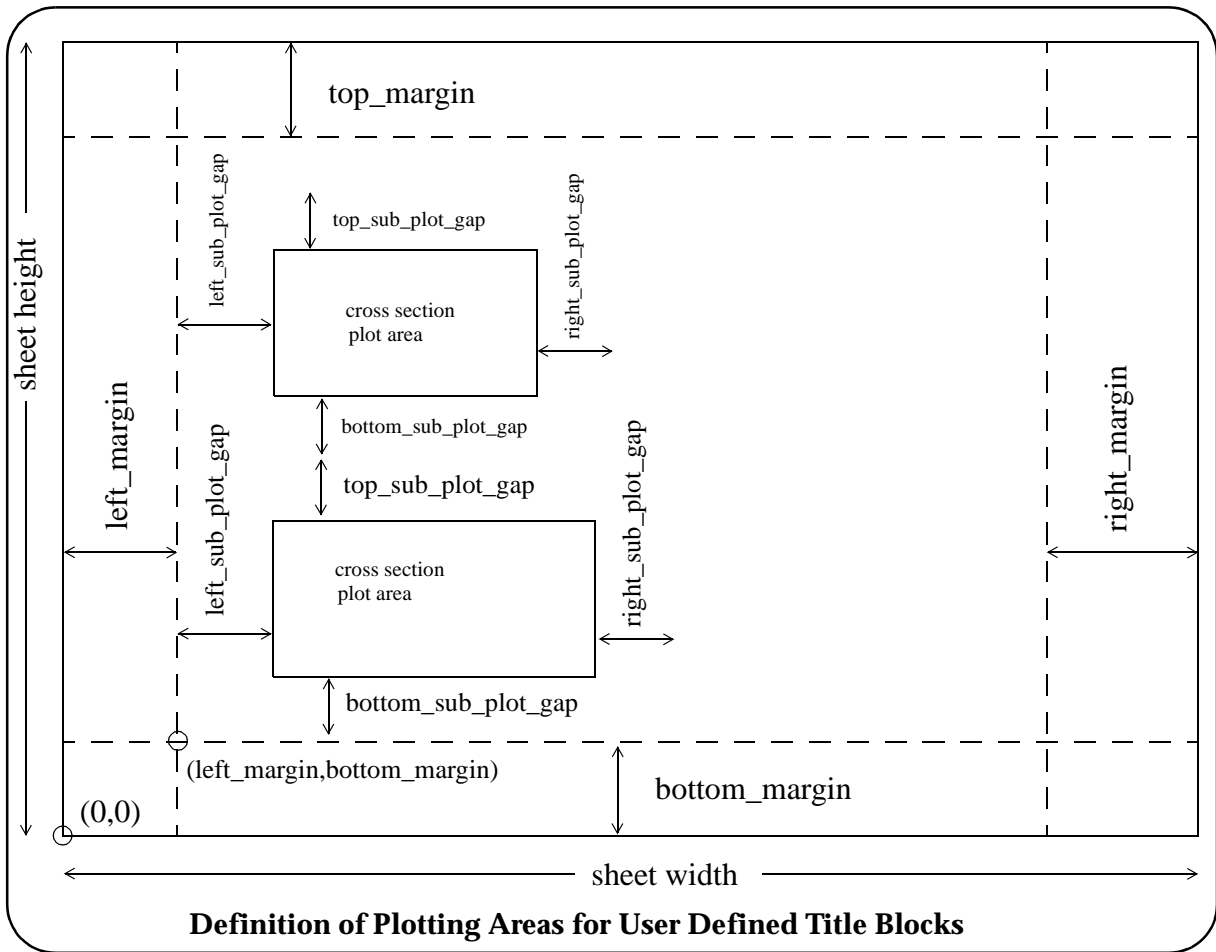
The x-sections are plotted in the order they occur in the x-section model and start being plotted at the bottom left hand corner of the cross section plotting area.

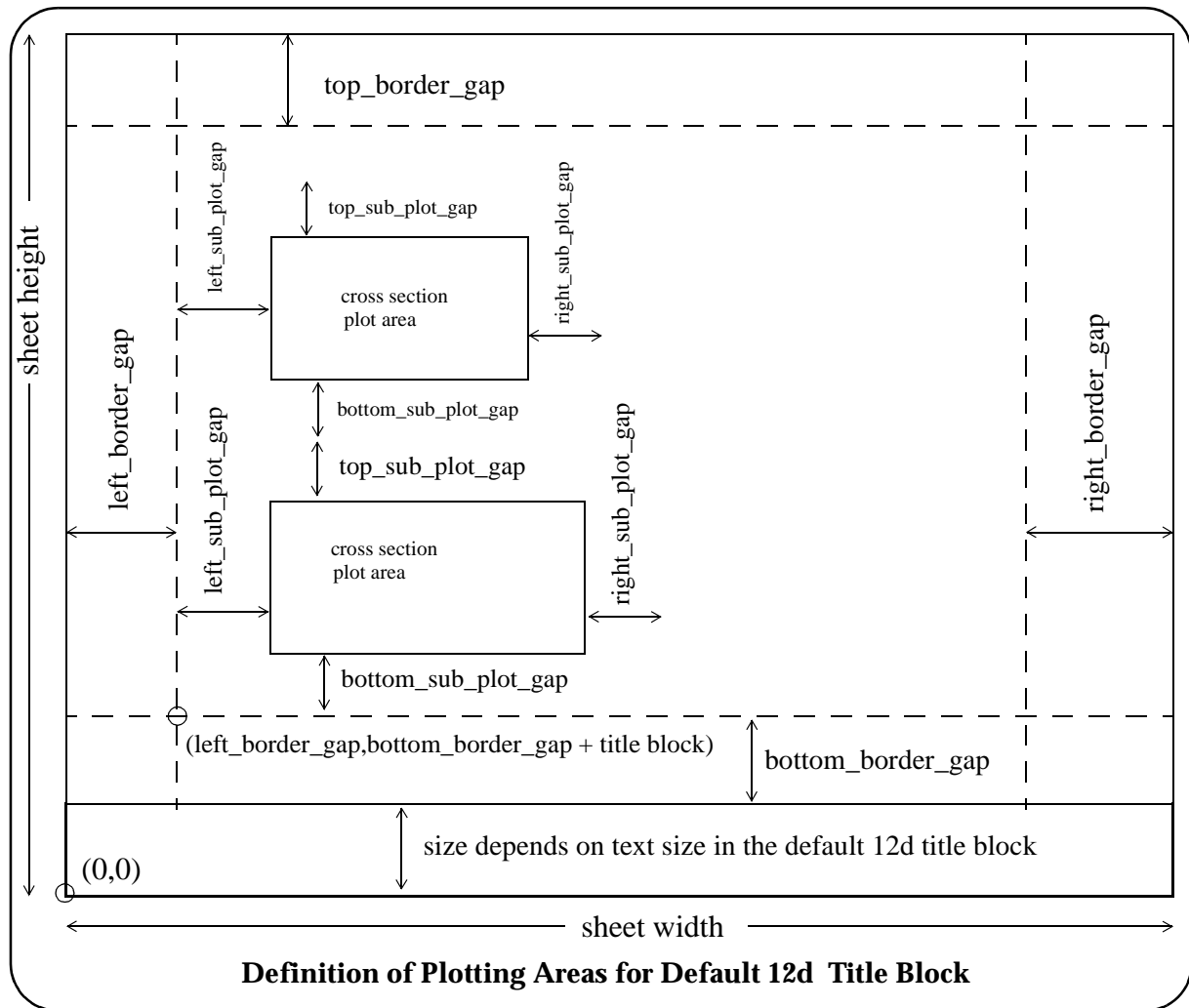
The individual x-section plots are then drawn going up the column, and when the column is full, start from the bottom of the next column.

When a sheet is full, a follow on sheet is created.

Each individual x-section sub-plot is positioned with the surrounding gaps:

left_sub_plot_gap	mm
right_sub_plot_gap	mm
top_sub_plot_gap	mm
bottom_sub_plot_gap	mm





If required, all the sub-plots in a column can be automatically positioned up so that the zero offsets (the centrelines) of each x-section line up.

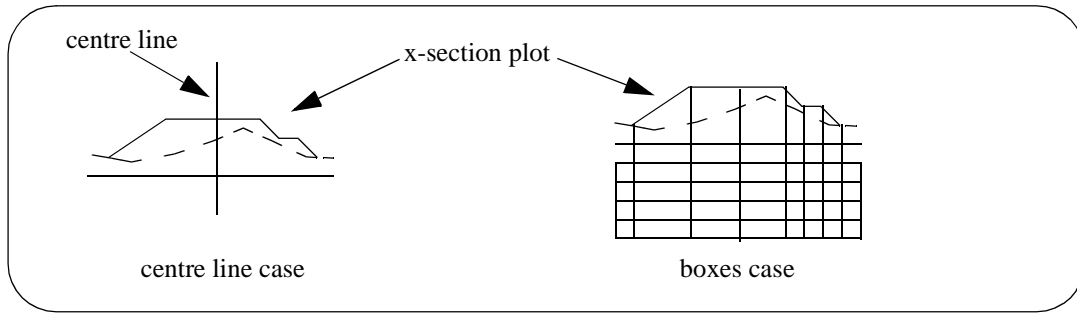
```
line_up_cl          yes/no          // yes - line up zero offsets
```

The width of the plot can be a fixed distance left or right of the centre line (zero offset) or for the full section plus an extra left and right distance:

```
absolute_extensions  yes           // The section goes from the
                        // left_extension offset on the left to the
                        // right_extension offset on the right.
                        no           // The section goes for the entire section
                        // length plus the left and right extension
                        // distances.
left_extension        world-units   // left extension value
right_extension       world-units   // right extension value
```

The x-section can be drawn and labelled with either

- (a) centreline case - the x-section is plotted and an upright, and the offset and height value at the zero offset (normally the centre line position)
- (b) boxes case - the x-section is plotted and the heights of the x-section and the tins at all the x-section points are labelled in boxes under the plot of the x-section.

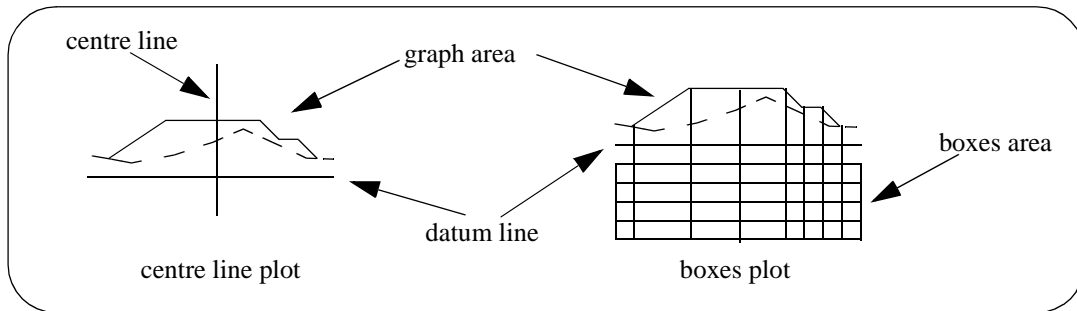


The x-section sub-plot itself consists of the three regions - graph, datum and boxes.

The **graph area** is the area where the actual plots of the strings are drawn. This exists for both the centreline and boxes case.

The **datum area** is the region between graph area and the datum line. This exists for both the centreline and boxes cases.

The **boxes area** is where the offset values and the heights for the strings drawn on the x-section plot are labelled. This only exists for the boxes case.



For both cases, the x-section sub-plot can be labelled with other information such as

- (a) grades across the x-section
- (b) points across the x-section
- (c) cuts the x-section makes through strings
- (d) cut and fill areas

All the required parameters will be described in the following sections.

Please continue to the next section “Boxes and Datum Area” .

Boxes and Datum Area

The x-section can be labelled with either

- (a) an upright, and the offset and height value at the zero offset (normally the centre line position)
- (b) the heights of the x-section and the tins at all the x-section points.

The choice is given by the parameter **label_type**:

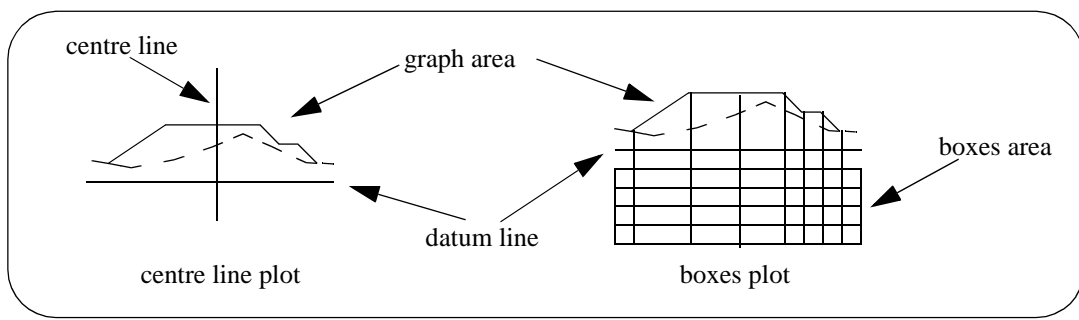
```
label_type          "centre line"          // type (a)
                   boxes                   // type (b)
```

A datum line exists for both cases.

For the boxes case, a box area for the offset and heights is created below the datum line. The available parameters for tailoring the box area will be given after describing the datum line parameters.

For the centre line case, the centre line and offset and height of the centre line are shown.

In both cases, the actual cross section plot is drawn above the datum line in the graph area.



Please continue to the next section "Centre Line Case" for the centre line parameters.

Please continue to the section "Boxes Case" for the boxes parameters.

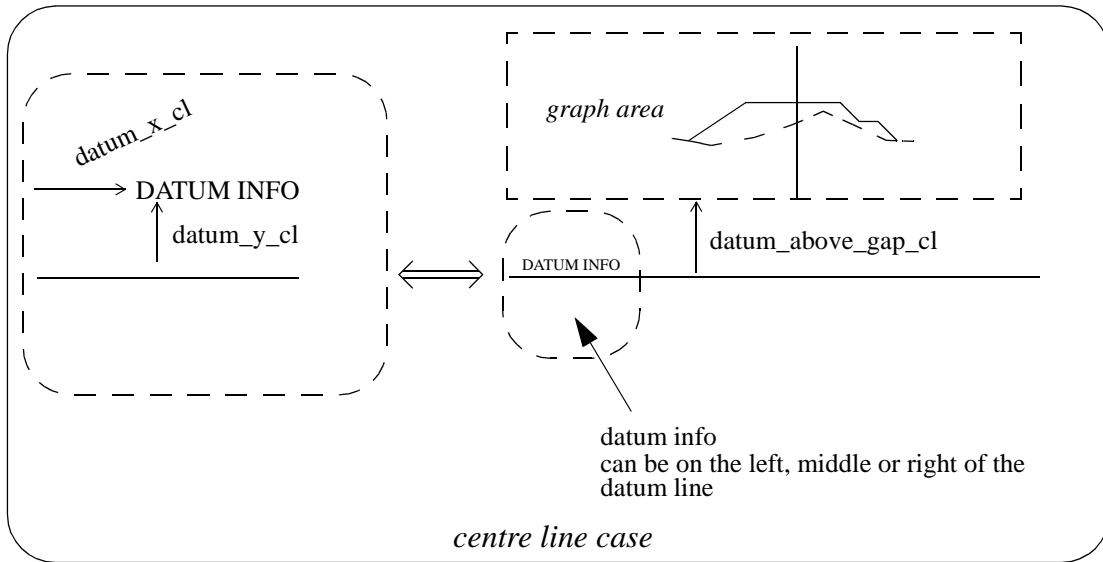
Centre Line Case

Datum Line

Each x-section sub-plot can be labelled with the datum value for the plot of the x-section string.

This DATUM INFO label is made up of the text strings:

"datum_name" followed by the *datum-value*
and is above the datum line.



For the centreline case, the graph area is positioned the distance **datum_above_gap_cl** above the datum line.

```
datum_above_gap_cl      mm           // dist from datum line to bottom of the
                               // graph area
```

The **datum_above_gap_cl** can be zero or positive.

The roundoff for the datum value is specified by the user (default 1.0) and the datum is automatically calculated for each sub-plot, and labelled.

The datum value can be placed on the left, centre or right side of the datum line.

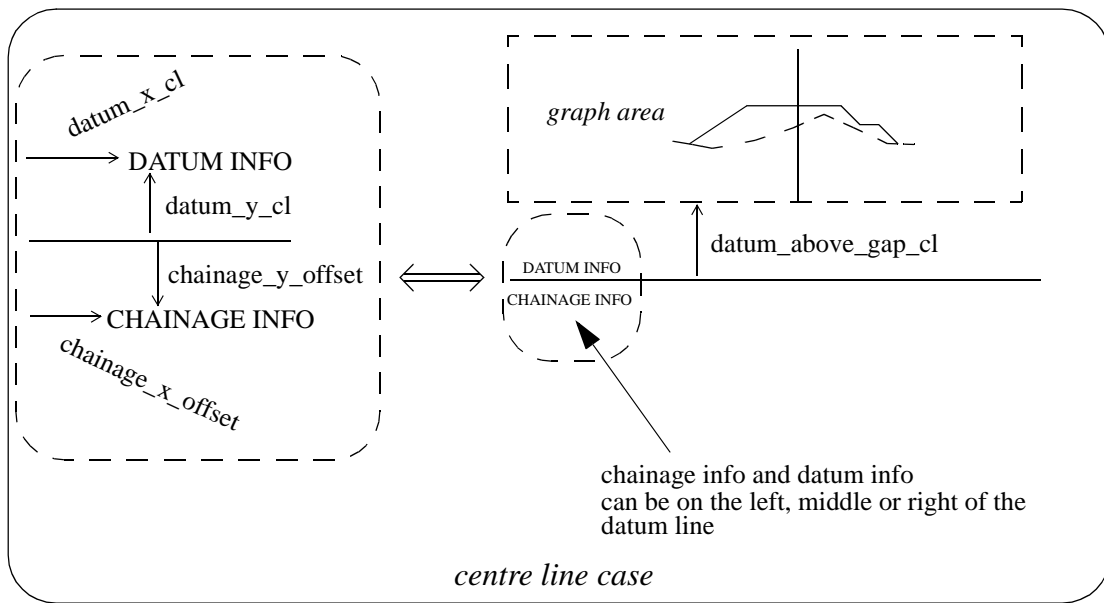
```
datum_roundoff          1.0          // value to roundoff the datum value to
                               // e.g. 0.5, 0.2, 1.0 (default 1.0)
datum_decimals           integer     // number of decimal places to display
                               // the datum value (default 1).
                               // If > 0, trailing zeros are removed after
                               // the decimal point.
                               // If < 0, the absolute value is taken as the
                               // number of decimal places to report
                               // i.e. no trailing zeros are removed
datum_side_cl            0           // datum text in middle of datum line
                               1       // " " " left of datum line (default)
                               2       // " " " right of datum line
datum_linestyle          linestyle   // datum line linestyle (default solid)
datum_name               text        // text to write before the datum value
datum_textstyle          text        // textstyle for datum information
datum_text_size          mm          // size of datum text and value
datum_colour             colour      // colour of the datum text
datum_line_colour        colour      // colour of the datum line
datum_text_justification_cl just     // justification for datum text
                               // NOTE - this is not normally required since
                               // by default the text justification is set to
                               // match datum_side_cl
datum_x_cl               mm          // distance to move the datum text
                               // along the datum line
datum_y_cl               mm          // distance to raise the datum text
                               // above the datum line (used to be
                               // called datum_offset)
```

The **datum_x_cl** and **datum_y_cl** can be positive, zero or negative.

Labelling the Centreline Chainage

Each x-section sub-plot can be labelled with the centreline chainage of the x-section string. This CHAINAGE INFO label is made up of the text strings:

"chainage_title" followed by the *chainage-value* and is drawn under the datum line.



The chainage value can be placed on the left, centre or right side of the datum line.

chainage_side_cl	0	// text in middle of datum line (default)
	1	// " " " " left of datum line
	2	// " " " " right of datum line

The parameters controlling the labelling are:

chainage_label	0/1	// 1 = label sub-plot with centreline // chainage, 0 don't label.
chainage_title	<i>text</i>	// text before the chainage value
chainage_decimals	<i>integer</i>	// number of decimals in the chainage // value. If <0, the absolute value // is taken as the number of decimal // places i.e. no trailing zeros are // removed for the values in the // chainage values.

chainage_colour	<i>colour</i>	// colour of the text
chainage_size	<i>mm</i>	// size of the text
chainage_textstyle	<i>colour</i>	// textstyle for the chainage label
chainage_text_justification_cl	<i>just</i>	// justification of the chainage text
chainage_x_offset	<i>mm</i>	// x position of text
chainage_y_offset	<i>mm</i>	// y position of text

The *chainage_x_offset* is measured from the beginning of the datum line.

The *chainage_y_offset* is measured from the bottom of the datum line with positive being **down**.

Centre Line Linestyle

The upright at the centre line position can have its own linestyle.

`cl_linestyle` *linestyle* //linestyle for centreline

Labelling the Design Height, X and Y Co-ordinates and Tin Heights at Offset Zero

The values of the height and X and Y co-ordinates of the **primary string** (usually the design cross section) at the zero offset can be labelled. Note that zero offset is normally where the alignment string cuts the cross section.

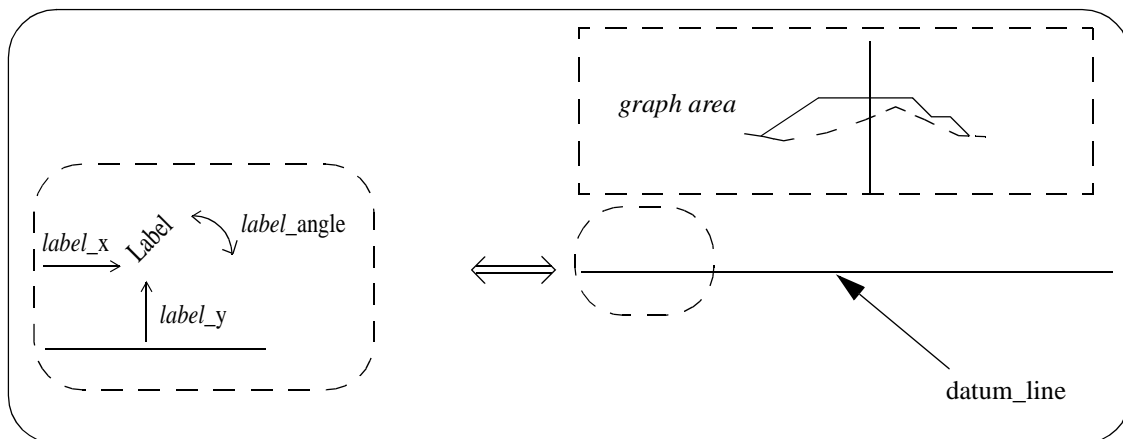
The heights of any tins (such as the natural surface) at the zero offset can also be labelled.

The labels are made up of:

pre_text value post_text

where *value* is either a height or a co-ordinate.

The label is positioned at either the left, right or middle of the datum line, with an x and y adjustment and a rotation.



Parameters for labelling the X Co-ordinate at Zero Offset:

primary_x0_draw_mode	0	// don't draw the label -default
	1	// draw the label
primary_x0_position	0	// label in middle of datum line (default)
	1	// " " " " left of datum line
	2	// " " " " right of datum line
primary_x0_pre_text	text	// pre-text for label - def " "
primary_x0_post_text	text	// post-text for label - def " "
primary_x0_decimals	integer	// number of decimal places to display - def 1
		// If > 0, trailing zeros are removed after
		// the decimal point
		// If < 0, the absolute value is taken as the
		// number of decimal places to report
		// i.e. no trailing zeros are removed
primary_x0_x	mm	// x adjustment to position of label - def 0
primary_x0_y	mm	// y adjustment to position of label - def 0
primary_x0_angle	degrees	// angle of the label - def 0
primary_x0_colour	colour	// colour of the label
primary_x0_size	mm	// size (in mm) of the label
primary_x0_textstyle	textstyle	// textstyle of the label
primary_x0_justify	just	// justification for text

Parameters for Labelling the Y Co-ordinate at Zero Offset:

primary_y0_draw_mode	0	// don't draw the label -default
	1	// draw the label
primary_y0_position	0	// label in middle of datum line (default)
	1	// " " " " left of datum line

	2	// " " " right of datum line
primary_y0_pre_text	text	// pre-text for label - def " "
primary_y0_post_text	text	// post-text for label - def " "
primary_y0_decimals	integer	// number of decimal places to display - def 1
		// If > 0, trailing zeros are removed after
		// the decimal point
		// If < 0, the absolute value is taken as the
		// number of decimal places to report
		// i.e. no trailing zeros are removed
primary_y0_x	mm	// x adjustment to position of label - def 0
primary_y0_y	mm	// y adjustment to position of label - def 0
primary_y0_angle	degrees	// angle of the label - def 0
primary_y0_colour	colour	// colour of the label
primary_y0_size	mm	// size (in mm) of the label
primary_y0_textstyle	textstyle	// textstyle of the label
primary_y0_justify	just	// justification for text

Parameters for Labelling the Height of Primary String at Zero Offset:

primary_height_draw_mode	0	// don't draw the label -default
	1	// draw the label
primary_height_position	0	// label in middle of datum line (default)
	1	// " " " left of datum line
	2	// " " " right of datum line
primary_height_pre_text	text	// pre-text for label - def " "
primary_height_post_text	text	// post-text for label - def " "
primary_height_decimals	integer	// number of decimal places to display - def 1
		// If > 0, trailing zeros are removed after
		// the decimal point
		// If < 0, the absolute value is taken as the
		// number of decimal places to report
		// i.e. no trailing zeros are removed
primary_height_x	mm	// x adjustment to position of label - def 0
primary_height_y	mm	// y adjustment to position of label - def 0
primary_height_angle	degrees	// angle of the label - def 0
primary_height_colour	colour	// colour of the label
primary_height_size	mm	// size (in mm) of the label
primary_height_textstyle	textstyle	// textstyle of the label
primary_height_justify	just	// justification for text

Parameters for Placing Some Text:

extra_text_draw_mode	0	// don't draw the label -default
	1	// draw the label
extra_text_position	0	// label in middle of datum line (default)
	1	// " " " left of datum line
	2	// " " " right of datum line
extra_text	text	// text for label - def " "
extra_text_x	mm	// x adjustment to position of label - def 0
extra_text_y	mm	// y adjustment to position of label - def 0
extra_text_angle	degrees	// angle of the label - def 0
extra_text_colour	colour	// colour of the label
extra_text_size	mm	// size (in mm) of the label
extra_text_textstyle	textstyle	// textstyle of the label
extra_text_justify	just	// justification for text

Parameters for Labelling the Height of a Tin at Zero Offset:

A section along the primary string through each tin on the section view is automatically drawn

on the cross section plot but the user can specify whether the tin height at the zero offset is labelled or not.

Hence although there may be a number of tins drawn on the section plot, not all of them need to have their height at zero offset labelled.

The default order for labelling the tins is the order that they were added to the view but it is possible to specify which tin is used for labelling by giving the tin name rather than just using the tin on the section view.

In fact, it is possible to use **any tin** in the project to **label** the height at zero offset, **not just those drawn** on the section view.

```
tin_n_name          text          // n=1, ... no of tins on the section view.
                               // use the tin called text to label the nth
                               // row of tin heights.
```

If a tin of the name given by ***tin_n_name*** does not exist, then the plot is not produced and an error message is given.

The parameters for labelling the height of the tin at zero offset are:

```
tin_n_height_draw_mode    0          // don't draw the label -default
                          1          // draw the label
tin_n_height_position     0          // label in middle of datum line (default)
                          1          // " " " " left of datum line
                          2          // " " " " right of datum line
tin_n_height_pre_text     text       // pre-text for label - def " "
tin_n_height_post_text    text       // post-text for label - def " "
tin_n_height_decimals     integer    // number of decimal places to display - def 1
                               // If > 0, trailing zeros are removed after
                               // the decimal point
                               // If < 0, the absolute value is taken as the
                               // number of decimal places to report
                               // i.e. no trailing zeros are removed
tin_n_height_x            mm         // x adjustment to position of label - def 0
tin_n_height_y            mm         // y adjustment to position of label - def 0
tin_n_height_angle        degrees   // angle of the label - def 0
tin_n_height_colour       colour    // colour of the label
tin_n_height_size         mm        // size (in mm) of the label
tin_n_height_textstyle    textstyle  // textstyle of the label
```

Labelling the Centre Line Offset and Height

In the centre line case, the value of the height of the **primary string** (usually the design cross section) at the zero offset can be labelled. This is normally where the alignment string cuts the cross section.

The label is made up of the texts:

primary_title offset_title offset_value height_text height_value

NOTE: These parameters have now been superseded. The parameters for labelling the height of the primary string at zero offset covers this case. To use the zero offset parameters instead, the *primary_height_pre_text* would include all text required for the Primary_title, offset_title, offset_value and height_text (offset_value is always 0.0).

The parameter *primary_mode_cl* controls whether the **primary_title** is included in the label.

primary_mode_cl	0	// don't include primary_title, primary_value
	1	// incl. primary_title, primary_value default

The parameter *height_mode_cl* controls whether the **height_title** and **height_value** are included in the label.

height_mode_cl	0	// don't include height_title, height_value
	1	// include height_title, height_value default

The parameter *offset_mode_cl* controls whether the **offset_title** and **offset_value** are included in the label.

offset_mode_cl	0	// don't include offset_title, offset_value
	1	// include offset_title, offset_value default

The label can be placed on the left, centre of right side of the datum line.

offset_height_side_cl	0	// text in middle of datum line (default)
	1	// " " " " left of datum line
	2	// " " " " right of datum line

The size, colour, text justification and text style for the label is given by:

primary_title	text	//primary title
offset_title	text	// offset label (default "Offset")
height_text	text	// height text label (default "Height")
primary_textstyle	textstyle	// textstyle used for offset and height label
primary_colour	colour	//colour for offset and height label
primary_size	mm	//size of the offset and height label
offset_height_text_justification_cl	justif	// text justification
		// NOTE - this is not normally required since
		// by default the text justification is set to
		// match offset_height_side_cl

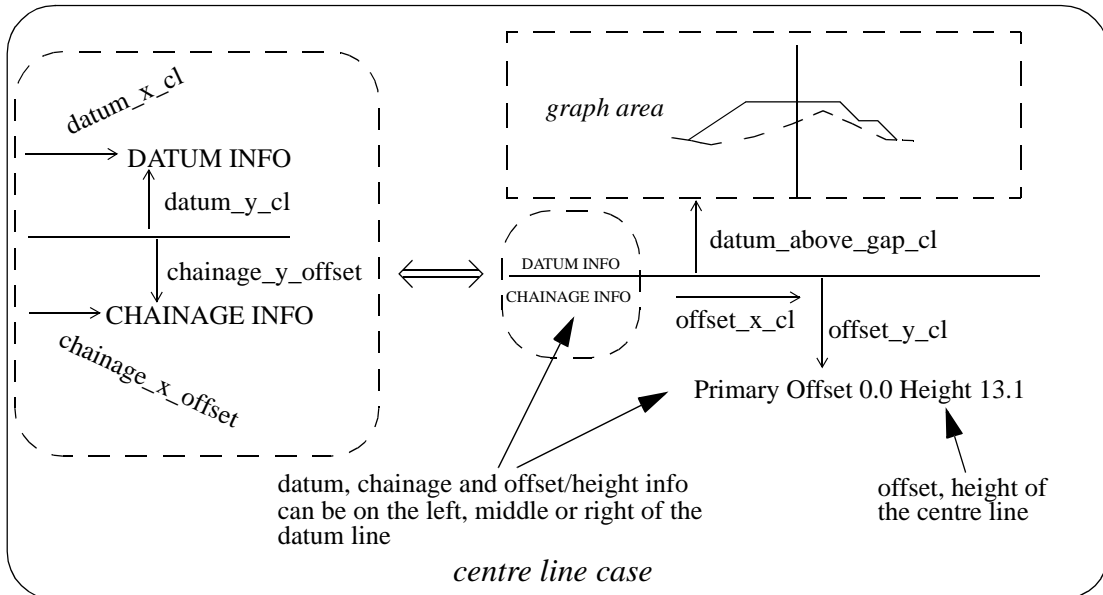
The number of decimals in the offset-value and height-value is controlled by:

number_of_decimals	integer	// number of decimal places in the offset,
		// height boxes. If <0, the absolute value
		// is taken as the number of decimal
		// places i.e. no trailing zeros are
		// removed for the values in the offset,
		// heights area.

The label is placed an distance *offset_x_cl* along the datum line and a distance *offset_y_cl* below the datum line of the plot.

offset_x_cl	mm	// distance to move the text along the
		// datum line
offset_y_cl	mm	// distance to shift the text below the
		// datum line

The *offset_y_cl* is measured from the datum line with positive being **down**.



Please continue to the next section “Boxes Case” for the boxes parameters.

Please continue to the section “Graph Area” if you are not using boxes parameters.

Boxes Case

Datum Line

For the boxes case, the **datum line** is positioned the distance ***datum_below_gap*** above the top of the boxes area and the graph area is then positioned the distance ***datum_above_gap*** above the datum line.

Hence the graph area is distance (*datum_below_gap* + *datum_above_gap*) above the top of the boxes area.

```
datum_above_gap      mm           // dist from datum line to bottom of the
                        // graph area
datum_below_gap      mm           // dist from datum line to the top of the
                        // boxes
datum_linestyle      linestyle    //linestyle for the datum line
```

The *datum_below_gap* and *datum_above_gap* can be zero or positive.

The roundoff for the datum value is specified by the user (default 1.0) and the datum is automatically calculated for each sub-plot, and labelled.

```
datum_roundoff      1.0           // value to roundoff the datum value to
                        // e.g. 0.5, 0.2, 1.0 (default 1.0)
datum_decimals      integer       // number of decimal places to display
                        // the datum value (default 1).
                        // If > 0, trailing zeros are removed after
                        // the decimal point.
                        // If <0, the absolute value is taken as the
                        // number of decimal places to report
                        // i.e. no trailing zeros are removed
datum_name          text          // text to write before the datum value
datum_textstyle     text          // textstyle for datum information
datum_text_size     mm           // size of datum text and value
datum_colour        colour       // colour of the datum text
datum_line_colour   colour       // colour of the datum line
datum_x            mm           // distance to move the datum text
                        // along the datum line
datum_y            mm           // distance to raise the datum text
                        // above the datum line (used to be
                        // called datum_offset)
```

The *datum_x* and *datum_y* can be positive, zero or negative.

Labelling the Centreline Chainage

Each x-section sub-plot can be labelled with the centreline chainage of the x-section string.

This CHAINAGE INFO label is made up of the text strings:

"chainage_title" followed by the *chainage-value*
and is drawn under the boxes area.

The parameters controlling the labelling are:

```
chainage_label      0/1           // 1 = label sub-plot with centreline
                        // chainage, 0 don't label.
chainage_title      text          // text before the chainage value
chainage_decimals   integer       // number of decimals in the chainage
                        // value. If <0, the absolute value
                        // is taken as the number of decimal
                        // places i.e. no trailing zeros are
                        // removed for the values in the
```

```

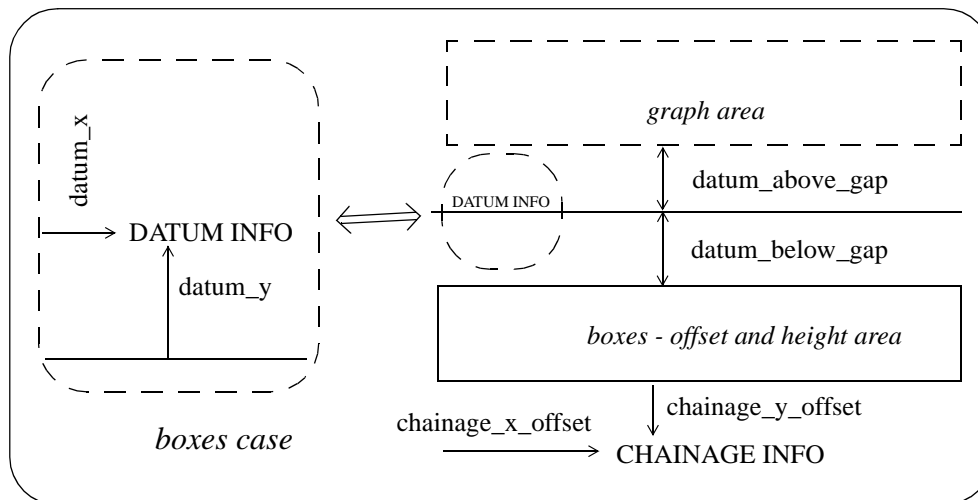
chainage_size           mm           // chainage values.
chainage_textstyle      colour      // size of the text
chainage_text_justification just    // textstyle for the chainage label
chainage_colour         colour      // justification of the chainage text
chainage_x_offset       mm           // colour of the text
chainage_y_offset       mm           // x position of text
                                // y position of text

```

The *chainage_x_offset* is measured from the beginning of the height boxes.

If *chainage_x_offset* is omitted, the text is centred on heights area.

The *chainage_y_offset* is measured from the bottom of the box area with positive being **down**.



Defining Boxes

When **boxes** is selected for *label_type*, the primary string (usually the design cross section) and each tin in the x-section sub-plot can be labelled with one or two lines of title, and the height at the offset position for each point in the primary string.

The **title** for the strings, is drawn in the **title area** of the **boxes area**.

The offsets/heights are drawn in the **heights area** of the **boxes area**.

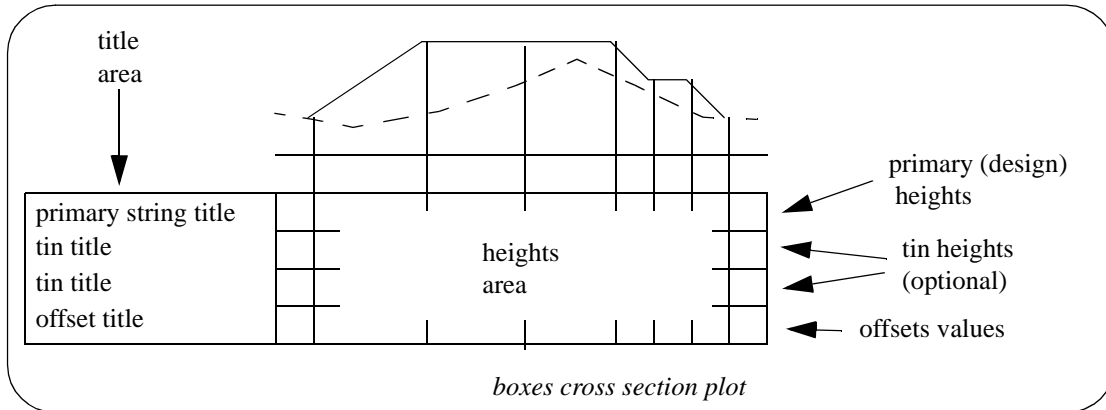
Consequently the boxes area is made up of rows of text consisting of:

string/tin titles followed by the **offset/height values** across the string/tin.

Each row is surrounded by lines to form a box.

The default order of the boxes from the bottom up is

- (a) offset title and values
- (b) tin title and heights - natural surface etc. (optional)
- (c) primary string title and heights - design x-section (optional)



The **title area** starts at the relative position (`left_sub_plot_gap`,`bottom_sub_plot_gap`).

The size of the title text is given by the **`title_box_text_size`** parameter.

The width of the title area is either given by the **`space_for_titles`** parameter, or if omitted, the required width is automatically calculated.

```
title_box_text_size      mm           // size of the titles in the boxes
space_for_titles        mm           // calculated if omitted
```

There can be two lines of title text and the title text, textstyle and colour can be set independently for the primary string and each tin.

The x position of the title text is the same for all the lines of title text and can be set to be a fixed distance from the left hand side of the boxes.

```
box_titles_x            mm           // distance to move the title text from the
// left hand side of the boxes
```

The **heights area** starts at the end of the title area.

The height text is written at right angles to the bottom of the boxes. It can be either top or bottom justified with respect to the box (**`box_text_justification`**).

The number of decimal places and the size of the heights text can also be specified.

The height of each individual box area is either given by the **`horizontal_line_spacing`** parameter, or if omitted, the required height is automatically calculated.

```
number_of_decimals     integer      // number of decimal places in the
// height boxes. If <0, the absolute value
// is taken as the number of decimal
// places i.e. no trailing zeros are
// removed for the values in the heights
// area.

text_size               mm           // size of the height values
offset_textstyle        textstyle    // textstyle for height text
offset_colour           colour       // colour of height text

box_text_justification  0           // bottom of individual boxes
                       1           // top of individual boxes

horizontal_line_spacing mm           // calculated if omitted
```

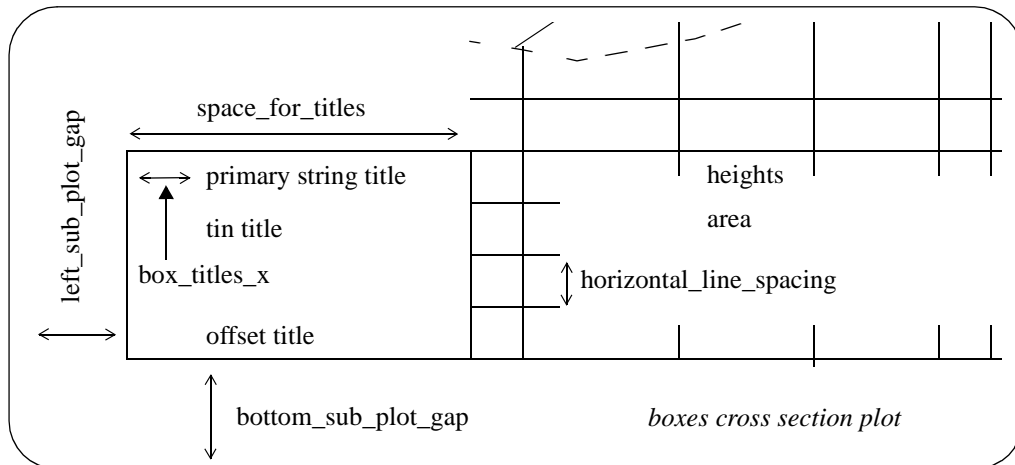
The total height of the boxes area is simply given by number of boxes drawn multiplied by the height of one box (they all have the same height).

The **width** of the heights area is determined by the number of chainages to be labelled and whether the values are staggered to prevent over writing.

Hence the total width of the boxes area is the width of the labels area plus the width of the

heights area.

Many distance definitions in the plot parameter file are given in terms of distance above the **top** of the boxes area.



The text in the title area is the same for each cross section plot on the sheet so it is possible to restrict the title area to be only on the first cross section on the sheet or the first column of cross sections.

label_first_only	0	//title area on all x-sections (default)
	1	// title area on first x-sect of page only
	2	// title area on x-sects in first column

The drawing of the box line work is user defined. This has been extended from V3.1 although *draw_box_mode* has been left in for forward compatibility.

draw_box_mode	0	// don't draw box lines
	1	// draw box lines around heights area // only
	2	// draw box lines around title and // heights areas
	3	// use draw_box_side_n, // box_line_draw_mode and // box_line_mode_n

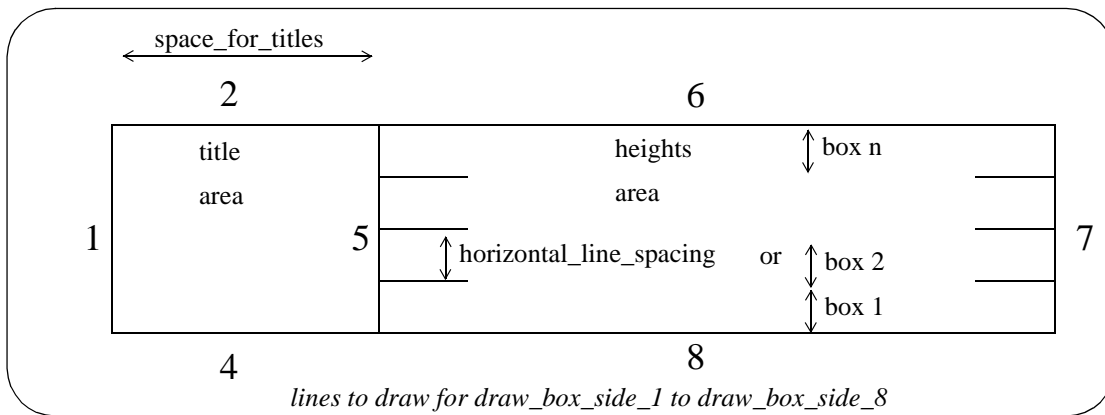
box_colour	colour	// colour of the boxes
------------	--------	------------------------

For V3.2, the line work for the outside of the title and heights boxes is controlled by the parameters *draw_box_side_n* and *box_side_colour_n*, and the separation lines inside the boxes are controlled by the parameters *box_line_draw_mode* and *box_line_mode_n* where the box numbering, n, starts from the bottom box.

Note: The following parameters are only used if *draw_box_mode* is set to **3**.

draw_box_side_1	1	// draw the left side of the title area (def)
	0	// don't draw the left side
box_side_colour_1	colour	// colour to draw left side of title area // default box_colour
draw_box_side_2	1	// draw top of the title area (default)
	0	// don't draw the top
box_side_colour_2	colour	// colour to draw top of title area // default box_colour
draw_box_side_4	1	// draw bottom of the title area (default)

	0	// don't draw the bottom
box_side_colour_4	colour	// colour to draw bottom of title area
		// default box_colour
draw_box_side_5	1	// draw left side of the heights area (def)
	0	// don't draw the left side
box_side_colour_5	colour	// colour to draw left side of heights area
		// default box_colour
draw_box_side_6	1	// draw top of the heights area (default)
	0	// don't draw the top
box_side_colour_6	colour	// colour to draw top of heights area
		// default box_colour
draw_box_side_7	1	// draw right side of the heights area def
	0	// don't draw the right side
box_side_colour_7	colour	// colour for right side of heights area
		// default box_colour
draw_box_side_8	1	// draw bottom of the heights area (def)
	0	// don't draw the bottom
box_side_colour_8	colour	// colour for bottom of heights area
		// default box_colour



The lines at the top of the individual boxes inside the title area and heights area (separation lines) are controlled by the parameters *box_line_draw_mode* and *box_line_mode_n*.

The separation lines can be drawn just in the title area, just in the heights area or in both areas.

The parameter *box_line_draw_mode* can be set to control all the separation lines but there are additional parameters, *box_line_mode_n*, which override *box_line_draw_mode* for each of the individual boxes where n = 1, ... number of boxes -1.

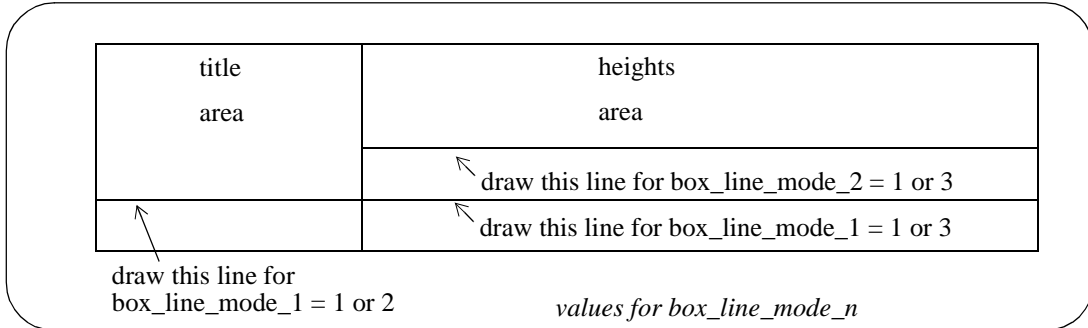
The top of the top box is not controlled by *box_line_mode_n* but is controlled by the parameters *draw_box_side_2* and *draw_box_side_6*.

box_line_draw_mode	0	// don't draw any separation lines inside
		// the title and heights areas
	1	// draw the separation lines inside the
		// title and heights areas (default)
	2	// draw the separation lines inside the
		// title area only
	3	// draw the separation lines inside the
		// heights area only
box_line_mode_n	0	// for the nth box, don't draw any
		// line at the top of the box for either
		// the title or the heights areas
	1	// for the nth box, draw the line at the
		// top of the box for both the

```

// title and heights areas
2 // for the nth box, draw the line at the
// top of the box for the title area only
3 // for the nth box, draw the line at the
// top of the box for the heights area only

```

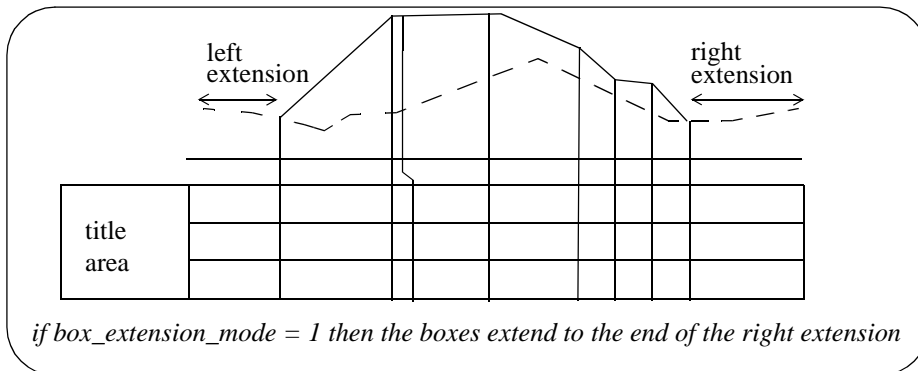


Finally, the right hand end of the boxes can stop at the end of the design x-section or extend to the end of the *right_extension* distance.

```

box_extension_mode    0 // default - stop right end of boxes at the
// end of design x-section
1 // extend right end of boxes to the end of
// the right_extension distance.

```



Offset Titles and Values

If the *label_type* is set to boxes, the offsets of the points across the primary string (usually the design cross section) are always labelled.

```

offset_title          text          // first line of offset title (def offsets)
offset_title_2       text          // second line of offset title
offset_title_textstyle textstyle   // textstyle for offset title
offset_title_colour  colour       // offset title text colour
offset_title_size    mm           // offset title text size
offset_colour        colour       // colour of offset values
offset_textstyle     textstyle    // textstyle for offset values
offset_size          mm           // size for offset values

```

Example of Offset Titles Parameters

```

// offset titles and values
offset_title      "Offset"
offset_title_2    "metres"
offset_title_colour grey

```

Primary String Titles and Heights

Sometimes the primary string (the design cross section) is only required to define the offset positions to label and the section line for the tin sections. In this case, the primary string would not be drawn on the cross section plot.

The drawing or not drawing of the primary string on each cross section plot is controlled by the parameter *primary_string*.

If the primary string is drawn, by default a row of labelling is included in the boxes area with up to two lines of title information and heights for each point across the cross section.

```

primary_string      yes          // draw and label the primary string
                   no           // don't draw or label the primary string

primary_title       text        // first line of string title
primary_title_2     text        // second line of string title
primary_title_textstyle textstyle // textstyle for primary string titles
primary_title_colour colour     // colour of the string titles
primary_title_size  mm          // primary title text size
primary_textstyle   textstyle   // textstyle for primary string heights
primary_title_y_pos mm          // if set, the height in mm above the
                               // bottom of all the boxes that the
                               // primary title text is drawn.
                               // If not set, then the text is placed at a
                               // height that puts it inside the default
                               // box for the primary title.

primary_colour      colour     // colour of the primary string heights
primary_size        mm          // primary text size
primary_y_pos       mm          // if set, the height in mm above the
                               // bottom of all the boxes that the
                               // primary height text is drawn.
                               // If not set, then the text is placed at a
                               // height that puts it inside the default
                               // box for the primary height text.

primary_decimals    integer     // number of dec places in primary height
                               // < 0 to keep all trailing zeros

```

Example of Labelling Primary String Titles

```
primary_title          "Design"  
// primary_title_2    "primary2" // not being used - commented out  
primary_colour        "purple"  
primary_title_colour  "red"
```

Tin Titles, Heights and Depths

A section along the primary string through each tin on the section view is automatically drawn on the cross section plot, but the user can specify whether the tin heights and depths are labelled or not in the boxes area.

Hence although there may be a number of tins drawn on the section plot, not all of them need to be labelled or have their depths labelled.

The default order for labelling the tins and depths is the order that they were added to the view but it is possible to specify which tin is used for labelling each row of tin heights and depths by giving the tin name rather than just using the tin order on the section view.

In fact, it is possible to use **any tin** in the project to label a row, **not just those drawn** on the section view.

```
tin_n_name          text          // n=1, ... no of tins on the section view.
                               // use the tin called text to label the nth
                               // row of tin heights.
```

If a tin of the name given by ***tin_n_name*** does not exist, then the plot is not produced and an error message is given.

For the following parameters, *n* takes the value 1 to 100 and specifies that the parameter set applies to the *n*th tin on the section view or if *tin_n_name* is set, by the tin specified by *tin_n_name*.

```
tin_n_draw_mode    I              // draw the nth tin (default)
                  0              // don't draw the nth tin
tin_n_draw_colour  colour         // colour to draw the nth tin
                               // if omitted then use the tin colour

tin_n_label        I              // label the nth tin (default)
                  0              // don't label the nth tin

tin_n_title        text          // first line of nth tin title
tin_n_title_2      text          // second line of nth tin title
tin_n_title_textstyle  textstyle // textstyle for nth tin titles
tin_n_title_colour colour        // colour for nth tin titles
tin_n_title_size   mm           // size for nth tin titles
tin_n_title_y_pos  mm           // if set, the height in mm above the
                               // bottom of all the boxes that the
                               // tin title text is drawn.
                               // If not set, then the text is placed at a
                               // height that puts it inside the default
                               // box for the tin heights.

tin_n_decimals     integer        // number of dec places in tin height
                               // < 0 to keep all trailing zeros

tin_n_textstyle    textstyle      // textstyle of the tin heights
tin_n_colour       colour         // colour for heights and depths
tin_n_size         mm            // default nth tin's title size
tin_n_y_pos       mm            //if set, the height in mm above the
                               //bottom of all the boxes that the
                               // tin height text is drawn.
                               //If not set, then the text is placed at a
                               //height that puts it inside the default
                               // box for the tin heights.

tin_n_depth_label  1/0           // 1 to label, 0 don't label depths
tin_n_depth_title  text          // first line of tin depth title
tin_n_depth_title_2 text         // second line of tin depth title
tin_n_depth_title_textstyle textstyle // textstyle of the tin depth titles
```

```

tin_n_depth_title_colour    colour    // colour for titles of depths
tin_n_depth_title_size     mm        // size for title of depths
tin_n_depth_title_y_pos    mm        // if set, the height in mm above the
                                // bottom of all the boxes that the
                                // tin depth title text is drawn.
                                // If not set, then the text is placed at a
                                // height that puts it inside the default
                                // box for the tin heights.

tin_n_depth_decimals       integer    // number of dec places in tin height
                                // < 0 to keep all trailing zeros

tin_n_depth_textstyle      textstyle  // textstyle of the tin depths
tin_n_depth_colour         colour     // colour for depths
tin_n_depth_size           mm        // size for depths
tin_n_depth_y_pos         mm        // if set, the height in mm above the
                                // bottom of all the boxes that the
                                // tin depth text is drawn.
                                // If not set, then the text is placed at a
                                // height that puts it inside the default
                                // box for the tin heights.

```

Definition of Depth to a Tin or to Offset Strings

The depth from the primary string to a tin, at a particular offset is defined as

$$\mathbf{depth} = \text{tin height value} - \text{height of the primary string}$$

That is, the depth that the primary string is **below** the tin.

Before plotting, the value of depth is multiplied by either the *depth_positive_factor* or *depth_negative_factor*.

```

if (depth >= 0)  plotted_depth_value = depth * depth_positive_factor
if (depth < 0)   plotted_depth_value = depth * depth_negative_factor

```

Hence the definition of depth can be modified by the parameters:

```

depth_positive_factor    value    // multiplier for positive depths
depth_negative_factor    value    // multiplier for negative depths

```

For example, if the opposite sign is required for depth, that is,

$$\mathbf{depth} = \text{height of the primary string} - \text{tin height value}$$

simply set

```

depth_positive_factor    -1
depth_negative_factor    1

```

Example of Labelling Tins

```

// tin label 1 for on
//           0 for off

tin_1_label            1
tin_1_title            "Natural"
// tin_1_title_2      "Surface"
tin_1_colour           grey
tin_1_title_colour     red

```

tin_2_label	1
tin_2_title	“Water table”
tin_2_colour	grey
tin_2_title_colour	red

Labelling the Design Height, X and Y Co-ordinates and Tin Heights at Offset Zero

The values of the height and X and Y co-ordinates of the **primary string** (usually the design cross section) at the zero offset can be labelled. Note that zero offset is normally where the alignment string cuts the cross section.

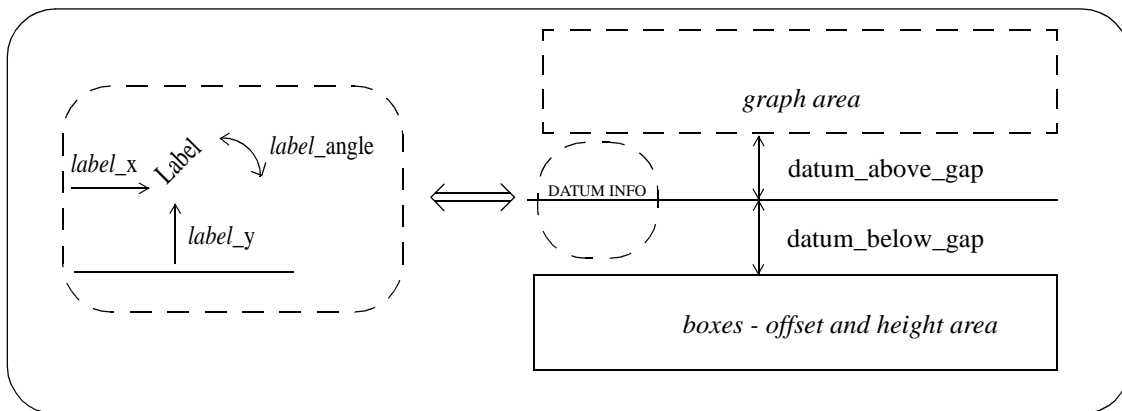
The heights of any tins (such as the natural surface) at the zero offset can also be labelled.

The labels are made up of:

pre_text value post_text

where *value* is either a height or a co-ordinate.

The label is positioned at either the left, right or middle of the datum line, with an x and y adjustment and a rotation.



Parameters for labelling the X Co-ordinate at Zero Offset:

primary_x0_draw_mode	0	// don't draw the label -default
	1	// draw the label
primary_x0_pre_text	text	// pre-text for label - def " "
primary_x0_post_text	text	// post-text for label - def " "
primary_x0_decimals	integer	// number of decimal places to display - def 1
		// If > 0, trailing zeros are removed after
		// the decimal point
		// If < 0, the absolute value is taken as the
		// number of decimal places to report
		// i.e. no trailing zeros are removed
primary_x0_x	mm	// x adjustment to position of label - def 0
primary_x0_y	mm	// y adjustment to position of label - def 0
primary_x0_angle	degrees	// angle of the label - def 0
primary_x0_colour	colour	// colour of the label
primary_x0_size	mm	// size (in mm) of the label
primary_x0_textstyle	textstyle	// textstyle of the label
primary_x0_justify	just	// justification for text

Parameters for Labelling the Y Co-ordinate at Zero Offset:

primary_y0_draw_mode	0	// don't draw the label -default
	1	// draw the label
primary_y0_pre_text	text	// pre-text for label - def " "

primary_y0_post_text	<i>text</i>	// post-text for label - def " "
primary_y0_decimals	<i>integer</i>	// number of decimal places to display - def 1 // If > 0, trailing zeros are removed after // the decimal point // If < 0, the absolute value is taken as the // number of decimal places to report // i.e. no trailing zeros are removed
primary_y0_x	<i>mm</i>	// x adjustment to position of label - def 0
primary_y0_y	<i>mm</i>	// y adjustment to position of label - def 0
primary_y0_angle	<i>degrees</i>	// angle of the label - def 0
primary_y0_colour	<i>colour</i>	// colour of the label
primary_y0_size	<i>mm</i>	// size (in mm) of the label
primary_y0_textstyle	<i>textstyle</i>	// textstyle of the label
primary_y0_justify	<i>just</i>	// justification for text

Parameters for Labelling the Height of Primary String at Zero Offset:

primary_height_draw_mode	<i>0</i>	// don't draw the label -default
	<i>1</i>	// draw the label
primary_height_pre_text	<i>text</i>	// pre-text for label - def " "
primary_height_post_text	<i>text</i>	// post-text for label - def " "
primary_height_decimals	<i>integer</i>	// number of decimal places to display - def 1 // If > 0, trailing zeros are removed after // the decimal point // If < 0, the absolute value is taken as the // number of decimal places to report // i.e. no trailing zeros are removed
primary_height_x	<i>mm</i>	// x adjustment to position of label - def 0
primary_height_y	<i>mm</i>	// y adjustment to position of label - def 0
primary_height_angle	<i>degrees</i>	// angle of the label - def 0
primary_height_colour	<i>colour</i>	// colour of the label
primary_height_size	<i>mm</i>	// size (in mm) of the label
primary_height_textstyle	<i>textstyle</i>	// textstyle of the label
primary_height_justify	<i>just</i>	// justification for text

Parameters for Placing Some Text:

extra_text_draw_mode	<i>0</i>	// don't draw the label -default
	<i>1</i>	// draw the label
extra_text_pre_text	<i>text</i>	// pre-text for label - def " "
extra_text_post_text	<i>text</i>	// post-text for label - def " "
extra_text_decimals	<i>integer</i>	// number of decimal places to display - def 1 // If > 0, trailing zeros are removed after // the decimal point // If < 0, the absolute value is taken as the // number of decimal places to report // i.e. no trailing zeros are removed
extra_text_x	<i>mm</i>	// x adjustment to position of label - def 0
extra_text_y	<i>mm</i>	// y adjustment to position of label - def 0
extra_text_angle	<i>degrees</i>	// angle of the label - def 0
extra_text_colour	<i>colour</i>	// colour of the label
extra_text_size	<i>mm</i>	// size (in mm) of the label
extra_text_textstyle	<i>textstyle</i>	// textstyle of the label
extra_text_justify	<i>just</i>	// justification for text

Offset Selection for Uprights and Staggering of Heights

For each sub-plot, the offsets of the points across the x-section string (primary string) are used for positioning uprights (leader lines), and the offset and height labels for the uprights.

By default, there is an upright at each point across the primary string.

However, if the primary string is a 4d string, then the text at the points on the 4d string can be used as a key to **suppress** the labelling and upright at that point.

The parameters to **stop** labelling and uprights are:

mask_name_n 4d_string_point_text where n=1,100

Note -the text 4d_string_point_text can include wild cards (*) and characters (?).

After any *name masks* have been applied, it is often desirable to weed out offset values that are too close together before doing any labelling.

```
offset_label_tolerance                      value                      // weed out offset values closer together
                                                    // (in offset units) than this value
```

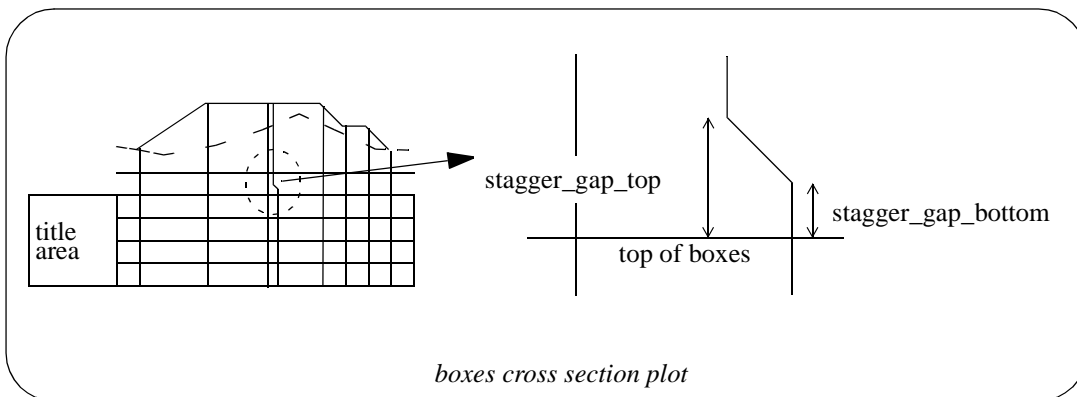
If the real offset position is used for the horizontal position of the offset/height text, text over writing can easily occur. To prevent over writing, the text is automatically **staggered**.

When staggering occurs, the real offset position is then indicated by the offset markers which are drawn at the top of the text boxes from the staggered text position back to the actual offset position of the text.

The size and position of the staggers are given by:

```
stagger_gap_top                      mm                      // distance from boxes to top of stagger
stagger_gap_bottom                      mm                      // distance from boxes to bottom of
                                                    // stagger
stagger_gap_factor                      value                      // distance between staggers is
                                                    // box_text_size * stagger_gap_factor
```

When staggering occurs, it is possible for the heights area to be wider than the graph area.



Uprights

Uprights (leader lines) can be drawn from the top of the staggers to strings drawn on the plot.

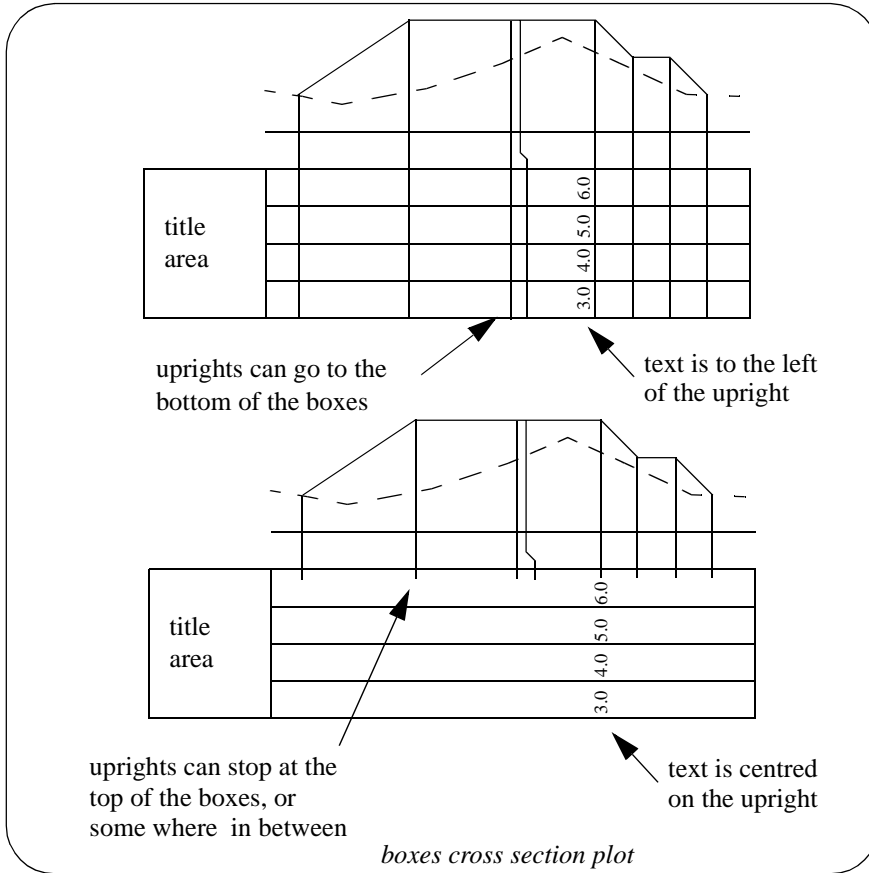
The height of the uprights is given by the ***uprights_draw_mode***:

<i>uprights_draw_mode</i>	0	// none
	1	// to maximum string height at that // chainage
	2	// ticks, to stagger height
	3	// to <i>uprights_y</i> above the boxes
	100	// to the primary string
	101-500	// to tin1 or tin2 etc.
<i>uprights_y</i>	<i>mm</i>	// distance to draw the uprights for // mode 3
<i>uprights_colour</i>	<i>colour</i>	// uprights colour (def boxes colour)

The uprights can go below the top of the boxes.

<i>uprights_bottom_mode</i>	0	// stop at top of boxes (default)
	1	// draw to bottom of boxes
	2	// draw to <i>uprights_bottom_y</i> below the // top of the boxes
	3	// draw to <i>uprights_bottom_y</i> above the // bottom of the boxes
	4	// ticks at chainage
<i>uprights_bottom_y</i>	<i>mm</i>	//distance
<i>uprights_text_offset_factor</i>	<i>value</i>	// move the text by this factor*size

When uprights go below the top of the boxes, the height and offset text is moved to the left so that the upright does not go through the text. The left hand side of the heights boxes also moves to the left to leave room for the height text.



Please continue to the next section "Graph Area" .

Graph Area

The **graph area** for each section sub-plot is the area where the actual plot of the x-section string is drawn.

The **width** of the graph area is determined by the width of the x-section string being plotted, the left and right extensions and horizontal scale (scale) given by parameters or in the **section x plot** panel, and the vertical exaggeration given by the section view or a parameter.

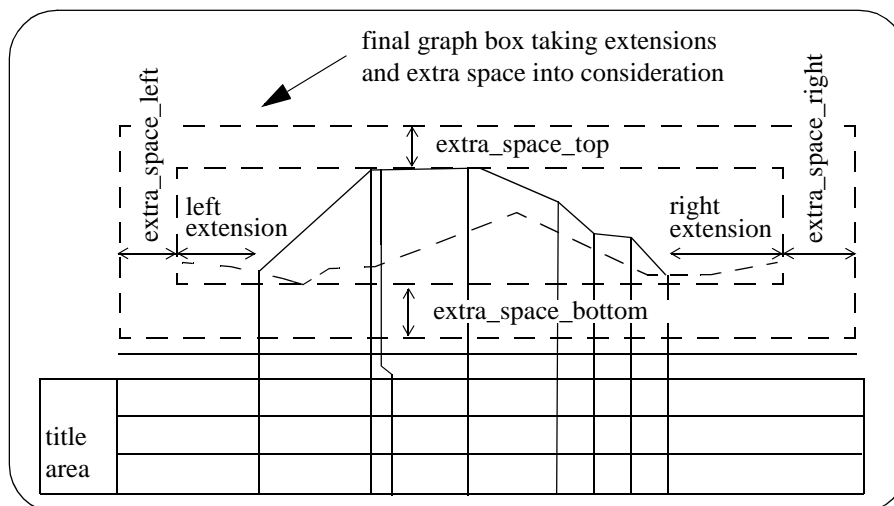
view_name	text	// default is section view in panel.
vertical_exaggeration	value	// default is vertical exag for view
scale	value	// 1:value - horizontal scale, default is // scale 1: in panel.
left_extension	world-units	// left extension value
right_extension	world-units	// right extension value

The vertical scale is determined by the horizontal scale and the vertical exaggeration.

The **height** of the graph area is determined by the vertical scale (given by the horizontal scale and the vertical exaggeration) and the minimum and maximum values of the data being plotted. Hence the graph height is a calculated rather than a given value.

The size of the graph area can also be extended to allow for symbols by the parameters:

extra_space_units	0	// extra space values are world units - default
	1	// " " " are millimetres on plot page
extra_space_left	units	// subtract from left of plot area, def 0
extra_space_right	units	// add to right of plot area, default 0
extra_space_top	units	// add to top of plot area, default 0
extra_space_bottom	units	// subtract from bottom of plot area, // default 0



The types of strings that are drawn in the graph area of a cross section plot are:

- primary string the x-section string from the x-section model that is being drawn.
Called the primary string and is usually the design x-section.
- tins sections of the primary string through any tins either in models on the section view or in corridor models.
- services parts of strings (from either models on the section view or in corridor models) that cut the defined corridor.

The **colour** of the strings in the plot is the actual string colour for cases (a) and (c), and the colour of the tin used for the section in case (b).

Although all the strings are plotted, the plot parameter file can be used to select which ones are

labelled with heights.

Primary String (Design Cross Section)

The primary string (the design cross section) is used to define

- (a) the design cross section
- (b) the chainage of the section
- (c) the offset positions for labelling heights and drawing uprights
- (d) the section line used for sectioning through tins
- (e) the section line for defining the corridor for services

Although the primary string is used to set up most of the information for the cross section plot, it doesn't have to be drawn on the cross section.

The drawing or not drawing of the primary string on each cross section plot is controlled by the parameter *primary_string* which was described earlier.

The **colour** of the primary string in the plot is the actual primary string colour.

Tins

A section along the primary string through each tin on the specified section view is automatically drawn on the cross section plot.

The **colour** and **linestyle** of the tin section in the plot is the actual tin colour and tin linestyle.

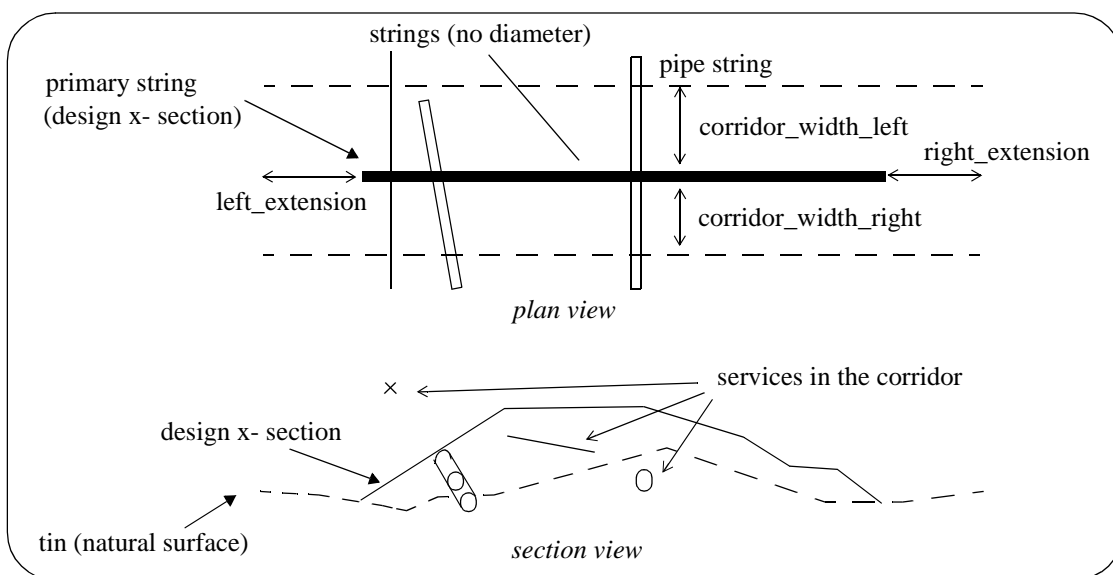
Whether the tin heights are labelled or not in the boxes area is controlled by parameters and has been described earlier

Corridor and Services

A corridor around the primary string is defined by giving a left and right corridor width and a left and right extension.

Any string in a model added to the section view is checked to see if it appears in the corridor, and if it does, then it is drawn on the cross section plot.

Strings do not have to cross the primary string, but just be in the corridor.



The corridor defining parameters are

```

left_extension      world-units      // left extension value
right_extension     world-units      // right extension value
corridor_width_left world-units      // corridor left and right widths
corridor_width_right world-units      // defaults are the section view values
corridor_overlap_left world-units      // corridor left and right overlaps.
corridor_overlap_right world-units      // defaults are the section view values
corridor_chord_arc  world-units      // chord-arc tolerance used to
// approximate arcs in the corridor.
// default is the section view value

```

The models containing tins for sectioning and strings for services are taken from the section view or given by the parameters

```

corridor_model_n    model          // n = 1, 2 ... 100
// models containing tins and service
// strings to be drawn on the view.

```

If any *corridor_model_n* parameters are defined, then only the models given by the parameters are used. If no *corridor_model_n* parameters are set, then the models added to the given section view are used.

That is, either the *corridor_model_n* parameters are used or if none exist, then the models added to the section view are used for tins and service strings.

The **colour** and **diameter** of the service strings drawn in the plot are the actual strings colour and diameter.

Please continue to the next section “Grade Labelling” .

Grade Labelling

The plot of the x-section string is made up of straight lines joining the individual points of the x-section.

The **grades** of these lines can be labelled:

```

grade_label        0          // don't label grades (default)
                   1          // label grades

```

Either the individual lines can be used as the segments to be labelled for grade, or adjacent lines of the same grade can be considered to be just one segment and labelled only once.

Hence the segments to be labelled for grade can be the individual lines of the x-section, or the segments defined by changes of grade.

```

grade_change_only  0          // label individual lines
                   1          // label change of grade segments

```

It is also possible to ignore segments smaller than a given minimum width on the plot.

```

grade_minimum_width mm          // segments smaller are not labelled

```

The grade labels are drawn parallel to the segment, centred about the segments end points, and a distance *grade_offset* above the segment. The size, colour and number of decimal places can all be set.

```

grade_decimals     integer      // number of decimal places in grade
grade_size         mm          // size of the grade label
grade_textstyle    text        // textstyle of the grade label
grade_colour       colour      // colour of the grade label
grade_offset       mm          // distance above the segment for label
grade_signed       yes         // default - grades are signed
                   no          // absolute value of grades

```

The grade can be labelled as percent cross-fall, 1 in slope, m/m or VicRoads x:1.

Also a threshold value can be set and any grades whose absolute value are below the threshold

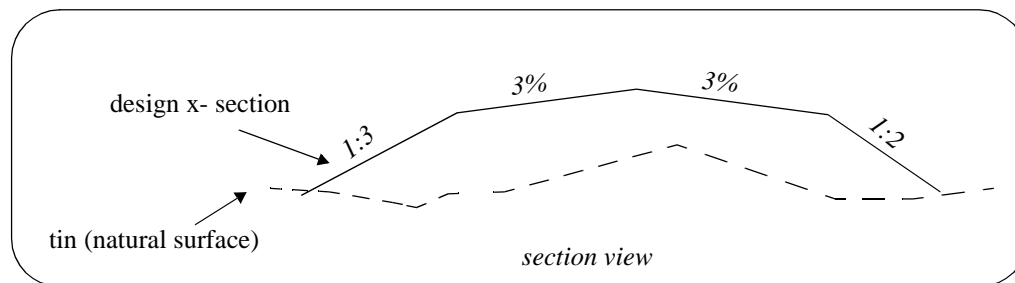
can be labelled in one way, and those above the threshold labelled a different way.

Hence, if the absolute value of the grade is less than or equal to the absolute value of *grade_threshold*, then **grade_mode** is used, otherwise **grade_upper_mode** is used.

```

grade_mode          0          // % grade
                   1          // 1 in
                   2          // m/m
                   3          // VicRoads x:1
grade_threshold     value      // grade threshold for type of grade
                                // labelling
grade_threshold_mode 0-3      // type of grade value given in
                                // grade_threshold types are the same as
                                // grade_mode
grade_upper_mode    0          // % grade
                   1          // 1 in
                   2          // m/m
                   3          // VicRoads x:1
grade_upper_decimals integer  // number dec places in grades above
                                // threshold value

```



Example of Grade Labelling

```

grade_label        1          // turn grade labels on
grade_mode         0          // percent grade
grade_decimals     1          // one decimal place, no trailing zeros
grade_change_only  1          // only label when change of grade

// text size for grade annotations
grade_size        2
grade_colour      yellow

// how far the annotation is (perpendicularly)
// from the string itself
grade_offset      1

// label all annotations separated by more than
// the minimum width in plot units
grade_minimum_width 0

// threshold and threshold mode describe the value
// at which the grade labelling changes
// mode to grade_upper_mode
grade_threshold    7          // change labelling when over 7%
grade_threshold_mode 0       // units for threshold - %
grade_upper_mode   1          // label as 1:x

```

Please continue to the next section “Labelling Points of the X-Sections” .

Labelling Points of the X-Sections

The points across each x-section can be automatically labelled on the x-section plots.

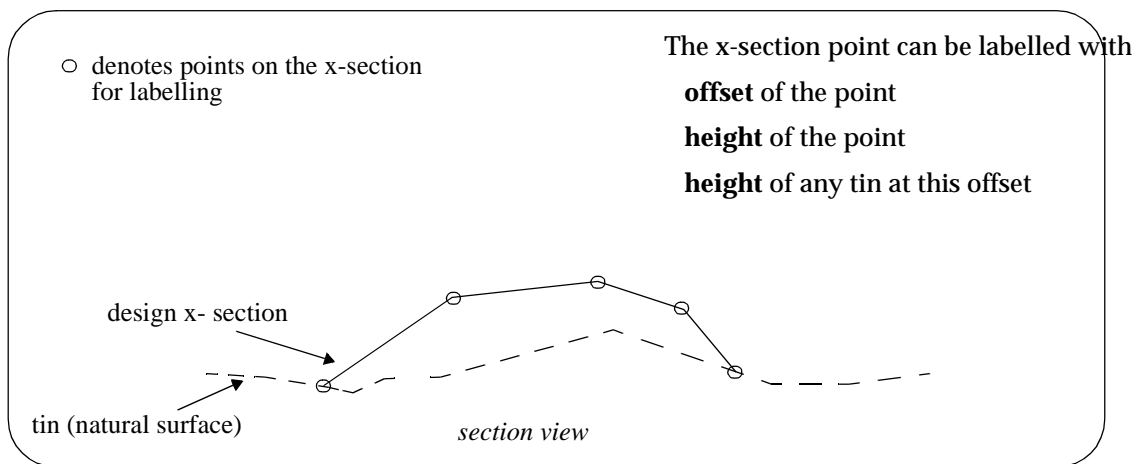
The **height**, **offset** and **name** of the point can be labelled as well as a **symbol** drawn. The height of tins at the same offset value can also be labelled.

The offset position for the labelling is the offset of the point.

The height position for the labelling can be specified as the

- (a) top of the boxes for the x-section
- (b) above the maximum height of the strings on the plot
- (c) height of the point on the x-section string (primary string)
- (d) height of a tin.

The actual position of the label is defined relative to the above point.



Note:

Only case (b) involves the actual height of the point on the cross section string. For all other cases, only the offset of the cut string is used.

Other heights, for example, the height of the tin at that offset can be used as the height (case (d)).

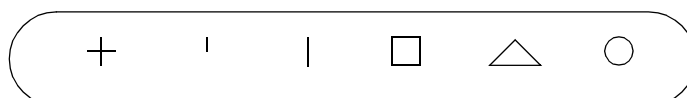
Text justification refers to the actual position and is given by

- | | | |
|---------------|-----------------|----------------|
| “top-left” | “top-centre” | “top-right” |
| “middle-left” | “middle-centre” | “middle-right” |
| “bottom-left” | “bottom-centre” | “bottom-right” |

A choice of six special symbols and/or any of the 12d symbols can be drawn at the cut point.

The special **12d** Model symbols of size one millimetre are drawn in a square box centred on (0,0) with sides of length two millimetres. That is, the box co-ordinates are (-1,-1), (1,1), (1,-1), (-1,-1).

The six special shapes are



Up to twenty five (25) separate sets of points can be labelled.

Parameters for Labelling Points of X-Sections

The points of the x-section to be for labelled for the nth set of parameters is restricted to all the points whose name satisfying the *points_n_mask*:

`points_n_mask` *point_names* // points to be labelled

where *point_names* is a text string containing the name masks, each separated by one or more spaces, to test the point name against. Each mask can include wild cards and wild characters.

For example

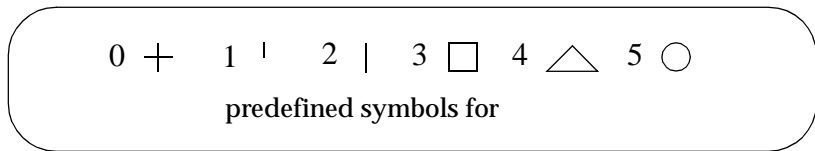
```

                                points_1_mask            "ke*"
or                               points_1_mask            "?bank*"
or, if both masks are required,
                                points_1_mask            "ke* ?bank*"
    
```

The parameters for drawing a **symbol** are

```

points_symbol_n_mode            0            // cross
                                1            // up from centre of box
                                2            // up and down from centre of box
                                3            // square
                                4            // triangle, base at bottom
                                5            //circle
                                6            // use a 12d symbol
    
```



If *points_symbol_n_mode* is 6, then the plot symbol is given by

```

points_symbol_n_style    plotsymbol    // name of the 12d symbol to draw at
point
    
```

Important Note

The plot symbol of name *plotsymbol* is defined in the file given by:

- (a) the parameter *plot_symbols* in the ppf file

```

plot_symbols            filename
    
```

or if *plot_symbols* is not defined, then

- (b) in the file pointed to by the environment variable `PLOT_SYMBOLS_4D`
`PLOT_SYMBOLS_4D` *filename* // default *plotsym.4d*

or if `PLOT_SYMBOLS_4D` is not defined, then

- (c) in the file *plotsym.4d*
 which is searched for in the standard set up file sequence

If none of the above files are defined, or if the symbol does not exist in the above files, then it will be searched for in the standard 12d symbols file which is:

- (d) either pointed to by the environment variable `SYMBOLS_4D`
`SYMBOLS_4D` *filename* // default *symbols.4d*

or if the environment variable `SYMBOLS_4D` does not exist, in the file, *symbols.4d*

The position of the symbol is given by:

points_symbol_n_position	1	// above point height value
	3	// above top of boxes
	4	// above top of graph area but not including // the extra_space_top
	100	// to primary string (same as 1)
	101-500	// to tin1 or tin2 etc.

The symbol can be adjusted by the parameters:

points_symbol_n_x	mm	// offset adjustment to position
points_symbol_n_y	mm	// height adjustment to position
points_symbol_n_angle	degrees	// rotation about point
points_symbol_n_colour	colour	// colour of symbol

and for all values of *points_symbol_n_mode* **other** than 6:

points_symbol_n_size	mm	// size of symbol, 0 don't draw
----------------------	----	---------------------------------

The value of the **offset** of the point can be labelled using the parameters

points_offset_n_position	1	// above point height value
	3	// above top of boxes
	4	// above top of graph area but not including // the extra_space_top
	100	// to primary string
	101-500	// to tin1 or tin2 etc.
points_offset_n_x	mm	// offset adjustment to position
points_offset_n_y	mm	// height adjustment to position
points_offset_n_angle	degrees	// rotation about point
points_offset_n_size	mm	// size of text, 0 don't label
points_offset_n_colour	colour	// colour of text
points_offset_n_textstyle	textstyle	// textstyle to use for points offset text.
points_offset_n_pre_text	text	// text before the offset value
points_offset_n_post_text	text	// text after the offset value
points_offset_n_justification	justification	// justification of the text
points_offset_n_no_decimals	integer	// number of decimals in offset

The value of a **height** at the offset of the point can be calculated and labelled using the parameters

points_height_n_mode	1	// use height of point itself
	3	// use real world height of position // above boxes
	100	// height of primary string (same as 1)
	101-500	// use height of to tin1 or tin2 etc.
points_height_n_position	1	// at points position
	3	// above top of boxes
	4	// above top of graph area but not including // the extra_space_top
	100	// to primary string (same as 1)
	101-500	// to tin1 or tin2 etc.
points_height_n_x	mm	// offset adjustment to position
points_height_n_y	mm	// height adjustment to position
points_height_n_angle	degrees	// rotation about point
points_height_n_size	mm	// size of text, 0 don't label
points_height_n_colour	colour	// colour of text
points_height_n_textstyle	textstyle	// textstyle to use for points height text.

points_height_n_pre_text	<i>text</i>	// text before the height value
points_height_n_post_text	<i>text</i>	// text after the height value
points_height_n_justification	<i>justification</i>	// justification of the text
points_height_n_no_decimals	<i>integer</i>	// number of decimals in height

A **label** which can include the **name** of the point is drawn by using the parameters

points_label_n_position	<i>1</i>	// at the points position
	<i>3</i>	// above top of boxes
	<i>4</i>	// above top of graph area but not including // the extra_space_top
	<i>100</i>	// to primary string (same as 1)
	<i>101-500</i>	// to tin1 or tin2 etc.
points_label_n_mode	<i>0</i>	// don't include point name
	<i>1</i>	// include point name in label
points_label_n_x	<i>mm</i>	// offset adjustment to position
points_label_n_y	<i>mm</i>	// height adjustment to position
points_label_n_angle	<i>degrees</i>	// rotation about point
points_label_n_size	<i>mm</i>	// size of text, 0 don't label
points_label_n_colour	<i>colour</i>	// colour of text
points_label_n_textstyle	<i>textstyle</i>	// textstyle to use for points label text.
points_label_n_pre_text	<i>text</i>	// text before the point name
points_label_n_post_text	<i>text</i>	// text after the point name
points_label_n_justification	<i>justification</i>	// justification of the text

Please continue to the next section "Labelling Cuts of X-Sections Through Strings in a Model" .

Labelling Cuts of X-Sections Through Strings in a Model

The cuts that each x-section string makes through any strings in user given models can be automatically labelled on the x-section plots.

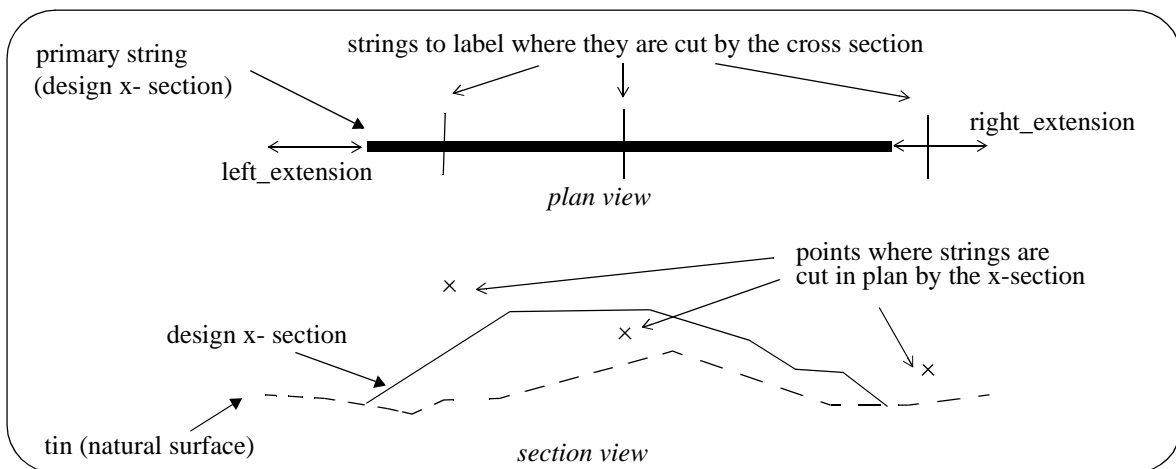
The **height**, **offset** and **name** of the cut string can be labelled as well as a **symbol** drawn. The height of tins at the same offset value can also be labelled.

The offset position for the labelling is the offset of the cut string.

The height position for the labelling can be specified as the

- top of the boxes on the x-section
- above the maximum height of the strings on the plot
- height value of the cut string
- height of the x-section string (the primary string)
- height of a tin.

The actual position of the label is defined relative to the above point.



Note:

Only case (b) involves the actual height of the cut string. For all other cases, only the offset of the cut string is used. Hence for all cases except (b), the string does need to have a sensible height to be used for cuts through strings.

For example, a boundary string may have null heights but only the offset is required and the height of the tin at that offset can be used as the height (case (d)).

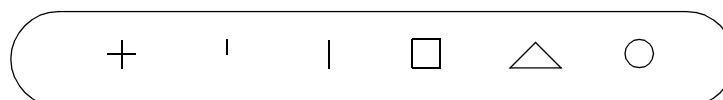
Text justification refers to the actual position and is given by

“top-left”	“top-centre”	“top-right”
“middle-left”	“middle-centre”	“middle-right”
“bottom-left”	“bottom-centre”	“bottom-right”

A choice of six special symbols and/or or any 12d symbols can be drawn at the cut point.

The special **12d** Model symbols of size one millimetre are drawn in a square box centred on (0,0) with sides of length two millimetres. That is, the box co-ordinates are (-1,-1), (1,1), (1,-1), (-1,-1).

The six special shapes are



Up to twenty five (25) separate models of strings can be cut and labelled.

Parameters for Labelling Cuts of X-Sections Through Strings in a Model

The method for specifying which strings are to be checked for cuts is by first specifying the **model** which contains the strings, and then a **name mask** which is used to restrict the strings in the model to only those whose name matches the name mask.

Up to twenty five different sets of models and name masks can be used so that different cut sets can be labelled in different ways.

The parameters for selecting and labelling the *n*th set (where *n* can be from 1 to 25) of cuts of the x-sections with the strings in the model are given by:

```
cuts_n_model          model_name          // model of strings to be cut
```

The selection of the strings from the model *model_name* whose cut points are to be labelled is all the strings whose name satisfies the name mask *cuts_n_mask*:

```
cuts_n_mask          name_mask          // strings to check for cuts
                                     // and if a cut occurs,
                                     // parameters show how to
                                     // label the cut
```

where *name_mask* is a text string containing the name masks, each separated by one or more spaces, to test the string name against. Each mask can include wild cards and wild characters.

For example

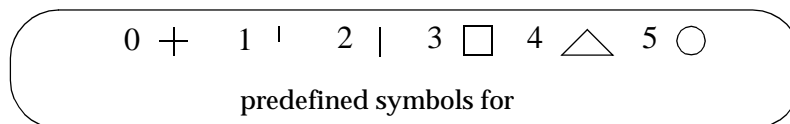
```
cuts_1_mask          "ke*"
or
cuts_1_mask          "?bank*"
or, if both masks are required,
cuts_1_mask          "ke* ?bank*"
```

If *cuts_n_mask* is missing, then all strings in the model are used. This is equivalent to *name_mask* being "*".

All strings in the model *cuts_n_model* whose name satisfy the name mask *cuts_n_mask* are then checked for cuts with the x-sections, and if a cut occurs, the cut point will be labelled according to the rest of the parameters in the *n*th set.

The parameters for drawing a **symbol** at the cut points are:

```
cuts_symbol_n_mode   0          // cross
                    1          // up from centre of box
                    2          // up and down from centre of box
                    3          // square
                    4          // triangle, base at bottom
                    5          // circle
                    6          // use a 12d symbol
```



If *cuts_symbol_n_mode* is 6, then the plot symbol is given by

```
cuts_symbol_n_style  plotsymbol        // 12d symbol to draw at cut
```

Important Note

The plot symbol of name *plotsymbol* is defined in the file given by:

- (a) the parameter *plot_symbols* in the ppf file

```
plot_symbols          filename
```

or if `plot_symbols` is not defined, then

(b) in the file pointed to by the environment variable `PLOT_SYMBOLS_4D`
`PLOT_SYMBOLS_4D filename // default plotsym.4d`

or if `PLOT_SYMBOLS_4D` is not defined, then

(c) in the file `plotsym.4d`
 which is searched for in the standard set up file sequence

If none of the above files are defined, or if the symbol does not exist in the above files, then it will be searched for in the standard 12d symbols file which is:

(d) either pointed to by the environment variable `SYMBOLS_4D`
`SYMBOLS_4D filename // default symbols.4d`
 or if the environment variable `SYMBOLS_4D` does not exist, in the file, `symbols.4d`

The position of the symbol is given by:

<code>cuts_symbol_n_position</code>	1	// above point height value
	3	// above top of boxes
	4	// above top of graph area but not including // the <code>extra_space_top</code>
	100	// to primary string
	101-500	// to tin1 or tin2 etc.

The symbol can be adjusted by the parameters:

<code>cuts_symbol_n_x</code>	<i>mm</i>	// offset adjustment to position
<code>cuts_symbol_n_y</code>	<i>mm</i>	// height adjustment to position
<code>cuts_symbol_n_angle</code>	<i>degrees</i>	// rotation about point
<code>cuts_symbol_n_colour</code>	<i>colour</i>	// colour of symbol

and for all values of `cuts_symbol_n_mode` **other** than 6:

<code>cuts_symbol_n_size</code>	<i>mm</i>	// size of symbol, 0 don't draw
---------------------------------	-----------	---------------------------------

The value of the **offset** of the cut string can be labelled using the parameters

<code>cuts_offset_n_position</code>	1	// above cut strings height value
	3	// above top of boxes
	4	// above top of graph area but not including // the <code>extra_space_top</code>
	100	// to primary string
	101-500	// to tin1 or tin2 etc.
<code>cuts_offset_n_x</code>	<i>mm</i>	// offset adjustment to position
<code>cuts_offset_n_y</code>	<i>mm</i>	// height adjustment to position
<code>cuts_offset_n_angle</code>	<i>degrees</i>	// rotation about point
<code>cuts_offset_n_size</code>	<i>mm</i>	// size of text, 0 don't label
<code>cuts_offset_n_colour</code>	<i>colour</i>	// colour of text
<code>cuts_offset_n_textstyle</code>	<i>textstyle</i>	// textstyle to use for cuts offset text.
<code>cuts_offset_n_pre_text</code>	<i>text</i>	// text before the offset value
<code>cuts_offset_n_post_text</code>	<i>text</i>	// text after the offset value
<code>cuts_offset_n_justification</code>	<i>justification</i>	// justification of the text
<code>cuts_offset_n_no_decimals</code>	<i>integer</i>	// number of decimals in offset

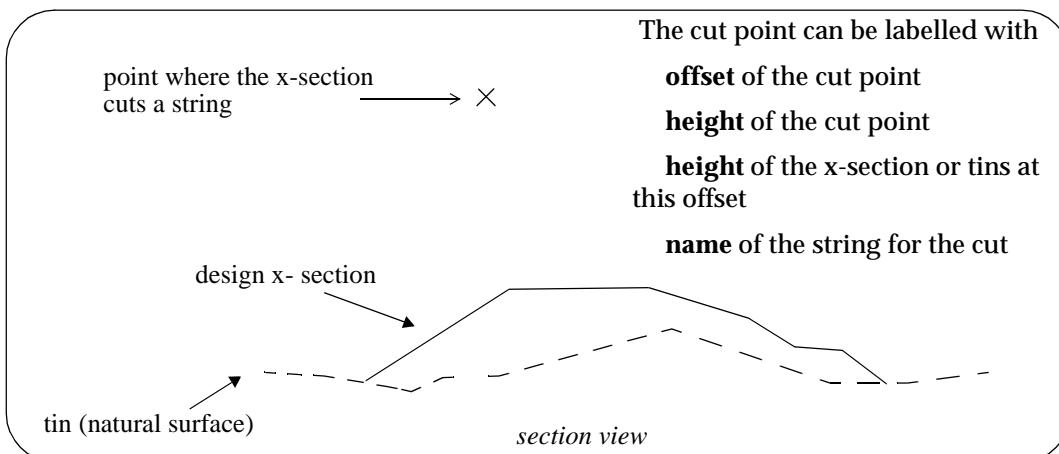
The value of a **height** at the offset of the point can be calculated and labelled using the parameters

<code>cuts_height_n_mode</code>	1	// use height of cut point itself
	3	// use real world height of position // above boxes

	100	// height of primary string
	101-500	// use height of to tin1 or tin2 etc.
cuts_height_n_position	1	// at points position
	3	// above top of boxes
	4	// above top of graph area but not including // the extra_space_top
	100	// to primary string
	101-500	// to tin1 or tin2 etc.
cuts_height_n_x	mm	// offset adjustment to position
cuts_height_n_y	mm	// height adjustment to position
cuts_height_n_angle	degrees	// rotation about point
cuts_height_n_size	mm	// size of text, 0 don't label
cuts_height_n_colour	colour	// colour of text
cuts_height_n_textstyle	textstyle	// textstyle to use for cuts heights text.
cuts_height_n_pre_text	text	// text before the height value
cuts_height_n_post_text	text	// text after the height value
cuts_height_n_justification	justification	// justification of the text
cuts_height_n_no_decimals	integer	// number of decimals in height

A **label** which can include the **name** of the cut string is drawn by using the parameters:

cuts_label_n_position	1	// above cut strings height value
	3	// above top of boxes
	4	// above top of graph area but not including // the extra_space_top
	100	// to primary string
	101-500	// to tin1 or tin2 etc.
cuts_label_n_mode	0	// don't include cut string name
	1	// include cut string name in label
cuts_label_n_x	mm	// offset adjustment to position
cuts_label_n_y	mm	// height adjustment to position
cuts_label_n_angle	degrees	// rotation about point
cuts_label_n_size	mm	// size of text, 0 don't label
cuts_label_n_colour	colour	// colour of text
cuts_label_n_textstyle	textstyle	// textstyle to use for cuts label text.
cuts_label_n_pre_text	text	// text before the string name
cuts_label_n_post_text	text	// text after the string name
cuts_label_n_justification	justification	// justification of the text



Please continue to the next section "Hatching Cut and Fill Areas" .

Hatching Cut and Fill Areas

This option is used to hatch cut and/or fill areas between sets of tins.

For each set, the name of the two tins, the hatch linestyle, colour and separation and whether cut and/or fill regions are required are all user definable.

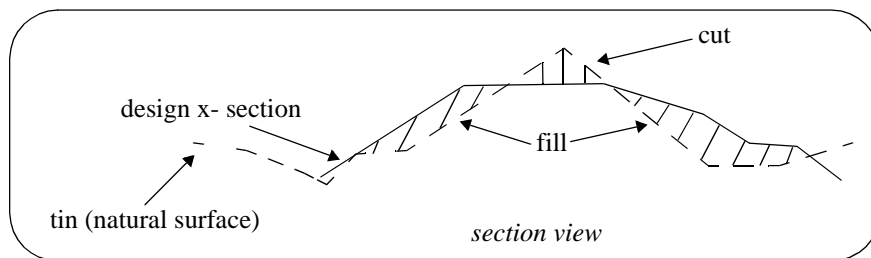
Up to twenty (20) separate sets of tins be hatched.

The parameters for labelling cuts and/or fill regions between tins are given by:

<code>hatch_original_tin_n</code>	<code>tin_name</code>	// tin_name for original surface
<code>hatch_new_tin_n</code>	<code>tin_name</code>	// tin_name for final surface
<code>hatch_cut_separation_n</code>	<code>mm</code>	// distance between cut hatch lines
	0	// don't do cut hatching
<code>hatch_cut_angle_n</code>	<code>degrees</code>	// angle in degrees of cut hatching
<code>hatch_cut_colour_n</code>	<code>colour</code>	// colour of the cut hatching
<code>hatch_cut_linestyle_n</code>	<code>linestyle</code>	// linestyle for cut hatching
<code>hatch_cut_draw_sides_n</code>	1/0	// 1 = draw sides of cut regions
<code>hatch_cut_draw_original_n</code>	1/0	// 1 = draw original tin in cut regions
<code>hatch_cut_draw_new_n</code>	1/0	// 1 = draw new tin in cut regions
<code>hatch_fill_separation_n</code>	<code>mm</code>	// distance between fill hatch line
	0	// don't do fill hatching
<code>hatch_fill_angle_n</code>	<code>degrees</code>	// angle in degrees of fill hatching
<code>hatch_fill_colour_n</code>	<code>colour</code>	// colour of the fill hatching
<code>hatch_fill_linestyle_n</code>	<code>linestyle</code>	// linestyle for fill hatching
<code>hatch_fill_draw_sides_n</code>	1/0	// 1 = draw sides of fill regions
<code>hatch_fill_draw_original_n</code>	1/0	// 1 = draw original tin in fill regions
<code>hatch_fill_draw_new_n</code>	1/0	// 1 = draw new tin in fill regions

Notes

- (a) cut is when the new tin is below the original tin.
fill is when the new tin is above the original tin.
- (b) cut hatching is turned off by setting `hatch_cut_separation_n` to 0.0.
fill hatching is turned off by setting `hatch_fill_separation_n` to 0.0.



Please continue to the next section "Extra Models of X-Sections" .

Extra Models of X-Sections

The order and centreline chainages of the x-section subplots for the x-section plot are defined by the sections from the primary model of cross sections.

The sections through any specified triangulations and service models, and offsets for labelling are fully defined by these primary x-sections.

However it is also possible to plot extra x-sections on each of the sub-plots by supplying extra models of x-sections which are at the same plan positions as the primary x-section strings.

Only those x-sections from the extra models that are within a user specified tolerance of a primary x-section are plotted.

The extra models of x-sections and the plan tolerance for checking that the extra cross-sections are the same position as the primary x-sections are

```
extra_model_tolerance_1      value                // tolerance in 12d Model units
extra_model_n                model_name        // where n=1, ... 100
                           // extra models of x-sections
```

The actual colour of the extra x-sections is used as their plotting colour.

Please continue to the next section “Sorting X-Sections by Chainage” .

Sorting X-Sections by Chainage

The chainage on the design string that the x-section is created at is stored with the cross-section.

When the x-sections are created by the apply functions, they are created in the order of increasing chainage and added to the *model for sections* in that order.

Hence if the cross sections are plotted, the natural order would be in increasing chainage order.

However, it is possible to upset the order in the model by manually adding in extra sections.

Hence there is a parameter in both the **section x plot** panel and the plot parameter file to ensure that the cross sections are sorted in increasing chainage order before they are plotted.

```
sort_sections                1                // sort sections by design chainage
                           0                // use order of sections in model
```

Please continue to the next section “Title Block Information” .

Title Block Information

The plot can have a standard 12d Model title block or a user defined title block.

The standard title block consists of a simple border around the plot and two lines of text in a box underneath the plot. For a user defined title block, all the line work and text is defined by the user.

Standard Title Block

For the standard 12d Model title block, there are extra parameters for two lines of text and text size and colour. The standard title block is turned on or off by the parameter *plot_border*.

<i>plot_border</i>	<i>yes/no</i>	<i>// yes plots a standard title block</i> <i>// default yes</i>
<i>title_1</i>	<i>text</i>	
<i>title_2</i>	<i>text</i>	
<i>title_text_size</i>	<i>value</i>	
<i>title_colour</i>	<i>colour</i>	

User Title Block

For the user defined title block, the title block drawing commands are kept in a file whose name is supplied by the user. The title block drawing commands are almost identical to the linestyle drawing commands and is given at the beginning of this chapter.

Hence for a user defined title block, there are just two parameters - one to say a title block file is being used and the other to give the name of the title block file. The *plot_border* parameter should also be set to *no* so that the standard title block is not also drawn.

<i>use_title_file</i>	<i>yes/no</i>	<i>// yes draws the title block given in title_file</i> <i>// default no</i>
<i>title_file</i>	<i>filename</i>	
<i>plot_border</i>	<i>no</i>	<i>// turn off standard title block</i>

Some special plot parameters are used to pass information down to variables in a user defined title block. For example, inside the title block file it is possible to have runtime user defined text variables. The actual text values for these text variables are passed down to the title block file from the plot parameter file via the parameters *user_text_n* ($n = 1, 2, \dots, 1000$)

<i>user_text_n</i>		<i>text</i>
--------------------	--	-------------

The special plot parameters are:

<i>time_format</i>	<i>text</i>	<i>// format for \$time</i>
<i>user_text_n</i>	<i>text</i>	<i>// where n = 1, 2, ... 1000</i> <i>// passed down to \$user_text_n</i>
<i>title_1</i>	<i>text</i>	<i>// passed down to \$title_1</i>
<i>title_2</i>	<i>text</i>	<i>// passed down to \$title_2</i>
<i>start_page_number</i>	<i>integer</i>	<i>// used as the starting value for</i> <i>// \$page_number. If missing,</i> <i>// \$page_number starts at 1.</i>
<i>start_drawing_number</i>	<i>integer</i>	<i>// added to \$drawing_number in title</i> <i>// block file. If missing,</i> <i>// \$drawing_number starts at 1.</i>
<i>drawing_number_prefix</i>	<i>text</i>	<i>// passed down to</i> <i>// \$drawing_number_prefix</i>
<i>drawing_number_postfix</i>	<i>text</i>	<i>// passed down to</i> <i>// \$drawing_number_postfix</i>

Please continue to the next section "Parameters that Modify Fields In the Cross Plot Panel".

Parameters that Modify Fields In the Cross Plot Panel

A number of parameters match those in the **section x plot** panel.

When the plot parameter file is first read, any parameters in the panel will be replaced by the values of any corresponding parameters in the parameter file.

However, if the parameter is subsequently modified in the panel, the panel value will be the value used for any plots.

The plot parameters that also occur in the **section x plot** panel are:

view_name	<i>text</i>
plotter_type	<i>text</i>
model_to_plot	<i>text</i>
plot_stem	<i>text</i>
start_chainage	<i>chainage</i>
end_chainage	<i>chainage</i>
sheet_size	<i>text</i> or “width height”
scale	<i>value</i>
absolute_extensions	<i>yes/no</i>
left_extension	<i>world-units</i>
right_extension	<i>world-units</i>
line_up_cl	<i>yes/no</i>
primary_string	<i>yes/no</i>
label_type	<i>yes/no</i>
box_colour	<i>colour</i>
text_size	<i>mm</i>
sort_sections	<i>yes/no</i>
use_title_file	<i>yes/no</i>
title_file	<i>filename</i>
plot_border	<i>yes/no</i>
title_1	<i>text</i>
title_2	<i>text</i>
title_text_size	<i>value</i>
title_colour	<i>colour</i>
global_textstyle	<i>textstyle</i>

Please continue to the next section “Generating Cross Section Plots Without a View” .

Generating Cross Section Plots Without a View

The cross section plot parameters are comprehensive enough that it is possible to completely generate a cross section plot without referencing a section view, or even using the **section X plot** panel.

Such a ppf can be run using the **plots=>plot a ppf** option or from the 4D Solutions programming language, 4DL.

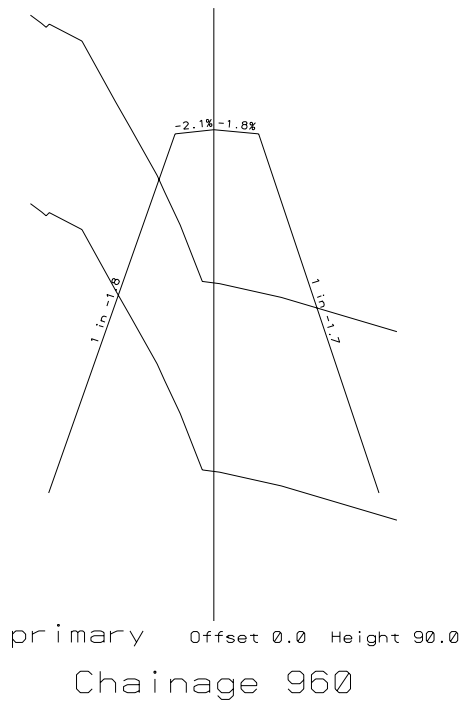
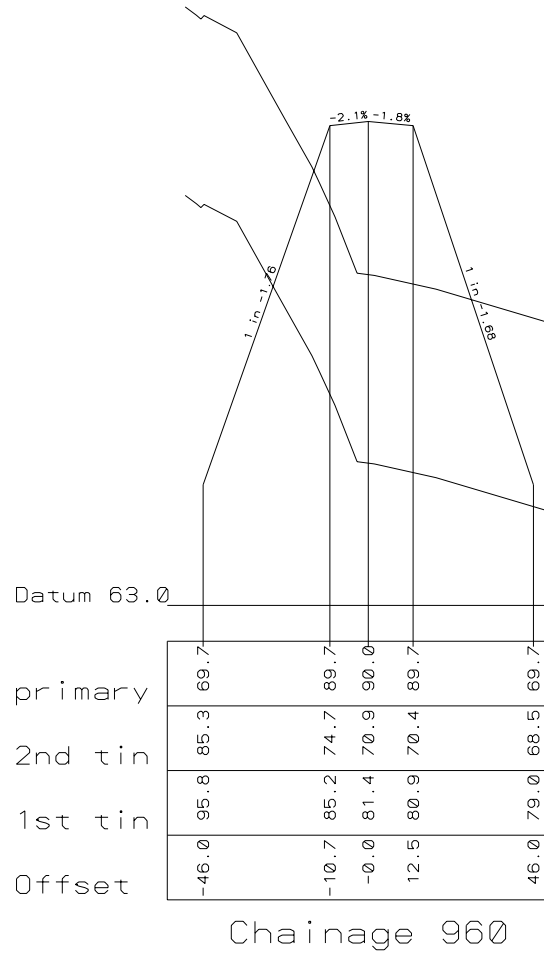
When generating a cross section plot using the **section X plot** panel, a plot parameter file containing all the parameters needed to regenerate the plot using **plots=>plot a ppf** can be written out by simply giving a name for the ppf file in the plot parameters write field of the **section X plot** panel.

Notes

1. A warning is given if the keyword in a plot parameter file does not exist.
2. A warning is also given if the key word pair is defined more than once in a ppf.

Please continue to the next section “Example of a Cross Section Plot Parameter File” .

Example of a Cross Section Plot Parameter File



```

// ppf file to generate x-section example
section_x_plot "plot 2" {

// plot margins
left_margin          0.0
right_margin         0.0
top_margin           0.0
bottom_margin        0.0

// white space surrounding each cross section
left_sub_plot_gap    20.0
right_sub_plot_gap   20.0
top_sub_plot_gap     20.0
bottom_sub_plot_gap  20.0

// these are only used with title boxes
'                   10.0
right_border_gap     10.0
top_border_gap       10.0
bottom_border_gap    10.0

// annotation for boxes area
// height text on centre line plot
height_text          "Height"

// mode for drawing boxes around
// 0 = none
// 1 = heights area
// 2 = heights and labels area
draw_box_mode        1
box_line_draw_mode   3
box_colour            grey

// size of title text in title box
title_box_text_size  5

// title text box size - automatically calculated if missing
// space_for_titles  30
// horizontal_line_spacing  15

// number of decimal places for height and offset values
number_of_decimals   1

// 0 for bottom justification of values
// 1 for top justification of values
box_text_justification  1

// offset titles and values
offset_title          "Offset"
// offset_title_2      "Offset 2"
// offset_colour        brown    // also in panel
offset_title_colour   grey

// primary string titles and heights
// defaults to string name and colour
primary_title         "primary"
// primary_title_2     "primary2"
primary_colour        "purple"
primary_title_colour  "red"

```

```
// tin titles and heights
// tin label 1 for on
//      0 for off
// tin text is the annotation text for that tin
// tin colour is the annotation colour for that tin
// range from tin_1_X to tin_100_X
tin_1_label      1
tin_1_title      "1st tin"
// tin_1_title_2  "1st tin 2"
tin_1_colour     grey
tin_1_title_colour red

tin_2_label      1
tin_2_title      "2nd tin"
tin_2_colour     grey
tin_2_title_colour red

// staggers definitions
stagger_gap_factor 1.3
stagger_gap_top    5.0
stagger_gap_bottom 2.0

// uprights definitions
// mode 0 = none
//      1 = full
//      2 = ticks
//      3 = height above boxes
//      100 = primary
//      101 = 1st tin
//      102 = 2nd tin
//...
//      500 = 400th tin

uprights_colour    red
uprights_draw_mode 100
uprights_y        100

// datum area
datum_name         "Datum"
datum_colour       orange
datum_text_size    4
datum_below_gap    10.0

// gap above datum to graph area for box and
// centre line plots
datum_above_gap    20
datum_above_gap_cl 20

// grade_label of 0 turns the labels off
//      1 turns it on
grade_label        1

// mode 0 for percent grade,
//      1 for one in x,
//      2 for grade in m/m
grade_mode         0
```



```

// grade decimal places
grade_decimals          1
// text size for grade annotations
grade_size              2
grade_colour            yellow
// how far the annotation is (perpendicularly)
// from the string itself
grade_offset            1
// label all annotations separated by more than
// the minimum width in plot units
grade_minimum_width     0
// threshold and threshold mode describe the value
// at which the grade labelling changes
// mode to grade_upper_mode
grade_threshold         0.2
grade_threshold_mode    2
grade_upper_mode        1
grade_change_only       1
// labelling of sub-plots
// centreline chainage: 1 for on, 0 for off
chainage_label          1
// distance below box to print annotation
chainage_y_offset       12
// distance from start of string to label - default centred
// chainage_x_offset     10
// chainage text label parameters
chainage_text           "Chainage"
chainage_size           6
chainage_colour         cyan
chainage_decimals       2

// ***** panel data *****

view_name               "4"

plotter_type            "model"
model_to_plot           "single xsec"
plot_stem               "pp"

sheet_size              "1000 800"
scale                   1000.0

absolute_extensions    "no"
left_extension          5
right_extension         5

line_up_cl              "yes"
primary_string          "yes"
label_type              "boxes"
offset_colour           "cyan"
text_size               3.0

```

```
use_title_file      "no"  
title_file         "titles.tf"  
plot_border       "no"  
title_1           ""  
title_2           ""  
title_text_size   4.0  
title_colour      magenta  
}
```

Long Section Plot Parameter File

The long section plot parameters are placed in a file with ending **.ppf**

Each parameter consists of a parameter name followed by one or more spaces and then the parameter value. There is only one parameter per line.

Anything on a line after a double forward slash // is considered to be a comment.

The set of all parameters for the long section plot is enclosed within a set of curly brackets { } with the header

```
section_long_plot "plot set name"
```

before the curly brackets.

That is,

```
section_long_plot "plot set name" {
    plot parameters
    one per line
}
```

If there is more than one section_long_plot parameter set in the file, only the first set is used.

There may also be parameter sets for other plot types such as section_x_plot in the same file. The other sets will be ignored when doing a long section plot.

The plot parameters are documented in following groups:

For *Defining chainage range*, go to the section "Possible Chainage Range" .

Breaking the plot into pages, go to the section "Pagination" .

Plot Sheet layout, go to the section "Plot Sheet Layout" .

Boxes area, go to the section "Boxes Area" .

Defining chainages and staggering, go to the section "Chainage Selection and Staggering" .

Defining uprights, go to the section "Uprights" .

Datum area, go to the section "Datum Area" .

Graph (drawing) area, go to the section "Graph Area" .

Defining bubbles, go to the section "Bubbles Definitions" .

Quick HG, go to the section "Quick Horizontal Geometry Labelling" .

Extensive HG, go to the section "Extensive Horizontal Geometry Labelling" .

Quick VG, go to the section "Quick Vertical Geometry Labelling" .

Extensive VG, go to the section "Extensive Vertical Geometry Labelling" .

Labelling heights, go to the section "Labelling Chainages and Heights in the Graph Area" .

Symbols, go to the section "Labelling With Symbols" .

Hatching cut/fill, go to the section "Hatching Cut and Fill Areas" .

Labelling cuts, go to the section "Labelling Cuts of Design Through Strings in a Model" .

Labelling string name, go to the section "Labelling the Primary String Name on the Plot" .

Labelling with scale, go to the section "Labelling the Scale on the Plot" .

Title block information, please continue to the section "Title Block Information" .

Panel modifying parameters, please continue to the section "Parameters that Modify Fields In the Long Plot Panel" .

Example, please continue to the section "Example of a Long Section Plot Parameter File" .

Possible Chainage Range

In the panel, the field **Use HG VG for min, max** determines whether the horizontal geometry (HG) and the vertical geometry (VG) are both used to determine the minimum and maximum chainages for drawing. This allows the vertical geometry to be plotted when it is outside the horizontal geometry (e.g. kerb returns).

The equivalent parameter in the ppf is

```
use_vg_hg_for_min_max      1           // the chainage range available for plotting
                               // is from the minimum of the horizontal
                               // geometry (HG) and the vertical geometry
                               // (VG) to the maximum of the HG and VG.
                               // This is useful for kerb returns
                               0           // the chainage range available for
                               // plotting is from the minimum of the
                               // horizontal geometry (HG) to the
                               // maximum of the HG.
```

Pagination

If the long section plot is too long to fit on one page, it can be broken into a number of pages (sheets).

The parameter, *pagination_length*, controls the amount of new chainage length on each plot page. Each page of the long section plot can also included a set chainage amount from the end of the **previous** plot.

Hence apart from the first page and possibly the last page, the plot will have a chainage length given by the sum of the *pagination_length* and *pagination_overlap*.

```
pagination                 yes/no      // if yes, then break the plot into pages
pagination_mode            chainage // length and overlap in chainage units
                               millimetre // length and overlap in millimetres
pagination_length          chainage or  // new chainage range on each page
                               millimetres
pagination_overlap         chainage or  // overlap between pages
                               millimetres
```

Note

The *pagination_length* and *pagination_overlap* are given in chainage units or millimetres. The user must choose values which will fit on the selected sheet size or the end of each plot will be truncated by the sheet.

Plot Sheet Layout

The plot **page** or **sheet** is considered to have only positive co-ordinates with the origin (0,0) in the left hand corner. The units for the plot are millimetres.

The overall size of the plot sheet is given by either a defined sheet size, or by the width and height of the plot given in millimetres and separated by one or more spaces.

```
sheet_size                 text           // sheet name, or
                               "mm mm"        // sheet size: width height
```

The sheet size name and width and heights can be specified by the user in a file named sheets.4d which is in the normal set up areas, or is pointed to by the environment variable

```
SHEET_SIZES_4D           file           // file of plotter sheets sizes
```

The plotting area is restricted to within the plot sheet by giving margins which are:

If a *User Defined Title Block* is used:

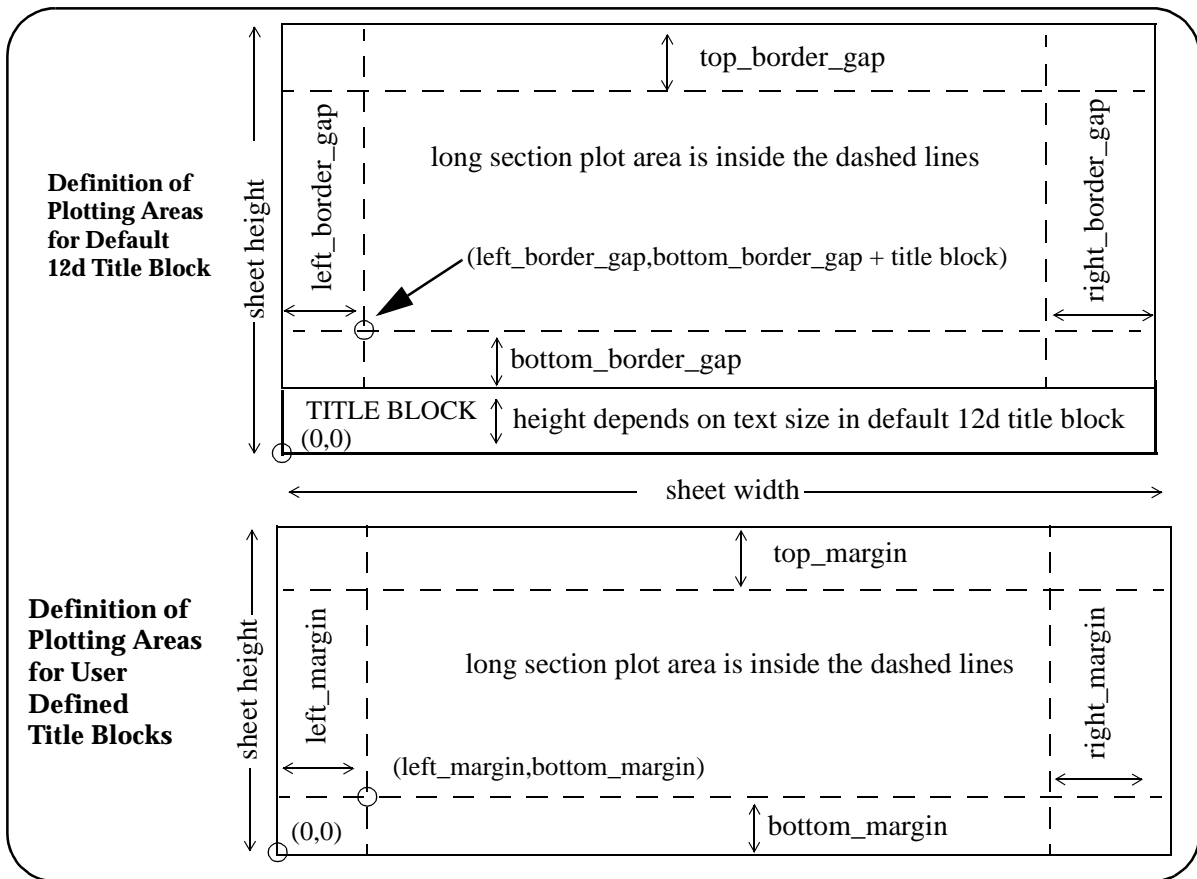
```
left_margin               mm
right_margin              mm
top_margin                mm
```

bottom_margin mm

If the *default 12d title block* is used, then the size of the bottom of title block depends on the text size. The following parameters are used in the default title block case and the *bottom_border_gap* is added to the calculated height of the bottom of the title block.

left_border_gap mm
 right_border_gap mm
 top_border_gap mm
 bottom_border_gap mm

Because the user can easily select from the plotting panel whether a User Defined Title Block or the default 12d title block is used, both sets of margins and gap parameters can exist in the one plot parameter file.



The long plot itself consists of the three regions - boxes, datum and graph areas.

The **boxes area** is where the titles and the chainage values and the heights/depths for the strings drawn on the long plot are labelled.

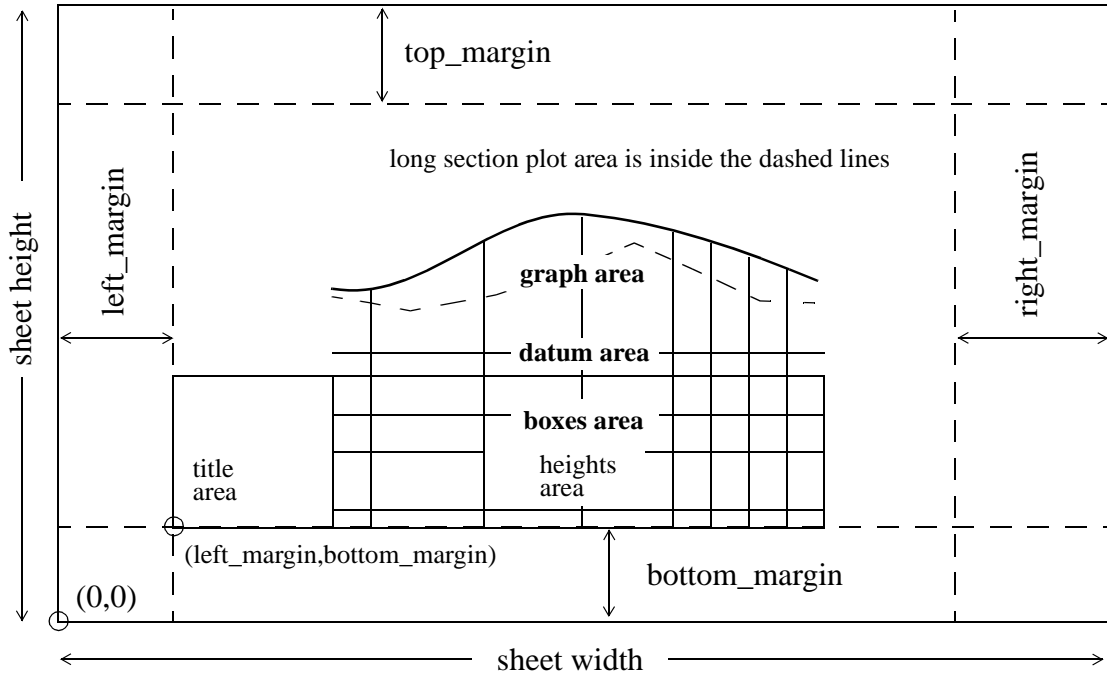
The **datum area** is the region between the boxes area and the graph area.

The **graph area** is the area where the actual plots of the strings are drawn.

Apart from information labelled in the boxes area, the long section plot can label other information such as

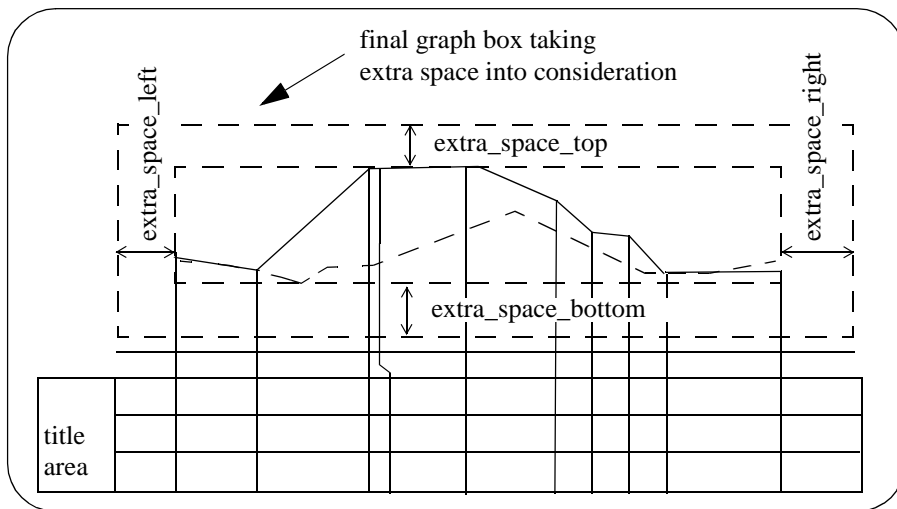
- (a) horizontal geometry
- (b) vertical geometry
- (c) chainage, heights at special points

- (d) symbols at special points
- (e) bubbles at special chainages
- (f) cuts the design string makes through strings
- (g) cut and fill areas



The size of the graph area can also be extended to allow for plot symbols by the parameters:

extra_space_units	0	// extra space values are world units - default
	1	// " " are millimetres on plot page
extra_space_left	units	// subtract from left of plot area, def 0
extra_space_right	units	// add to right of plot area, default 0
extra_space_top	units	// add to top of plot area, default 0
extra_space_bottom	units	// subtract from bottom of plot area, default 0



Please continue to the next section "Boxes Area" .

Boxes Area

Each string in the long section plot can be labelled with one or two lines of title, and the chainages/heights/depths at the user specified chainages for the strings.

The **title** for the strings, is drawn in the **title area** of the **boxes area**.

The **chainages/heights/depths** are drawn in the **heights area** of the **boxes area**.

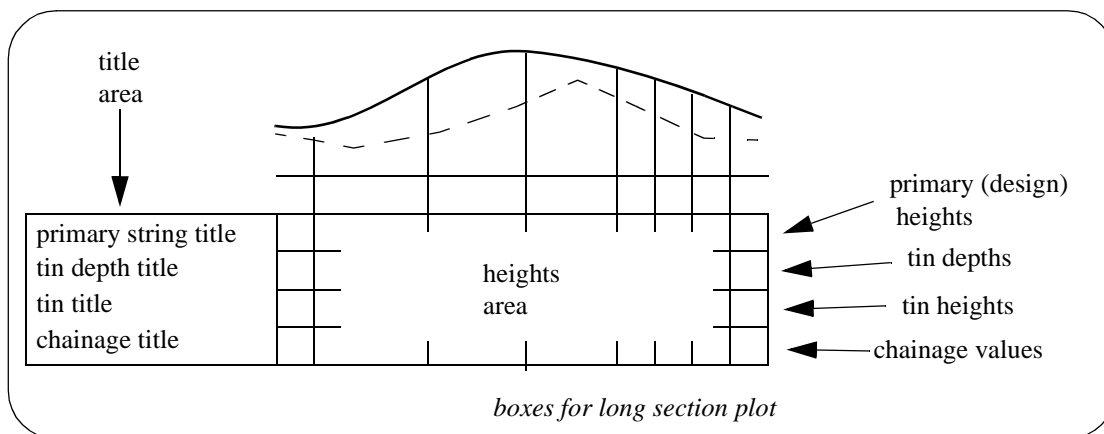
Consequently the boxes area is made up of rows of text consisting of:

string/tin titles followed by the **chainage/height/depth** values along the string.

Each row is surrounded by lines to form a box.

The default order of the boxes from the bottom up is

- (a) optional super-elevation diagram
- (b) chainage values
- (c) can be primary string heights - user choice
- (d) tin heights and depths
- (e) offset heights and depths
- (f) optional volumes or earth works
- (g) can be primary string heights - user choice
- (h) zero or more blank boxes



The blank boxes are used to place other information in (such as horizontal or vertical geometry) or for other user supplied information.

Placing the primary string label before the bank boxes or just after the chainage box is controlled by the parameter *primary_label_mode*.

```

number_of_blank_boxes      integer           // integer > 0
primary_label_mode         0                   //put primary string labels in last box
                             // before blank boxes
                             1                   // or first box above the chainages

```

Although the order of the boxes may appear to be fixed, in practice they can be in any order. This is possible because for each box, there is a parameter to set the height in millimetres from the bottom of all the boxes that the text in the box is drawn at (the *_y_pos* parameters).

The **title area** starts at the co-ordinate (left_margin,bottom_margin).

The size of the title text is given by the **title_box_text_size** parameter.

The **width** of the title area is either given by the *space_for_titles* parameter, or if omitted, the required width is automatically calculated.

```

title_box_text_size      mm          // size of the title text for boxes
space_for_titles        mm          // calculated if omitted

```

There can be two lines of title text and the title text, textstyle and colour can be set independently for each box.

The x position of the title text is the same for all the lines of title text and can be set to be a fixed distance from the left hand side of the boxes.

```

box_titles_x            mm          // distance to move the title text from the
                                // left hand side of the boxes

```

The y position of the title text can be set separately for each type of title. The parameters are given later under each of the title types (e.g. chainages, primary string, tins, depths etc.).

After the title area there can be a user defined gap, followed by the heights area

```

box_gap                mm          // blank area between the title area
                                // and the heights area default 0

```

The **heights area** starts at the end of the title area.

The height text is written at right angles to the bottom of the boxes. It can be either top or bottom justified with respect to the box (*box_text_justification*).

The number of decimal places (*number_of_decimals*), and the size of the heights text (*box_text_size*) can be specified globally but there is a parameter for each box which overrides these defaults for each box of heights.

```

box_text_justification  0          // bottom of individual boxes
                        1          // top of individual boxes

number_of_decimals     integer    // number of decimal places in the
                                // height boxes. If <0, the absolute value
                                // is taken as the number of decimal
                                // places i.e. no trailing zeros are
                                // removed for the values in the heights
                                // area.

box_text_size          mm          // size of the height text values

```

A global height for the individual boxes is either given by the *horizontal_line_spacing* parameter, or if omitted, a height to fit the largest height or depth value is calculated and used as the default box height.

```

horizontal_line_spacing mm          // calculated if omitted

```

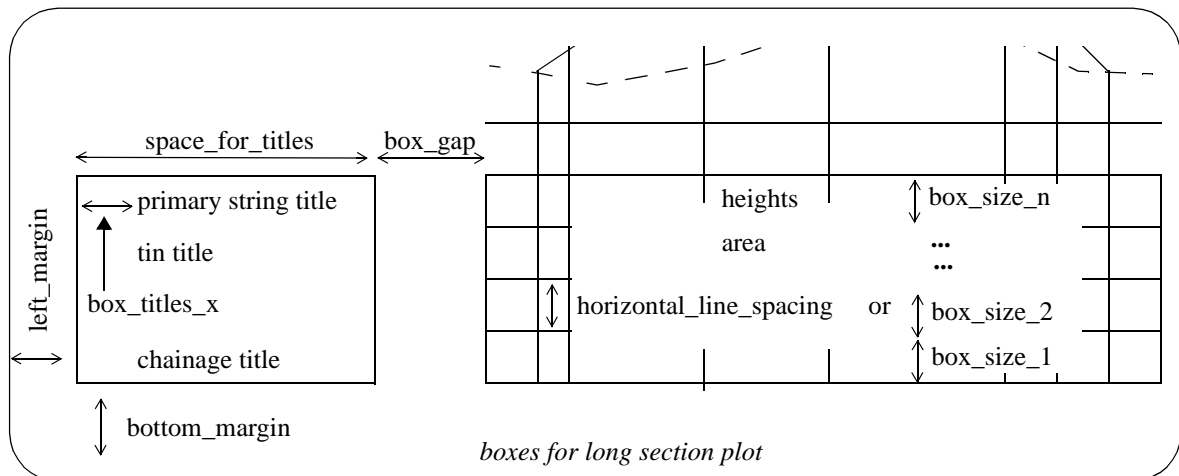
However, the height of each box can be individually set by parameters *box_size_n* where the boxing numbering, n, starts from the bottom box. The value of *horizontal_line_spacing* is used for any of the *box_size_n* parameters not specified.

```

box_size_n             mm          // height of the nth box, numbered from
                                // bottom up.

```

The total height of the boxes area is simply given by the sum of the heights of each box.



The **width** of the **heights area** is determined by the number of chainages to be labelled and whether the values are staggered to prevent over writing.

Hence the total width of the boxes area is the width of the **title area** plus **box_gap**, plus the width of the **heights area**.

Many distance definitions in the plot parameter file are given in terms of distance above the **top** of the boxes area so that the distances are independent of the number of boxes and box sizes.

The drawing of the box line work, the box colour, the position of the primary string labels and the number of blank boxes are all set by parameters.

First, all the line work for the box itself is user defined. This has been extended from V3.1 although *draw_box_mode* has been left in for upward compatibility.

```

draw_box_mode          0           // don't draw box lines
                      1           // draw box lines around heights area
                      // only
                      2           // draw box lines around title and
                      // heights areas
                      3           // use draw_box_side_n,
                      // box_line_draw_mode and
                      // box_line_mode_n

box_colour             colour      // colour of the boxes

```

For V3.2, the line work for the outside of the title and heights boxes is controlled by the parameters *draw_box_side_n* and *box_side_colour_n*, and the separation lines inside the boxes are controlled by the parameters *box_line_draw_mode* and *box_line_mode_n* where the box numbering, n, starts from the bottom box.

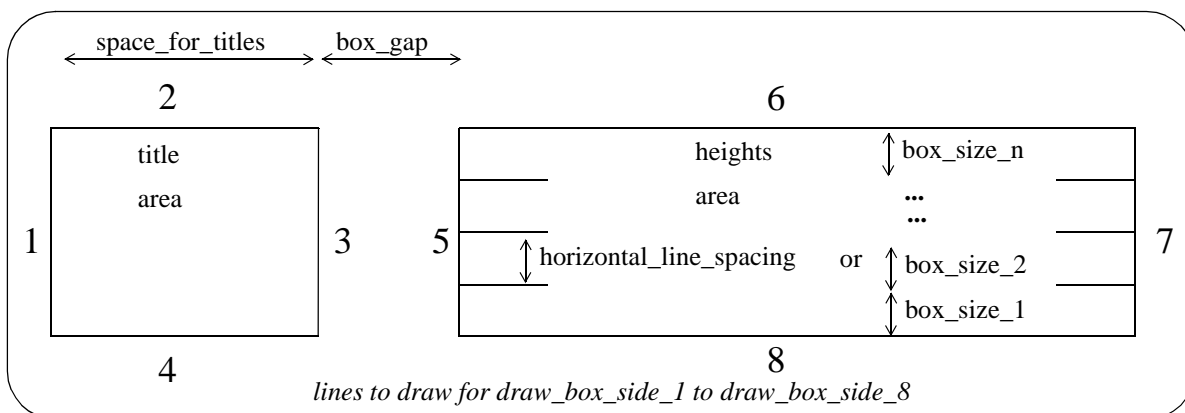
Note: The following parameters are only used if *draw_box_mode* is set to 3.

```

draw_box_side_1       1           // draw the left side of the title area (def)
                      0           // don't draw the left side
box_side_colour_1     colour      // colour to draw left side of title area
                      // default box_colour
draw_box_side_2       1           // draw top of the title area (default)
                      0           // don't draw the top
box_side_colour_2     colour      // colour to draw top of title area
                      // default box_colour
draw_box_side_3       1           // draw right side of the title area

```

		// (default if box_gap is non-zero)
	0	// don't draw the right side
		// (default if box_gap is zero)
box_side_colour_3	colour	// colour to draw right side of title area
		// default box_colour
draw_box_side_4	1	// draw bottom of the title area (default)
	0	// don't draw the bottom
box_side_colour_4	colour	// colour to draw bottom of title area
		// default box_colour
draw_box_side_5	1	// draw left side of the heights area (def)
	0	// don't draw the left side
box_side_colour_5	colour	// colour to draw left side of heights area
		// default box_colour
draw_box_side_6	1	// draw top of the heights area (default)
	0	// don't draw the top
box_side_colour_6	colour	// colour to draw top of heights area
		// default box_colour
draw_box_side_7	1	// draw right side of the heights area def
	0	// don't draw the right side
box_side_colour_7	colour	// colour for right side of heights area
		// default box_colour
draw_box_side_8	1	// draw bottom of the heights area (def)
	0	// don't draw the bottom
box_side_colour_8	colour	// colour for bottom of heights area
		// default box_colour



The lines at the top of the individual boxes inside the title area and heights area (separation lines) are controlled by the parameters *box_line_draw_mode* and *box_line_mode_n*.

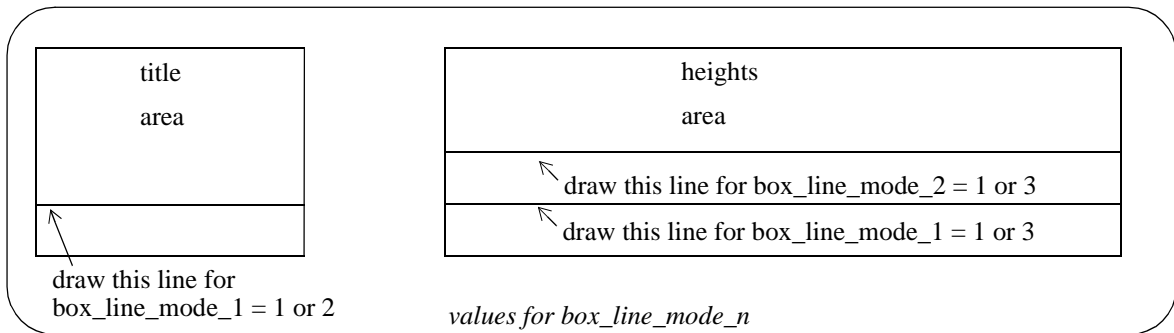
The separation lines can be drawn in just the title area, just the heights area or in both areas.

The parameter *box_line_draw_mode* can be set to control all the separation lines but there are additional parameters, *box_line_mode_n*, which override *box_line_draw_mode* for each of the individual boxes where n = 1, ... number of boxes - 1.

The top of the top box is not controlled by *box_line_mode_n* but is controlled by the parameters *draw_box_side_2* and *draw_box_side_6*.

box_line_draw_mode	0	// don't draw any separation lines inside
		// the title and heights areas
	1	// draw the separation lines inside the
		// title and heights areas (default)
	2	// draw the separation lines inside the
		// title area only

	3	// draw the separation lines inside the // heights area only
box_line_mode_n	0	// for the nth box, don't draw any // line at the top of the box for either // the title or the heights areas
	1	// for the nth box, draw the line at the // top of the box for both the // title and heights areas
	2	// for the nth box, draw the line at the // top of the box for the title area only
	3	// for the nth box, draw the line at the // top of the box for the heights area only



Chainage Titles and Values

The chainages are always labelled

chainage_title	<i>text</i>	// first line of chainage title // (default chainages)
chainage_title_2	<i>text</i>	// second line of chainage title
chainage_title_textstyle	<i>textstyle</i>	// textstyle of the chainage titles
chainage_title_colour	<i>colour</i>	// default chainage title colour
chainage_title_size	<i>mm</i>	// default chainage title size
chainage_title_y_pos	<i>mm</i>	// if set, the height in mm above the // bottom of all the boxes that the // chainage title text is drawn. // If not set, then the text is placed at a // height that puts it inside the default // box for the chainage.
chainage_decimals	<i>integer</i>	// number of decim places for chainages
chainage_textstyle	<i>textstyle</i>	// textstyle of the chainage values
chainage_colour	<i>colour</i>	// colour of chainages, def is box_colour
chainage_size	<i>mm</i>	// size of chainages, def is box_text_size
chainage_y_pos	<i>mm</i>	// if set, the height in mm above the // bottom of all the boxes that the // chainage values text is drawn. // If not set, then the text is placed at a // height that puts it inside the default // box for the chainage.

Example of Chainage Titles

chainage_title	"DESIGN"
chainage_title_2	"CHAINAGE"

```
chainage_title_colour    "yellow"  
chainage_colour         "grey"           // colour of chainage text  
chainage_decimals       -3              // 3 decimal places - leave trailing zeros
```

Primary String Title and Heights

Sometimes the primary string is only required to define chainages or the horizontal path for tin sections. In this case, the primary string would not be drawn on the long section plot.

If the primary string is drawn, it is automatically labelled.

Also the drawing of crosses at the vertical intersection points can be controlled from the ppf file.

```
primary_draw_vips      1           // draw crosses at VIPS (default)
                       0           // don't draw VIP crosses
```

The position of the primary string label box can be either straight after the chainage box, or after the tin and offset boxes but before the blank boxes.

```
primary_string         yes           // draw and label the primary string
                       no           // don't draw or label the primary string

primary_label_mode     0           // last box before blank boxes
                       1           // first box above the chainages

primary_title          text         // first line of string title
primary_title_2        text         // second line of string title, default is
                                   // the primary string name.
primary_title_textstyle textstyle   // textstyle of the primary string titles
primary_title_colour   colour       // colour of the string titles
primary_title_size     mm           // default primary title size
primary_title_y_pos    mm           // if set, the height in mm above the
                                   // bottom of all the boxes that the
                                   // primary string title text is drawn.
                                   // If not set, then the text is placed at a
                                   // height that puts it inside the default
                                   // box for the primary string.

primary_decimals       integer      // number of decimal places
primary_textstyle      textstyle    // textstyle of the primary string heights
primary_colour         colour       // colour of the heights
primary_size           mm           // default primary value size
primary_y_pos          mm           // if set, the height in mm above the
                                   // bottom of all the boxes that the
                                   // primary string height text is drawn.
                                   // If not set, then the text is placed at a
                                   // height that puts it inside the default
                                   // box for the primary string.

primary_ch_tolerance   mm           // for a given chainage, if no z value exists,
                                   // this distance is added to/subtracted from the
                                   // chainage to search for a valid z value.
```

Example of Primary String Titles

```
primary_title          "DESIGN"
primary_title_2        "CENTRELINE"
primary_title_colour   "yellow"
primary_colour         "grey"       // colour of height text
primary_decimals       -2           // 2 decimal places - leave trailing zeros
```

Tin Titles and Heights

A section along the primary string through each tin on the section view can be automatically drawn on the long plot, and the user can specify whether the tin heights and depths are labelled or not in the boxes area.

Hence although there may be a number of tins drawn on the section plot, not all of them need to be labelled or have their depths labelled.

The default order for labelling the tins and depths is the order that the tins were added to the view however it is possible to specify which tin is used for labelling each row of tin heights and depths by giving the tin name rather than just using the tin order on the section view.

In fact, it is possible to use **any tin** in the project to label a row, **not just those drawn** on the section view.

The parameter to define the nth tin by name is *tin_n_name*:

```
tin_n_name          text          // n=1, ... no of tins on the section view.
                               // use the tin named text to label the nth
                               // row of tin heights and depths.
```

If a tin of the name *tin_n_name* does not exist, then the plot is not produced and an error message is given.

For the following parameters, n takes the value 1 to 100 and specifies that the parameter set applies to the nth tin on the section view, or if *tin_n_name* is set, for the tin specified by *tin_n_name*.

```
tin_n_draw_mode      1          // draw the nth tin (default)
                    0          // don't draw the nth tin
tin_n_draw_colour    colour     // colour to draw the nth tin.
                               // If omitted, then use the tin colour
tin_n_label          1          //label the tin's heights (default)
                    0          // don't label the tin's heights

tin_n_title          text       // first line of tin title
tin_n_title_2        text       // second line of tin title
tin_n_title_textstyle textstyle // textstyle of the tin titles
tin_n_title_colour    colour     // colour for titles of heights
tin_n_title_size      mm        // default nth tin's title size
tin_n_title_y_pos    mm        // if set, the height in mm above the
                               // bottom of all the boxes that the
                               // tin title text is drawn.
                               // If not set, then the text is placed at a
                               // height that puts it inside the default
                               // box for the tin heights.

tin_n_decimals        integer   // number of dec places in tin height
tin_n_textstyle       textstyle // textstyle of the tin heights
tin_n_colour          colour     // colour for heights and depths
tin_n_size            mm        // default nth tin's title size
tin_n_y_pos           mm        //if set, the height in mm above the
                               //bottom of all the boxes that the
                               // tin height text is drawn.
                               //If not set, then the text is placed at a
                               //height that puts it inside the default
                               // box for the tin heights.

tin_n_depth_label    1/0        // 1 to label, 0 don't label depths
tin_n_depth_title     text       // first line of tin depth title
tin_n_depth_title_2   text       // second line of tin depth title
tin_n_depth_title_textstyle textstyle // textstyle of the tin depth titles
tin_n_depth_title_colour colour // colour for titles of depths
tin_n_depth_title_size colour // size for title of depths
```

<code>tin_n_depth_title_y_pos</code>	<code>mm</code>	// if set, the height in mm above the // bottom of all the boxes that the // tin depth title text is drawn. // If not set, then the text is placed at a // height that puts it inside the default // box for the tin depths.
<code>tin_n_depth_decimals</code>	<code>integer</code>	// number of dec places in tin depth
<code>tin_n_depth_textstyle</code>	<code>textstyle</code>	// textstyle of the tin depths
<code>tin_n_depth_colour</code>	<code>colour</code>	// colour for depths
<code>tin_n_depth_size</code>	<code>mm</code>	// size for depths
<code>tin_n_depth_y_pos</code>	<code>mm</code>	// if set, the height in mm above the // bottom of all the boxes that the // tin depth text is drawn. // If not set, then the text is placed at a // height that puts it inside the default // box for the tin depths.

Offset Model Titles and Heights

For **12d** Model V3.2, Each string in the offset model given in the **section long plot** panel can be automatically projected onto the primary string and drawn on the long section plot.

For **12d Model V4.0**, the idea of an offset model has been modified to allow strings to be projected onto the primary string to be specified by model and name, rather than just projecting all the strings in a given model. The string can also be labelled with either the string name, its model name or both.

The string is specified by

```
offset_n_mask          "model_name->string_name"
```

For each n, a set of plot parameters determine if the string's heights and/or depths from the primary string are labelled in the boxes area.

If only the *string_name* is given, then the model given in the Offset model field of the **Section Long Plot** panel.

If there is **more than one string** with the given model and name, then it will be considered to be one string and at any primary string chainage, the closest of the strings will be the part used for projecting. For example, strings of the same name on either side of a road intersection will be considered to be the one string for projecting.

If any *offset_n_mask* is used, then the Offset option expects all the strings to be specified by an *offset_n_mask*. Then if no mask exists for any value of n, then that parameter set is ignored and no string projected.

If no offset masks are used (that is, no *offset_n_mask*'s are used), then the Offset option works as it did in **12d** Model V3.0. That is, plot parameters determine whether each string in the offset model is drawn, and if the string's heights and depths from the primary string are labelled in the boxes area. The order that the strings are then plotted and labelled is the same as the order of the strings in the Offset model.

For the following sets of parameters, n takes the value 1 to 100 and specifies that the parameter set applies to the nth string given by *offset_n_mask* or, if no offset masks are given, the nth string in the *Offset model*.

```
offset_n_mask          "model_name->string_name"
offset_n_draw_mode     1          // draw the nth offset string (default)
                       0          // don't draw the nth offset string
offset_n_lw            value     // default 1000. Distance to search to the left
                               // of the primary string for the offset string.
```

		// If 0, don't search to the left.
offset_n_rw	<i>value</i>	// default 1000. Distance to search to the right // of the primary string for the offset string. // If 0, don't search to the right.
offset_n_draw_colour	<i>colour</i>	// colour to draw the nth offset string. // If omitted, then use the string colour
offset_n_label	<i>1</i> <i>0</i>	//label the string's heights (default) // don't label the string's heights

The default title for each set each parameter set, is the string name but this can be changed to just the model name or the model and string name:

offset_title_mode	<i>0</i> <i>1</i> <i>2</i>	// label with string name (default) // label with model name // label with model->string as name
-------------------	----------------------------------	--

or, for any set, the *offset_title_mode* can be replaced by two lines of user defined title:

offset_n_title	<i>text</i>	// first line of title
offset_n_title_2	<i>text</i>	// second line of title
offset_n_title_textstyle	<i>textstyle</i>	// textstyle of the offset titles

The rest of the parameters for the set are:

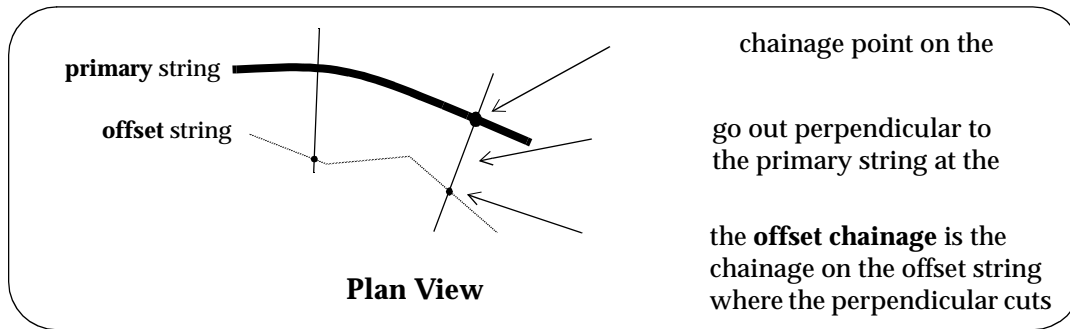
offset_n_title_colour	<i>colour</i>	// colour for titles of heights
offset_n_title_size	<i>size</i>	// colour for titles of heights
offset_n_title_y_pos	<i>mm</i>	// if set, the height in mm above the // bottom of all the boxes that the // offset title text is drawn. // If not set, then the text is placed at a // height that puts it inside the default // box for the offset heights.
offset_n_decimals	<i>integer</i>	// number of dec places in offset height
offset_n_textstyle	<i>textstyle</i>	// textstyle of the offset heights
offset_n_colour	<i>colour</i>	// colour for heights
offset_n_size	<i>size</i>	// size for heights
offset_n_y_pos	<i>mm</i>	// if set, the height in mm above the // bottom of all the boxes that the // offset height text is drawn. // If not set, then the text is placed at a // height that puts it inside the default // box for the offset heights.
offset_n_depth_label	<i>1/0</i>	// 1 to label, 0 don't label depths
offset_n_depth_title	<i>text</i>	// first line of offset depth title
offset_n_depth_title_2	<i>text</i>	// second line of offset depth title
offset_n_depth_title_textstyle	<i>textstyle</i>	// textstyle of the offset depth titles
offset_n_depth_title_colour	<i>colour</i>	// colour for titles of depths
offset_n_depth_title_size	<i>mm</i>	// size for titles of depths
offset_n_depth_title_y_pos	<i>mm</i>	// if set, the height in mm above the // bottom of all the boxes that the // offset depth title text is drawn. // If not set, then the text is placed at a // height that puts it inside the default // box for the offset depths.
offset_n_depth_decimals	<i>integer</i>	// number of dec places in offset depth
offset_n_depth_textstyle	<i>textstyle</i>	// textstyle of the offset depths

<code>offset_n_depth_colour</code>	<i>colour</i>	// colour for depths
<code>offset_n_size</code>	<i>size</i>	// size for depths
<code>offset_n_depth_y_pos</code>	<i>mm</i>	// if set, the height in mm above the // bottom of all the boxes that the // offset depth text is drawn. // If not set, then the text is placed at a // height that puts it inside the default // box for the offset depths.

Chainages of Offset Strings - Offset Chainages

For a string other than the primary string, it is possible to label the chainages that are obtained from the other string by going out perpendicular to the primary string at a chainage, cutting the other string and then calculating the chainage from the other string at the cut point.

The other string is known as an **offset** string and the chainage from the offset string corresponding to a primary chainage is called the **offset chainage**.



Up to twenty sets of offset chainages can be labelled - each is defined by its own set of parameters:

Note no box is automatically created for the offset chainages. An empty box must be defined and the appropriate values set for *chainage_n_title_y_pos* and *chainage_n_y_pos*

<i>chainage_n_offset_mode</i>	<i>tick box</i>	// if ticked, use nth offset string for calculations
<i>chainage_n_offset_string</i>	" <i>model_name->string_name</i> "	// string to calculate offset chainages for
<i>chainage_n_title</i>	<i>text</i>	// first line of offset chainage title
<i>chainage_n_title_2</i>	<i>text</i>	// second line of offset chainage title
<i>chainage_n_title_textstyle</i>	<i>textstyle</i>	// textstyle of the offset chainage titles
<i>chainage_n_title_colour</i>	<i>colour</i>	// offset chainage title colour
<i>chainage_n_title_size</i>	<i>mm</i>	// offset chainage title size
<i>chainage_n_title_y_pos</i>	<i>mm</i>	// the height in mm above the bottom of all the boxes that the offset chainage title text is drawn.
<i>chainage_n_decimals</i>	<i>integer</i>	// number of decim places for offset chainages
<i>chainage_n_textstyle</i>	<i>textstyle</i>	// textstyle of the offset chainage values
<i>chainage_n_colour</i>	<i>colour</i>	// colour of offset chainages
<i>chainage_n_size</i>	<i>mm</i>	// size of offset chainages
<i>chainage_n_y_pos</i>	<i>mm</i>	// the height in mm above the bottom of all the boxes that the chainage values text is drawn.

Example of Offset Chainage and Titles

<i>chainage_1__offset_string</i>	"Design->RKERB"	
<i>chainage_1__title</i>	"RIGHT KERB"	
<i>chainage_1_title_2</i>	"CHAINAGE"	
<i>chainage_1_title_colour</i>	"yellow"	
<i>chainage_1_colour</i>	"grey"	// colour of offset chainage text
<i>chainage_1_decimals</i>	-3	// 3 decimal places - leave trailing zeros

Definition of Depth to a Tin or to Offset Strings

The depth from the primary string to a tin or to a string from the offset model, at a particular chainage is defined as

$$\mathbf{depth} = \text{tin height value} - \text{height of the primary string}$$

or

$$\mathbf{depth} = \text{offset string height value} - \text{height of the primary string}$$

That is, the depth that the primary string is **below** the tin or a string from the offset model.

Before plotting, the value of depth is multiplied by either the *depth_positive_factor* or *depth_negative_factor*.

if (depth >= 0) plotted_depth_value = depth * depth_positive_factor

if (depth < 0) plotted_depth_value = depth * depth_negative_factor

Hence the definition of depth can be modified by the parameters:

```
depth_positive_factor    value    // multiplier for positive depths
depth_negative_factor    value    // multiplier for negative depths
```

For example, if the opposite sign is required for depth, that is,

$$\mathbf{depth} = \text{height of the primary string} - \text{tin/offset string height value}$$

simply set

```
depth_positive_factor    -1
depth_negative_factor    -1
```

Super-Elevation Diagram

The optional *super-elevation diagram* draws the values of the cross-fall (x-fall) between two strings using the primary string as the reference string. The cross-fall at a given chainage on the primary string is calculated by sectioning perpendicular to the reference string at that chainage and cutting the two strings. The cross-fall is defined as the cross-fall between the two cuts points on the strings.

The diagram has levels for the cross fall for a pair of strings on the left of the primary string, and a pair of strings on the right of the primary string. The diagram also has uprights in the super-elevation box with chainage values at the change of super values.

For the left hand side, the cross-fall is calculated at right angles to the primary string between the user given left hinge string and the left edge string.

There are plot parameters to control all aspects of the super diagram.

```

super_draw_mode          0           // default, don't draw a super diagram
                        1           // draw super using super_sample_interval
                        2           // sample super using chainages of x-sections
                        3           // sample super using chainages from a string
super_sample_interval    value       // if super_draw_mode = 1, default 20
                                // chainage distance to sample x-fall
super_sample_name        model_name  // if super_draw_mode = 2
                                model_name->string_name // if super_draw_mode = 3

super_tolerance          value       // If super_draw_mode is 1, the change
                                // of super is greater than super_tolerance,
                                // draw uprights

super_title              text        // first line of super title
                                // def Super elevation

super_title_textstyle    textstyle   // textstyle of the super titles
super_title_colour       colour      // super title colour, def box_colour
super_title_size         mm          // super title size, def label_text_size
super_title_y_pos        mm          // if set, the height in mm above the
                                // bottom of all the boxes that the
                                // super title text is drawn.
                                // If not set, then the text is placed at a
                                // height that puts it inside the default
                                // box for the super.

super_xfall_textstyle    textstyle   // textstyle of the super x-fall labels
super_xfall_colour       colour      // super x-fall colour, def box_colour
super_xfall_size         mm          // super x-fall size, def label_text_size
super_xfall_x            mm          // def 0
super_xfall_y            mm          // def 0.5
super_ch_textstyle       textstyle   // textstyle of the super chainages
super_ch_colour          colour      // super chainage colour, def box_colour
super_ch_size            mm          // super chainage size, def label_text_size
super_ch_x               mm          // def 0
super_ch_y               mm          // def -1
super_ch_decimals        integer     // number decimal places in chainage
                                // def number_of_decimals

super_hinge_name_left    model_name->string_name // left hinge string
super_edge_name_left     model_name->string_name // left edge string
super_left_linestyle     linestyle   // default DASHED
super_left_line_colour   colour      // default box_colour
super_left_decimals      integer     // number decimal places in left x-fall
                                //def 0

super_left_pre           text        // text before left x-fall value
super_left_post          text        // text after left x-fall value
super_hinge_name_right   model_name->string_name // right hinge string

```

```

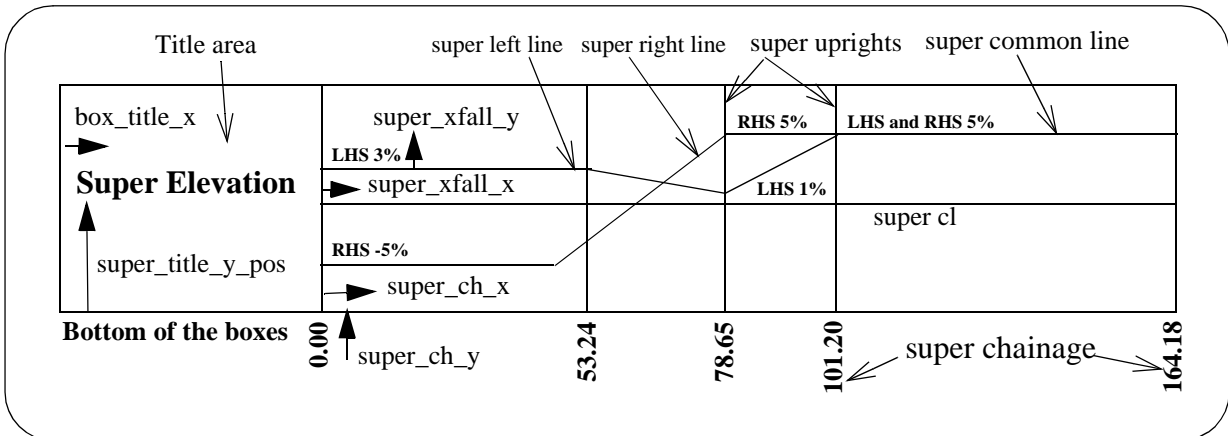
super_edge_name_right      model_name->string_name // right edge string
super_right_linestyle      linestyle // default DASHED2
super_right_line_colour    colour // default box_colour
super_right_decimals       integer // number decimal places in right x-fall
                             //def 0

super_right_pre            text // text before right x-fall value
super_right_post           text // text after right x-fall value
super_cl_linestyle        linestyle // default 1
super_cl_line_colour       colour // default box_colour

super_common_pre           text // text before common x-fall value
super_common_post         text // text after common x-fall value
super_common_linestyle    linestyle // default 1
super_common_line_colour  colour // default box_colour
super_common_decimals     integer // number decimal places in common xfall
                             //def 0

super_upright_mode        0 // uprights for left string only (default)
                           1 // right
                           2 // left and right

super_upright_colour      colour // default box_colour
    
```



Example of Super

```

super_hinge_name_left      "super->lkerb"
super_edge_name_left      "super->lshoulder"

super_hinge_name_right    "super->rkerb"
super_edge_name_right    "super->rshoulder"

super_draw_mode           3
super_sample_interval     10
super_sample_name        "super->lkerb"

super_title_size          5
super_title_colour        ORANGE
super_title_textstyle     GOTHIC
super_title_y_pos        10
super_title              "Super EL"

super_xfall_size          1.5
super_xfall_colour        GREY
super_xfall_textstyle     HELV
    
```

```
// super_xfall_y          0.5
// super_xfall_x          2

super_ch_size             3
super_ch_colour           YELLOW
super_ch_textstyle       ISO
super_ch_y                -2
super_ch_x                -0.5
super_ch_decimals        -2

super_left_linestyle      DIVIDE
super_right_linestyle     PHANTOM2
super_cl_linestyle        PHANTOM
// super_common_linestyle thick

super_left_line_colour    RED
super_right_line_colour   YELLOW
super_cl_line_colour      CYAN
super_common_line_colour  MAGENTA
super_upright_colour      BLUE

// super_common_pre       "Pre "
// super_common_post      "% Post"

// super_common_decimals  -1
super_right_decimals      1
super_left_decimals       1
```

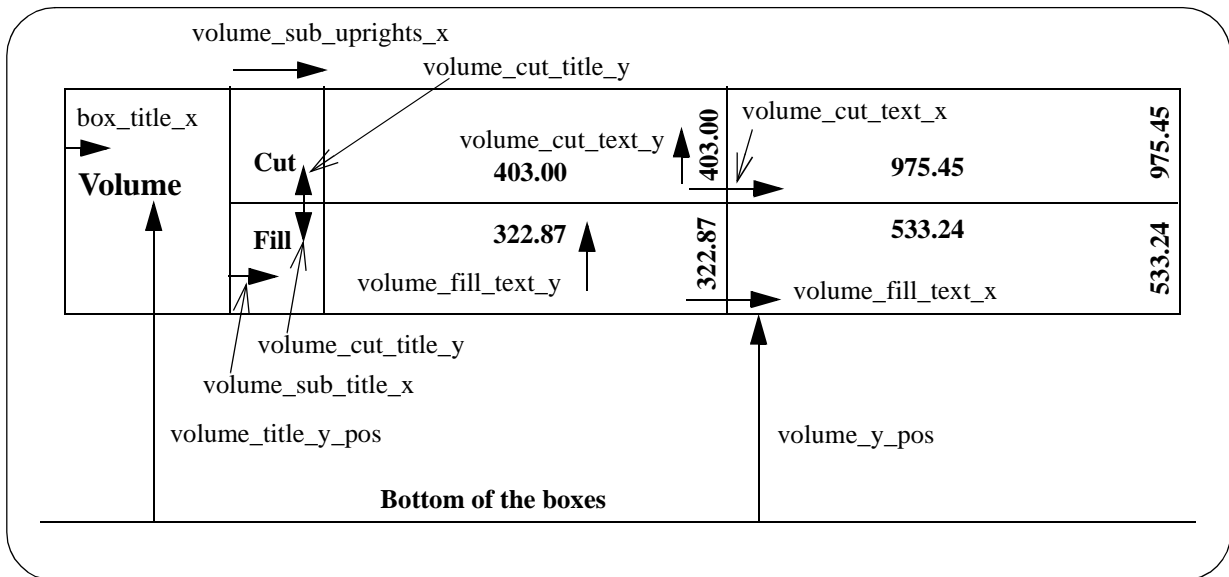
Volume Cut and Fill Values

The values of calculated cut and fill volumes (cut and fill earth works) can be read from a file and then interpolated to produce cut and fill volumes for a given interval along the primary string.

There are plot parameters to control all aspects of the volume diagram.

volume_draw_mode	0	// default, don't draw a volume diagram
	1	// draw a volume diagram
volume_text_centre_mode	0	// default, the text of cut and fill are labelled // along the uprights
	1	// the text are centred in between the uprights
volume_sample_interval	value	// interval to display volumes, default 20
volume_file_name	file_name	// the volumes report file
volume_y_pos	mm	// if set, the volume box is positioned at this // height from the bottom of the first box
volume_box_size	mm	// if set, the uprights and volume and titles // are plotted in accordance with this heights
volume_title	text	// first line of volume title // default <i>Earthworks</i>
volume_title_textstyle	textstyle	// textstyle of the volume titles
volume_title_colour	colour	// volume title colour, def box_colour
volume_title_size	mm	// volume title size, def label_text_size
volume_title_y_pos	mm	// if set, the height in mm above the // bottom of all the boxes that the // volume title text is drawn. // If not set, then the text is placed at a // height that puts it inside the default // box for the volumes.
volume_cut_title	text	// first line of volume sub title // default <i>cut</i>
volume_cut_title_textstyle	textstyle	// textstyle of the cut volume titles
volume_cut_title_colour	colour	// cut volume title colour, def box_colour
volume_cut_title_size	mm	// cut volume title size, def label_text_size
volume_cut_title_y	mm	// if set, the height in mm above the // default position. // If not set, then the text is placed at a // height that puts it inside the default // box for the cut volumes.
volume_fill_title	text	// first line of volume sub title // default <i>fill</i>
volume_fill_title_textstyle	textstyle	// textstyle of the fill volume titles
volume_fill_title_colour	colour	// fill volume title colour, def box_colour
volume_fill_title_size	mm	// fill volume title size, def label_text_size
volume_fill_title_y	mm	// if set, the height in mm above the // default position. // If not set, then the text is placed at a // height that puts it inside the default // box for the fill volumes.
volume_cut_textstyle	textstyle	// textstyle of the cut values
volume_cut_text_colour	colour	// cut value colour, def box_colour
volume_cut_text_size	mm	// cut value size, def label_text_size
volume_cut_text_x	mm	// the x distance to move the cut text from the // default cut text position, def 0, it is not used // if volume_text_centre_mode=1
volume_cut_text_y	mm	// the y distance to move the cut text from the // default cut text position, def 0
volume_cut_decimals	integer	// number decimal places in cut values //def number_of_decimals

volume_fill_textstyle	<i>textstyle</i>	// textstyle of the fill values
volume_fill_text_colour	<i>colour</i>	// fill value colour, def box_colour
volume_fill_text_size	<i>mm</i>	// fill value size, def label_text_size
volume_fill_text_x	<i>mm</i>	// the x distance to move the fill text from the // default fill text position, def 0, it is not used // if volume_text_centre_mode=1
volume_fill_text_y	<i>mm</i>	// the y distance to move the fill text from the // default fill text position, def 0
volume_fill_decimals	<i>integer</i>	// number decimal places in fill values //def number_of_decimals
volume_cl_linestyle	<i>linestyle</i>	// linestyle of horizontal cut/fill dividing line
volume_cl_line_colour	<i>colour</i>	// colour of horizontal cut/fill dividing line
volume_uprights_draw_mode	<i>0</i>	// default, don't draw cut/fill uprights
	<i>1</i>	// draw cut/fill uprights
volume_uprights_line_colour	<i>colour</i>	// colour of uprights
volume_sub_upright_colour	<i>colour</i>	// colour of sub uprights line
volume_sub_uprights_x	<i>mm</i>	// the distance to move from the default // sub uprights position, def 0
volume_sub_title_x	<i>mm</i>	// the distance to move the sub title text // from the volume sub uprights



Example of Volumes

volume_draw_mode	1
volume_sample_interval	25
volume_file_name	"volume.rpt"
volume_text_centre_mode	0
volume_y_pos	150
volume_box_size	40
volume_title	"Volumes"
volume_title_size	5
volume_title_colour	grey

```

//          volume_title_textstyle
           volume_title_y_pos                165

           volume_cut_title                 "cut"
//          volume_cut_title_size
//          volume_cut_title_colour
//          volume_cut_title_textstyle
           volume_cut_title_y                3

           volume_fill_title                "fill"
//          volume_fill_title_text_size
//          volume_fill_title_text_colour
//          volume_fill_title_textstyle
           volume_fill_title_y              -3

           volume_cut_text_size             3
//          volume_cut_text_colour
//          volume_cut_textstyle
           volume_cut_text_y                5
//          volume_cut_text_x
           volume_cut_decimals              0
           volume_fill_text_size            3
//          volume_fill_text_colour
//          volume_fill_textstyle
           volume_fill_text_y              245
//          volume_fill_text_x
           volume_fill_decimals             0

           volume_cl_linestyle              "PHANTOM"
           volume_cl_line_colour            red

           volume_uprights_draw_mode        1
           volume_uprights_line_colour      "purple"

           volume_sub_upright_colour        23
           volume_sub_uprights_x            10

           volume_sub_title_x               3

```

X,Y Values

The values of the X and Y coordinate for selected chainages can be labelled as separate boxes. The chainages specified are limited to the base set of chainages already defined in the chainage selection and staggering section. i.e. an upright must exist for the X and Y value to be labelled. Not all of the uprights have to be labelled, just those specified in this section.

There are plot parameters to control all aspects of the X and Y labelling.

Chainages are used for positioning X and Y labels.

The chainages for the long section plot relate to the primary string and are controlled by a set of parameters.

xy_order	0		// 0 = X on bottom, Y on top
	1		// 1 = Y on bottom, X on top
xy_chord_arc	0		// don't use chord/arc chainages
	1		// include chainages for chord/arc
xy_start_chainage	<i>value</i>		// start chainage of labelling range
xy_end_chainage	<i>value</i>		// end chainage of labelling range
xy_interval	<i>value</i>		// regular interval (0 = no regulars)
xy_label_hcp	0/1		// 1 = include tangents, spirals
xy_label_hip	0/1		// 1 = include hip points
xy_label_vip	0/1		// 1 = include vip points
xy_label_vtp	0/1		// 1 = include tangent points
xy_label_crest	0/1		// 1 = include crest points
xy_label_sag	0/1		// 1 = include sag points
xy_label_grade_change	0/1		// 1 = include change of vertical grade
xy_special_n_file	<i>filename</i>		// n = 1 to 20 - include chainages from // the file (one chainage per line)
xy_label_tolerance	<i>value</i>		// > 0 use as weeding tolerance // <= 0, don't weed

For X parameters:

x_label	0/1		// 0 = Don't label X values/titles // 1 = Label X values/titles
x_title	<i>text</i>		// first line of X title // (default "Easting")
x_title_2	<i>text</i>		// second line of X title
x_title_textstyle	<i>textstyle</i>		// textstyle of the X titles
x_title_colour	<i>colour</i>		// default X title colour
x_title_size	<i>mm</i>		// default X title size
x_title_y_pos	<i>mm</i>		// if set, the height in mm above the // bottom of all the boxes that the // X title text is drawn. // If not set, then the text is placed at a // height that puts it inside the default // box for the X.
x_label_decimals	<i>integer</i>		// number of decim places for X values
x_label_textstyle	<i>textstyle</i>		// textstyle of the X values
x_label_colour	<i>colour</i>		// colour of X values, def is box_colour
x_label_size	<i>mm</i>		// size of X values, def is box_text_size
x_label_y_pos	<i>mm</i>		// if set, the height in mm above the // bottom of all the boxes that the // X value text is drawn. // If not set, then the text is placed at a // height that puts it inside the default // box for the X value.

For Y parameters:

y_label	0/1	// 0 = Don't label Y values/titles // 1 = Label Y values/titles
y_title	text	// first line of Y title // (default "Easting")
y_title_2	text	// second line of Y title
y_title_textstyle	textstyle	// textstyle of the Y titles
y_title_colour	colour	// default Y title colour
y_title_size	mm	// default Y title size
y_title_y_pos	mm	// if set, the height in mm above the // bottom of all the boxes that the // Y title text is drawn. // If not set, then the text is placed at a // height that puts it inside the default // box for the Y.
y_label_decimals	integer	// number of decim places for Y values
y_label_textstyle	textstyle	// textstyle of the Y values
y_label_colour	colour	// colour of Y values, def is box_colour
y_label_size	mm	// size of Y values, def is box_text_size
y_label_y_pos	mm	// if set, the height in mm above the // bottom of all the boxes that the // Y value text is drawn. // If not set, then the text is placed at a // height that puts it inside the default // box for the Y value.

Please continue to the next section "Chainage Selection and Staggering" .

Chainage Selection and Staggering

Chainages are used for positioning height labels, uprights (leader lines) and bubbles.

The chainages for the long section plot relate to the primary string and are controlled by a set of parameters.

chord_arc	0	// don't use chord/arc chainages
	1	// include chainages for chord/arc
chainage_interval	<i>value</i>	// regular interval (0 = no regulars)
chainage_label_ends	0/1	// 1 = include start and end chainages
chainage_label_hcp	0/1	// 1 = include tangents, spirals
chainage_label_hip	0/1	// 1 = include hip points
chainage_label_vip	0/1	// 1 = include vip points
chainage_label_vtp	0/1	// 1 = include tangent points
chainage_label_crest	0/1	// 1 = include crest points
chainage_label_sag	0/1	// 1 = include sag points
chainage_label_grade_change	0/1	// 1 = include change of vertical grade
chainage_special_n_file	<i>filename</i>	// n = 1 to 20 - include chainages from // the file (one chainage per line)
chainage_label_tolerance	<i>value</i>	// > 0 use as weeding tolerance // <= 0, don't weed
chainage_merge_bubbles	0/1	// 1 = merge in the bubble chainages
chainage_merge_tolerance	<i>value</i>	// > 0, weeding tol after bubble merge // <= 0, don't weed after merge

Default values

chainage_label_tolerance = 1.0 exp -4 (world units)

chainage_merge_tolerance = 1.0 exp -8 (world units)

If a tolerance is zero or negative, no weeding is performed.

The format of a chainage special file is simply a list of chainage values, one value per lines. Blank lines in the file are ignored and anything on a line after a // is a comment.

If the real chainage position is used for the horizontal position of the chainage/height/depth text, text over writing can easily occur.

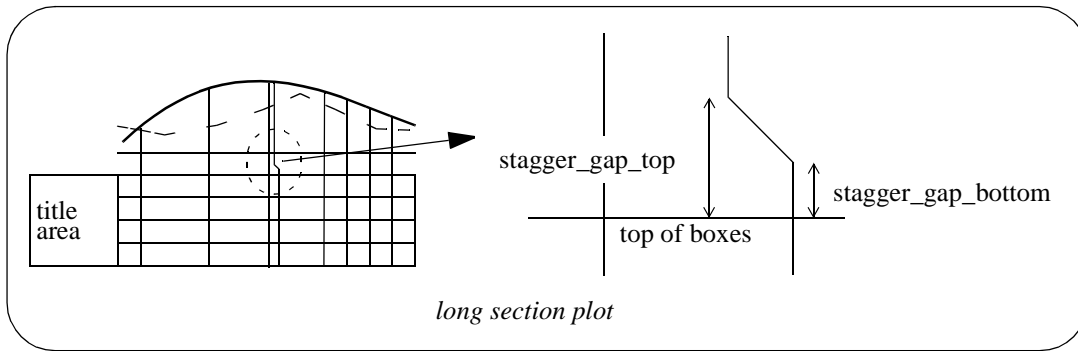
To prevent over writing, the text can be **staggered**.

If the **stagger_mode** parameter is set to 1, the text position is adjusted so that the text does not over write.

The real chainage position is then indicated by the chainage markers which are drawn at the top of the text boxes from the staggered text position back to the actual chainage position of the text.

stagger_mode	0	// no staggering, allow over writing
	1	// stagger text to prevent over writing
stagger_gap_top	<i>mm</i>	// distance from boxes to top of stagger
stagger_gap_bottom	<i>mm</i>	// distance from boxes to bottom of // stagger
stagger_gap_factor	<i>value</i>	// distance between staggers is // box_text_size * stagger_gap_factor

When staggering occurs, it is possible for the heights area to be longer than the graph area.



Please continue to the next section “Uprights” .

Uprights

Uprights, or leader lines, can be drawn from the top of the staggers to the strings drawn on the plot.

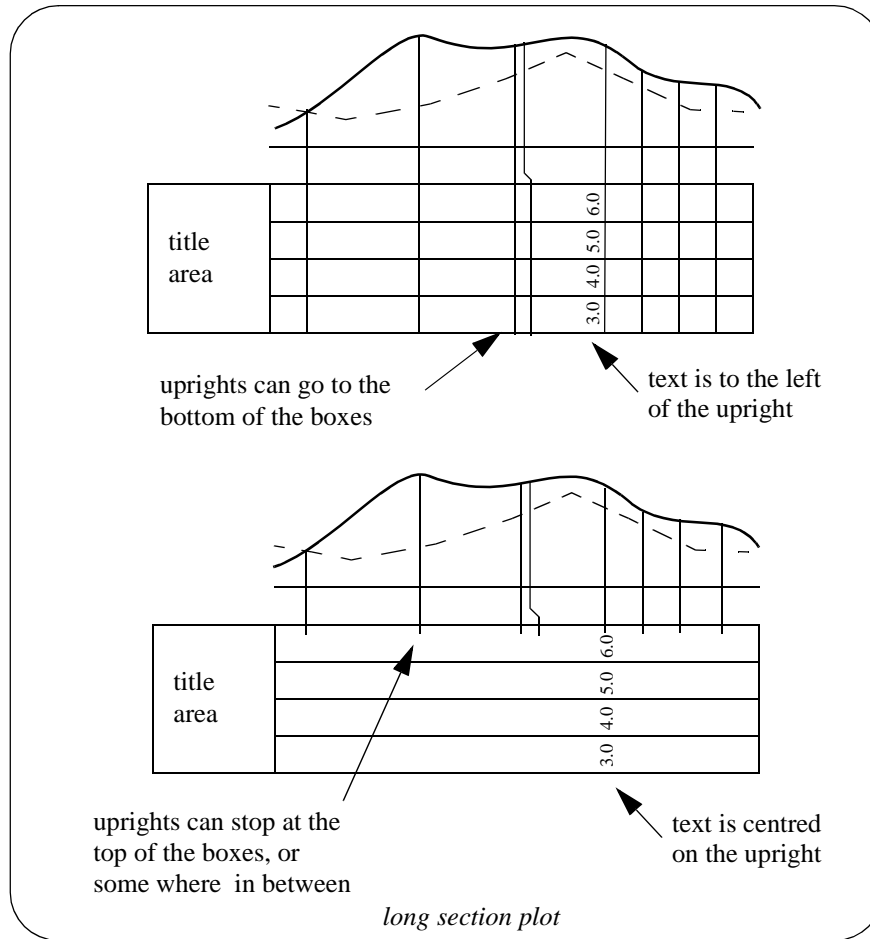
The height of the uprights is given by the `uprights_draw_mode`:

<code>uprights_draw_mode</code>	0	// none
	1	// to maximum string height at that // chainage
	2	// ticks, to stagger height
	3	// to <code>uprights_y</code> above the boxes
	100	// to the primary string
	101-500	// to tin1 or tin2 etc.
	501-900	// to offset1 or offset2 etc.
<code>uprights_y</code>	<i>mm</i>	// distance to draw the uprights for // mode 3
<code>uprights_colour</code>	<i>colour</i>	// uprights colour (default <code>boxes_colour</code>)

The uprights can go below the top of the boxes.

<code>uprights_bottom_mode</code>	0	// stop at top of boxes (default)
	1	// draw to bottom of boxes
	2	// draw to <code>uprights_bottom_y</code> below the // top of the boxes
	3	// draw to <code>uprights_bottom_y</code> above the // bottom of the boxes
	4	// ticks at chainage
<code>uprights_bottom_y</code>	<i>mm</i>	//distance
<code>uprights_text_offset_factor</code>	<i>value</i>	// move the text by this factor*size

When uprights go below the top of the boxes, the height and offset text is moved to the left so that the upright does not go through the text. The left hand side of the heights boxes also moves to the left to leave room for the height text.



Please continue to the next section "Datum Area".

Datum Area

The **datum area** is the region between the boxes area and the graph area.

The **datum line** is positioned the distance *datum_below_gap* above the top of the boxes area and the graph area is positioned the distance *datum_above_gap* above the datum line.

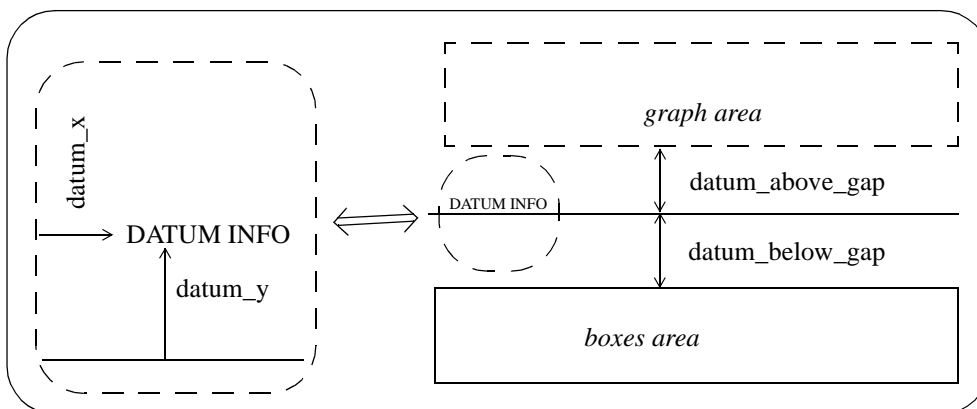
Hence the graph area is distance (*datum_below_gap* + *datum_above_gap*) above the top of the boxes area.

<i>datum_above_gap</i>	<i>mm</i>	// distance from datum line to the // bottom of the graph area
<i>datum_below_gap</i>	<i>mm</i>	// distance from datum line to the top of // the boxes
<i>datum_linestyle</i>	<i>linestyle</i>	// linestyle for datum line (default solid)

The *datum_below_gap* and *datum_above_gap* can be zero or positive.

A value for the datum can be specified by the parameter **datum_value** or if the *datum_value* is not set, a datum value is automatically calculated for the long section using a roundoff specified by the user (default 1.0).

<i>datum_value</i>	<i>value</i>	// if set, the value to use for datum. // If not set, the datum is automatically // calculated (using <i>datum_roundoff</i>)
<i>datum_roundoff</i>	<i>1.0</i>	// value to roundoff the datum value to // e.g. 0.5, 0.2, 1.0 (default 1.0)
<i>datum_decimals</i>	<i>integer</i>	// number of decimal places to display // the datum value (default 1). // If > 0, trailing zeros are removed after // the decimal point. // If < 0, the absolute value is taken as the // number of decimal places to report // i.e. no trailing zeros are removed
<i>datum_name</i>	<i>text</i>	// text to write before the datum value
<i>datum_textstyle</i>	<i>textstyle</i>	// textstyle for the datum text
<i>datum_text_size</i>	<i>mm</i>	// size of datum text and value
<i>datum_colour</i>	<i>colour</i>	// colour of the datum text and line
<i>datum_x</i>	<i>mm</i>	// distance to move the datum text // along the datum line
<i>datum_y</i>	<i>mm</i>	// distance to raise the datum text // above the datum line (used to be // called <i>datum_offset</i>)



Please continue to the next section “Graph Area” .

Graph Area

The **graph area** is the area where the actual plots of the strings are drawn.

The string used to define the horizontal position and chainage of the plot is called the **primary string** and is either

- (a) the string being profiled on the given section view
- or
- (b) the string given by the parameter

```
string_to_plot          "model->string_name"    // name of string to profile
```

When the primary string is being written out to a plot parameter file by **12d Model**, a *string_to_plot* parameter and special parameters recording the internal id's for the string and it's model are all written out.

```
primary_model_id      integer                // internal 12d Model parameter
primary_string_id     integer                // internal 12d Model parameter
```

The **length** of the graph area is determined by the length of the primary string being plotted (restricted to the specified start and end chainages) and the horizontal scale (scale) given by parameters or in the **section long plot** panel, and the vertical exaggeration given by the section view or a parameter.

```
view_name             text                   // default is section view in panel.
vertical_exaggeration value                 // default is vertical exag for the view
scale                 value                 // 1:value - horizontal scale, default is
// scale 1: in panel
start_chainage        value                 // "" means use start of primary string
end_chainage          value                 // "" means use end of primary string
```

The vertical scale is determined by the horizontal scale and the vertical exaggeration.

The **height** of the graph area is determined by the vertical scale (given by the horizontal scale and the vertical exaggeration) and the minimum and maximum values of the data being plotted. Hence the graph height is a calculated rather than a given value.

The types of strings that can be drawn in the graph area of a long section plot are:

- (a) primary string the string being profiled (usually the design string).
- (b) tins sections of the primary string through any tins either in models on the section view or in corridor models.
- (c) offset strings strings in the **offset model** that are projected back onto the primary string
- (d) services parts of strings (from either models on the section view or in corridor models) that cut the defined corridor.

The **colour** of the strings in the plot is the actual string colour for cases (a), (c) and (d), and the colour of the tin used for the section in case (b).

Although all the strings are plotted, the plot parameter file can be used to select which ones are labelled with heights and/or depths.

Primary String (Design String)

The primary string (the design string) is used to define

- (a) the design long section
- (b) the chainage positions for labelling heights and drawing uprights
- (c) the section line used for sectioning through tins
- (d) the section line for defining the corridor for services

Although the primary string is used to set up most of the information for the long section plot, it doesn't have to be drawn on the long section.

The drawing or not drawing of the primary string on each cross section plot is controlled by the parameter *primary_string* which was described earlier.

The **colour** of the primary string in the plot is the actual primary string colour.

Tins

A section along the primary string through each tin on the specified section view is automatically drawn on the cross section plot.

The **colour** and **linestyle** of the tin section in the plot is the actual tin colour and tin linestyle.

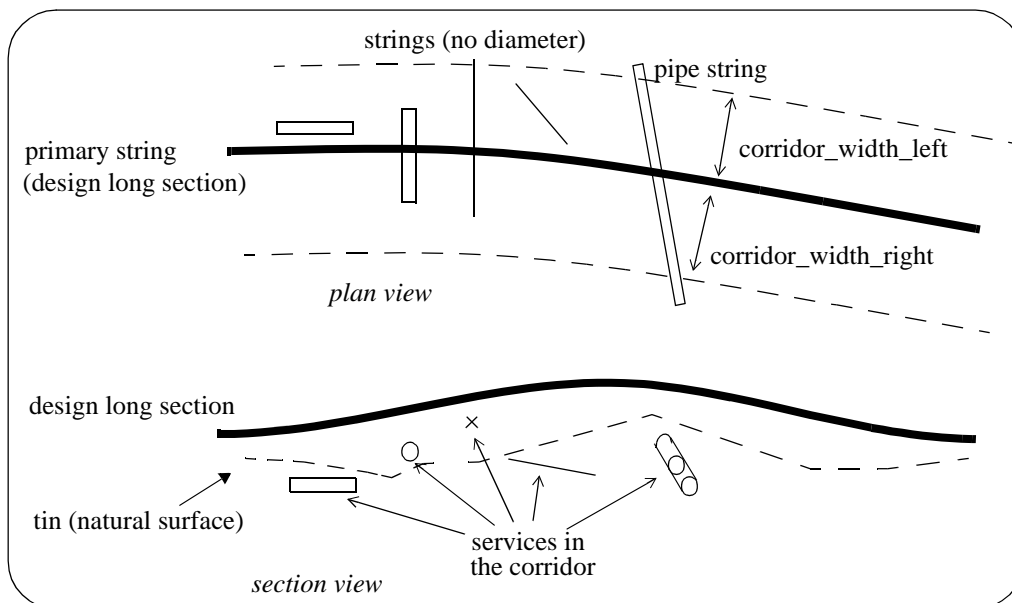
Whether the tin heights are labelled or not in the boxes area is controlled by parameters and has been described earlier

Corridor and Services

A corridor around the primary string is defined by giving a left and right corridor width.

Any string in a model added to the section view is checked to see if it appears in the corridor, and if it does, then it is drawn on the long section plot.

To be drawn, strings do not have to cross the primary string, but just be in the corridor.



The corridor defining parameters are

<code>corridor_width_left</code>	<code>world-units</code>	// corridor left and right widths
<code>corridor_width_right</code>	<code>world-units</code>	// defaults are the section view values
<code>corridor_overlap_left</code>	<code>world-units</code>	// corridor left and right overlaps.
<code>corridor_overlap_right</code>	<code>world-units</code>	// defaults are the section view values
<code>corridor_chord_arc</code>	<code>world-units</code>	// chord-arc tolerance used to // approximate arcs in the corridor. // default is the section view value

The models containing tins for sectioning and strings for services are taken from the section view or given by the parameters

<code>corridor_model_n</code>	<code>model</code>	// n = 1, 2 ... 100 // models containing tins and service // strings to be drawn on the view.
-------------------------------	--------------------	---

If any *corridor_model_n* parameters are defined, then only the models given by the parameters are used. If no *corridor_model_n* parameters are set, then the models added to the given section view

are used.

That is, either the *corridor_model_n* parameters are used or if none exist, then the models added to the section view are used for tins and service strings.

The **colour** and **diameter** of the service strings drawn in the plot are the actual strings colour and diameter.

The graph area sits on top of the boxes and datum areas, so there may not be enough room left on the sheet for the full plot height. In this case, the plot will be truncated at the top of the allowed graph area.

Please continue to the next section “Bubbles Definitions” .

Bubbles Definitions

Circles with the string name and a unique number (**bubbles**) can be drawn on the long section plot. Bubbles are normally used for lip profiles.

The chainages used for the bubbles are given by a set of parameters similar to the chainage parameters. The resulting set of bubbles are sequentially numbered (starting with one) in chainage order.

Although many bubbles can be defined by the bubble parameters, a bubble is only drawn on the plot if there is a labelled chainage to draw it above.

Hence not all bubbles given by the bubble chainage parameters are drawn but for the ones that are drawn, the bubble number is taken from the full bubble set.

chainage_bubbles	0	// don't drawn bubbles
	1	// draw bubbles
bubble_radius	<i>mm</i>	// radius of the bubbles
bubble_colour	<i>colour</i>	// colour for the bubbles
bubble_text_string_name_mode0		// do not label with string name
	1	// label string name
	2	// label with model->string name
bubble_pre_text	<i>text</i>	
bubble_post_text	<i>text</i>	
bubble_textstyle	<i>textstyle</i>	
bubble_text_size	<i>mm</i>	
bubble_text_colour	<i>colour</i>	
bubble_text_offset	<i>mm</i>	
bubble_upright_distance	<i>mm</i>	// distance bubbles are above boxes/uprights
bubble_mode	0	// bubble_upright_distance is above boxes
	1	// bubble_upright_distance is above
		// uprights
bubble_draw_upright	0/1	// 1 = draw extra upright if
		// bubble_mode = 1
bubble_start_chainage	<i>value</i>	// start chainage for bubbles
bubble_end_chainage	<i>value</i>	// end chainage for bubbles
bubble_chord_arc	0/1	// 1 = use chord-arc chainages
bubble_interval	<i>value</i>	// include regular interval
		// (0 = no regulars)
bubble_label_ends	0/1	// 1 = include start and end chainages
bubble_label_hcp	0/1	// 1 = include tangents, spirals
bubble_label_hip	0/1	// 1 = include hip points
bubble_label_vip	0/1	// 1 = include vip points
bubble_label_vtp	0/1	// 1 = include tangent points
bubble_label_crest	0/1	// 1 = include crests
bubble_label_sag	0/1	// 1 = include sags
bubble_label_grade_change	0/1	// 1 = include change of grade
bubble_special_n_file	<i>filename</i>	// n = 1 to 20 include chainages from the
		// file
bubble_label_tolerance	<i>value</i>	// > 0 use as weeding tolerance
		// <= 0, don't weed

Defaults

bubble_label_tolerance = 1.0 exp -4 (world units)

If a tolerance is zero or negative, no weeding is performed.

The format of a bubble special file is simply a list of chainage values, one value per lines. Blank lines in the file are ignored and anything on a line after a // is a comment.

Please continue to the next section “Quick Horizontal Geometry Labelling” .

Quick Horizontal Geometry Labelling

The standard horizontal geometry arrows can be drawn at a given distance above the top of the boxes area.

```

horizontal_geometry_y'                mm                // dist above boxes
                                           // 0 = don't draw

horizontal_geometry_arrow_text_colour  colour
horizontal_geometry_arrow_textstyle   textstyle
horizontal_geometry_arrow_text_size   mm
horizontal_geometry_arrow_colour      colour
horizontal_geometry_arrow_height      mm
horizontal_geometry_label_text        text
horizontal_geometry_label_textstyle   textstyle
horizontal_geometry_label_text_colour  colour
horizontal_geometry_label_text_size   mm
horizontal_geometry_label_decimals    number

```

Please continue to the next section “Extensive Horizontal Geometry Labelling” .

Extensive Horizontal Geometry Labelling

For complicated horizontal geometry labelling, there are sets of horizontal geometry labelling parameters which give tight control over the position and types of labels.

It is also possible to label the horizontal geometry of **alignment** strings other than the primary string. To plot such a string on the same plot, the chainage position of the horizontal geometry for the non-primary alignment strings is *projected* onto the primary string to give a primary string chainage for plotting. The values of the horizontal geometry (such as radius and spiral length) that are plotted are taken from the other string. Independently graded offset strings (such as a left and right kerbs) are the type of additional alignment strings that may need to be plotted on the same long section plot as the reference string (primary string).

For plotting horizontal geometry, the user can give up to twenty sets of these labels and they can be used to label spirals, curves and tangent information for the primary string and/or additional alignment strings.

Each label set consists of three parts:

- (a) a text label on the left hand side of the plot
- (b) an arrow
- (c) text on the arrows.

For the following parameters, n takes the value 1 to 20 and specifies the nth parameter set.

```

h_g_n_type          0                // label spirals
                    1                // label horizontal curves
                    2                // label horizontal tangents

```

If *h_g_n_type* is missing, then the set is ignored.

```

h_g_n_value_mode
for spiral labelling  0                // nothing
                    1                // length
for curve labelling  0                // nothing
                    1                // length
                    2                // radius
for tangent labelling 0                // nothing

```

```

for spiral labelling      1 // length
                        0 // nothing
                        1 // length
                        2 // radius*length
      h_g_n_label_y      mm // distance of arrow line above the top of
                        // the boxes

```

Parameters for the left hand label of the line of the horizontal geometry arrows:

```

      h_g_n_label_x      mm // distance from the left hand side of the
                        // labels area
      h_g_n_label_offset mm // distance to raise the label_text above
                        // arrow line

      h_g_n_label_text_size mm
      h_g_n_label_text_colour colour
      h_g_n_label_text text
      h_g_n_label_textstyle textstyle // textstyle used

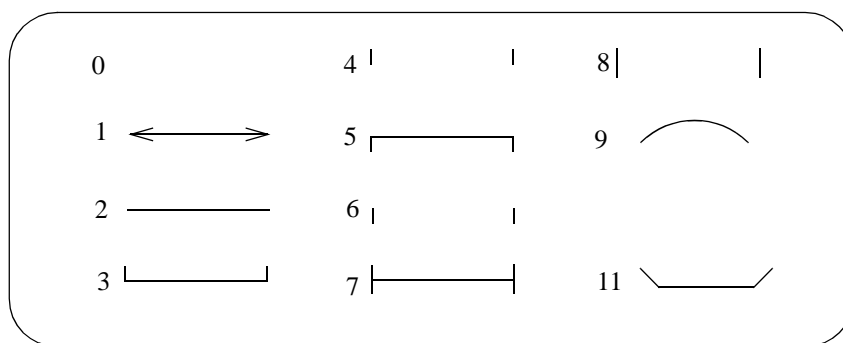
```

Parameters for arrow type

```

      h_g_n_draw_mode    0 // no arrow
                        1 // arrow
                        2 // line
                        3 // line with uprights at ends
                        4 // uprights, no line
                        5 // line with downrights
                        6 // downrights, no line
                        7 // line with up and downrights at ends
                        8 // up and downrights, no line
                        9 // draw curve
                       11 // radius*length curve

```



```

      h_g_n_left_gap     mm // size of gap for left side of arrow
      h_g_n_right_gap    mm // size of gap for right side of arrow
      h_g_n_colour       colour // colour of the arrow
      h_g_n_height       mm // height of the arrow
      h_g_n_gap          0 // no gap
                        1 // leave gap in arrow for text

```

Parameters for text on the arrows

```

      h_g_n_text_colour  colour // colour of the text
      h_g_n_text_size    mm // size of the text
      h_g_n_text_offset mm // distance to raise the text above the
                        // arrow line

      h_g_n_pre_text     text // text before the arrow text
      h_g_n_post_text    text // text after the arrow text
      h_g_n_textstyle    textstyle // textstyle used

```

```

h_g_n_no_decimals      integer      // number of decimal places in arrow
                        // text.
                        // If > 0, all trailing zeros after the
                        // decimal place are removed.
                        // If < 0, the absolute value is taken as
                        // the number of decimal places and no
                        // trailing zeros are removed after the
                        // decimal point.
h_g_n_rotate           mm              // if ticked, the text on the arrows will be
                                        rotated to fit.

```

If the set of parameters is to apply to the horizontal geometry of an alignment string *other* than the primary string, then simply add the following parameter to define the other alignment string

```

h_g_n_offset_string    "model->string_name"
or
h_g_n_offset_string    "string_name"

```

and the model is the *Offsets model* from the **Section Long Plot** panel.

If the *h_g_n_offset_string* parameter does not exist, then the set of horizontal geometry parameters is applied to the primary string.

Example of Extensive Horizontal Geometry

```

// Parameter to stop the drawing of the quick horizontal geometry
horizontal_geometry_y  0
// Set 1 - Extensive Horizontal Geometry Labelling - label the horizontal curve radius
h_g_1_type             1              // label horizontal curve
                        // if this param is missing then set is ignored
h_g_1_value_mode       2              // label curve radius
h_g_1_label_y          45
h_g_1_label_x          0
h_g_1_label_offset     2
h_g_1_label_text_size  4
h_g_1_label_text_colour YELLOW
h_g_1_label_text       "Horiz Curve Data"
// Parameters for arrow type
h_g_1_draw_mode        1
h_g_1_colour           "white"
h_g_1_height           1.5
h_g_1_gap              0
// Parameters for text on the arrows
h_g_1_text_colour      YELLOW
h_g_1_text_size        3.5
h_g_1_text_offset      2.5
h_g_1_pre_text         "R"
h_g_1_post_text        "m"
h_g_1_no_decimals     2

```

Example of Extensive Horizontal Geometry for use with a Non-primary Alignment String

```
// Set 2 labels the horizontal curves radii of the kerb string projected onto primary stings
h_g_2_offset_string      "left offsets->kerb"      // non-primary string to do VG of
h_g_2_type              1                        // label horizontal curve
                                                // if this param is missing then set is ignored
h_g_2_value_mode        2                        // label curve radius
h_g_2_label_y           55
h_g_2_label_x           0
h_g_2_label_offset      2
h_g_2_label_text_size   4
h_g_2_label_text_colour GREEN
h_g_2_label_text        "Left Kerb - Horiz Curve Data"

// Parameters for arrow type
h_g_2_draw_mode         1
h_g_2_colour            "white"
h_g_2_height            1.5
h_g_2_gap               0

// Parameters for text on the arrows
h_g_2_text_colour       GREEN
h_g_2_text_size         3.5
h_g_2_text_offset       2.5
h_g_2_pre_text          "R"
h_g_2_post_text         "m"
h_g_2_no_decimals       2
```

Please continue to the next section “Quick Vertical Geometry Labelling” .

Quick Vertical Geometry Labelling

The standard vertical geometry arrows can be drawn at a given distance above the top of the boxes area.

vertical_geometry_grade_y	<i>mm</i>	// dist above boxes // 0 = don't draw
vertical_geometry_grade_mode	0 1	// % // 1 in
vertical_geometry_label_grade_text	<i>text</i>	
vertical_geometry_label_grade_textstyle	<i>textstyle</i>	// textstyle to use
vertical_geometry_label_grade_text_colour	<i>colour</i>	
vertical_geometry_label_grade_text_size	<i>mm</i>	
vertical_geometry_label_grade_decimals	<i>number</i>	
vertical_geometry_length_y	<i>mm</i>	// dist above boxes // 0 = don't draw
vertical_geometry_length_mode	0 1 2 3	// length // radius // k value // mixed - length for parabolic // radius for circular
vertical_geometry_label_length_text	<i>text</i>	
vertical_geometry_label_length_textstyle	<i>textstyle</i>	// textstyle to use
vertical_geometry_label_length_text_colour	<i>colour</i>	
vertical_geometry_label_length_text_size	<i>mm</i>	
vertical_geometry_label_length_decimals	<i>number</i>	
vertical_geometry_arrow_mode	0 1	// ticks // arrows
vertical_geometry_arrow_grade_textstyle	<i>textstyle</i>	// textstyle to use
vertical_geometry_arrow_grade_text_colour	<i>colour</i>	
vertical_geometry_arrowl_grade_text_size	<i>mm</i>	
vertical_geometry_arrow_length_textstyle	<i>textstyle</i>	// textstyle to use
vertical_geometry_arrow_length_text_colour	<i>colour</i>	
vertical_geometry_arrow_length_text_size	<i>mm</i>	
vertical_geometry_arrow_colour	<i>colour</i>	
vertical_geometry_arrow_height	<i>mm</i>	

Please continue to the next section "Extensive Vertical Geometry Labelling".

Extensive Vertical Geometry Labelling

For complicated vertical geometry labelling of the *primary alignment* string, there are sets of vertical geometry labelling parameters which give tight control over the position and types of labels.

It is also possible to label the vertical geometry of **alignment** strings other than the primary string. To plot such a string on the same plot, the chainage position of the vertical geometry for the non-primary alignment strings is *projected* onto the primary string to give a primary string chainage for plotting. The values of the vertical geometry (such as grade and curve length) that are plotted are taken from the other string. Independently graded offset strings (such as a left and right kerbs) are the type of additional alignment strings that may need to be plotted on the same long section plot as the reference string (primary string).

For plotting vertical geometry, the user can give up to twenty sets of these labels and they can be used to label grades or vertical curve information for the primary string and/or additional alignment strings.

Each label set consists of three parts:

- (a) a text label on the left hand side of the plot
- (b) an arrow
- (c) text on the arrows.

For the following parameters, *n* takes the value 1 to 20 and specifies the *n*th parameter set.

<i>v_g_n_type</i>	0	// labelling grades
	1	// labelling vg curve information

If *v_g_n_type* is missing, then the entire *n*th set is ignored.

The interpretation of the value of the

parameter *v_g_n_value_mode* depends on whether the set is being used for grade labelling or curve labelling:

<i>v_g_n_value_mode</i>		
for grade labelling	0	// nothing
	1	// % grade
	2	// 1 in grade
	3	// m/m grade
	4	// chainage length between vertical // curve points
	5	// per chord - Queensland Rail
for curve labelling	0	// nothing
	1	// length - chainage for parabolic vc's // arc length for circular vc's
	2	// radius
	3	// K value
	5	// curve constant - Queensland Rail

Vertical curve points to draw the arrows between (for grade labelling only)

<i>v_g_n_between_mode</i>	0	// between chainages at the vip's
	1	// between chainages at the vtp's

Position of the Arrow Line

<i>v_g_n_label_y</i>	<i>mm</i>	// distance of arrow line above the top of // the boxes this can be negative
----------------------	-----------	---

Parameters for the left hand label of the whole line of the vg arrows:

<i>v_g_n_label_x</i>	<i>mm</i>	// distance from the left hand side of the // labels area
<i>v_g_n_label_offset</i>	<i>mm</i>	// distance to raise the label_text above // arrow line
<i>v_g_n_label_text</i>	<i>text</i>	
<i>v_g_n_label_textstyle</i>	<i>textstyle</i>	
<i>v_g_n_label_text_size</i>	<i>mm</i>	
<i>v_g_n_label_text_colour</i>	<i>colour</i>	

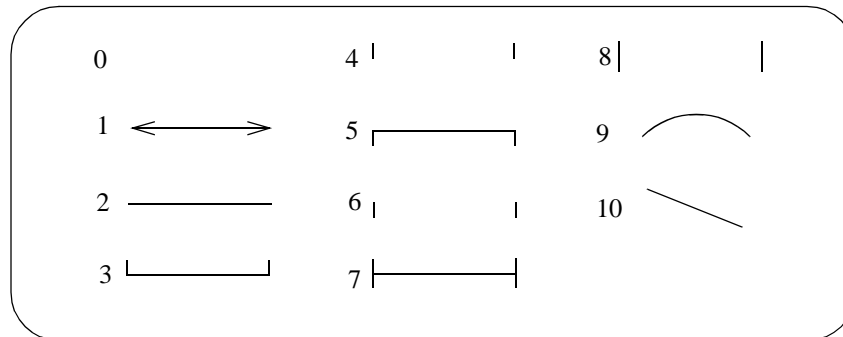
Parameters for arrow type

<i>v_g_n_draw_mode</i>	0	// no arrow
	1	// arrow
	2	// line
	3	// line with uprights at ends
	4	// uprights, no line
	5	// line with downrights
	6	// downrights, no line

```

7 // line with up and downrights at ends
8 // up and down rights, no line
9 // draw curve
10 // draw grade

```



```

v_g_n_left_gap      mm // size of gap for left side of arrow
v_g_n_right_gap     mm // size of gap for right side of arrow
v_g_n_colour        colour // colour of the arrow
v_g_n_height        mm // height of the arrow
v_g_n_gap           0 // no gap
                   1 // leave gap in arrow for text

```

Parameters for text on the arrows

```

v_g_n_text_colour   colour // colour of the text
v_g_n_text_size     mm // size of the text
v_g_n_text_offset   mm // distance to raise the text above the
                       // arrow line

v_g_n_pre_text      text // text before the arrow text
v_g_n_post_text     text // text after the arrow text
v_g_n_textstyle     textstyle // textstyle used
v_g_n_no_decimals   integer // number of decimal places in arrow
                           // text.
                           // If > 0, all trailing zeros after the
                           // decimal place are removed.
                           // If < 0, the absolute value is taken as
                           // the number of decimal places and no
                           // trailing zeros are removed after the
                           // decimal point.

v_g_n_rotate        mm // if ticked, the text on the arrows will be
                       // rotated to fit.

```

If the set of parameters is to apply to the vertical geometry of an alignment string *other* than the primary string, then simply add the following parameter to define the other alignment string

```

v_g_n_offset_string "model->string_name"
or
v_g_n_offset_string "string_name"

```

and the model is the *Offsets model* from the **Section Long Plot** panel.

If the *v_g_n_offset_string* parameter does not exist, then the set of vertical geometry parameters is applied to the primary string.

Example of Extensive Vertical Geometry

```
// Parameter to not to draw the quick vertical geometry
vertical_geometry_grade_y    0

// Set 1 labels the vertical curves with length
v_g_1_type                  1 // curve
v_g_1_value_mode            1 // chainage length

v_g_1_label_y               45
v_g_1_height                 4
v_g_1_label_offset          -2
v_g_1_label_text             "VG Curves"
v_g_1_text_offset            2
v_g_1_label_text_size        6
v_g_1_pre_text               ""
v_g_1_post_text              "L"
v_g_1_gap                    0
v_g_1_draw_mode              8
v_g_1_text_size              4

// Set 2 labels the vertical curves with K value
v_g_2_type                  1 // curve
v_g_2_value_mode            3 // K value

v_g_2_label_y               45
v_g_2_height                 1.5
v_g_2_label_text             ""
v_g_2_text_offset            -5
v_g_2_pre_text               ""
v_g_2_post_text              "K"
v_g_2_gap                    0
v_g_2_draw_mode              1
v_g_2_text_size              4
```

Example of Extensive Vertical Geometry for use with a Non-primary Alignment String

```
// Set 3 labels the vertical curves with length with the kerb string projected onto primary strings
v_g_3_offset_string         "left offsets->kerb" // non-primary string to do VG of
v_g_3_type                  1 // curve
v_g_3_value_mode            1 // chainage length

v_g_3_label_y               55
v_g_3_height                 4
v_g_3_label_offset          -2
v_g_3_label_text             "Left kerb - VG Curves"
v_g_3_text_offset            2
v_g_3_label_text_size        6
v_g_3_pre_text               ""
v_g_3_post_text              "L"
v_g_3_gap                    0
v_g_3_draw_mode              8
v_g_3_text_size              4
```

Please continue to the next section “Labelling Chainages and Heights in the Graph Area” .

Labelling Chainages and Heights in the Graph Area

The chainage and/or height values for certain points (given by *label_n_type*) can be labelled.

Up to twenty sets of chainage/height labels can be done.

<i>label_n_type</i>	0	// chainage of vip, height of vip
	1	// chainage of vip, height of primary
	2	// crest
	3	// sag
	4	// vtp
	5	// hcp
	6	// change of grade
	7	// mid-ordinate of the vertical curve

If *label_n_type* is missing, then the set is ignored.

<i>label_n_y_mode</i>	0	// height in mm above boxes
	1	// above height value (default)
	2	// above primary height
<i>label_n_y</i>	<i>mm</i>	// distance above point
<i>label_n_angle</i>	<i>degrees</i>	// rotation about point
<i>label_n_x</i>	<i>mm</i>	// distance along from point
<i>label_n_offset</i>	<i>mm</i>	// text raise height
<i>label_n_justification</i>	0	// left end
	1	// middle
	2	// end
<i>label_n_size</i>	<i>mm</i>	
<i>label_n_colour</i>	<i>size</i>	
<i>label_n_textstyle</i>	<i>textstyle</i>	
<i>label_n_value_mode</i>	0	// no values labelled
	1	// val 1 = chainage
	2	// val 1 = height
	3	// val 1 = chainage, val 2 = height
	4	// val 1 = height, val 2 = chainage
<i>label_n_pre_text</i>	<i>text</i>	
<i>label_n_mid_text</i>	<i>text</i>	
<i>label_n_post_text</i>	<i>text</i>	
<i>label_n_textstyle</i>	<i>textstyle</i>	// <i>textstyle</i> to use
<i>label_n_no_decimals_1</i>	<i>integer</i>	// number of decimal places in val 1
<i>label_n_no_decimals_2</i>	<i>integer</i>	// number of decimal places in val 2

If the **number of decimal places is greater than zero (> 0)**, then any trailing zeros after the decimal point are removed.

If the **number of decimal places is less than zero (< 0)**, the absolute value is taken as the number of decimal places and **no** trailing zeros after the decimal point are removed.

Example of Labelling Chainage and Heights

```
// label the crests with chainage on one line
// and height (elevation) on the next

label_1_type      2 // crest
label_1_y_mode    2 // above string
label_1_y         10
label_1_angle     0
label_1_justification 1 // centre
label_1_size      4
label_1_colour    red
label_1_value_mode 1 // chainage
```

```

label_1_pre_text      "CH "
label_1_no_decimals_1 1
label_2_type          2 // crest
label_2_y_mode        2 // above string
label_2_y              2
label_2_angle          0
label_2_justification 1 // centre
label_2_size           4
label_2_colour         red
label_2_value_mode     2 // height
label_2_pre_text      "EL "
label_2_no_decimals_1 1

```

Please continue to the next section "Labelling With Symbols" .

Labelling With Symbols

Symbols can be placed at certain points given by *symbol_n_type*.

The symbol is drawn in a square box centred on (0,0) with sides of length two millimetres. That is, the box co-ordinates are (-1,-1), (1,1), (1,-1), (-1,-1).

Up to twenty sets of symbol labelling can be done.

```

symbol_n_type          0 // chainage of vip, height of vip
                      1 // chainage of vip, height of primary
                      2 // crest
                      3 // sag
                      4 // vtp
                      5 // hcp
                      6 // change of grade

```

If *symbol_n_type* is missing, then the set is ignored.

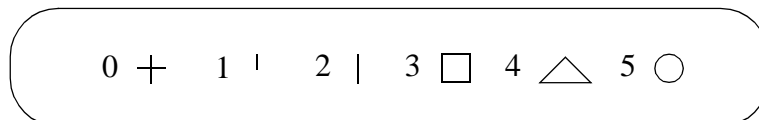
```

symbol_n_y_mode        0 // height in mm above boxes
                      1 //   above height value (default)
                      2 //   above primary height

symbol_n_y              mm // distance above point given by mode
symbol_n_angle          degrees // rotation about point
symbol_n_x              mm // distance along from point
symbol_n_size           mm //
symbol_n_colour         colour // colour of symbol

symbol_n_draw_mode     0 // cross
                      1 // upright from centre of box
                      2 // up and downright from centre of box
                      3 // square
                      4 // triangle, base at bottom
                      5 // circle

```



Example of Labelling with Symbols

```

// draw a triangle symbol at the crest
symbol_1_type          2 // crest

```

```

symbol_1_y_mode      2 // above string
symbol_1_y           0
symbol_1_angle       0
symbol_1_size        2
symbol_1_colour      red
symbol_1_draw_mode   4 // triangle
    
```

Please continue to the next section “Hatching Cut and Fill Areas” .

Hatching Cut and Fill Areas

This option is used to hatch cut and/or fill areas between sets of tins.

For each set, the name of the two tins, the hatch linestyle, colour and separation and whether cut and/or fill regions are required are all user definable.

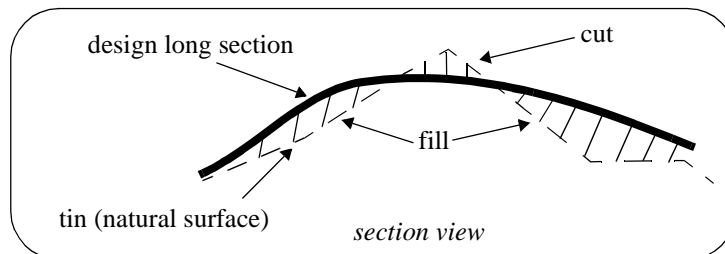
Up to twenty (20) separate sets of tins be hatched.

The parameters for labelling cuts and/or fill regions between tins are given by:

<code>hatch_original_tin_n</code>	<code>tin_name</code>	// tin_name for original surface
<code>hatch_new_tin_n</code>	<code>tin_name</code>	// tin_name for final surface
<code>hatch_cut_separation_n</code>	<code>mm</code>	// distance between cut hatch lines
	<code>0</code>	// don't do cut hatching
<code>hatch_cut_angle_n</code>	<code>degrees</code>	// angle in degrees of cut hatching
<code>hatch_cut_colour_n</code>	<code>colour</code>	// colour of the cut hatching
<code>hatch_cut_linestyle_n</code>	<code>linestyle</code>	// linestyle for cut hatching
<code>hatch_cut_draw_sides_n</code>	<code>1/0</code>	// 1 = draw sides of cut regions
<code>hatch_cut_draw_original_n</code>	<code>1/0</code>	// 1 = draw original tin in cut regions
<code>hatch_cut_draw_new_n</code>	<code>1/0</code>	// 1 = draw new tin in cut regions
<code>hatch_fill_separation_n</code>	<code>mm</code>	// distance between fill hatch line
	<code>0</code>	// don't do fill hatching
<code>hatch_fill_angle_n</code>	<code>degrees</code>	// angle in degrees of fill hatching
<code>hatch_fill_colour_n</code>	<code>colour</code>	// colour of the fill hatching
<code>hatch_fill_linestyle_n</code>	<code>linestyle</code>	// linestyle for fill hatching
<code>hatch_fill_draw_sides_n</code>	<code>1/0</code>	// 1 = draw sides of fill regions
<code>hatch_fill_draw_original_n</code>	<code>1/0</code>	// 1 = draw original tin in fill regions
<code>hatch_fill_draw_new_n</code>	<code>1/0</code>	// 1 = draw new tin in fill regions

Notes

- (a) cut is when the new tin is below the original tin.
fill is when the new tin is above the original tin.
- (b) cut hatching is turned off by setting `hatch_cut_separation_n` to 0.0.
fill hatching is turned off by setting `hatch_fill_separation_n` to 0.0.



Please continue to the next section “Labelling Cuts of Design Through Strings in a Model” .

Labelling Cuts of Design Through Strings in a Model

The cuts that the primary string (design line) makes through any strings in user given models can be automatically labelled on the long section plots.

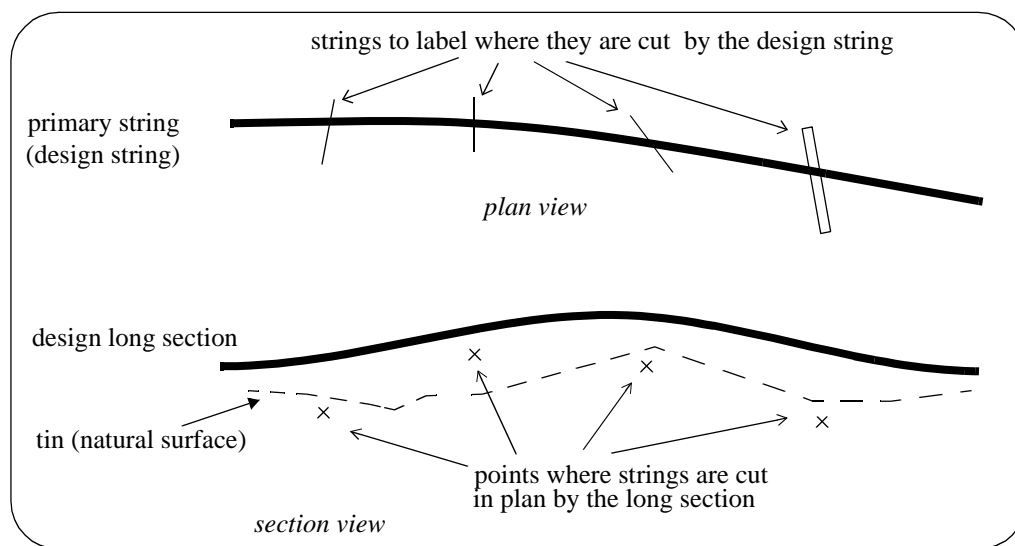
The **height**, **chainage** and **name** of the cut string can be labelled as well as a **symbol**. The height of tins at the same offset value can also be labelled.

The chainage position for the labelling is the chainage of the cut string.

The height position for the labelling can be specified as the

- (a) top of the boxes on the long section
- (b) height value of the cut string
- (c) height of the primary string
- (d) height of a tin.

The actual position of the label is defined relative to the above point.



Note:

Only case (b) involves the actual height of the cut string. For all other cases, only the chainage of the cut string is used. Hence for all cases except (b), the string does need to have a sensible height to be used for cuts through strings.

For example, a boundary string may have null heights but only the chainage is required and the height of the tin at that chainage can be used as the height (case (d)).

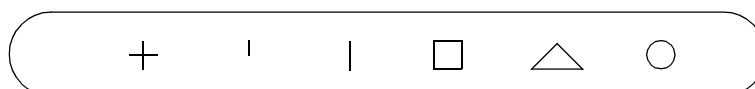
Text justification refers to the actual position and is given by

“top-left”	“top-centre”	“top-right”
“middle-left”	“middle-centre”	“middle-right”
“bottom-left”	“bottom-centre”	“bottom-right”

A choice of six special symbols and/or any 12d symbols can be drawn at the cut point.

The special 12d Model symbols of size one millimetre are drawn in a square box centred on (0,0) with sides of length two millimetres. That is, the box co-ordinates are (-1,-1), (1,1), (1,-1), (-1,-1).

The six special shapes are



Up to twenty five (25) separate models of strings can be cut and labelled.

Parameters for Labelling Where the Design Cuts Strings in a Model

The method for specifying which strings are to be checked for cuts is by first specifying the **model** which contains the strings, and then a **name mask** which is used to restrict the strings in the model to only those whose name matches the name mask.

Up to twenty five different sets of models and name masks can be used so that different cut sets can be labelled in different ways.

The parameters for selecting and labelling the *n*th set (where *n* can be from 1 to 25) of cuts of the design string with the strings in the model are given by:

```
cuts_n_model          model_name          // model of strings to be cut
```

The selection of the strings from the model *model_name* whose cut points are to be labelled is all the strings whose name satisfies the name mask *cuts_n_mask*:

```
cuts_n_mask          name_mask          // strings to check for cuts
                                     // and if a cut occurs,
                                     // parameters show how to
                                     // label the cut
```

where *name_mask* is a text string containing the name masks, each separated by one or more spaces, to test the string name against. Each mask can include wild cards and wild characters.

For example

```
or          cuts_1_mask          "ke*"
           cuts_1_mask          "?bank*"
```

or, if both masks are required,

```
           cuts_1_mask          "ke* ?bank*"
```

If *cuts_n_mask* is missing, then all strings in the model are used. This is equivalent to *name_mask* being "*".

All strings in the model *cuts_n_model* whose name satisfy the name mask *cuts_n_mask* are then checked for cuts with the design string, and if a cut occurs, the cut point will be labelled according to the rest of the parameters in the *n*th set.

The parameters for drawing a **symbol** at the cut points are

```
cuts_symbol_n_mode    0          // cross
                     1          // up from centre of box
                     2          // up and down from centre of box
                     3          // square
                     4          // triangle, base at bottom
                     5          // circle
                     6          // use a 12d symbol
```

0 + 1 | 2 | 3 □ 4 △ 5 ○

predefined symbols for

If *cuts_symbol_n_mode* is 6, then the 12d symbol is given by

```
cuts_symbol_n_style    plotsymbol    // plot symbol to draw at cut
```

Important Note

The plot symbol of name *plotsymbol* is defined in the file given by:

- (a) the parameter *plot_symbols* in the ppf file

plot_symbols filename

or if plot_symbols is not defined, then

(b) in the file pointed to by the environment variable PLOT_SYMBOLS_4D
PLOT_SYMBOLS_4D filename // default plotsym.4d

or if PLOT_SYMBOLS_4D is not defined, then

(c) in the file *plotsym.4d*
which is searched for in the standard set up file sequence

If none of the above files are defined, or if the symbol does not exist in the above files, then it will be searched for in the standard 12d symbols file which is:

(d) either pointed to by the environment variable SYMBOLS_4D
SYMBOLS_4D filename // default symbols.4d
or if the environment variable SYMBOLS_4D does not exist, in the file, *symbols.4d*

The position of the symbol is given by:

cuts_symbol_n_position	1	// above point height value
	3	// above top of boxes
	100	// to primary string
	101-500	// to tin1 or tin2 etc.

The symbol can be adjusted by the parameters:

cuts_symbol_n_x	mm	// offset adjustment to position
cuts_symbol_n_y	mm	// height adjustment to position
cuts_symbol_n_angle	degrees	// rotation about point
cuts_symbol_n_colour	colour	// colour of symbol

and for all values of *cuts_symbol_n_mode* **other** than 6:

cuts_symbol_n_size	mm	// size of symbol, 0 don't draw
--------------------	----	---------------------------------

The value of the **chainage** of the cut string can be labelled using the parameters

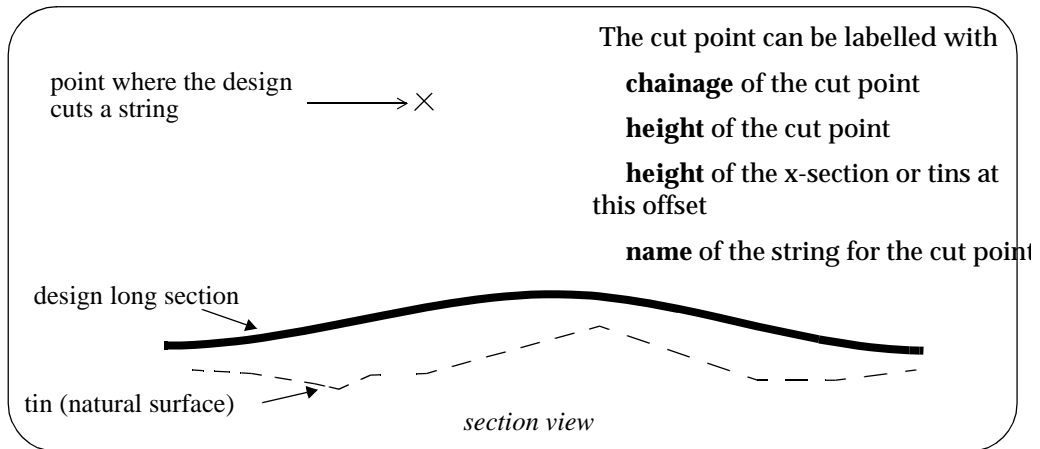
cuts_chainage_n_position	1	// above cut strings height value
	3	// above top of boxes
	100	// to primary string
	101-500	// to tin1 or tin2 etc.
cuts_chainage_n_x	mm	// chainage adjustment to position
cuts_chainage_n_y	mm	// height adjustment to position
cuts_chainage_n_angle	degrees	// rotation about point
cuts_chainage_n_size	mm	// size of text, 0 don't label
cuts_chainage_n_colour	colour	// colour of text
cuts_chainage_n_textstyle	text	// textstyle of text chainage
cuts_chainage_n_pre_text	text	// text before the chainage value
cuts_chainage_n_post_text	text	// text after the chainage value
cuts_chainage_n_justification	justification	// justification of the text
cuts_chainage_n_no_decimals	integer	// number of decimals in chainage

The value of a **height** at the chainage of the point can be calculated and labelled using the parameters

cuts_height_n_mode	1	// use height of cut point itself
	3	// use real world height of the position // of the label above the boxes
	100	// height of primary string
	101-500	// use height of to tin1 or tin2 etc.
cuts_height_n_position	1	// at points position
	3	// above top of boxes
	100	// to primary string
	101-500	// to tin1 or tin2 etc.
cuts_height_n_x	mm	// chainage adjustment to position
cuts_height_n_y	mm	// height adjustment to position
cuts_height_n_angle	degrees	// rotation about point
cuts_height_n_size	mm	// size of text, 0 don't label
cuts_height_n_colour	colour	// colour of text
cuts_height_n_textstyle	text	// textstyle of text height
cuts_height_n_pre_text	text	// text before the height value
cuts_height_n_post_text	text	// text after the height value
cuts_height_n_justification	justification	// justification of the text
cuts_height_n_no_decimals	integer	// number of decimals in height

A **label** which can include the **name** of the cut string is drawn by using the parameters

cuts_label_n_position	1	// above cut strings height value
	3	// above top of boxes
	100	// to primary string
	101-500	// to tin1 or tin2 etc.
cuts_label_n_mode	0	// don't include cut string name
	1	// include cut string name in label
cuts_label_n_x	mm	// chainage adjustment to position
cuts_label_n_y	mm	// height adjustment to position
cuts_label_n_angle	degrees	// rotation about point
cuts_label_n_size	mm	// size of text, 0 don't label
cuts_label_n_colour	colour	// colour of text
cuts_label_n_textstyle	text	// textstyle of text label
cuts_label_n_pre_text	text	// text before the string name
cuts_label_n_post_text	text	// text after the string name
cuts_label_n_justification	justification	// justification of the text



Please continue to the next section “Labelling the Primary String Name on the Plot” .

Labelling the Primary String Name on the Plot

The plot can be labelled with a name under the boxes area.

The name is made up of concatenation the text strings:

```
plot_name_pre_text      primary-string-name      plot_name_post_text
```

The plot name is positioned under the boxes.

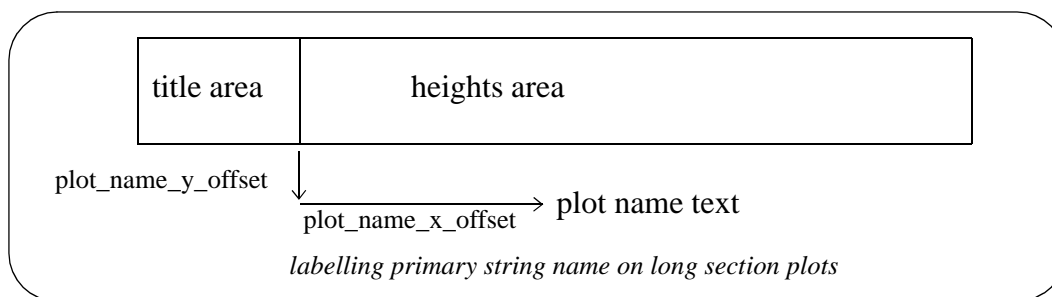
```
plot_name_string_name      0          // don't use the primary string name
                           1          // use primary string name
                           2          // use model->string name

plot_name_pre_text        text
plot_name_post_text       text
plot_name_textstyle       textstyle
plot_name_size            mm
plot_name_colour          colour
plot_name_x_offset        mm
plot_name_y_offset        mm
```

The *plot_name_x_offset* is measured from the beginning of the height boxes.

The default for *plot_name_x_offset* is centred on heights area.

The *plot_name_y_offset* is measured from the bottom of the box area with positive being **down**.



Example of Labelling Primary String Name

```
plot_name_pre_text      "Long Section Plot for String"
plot_name_post_text     ""
plot_name_size          15
plot_name_colour        red
plot_name_string_name   1
plot_name_y_offset      30
```

Please continue to the next section "Labelling the Scale on the Plot" .

Labelling the Scale on the Plot

The plot can be labelled with the horizontal and vertical scale under the boxes area.

The scale label is made up of concatenation the text strings:

```

scale_horizontal_pre_text    horizontal scale value    scale_horizontal_post_text
and
scale_vertical_pre_text      vertical scale value        scale_vertical_post_text

```

The horizontal scale value is the value given by the scale parameter.

The vertical scale value is calculated from the horizontal scale and the vertical exaggeration for the section view.

The scales are positioned under the boxes.

scale_horizontal_pre_text	<i>text</i>
scale_horizontal_post_text	<i>text</i>
scale_horizontal_textstyle	<i>textstyle</i>
scale_horizontal_size	<i>mm</i>
scale_horizontal_colour	<i>colour</i>
scale_horizontal_x_offset	<i>mm</i>
scale_horizontal_y_offset	<i>mm</i>
scale_horizontal_decimals	<i>integer</i>
scale_vertical_pre_text	<i>text</i>
scale_vertical_post_text	<i>text</i>
scale_vertical_textstyle	<i>textstyle</i>
scale_vertical_size	<i>mm</i>
scale_vertical_colour	<i>colour</i>
scale_vertical_x_offset	<i>mm</i>
scale_vertical_y_offset	<i>mm</i>
scale_vertical_decimals	<i>integer</i>

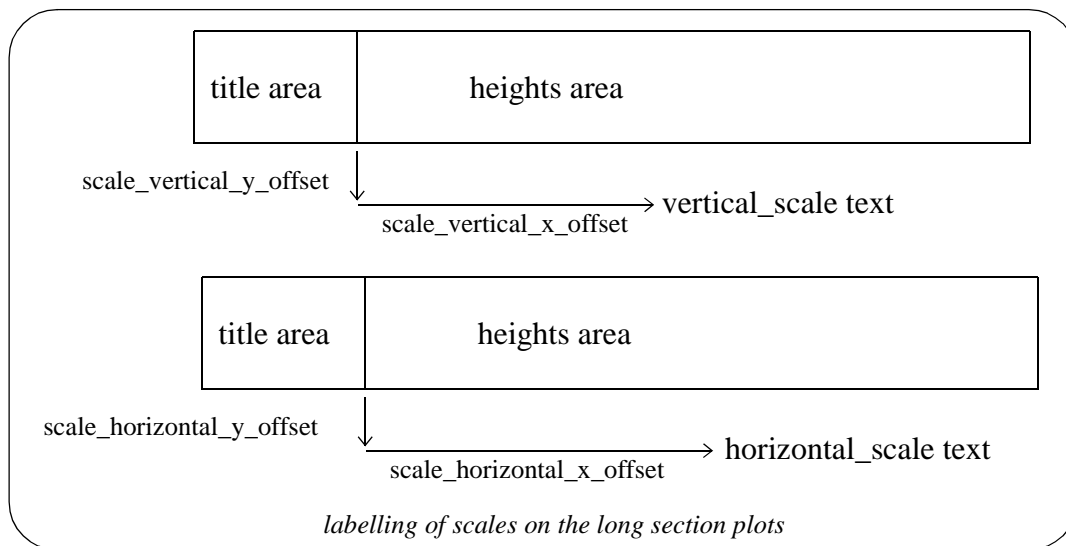
The *scale_vertical_x_offset* and *scale_horizontal_x_offset* are measured from the beginning of the heights area.

The default for *scale_vertical_x_offset* and *scale_horizontal_x_offset* are centred on the heights area.

The *scale_vertical_y_offset* and *scale_horizontal_y_offset* are measured from the bottom of the box area with positive being **down**.

If the **number of decimal places is greater than zero (> 0)**, then any trailing zeros after the decimal point are removed.

If the **number of decimal places is less than zero (< 0)**, the absolute value is taken as the number of decimal places and **no** trailing zeros after the decimal point are removed.



Example of Labelling Horizontal and Vertical Scales

scale_horizontal_pre_text	"Horizontal Scale 1:"
scale_horizontal_post_text	""
scale_horizontal_size	15
scale_horizontal_colour	yellow
scale_horizontal_y_offset	60
scale_vertical_pre_text	"Vertical Scale 1:"
scale_vertical_post_text	""
scale_vertical_size	15
scale_vertical_colour	green
scale_vertical_y_offset	90

Please continue to the next section "Title Block Information" .

Title Block Information

The plot can have a standard **12d** Model title block or a user defined title block.

The standard title block consists of a simple border around the plot and two lines of text in a box underneath the plot. For a user defined title block, all the line work and text is defined by the user.

Standard Title Block

For the standard **12d** Model title block, there are extra parameters for two lines of text and text size and colour. The standard title block is turned on or off by the parameter *plot_border*:

<i>plot_border</i>	<i>yes/no</i>	<i>// yes plots a standard title block</i> <i>// default yes</i>
<i>title_1</i>	<i>text</i>	
<i>title_2</i>	<i>text</i>	
<i>title_text_size</i>	<i>value</i>	
<i>title_colour</i>	<i>colour</i>	

User Title Block

For the user defined title block, the title block drawing commands are kept in a file whose name is supplied by the user. The title block drawing commands are almost identical to the *linestyle* drawing commands and is given at the beginning of this chapter.

Hence for a user defined title block, there are just two parameters - one to say a title block file is being used and the other to give the name of the title block file. The *plot_border* parameter should also be set to *no* so that the standard title block is not also drawn.

<i>use_title_file</i>	<i>yes/no</i>	<i>// yes draws the title block given in title_file</i> <i>// default no</i>
<i>title_file</i>	<i>filename</i>	
<i>plot_border</i>	<i>no</i>	<i>// turn off standard title block</i>

Some special plot parameters are used to pass information down to variables in a user defined title block. For example, inside the title block file it is possible to have runtime user defined text variables. The actual text values for these text variables are passed down to the title block file from the plot parameter file via the parameters *user_text_n* ($n = 1, 2, \dots, 1000$)

<i>user_text_n</i>	<i>text</i>
--------------------	-------------

The special plot parameters are:

<i>time_format</i>	<i>text</i>	<i>// format for \$time</i>
<i>user_text_n</i>	<i>text</i>	<i>// where n = 1, 2, ... 1000</i> <i>// passed down to \$user_text_n</i>
<i>title_1</i>	<i>text</i>	<i>// passed down to \$title_1</i>
<i>title_2</i>	<i>text</i>	<i>// passed down to \$title_2</i>
<i>start_page_number</i>	<i>integer</i>	<i>// used as the starting value for</i> <i>// \$page_number. If missing,</i> <i>// \$page_number starts at 1.</i>
<i>start_drawing_number</i>	<i>integer</i>	<i>// added to \$drawing_number in title</i> <i>// block file. If missing,</i> <i>// \$drawing_number starts at 1.</i>
<i>drawing_number_prefix</i>	<i>text</i>	<i>// passed down to</i> <i>// \$drawing_number_prefix</i>
<i>drawing_number_postfix</i>	<i>text</i>	<i>// passed down to</i> <i>// \$drawing_number_postfix</i>

Please continue to the next section "Parameters that Modify Fields In the Long Plot Panel".

Parameters that Modify Fields In the Long Plot Panel

A number of parameters match those in the **section long plot** panel.

When the plot parameter file is first read, any parameters in the panel will be replaced by the values of any corresponding parameters from the parameter file.

However, if the parameter is subsequently modified in the panel, the panel value will be the value used for any plots.

The plot parameters that also occur in the **section long plot** panel are:

scale	<i>value</i>
start_chainage	<i>value</i>
end_chainage	<i>value</i>
chainage_interval	<i>value</i>
chord_arc	0/1
plotter_type	<i>text</i>
plot_file	<i>text</i>
view_name	<i>text</i>
offset_model	<i>text</i>
plot_border	<i>yes/no</i>
label_depths	<i>yes/no</i>
primary_string	<i>yes/no</i>
datum_value	<i>value</i>
sheet_size	<i>text</i> or “width height”
box_text_size	<i>mm</i>
box_colour	<i>colour</i>
use_title_file	<i>yes/no</i>
title_file	<i>filename</i>
plot_border	<i>yes/no</i>
title_1	<i>text</i>
title_2	<i>text</i>
title_text_size	<i>value</i>
title_colour	<i>colour</i>
pagination	<i>yes/no</i>
pagination_length	<i>value</i>
pagination_overlap	<i>value</i>
global_textstyle	<i>textstyle</i>

Please continue to the next section “Generating Long Section Plots Without a View” .

Generating Long Section Plots Without a View

The long section plot parameters are comprehensive enough that it is possible to completely generate a long section plot without referencing a section view, or even using the **section long plot** panel.

Such a ppf can be run using the `plots=>plot a ppf` option or from the 4D Solutions programming language, 4DML.

When a long section plot is being generated entirely from a file, an extra parameter is needed to specify whether the datum value is calculated or the `datum_value` parameter is used.

```
manual_datum          1           // use the datum_value parameter for
                        // the datum
                        0           // ignore the datum_value and let
                        // 12d Model calculate the datum.
```

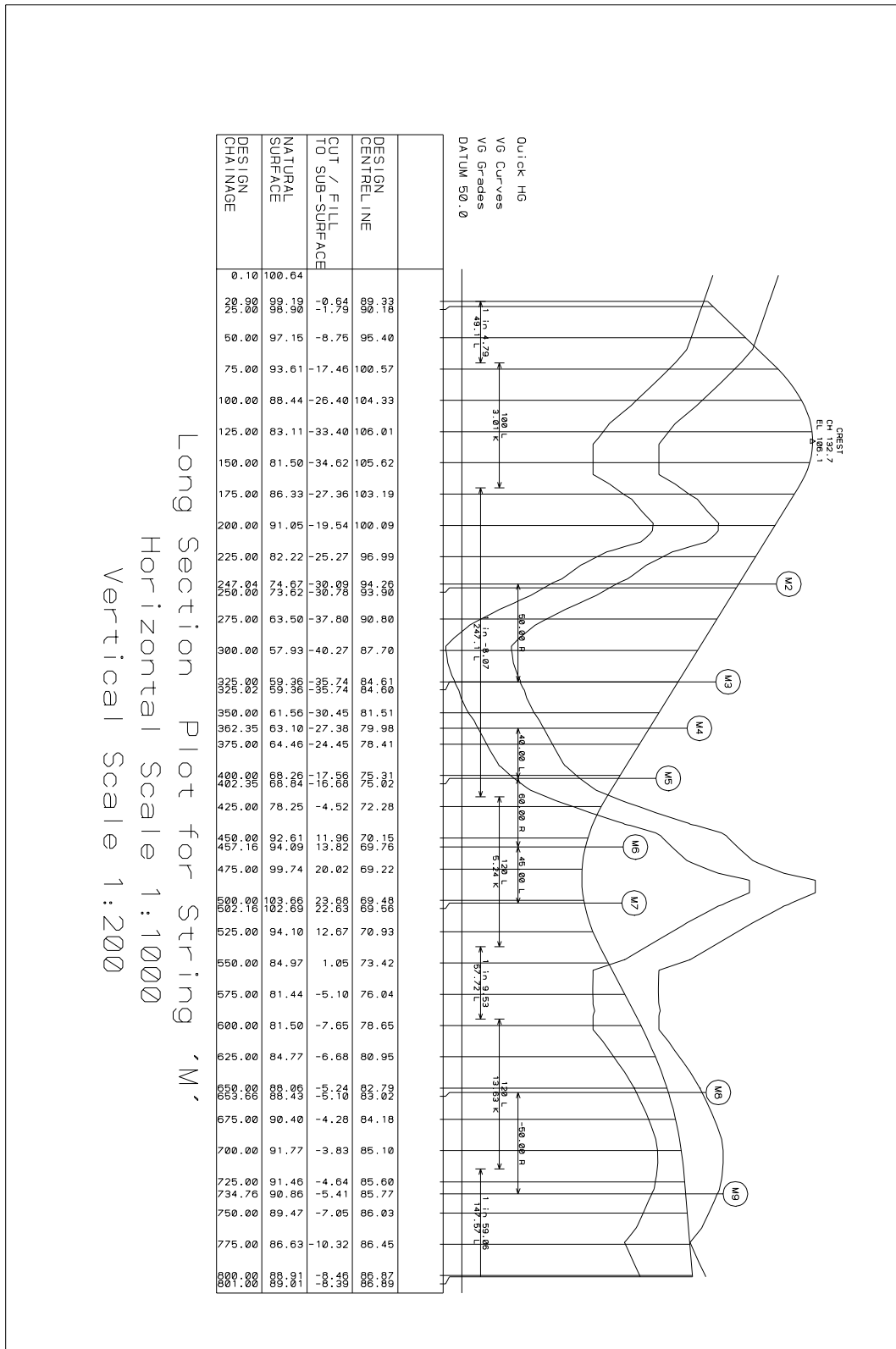
When generating a long section plot using the **section long plot** panel, a plot parameter file containing all the parameters needed to regenerate the plot using `plots=>plot a ppf` can be written out by simply giving a name for the ppf file in the plot parameters write field of the **section long plot** panel.

Notes

1. A warning is given if the keyword in a plot parameter file does not exist.
2. A warning is also given if the key word pair is defined more than once in a ppf.

Please continue to the next section “Example of a Long Section Plot Parameter File” .

Example of a Long Section Plot Parameter File



```

// ppf file to generate longsection example
section_long_plot "diag2" {
// plot margins
left_margin      0
right_margin     0
top_margin       0
bottom_margin    30

number_of_decimals 2 // no dec places for heights
title_box_text_size 7
// annotation for title text and heights etc.
// chainages
chainage_title    "DESIGN"
chainage_title_2  "CHAINAGE"
chainage_colour   "red"
// primary string
primary_title     "DESIGN"
primary_title_2   "CENTRELINE"
primary_colour    "grey"
primary_title_colour "yellow"
// primary label modes are
// 0 - last box before blank boxes
// 1 - after chainage annotations
primary_label_mode 0
// uprights
uprights_colour   "yellow"
//uprights_draw_mode 0 // none
uprights_draw_mode 100 // to primary
uprights_y        200
// gap factor for staggering
stagger_gap_factor 1.3
stagger_gap_top    5.0
stagger_gap_bottom 2.0
stagger_mode       1
// datum parameters
datum_text_size   6
datum_colour      brown
datum_name        "DATUM"
datum_above_gap   15
datum_below_gap   15
datum_y           -2
// 0 for bottom text justification
// 1 for top justification
box_text_justification 1
// draw lines around annotation at bottom of plot
// 0 - don't draw them
// 1 - do draw
// 2 - draw box around label text as well
// plus many others
draw_box_mode     2

```

```
// tin titles and depth labels
// label = 0 for no label, 1 for label
tin_1_label      1      // label natural surface
tin_1_title      "NATURAL"
tin_1_title_2    "SURFACE"
tin_1_title_colour yellow
tin_1_colour     "green"
tin_1_depth_label 0    // don't label depth to natural surface
tin_1_depth_title "CUT / FILL"

tin_2_label      0      // don't label sub-surface
tin_2_depth_label 1    // label depth to sub-surface
tin_2_title      "SUB"
tin_2_title_2    "SURFACE"
tin_2_title_colour yellow
tin_2_colour     "green"
tin_2_depth_title "CUT / FILL"
tin_2_depth_title_2 "TO SUB-SURFACE"

// number of blank boxes at the top
// of the plot for user annotations
number_of_blank_boxes 1

// chainages to include for heights labelling
// 0 don't use, 1 use
// include the chord-arc points?
chord_arc          0

// include the horizontal critical points?
chainage_label_hcp 1

// include horizontal ip's with no curves?
chainage_label_hip 0

// include the vertical tangent points?
chainage_label_vtp 0

// include the vips?
chainage_label_vip 0

// include the crests?
chainage_label_crest 0

// include the sags?
chainage_label_sag 0

// include change of grade
chainage_label_grade_change 0

// don't include bubble chainages
chainage_merge_bubbles 0
```

```

// Quick geometry - by default the geometry annotation
// are those of the view
// if they are zero no annotations are performed
horizontal_geometry_y          60
horizontal_geometry_arrow_text_size  4
horizontal_geometry_arrow_height  3
horizontal_geometry_arrow_colour   red
horizontal_geometry_label_text     "Quick HG"
horizontal_geometry_label_text_colour green
horizontal_geometry_label_text_size 6

vertical_geometry_grade_y        0
vertical_geometry_length_y       0

// Extensive vertical geometry annotations
v_g_1_type          1 // curve
v_g_1_value_mode    1 // chainage length

v_g_1_label_y       45
v_g_1_height        4
v_g_1_label_offset  -2
v_g_1_label_text    "VG Curves"
v_g_1_text_offset   2
v_g_1_label_text_size 6
v_g_1_pre_text      ""
v_g_1_post_text     "L"
v_g_1_gap           0
v_g_1_draw_mode     8
v_g_1_text_size     4

v_g_2_type          1 // curve
v_g_2_value_mode    3 // K value

v_g_2_label_y       45
v_g_2_height        1.5
v_g_2_label_text    ""
v_g_2_text_offset   -5
v_g_2_pre_text      ""
v_g_2_post_text     "K"
v_g_2_gap           0
v_g_2_draw_mode     1
v_g_2_text_size     4

v_g_3_type          0 // grade
v_g_3_value_mode    2 // 1 in grade
v_g_3_between_mode  1 // between vtp's

v_g_3_label_y       30
v_g_3_height        4
v_g_3_label_offset  -2
v_g_3_label_text    "VG Grades"
v_g_3_label_text_size 6
v_g_3_text_offset   2
v_g_3_pre_text     "1 in "
v_g_3_post_text     ""
v_g_3_gap           0
v_g_3_draw_mode     8
v_g_3_text_size     4

```

```
v_g_4_type          0 // grade
v_g_4_value_mode    4 // chainage length
v_g_4_between_mode  1 // between vtp's

v_g_4_label_y       30
v_g_4_height        1.5
v_g_4_label_text    ""
v_g_4_text_offset   -5
v_g_4_pre_text      ""
v_g_4_post_text     "L"
v_g_4_gap           0
v_g_4_draw_mode     1
v_g_4_text_size     4

// label the crests with chainage on one line
// and height (elevation) on the next

label_1_type        2 // crest
label_1_y_mode      2 // above string
label_1_y           10
label_1_angle       0
label_1_justification 1 // centre
label_1_size        4
label_1_colour      red
label_1_value_mode  1 // chainage
label_1_pre_text    "CH "
label_1_no_decimals_1 1

label_2_type        2 // crest
label_2_y_mode      2 // above string
label_2_y           2
label_2_angle       0
label_2_justification 1 // centre
label_2_size        4
label_2_colour      red
label_2_value_mode  2 // height
label_2_pre_text    "EL "
label_2_no_decimals_1 1

label_3_type        2 // crest
label_3_y_mode      2 // above string
label_3_y           18
label_3_angle       0
label_3_justification 1 // centre
label_3_size        4
label_3_colour      red
label_3_value_mode  0 // no values
label_3_pre_text    CREST
```



```

// Draw bubbles at the horizontal critical points:
// chainages to include for bubbles numbering
// 0 don't use, 1 use
chainage_bubbles          1
bubble_label_hcp         1
bubble_label_hip         0
bubble_label_vtp         0
bubble_label_vip         0
bubble_label_crest       0
bubble_label_sag         0
bubble_label_grade_change 0

bubble_radius            10
bubble_colour            cyan
bubble_text_size         5
bubble_text_colour       red

bubble_upright_distance  30
bubble_mode              1
bubble_draw_upright      1

plot_name_pre_text      "Long Section Plot for String"
plot_name_post_text     ""
plot_name_size          15
plot_name_colour        red
plot_name_string_name   1
plot_name_y_offset      30

scale_horizontal_pre_text "Horizontal Scale 1:"
scale_horizontal_post_text ""
scale_horizontal_size     15
scale_horizontal_colour   yellow
scale_horizontal_y_offset 60

scale_vertical_pre_text  "Vertical Scale 1:"
scale_vertical_post_text ""
scale_vertical_size      15
scale_vertical_colour    green
scale_vertical_y_offset  90

// ***** panel data *****
view_name                4

plotter_type             model
plot_file                "diag2"

start_chainage           0
end_chainage             801

chainage_interval        25

sheet_size               "1000 800"
scale                    1000.0

primary_string           yes
label_depths            no

```

```
box_text_size      5
box_colour         green

datum_value        50
offset_model       ""

plot_border        "no"
title_1            "Title 1"
title_2            "Title 2"
title_text_size    2.5
title_colour       "magenta"
}
```

#Include in Plot Parameter Files

The plot parameter file also recognizes the CCCP preprocessor rules including #include which can be used to include other files in the plot parameter file.

The format of the #include command is:

#include *file_name*

Hence a block of plot parameters can be set up in a file and included in another file using #include rather than typing them all in again.

Any number of #include's can be placed in the plot parameter file.

P Glossary

Glossary of Common Terms

Arc

Part of the circumference of a circle.

Affine Transformation 2D

A two dimensional transformation where one set of points is fitted to another. The transformation is a five parameter transformation, i.e., x displacement, y displacement, x scale factor, y scale factor and rotation. If more variables exist than degrees of freedom, i.e., more than three control points are used, a least squares solution is calculated.

AGD

Australian Geodetic Datum.

AGD66

Australian Geodetic Datum 1966.

AGD84

Australian Geodetic Datum 1984.

AMG

Australian Map Grid.

Angle, Cartesian Angle, Mathematical Angle

The angle of a point is the counter-clockwise angle from the x-axis (horizontal or East line) to the line joining the point to the origin.

The angle of a line is the counter-clockwise angle measured from the x-axis to the line.

Batter

A steeply sloping surface (usually the wall of an earth bank).

Bearing

The bearing of a point is the clockwise angle from the y-axis (vertical or North line) to the line joining the point to the origin.

The bearing of a line is the clockwise angle measured from the y-axis to the line.

Breakline

A line on a surface joining a series of points on a common change-of-grade line. For example, the ridge top or spur, top or toe of batter, creek bank. See also *tinable segment*.

Cartesian Angle

See Angle.

Chainage

Chainage is a measure of the plan length along a string. The chainage at a point on a string is the start chainage of the string plus the plan length of the string from the beginning of the string to that point.

Circular Curve

Curves defined as an arc.

Cross Fall

The lateral grade or slope of a surface (particularly of a road pavement); usually expressed as a percentage of the proportion of metres vertically to metres horizontally.

End Chainage

The chainage of the last point of a string.

Eye-Point

For a perspective view, it is the point where the observer of the perspective view looks from.

GDA

Geocentric Datum of Australia.

GDA94

Geocentric Datum of Australia 1994.

GPS

Global Positioning System.

Grade

The longitudinal slope of a surface (particularly of road pavement). Usually expressed as a cross fall percentage or as a ratio of one unit vertically to a number of units horizontally. For example, 3% or 1:10.

GRS80

Geocentric Reference System 1980.

Helmert Transformation 2D

A two dimensional transformation where one set of points is fitted to another. The transformation is a four parameter transformation, i.e., x displacement, y displacement, scale factor and rotation. If more variables exist than degrees of freedom, i.e., more than two control points are used, a least squares solution is calculated.

Hidden Line

Lines that are hidden between protruding landforms, etc. in perspective views.

Horizontal Alignment

The plan position of an alignment string (centre line) defined by intersection points, spirals and arcs.

Intersection Point (IP)

The point where two lines intersect. Usually horizontal intersection points (HIP) or vertical intersection points (VIP)

Invert

The lower inner surface of a drain or sewer pipe.

ISG

Integrated Survey Grid (NSW Australia).

MGA, MGA94

Map Grid of Australia 1994.

NTv2

National Transform Version 2. Special grid file format used in Australia, NZ and Canada for converting longitude and latitude.

Null Value

In three dimensional data, it is possible that a point can have a valid plan position but an undefined height. In 12d Model, there is a special **null** value which is used internally when height is undefined (-9.9e29).

Obvert

The upper inner surface of a drain or sewer pipe.

Parabolic Curve

Curves defined as a parabola.

Plot File

A file of plotting instructions in a format to suit a particular plotter. In 12d Model, HPGL is the default format for plot files.

Polygon

A string where the first point and the last point have the same plan co-ordinate. That is, the string closes on itself.

Screen Units

The unit of resolution for the computer screen - usually called pixels.

Shade

For a shade for a perspective view, the colour of all triangle faces are adjusted depending on the angle they make with a specified light source.

Slope

The inclination or grade of a surface or line, usually expressed as a ratio between one unit vertically to a number of units horizontally. For example, 1:10.

Snapping

A process where the element to be selected does not have to be exactly located. A tolerance is specified (the snap tolerance) and if the cursor is placed within the tolerance distance of the element then the cursor is moved directly ("snaps") to the element.

Different snap settings determine what parts of the element are considered for snapping to. For example, points on the string (point snap), drop perpendicular on the lines of an element (line snap) and grid points (grid snap).

Spiral

The special type of curve used for transitioning between straights and arcs in an alignment string (centre line). Also known as a transition curve or transition spiral.

Start Chainage

The chainage of the first point of a string.

String

A string is an ordered series of points.

Apart from the first and last point in a string, each point in a string has a unique next point (successor) and a unique previous point (predecessor). The previous and next points for a point are called its string neighbours. The lines joining a point with its neighbours are called string links.

A string which has the same first and last point is called a closed string otherwise a string is said to be open.

Strings are very useful in the modelling of terrain and design surfaces. 12d Model uses a number of different **types** of strings which as defined in the chapter **Tools and Concepts**.

Sweep Angle

For an arc, the sweep angle is the angle, measured in the **clockwise** direction, between the line joining the arc start point to the arc centre and the line joining the arc end point to the arc centre.

Tangent Point

A point at which a curve touches a line or another curve such that the tangent vector at that point is the same for the two touching items.

Target-Point

For a perspective view, it is the point that the observer is looking at.

Template

Standardized cross-section which is applied to a string at defined chainage points.

Template Modifiers

12d Model commands which modify the definition of a template. Template modifiers are used in preference to defining hundreds of different templates.

TIN

Triangulated Irregular Network. A TIN is a set of triangles which do not non-overlap in plan. Each vertex of a triangle has a z-value so that the TIN represents a surface in three dimensional space made up of triangular faces. When a TIN is created from a data set, the triangles are formed so that all non-null points are vertices of triangles. If breaklines are preserved in the TIN, then triangles are constrained so that any link from a breakline string is a side of a triangle.

Tinable vertex or point

If a vertex or point is tinable, then the vertex/point is included in triangulations. If the vertex/point is not tinable, then the vertex/point is ignored when triangulating.

Tinable segment or line

If a segment or line is tinable (and both the vertices at the ends of the segment/line are tinable and the z-values not null), then the segment/line is used as a side of a triangle during triangulation. This may not be possible if there are *crossing* tinable segments/lines.

A tinable segment is also known as a *breakline*.

Note that for a segment/line to be used as a side of a triangle, then its end vertices must be tinable and the z-values not null.

Triangulation

A set triangles, which do not overlap in a plan view, created from a set of data points. See TIN.

UTM

Universal Transverse Mercator.

View

The area in **12d** Model used for displaying (drawing) graphical information. In **12d** Model there are three types of views - plan, section and perspective.

Vertical Alignment

The long section position of an alignment string (centre line) defined by vertical intersection points (VIP's) and parabolic or circular curves.

WGS84

World Geodetic System 1984.

World Units

The fundamental units used in 12d Model - usually metres.

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