12d® Model

Civil and Surveying Software

What's New in 12d Model 15

November 2022

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What’s New in 12d Model 15

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Table of Contents

1 About This Manual

The section 1.1 Read This Section First highlights important information that you need to be aware of being moving to ***12d Model 15.***

This manual then contains information on:

(a) details on some of the new, or modified, options in ***12d Model 15.***

Chapter 2 General Items is general information.

Chapter 3 Starting Up describes the new start up screen for ***12d Model 15.***

Chapter 5 Tools and Concepts explains new or modified concepts.

Chapter 6 Menus on Views has information about the menus on Plan, Section and Perspective views.

The chapters 7 Project to 23 Help are set out in the order that options appear on the ***12d Model 15*** **menus**, **Reference** manual.

(b) the following sections contain information you need when installing and moving across to ***12d Model 15.***

28.1 Hardware Locks for 12d Model 15

28.2 Installers for Lock Drivers and 12d Model

28.3 User, User_Lib and env.4d for 12d Model 15

28.4 Network Hardware Locks and 12d Model

IMPORTANT NOTE:

Some of the links in this file may not be valid as they are links to information in the ***12d Model 15 Reference*** manual.

Continue to the section 1.1 Read This Section First.

1.1 Read This Section First

See

1.1.1 Features Not Yet Completed for 12d Model 15 C1f
1.1.2 Windows Operating Systems Supported
1.1.3 Hardlock dongles will NOT work with 12d Model 15.
1.1.4 CodeMeters Need Drivers of at Least Version 6.1
1.1.5 Installer Deletes the Program Files 15.00 Areas
1.1.6 New Guid File Naming Convention
1.1.7 12d Model 15 Projects
1.1.8 Using V15 Projects with 12d Synergy

1.1.1 Features Not Yet Completed for 12d Model 15 C1f

Because of a number of major changes done for ***12d Model 15*** including ***Themes***, ***Object Tree*** and ***GUID naming on disk*** (for Models, Tins, Functions and Templates), ***12d Model 15 C1a*** was released with some features not completed.

This decision was made so that users who do not currently need the missing features can start using ***12d Model 15***.

However most of these missing features have been finished for ***12d Model 15 C1f***.

The features that will **NOT** be completed for ***12d Model 15 C1f*** are:

(a) Support for Music X - previous versions of Music are supported.

(b) Water to zip for Shared in models and tins

(c) ***Getting Started for Design*** pdf and data is still only for V14 as it is being rewritten for V15 using a new dataset.

(d) ***Getting Started for Surveying*** pdf and data is still only for V14 as it is being rewritten for V15 using a new dataset

If you have any issues with ***12d Model 15 C1f***, please let your ***Reseller*** know as soon as possible so that we can endeavour to fix them for ***12d Model 15 C1g***.

1.1.2 Windows Operating Systems Supported

(a) ***12d Model 15*** **WILL RUN** on **Windows 10**.

(b) **Windows 11** has only just been released and we are still evaluating it.

(c) ***12d Model 15*** **SHOULDN NOT BE RUN** on Windows 8.0.

Windows 8.0 is very buggy and no one should be using it for***12d Model 15***.

(a) ***12d Model 15*** **MAY RUN** on **Windows 8.1** but that is not recommended.

Windows 8.1 is better than Windows 8 but is still very buggy so there is no guarantee that everything will run as expected for ***12d Model 15***.

(b) ***12d Model 15*** will **NOT RUN** on Windows **Vista**, **XP** or **earlier versions of Windows**.

1.1.3 Hardlock dongles will NOT work with *12d Model 15*.

If you have a Hardlock dongle, please contact your Reseller.

1.1.4 CodeMeters Need Drivers of at Least Version 6.1

To obtain new CodeMeter drivers, see 28.2 Installers for Lock Drivers and 12d Model

if you have a Hardlock dongle, please contact your Reseller.

1.1.5 Installer Deletes the Program Files 15.00 Areas

The ***12d Model 15 Installer*** first deletes everything in the ***15.00*** Area before starting the installation. That is, the ***12d Model 15*** Installer **delete all files** in the 32-bit or 64-bit folders

Program Files\12d\12dmodel\15.00

or

Program Files (x86)\12d\12dmodel\15.00

So **do not** add or modify any files in those areas because they will be deleted by the next ***12d Model 15 Install***.

1.1.6 New Guid File Naming Convention

In previous version of ***12d Model***, model and tins were saved on disk with the same file name as the model or tin followed by a dot and a file ending to indicate if it was a model or a tin.

For ***12d Model 15*** this has been changed and the files on disk for models and tins have a guid as their name. The actual model or tin name is now inside the guid named file.

This is a totally new concept for ***12d Model*** and because names of models, tins, functions and templates can no longer be known by just looking at the file name on the disk using Windows **File Explorer**.

For more information go to 2.2 Guid Naming Convention for 12d Model 15.

1.1.7 12d Model 15 Projects

12d Model 15 writes a ***V15 Project*** which means that the **V15** project can not be opened by any earlier versions of ***12d Model***. For example, ***12d Model 14 CAN NOT*** open a **V15** Project.

A ***V15 Project*** CAN NOT be converted to an earlier ***12d Model*** Project. For example, a ***V15 Project*** can not be converted to a ***V14 Project.***

1.1.8 Using V15 Projects with 12d Synergy

12d Model Projects with a ***V15 database*** can be used with ***12d Synergy 4*** and ***12d Synergy 5.***

However, it requires 1***12d Synergy 5.1.1.48*** or ***12d Synergy 4.3.10.141***, both of which have been released.

Note: both Server AND Client must be on the appropriate version for it to work.

2 General Items

See

2.1 Object Tree

As project have become large and the number of models, tins and functions in a project rapidly increased, many users have asked about the possibility of models, tins and functions having groups like linestyles, and to any number of levels. This would make it much easier to group these objects together, and make pop-up lists etc more readable and usable.

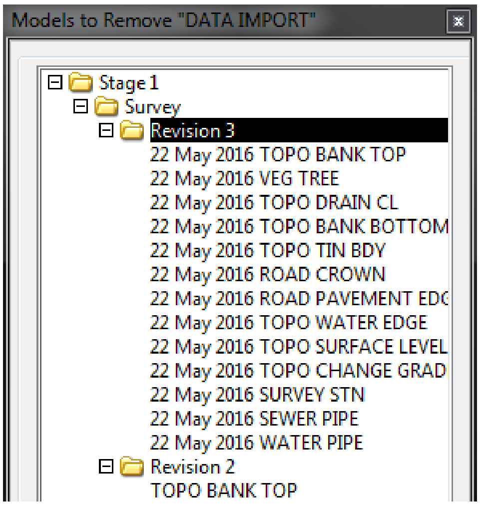
That is, the wish is to allow some object names to have a tree structure and full path names like attributes or Windows folders so that it is easier to group the objects together in pop-up lists.

For example, if the models were called:

"Stage 1/Survey/Revision 3/22 May 2016 TOPO BANK TOP"

"Stage 1/Survey/Revision 3/22 May 2016 VEG TREE" etc

then when looking at a list of models, the list would have a four level tree structure showing "Stage 1" at the top level, with "Survey" at the second level, "Revision 3" at the third level and finally "22 May 2016 TOPO BANK TOP", "22 May 2016 VEG TREE" as sub nodes of "Revision 3" at the fourth level.



This grouping is being called **Object Tree**, and the example above is the case of ***Object Tree*** being used for ***model names***.

In ***12d Model 15***, this ability to use a tree path name has been implemented for:

(a) models

(b) tins

(c) functions

(d) templates

When a new ***12d Model 15*** is created it is automatically ***Object Tree*** enabled.

Note

Any pre and post spaces in the each part of the object tree path will be removed but imbedded spaces are not.

That is, "   fred jones / joe /   lee   " is the same as "fred jones/joe/lee"

but

"fred   jones" is different to "fred jones"

2.2 Guid Naming Convention for 12d Model 15

In previous version of ***12d Model***, models, tins, functions and templates were saved on disk with the same file name as the model, tin, function or template followed by a dot and a special file ending to indicate if it was a model, tin, function or template.

For ***12d Model 15*** this has been changed and the files on disk for models, tins, functions and templates have a guid as the unique part of their file name, followed by a dot and a special file ending to indicate if it was a model, tin, function or template.

For example,

C45EDEB2-0110-4FEB-9699-37EE0364DFDF.model

The actual name of the item is now **inside** the file and so is no longer easily recognised using tools such as Windows **File Explorer**.

These new names will be referred to as the **guid naming convention** and ***12d Model*** projects using it are called **guid projects.**

This change can have important ramifications for anyone replying on the name of the file on disk for a model, tin, function or template to use for another purpose.

For example, in a back up of your data, you can't tell the name of the model, tin, function or template just by looking at the file name.

Another consequence of the new guid naming convention is that models and tins from earlier versions of ***12d Model*** can not be shared into ***12d Model 15***. All non-guid projects must be migrated to ***12d Model 15*** projects before any of their tins or models can be shared into a ***12d Model 15*** project. For information on migrating a project, see 2.3 Migrating a Project.

However the ***12d Model 15*** options **Copy Project /Folder** for ***models***, ***tins***, ***functions*** and ***templates*** can be used to bring data from non-guid projects into a ***12d Model 15*** project.

Also ***12dXML*** and ***12da*** can be used to bring data from earlier versions of ***12d Model*** into ***12d Model 15***.

This change to a guid file naming convention for models, tins, functions and templates could have unforeseen consequences so if you run into any difficulties please contact your ***12d Model Reseller ASAP*** so that is can be looked into.

For information on migrating a project, see 2.3 Migrating a Project.

2.3 Migrating a Project

When ***12d Model 15*** attempts to open a **non-V15** project, rather than trying to convert the project and saving on top of the old project, the user is asked if the old project is to be ***migrated*** to **V15**.

What **migration** does is:

(a) for the existing project called XXX, renames it to XXX_old

(b) in the same working folder as the existing project, creates a new V15 project with the original project name XXX

(c) copies the models, tins, functions and templates from the original project to the new project. In the new project all elements are given the same element id's as in the existing project but the models, tins, functions are given guid names.

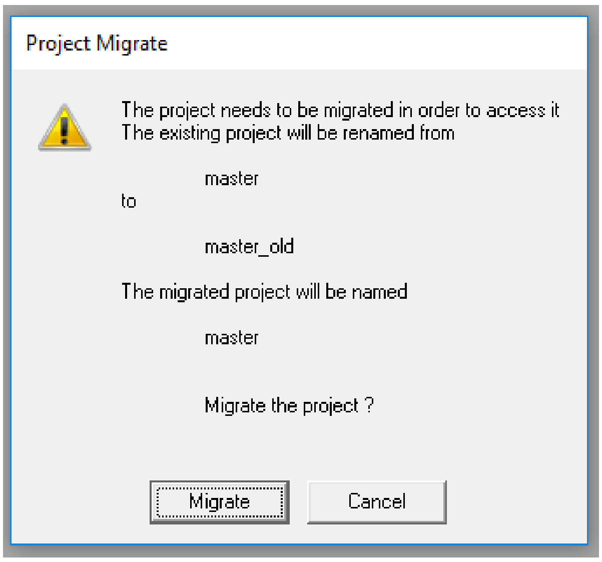
(d) copies all the other files in the old project folder over to the new project folder.

Consequently migration will not destroy the original project.

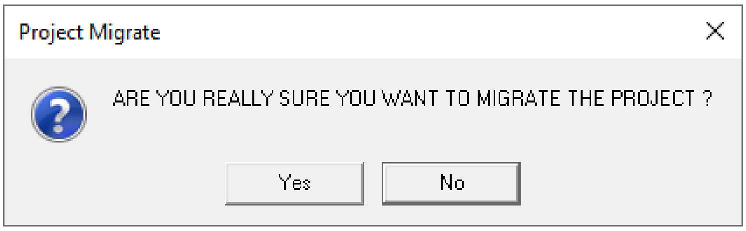
Notes

1. Migration will be triggered if the project is selected from the list in the **Open a Recent Project** panel, from the walk-right list in ***Project =>Recent projects*** and when you ***Drag and Drop*** a project onto a V15 desktop shortcut.
2. Migration is also necessary for **V15** projects that were created **BEFORE** the **V15** guid version was available. That is, those created by V15 versions before **15.0.0.689**.
3. Migration is also necessary for **V15** projects that were created as non-Object Tree projects **BEFORE** it was decided that **all V15 projects must be Object Tree**.
4. Because the original project is renamed to XXX_old, you can only migrate a project once. But you can get around it by renaming XXX_old to a different name.

When a project that requires migration is selected for opening then the **Project Migrate** panel is displayed.



When **Migrate** is pressed, a confirmation panel is displayed:



if **Yes** is selected then the migration proceeds.

2.4 Themes

Now documented In the v15 reference manual

Before ***12d Model 15***, ***12d Model*** was shipped with a fixed set of menus on the **Main** menu and fixed menus on each type of View. The icons were 16x16 pixels.

Users could change the size of the icons for toolbars but the resulting icons were the traditional ***12d Model 14*** icons blown up to the larger size.

In ***12d Model 15***, there are sets of different Main menus, submenus and toolbars, with a variety of icon sizes. The different sets are called **Themes**.

One **Theme** called **Classic** has the set of menus, submenus and toolbars as used in ***12d Model 14*** and using the 16x16 pixel icons from ***12d Model 14***.

There is another **Theme** called **Neo Classic**, or **Neo**, which has the same menu and toolbar structure as **Classic** but has new 16x16 pixel icons that match the icons used in the other Themes.

For all **Themes** other than **Classic** and **Neo**, **Themes** allow for:

(a) different menus and submenus for the **Main** menu across the top of ***12d Model***.

(b) different menus and submenus for each of the **View** types.

(c) different icon sets for the standard Microsoft choices 125%, 150%, 175% and 200%.

The icon sets are tailored for each icon size.

(d) changing between the different **Themes** without leaving ***12d Model***

(e) changing icons sizes for a **Theme** without leaving ***12d Model***

For all **Themes** other than **Neo Classic** or **Classic**, the choice of icon sizes are:

(a) Small (**S**) - 20x20 pixels

(b) Medium (**M**) - 24x24 pixels

(c) Large (**L**) - 32x32 pixels

and
(d) Extra Large (**XL**) - 36x36 pixels

The available **Themes** are:

(a) Classic

The **Classic** theme uses a similar layout for the top menu and submenus as that used in ***12d Model 14.*** The icons and size of icons, are the 16x16 icons used in ***12d Model 14.***

All ***12d Model*** options appear in the **Classic** theme.

(a) Neo Classic

The **Neo Classic**, or ***Neo***, theme uses a similar layout for the top menu and submenus as that used in ***12d Model 14*** and the size of icons is 16x16. However the icons are the new icons used in the other Themes in ***12d Model 15.***

All ***12d Model*** options appear in the **Neo Classic** theme.

(b) Standard

has the same menu layout as Classic but the icons are different and the size of the icons can be selected as **small**, **medium**, **large** and **extra large**. The small size is slightly larger than for ***12d Model 14*** and **Classic** so that they can have more detail in the icons.

(c) Design

a theme set up with the Design options on the main menu. The icon size can be selected from **small**, **medium**, **large** and **extra large**.

(d) Water

a theme set up with Water options on the main menu. The icon size can be selected from **small**, **medium**, **large** and **extra large**.

(e) Survey

a theme set up with Survey options on the main menu. The icon size can be selected from **small**, **medium**, **large** and **extra large**.

(f) 12d Field

a theme set up for working with 12d Field. The icon size can be selected from **small**, **medium**, **large** and **extra large**.

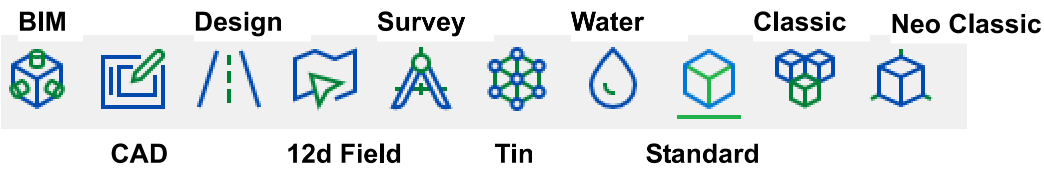
(g) CAD

a theme set up for drafting. The icon size can be selected from **small**, **medium**, **large** and **extra large**.

(h) BIM

a theme set up for BIM work. The icon size can be selected from **small**, **medium**, **large** and **extra large**.

Each theme has its own icon



The **BIM**, **CAD**, **Design**, **12d Field**, **Survey**, **Tin** and **Water** themes each has a different menu structure that is tailored to the type of work being undertaken but this means that not all ***12d Model*** options appear in each theme. However all ***12d Model*** options can still be found using the **Search Bar,** or by changing back to the **Neo**, **Classic** or **Standard** themes.

The **Theme** that is currently being used is shown as the next item after ***Help*** on the ***Main*** menu, and for themes other than **Neo** or **Classic**, the choice of icon sizes is displayed after the name of the current **Theme**, and the icon size currently being used for the theme is surrounded by square brackets **[ ]**.

For information on changing ***Themes*** and ***icon sizes***, see [2.4.1 Changing Themes and Icon Size].

For information on changing the **size of the text** on menus, see [2.4.2 Changing Text Size on Menus].

Note - If there are any problems with the **Neo**, **Classic** or other ***Themes***, please report them to **12d Solutions** on support@12d.com ASAP.

In the meantime you can switch to the **Inbuilt** menu structure until the problem is fixed. See 2.4.3 Accessing the Inbuilt 12d Model Menus.

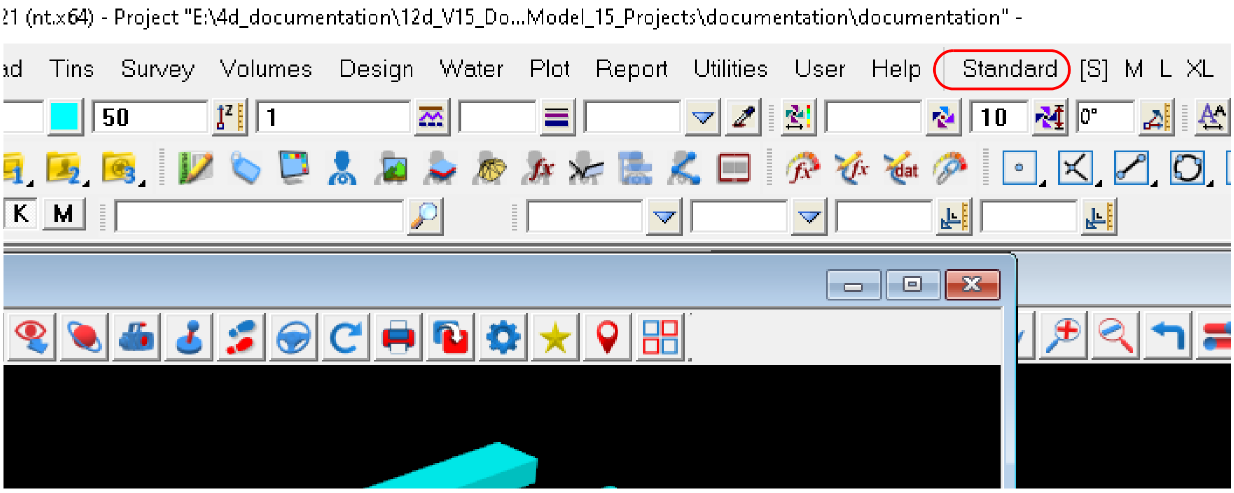
Continue to 2.4.1 Changing Themes and Icon Size or return to 2 General Items.

2.4.1 Changing Themes and Icon Size

The **Theme** that you are currently using is shown as the next item after ***Help*** on the ***Main*** menu and clicking on the current Theme name will bring up a menu of the available Themes.

Clicking on another **Theme** on the menu will change to that **Theme**.

For example, **Standard**.



For all **Themes** other than **Neo** and **Classic** (which use 16x16 pixel icons), there is also a choice of icon size to sue for the selected **Theme**. The choices are:

(a) Small (**S**) - 20x20 pixels

(b) Medium (**M**) - 24x24 pixels

(c) Large (**L**) - 32x32 pixels

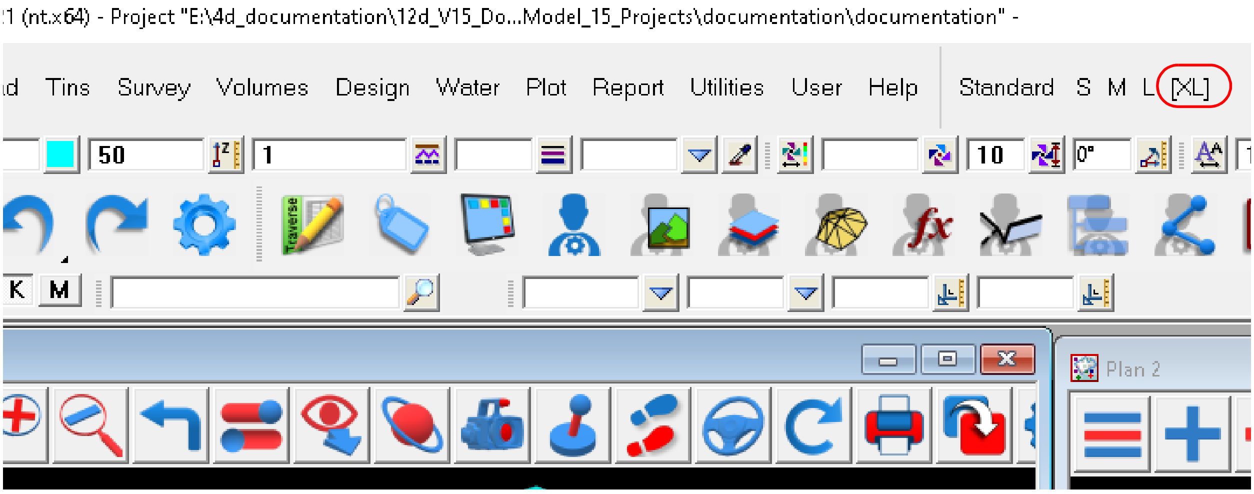
and

(d) Extra Large (**XL**) - 36x36 pixels

The choice of icon sizes is displayed after the name of the current **Theme**, and the icon size currently being used is surrounded by square brackets **[ ]**.

To change to different size icons for the same **Theme**, simply click on the **S**, **M**. **L**, or **XL** to select the new icon size and ***12d Model*** will then replace the icons and text with the new size.

For example, after changing to **XL**:



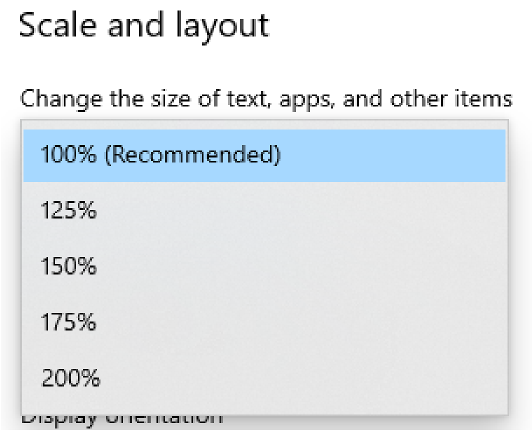
Note: The **Standard** Theme has the same menu structure as the **Neo** and **Classic** Theme but the icons are the new icons with the selected icon size.

Note: The size of the text on menus is independent to the size of the icons and is changed separately. See 2.4.2 Changing Text Size on Menus.

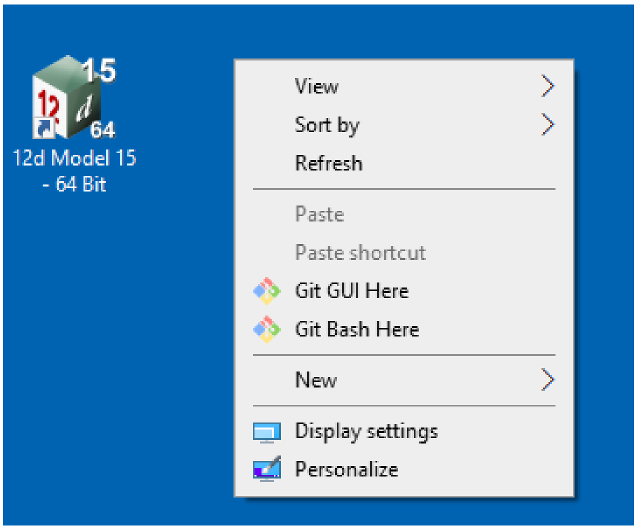
Continue to 2.4.2 Changing Text Size on Menus or return to 2.4 Themes.

2.4.2 Changing Text Size on Menus

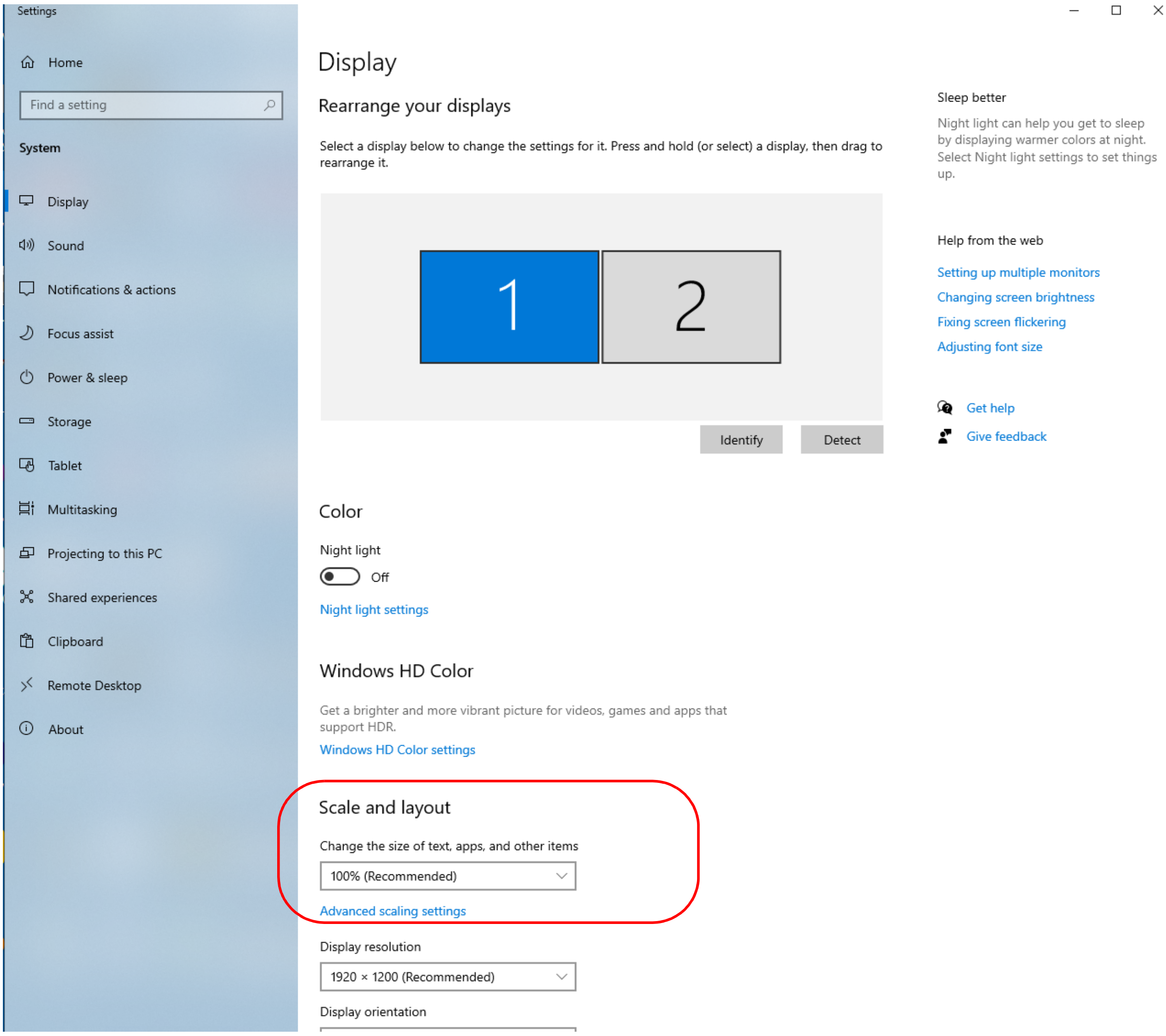
The size of the text on menus is controlled separately to the size of the icons and is controlled by the **Microsoft Display Settings**.



To access the **Microsoft Display setting**, click RMB (right mouse button) in the Microsoft window to bring up the menu:

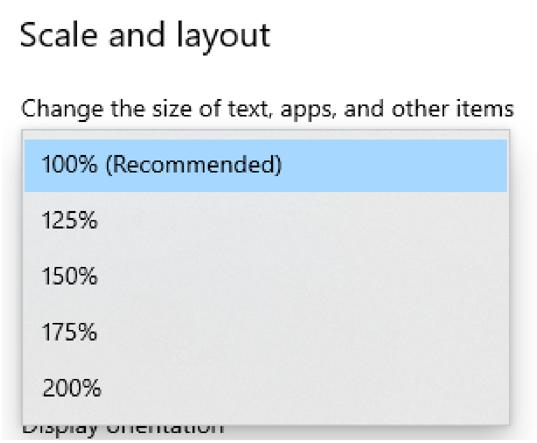


Click on **Display settings** to bring up the **Windows Setting** panel.



Under **Scale and layout,** click on the choice chevron beside **Change the size of text, apps, and other items** and a pop-up with the choices 100%, 125%, 175% and 200% is displayed.

,

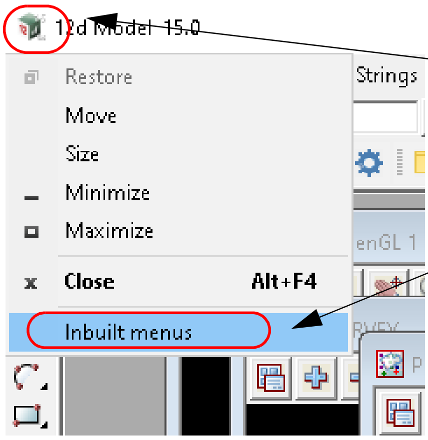


Select the percentage that you want the text size to become.

Continue to 2.4.3 Accessing the Inbuilt 12d Model Menus or return to 2.4 Themes.

2.4.3 Accessing the Inbuilt 12d Model Menus

Whilst in a ***12d Model Theme***, if there are any problems you can return to the **Inbuilt *12d Model Main Menu and View menus*** for the rest of the session by clicking on the **12d** icon in the top left hand corner of the ***12d Model*** window and select ***Inbuilt menus***.



Click on **12d** icon to bring up the menu

Click to return to the traditional menus

However when ***12d Model*** is restarted, it will revert to the last **Theme** that was being used.

Please report any problems in a **Theme** to 12d Solutions on support@12d.com ASAP so they can be fixed.

Continue to 2.5 E Snap or return to 2.4 Themes.

2.5 E Snap

Now documented In the v15 reference manual

E for Extrusion snap

In ***12d Model 14***, ***Face*** snap (**F**) was introduced and when turned on, allowed you to pick on the triangle face of a trimesh. So using **P**, **L** and **F** snap, you can select the vertex, edge or face a Trimesh.

For ***12d Model 15***, a new snap call ***Extrusion*** snap (**E**) was introduced and its use will now be explained.

In ***12d Model super string extrusions*** are created in a number of ways.

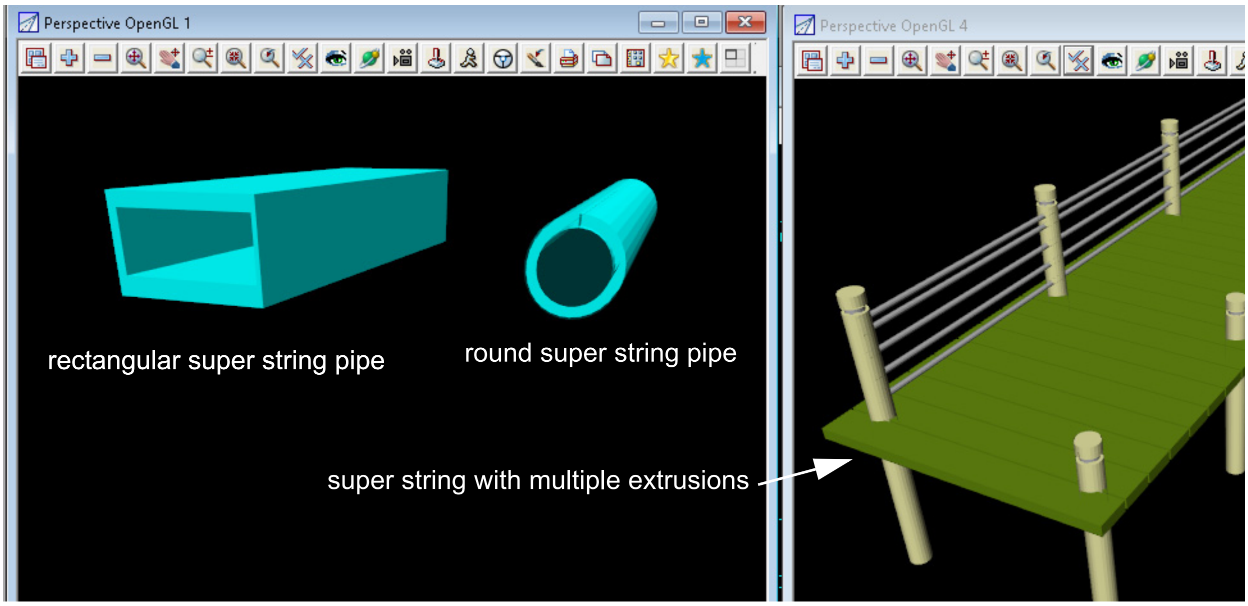
(a) super string as a round pipe

(b) super string as a rectangular pipe

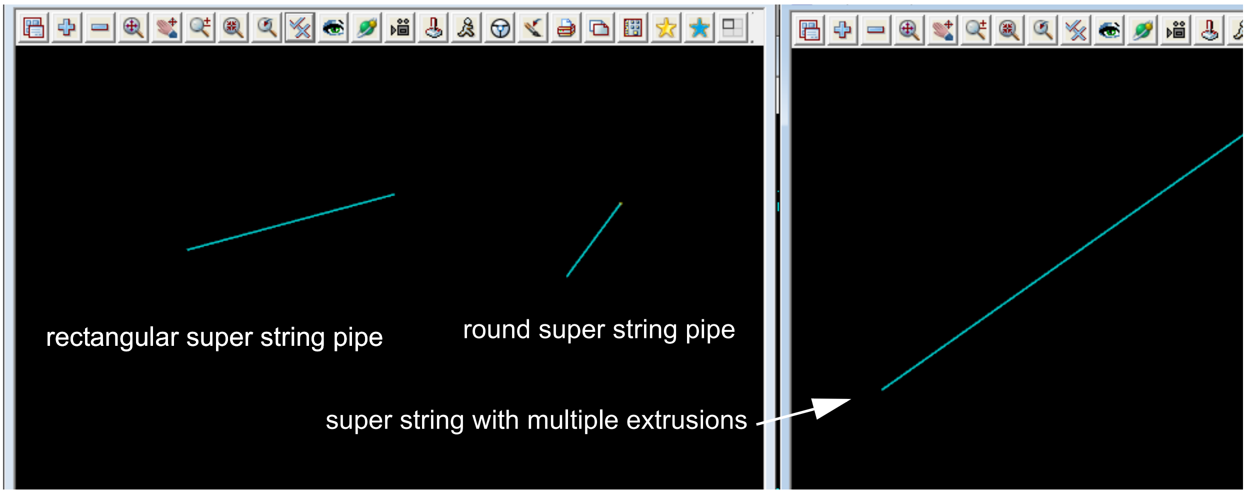
(c) super string with a 2D super string (with and without holes) swept along the super string

(d) super string with multiple extrusion

Round and rectangular pipes are special cases of (c) but because they are easily defined with a few parameters, they exist as special cases of the super string. Similarly multiple extrusions includes (c).



In each case there is only one super string and this become obvious is Extrusions are turned off on the perspective views:



The super string itself is referred to as the **spine** of the super string.

In ***12d Model 14***, when picking a super string, with or without an extrusion, the pick only selected the **spine** of the super string and not the surface of the extrusion.

To overcome this limitation, in ***12d Model 15*** a new snap, **Extrusion** (**E**) snap, has been introduced.

When **E** snap is **off**, picking a super string is the same as in ***12d Model 14***.

That is, when **E** snap is **off**:

(a) you can only pick the **spine** of the super string

(b) **P** snap picks vertices of the super string

(c) **L** snap picks on a segment of the super string.

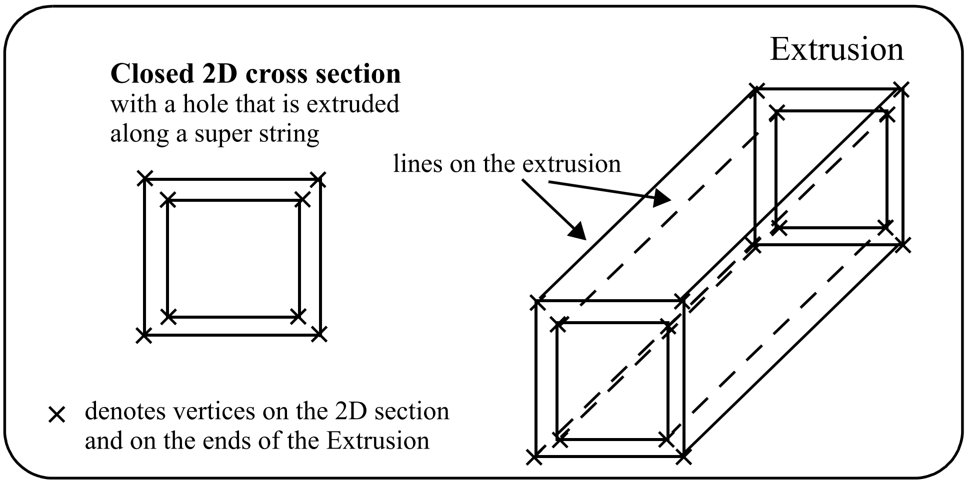
When **E** snap is **on**:

(a) you can only pick **on the extrusion** itself and not the spine.

(b) **P** snap picks vertices of the 2D section at the beginning and the end of the super string segment

(c) **L** snap picks on the lines on the extrusion created by a point on the 2D section as it is swept along the super string spine.

(d) **F** snaps picks on the surface of the extrusion



Continue to 2.6 AutoUpdater for 12d Model 15 or return to 2 General Items.

2.6 AutoUpdater for 12d Model 15

Now documented In the v15 reference manual

For ***12d Model 15***, there is a new background service on your computer called ***12d Model Updater Service*** that removes the requirements that Administrator rights are needed for subsequent installs.

When implemented, the ***12d Model Updater Service*** checks for newer versions of ***12d Model 15*** and can then automatically download and **install** the new version.

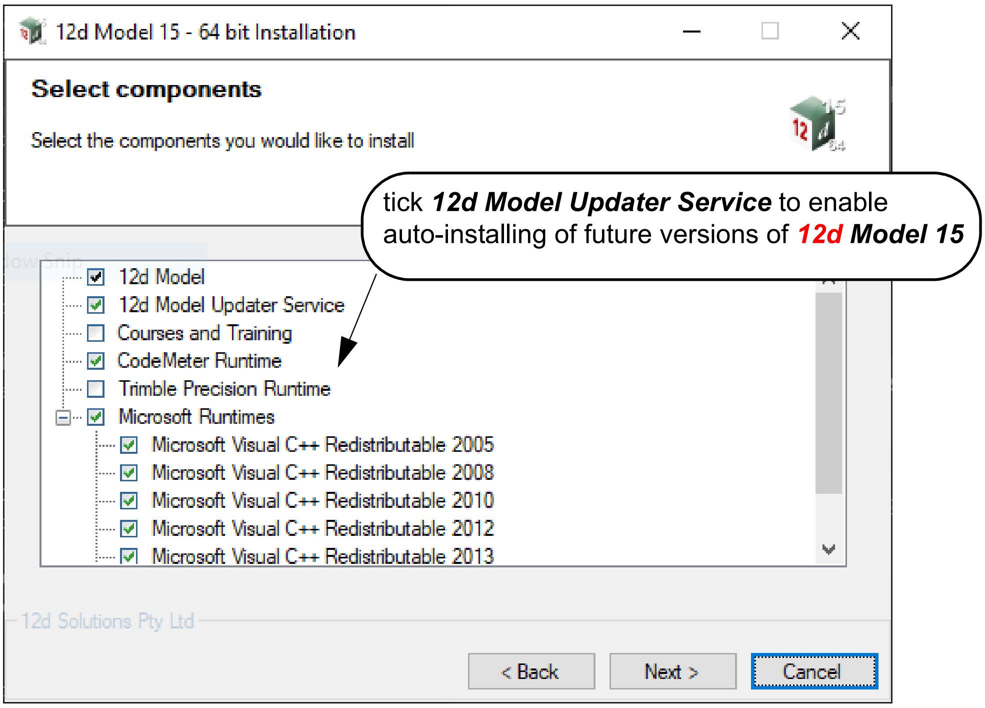
You can set whether the installation exe is automatically deleted after the installation, or it is left in case you want to use it for a manual install at a later time.

The installation exes are downloaded to a default folder but this can also be changed to the folder you want.

Installing the ***12d Model Updater Service*** and setting up the ***AutoUpdater*** consists of a few simple steps:

Step 1.Ticking on 12d Model Updater Service when Installing *12d Model 15*

First ***12d Model 15*** needs to be installed by the Administrator and the Administrator needs to select the ***12d Model Updater Service*** component. See 28.2.2 Installers for 12d Model.



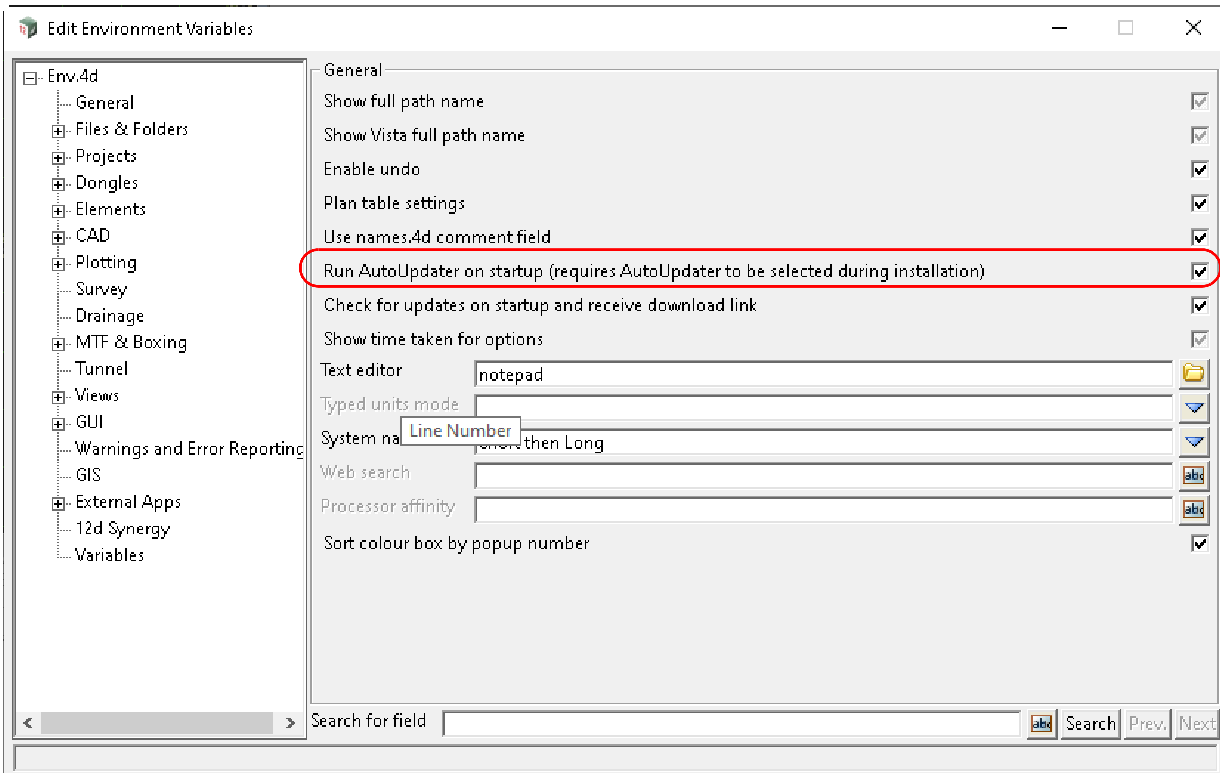
This creates a background service on your computer that has Administrator rights, and each time ***12d Model 15*** is started, it checks if a new version is available and if so, asks if you would like it to automatically download and install the new version.

The ***12d Model Update Service*** remembers the answers made during this installation and apart from the Microsoft Redistributables that are only needed to be installed once, reuses the answers for any future installation made by the ***12d Model Update Service***.

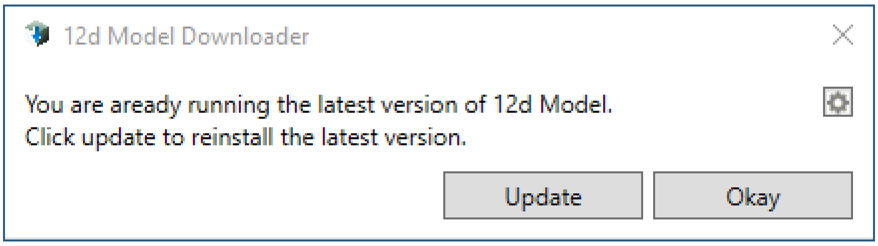
Step 2.Setting up an environment variable

After ***12d Model 15*** is installed, even though the background service is running, the environment variable **auto_updater_4d** needs to be set to **1** for it to be used.

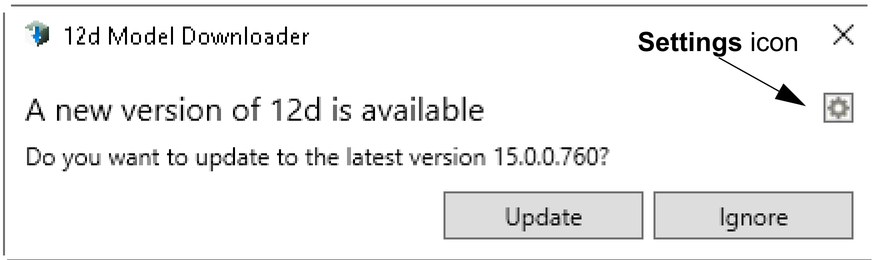
This is done in the ***General*** section of the **Edit Environment Variables** panel by ticking on the ***Run AutoUpdater on startup***.



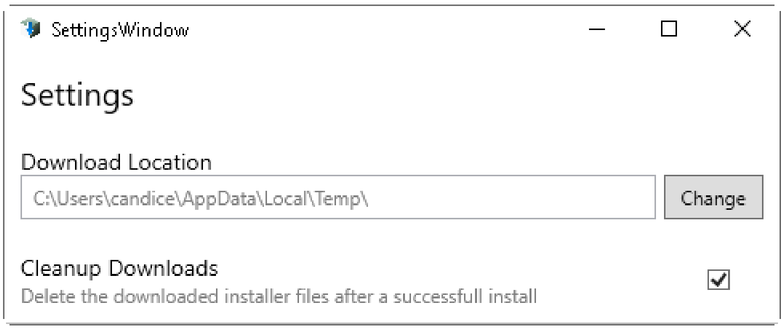
After these steps are done, each time ***12d Model 15*** is started a check is made to see if a newer version of is ***12d Model 15*** available and if one is available, then you will get either the panel:



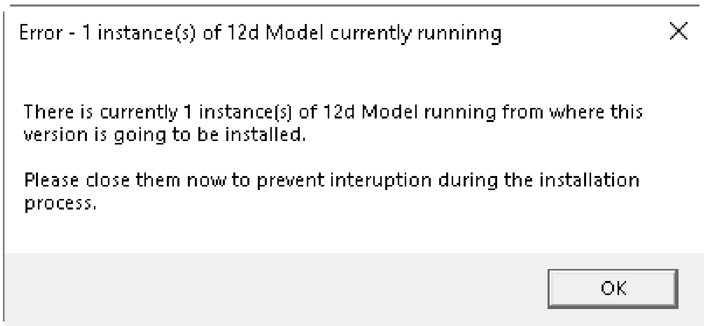
or the panel



Clicking the **Settings** icon allows you to change the location that the installation file will be downloaded to, and to specify if the installation file is to be deleted, or not, after the installation is completed.

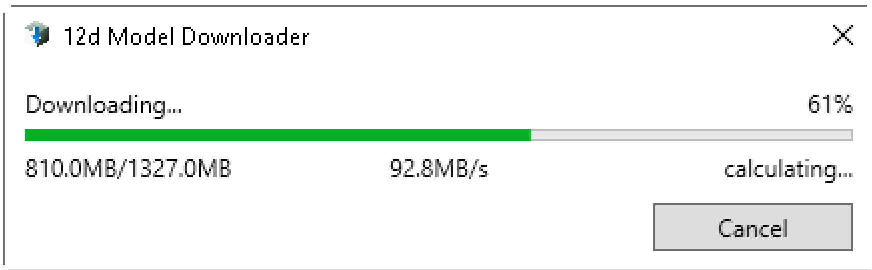


On the **12d Model Downloader** panel, if **Update** is selected, the ***12d Model Update Service*** first checks to see if any copies of ***12d Model 15*** are open. If any are open then they must be closed before the installation can take place.



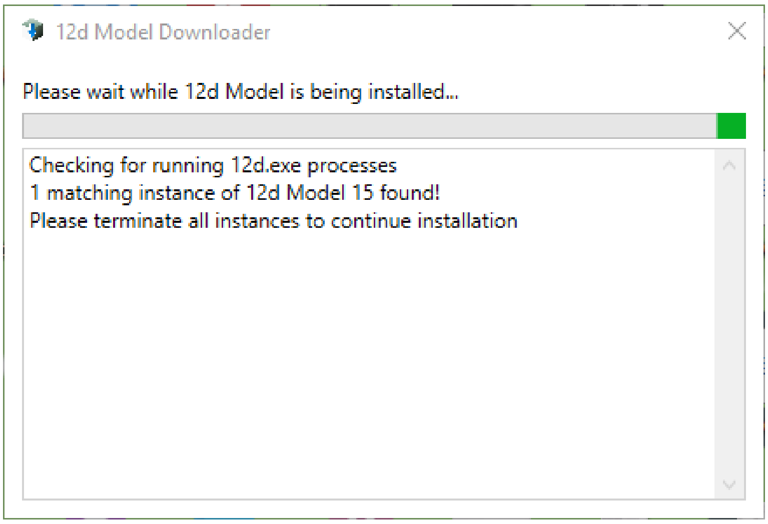
This often occurs because you need to start ***12d Model 15*** to be asked about AutoUpdating.

Even if all copies are not closed, the download will begin when **OK** is pressed.



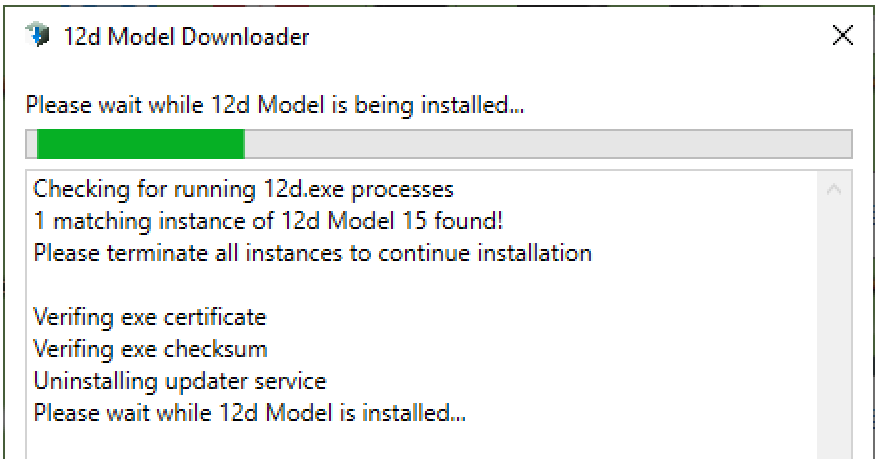
Once the download is complete, the installation process begins.

However, a check is again made to see if all copies of ***12d Model 15*** are be closed otherwise you will get the message:



The installation will not continue until all instances for Once all instances of ***12d Model 15*** are closed.

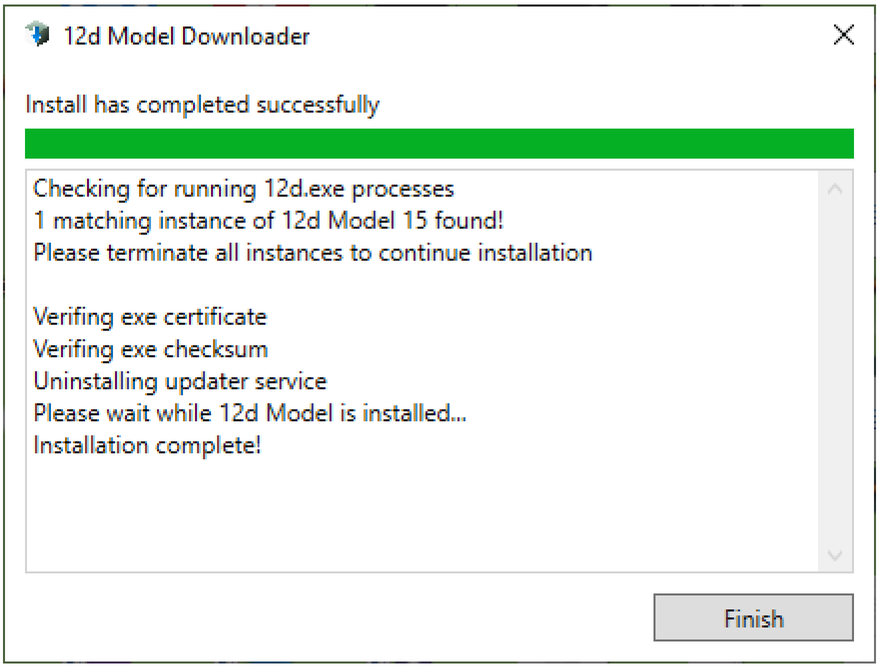
Once all instances closed of ***12d Model 15*** have been closed, the **AutoUpdater** will proceed with the installation and posts the message ***Please wait while installing...:***



Because the ***12d Model Update Service*** is now doing the installation, you no longer have to provide an Administrator account and password, or answer any Installation questions.

During the installation the only thing you will notice is that at some stage the ***12d Model 15*** icon is removed from the screen.

Once the installation is complete, the ***12d Model 15*** icon is restored and the message **"Install has completed successfully"** is displayed.



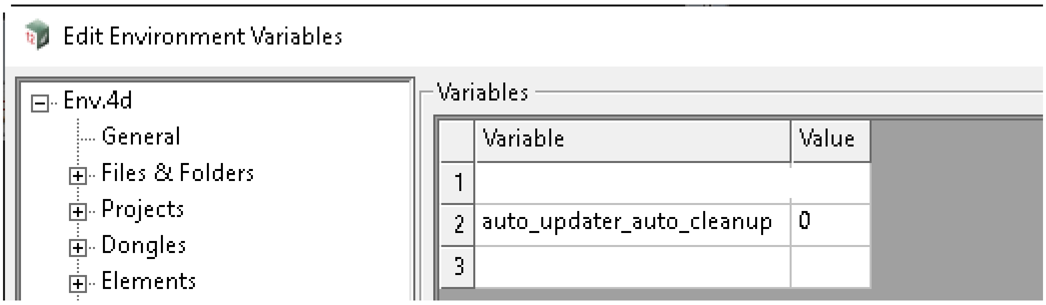
Click on **Finish** to remove the panel.

Step 3. Delete or Not Delete the Installation Exes 12d Model as Administrator

You can select to delete, or to not delete, the installation exes after the installation has completed. The **default** is to automatically **delete** the installation exes.

To **not delete** the installation exes, set the env variable **auto_updater_auto_cleanup_4d** to **0**.

This is done in the ***Variables*** section of the **Edit Environment Variables** panel.



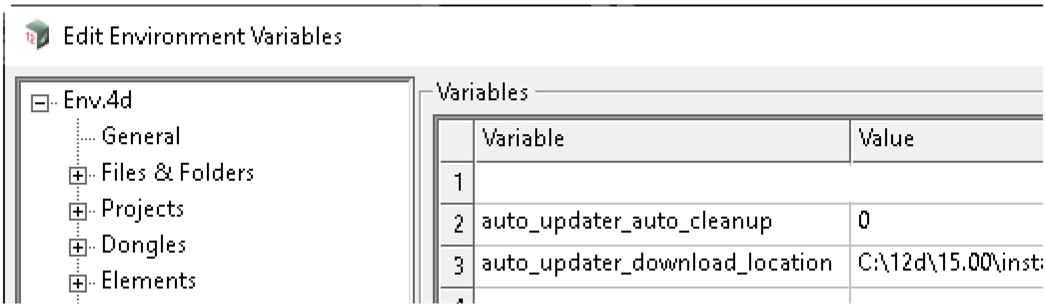
Step 4. Where to Put the Installation Exes

By default, the installation exe's are in the %temp% folder inside 12d\downloads.

But you can specify a different folder by setting the env variable

auto_updater_download_location_4d to **your preferred folder**

This is done in the ***Variables*** section of the **Edit Environment Variables** panel.

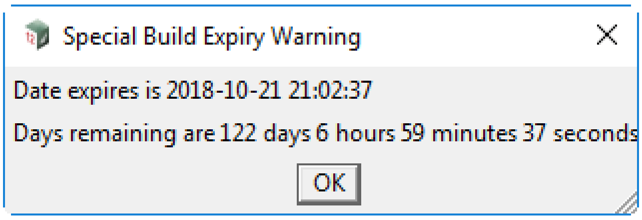


IMPORTANT NOTES

1. Because the ***12d Model Update Service*** has the **Administrator rights to install *12d Model 15,*** after the initial installation of ***12d Model 15*** by the Administrator, the user no longer needs Administrator rights for the subsequent installations to occur.
2. The installation exes are given a name with the date in the form ***dd_mmm_yy*** imbedded in the name.
3. If the installation exe already exists, it won't be downloaded again.

2.7 Time Warning When NOT a Release Version

If your version of ***12d Model 15*** is **NOT** a **Release Version** then the version will only run for a maximum of three months from the date that the version was built.

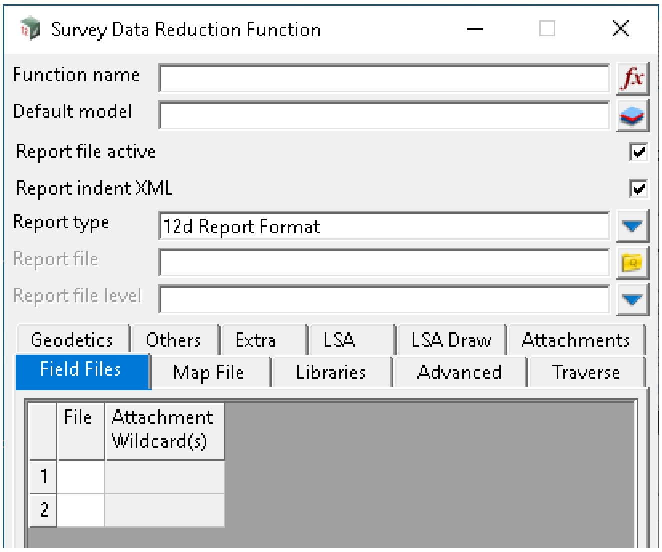


The only way to continue running after the three months has expired is to install full Release version or non Full Release version that was built in the last three months.

Non Release versions include Alpha versions, Beta versions, Technical Release versions, INT versions, Develop versions and Ad Hoc versions.

2.8 Active Tab Coloured Blue

With Microsoft changes over time, what tab on a panel is actually the highlighted tab has become very hard to determine and so for ***12d Model 15***, the active tab is highlighted in blue.



2.9 Options Log Files Saved & Emailed to 12d

This was introduced in ***12d Model 14.***

Whilst ***12d Model*** is running, a log of each option used in the session is written to a temporary file ***Options.txt*** in a subfolder of %TEMP%\12d.

At the end of the ***12d Model*** session, the options log file is stored on your computer, and also emailed back to ***12d Solutions*** at the end of the session.

If a crash occurs, this log file is included in the Crash email that is sent back to ***12d Solutions***. These options log files have proved to be invaluable in helping to find crashes.

IMPORTANT NOTE:

To **turn options logging off** and **NOT EMAIL** the log file back to ***12d Solutions***, set the env variable **USE_OPTIONS_LOGFILE_4D** to **0**.

The log file is stored in the folder ***options_logs*** in the working folder for the last project used. The options log file is renamed to give it a unique name in the folder.

The information that is recorded in the options log file and sent back to ***12d Solutions*** includes:

Microsoft User name:

12d Model Client name

Hardware lock used:

Full path name of the ***12d Model*** project.

Path to the ***12d Model*** executable

12d Model version

and

a line of detail each time an option is used

the number of times certain modules were used in the session.

When you exit ***12d Model*** or have a crash, the options log for that session is emailed to ***12d Solutions.***

As the number of logs can build up over time, there is an option to delete unwanted options log files from the ***options_logs*** folder in the working folder of a project.

IMPORTANT NOTE:

To **turn options logging off** and **NOT EMAIL** the log file back to ***12d Solutions***, set the env variable **USE_OPTIONS_LOGFILE_4D** to **0**.

2.10 Preventing Open GL Views

At times graphics drivers for a graphics card may be shipped with bugs in their OpenGL routines and they may be so bad as to prevent ***12d Model*** from even starting up when there is an existing OpenGL view in the project.

The environment variable **ALLOW_OPENGL_VIEWS_4D** has been introduced to allow users with problems with their graphics cards that cause regular crashes with OpenGL views, to run ***12d Model*** by replacing OpenGL views by non-OpenGL views.

If set to **0**, the environment variable **ALLOW_OPENGL_VIEWS_4D** will

(a) stop OpenGL Plan and OpenGL Perspective views from being created.

(b) if OpenGL Plan and OpenGL Perspective views already exist in a project, they will be replaced by Plan and Perspective views respectively on opening the project.

.

ALLOW_OPENGL_VIEWS_4D value 0 or **1**

If **0**, then any Perspective OpenGL views are only opened as Perspective views, and any Plan OpenGL views are only opened as Plan views.

If **1**, then Perspective OpenGL views are opened as OpenGL Perspective views, and any Plan OpenGL views are opened as OpenGL Plan views. That is, the standard behaviour of ***12d Model***

The default is **1**.

2.11 Outputting Missing Super Tin Components

In all write **12d Solutions Data** panels, there is a new tick box **Output missing super tin components.**

If the box is ticked then for every super tin in the data source, ***12d Model*** will write out all the super tin components, even if they are not included in the data source.

The default for this tick box is **not ticked.**

2.12 Trimeshes and Drafting Elements Working with Polygon Choices in Source Boxes

Trimeshes and drafting elements are new type of elements in version 11. Since they are not strings, there are some conflicting ideas about the definition when they are in/out/cutting polygons.

In version 15, we enable some simple logic rules to define the relationship of trimeshes and drafting elements relative to source boxes polygon.

A trimesh is inside a polygon if all its vertices are inside the polygon. A trimesh is outside a polygon if all its vertices are outside the polygon. A trimesh with some vertices are inside and some vertices are outside a polygon is call cutting the polygon.

Note that the above definition does not take into account of trimesh edges and faces. Hence a trimesh inside a polygon might have part of some edges or faces being out of the polygon - similar things happen with the outside definition.

Since some drafting elements might use paper-size or device-size similar to texts; the interaction of those with polygon choices in source boxes will have additional problem as texts,

Two typical examples

Example 1: Global change panel.

Using **lasso** will pick up trimeshes and drafting elements.

Example 2: Flip trimeshes faces panel.

The data source for trimesh in v15 will be a full one (with polygon choices and filters enables).

2.13 Additional Items for Attribute Manipulator

More ***12d Model*** element properties have been added to the attribute manipulator so that the properties can be set using attributes and the attributes can be created using properties.

Some additions are:

1. Water link name (segment property)
2. Water node name (vertex property)
3. Internal, external diameter of round pipe for super string, super alignment (string or segment property)
4. Thickness of round pipe for super string, super alignment (string or segment property)
5. Internal, external width of culvert (rectangular pipe) for super string, super alignment (string or segment property)
6. Internal, external height of culvert (rectangular pipe) for super string, super alignment (string or segment property)
7. Left, right, top and bottom thicknesses of culvert (rectangular pipe) for super string, super alignment (string or segment property)
8. Segment bearing for string (segment property)
9. Segment grade for string (segment property)

2.14 Options No Longer Using Old String Types

More ***12d Model*** options that were producing old string types have been modified to produce super strings instead.

1. Project =>Tree node Symbols/Create symbols
2. Project =>Tree node Linestyles/Create linestyle
3. Strings =>Label =>Cut/fill => Ticks
4. Strings =>Label =>Cut/fill => Tadpoles - no file
5. Tins =>Utilities =>Grid DTM
6. Tins =>Utilities =>Rotated Grid DTM
7. Tins =>Utilities =>Z diffs from tins
8. Tins =>Drape =>Drape - vertices only mode
9. Tins =>Tin analysis =>Slope =>Slope analysis 2 (new)
10. Tins =>Tin analysis =>Flow arrows
11. Design => Sight lines => Sight distance enhanced
12. Utilities =>A-G =>Explodes =>Explode text - for non-multiline text

3 Starting Up

This chapter contains information about how to start ***12d Model***, organising ***12d Model*** error logging and how to run chains and macros when starting up ***12d Model***.

See

3.1 12d Model Start Up Icon

When ***12d Model*** is installed, the **12d** icon ***12d Model 15*** is created.

icon for 12d Model 64 bit exe

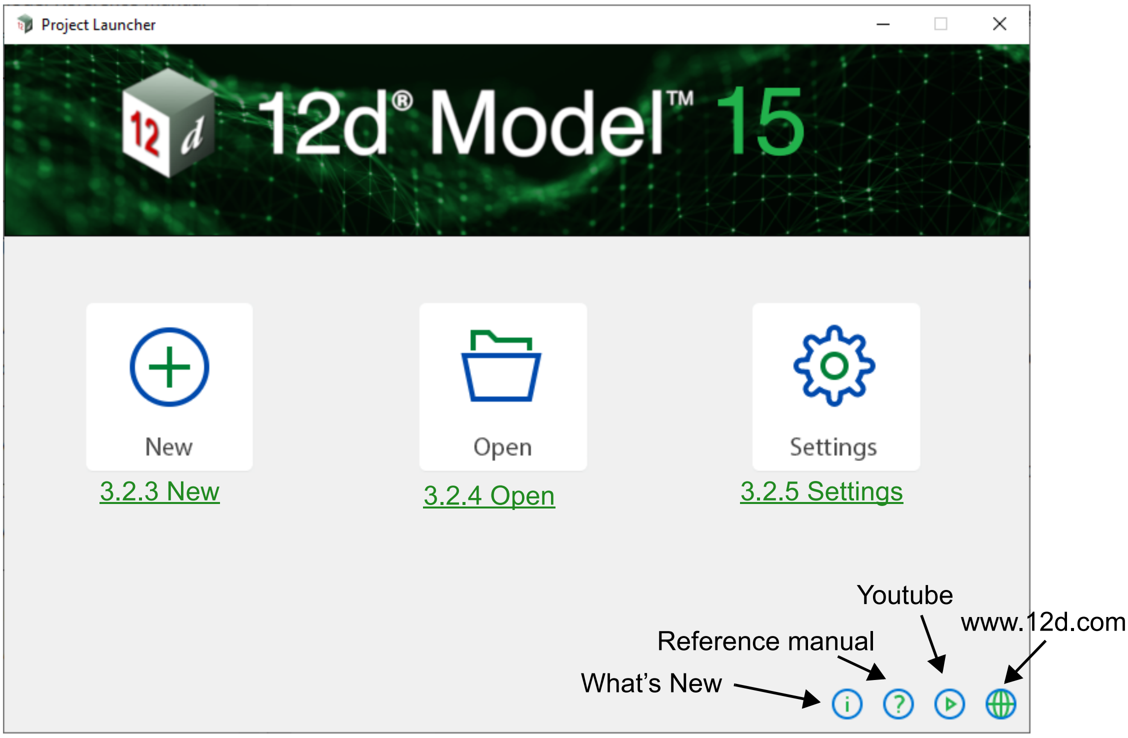
The ***12d Model*** icon is a **shortcut** to start ***12d Model*** and then attach to the folder ***C:\12d\15.00***

Double clicking the ***12d Model*** icon starts ***12d Model*** and brings up the **Project Launcher** panel (3.2 Project Launcher).

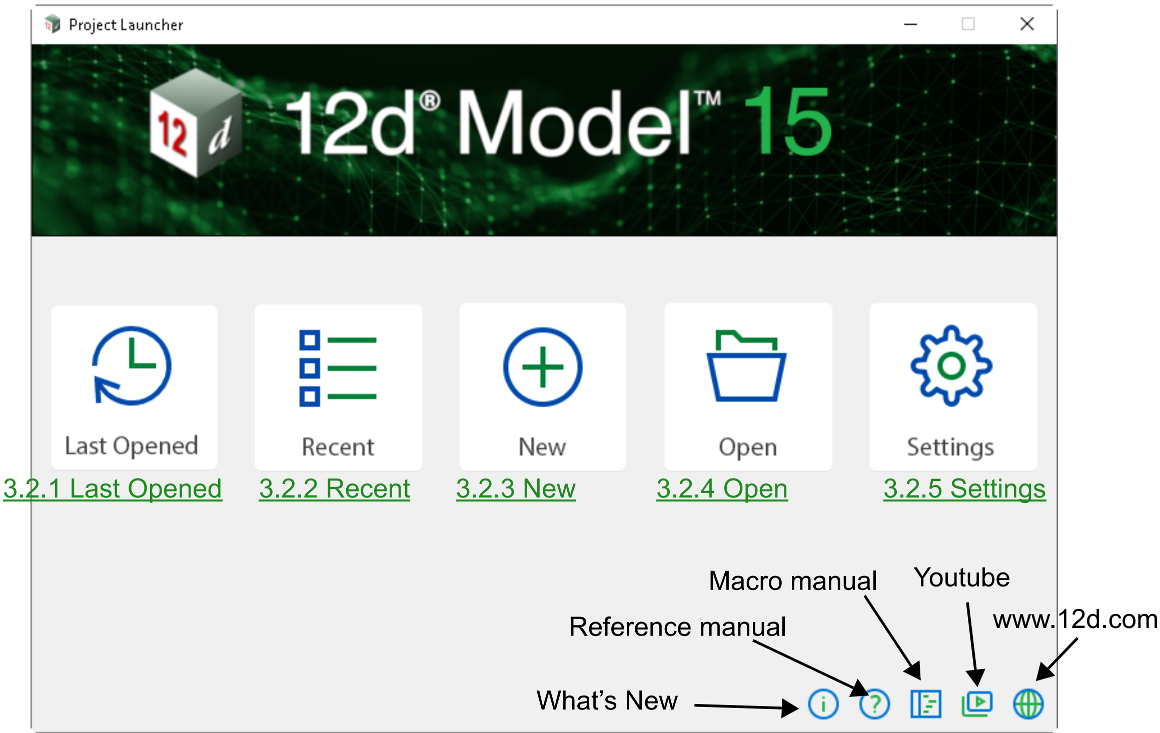
3.2 Project Launcher

The **Project launcher** panel is used to access existing ***12d Model*** projects and create new projects.

If there are no projects that you have previously visited the **Project launcher** panel will display as:

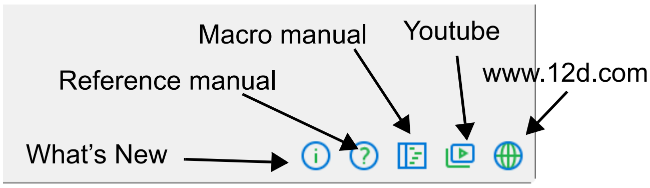


Otherwise there will also be **Last** and **Recent** icons on the **Project Launcher**.



Clicking on the icons ***Last Opened, Recent***, ***New***, ***Open*** and ***Settings*** accesses the functionality of the ***Project Launcher***.

The icons in the bottom right hand corner open the ***What's New in 12d Model 15*** pdf, the ***12d Model 15 Reference Manual***, the ***12d Model*** section of ***Youtube*** and the **12d** website www.12d.com



See

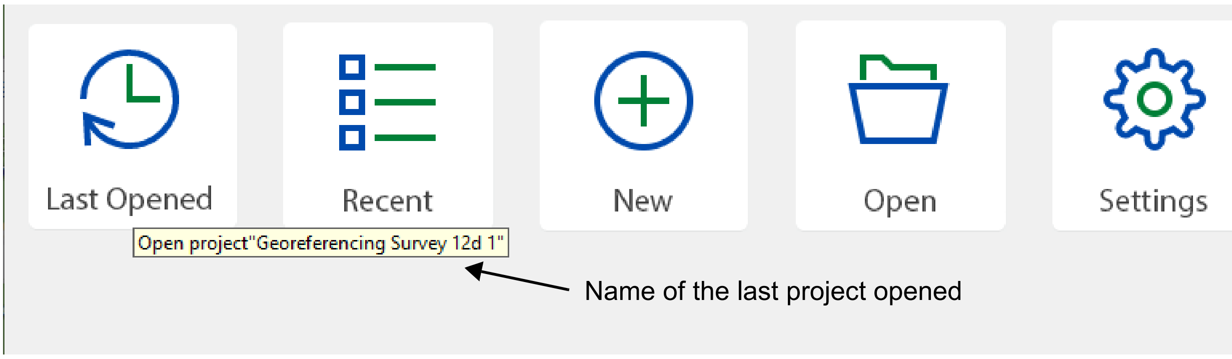
3.2.1 Last Opened
3.2.2 Recent
3.2.3 New
3.2.4 Open
3.2.5 Settings
3.2.6 Selecting a Theme Using the Theme Icons
3.2.7 Recent Projects List

3.2.1 Last Opened

Clicking **Last Opened** opens the last ***12d Model*** project you opened and uses the same settings as when that project was last opened.

That is, it opens the first project in the ***Recent Projects*** list (see 3.2.2 Recent).

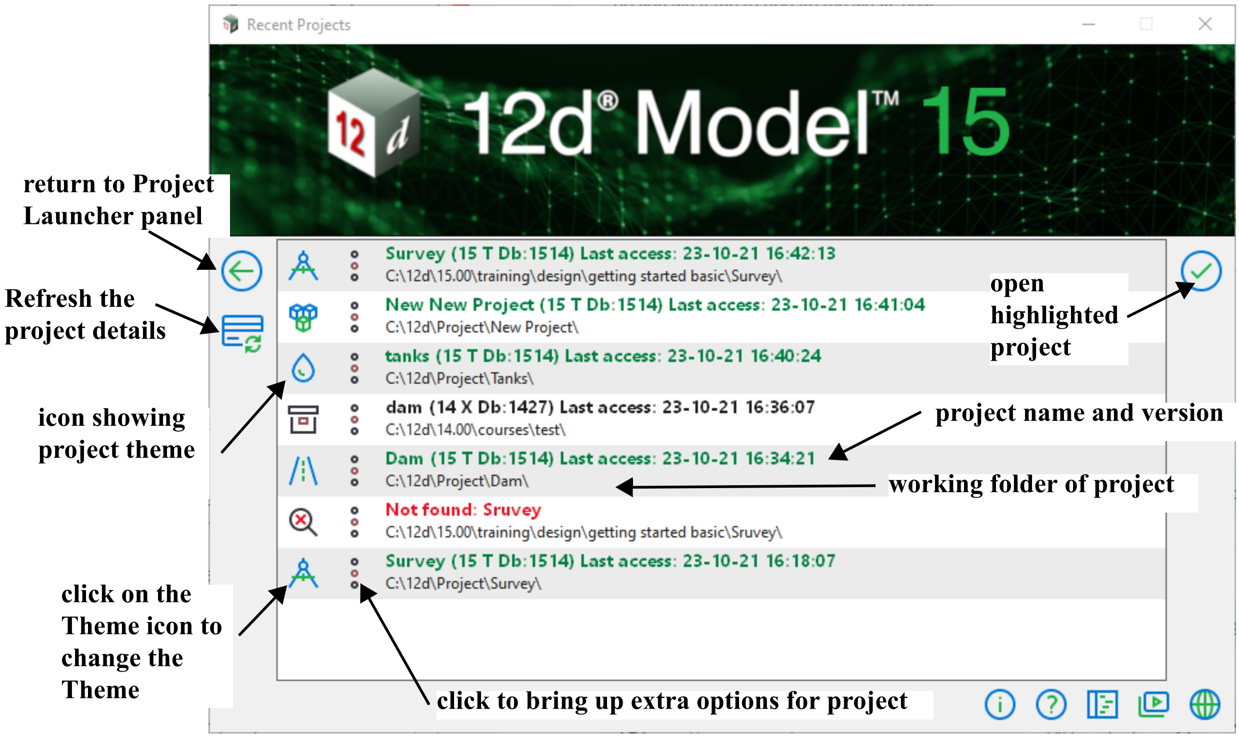
Hovering over the **Last Opened** icon displays the name of the last opened project as a **tool tip**.



Continue to 3.2.2 Recent or return to 3.2 Project Launcher.

3.2.2 Recent

Clicking **Recent** accesses the **Recent Projects** panel which displays a list of your recently opened projects sorted in the reverse data order of when the projects were last opened.



For each project in the **Recent Projects** list, there are two icons and two lines of information about each project.

(a) On the left is an icon displaying the Theme being used for the project.

Clicking on the **Theme** icon brings up a panel to change the **Theme**, **Environment configuration** and the **Dongle** for the project. See 3.2.2.1 Change Theme.

(b) In the middle is an icon that when clicked brings up extra options that can be performed on the project. See 3.2.2.2 Extra Options for the Project.

(c) On the right, there are two lines of information about the project.

The **first line** gives the project name, the project view, the project database number and finally the date that the project was last accessed.

The first line is **coloured** to provide additional information about the project. The line is:

orange if the project is already open and hence locked

green if the project is a V15 Object Tree project

red if the project no longer exists

blue if the project is a V15 non-object Tree project which will need to be migrated to a V15 Object Tree project before use

black if the project is an earlier ***12d Model*** version that needs to be migrated to a V15 project

The **second line** gives the path of the working folder that contains the project.

Double clicking on the lines of information **opens the project**.

And when the project lines are selected (and hence highlighted), clicking on the tick icon also opens the project.

Click the refresh icon to refresh the details of the projects in the **Recent Projects** list.

Click the left arrow icon to return to the **Project launcher** panel.

Continue to 3.2.2.1 Change Theme or return to 3.2 Project Launcher.

3.2.2.1 Change Theme

Clicking on the Theme icon beside the project name displays more information about the project and allows the theme for the project to be changed by selecting the new theme from the **Theme** icons on top.

The **Environment configuration** and the **dongle** to be used can also be changed using the **Environment configuration** and **Dongle configuration** pop-ups

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

Field Description Type Defaults Pop-Up

Project location output only

location of the working folder for the project.

Project name output only

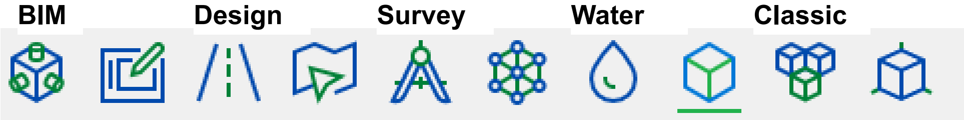
name of the project.

Theme name Theme select

name of the theme for the project.

*The theme can be changed by clicking on the required Theme icon just above **Project location** field.*

BIM **Design** **Survey** **Water** **Classic**



CAD **12d Field** **Tin** **Standard** **Neo Classic**

For more information on Themes, see 3.2.6 Selecting a Theme Using the Theme Icons.

Environment configuration and **Dongle Configuration fields**

*The **Registry file** given in the* **Registry file** *field in the* **Start-up Settings** *panel is used for the pop-ups for the* **Environment configuration** *and* **Dongle configuration** *fields in this panel.*

Environment configuration

*if the project already has an **Environment configuration** then it will be displayed in this field.*

A new value can be selected from the pop-up for this field.

Dongle configuration

*if the project already has a **Dongle configuration** then it will be displayed in this field.*

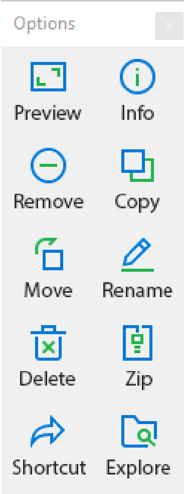
A new value can be selected from the pop-up for this field.

If any of the fields are changed then you need to click on the tick icon to open the project for the changes to take affect.

Clicking the left arrow icon returns to the **Project Launcher** panel but **none of the changes are saved**.

Continue to 3.2.2.2 Extra Options for the Project or return to 3.2 Project Launcher.

3.2.2.2 Extra Options for the Project



Preview - display the preview of the project. See 3.2.2.2.1 Preview icon

Info - display the project description. See 3.2.2.2.2 Info icon

Remove the project from the **Recent Projects** list

Copy the project and optionally copy the working folder with the project in it. See 3.2.2.2.3 Copy Project icon.

Move the project and optionally the working folder to a new folder. See 3.2.2.2.4 Move Project icon.

Rename the project and optionally rename the working folder. See 3.2.2.2.5 Rename Project icon.

Delete the project and optionally delete the working folder. See 3.2.2.2.6 Delete Project icon.

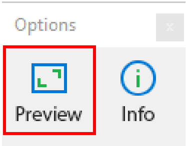
Zip the project and optionally zip the working folder with the project in it. See 3.2.2.2.7 Zip Project icon.

Shortcut - create a desktop shortcut that starts ***12d Model*** and opens the project. See 3.4 Project Shortcuts

Explore - open Windows explorer at the working folder

Click the left arrow icon  to return to the **Project Launcher** panel.

3.2.2.2.1 Preview icon

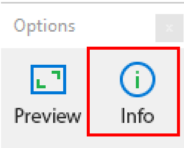


Clicking on the **Preview** icon displays the **preview** of the **project**

Click the left arrow icon  to return to the **Project Launcher** panel.

Continue to 3.2.2.2.2 Info icon or return to 3.2.2.2 Extra Options for the Project.

3.2.2.2.2 Info icon



Clicking on the **Info** icon displays the **description** for the **project**

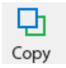
Click the left arrow icon  to return to the **Project Launcher** panel.

Continue to 3.2.2.2.3 Copy Project icon or return to 3.2.2.2 Extra Options for the Project.

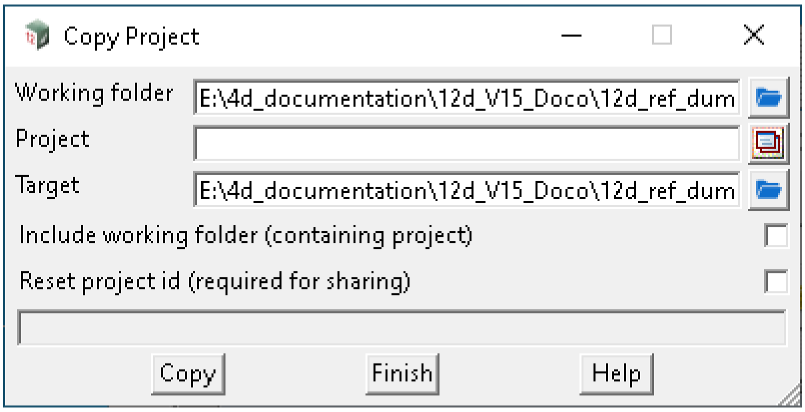
3.2.2.2.3 Copy Project icon

Position of option on menu: **Project Launcher =>Recent =>Copy Project icon**

This option copies a project to a new location. If you are attempting to copy the project you are currently in, ***12d Model*** will prompt you to save and restart.

Selecting 

brings up the **Copy Project** panel:



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

Field Description	Type	Defaults	Pop-Up

Working folder file

The folder containing the project.

Project

The name of the project to copy.

Target file

Where the project should copied to.

Include working folder (containing project) tick box

*If **ticked**, the folder containing the project (and all sub folders) will also be copied.*

Reset project id (required for sharing) tick box

If you are intending to share the copied project, you must reset the ID - otherwise sharing will not be allowed from the copied project.

Copy button

Copies the project.

Additional Information

Example:

If

Working folder is: "d:\4d_test\one\job1234"

project is: "detailed survey"

target is: "e:\4d_test\two\three"

When ***Include working folder (containing project)*** *is* ***ticked****, the resulting folder will be copied from*

d:\4d_test\one\job1234

to

e:\4d_test\two\three\job1234

This includes all files and folders recursively, including the nominated project.

When ***Include working folder (containing project)*** *is* ***not ticked,*** *the resulting folder will be copied from*

d:\4d_test\one\job1234\detailed_survey.project

to

e:\4d_test\two\three\detailed_survey.project

Additional checks made.

That there is sufficient disk space on the target volume.

Continue to 3.2.2.2.4 Move Project icon or return to 3.2.2.2 Extra Options for the Project.

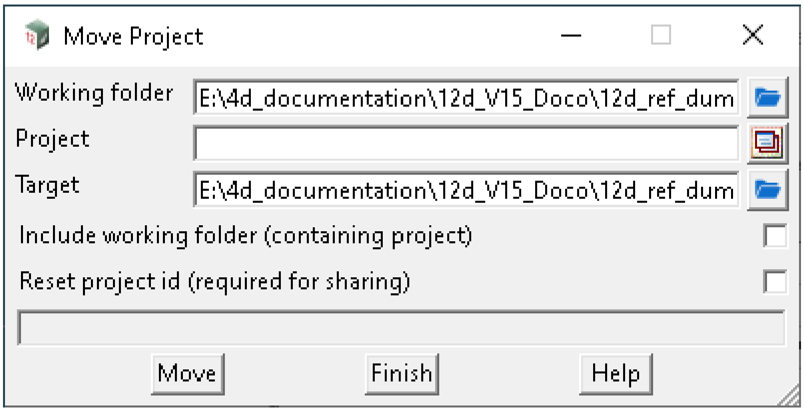
3.2.2.2.4 Move Project icon

Position of option on menu: **Project Launcher =>Recent =>Move Project icon**

This option moves a project to a new location. If you are attempting to move the project you are currently in, ***12d Model*** will prompt you to save and restart.

Selecting 

brings up the **Move Project** panel:



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

Field Description	Type	Defaults	Pop-Up
Working folder	file		

the folder containing the project

Project

the name of the project to move

Target file

where the project should moved to

Include working folder (containing project) tick box

if ticked, the folder containing the project (and all sub folders) will also be moved

Reset project id (required for sharing) tick box

if you are intending to share the moved project, you must reset the id - otherwise sharing will not be allowed from the moved project.

Move button

moves the project

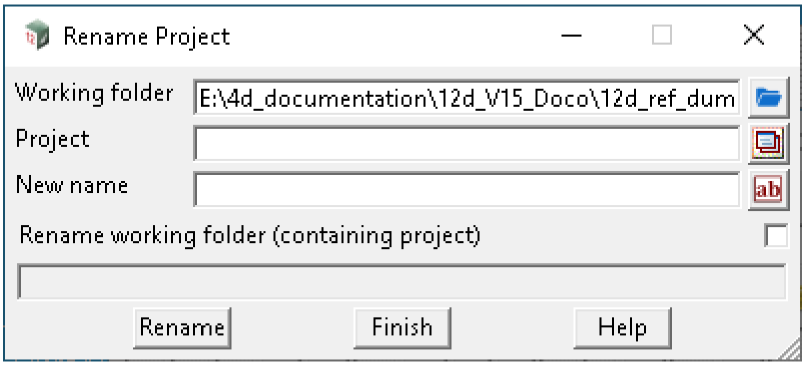
Continue to 3.2.2.2.5 Rename Project icon or return to 3.2.2.2 Extra Options for the Project.

3.2.2.2.5 Rename Project icon

Position of option on menu: **Project Launcher =>Recent =>Rename**

The **Rename** option is used to rename any project (other than the current project) in a given folder (a working folder), and if required, the contents of the working folder as well.

Selecting  brings up the **Rename Project** panel:



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

Field Description	Type	Defaults	Pop-Up
Working folder	folder box		folder browse

name of the folder that contains the project to be renamed (the working folder for the project).

Project	project box		projects in working folder

name of the project to rename - this can't be the project currently opened.

New name input

name of the new name for the project. The new project name cannot be the same as an existing project in the working folder.

Rename working folder (containing the project) tick box

*if **tick**, if the working folder containing the project to be renamed is the same as the project name, then the working folder will also be renamed. This is to maintain the convention of there being only one project in a working folder and the working folder has the same name as the project.*

Rename button

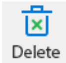
after selecting this button, the selected project will be given the new name. If **Rename working folder (containing project)** *is ticked and the name working folder is the same as the project, then the working folder will also be renamed.*

Continue to 3.2.2.2.6 Delete Project icon or return to 3.2.2.2 Extra Options for the Project.

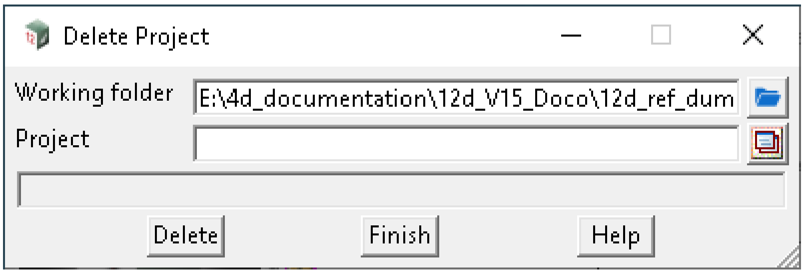
3.2.2.2.6 Delete Project icon

Position of option on menu: **Project Launcher =>Recent =>Delete Project icon**

This will delete a project. This cannot be the current open project.

Selecting 

brings up the **Delete Project** panel:



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

Field Description Type Defaults Pop-Up

Working folder file

the folder containing the project to be deleted

Project

the name of the project to delete

Delete button

delete the project

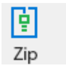
Continue to 3.2.2.2.7 Zip Project icon or return to 3.2.2.2 Extra Options for the Project.

3.2.2.2.7 Zip Project icon

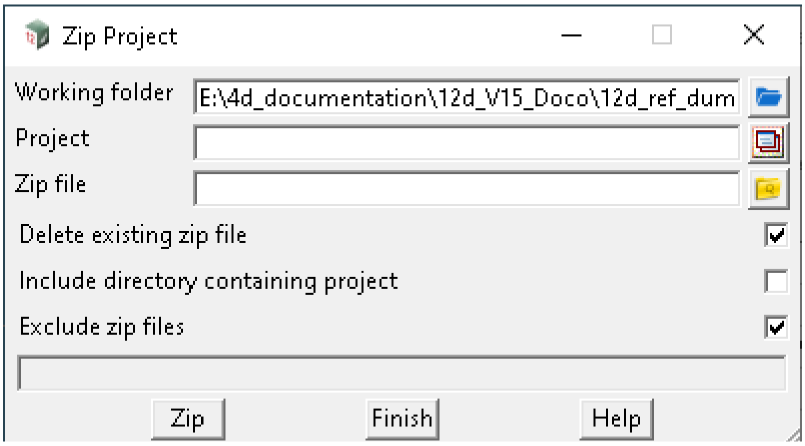
Position of option on menu: **Project Launcher=> Recent =>Zip Project icon**

Position of option on menu: **Project =>Open=> Zip Project icon**

This option zips a project. If you attempt to zip the current project, ***12d Model*** will prompt you to save and restart.

Selecting 

brings up the **Zip Project** panel:



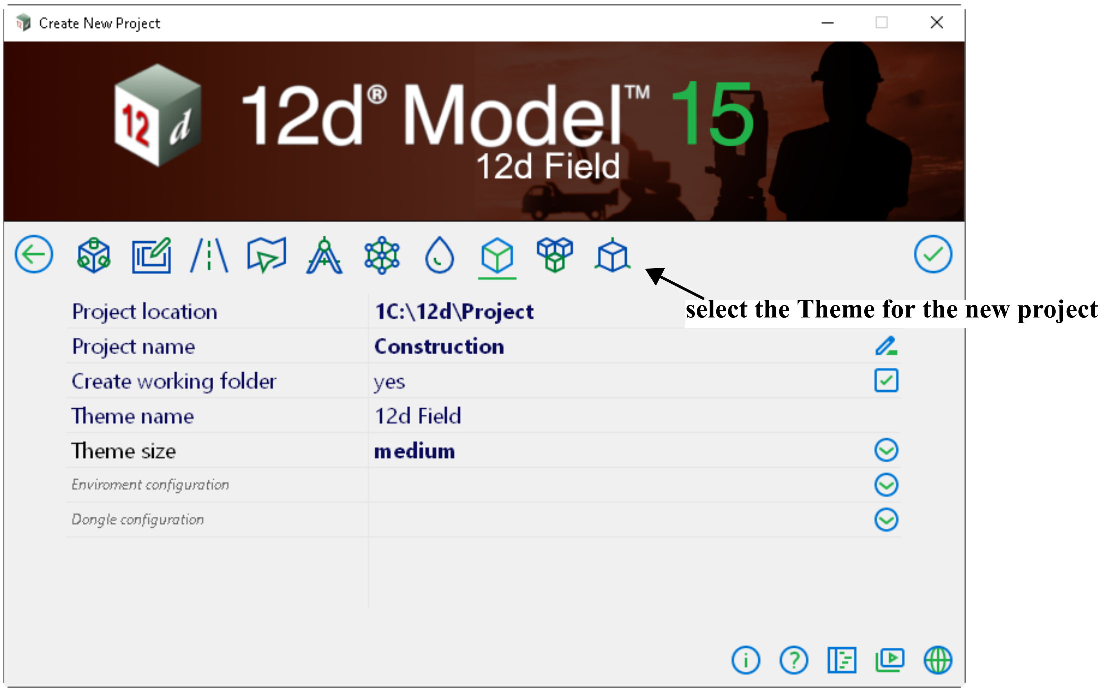
The fields and buttons used in this panels have the following functions.

Field Description	Type	Defaults	Pop-Up
Working folder	file box		
the folder where the project resides			
Project	project box		
the name of the project you wish to zip			
Zip file	file box		
the file to zip into			
Delete existing zip file	tick box		
*if **ticked**, any existing zip file will be deleted*			
Include directory containing project	tick box		
if ticked on, the directory containing the project (the working directory) will also be zipped, along with all sub folders			
Zip	button		
zips the project			

Continue to 3.2.3 New or return to 3.2.2.2 Extra Options for the Project.

3.2.3 New

Clicking on **New** displays the **Create New Project** panel which is used to create a new ***12d Model 15*** project.



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

Field Description | Type | Defaults | Pop-Up

Project location folder box

location for the new project.

Project name text box

name of the new project.

Create working folder tick box

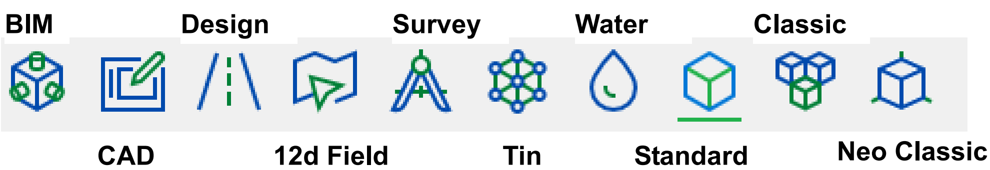
*if **ticked** then a folder of the same name as the **Project name** is created in the **Project location** and the project is created inside that folder. In that case the working folder and the project will have the same name.*

*if **not ticked** then the project is created in the **Project location.** In that case, the working folder is the Project location.*

Theme name Theme select

name of the theme for the project.

*The theme can be selected by clicking on the required Theme icon just above **Project location** field.*



For more information on Themes, see 3.2.6 Selecting a Theme Using the Theme Icons.

Environment configuration and **Dongle Configuration fields**

*The **Registry file** given in the* **Registry file** *field in the* **Start-up Settings** *panel is used for the pop-ups for* *the* **Environment configuration** *and* **Dongle configuration** *fields in this panel.*

Environment configuration

if there is a value in the ***Default environment configuration*** *filed in the Start-up Settings panel then it will be displayed in this field.*

A new value can be selected from the pop-up for this field.

Dongle configuration

if there is a value in the ***Default dongle configuration*** *filed in the Start-up Settings panel then it will be displayed in this field.*

A new value can be selected from the pop-up for this field.

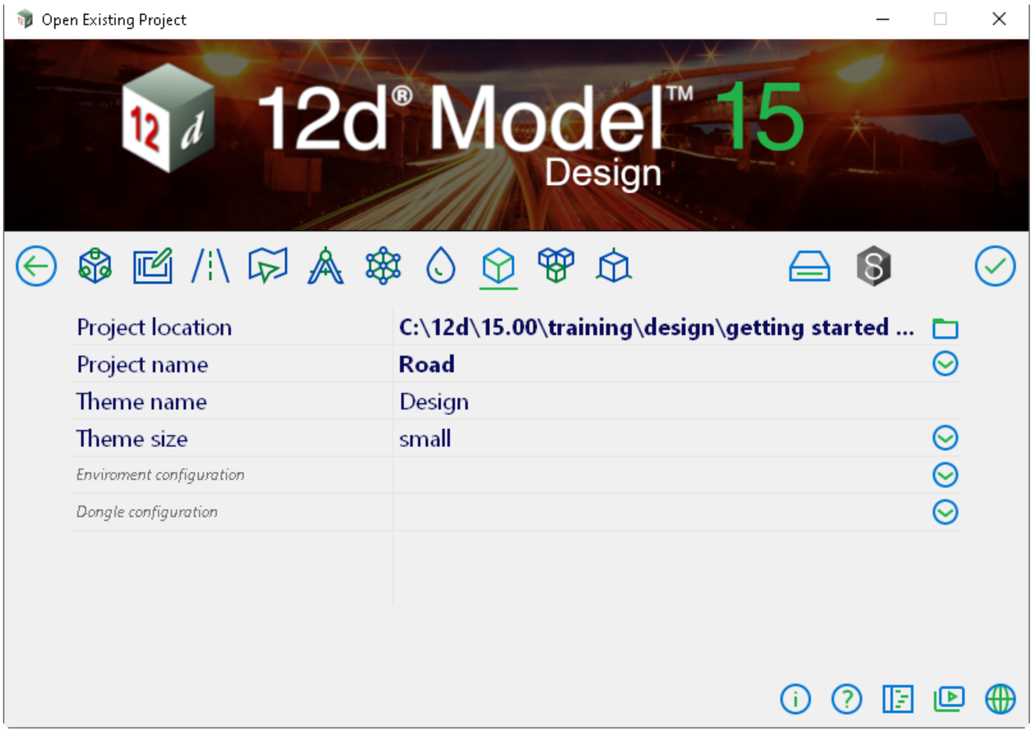
After filling in the information for the new project, click the tick icon to create and open the new project.

Click the left arrow icon will return to the **Project Launcher** panel **without** creating a new project.

Continue to 3.2.4 Open or return to 3.2 Project Launcher.

3.2.4 Open

Clicking on **Open** allows brings up the **Open Existing Project** panel that allows you to open an existing ***12d Model 15*** project.



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

Field Description	Type	Defaults	Pop-Up
Project location	folder box		

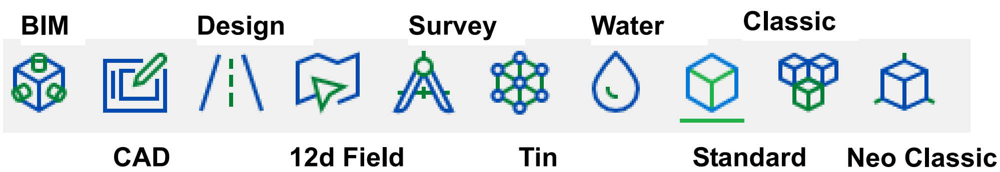
location for the project to be opened.

Project name	project box		projects in Project location

name of the project to be opened.

Theme name	Theme select		

after a project is selected, the name of the Theme for the project is displayed in this field.
*A new theme can be selected by clicking on the required Theme icon just above **Project location** field.*



For more information on Themes, see 3.2.6 Selecting a Theme Using the Theme Icons.

Environment configuration and **Dongle Configuration fields**

*The **Registry file** given in the* **Registry file** *field in the* **Start-up Settings** *panel is used for the pop-ups for the* **Environment configuration** *and* **Dongle configuration** *fields in this panel.*

Environment configuration

*if the project has an **environment configuration** then it is displayed in this field.*

A new environment configuration can be selected from the pop-up for this field.

Dongle configuration

*if the project has an **dongle configuration** then it is displayed in this field.*

A new dongle configuration can be selected from the pop-up for this field.

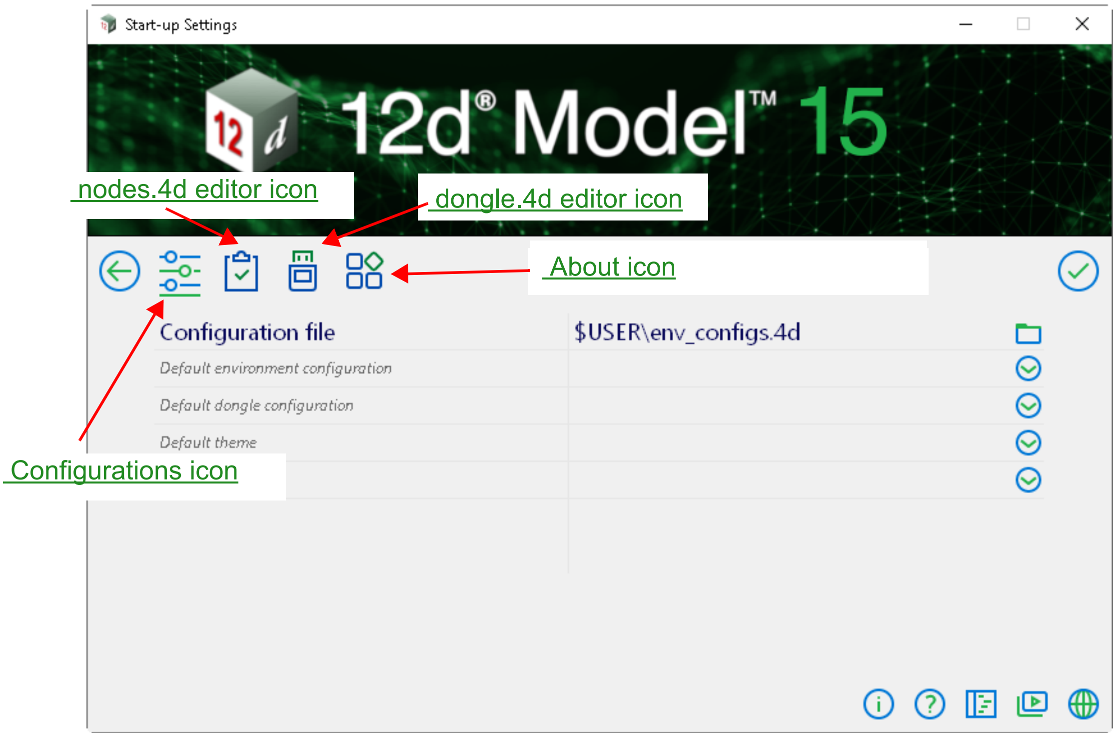
After filling in the details for the project to be opened, click the tick icon to open the existing project.

Clicking the left arrow icon will return to the **Project Launcher** panel **without** opening a project.

Continue to 3.2.5 Settings or return to 3.2 Project Launcher.

3.2.5 Settings

Clicking on **Settings** displays the **Start-up Settings** panel.



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

Configurations icon

Field Description	Type	Default
Configuration file	folder box	$USER\env_configs.4d

*if a **Configuration file** is selected then it is used for the pop-ups for the* **Default environment configuration** *and* **Default dongle configuration** *fields in this panel and for the pop-ups for the* **Environment configuration** *and* **Dongle configuration** *fields in other panels in the **Project Launcher**.*

Default environment configuration

*A value can be selected from the pop-up for this field (the pop-up is taken from the **Configuration file**).*

*This value will be used as the default value in the **Environment configuration** fields in the **Project Launcher**.*

Default dongle configuration

*A value can be selected from the pop-up for this field (the pop-up is taken from the **Configuration file**).*

*This value will be used as the default value in the **Dongle configuration** fields in the **Project Launcher**.*

Default theme

The Theme to use for a new project.

Default theme size

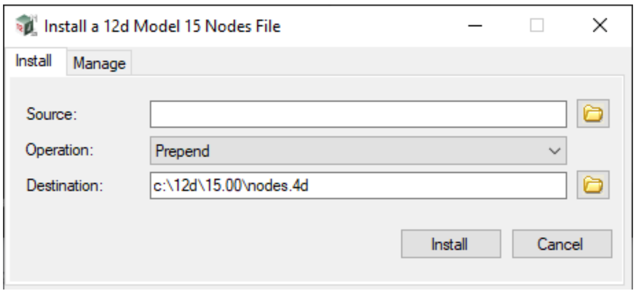
The size of the Theme to use for a new project.

After filling in the any of optional setting for the **Configuration file**, **Default environment configuration** and **Default dongle configuration** fields, click the tick icon to **save** the settings.

Click the left arrow icon to return to the **Project Launcher** panel.

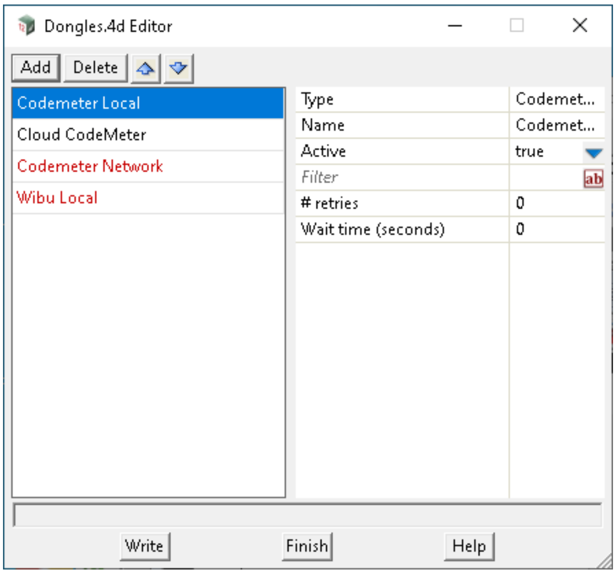
nodes.4d editor icon

Clicking on the **nodes.4d editor** icon brings up the **Installing a 12d Model 15 Nodes File** panel



dongle.4d editor icon

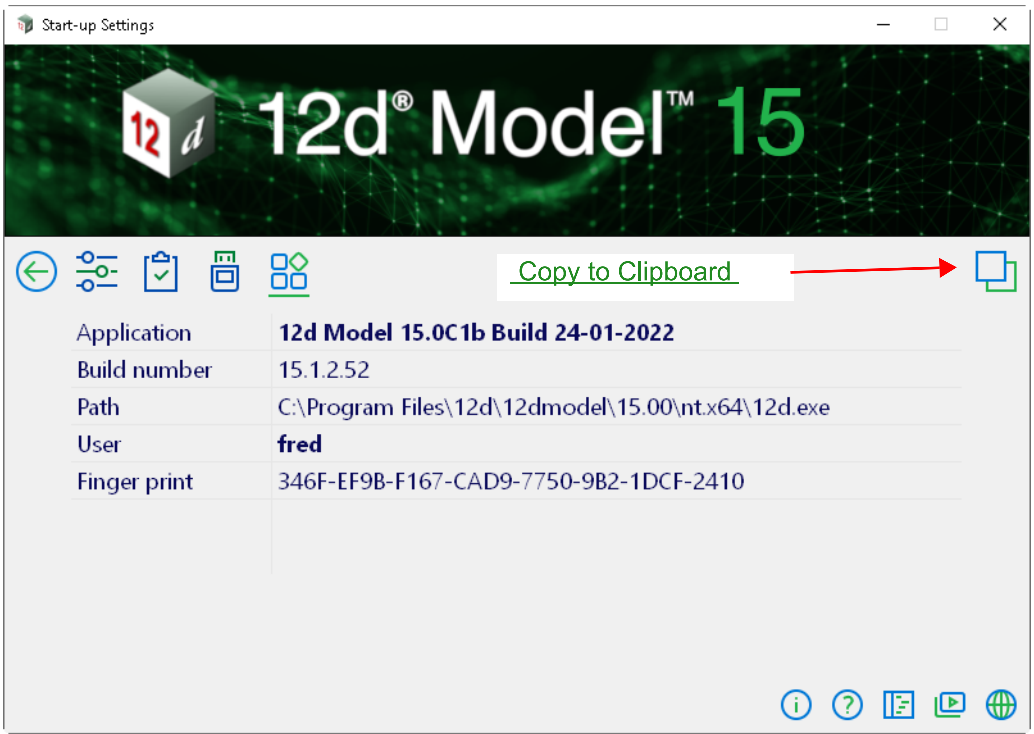
Clicking on the **dongles.4d editor** icon brings up the **Installing a 12d Model Nodes File** panel



Click the left arrow icon  to return to the **Project Launcher** panel.

About icon

Clicking on the **About** icon changes to the **About** information



Copy to Clipboard icon

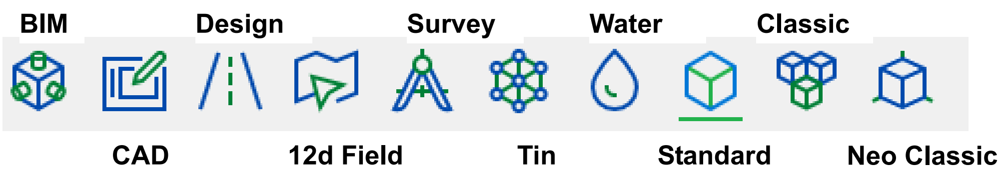
Clicking on the **Copy to clipboard** copies the information on the panel to the clipboard.

Click the left arrow icon  to return to the **Project Launcher** panel.

Continue to 3.2.6 Selecting a Theme Using the Theme Icons or return to 3.2 Project Launcher.

3.2.6 Selecting a Theme Using the Theme Icons

For some options, the available themes are displayed as a toolbar of icons.



To select a **Theme** from the toolbar of icons, simply click on the icon for the required theme. The selected theme will then be displayed with a bar below the theme icon.

For example, in the above image, **Design** has been selected.

The **Classic** theme uses the same top menu arrangements, icons and size of icons (16x16 pixels), that is used in ***12d Model 14.*** All options appear in the **Classic** theme.

The **Neo Classic** theme uses the same top menu arrangements as in **Classic** except the icons are the new icon in 16x16 pixels.

The **Standard** theme uses the same top menu arrangements as **Neo Classic** but the size of the icons can be selected as **small**, **medium**, **large** and **extra large**. The small size is slightly larger than for ***12d Model 14*** and **Neo Classic** so that they can have more detail in the icons.

The **BIM**, **CAD**, **Design**, **12d Field**, **Survey**, **Tin** and **Water** themes each have a different top menu structure and tool bars that are more tailored to the type of work being undertaken. This means that many options will not appear in some Theme menus but all the available options can still be found using the **Search Bar,** or by changing back to the **Neo Classic**, **Classic** or **Standard** themes.

Continue to 3.3 Organizing Working Areas.

Continue to 3.2.7 Recent Projects List or return to 3.2 Project Launcher.

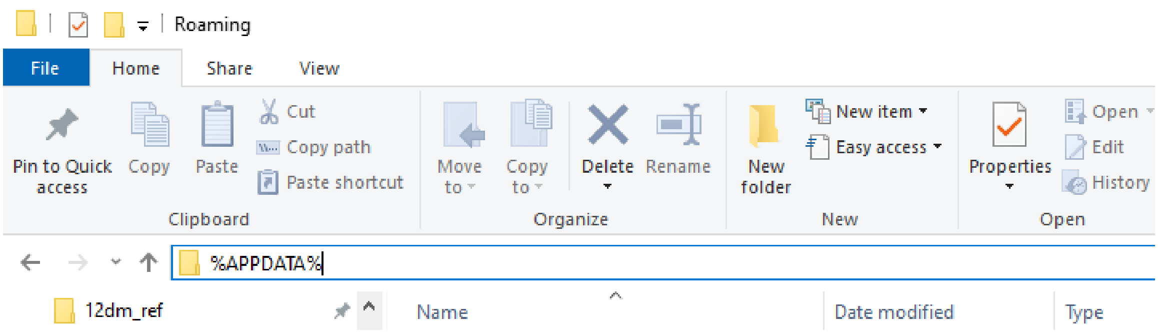
3.2.7 Recent Projects List

The list of recent projects is shared between all versions of ***12d Model***.and is recorded in the file "**Recent Projects.4d**" stored in the folder %APPDATA%.

The maximum number of entries stored in "**Recent Projects.4d**" is controlled by the environment variable RECENT_PROJECTS_4D,

Note:

To access %APPDATA%., type **%APPDATA%** into Microsoft's File Explorer and press <Enter>.



Continue to 3.3 Organizing Working Areas or return to 3.2 Project Launcher.

3.3 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, for the project ***Olympic***, and folder called ***Olympic.project*** is created.

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

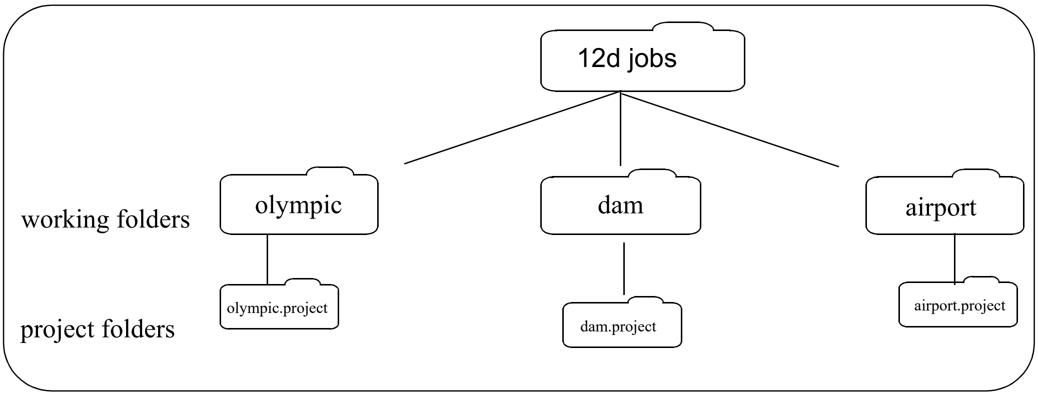
All outputs, reports and plots are written to the working folder (the folder containing the project) and are **not** held inside the project area.

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 project in its 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 then be easily backed up.

As an example, if three unrelated projects - olympics, airport, and dam - are to be created in a folder called **12d jobs**, it is suggested that the project ***olympic*** is created in a **sub folders** of **12d jobs** called ***olympic***, ***dam*** is created in a **sub folders** of **12d jobs** called ***dam*** and ***airport*** is created in a **sub folders** of **12d jobs** called ***airport***.

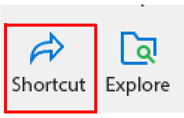


To help users adhere to this convention, when creating new projects, there is a Create working folder tick box which if ticked, will first create a folder of the same name as the project being created and then create the project in that folder.

Continue to 3.4 Project Shortcuts.

Continue to 3.4 Project Shortcuts or return to 3 Starting Up.

3.4 Project Shortcuts



The list of most recent projects makes it very easy for ***12d Model*** 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.

The easiest way to create the Windows shortcut is to

(a) first make sure that the project is in the recent projects list. To do this, just open up the project and then exit ***12d Model***.

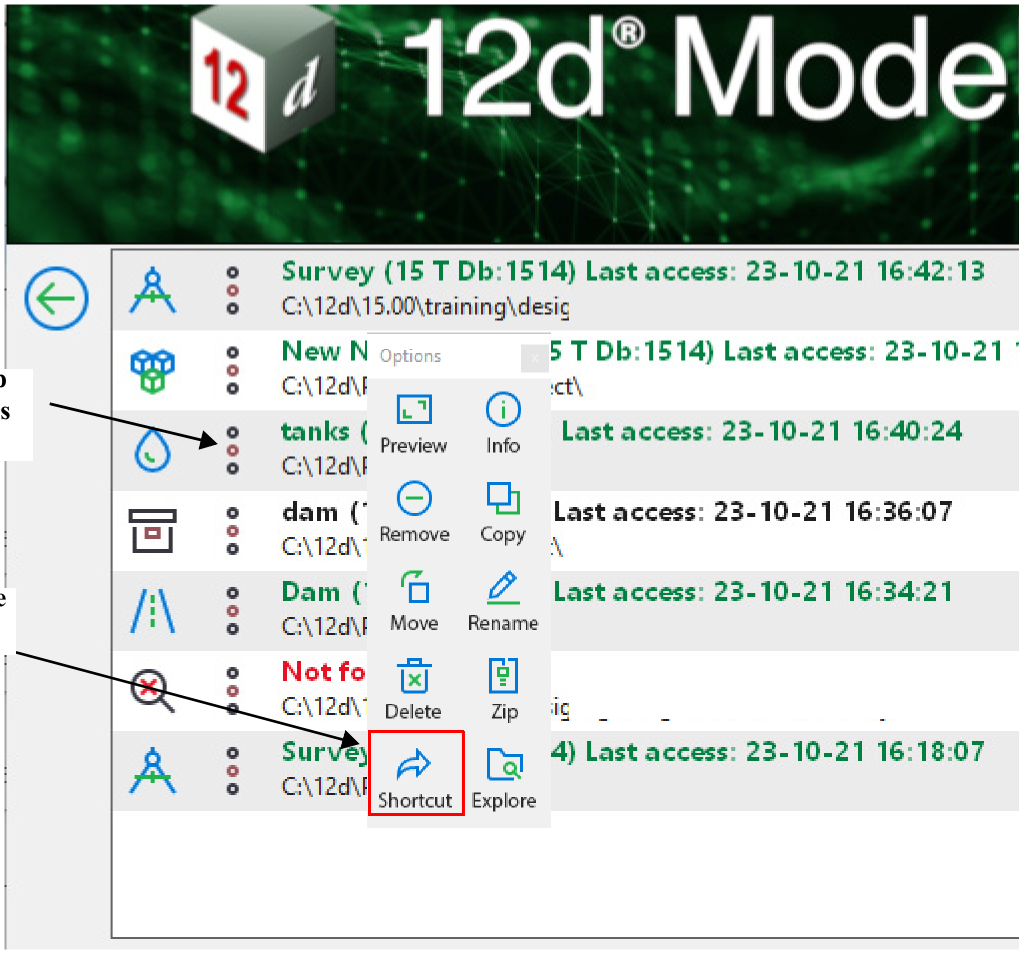
(b) start up ***12d Model*** again by clicking on the ***12d*** icon on the desktop,

(c) highlight the project in the ***recent projects list*** and select the icon for Shortcut on the right hand side of the project list.

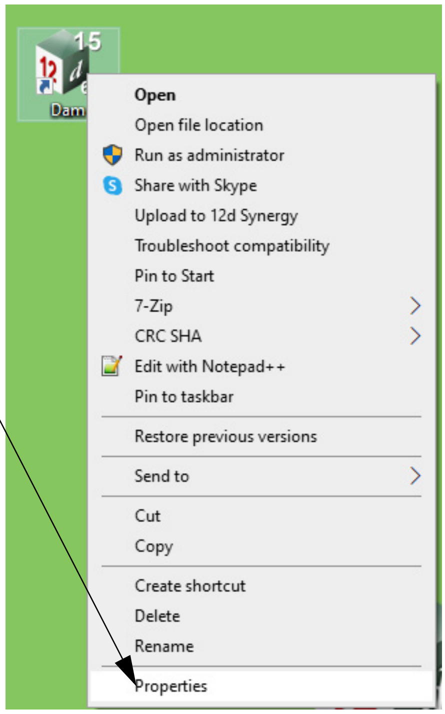
This will create a **shortcut** on the desktop with the **name of the project,** and the shortcut is set to open up the project when the icon is double clicked.

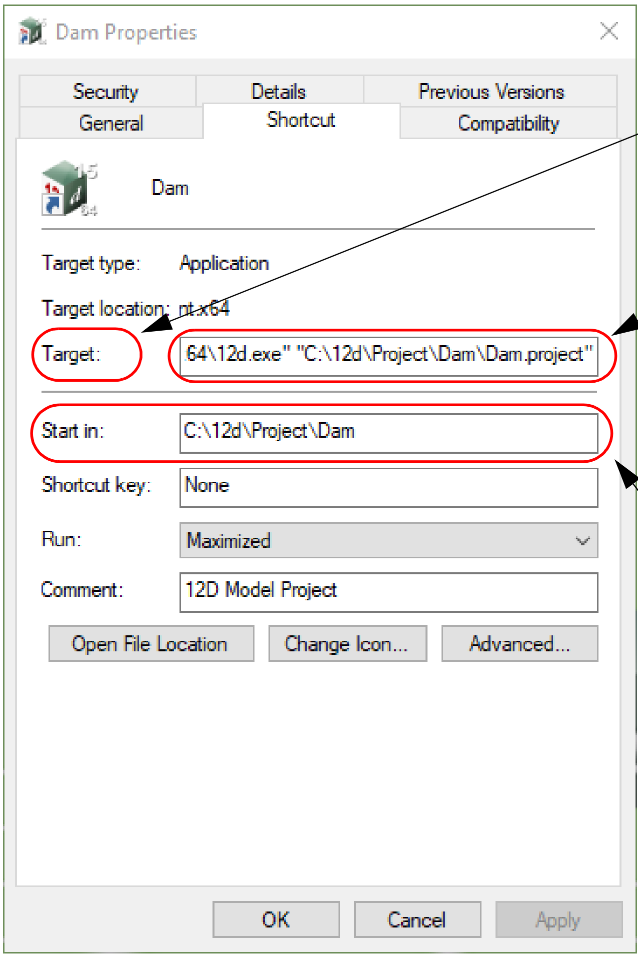
click to bring up the extra options for the project

then click on the Shortcut icon



To see what has been created with the new ***12d Model*** icon, highlight the icon and click RB to bring up the icon menu and then select **Properties** and click on the **Shortcut** tab





Target: has the path to **12d.exe**

And as well as the path to 12d.exe, **Target:** has optionally

(a) a full path name to an existing project (including the project name) and this is opened when the icon is clicked

OR

(b) just the name of an existing project and this must be in the folder given in **Start in:** and it is opened when the icon is clicked

Start in: is used as the working folder when no full project path is given in **Target:**

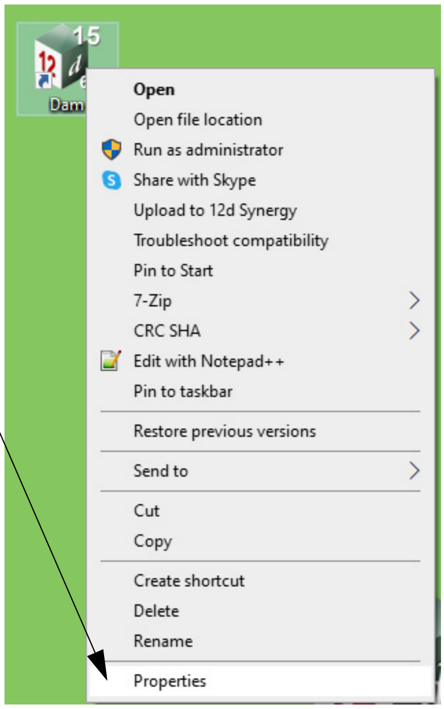
Continue to 3.5 Creating Project Shortcuts by Hand or return to 3 Starting Up.

3.5 Creating Project Shortcuts by Hand

Creating an icon to open up in an existing ***12d Model*** project can also be done by hand by copying a ***12d*** icon that is already on the screen, and then renaming the copied icon to the name of the project (say *survey).*

To display and modify the properties of a **12d** desktop icon, click RB over the ***12d*** icon and select **Properties** from the menu.

Then click on the ***Shortcut*** tab



The Properties for the icon *survey* is then modified by changing what is in the **Target:** box and maybe the **Start in:** box.

To display and modify the properties of a desktop icon, click RB over the ***12d*** icon and select *Properties* from the menu. Then click on the *Shortcut* tab

The Properties for the icon *survey* can now be modified to:

(a) open an existing project by giving the full path name

If an icon is to open a given project, then the full path to the projects (including the project folder name) in given in the **Target:** field after the path to the 12d exe.

For example, if the ***12d Model*** project *survey* was in the folder "12d jobs\survey ", set the **Target:** for the icon ***survey*** to:

"C:\Program Files\12d\12dmodel\15.00\nt.x86\12d.exe" "C:\12d jobs\survey\wurvey.project"

The icon *survey* would then automatically open up the project

C:\12d jobs\survey\survey.project

Note that if the path name for the project in **Target:** contain spaces, then it must be enclosed in double quotes (**"**).

If the *survey* icon was double clicked on, it would now open the project *survey.*

The **Start in:** is ignored.

(b) open an existing project given in the **Start in:** field

Another way that an existing project can be opened is that if a project such as *survey* already exists in the folder given by the **Start in:** field, then in the **Target:** field, the project name is added after the path to 12d. exe.

For example, the **Target**:

"C:\Program Files\12d\12dmodel\15.00\nt.x86\12d.exe"   survey

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

So **Target:** and **Start in:** are used to obtain the existing project to open whereas in (a), only Target: is used.

Note that if either the path names for the **Target:** or **Start in:**, or the project name contain spaces, then they must be enclosed in double quotes (**"**).

A Note on Target: Field

The **Target:** field is actually a command line to use when starting up ***12d Model***. For more information on what can be done in such a command line, see 43.8 Arguments When Starting 12d Model in Appendix 43 Setting Up and Configuring 12d.

Continue to 3.6 Environment Variables Shortcut or return to 3 Starting Up.

3.6 Environment Variables Shortcut

If a file of ***12d Model*** environment variables has been set up by the user (see section 43.4 Environment Variables in Appendix 43 Setting Up and Configuring 12d), 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:\Program Files\12d\12dmodel\15.00\nt.x64\12d.exe"   -env F:\12d\env.4d

would fire up the 64-bit ***12d.exe*** using the file of environment variables called F:\12d\env.4d

The **Target**:

"C:\Program Files\12d\12dmodel\15.00\nt.x64\12d.exe"   -env F:\12d\env.4d   airport

would fire up the 64-bit ***12d.exe*** using the file of environment variables called F:\12d\env.4d **and** also automatically open the project **airport** in the **Start in:** folder of the shortcut.

Again if any of the path names contain spaces, then they must be enclosed in double quotes (**"**).

The **Target:** field is actually a command line to start up ***12d Model***. For more information see 43.8 Arguments When Starting 12d Model in Appendix 43 Setting Up and Configuring 12d.

Continue to 3.7 Error Logging File or return to 3 Starting Up.

3.7 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.

Continue to 3.8 Running Macros and Chains on Start Up or return to 3 Starting Up.

3.8 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*** can be set up to run user supplied files of macros and/or chains both for new projects or when an existing project starts up.

For more information see 43.7 Running Macros and Chains on Start Up.

Continue to 4 Tools and Concepts or return to 3 Starting Up.

4 Options To Move to Menus

Some options are still be added to the menus.

4.1 Simplify Extrudes

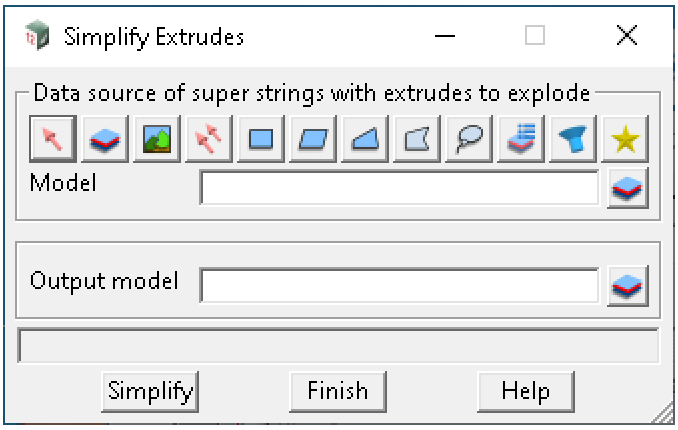
Position of option on menu:

A ***simple extrusion*** is an extrusion of a 2D shape down a super string.

This option attempts to convert complex extrusions to a series of simple extrusions and if a part of an extrusion cannot be created as a simple extrusion then a trimesh will be created for that part of the extrusion.

The potential for this test option is for IFC work where a simple extrude can be written out to an IFC file as a sweep down a string rather than as a trimesh.

Selecting **Simplify Extrudes** brings up the **Simplify Extrudes** panel.



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

Field Description	Type	Defaults	Pop-Up

Data source of super strings with extrudes to explode

data selection of super strings - for a full description go to 4.24.3 Data Source.

Selected data source	input	Model	

source of data to process.

Output model	model box		available models

model for the simple extrusions to be added to.

Buttons at Bottom

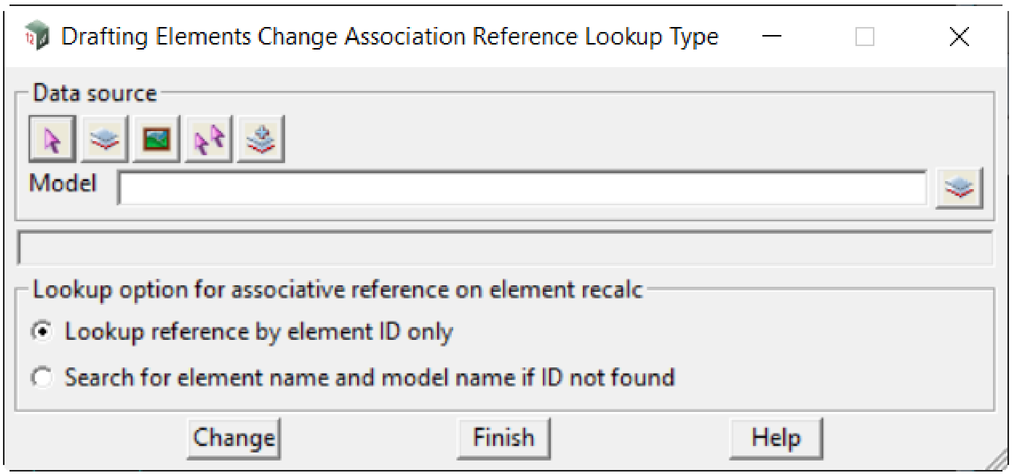
Simply	button		

run the option.

4.2 Change Drafting Element Association Ref

Position of option on menu:

Selecting **Change Drafting Element Association Reference Recalc Type** displays the **Drafting Elements Change Association Reference Lookup Type** panel



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

Field Description	Type	Defaults	Pop-Up
Data source	model box		

....

Lookup option for associative reference on element recalc

Lookup reference by element ID only

...

Search for element name and model name if ID not found

...

Buttons at bottom

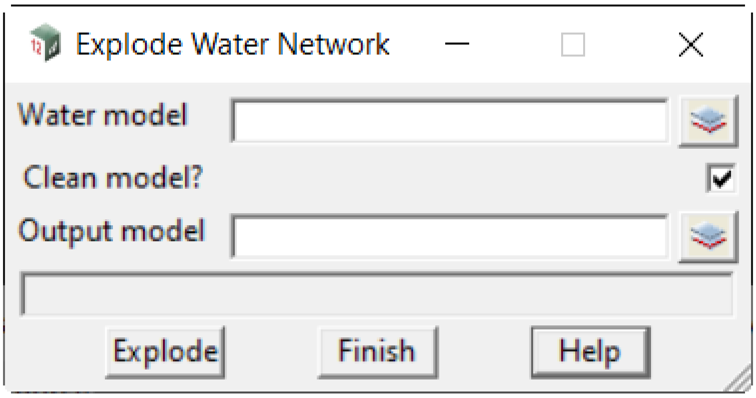
Change	button		

....

4.3 Explode Water Network

Position of option on menu:

Selecting **Explode Water Network** displays the **Explode Water Network** panel

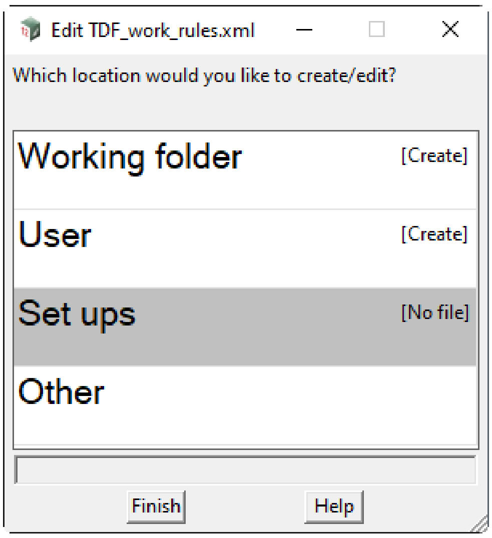


The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Water model	model box		available models
....			
Clean Model?	tick box	ticked	
....			
Output model	model box		available models
....			

Button at bottom

Explode	button
....	



5 Tools and Concepts

There has been changes to the **Tools and Concepts** chapter in the ***12d Model Reference manual***.

See

5.1 Polymesh
5.2 Border and Border Style
5.3 Options Search Bar
5.4 Panel Fields
5.5 Search Field for Model, Tin, Template and Functions, and + and - View Buttons
5.6 Chainage Equalities
5.7 Sharing of Models and Tins
5.8 Enabling Long Paths in Windows
5.9 Migration of Projects From Command Line
5.10 Startup Information in Output Window

5.1 Polymesh

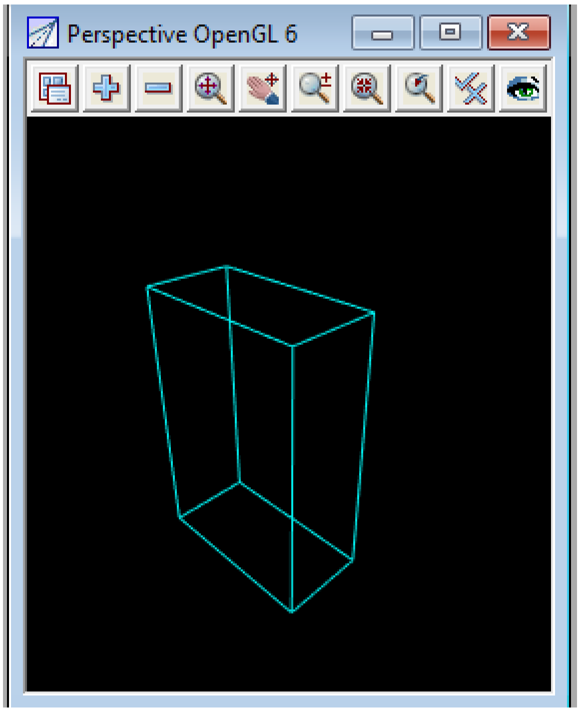
Now documented In the v15 reference manual

The Trimesh was introduced in V11 and for V15, it has been generalised to a ***polymesh***.

A ***polymesh*** is a 3D object that is composed of Jordan (simple) polygons (**polyfaces**) and **triangles**. The polygons and triangles are connected to each other to form a mesh that defines the shape. The whole shape can be open, where some edges belong to only one polygon or triangle, or closed, where all edges belong to two polygons or triangles so that the mesh is watertight.

So a ***trimesh*** is a ***polymesh*** where all the polygons are ***triangles***.

An example of a polymesh that is not a trimesh is a box.



The polygons that make up the polymesh are the ***polymesh faces*** and a face can be:

(a) a **planar face of more than three vertices**.

That is, the face is bounded by a simple polygon of more than three vertices that is in the **one** plane.

Because it is in the one plane, a planar face uniquely defines the z-values of all the points inside the bounding polygon. In ***12d Model*** a planar face does have a triangle decomposition but how the triangles are defined does not affect the z-values - they are all in the one plane.

(b) a **non-planar face**.

That is, the face is bounded by a simple polygon that is not in the one plane.

Unlike a planar face, for a non-planar face there is no uniquely defined surface within the bounding polygon. So to ensure the 3D surface represented by a non-planar polygon is unique, in ***12d Model*** a non-planar face must also have a triangle decomposition to uniquely represent the 3D surface of the non-planar face.

So in ***12d Model***, a **polymesh** is made up of **triangles** and **polyfaces** but internally, each polyface is decomposed into triangles.

The polygon boundary of a polyface can have a name and a colour

To display a polymesh on an ***OpenGL Perspective view*** , the ***Toggles*** menu on an ***OpenGL Perspective view*** has an extra walk-right menu called ***Polymesh drawing*** that are used when ***Drawing wirefame*** is **[on]**.

The three toggles on the **Polymesh drawing** walk-right menu **Polymesh Drawing Toggle** are:

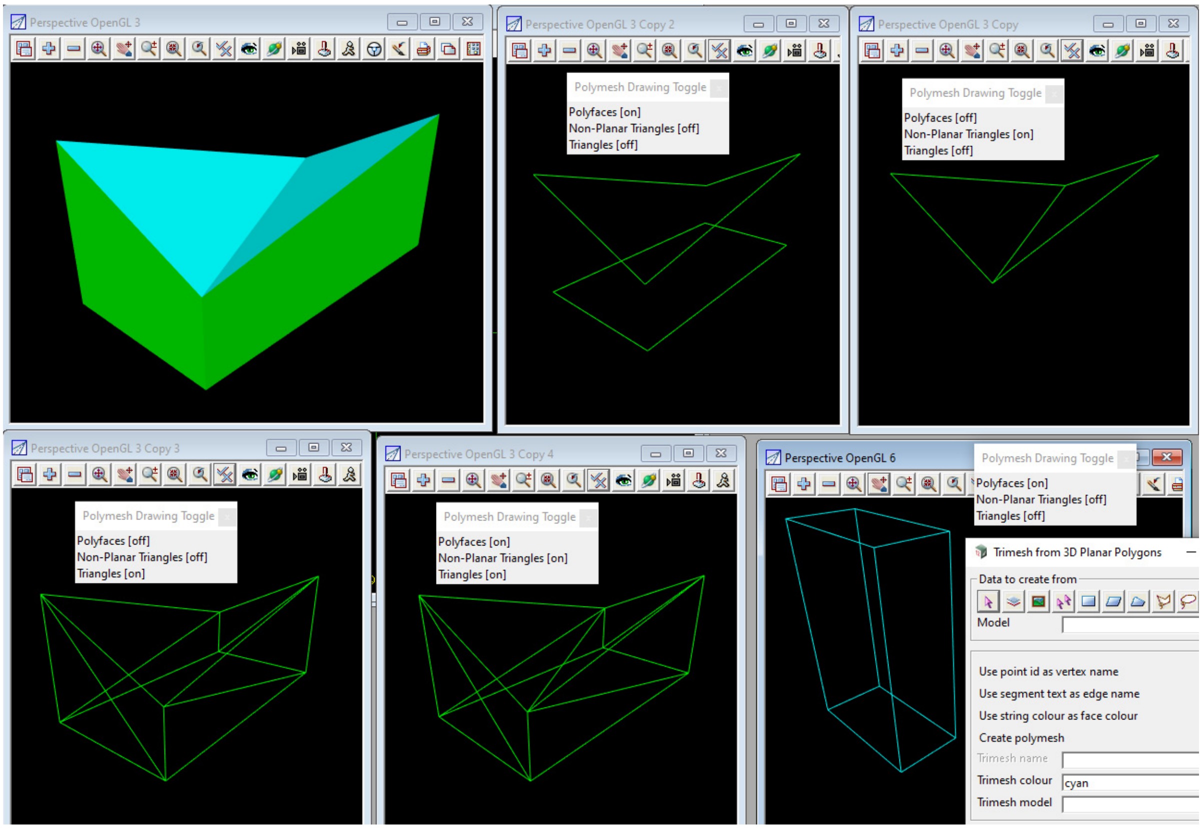
Polyfaces - when toggled on, the boundary polygon of any planar faces are drawn on the view. This probably should say Planar polyfaces.

Non-Planar Triangles - when toggled on, the boundary polygon of any non-planar face, plus the enclosed triangles of the non-planar faces, are drawn on the view. This probably should be Non-planar polyfaces and their internal triangles.

Triangles - when toggled on, the faces that are not polyfaces are drawn on the view.

So to see all the components that are contained in a polymesh, you need all three toggled on.

In the image below, the polymesh in view **3** consists of a non-planar face on the top (cyan) and a planar face on the bottom.



So in view ***3 Copy 2*** which has only ***Polyfaces turned on,*** you only see the bounding polygons of the top and the bottom of the object.

In view ***3 Copy*** which has only ***Non-Planar triangles turned on,*** you only see the bounding polygon of the top and its triangle decomposition.

In view ***3 Copy 3*** with only ***Triangles turned on,*** you only see the triangles that are not polyfaces which is how the sides of the object were constructed.

In view ***3 Copy 4, Polyfaces, Non-Planar triangles*** and ***Triangles*** are all ***turned on*** so you can see all the triangles that make up all the polyfaces of the polymesh.

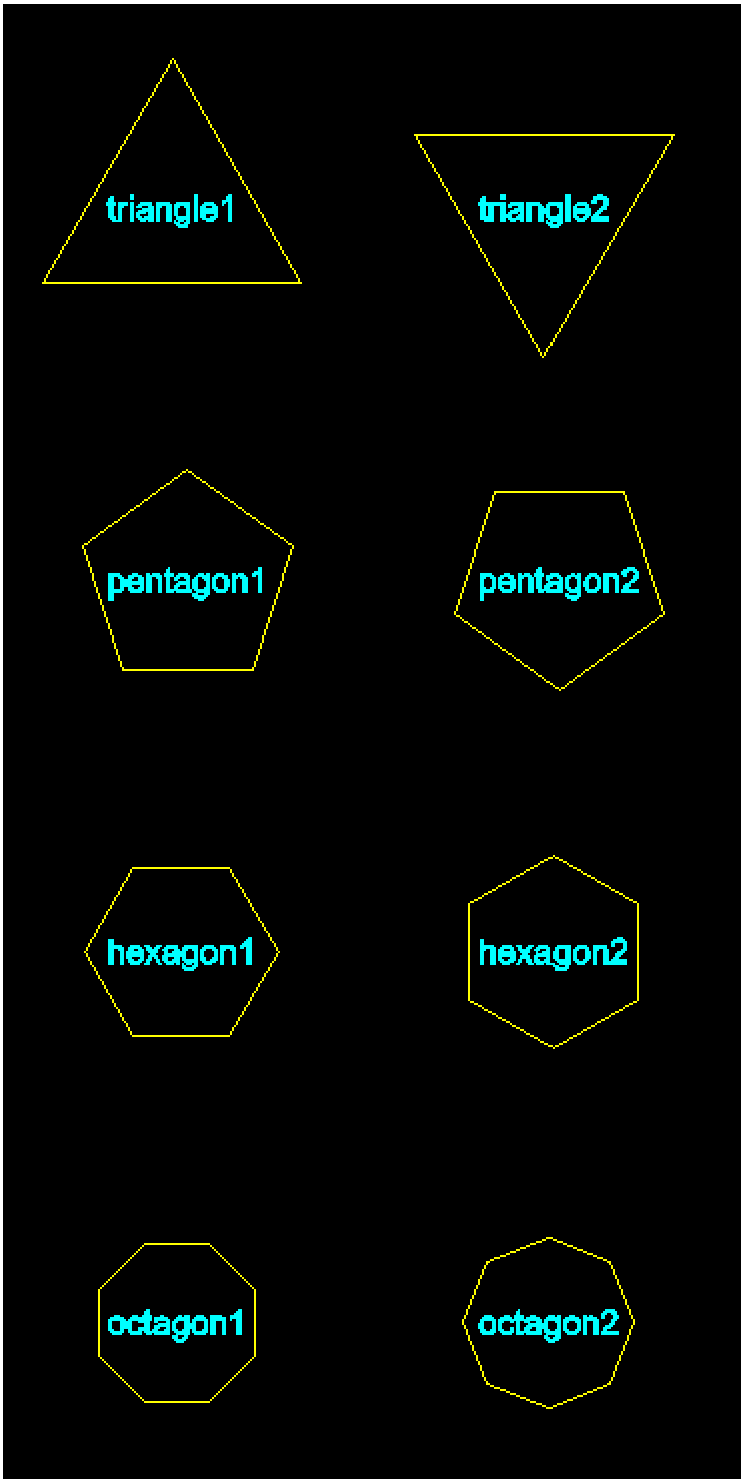
Note: a polymesh could be converted into a trimesh but then all the polygon boundaries of the polyfaces would be lost.

5.2 Border and Border Style

Now documented In the v15 reference manual

Additional styles include:

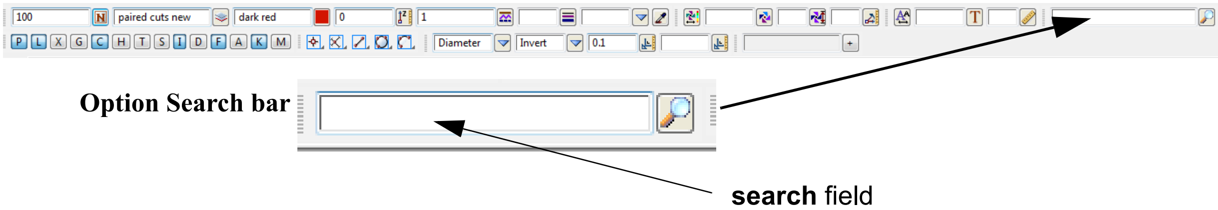
Triangle1, Triangle2, Pentagon1, Pentagon2, Hexagon1, Hexagon1, Octagon1, Octagon2



5.3 Options Search Bar

Now documented In the v15 reference manual

The **Option Search Bar** allows quick access to most options in ***12d Model***.



The **Options Search bar** uses **key words** separated by spaces and the logic operators ***comma*** ",", ***plus*** "+" or ***minus*** "-", to define the accepted matches in the text being searched for from:

(a) the **titles of the hard coded panels** (i.e. not macros) that satisfy the search criteria

The full title of the panel is shown

(b) the **full path names of menu items on the Main menus** in the current ***Theme*** that satisfy the search criteria

The final text on the menu is displayed followed by the full menu path name in square brackets.

(c) the **name of the options** in the ***Classic Theme*** that satisfy the search criteria

The final text on the menu is displayed.

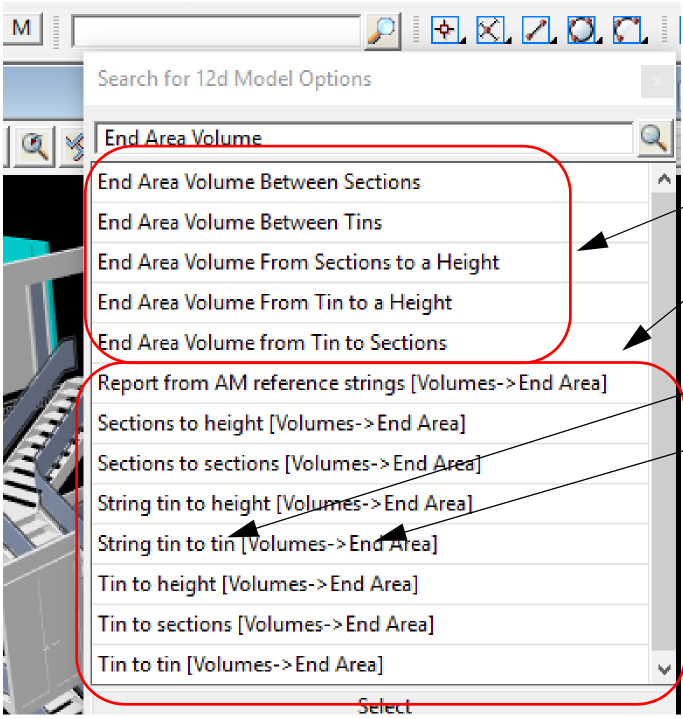
So even if an option is not on any menu for the current Theme, it can still be found in the Classic Theme.

The search only needs a partial match and is case insensitive. That is, the keyword only has to match part of the text and case is ignored. For example, "vol" will match "Volume".

For information on the logic operators used in the search, see 5.3.1 Options Search Bar Syntax.

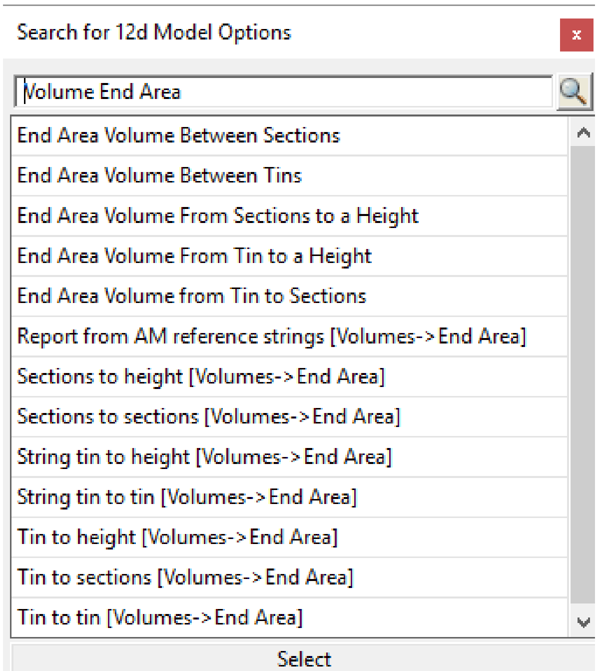
In the simplest case, the **key words** are separated by spaces and a space is an **AND** operator so the search finds the text with **case insensitive partial matches** to **all** the key words.

For example, typing in the key words **End Area Volume** into the **Search field** will bring up the list of found options as a **Search for 12d Model Options** panel which is **separate** to the **Options Search bar**:



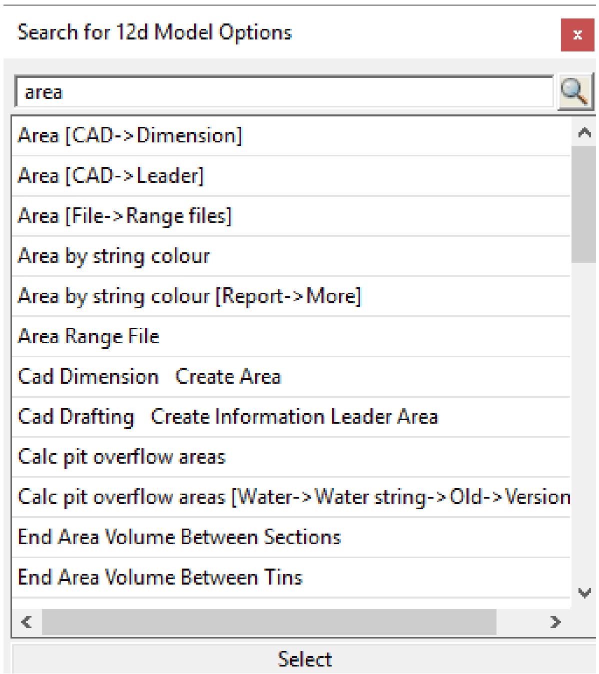
Double clicking on an item in the list brings up the panel for that option.

Important Note
the **order** of the key words is **not important**.Typing **Volume End Area** brings up exactly the same list.

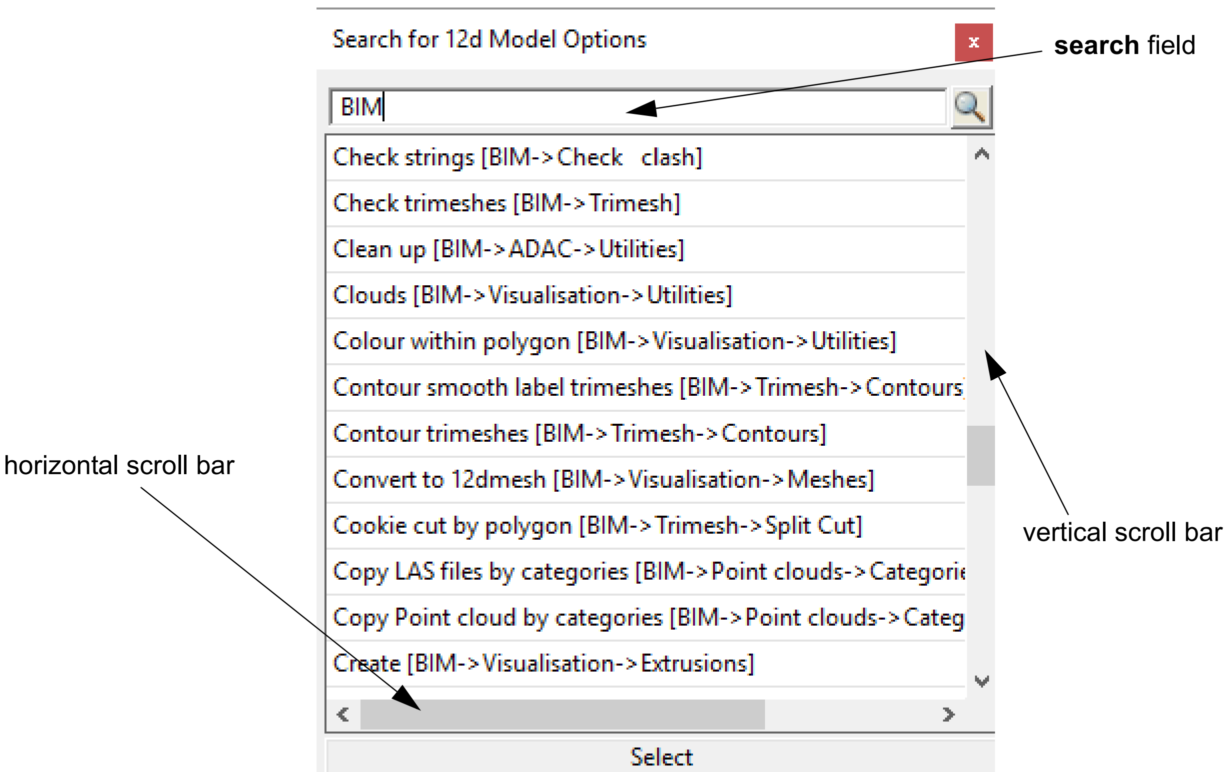


Also note that **Volume** matched with **Volumes** as a keyword only requires a match with part of a word.

And it was just luck that in this list all the panel names came before the Main menu path names. Typing in **area** will mix them up.

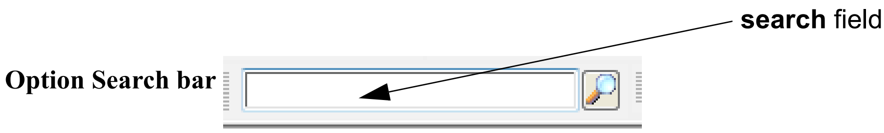


The settings for controlling the size of the list of options in the **Search for 12d Model Options Bar *panel*** are saved as ***Project Settings*** (see 7.10.2.9 Search Bar Settings) and if the selected options list is either wider or higher than the width of the pop-up list, then horizontal and/or vertical scroll bars are added to the panel.



Search bars can be pinned (5.3.2 Moving the Search for 12d Model Options Panel) and the Search text can also be saved for reuse (5.3.3 Saving and Reusing Searches).

5.3.1 Options Search Bar Syntax



The **search** field in the **Options Search Bar** does allow more than words separated by spaces.

When you type alpha numeric keywords into the search field of the **Options Search Bar,** the words can be separated by the special characters **space** ' ', **comma** ',', **plus** '+' or **minus** '-' and ***12d Model*** will interpret them to perform the following **logic operations**:

AND use **space** ' ' **or plus** '+'

For example:

X Y will search for text that contain **BOTH X and Y**.

X+Y will also search for text that contain **BOTH X and Y**.

That is, the search will return only results that have both X and Y in them.

OR use **comma** ','

For example:

X,Y will search for text that contain **EITHER X or Y** or **BOTH X and Y.**

That is, the search will return results that have X or Y, or both X and Y in them.

NOT use **minus** '-'

For example:

-X will exclude text that has **X in them**

That is, the search will return results that don't contain X.

The syntax is evaluated from left to right.

That is, you can have things like:

X Y,Z-A

which means the search will find text with

(X and Y) or Z, but none of them containing A

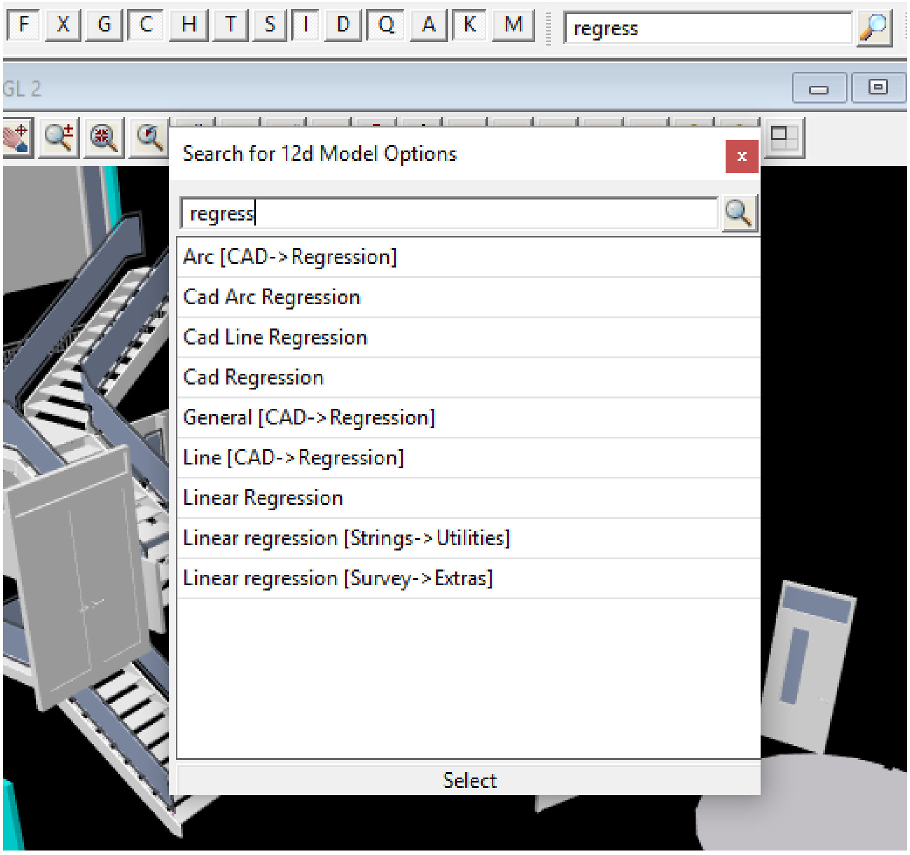
Important Note

The search for ***12d Model*** options is **case insensitive**.

5.3.2 Moving the Search for 12d Model Options Panel

When information is typed into the **Options Search bar,** the **Search for 12d Model Options** panel comes up.

If the **Search for 12d Model Options** panel is moved, it is then automatically pinned. That is, it stays at the new position until the panel is deleted (by clicking on the **x**).



This means that any number of options can be selected from the **Search for 12d Model Options** panel and it won't be removed from the screen until the **X** button is selected.

If you click in the Search bar whilst the **Search for 12d Model Options** panel is up, the cursor is automatically moved to the **Search** field in the **Search for 12d Model Option** panel.

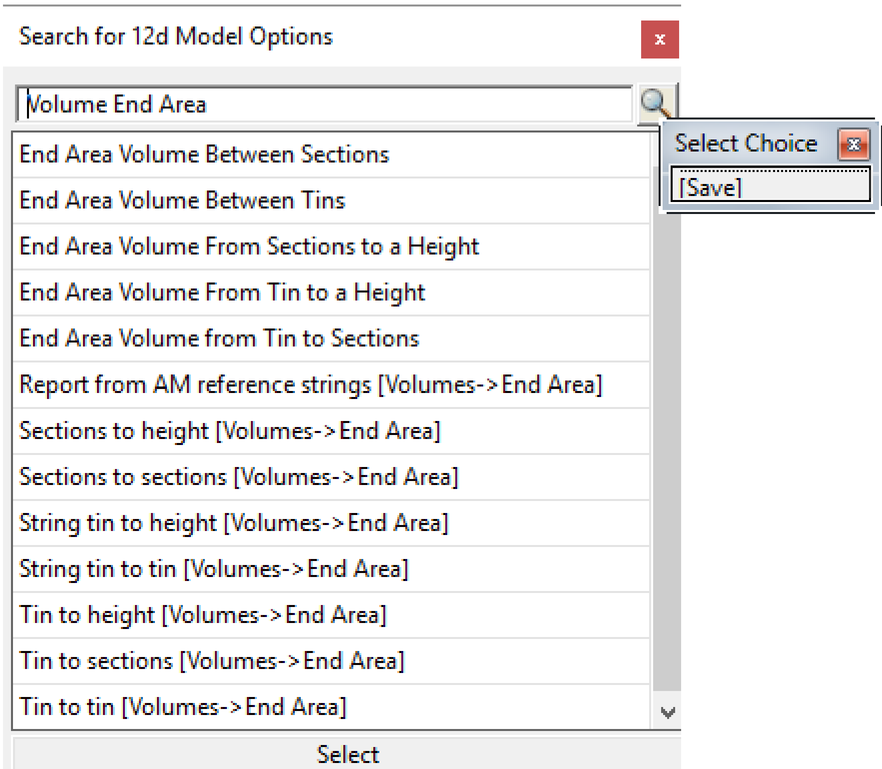
When the pinned panel is removed, the text in the **Search** field of the **Search for 12d Model Option** panel is written to the **Options Search Bar**.

Any text in the **Search** field text can be saved and reused for future **Search for 12d Model Option** panels (see 5.3.3 Saving and Reusing Searches).

5.3.3 Saving and Reusing Searches

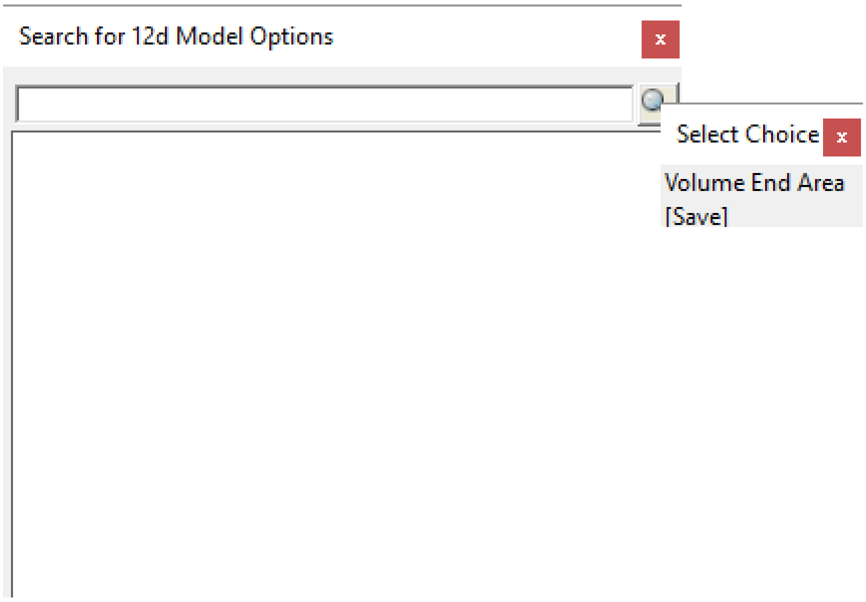
When text is typed into the **Search** field in the **Search for 12d Model Options** panel, the text typed in can be saved and reused for future Searches.

When the information is typed, click on the **Information** (magnifying glass) icon and click on **[Save]**.

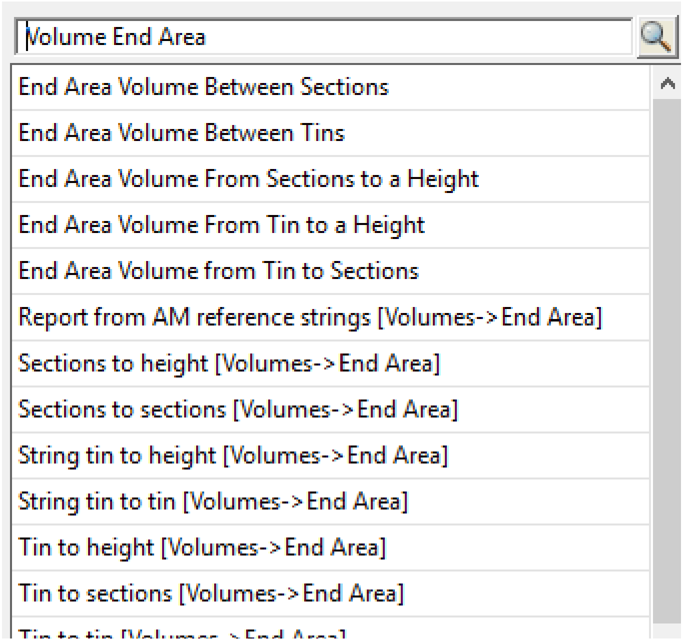


The text will be saved away when a Project **Save** is one.

In future, for any **Searches** of the same type, clicking on the **Information** icon will display the list of saved **Search** texts.



Clicking on a **Select Choice** text will pipe it into the panel and apply it.



Note:

The Search text is only saved for the Project when a ***Project =>Save*** is done.

The ***Saved Searches*** can also be examined and modified via the **Project Settings** panel.

5.4 Panel Fields

Now documented In the v15 reference manual

See

5.4.1 Unit Conversions in Real Value Fields
5.4.2 Choice Box

5.4.1 Unit Conversions in Real Value Fields

Now documented In the v15 reference manual

Conversions from various distance units into metres are possible by post-fixing a valid real value with a defined single character, these combined values can be freely used in expressions.

For example, to find the width in metres of a standard gauge railway, **4' 8 ½"** we need to convert the feet and inch parts to metres and add them together.

Post fixing a value with **f** indicates the value is in feet, i it is in inches, (full list follows further down), the expression first converts the values into metres then performs any operations on the resulting values. So, the above example can be written in 2 ways, **4f + 8.5i or 4f + 8i + 1i/2**.

Note how to enter fractions, for example 5/8 of an inch will be entered as **5i/8**. **(5/8)i** is not a valid syntax and **5/8i** is actually 5 divided by 8 inches.

Due to the small differences between international, (imperial) and US feet an environment variable **TYPED_UNITS_MODE_4D** controls which unit is used.

if **0**, the default value, only international units are supported, for example **4f** and **4F** will both represent 4 international feet.

if **1** only US units are supported, for example **4f** and **4F** will both represent 4 US feet.

if **2** both international and US units are supported, lower case for international units and upper case for US units, for example **4f** is 4 international feet and **4F** US feet.

Units that support both international and US versions

i/I - inches

f/F - feet

y/Y - yards

m/M - miles

l/L - links

c/C - chains

p/P - perches

r/R - rods

Units that do not have US versions, the upper case version is an error and the expression will fail

k - kilometres,

n - nautical mile

5.4.2 Choice Box

The **Choice Box** is for a general tool for displaying a list of items that the user can select from.

A choice can be typed in, or the list of available choices displayed in a pop-up by clicking on the **Choice** icon at the right hand end of the Choice box

Being a general box, what choices are in the pop-up is different for each **Choice** box and are documented for each option that includes a Choice box.

There are three different styles of Choice Boxes:

(a) Choice Box with a select field on the **Select Choice** pop-up

This is the most general purpose Choice Box and is used when there is a large number of choices and depending on the application, more than one choice can be selected.

The required choices can often be more easily selected by first typing in selection criteria into a search field and then the required choice(s) selected from the smaller list.

Searches can be by whole or partial words, and case can be ignored or not ignored.

See 5.4.2.1 .Choice Box with Search Field on Select Choice Pop-Up

(b) Select choice without a search field on the **Select Choice** pop-up

This is used when there is a small number of choices and so a search field is not needed.

See 5.4.2.2 Choice Box With No Search Field on Select Choice Pop-Up

(c) Older Style Choice Box

This is the original Choice box and is still used in some panels, especially when the number of choices is very limited and only can be selected.

See 5.4.2.3 Older Style Choice Box

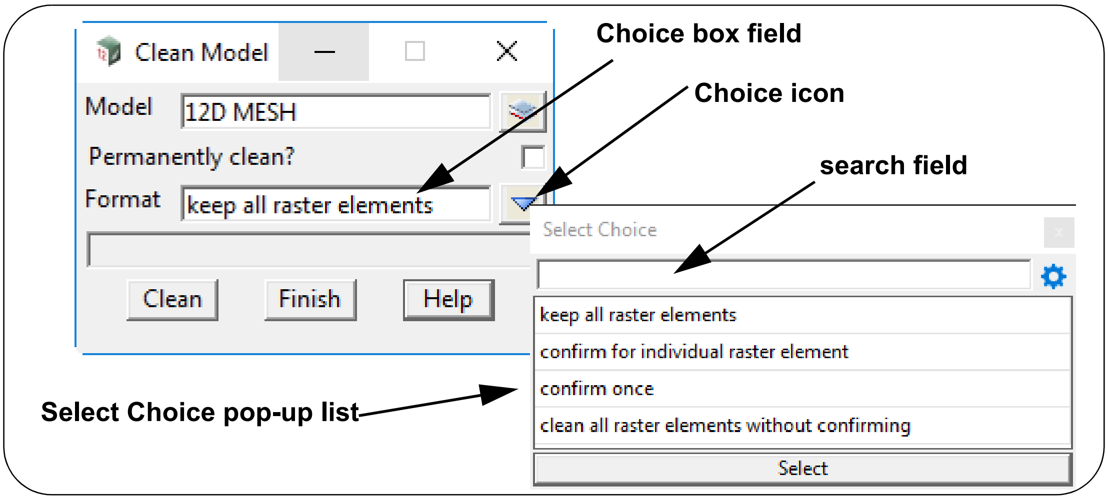
Note:
There are other specialised boxes such as **Model box** or a **Tin Box** that also allow users to select from a pop-up list.

5.4.2.1 .Choice Box with Search Field on Select Choice Pop-Up

This is the most general purpose **Choice Box** and is used when there is a large number of choices and depending on the application, more than one choice can be selected.

The required choices are often more easily selected by first typing selection criteria into a **search field** and then the required choice(s) selected from a smaller list.

Searches can be by whole or partial words, and case can be ignored or not ignored.



Click on one the Choice icon at the end of the Choice Box brings up the **Select Choice** pop-up with the search field at the top, followed by the list of choices satisfying the search criteria, and a **Select** and possibly other buttons such as **Clear**, at the bottom.

Clicking on the **X** at the top right hand corner of the **Select Choice** pop-up removes it.

Clicking and **dragging** on the **title area** of the pop-up allows you to **move** and **pin** the **Select choice** pop-up.

When there is a **[Clear]** button, clicking on it will clear what is in the **Choice box** field when having no selection is allowed.

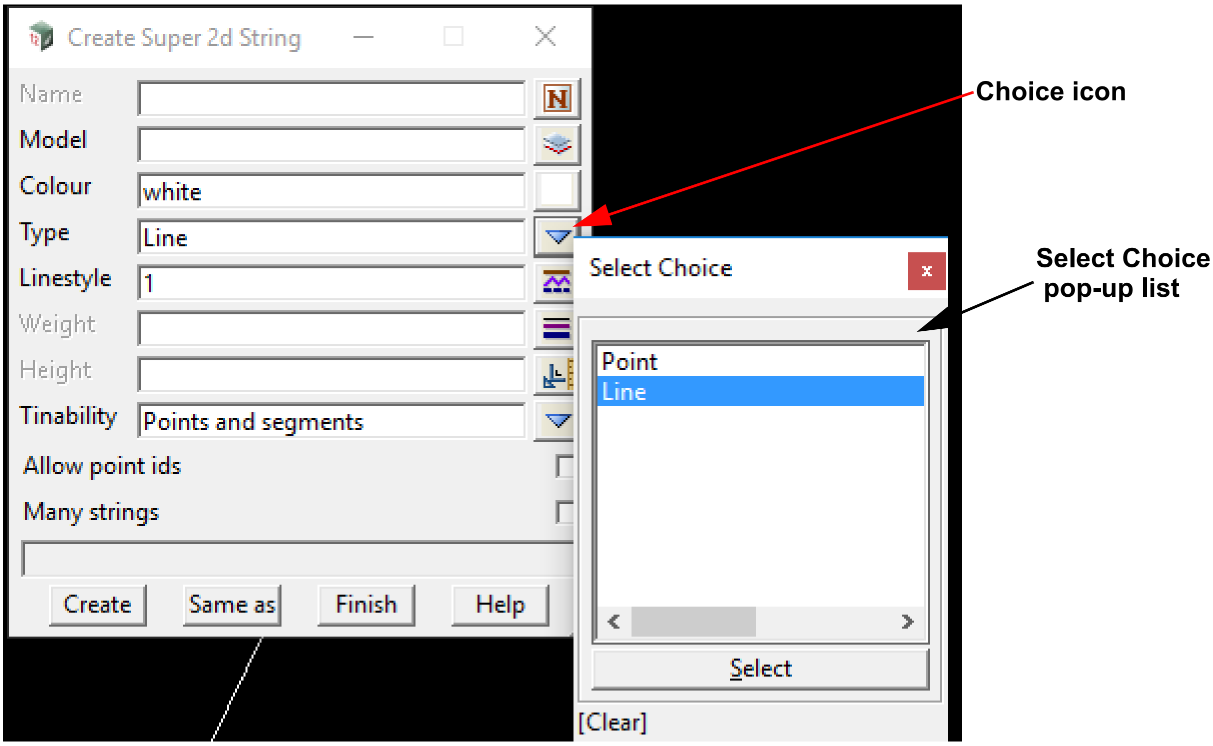
The choices above **[Clear]** will be different for each option.

If nothing is typed into the search field then all the choices are displayed in the pop-up list but there is a special syntax using the characters **plus** (+), **comma** (,) and **minus** (-) for AND, OR and NOT logical operators to restrict what is shown in the pop-up. See 5.5.6 Search Field Syntax for Selects.

For a **Choice Box with a search field,** full information on the search settings **Match Case**, **Whole Word, Search field** and on **Save Selects** is in 5.5.1 Search Field for Model, Tin, Function and Template Box.

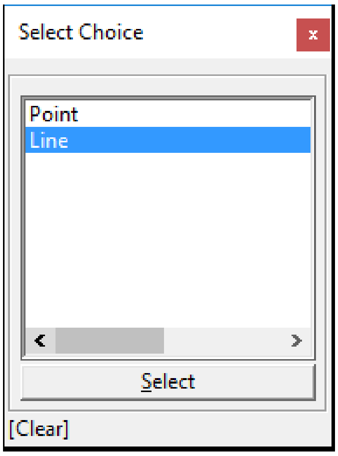
Continue to5.4.2.2 Choice Box With No Search Field on Select Choice Pop-Up or return to 5.4.2 Choice Box or 5.4 Panel Fields.

5.4.2.2 Choice Box With No Search Field on Select Choice Pop-Up



Clicking on the **Choice icon** will display the pop-up choice list.

As an example:



Clicking on the **X** at the top right hand corner removes the option.

Clicking and **dragging** on the title area of the menu allows you to **pin** the menu.

Clicking on the **[Clear]** button will clear the current field.

For the meaning of the buttons above it, refer to the help for the specific option.

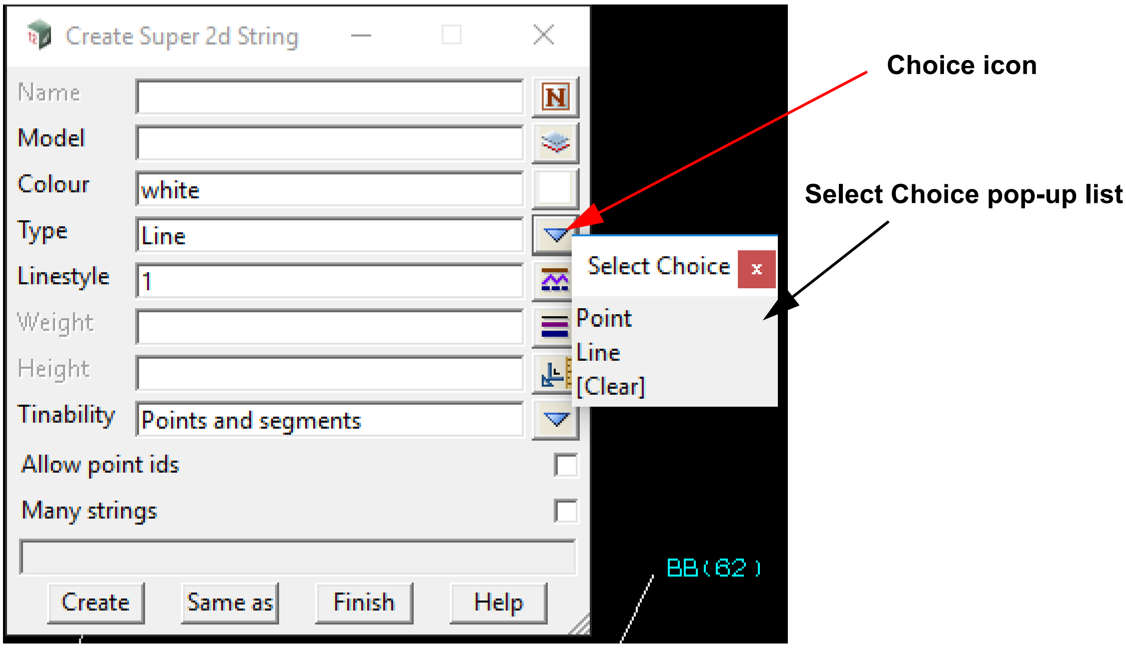
The **Select** button uses the current selection in the list and populates the panel field.

This style is used when the there is a large number of choices, usually greater than 26.

Double clicking on a choice, populates the panel field directly.

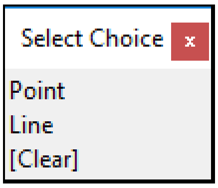
Continue to5.4.2.3 Older Style Choice Box.

5.4.2.3 Older Style Choice Box



Clicking on the **Choice** icon will display the choice list.

As an example:



Clicking on the **X** at the top right hand corner removes the option.

Clicking and **dragging** on the **title area** of the menu allows you to **pin** the **Select choice** menu.

Clicking on **[Clear]** will clear what is in the Choice box field.

The choices above **[Clear]** will be specific to the particular choices required in an option.

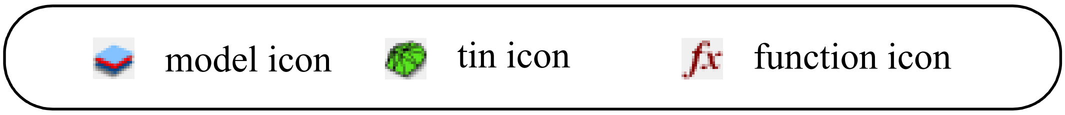
5.5 Search Field for Model, Tin, Template and Functions, and + and - View Buttons

Now documented In the v15 reference manual

For Plan, Section and Perspective views, clicking on the View Buttons **+** (**Add** models) or **-** (**Remove** models) brings up a list of models to add to, or remove from, the view. One or many models can be selected to add/remove by using the <Shift> and <Ctrl> keys.

By typing a * over the **+** or the **-** brings up the **Add Models to View** and **Remove Models from View** panels where wild cards (*) and wild characters (?) can be used to Add model to, or Remove from, a view.

Similarly by clicking on a model, tin or function icon at the end of the Model box, Tin box or Function box panel fields, a list of available models, tins of functions is displayed so that a model/tin/function can be selected



Also for a model/tin/function box, if you enter characters into the panel field and then type **<ctrl>+d**, a list of all the items that start with the typed characters will appear to select from.

From ***12d Model 12*** onwards, an improved **Search** field with associated icons is used to provide a more powerful method for selecting the models to appear in the pop-up list when using the **Add** (+) or **Remove** (-) icon on Views, and for selecting the models/tins/functions/templates that appear in the pop-ups for the model, tin, function or template icons.

From ***12d Model 15***, the new method is **on** by default and to NOT use the new method, the environment variable ***model_search_4d*** must be set to 0:

model_search_4d ***0***

Note: for setting this environment variable, see the Variables section in the env.4d editor 7.12.2 Create/Edit env.4d).

Although some of the actions and icons used for the **Search** field for the **+** and **-** are different to how they work for model, tin, function and template boxes, most are the same and can be documented together.

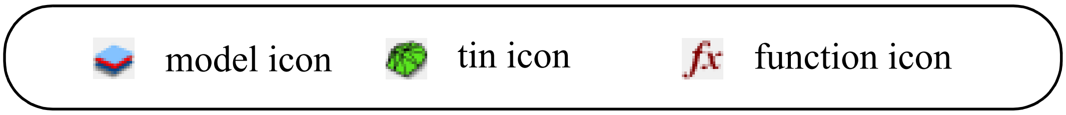
See

5.5.1 Search Field for Model, Tin, Function and Template Box

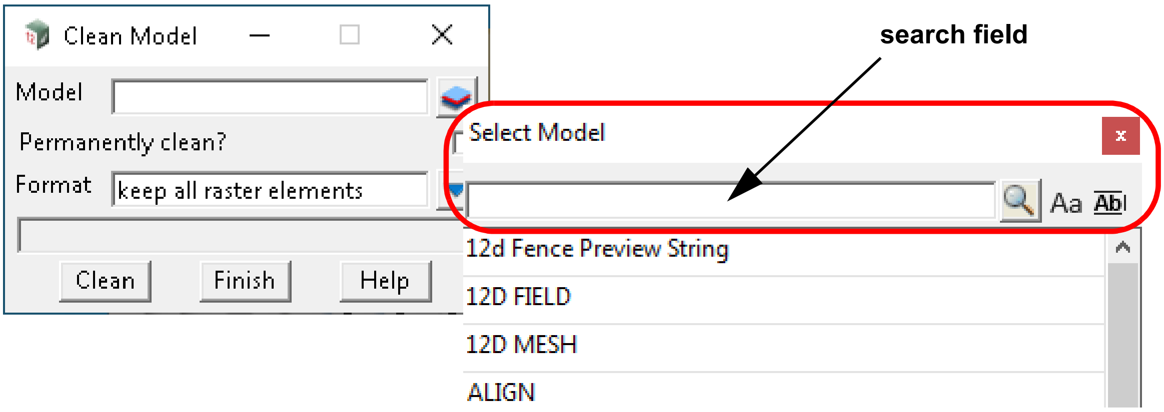
5.5.2 Search Field for the Add (+) and Remove (-) View Buttons

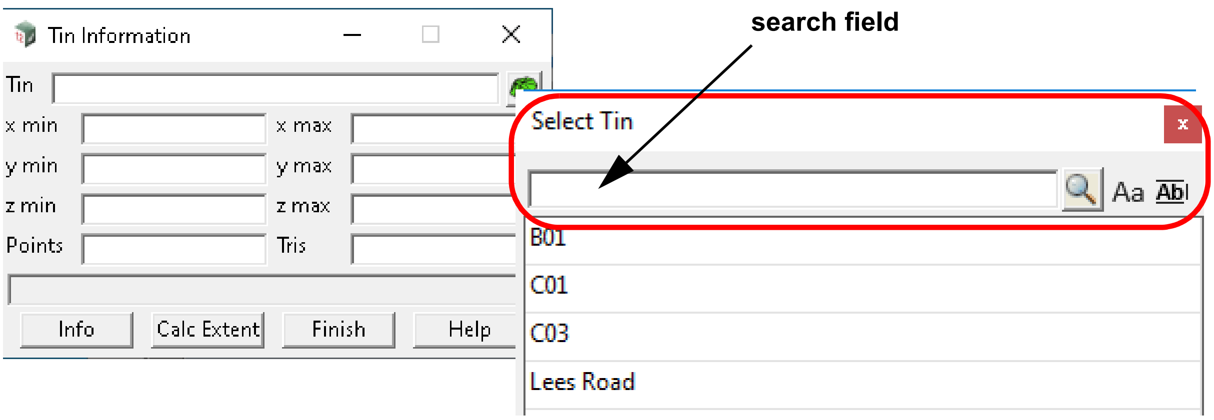
5.5.1 Search Field for Model, Tin, Function and Template Box

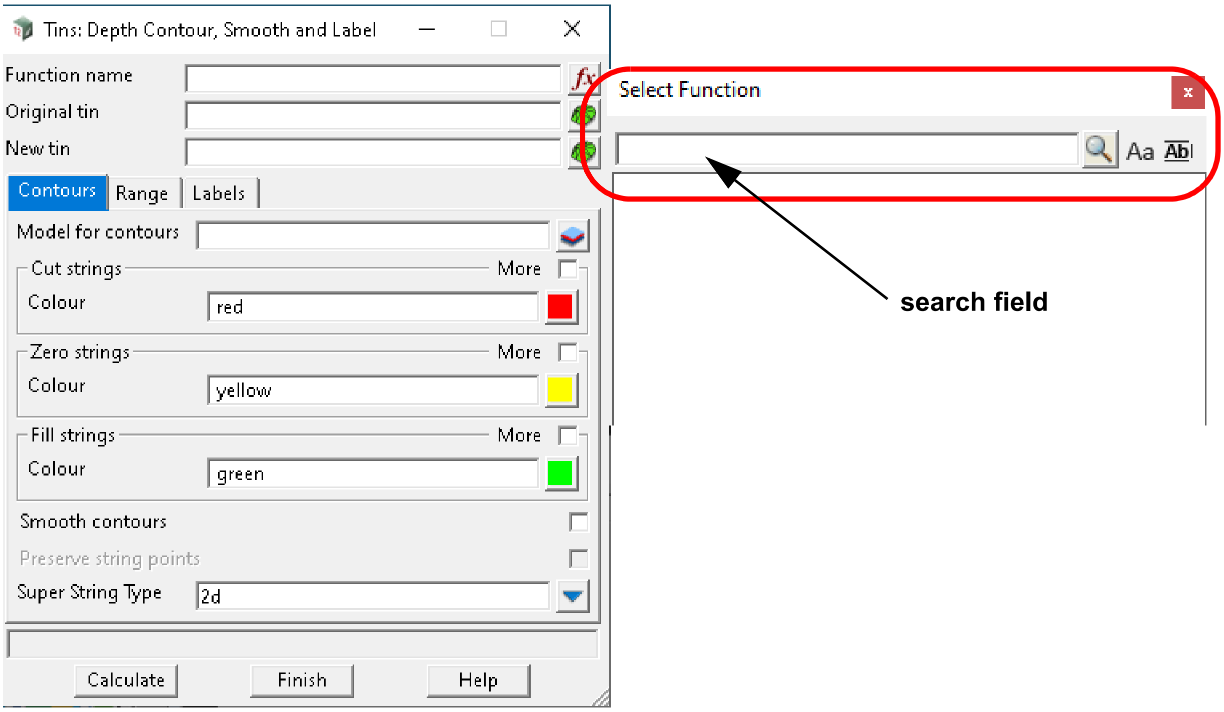
By clicking on the model, tin, function or template icon at the end of the Model box, Tin box, Function box and Template box panel fields, a list of available models, tins, functions or templates is displayed so that a model/tin/function/template can be selected

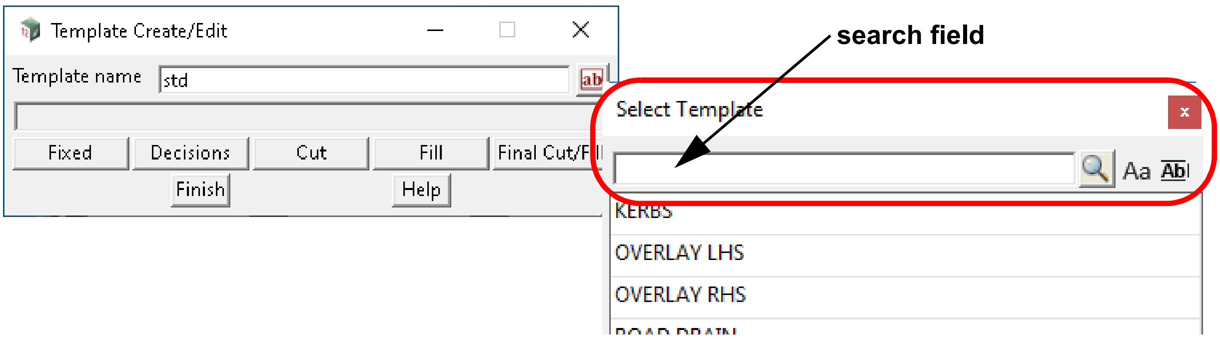


When the environment variable ***model_search_4d*** is set to **1**, the **Select Model/Tin/Function/Template** panel has a **Search** field and four extra icons above the list of models/tins/functions/templates. This is the default for ***12d Model*** and so doesn't have to be set by the User.







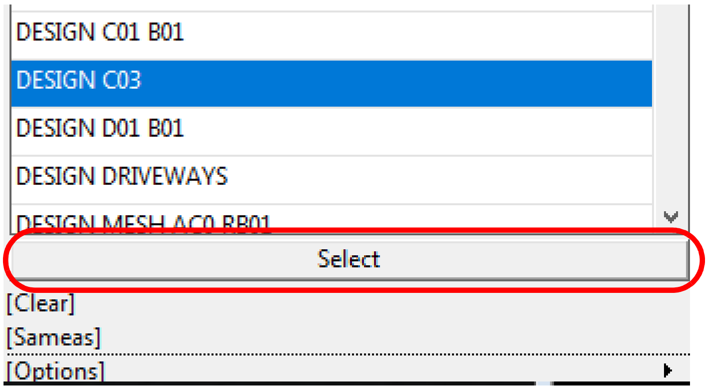


When there are **model/tin/function/template names** displayed in the list, an item is selected from the list by either:

(a) **double clicking** on the item in the list

or by

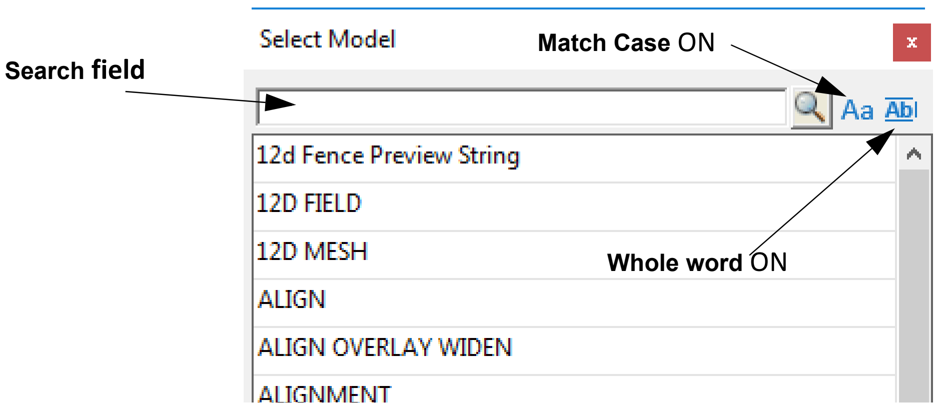
(b) clicking on an item in the list to highlight it and then clicking on **Select** at the bottom of the list.



The selected item is then written to the panel field.

This behaviour is identical to the original **Select Model/Tin/Function/Template** panel.

The **Search field** in conjunction with the **Match case** and **Whole word** icons **adds increased functionality** for controlling what is in the pop-up for existing Models/Tins/Functions/Templates.



The use of the **Search** field, **Match Case** and **Whole word** icons restricts the items in the list from the list of all available items making it easier to make a single selection.

For a description of the behaviour of each icon, see

Match Case icon	5.5.3 Match Case and Don't Match Case Modes
Whole Word Icon	5.5.4 Whole Word is Off - Anywhere Search
	5.5.5 Whole Word is On - Pattern Search
Name and View icons	5.5.7 Name Icon and View Order Icon For Views

Note that the **Match sensitive** and **Whole word** icons are **off** when they display in **black** and **on** when they are displayed In **blue**.

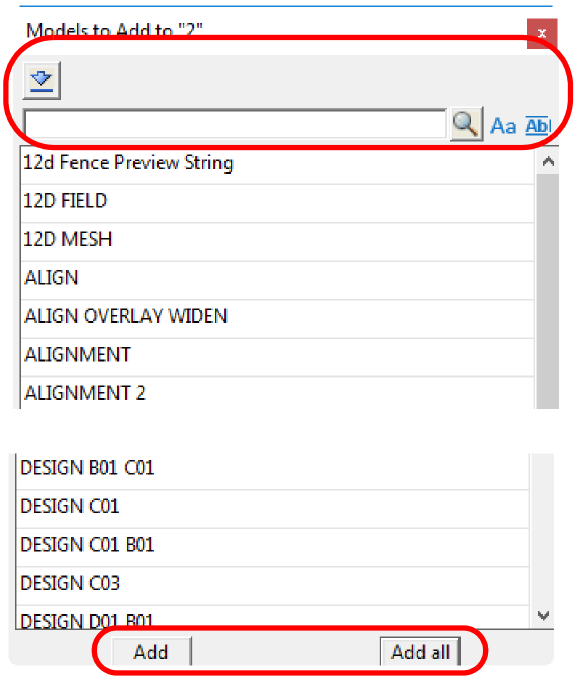
Continue to 5.5.2 Search Field for the Add (+) and Remove (-) View Buttons or return to 5.5 Search Field for Model, Tin, Template and Functions, and + and - View Buttons.

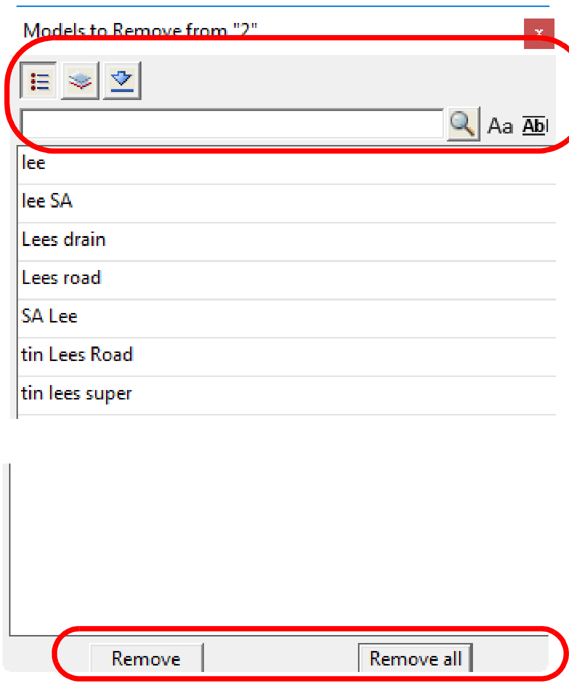
5.5.2 Search Field for the Add (+) and Remove (-) View Buttons

For Plan, Section and Perspective views, clicking LB on the View Buttons **+** (**Add** models) or **-** (**Remove** models) brings up a list of models to add to, or remove from, the view. One or many models can be selected. to add/remove by using the <Shift> and <Ctrl> keys.

Similarly typing a character over the View Buttons **+** (**Add** models) or **-** (**Remove** models) also brings up a list of models to add to, or remove from, the view. One or many models can be selected. to add/remove by using the <Shift> and <Ctrl> keys.

When the environment variable ***model_search_4d*** is set to **1**, and **LB** is clicked on **+** or **-**,the **Model to Add** and **Models to Remove** panels have a **Search** field and extra icons above the list of models.





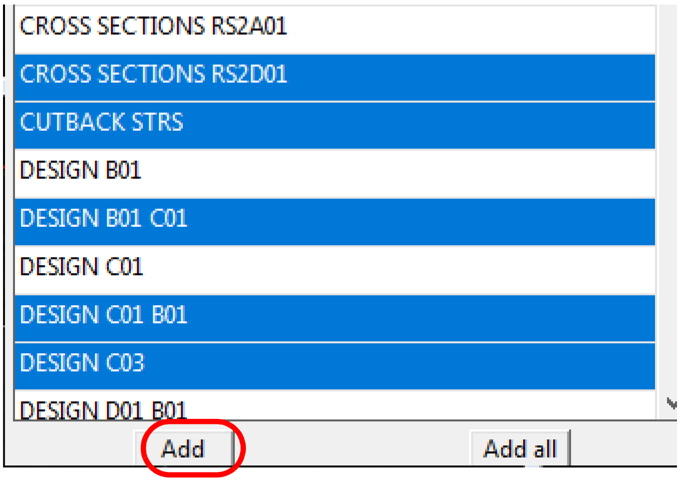
When there are models displayed in the list, models can be selected from the list by either:

(a) clicking on **Add/Remove all** to Add/Remove all the models in the list

(b) **double clicking** on a model in the list

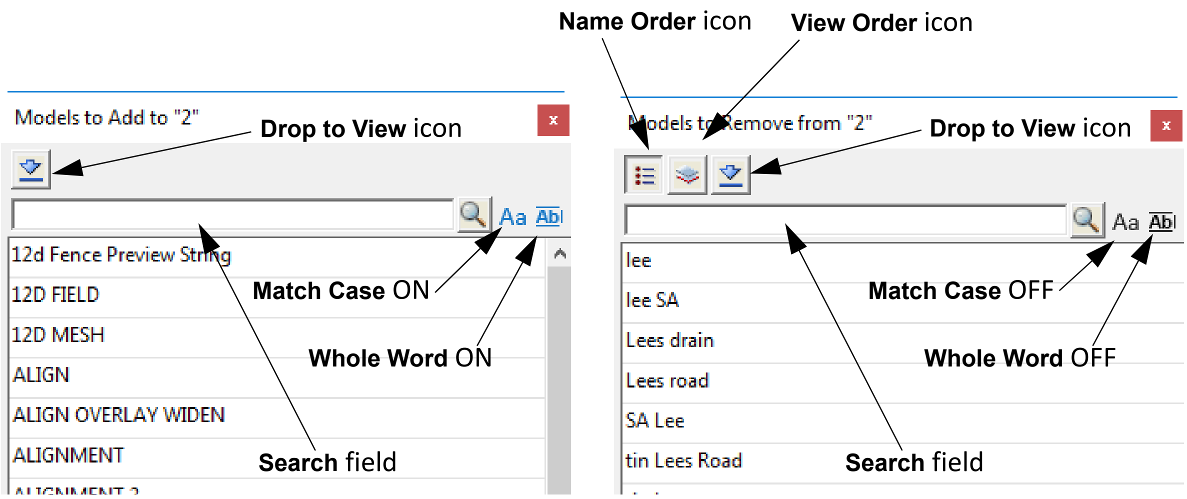
or by

(c) highlighting models by picking and using the <Ctrl> and <Shift> keys to select multiple models and then clicking on **Add/Remove** at the bottom of the list.



This behaviour is identical to the original **Model to Add/Remove** panels.

The **Search** field in conjunction with the **Match Case** and **Whole word** icons **adds increased functionality** over selecting models Models to add or remove.



The use of the **Search** field, **Match Case** and **Whole word** icons restricts the models in the list from the list of available models making it easier to make a single or multiple selections, or select the entire list of models.

For a description of the behaviour of each icon, see

Name and View Order icons	5.5.7 Name Icon and View Order Icon For Views
Drop to View Icon	5.5.9 Drop to View icon - Adding Selected Models to Another View
Case Sensitive icon	5.5.3 Match Case and Don't Match Case Modes
Whole Word Icon	5.5.4 Whole Word is Off - Anywhere Search
	5.5.5 Whole Word is On - Pattern Search
Typing above + or -	5.5.8 Typing a Character Above the + or - View Buttons

Note that the **Match Case** and **Whole Word** icons are **off** when they display in **black** and **on** when they are displayed In **blue**.

Continue to 5.5.3 Match Case and Don't Match Case Modes or return to 5.5 Search Field for Model, Tin, Template and Functions, and + and - View Buttons.

5.5.3 Match Case and Don't Match Case Modes

When the **Match Case** icon is **on** (**Aa**) the search matches on case. That it, it is case **sensitive**.

When the **Match Case** icon is **off** (**Aa**), the search does not match case. That is, it is case **insensitive**.

The setting for **Match Case** is the same for Models, Tins, Functions and Templates and any change to the setting is automatically made to the ***Project Settings >Model, Tins, Functions*** setting and so if a save is done for the project, the new **Match Case** setting are be remembered. See 7.10.2.7 Select >Models, Tins, Functions Settings.

The setting for **Match Case** is the same adding models to a view and removing models from a view and any change to the setting is automatically made to the ***Project Settings >View Models*** setting and so if a save is done for the project, the new **Match Case** setting are be remembered. See 7.10.2.5 Select >View Models Settings.

Continue to 5.5.4 Whole Word is Off - Anywhere Search or return to 5.5 Search Field for Model, Tin, Template and Functions, and + and - View Buttons.

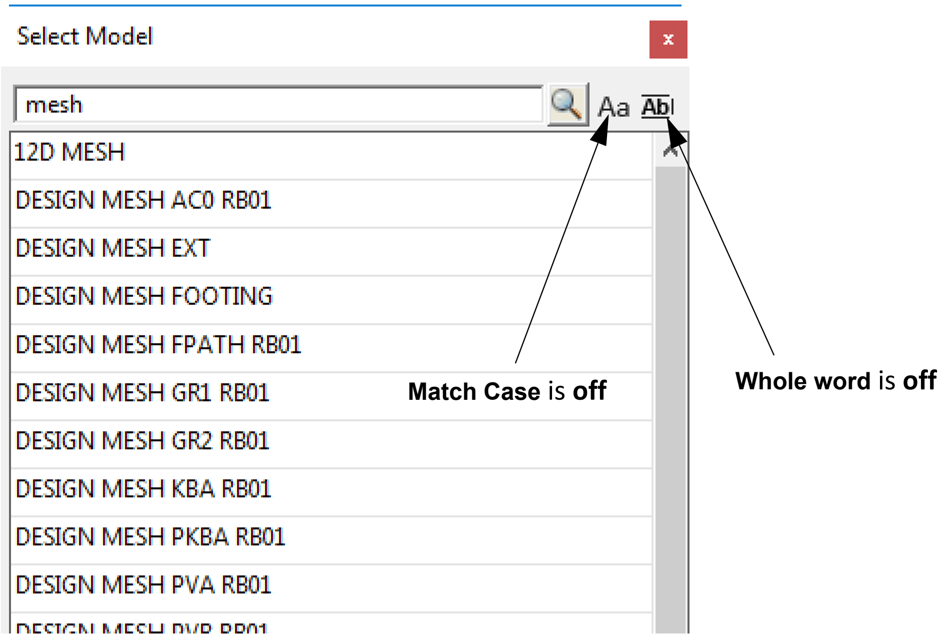
5.5.4 Whole Word is Off - Anywhere Search

When the **Whole word** icon is **off** the search looks for the characters **anywhere** in the item names.

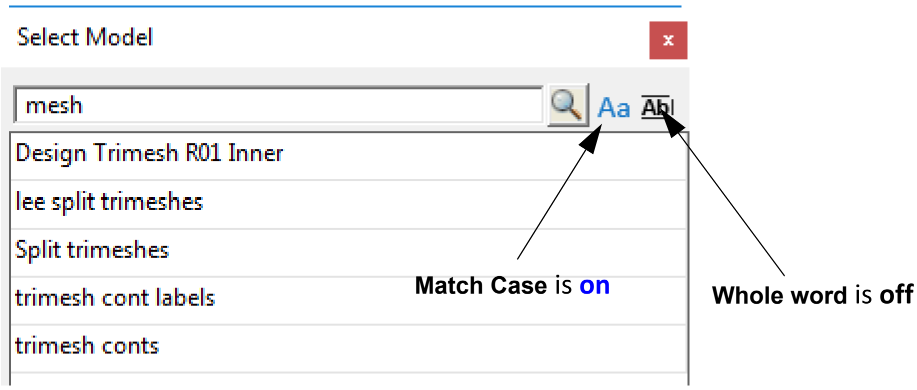
That is, if **Whole word** is **off**, when you type text into the search field it will display in the list the items that **contain** the typed letters **anywhere** in the item name.

Note: The search will only consider case if the **Match Case** icon is on (**Aa**)

For example, typing in “mesh" with **Match Case off** displays



For example, typing in “mesh" with **Match Case** on (**Aa**) displays

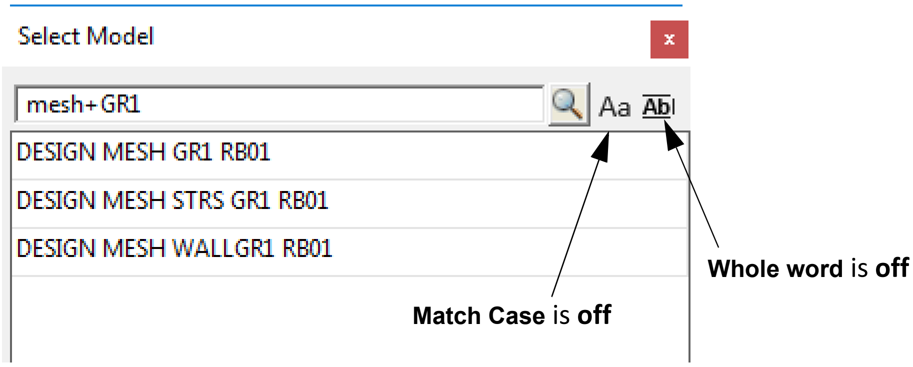


None of the models containing MESH are then listed.

Having one of more sets of letters separated by a **plus** sign (**+)** will list only the appropriate items containing each of the sets of letters on each side of the **+**. For example

mesh+GR1

only selects items that contain the letters **mesh AND** the letters **GR** in them.

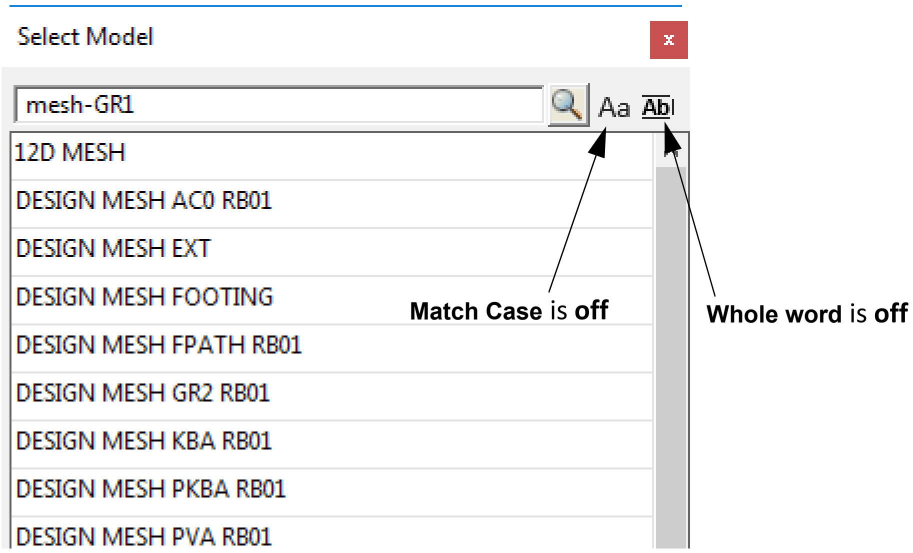


Using a **minus** sign (**-**) means that the following letters will **NOT** appear in the list.

For example

mesh-GR1

only selects items that contain **mesh** but do **not** contain **GR**



The setting for **Whole Word** is the same for Models, Tins, Functions and Templates and any change to the setting is automatically made to the ***Project Settings >Model, Tins, Functions*** setting and so if a save is done for the project, the new **Whole Word** setting are be remembered. See 7.10.2.7 Select >Models, Tins, Functions Settings.

The setting for **Whole Word** is the same adding models to a view and removing models from a view and any change to the setting is automatically made to the ***Project Settings >View Models*** setting and so if a save is done for the project, the new **Whole Word** setting are be remembered. See 7.10.2.5 Select >View Models Settings.

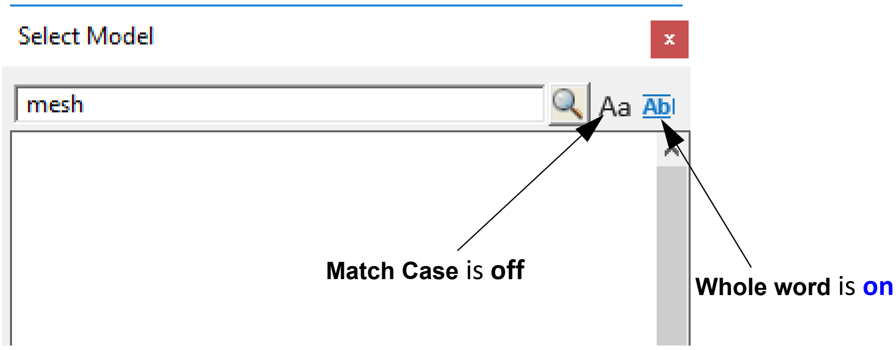
Continue to 5.5.5 Whole Word is On - Pattern Search or return to 5.5 Search Field for Model, Tin, Template and Functions, and + and - View Buttons.

5.5.5 Whole Word is On - Pattern Search

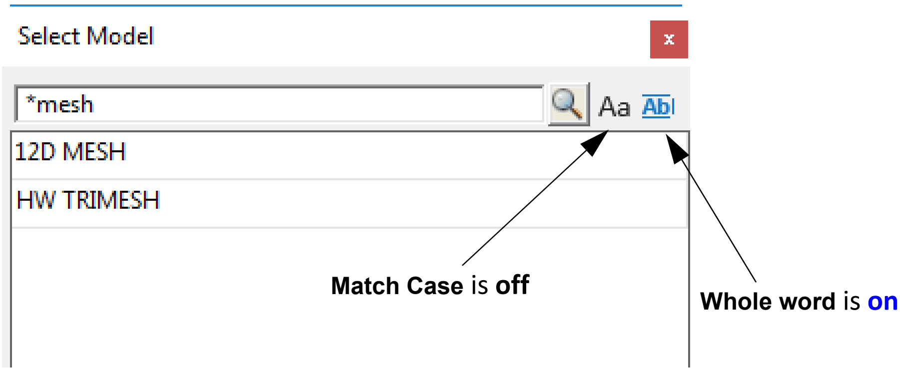
When the **Whole word** icon is **on** the search is switched to **pattern** mode and the text searched for must exactly match the typed in text. Wild cards (*) and wild characters (?) can be included in the search text.

Note: The search will only consider case if the **Case sensitive** icon is on.

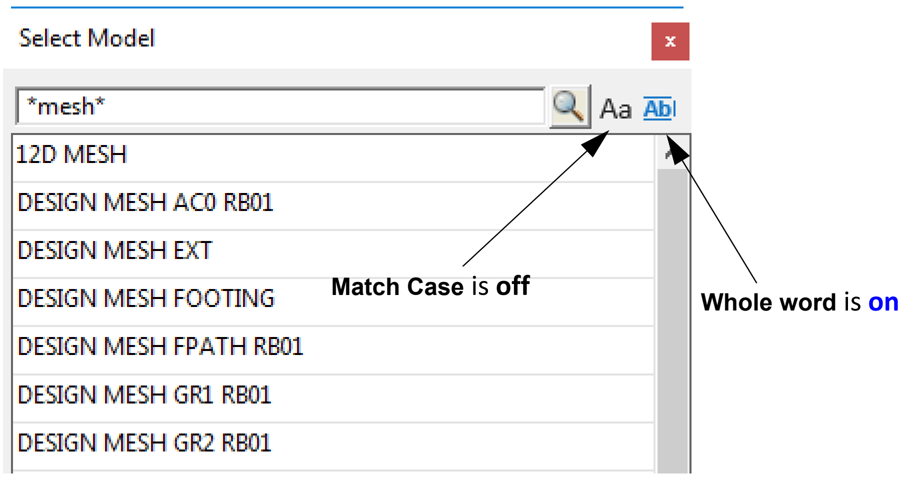
So when **Whole word** is **on**, typing **mesh** does not select any items.



But typing ***mesh** when **Whole word** is **on**, selects all items ending in **mesh**.



Typing ***mesh*** when **Whole word** is **on**, selects all items that include the text **mesh**.



So typing characters into the **Search** field in **Anywhere search** (**Whole word off**) is equivalent to typing * before and after the characters in **Pattern Search** (**Whole word on**).

The setting for **Whole Word** is the same for Models, Tins, Functions and Templates and any change to the setting is automatically made to the ***Project Settings >Model, Tins, Functions*** setting and so if a save is done for the project, the new **Whole Word** setting are be remembered. See 7.10.2.7 Select >Models, Tins, Functions Settings.

The setting for **Whole Word** is the same adding models to a view and removing models from a view and any change to the setting is automatically made to the ***Project Settings >View Models*** setting and so if a save is done for the project, the new **Whole Word** setting are be remembered. See 7.10.2.5 Select >View Models Settings.

Continue to 5.5.6 Search Field Syntax for Selects or return to 5.5 Search Field for Model, Tin, Template and Functions, and + and - View Buttons.

5.5.6 Search Field Syntax for Selects

The following documentation applies to the **Search field** for the **Select** on:

(a) **+** and **-** buttons on Views

(b) Model boxes

(c) Tin boxes

(d) Function boxes

(e) Template boxes

(f) Choice boxes

The search for the **Options Search Bar** is different and is discussed separately in 5.3.1 Options Search Bar Syntax).

To search for special text among a list of text items, the following rules apply:

When you type alpha numeric keywords into the search box, the words can be separated by the special characters **space** ' ', **comma** ',', **plus** '+' or **minus** '-' and ***12d Model*** will interpret them to perform the following **logic operations**:

AND use **space** ' ' **or plus** '+'

For example:

X Y will search for text that contain **BOTH X and Y**.

X+Y will also search for text that contain **BOTH X and Y**.

That is, the search will return only results that have both X and Y in them.

OR use **comma** ','

For example:

X,Y will search for text that contain **EITHER X or Y** or **BOTH X and Y.**

That is, the search will return results that have X or Y, or both X and Y in them.

NOT use **minus** '-'

For example:

-X will exclude text that has **X in them**

That is, the search will return results that don’t contain X.

The syntax is evaluated from left to right.

That is, you can have things like:

X Y,Z-A or X+Y,Z-A

which means the search will find text with

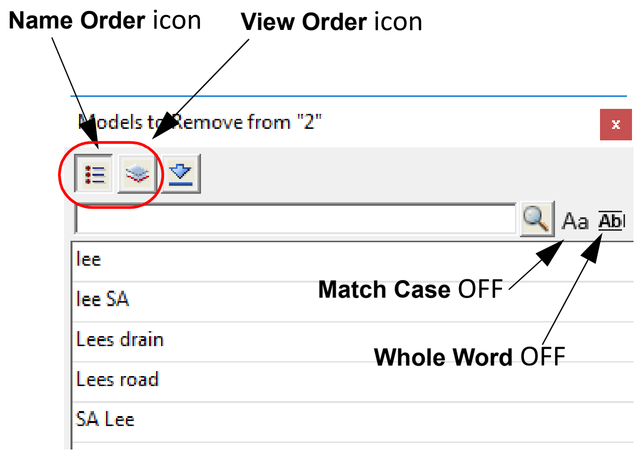
(X and Y) or Z, but none of them containing A

Important Note

The search in the search field for a **Select Choice** is **case insensitive**.

Continue to 5.5.7 Name Icon and View Order Icon For Views or return to 5.5 Search Field for Model, Tin, Template and Functions, and + and - View Buttons.

5.5.7 Name Icon and View Order Icon For Views



For the **Models to Remove** panel:

(a) clicking on the **Name** icon means that the items in the list are sorted alphabetically.

Whether the list is sorted in ascending or descending order is controlled by Project Settings. See 7.10.2.5 Select >View Models Settings.

(b) clicking on the **View Order** icon means that the item list is in the order that the models were added to the view.

The choice of **Name Order** or **View Order** is automatically made to the ***Project Settings >View Models*** setting and so if a save is done for the project, the new setting are be remembered. See 7.10.2.5 Select >View Models Settings.

Continue to 5.5.8 Typing a Character Above the + or - View Buttons or return to 5.5 Search Field for Model, Tin, Template and Functions, and + and - View Buttons.

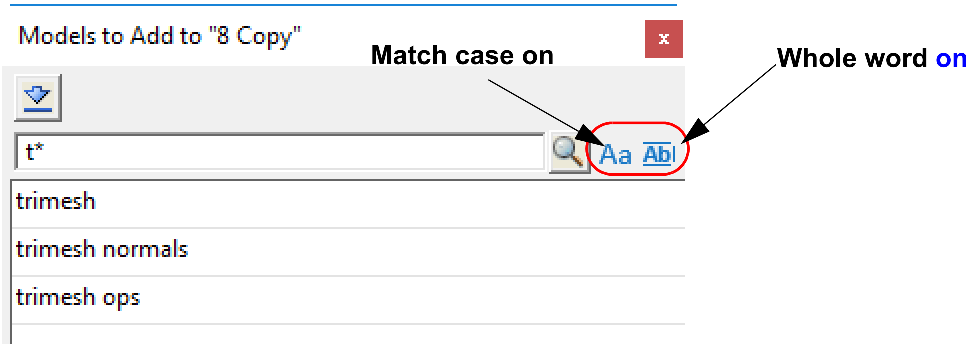
5.5.8 Typing a Character Above the + or - View Buttons

Typing one alphanumeric character above the **+** or the **–** brings up the new panel with the **Search** field and what then happens depends on the setting of the icons **Match Case** and **Whole Word**.

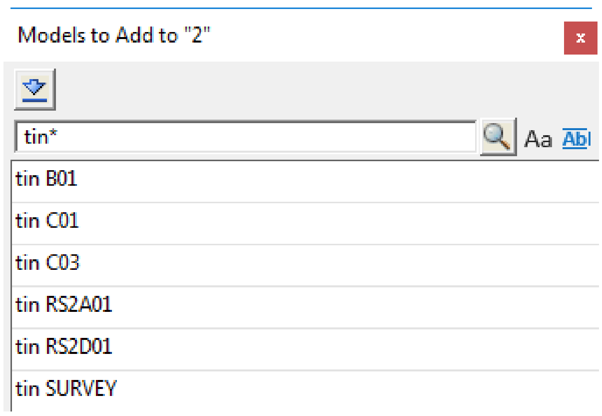
If the **Whole Word** icon is **off** (**Bb**) then the typed character is added into the **Search** field so any appropriate model containing that letter will be displayed. If **Match Case** is **off** (**Aa**) then any model name containing either the upper or lower case character is displayed.

If the **Whole Word** icon is **on** then the typed character followed by a * is added into the search field so any appropriate model name starting with that letter will be displayed. If **Match Case** is **off** (**Aa**) then any model name starting with either the upper or lower case character is displayed.

So if **t** is typed above the + and **Whole Word** is on, the **Models to Add** panel comes up with **t*** in it and the model selection already made.



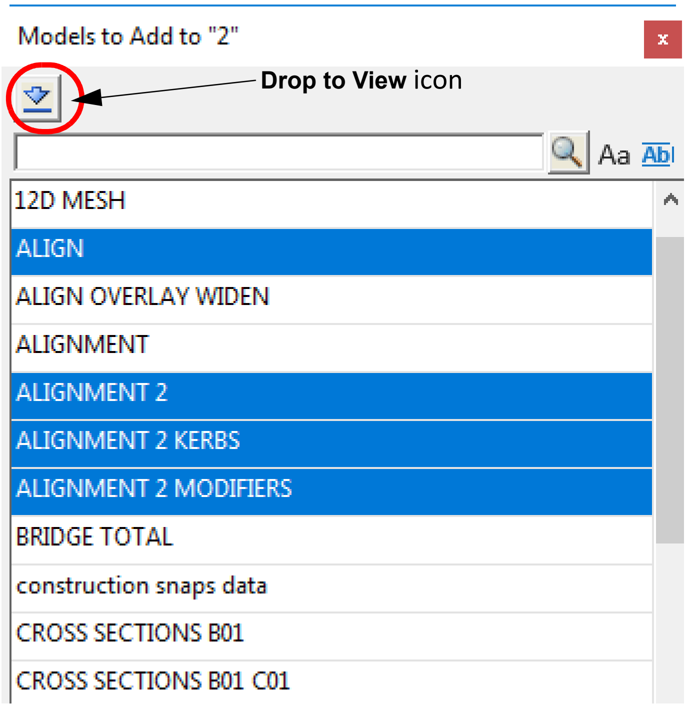
Note that with the new Search, you can continue typing after the **t** and the extra characters will be piped into the Search and immediately acted upon.



Continue to 5.5.9 Drop to View icon - Adding Selected Models to Another View or return to 5.5 Search Field for Model, Tin, Template and Functions, and + and - View Buttons.

5.5.9 Drop to View icon - Adding Selected Models to Another View

To add selected models to another view, if you have models **highlighted** in the **Models to Add** or **Models to Remove** panel then click on the **Drop to view** icon.



A view is then selected by picking and accepting anywhere inside that view and on accepting, **all the highlighted models** are **added to the selected view**.

5.6 Chainage Equalities

Now documented In the v15 reference manual

In some Jurisdictions, **Chainage Equalities** are called **Station Equations**, or **Broken Chainages**.

See

5.6.1 Natural/Raw Chainage
5.6.2 Chainage Equalities
5.6.3 Internal Equality
5.6.4 K-Post
5.6.5 Zones

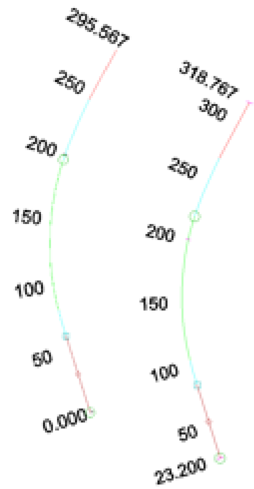
5.6.1 Natural/Raw Chainage

When designing and using an alignment, the horizontal distance (plan or 2D distance) along the alignment is regularly used to define and position objects in 2D that are on the alignment, or near the alignment.

For an alignment, the **natural chainage (raw)** is defined to be the horizontal distance along the alignment as measured from the start of the alignment **plus** a given start chainage value for the alignment.

Natural/Raw chainage of a place on the alignment = **Start chainage** + **Horizontal distance from the start of the alignment to the place**

Example 1



In Example 1, the alignment on the left has a start chainage of **0.000** and an end chainage of **295.567**.

Labelling of the chainages on the left occur in intervals of 50.

The alignment on the right has a start chainage of **23.200** and an end chainage of **316.767**.

Labelling of the chainages on the right also occur in intervals of 50.

Continue to 5.6.2 Chainage Equalities or return to 5.6 Chainage Equalities

5.6.2 Chainage Equalities

One issue with natural chainages is that whenever the horizontal section of an alignment is modified, the natural chainages of positions on the alignment may be affected.

This can be a problem in some industries, especially railways, were the places of objects along the railway alignment is often only recorded as a chainage value and a perpendicular offset at that chainage. In this case, having the chainages change would invalidate all those records.

To overcome this problem, the concept of **Chainage Equalities** evolved to allow some of the original chainages to be maintained.

So **chainage equalities**, also known as **chainage equations** or **station equations**, are used so that even when the horizontal geometry, and hence raw chainages, change for an alignment, labels can still be produced that reflect the original, or recorded, chainages.

In ***12d Model***, the **super alignment** supports chainage equalities.

A ***chainage equality*** is a place on the super alignment where the **chainage value is reassigned** and given a **new chainage value** at that place. This new chainage will normally be different to the natural/raw chainage.

The new chainage (**equality chainage**) for a position on the alignment **after** a chainage equality is the new chainage value at the preceding chainage equality **plus** the horizontal distance of the position from the preceding chainage equality.

That is:

Chainage of a position after a chainage equality (equality chainage) = **New chainage at the chainage equality** + **Horizontal distance from the chainage equality**

So when **chainage equalities** are involved, the equality chainage of a place on the super alignment depends on the chainage equalities, especially the last one, that proceeds it.

Equality chainage of a position after a chainage equality = **New chainage at the chainage equality** + **Horizontal distance from the chainage equality**

So for a position on an alignment, there is its **natural/raw chainage** and its **equality chainage**.

In ***12d Model,*** the super alignment supports two types of chainage equalities: 5.6.3 Internal Equality and 5.6.4 K-Post.

What the **equality chainage** is after a **chainage equality** depends on whether the chainage equality is an 5.6.3 Internal Equality or a 5.6.4 K-Post.

Continue to 5.6.3 Internal Equality or return to 5.6 Chainage Equalities

5.6.3 Internal Equality

An **internal equality** is a **chainage equality** where a **Before value** and an **After value** is provided.

The **value** in the **Before value** is the equality chainage where the chainage equality occurs. That is, the **Before value** takes into account the previous chainage equalities.

The **value** in **After value** is the new chainage that the place where chainage equality occurs, takes.

All subsequent chainages beyond the **internal equality** point are adjusted to be **relative** to the **After value**.

That is:

Chainage of a place after an internal equality = **"After" chainage at the internal equality** + **Horizontal distance from the internal equality**

An **Internal equality** is written as:

Before value = After value

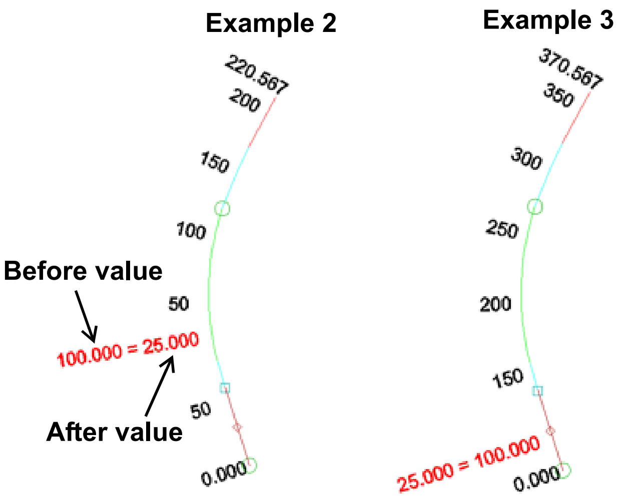
where the **value** in **Before value** is the **equality chainage of where the chainage equality occurs**. That is, the **Before value takes** into account the previous chainage equalities.

In Example 2, the **Before value** is **100** and the **After value** is **25**.

Therefore, chainage 50 is repeated twice - once before the Internal equality and once after the internal equality.

In Example 3, the **Before value** is **25** and the **After value** is **100**.

Hence chainage 50 does not exist at all.



Continue to 5.6.4 K-Post or return to 5.6 Chainage Equalities

5.6.4 K-Post

K-post stands for **Kilometre post.**

In ***12d Model***, a **K-post** is a place on a super alignment where **the chainage (and Zone number) is reset to zero** and all subsequent chainage values until the **next K-post** include the **unique Name** of the **K-post** as **text before the chainage value**.

This is:

Chainage of a place after a K-post = K-Post name followed by Horizontal distance from the K-post equality

A **K-post** is written as:

Before value = K-Post name

where **value** in **Before value** is the **equality chainage where the K-post occurs**. That is, **Before value** takes into account the previous chainage equalities.

In ***12d Model***, the position of a **K-post** can be defined in three ways - 5.6.4.1 K-post coord, 5.6.4.2 K-post chainage and 5.6.4.3 K-post relative

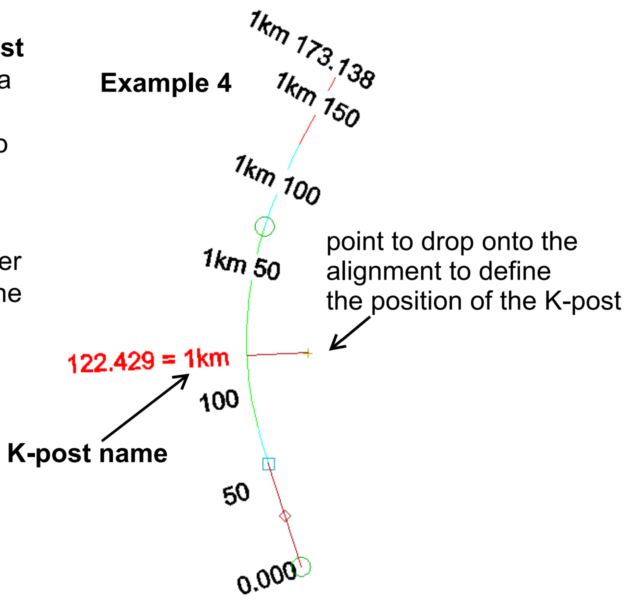
Note: If the preceding chainage equality to an **internal equality** is a 5.6.4 K-Post, the **Before value** is the horizontal distance from that **K-post**.

Continue to 5.6.4.1 K-post coord or return to 5.6 Chainage Equalities

5.6.4.1 K-post coord

For **K-post coord**, the position of the **K-post** is calculated by giving the **coordinates** of a point near the alignment and the **K-post** is where that point drops perpendicularly onto the alignment.

In Example 4, the point drops onto the super alignment at equality chainage **122.429**. The **K-post name** (used as pretext) is **1km**.

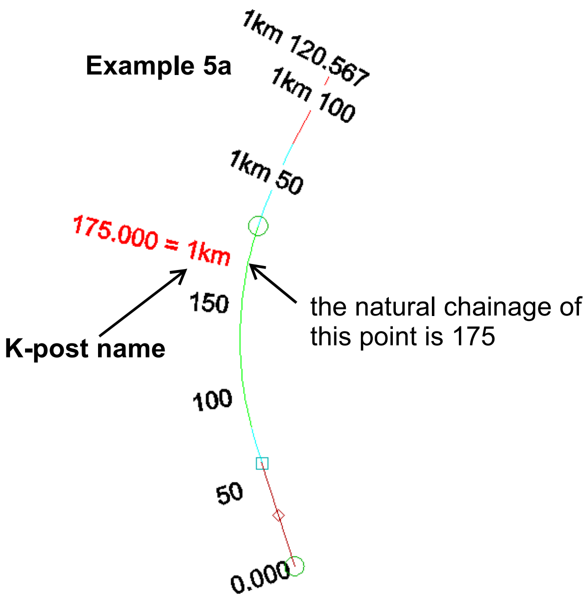


Continue to 5.6.4.2 K-post chainage or return to 5.6 Chainage Equalities

5.6.4.2 K-post chainage

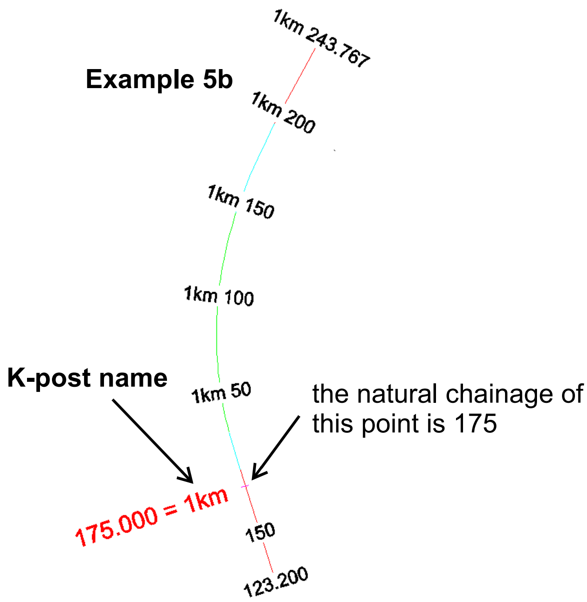
For **K-post chainage**, the position of the **K-post** by giving its 5.6.1 Natural/Raw Chainage.

In Example 5a the position of the **K-post chainage** is at natural chainage **175** and the **K-post name** is **1km**.



In Example 5b the position of the **K-post chainage** is at chainage **175** and the **K-post name** is **1km**.

Note that because the start chainage is not zero, the position of natural chainage 175 changes from where it was in Example 5a.



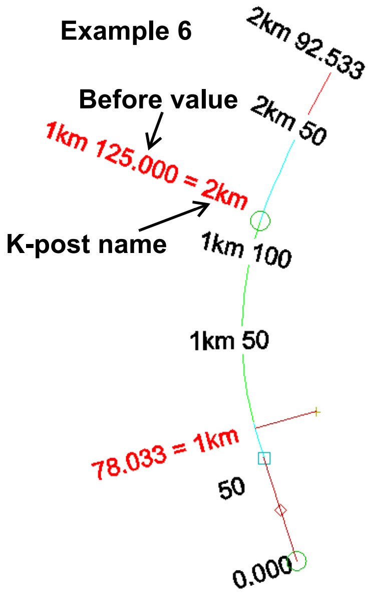
5.6.4.3 K-post relative

For **K-post relative**, a **distance** is given and a **K-post** is created at that **horizontal distance from the previous chainage equality** in the list in the super alignment editor.

If there is no previous chainage equality, the distance of the **K-post** is calculated from the start chainage:

In Example 6 the **K-post relative** has a **Before value** of **125** which represents a horizontal distance from the previous chainage equality which is a **K-post** at raw chainage 78.033 and with a K-post name of **1Km.**

The **K-post name** for the new K-post is **2km**.

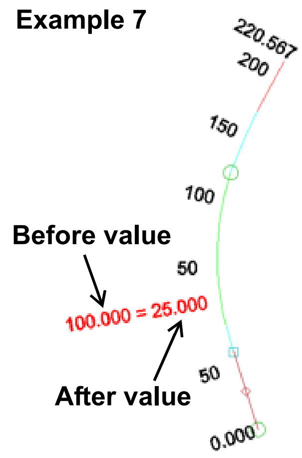


Continue to 5.6.5 Zones or return to 5.6 Chainage Equalities

5.6.5 Zones

When **Chainage equalities,** either **Internal Equalities** and/or **K-posts**, are allowed, a chainage value can be repeated multiple times.

For example in Example 7, chainage **50** refers to two places.



To distinguish between the duplicated chainages, the concept of **Zones** is used.

A **Zone** is the section of the alignment from **a chainage equality until the next chainage equality**.

The first **Zone 0** (or zoneless) by default occurs from the start chainage to the following chainage equality.

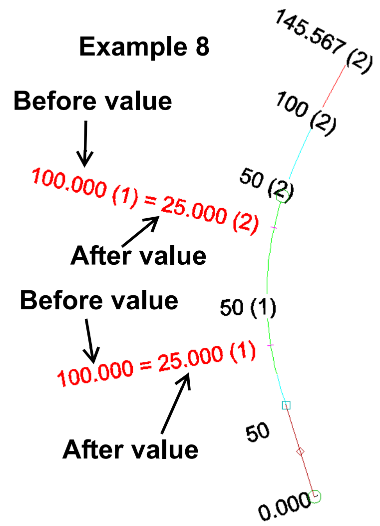
The following **Zones** are labelled as 1, 2, 3, etc until a **K-post** occurs and then the **Zone numbering is reset to Zone 0** (or zoneless) and the **chainage is reset to zero**.

If there are chainage equalities prior to the start chainage then Zone 0 will begin at the first chainage equality and not the start chainage.

For zone numbers other than Zone 0, the zone number is written in round brackets after the chainage value.

In Example 8, there are three chainages equal to 50 but each is in a different Zone.

They are **50**, **50 (1)** and **50 (2)**.



In Example 9, there are two chainage equalities for the super alignment.

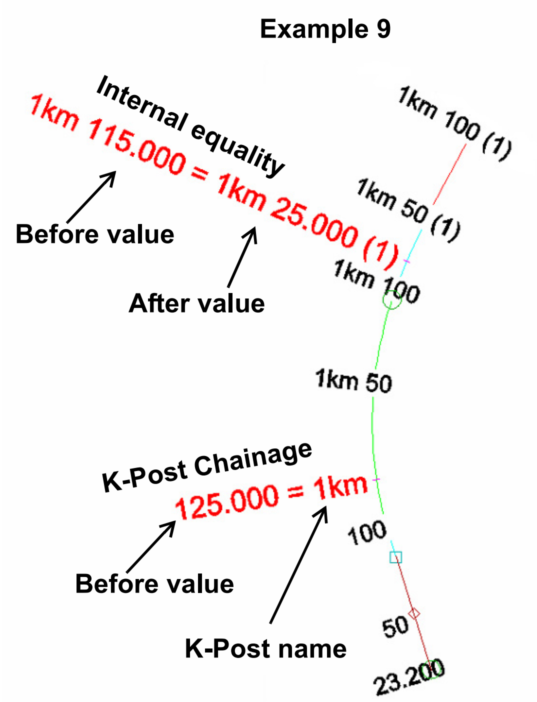
The first chainage equality is a **K-post Chainage** with a **Before value** of **125** and a **K-Post name** of **1 km**.

Subsequent chainages are displayed with a **horizontal distance relative** to the **K-post** and the prepended **K-post name**.

For example, **1km 50**

The second chainage equality is an **Internal Equality** with a **Before value** of **1 km 115** and an **After value** of **1 km 25**.

Subsequent chainages to the second chainage equality are displayed with an **horizontal distance relative** to the **After value** of the internal equality (ie 25.0 + horizontal distance from the internal equality), with the **prepended K-post name** from the first chainage equality. Plus an appended zone label of **(1)** to indicate it a new zone with an incremented number starts after an internal equality.



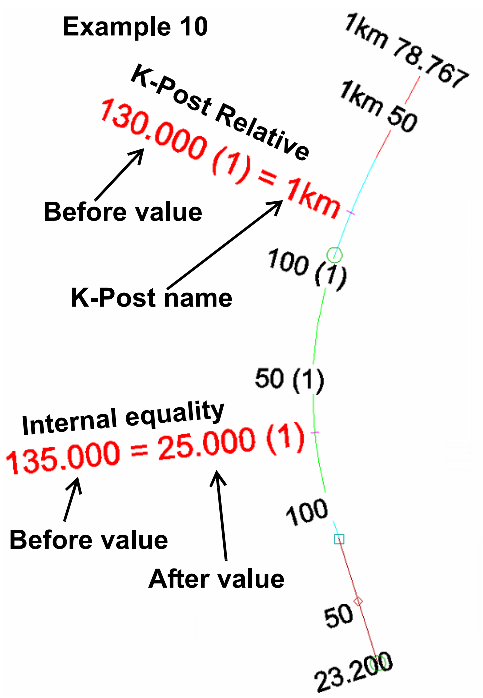
In example 10, there are two chainage equalities for the super alignment.

The first chainage equality along the super alignment is an **Internal Equality** with a **Before value** of **135** and an **After value** of **25**.

Subsequent chainages **until the K-post** are displayed with an offset relative to the **After value** with an appended zone label of **(1)** to indicate the new zone after the internal equality.

The second chainage equality is a **K-post Relative** with a **Before value** of **130**. The subsequent chainages along the super alignment are displayed with a horizontal distance from the **K-post** and the prepended **K-post name** of **1 km**.

Note: Zoning is reset to **0** (Zoneless) after each **K-post**



Continue to 5.7 Sharing of Models and Tins or return to 5.6 Chainage Equalities

5.7 Sharing of Models and Tins

Now documented In the v15 reference manual

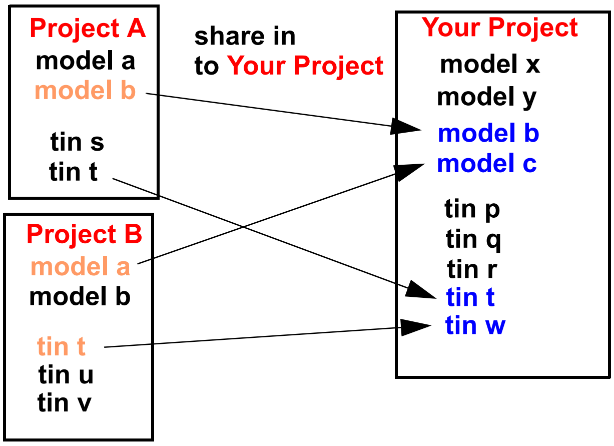
See

5.7.1 Share In
5.7.2 Share Out
5.7.3 Share In and Out
5.7.5 Sharing Cache Folder
5.7.6 Master Share Files

5.7.1 Share In

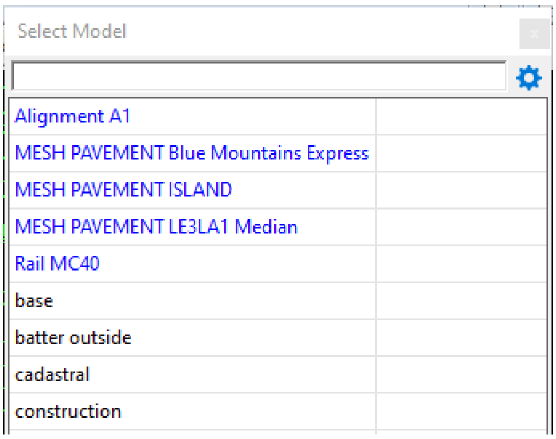
Models and **Tins** can be **shared into your project** from other projects.

What that means is that in your project, you can have models and tins that are not created in your project, but are **copies** of the models and tins from the other project.



And when the models and tins are modified in the other project, they can be **automatically updated** in your project.

In the pop-up lists for models and tins, the models and tins that have been **shared in** to your project are shown in **blue**.



Note: the colour denoting **shared out** models and tins can be changed in the env.4d file. See

Projects > Sharing or SHARING_ELEMENT_COLOUR_4D.

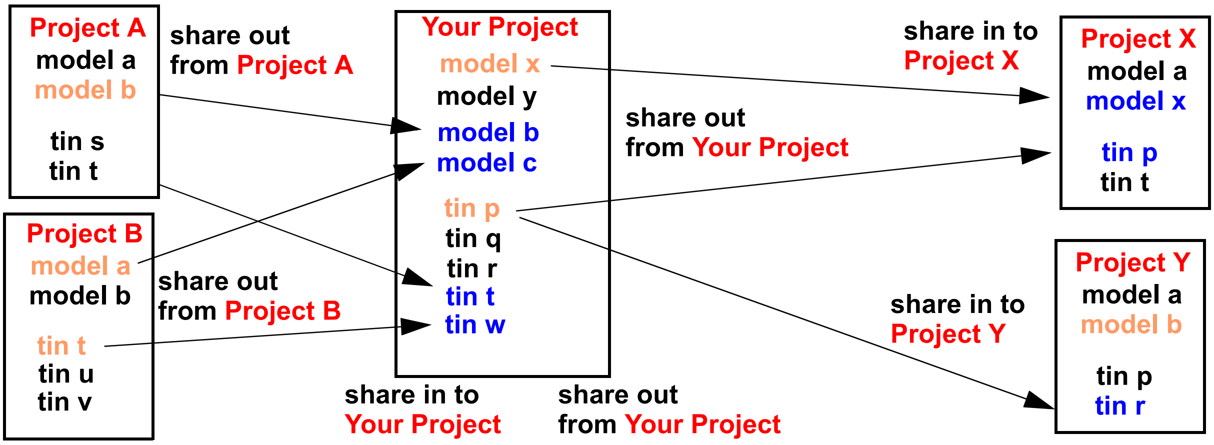
To share in models, see 10.8.7.2 Share In Other Models.
To share in tins, see 15.13.16.2 Share In Other Tins.

Continue to 5.7.2 Share Out or return to 5.7 Sharing of Models and Tins.

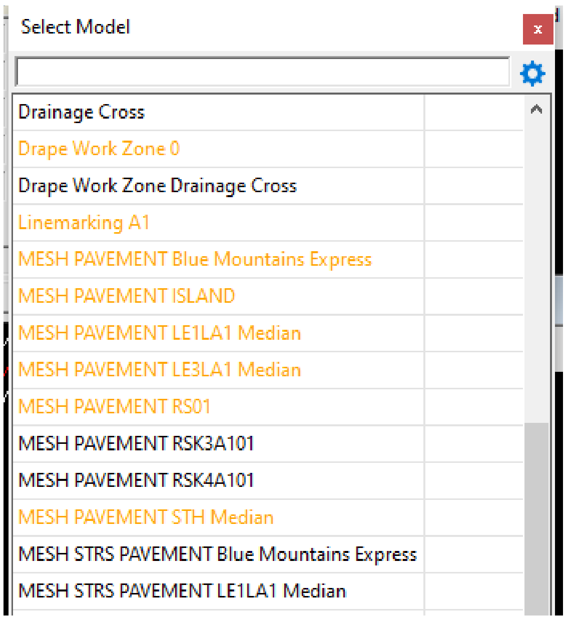
5.7.2 Share Out

In a project, which models and tins are available to be shared in to other projects is totally controlled.

This is done by specifying in the project, which models and tins can be **shared out** and hence available to be shared in to other projects.



In the pop-up lists for models and tins, the models and tins in a project that have been designated as **share out** models are shown in orange.



Note: the colour denoting **shared out** models and tins can be changed in the env.4d file. See Projects > Sharing or SHARED_ELEMENT_COLOUR_4D.

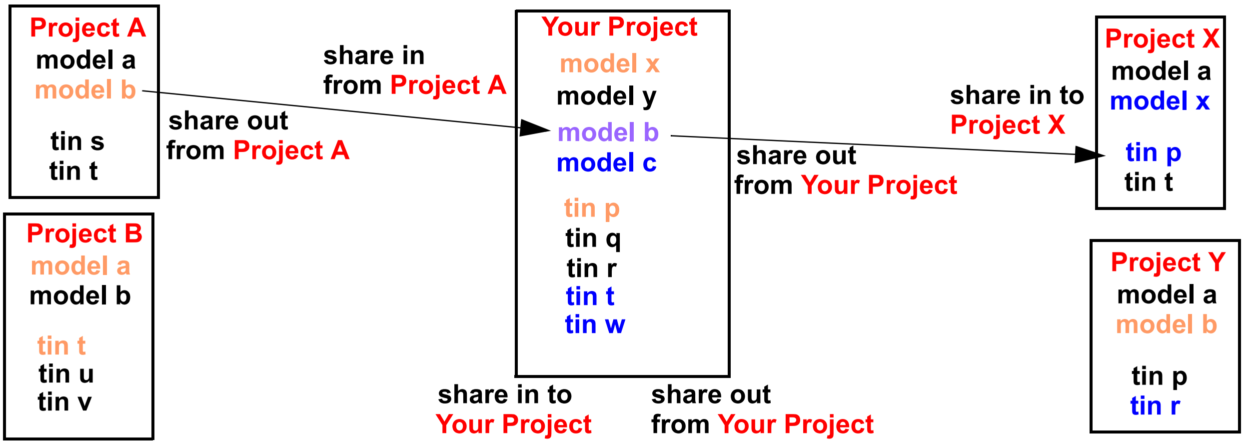
To share out models, see 10.8.7.1 Share Out Models and 7.13.2 Share Manager.

To share in tins, see 15.13.16.1 Sharing Out Tins and 7.13.2 Share Manager.

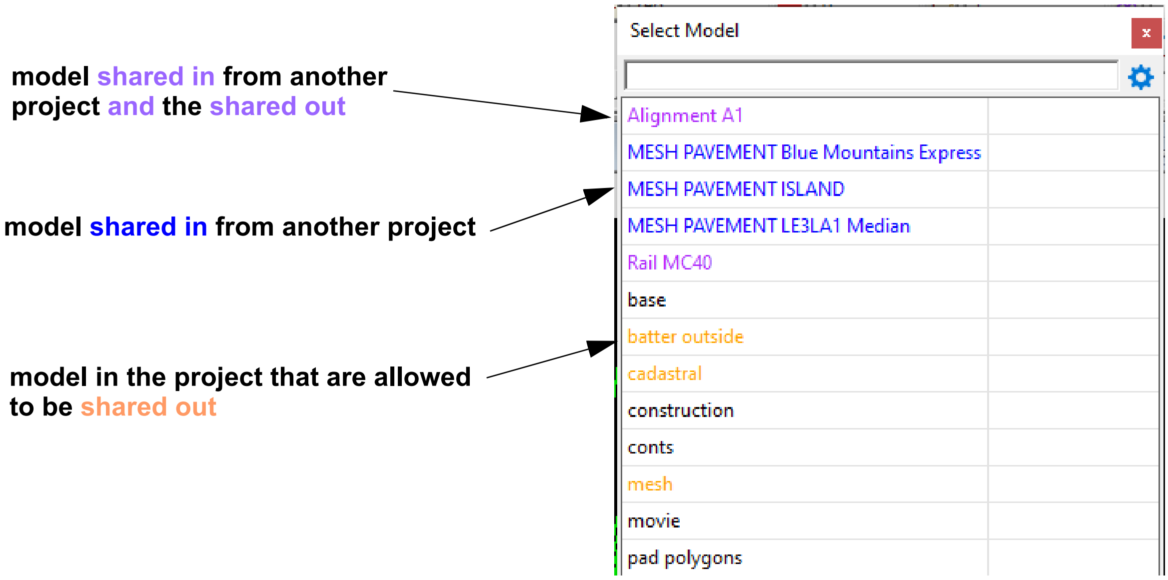
Continue to 5.7.3 Share In and Out or return to 5.7 Sharing of Models and Tins.

5.7.3 Share In and Out

It is possible to have Shares of Shares. That is, you share a model or tin **in to your project**, and then that model or tin is **shared out to another project**.



In the pop-up lists for models and tins, the models and tins that have been shared in to your project, and then made available to be **share out** from your project, are shown in **mauve**. This colour can be changed in the env.4d file - see Projects > Sharing.



Continue to 5.7.4 Synchronising Shares or return to 5.7 Sharing of Models and Tins.

5.7.4 Synchronising Shares

When models and tins that are shared in to your project are modified in their original projects, the shared in models and tins in the project need to be updated to match the modified models and tins.

Synchronization regularly checks each model and tin shared in to the current project to see if the model or tin has been modified in the original project since the model or tin was last copied to the current project. If any tin or model has been modified, it is re-copied to the current project.

The time, in **seconds**, between checks is given by the environment variable 10.8.7.4 Synchronize Shared In Models. There are also two other environment variables, AUTO_MODEL_SYNC_4D and AUTO_TIN_SYNC_4D, to control if synchronization is done or not done for models and tins respectively.

The three (3) environment variables SHARE_CHECK_INTERVAL_4D, AUTO_MODEL_SYNC_4D and AUTO_TIN_SYNC_4D are set in the Projects > Sharing section of the env.4d editor (7.12.2 Create/Edit env.4d).

For more flexibility, the values of the three environment variables can be modified for the current session using the panel **Project Share Settings** found at ***Project =>Sharing =>Settings*** (7.13.3 Project Share Settings).

Finally, synchronizing can be done manually at anytime using the options **Synchronize Shared In Models** (10.8.7.4 Synchronize Shared In Models) and **Synchronize Shared In Tins** (15.13.16.4 Synchronize Shared In Tins).

Continue to 5.7.5 Sharing Cache Folder or return to 5.7 Sharing of Models and Tins.

5.7.5 Sharing Cache Folder

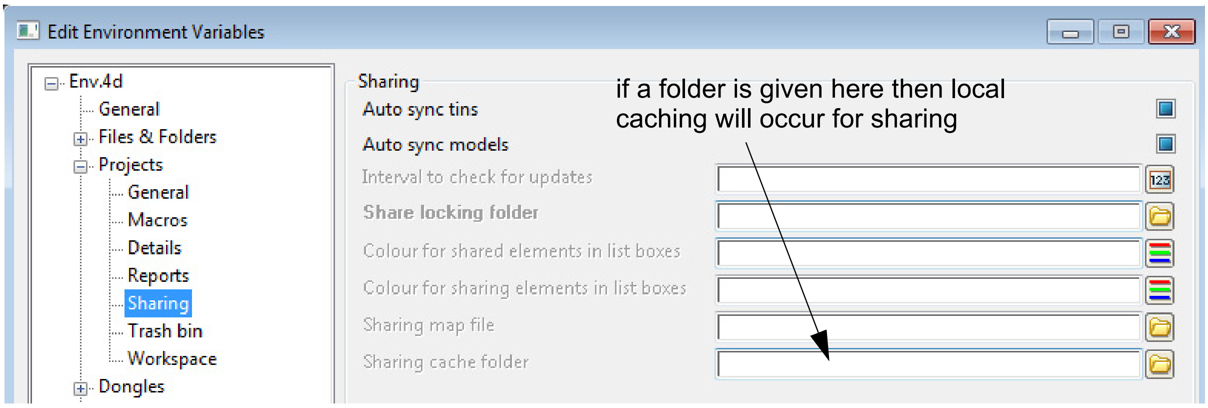
NOT YET IMPLEMENTED FOR V15

When models and tins are shared into your project, a copy of the models and tins are copied over into your project. And each time one of the models or tins is modified in the original project, a new copy is made in your project.

However when you exit a project, the next time you start the project the models and tins that are shared into your project may not have changed. Rather than copying the models and tins again, it is possible to have the models and tins saved in a special folder, called a **Sharing Cache Folder**, so they do not have to be copied over again when ever a project is restarted.

There is an environment variable, **SHARING_CACHE_4D**, which gives the full path name to the local folder to use as the ***Sharing Cache Folder***.

In the ***Edit Environment Variables*** panel, it is the field ***Sharing cache folder*** in Projects > Sharing



If ***Sharing cache folder*** is left blank then local caching does not occur.

Continue to 5.7.5 Sharing Cache Folder or return to 5.7 Sharing of Models and Tins.

5.7.6 Master Share Files

Although for each project you can define which models and tins are shared into the project, this can become unwieldy when there are a large number of projects sharing in data from many other projects. Master share files are very useful in these situations.

A ***Master Share File*** is a file that contains a list of projects, and for each project, the models and tins that are to be shared in from that project. There can be more than one Master Share File.

Any number of projects can use one or more Master Share FIles.

Using a master share fIle with a project shares in all the models and tins listed in the master share files without having to do them individually.

So master share files are an easy way to set up the models and tins to be automatically shared in by a group of users.

Master share files are created and edited using the **Share Manager** panel. For a particular project, the **Share Manager** panel also specifies which master share files are used by the project. See 7.13.2 Share Manager.

Important Note

A master share file **CANNOT** make a model or tin in any project available for sharing out. This is strictly under the control of each individual project.

So even though a model or tin is listed for a particular project in a master share file, it is only when the model or tin has been shared out in the project itself, that the model or tin can be share into another project using a master share file.

For more information on sharing, see 5.7 Sharing of Models and Tins.

5.8 Enabling Long Paths in Windows

Now documented In the v15 reference manual

Starting in Windows 10, version 1607, **MAX_PATH** limitations have been removed from common Win32 file and directory functions. However, you must opt-in to the new behavior.

To enable the new long path behavior, both of the following conditions must be met:

The registry key

Computer\HKEY_LOCAL_MACHINE\SYSTEM\CurrentControlSet\Control\FileSystem\LongPathsEnabled

must exist and be set to **1** (Type: REG_DWORD) .

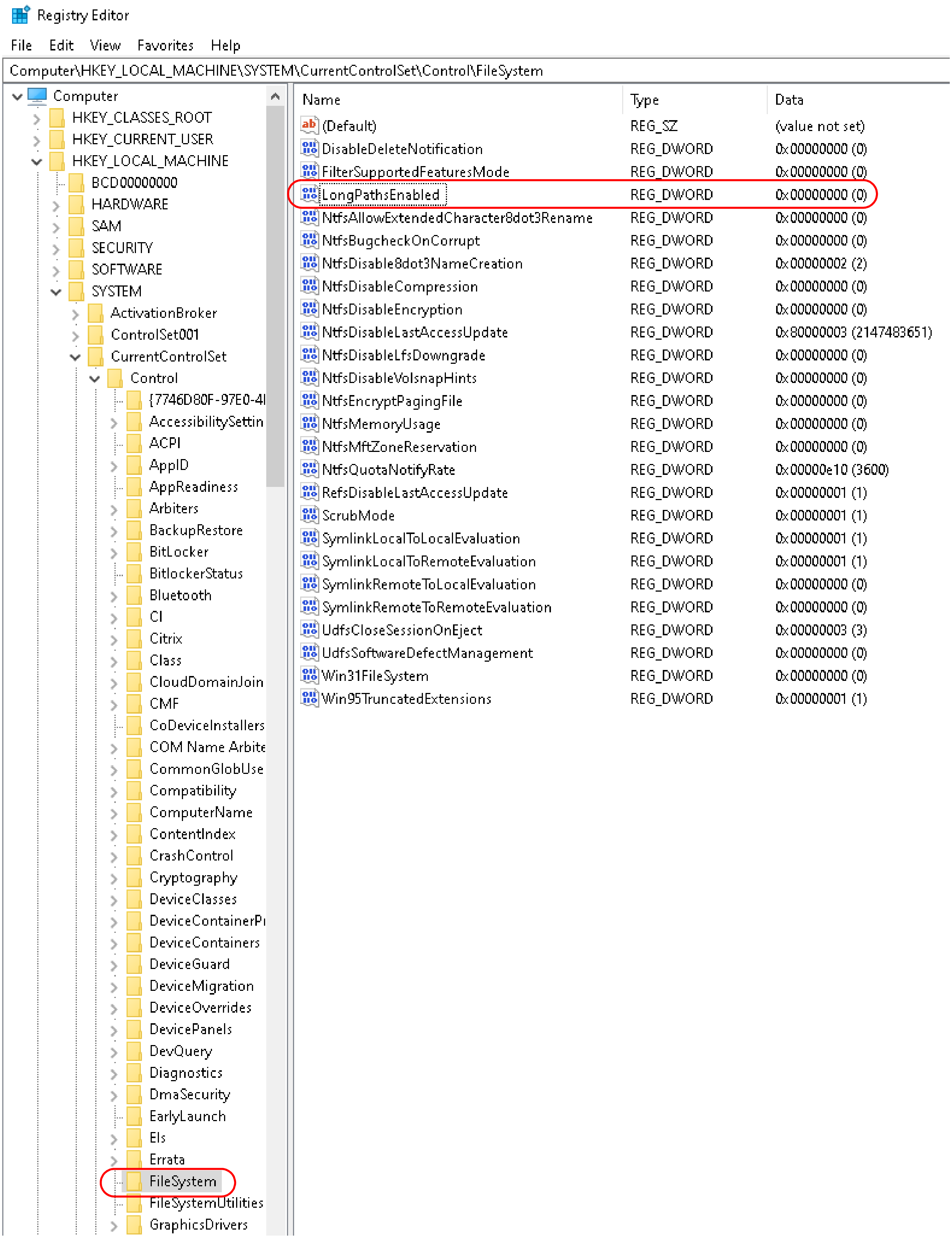
The key's value will be cached by the system (per process) after the first call to an affected Win32 file or directory function.

The registry key will not be reloaded during the lifetime of the process.

In order for all apps on the system to recognise the value of the key, a reboot might be required because some processes may have started before the key was set.

See

https://docs.microsoft.com/en-us/windows/win32/fileio/maximum-file-path-limitation?tabs=cmd


Registry Editor
File Edit View Favorites Help
Computer\HKEY_LOCAL_MACHINE\SYSTEM\CurrentControlSet\Control\FileSystem
Computer
HKEY_CLASSES_ROOT
HKEY_CURRENT_USER
HKEY_LOCAL_MACHINE
BCD00000000
HARDWARE
SAM
SECURITY
SOFTWARE
SYSTEM
ActivationBroker
ControlSet001
CurrentControlSet
Control
{7746D80F-97E0-4I
AccessibilitySettin
ACPI
AppID
AppReadiness
Arbiters
BackupRestore
BitLocker
BitlockerStatus
Bluetooth
CI
Citrix
Class
CloudDomainJoin
CMF
CoDeviceInstallers
COM Name Arbite
CommonGlobUse
Compatibility
ComputerName
ContentIndex
CrashControl
Cryptography
DeviceClasses
DeviceContainerPr
DeviceContainers
DeviceGuard
DeviceMigration
DeviceOverrides
DevicePanels
DevQuery
Diagnostics
DmaSecurity
EarlyLaunch
Els
Errata
FileSystem
FileSystemUtilities
GraphicsDrivers
Name Type Data
(Default) REG_SZ (value not set)
DisableDeleteNotification REG_DWORD 0x00000000 (0)
FilterSupportedFeaturesMode REG_DWORD 0x00000000 (0)
LongPathsEnabled REG_DWORD 0x00000000 (0)
NtfsAllowExtendedCharacter8dot3Rename REG_DWORD 0x00000000 (0)
NtfsBugcheckOnCorrupt REG_DWORD 0x00000000 (0)
NtfsDisable8dot3NameCreation REG_DWORD 0x00000002 (2)
NtfsDisableCompression REG_DWORD 0x00000000 (0)
NtfsDisableEncryption REG_DWORD 0x00000000 (0)
NtfsDisableLastAccessUpdate REG_DWORD 0x80000003 (2147483651)
NtfsDisableLfsDowngrade REG_DWORD 0x00000000 (0)
NtfsDisableVolsnapHints REG_DWORD 0x00000000 (0)
NtfsEncryptPagingFile REG_DWORD 0x00000000 (0)
NtfsMemoryUsage REG_DWORD 0x00000000 (0)
NtfsMftZoneReservation REG_DWORD 0x00000000 (0)
NtfsQuotaNotifyRate REG_DWORD 0x00000e10 (3600)
RefsDisableLastAccessUpdate REG_DWORD 0x00000001 (1)
ScrubMode REG_DWORD 0x00000001 (1)
SymlinkLocalToLocalEvaluation REG_DWORD 0x00000001 (1)
SymlinkLocalToRemoteEvaluation REG_DWORD 0x00000001 (1)
SymlinkRemoteToLocalEvaluation REG_DWORD 0x00000000 (0)
SymlinkRemoteToRemoteEvaluation REG_DWORD 0x00000000 (0)
UdfsCloseSessionOnEject REG_DWORD 0x00000003 (3)
UdfsSoftwareDefectManagement REG_DWORD 0x00000000 (0)
Win31FileSystem REG_DWORD 0x00000000 (0)
Win95TruncatedExtensions REG_DWORD 0x00000001 (1)

5.9 Migration of Projects From Command Line

Now documented In the v15 reference manual

Lets assume there is a project in

"c:\4d_test\projects\job 1234"

and the project folder is

emu_park.project

1st rename the folder to

emu_park_old.project

then run the command line

"c:\program files\12d\12dmodel\15.00\nt.x64\12d.exe" -create "c:\4d_test\projects\job 1234\emu_park.project" -migrate_offline "c:\4d_test\projects\job 1234\emu_park_old.project"

this will create the V15 project, from the old, and once the migration is finished, 12d will exit.

Note the command line:

"c:\program files\12d\12dmodel\15.00\nt.x64\12d.exe" -create "c:\4d_test\projects\job 1234\emu_park.project" -migrate "c:\4d_test\projects\job 1234\emu_park_old.project"

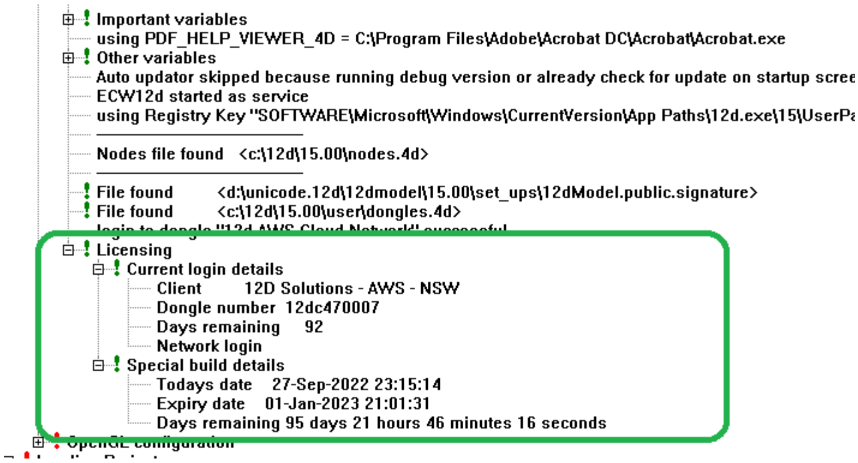
will also migrate the project, however 12d will continue to run.

Note:

A file called, **emu_park_migration_output_window.xml w**ill be created which is the contents of the output window. This is handy if you are migrating many project as a single batch operation. So as you can see, for the project folder "emu_park.project" , the folder name minus .project is uses as the stem for the file name. So for the project folder "fred_blogs.project" , the xml file name will be "fred_blobs_migration_output_window.xml".

5.9.0.1 Startup Information in Output Window

The logline group Licensing contains information about the current licensing.



Two sub groups are as below and contains the information:

Current login details

Client

Dongle number

Days remaining

Local login, or Network login

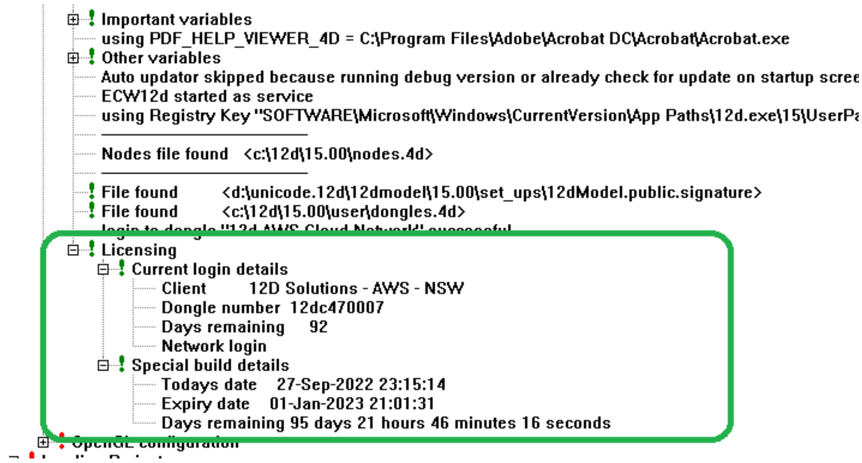
Special build details

Todays date

Expiry date

5.9.0.2 Startup Information in Output Window

The logline group Licensing contains information about the current licensing.



Two sub groups are as below and contains the information:

Current login details

Client

Dongle number

Days remaining

Local login, or Network login

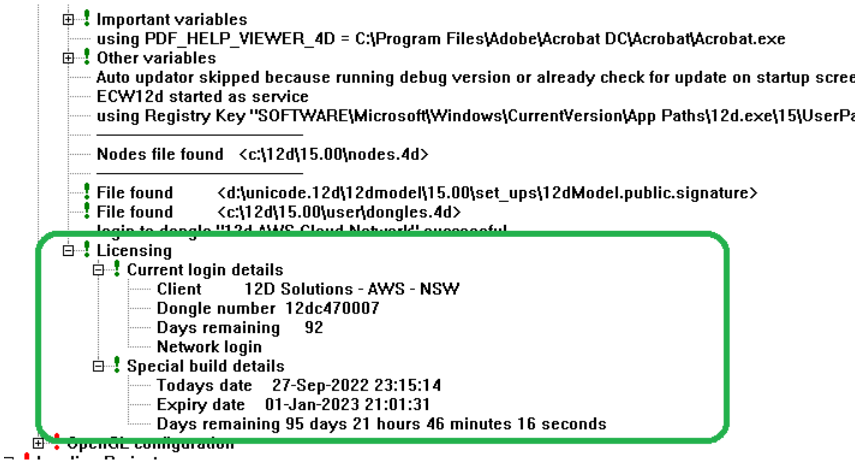
Special build details

Todays date

Expiry date

5.10 Startup Information in Output Window

The logline group Licensing contains information about the current licensing.



Two sub groups are as below and contains the information:

Current login details

Client

Dongle number

Days remaining

Local login, or Network login

Special build details

Todays date

Expiry date

Days remaining

6 Menus on Views

There has been changes to the **View** chapter in the ***12d Model Reference manual***.

See 6.1 Plan View Menu

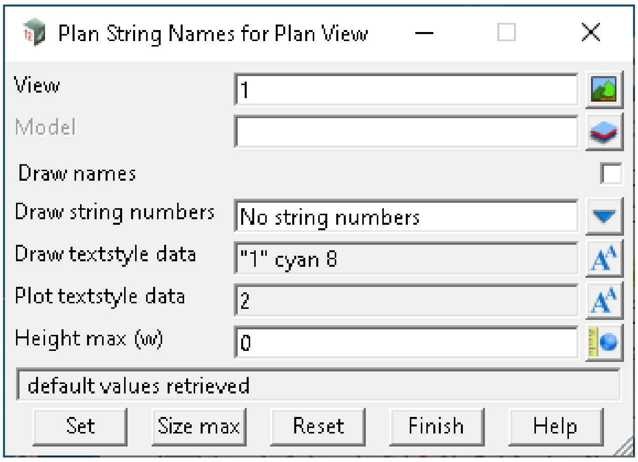
See 6.2 Persepctive View Menu

See 6.3 Section View Menu

6.1 Plan View Menu

6.1.1 Single for Values Text, Crosses and Text on Plan Views

The option **Draw string numbers** has changed from a tick box to a choice box.



For Plan String Names

Draw string numbers	choice box	No strings	No string numbers, All string numbers String numbers excluding 0 or blank

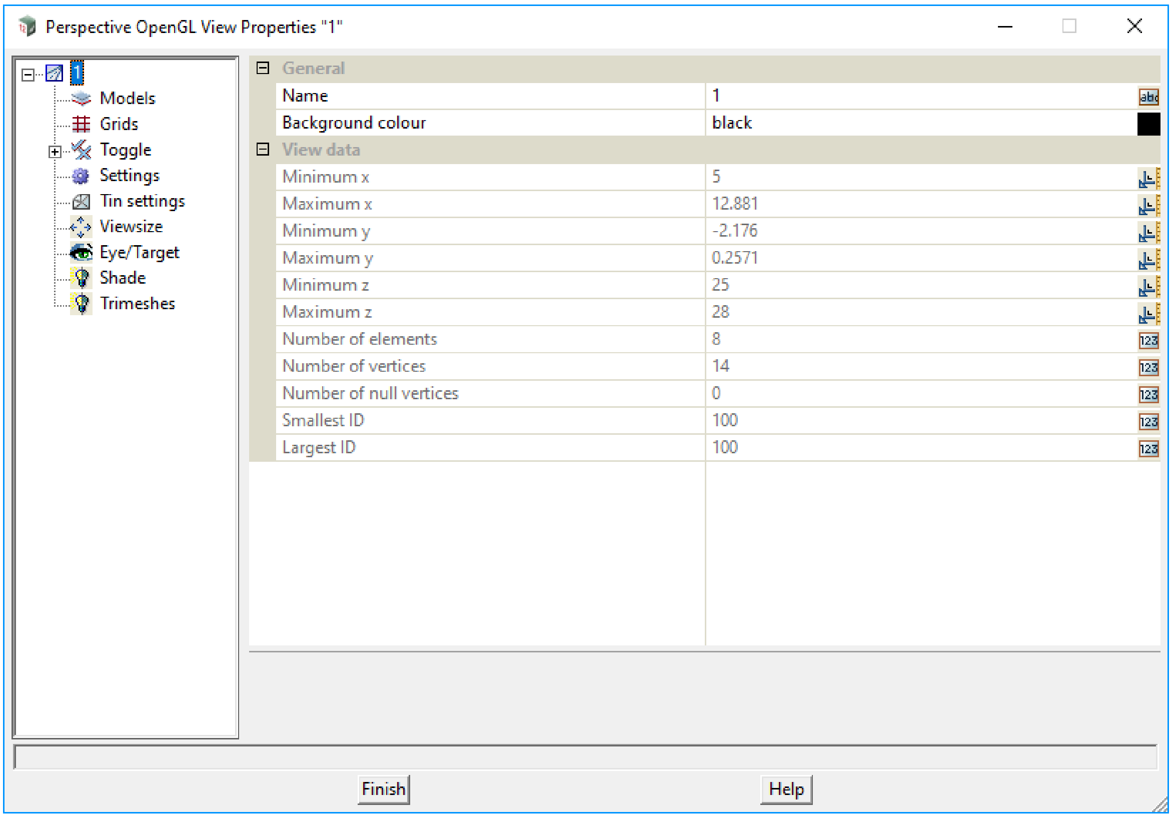
*If **No string numbers** is selected, then the view does not display any objects assigned a string number.*

*If **All string numbers** is selected, then the view displays (?) after the string name, even if string number is 0 or blank.*

*If **String numbers excluding 0 or blank**, then the view on display (?) after the string name, but will not display (?) if the string number is 0 or blank.*

6.2 Persepctive View Menu

6.2.1 Perspective/Perspective Opengl View Properties



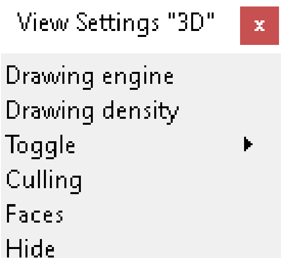
6.2.2 Perspective View Settings

Now documented In the v15 reference manual

Position of menu: **Perspective View Menu** **View =>Settings**

If the **Settings** option is clicked rather than moving onto the **Settings** 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 (see 6.2.2.1 Perspective Toggle).

The **Settings** walk-right menu for the perspective view is



See

6.2.2.1 Perspective Toggle

6.2.2.1 Perspective Toggle

Position of menu: **Perspective View Menu =>Settings =>Toggle**

Toggle button **on Perspective View buttons**

The **Toggle** walk right brings up the **Toggle** perspective view menu with a number of new options:

See

6.2.2.1.1 Toggle Draw Solid Coloured Faces
6.2.2.1.2 Toggle Draw Edges
6.2.2.1.3 Toggle Shade Solids
6.2.2.1.5 Toggle Shade Edges

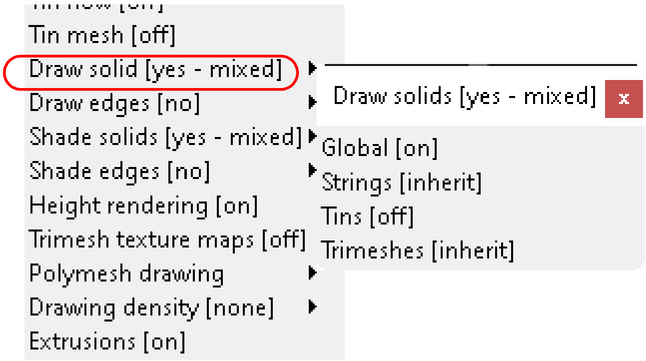
6.2.2.1.6 Toggle Displaying Trimeshes with Texture Mapping
6.2.2.1.7 Polymesh Drawing
6.2.2.1.8 Drawing Density Toggle
6.2.2.1.9 Toggle Extrusions

6.2.2.1.1 Toggle Draw Solid Coloured Faces

On Open GL views, **solid colour filled faces** such as in super pipes, tins, trimeshes, water strings, and super alignment pipes can be displayed or not displayed.

It is possible to separately define if super pipes, tins or trimeshes are **drawn** or **not drawn**.

So the **Draw solid** menu item has a walk-right menu as well:



Clicking the **Draw solid** menu item itself toggles the **displaying coloured faces on** and **off**.

Note: This toggle is for the coloured faces but there is also a toggle for the edges of faces. So even if the faces are not drawn, the edges of the faces can be drawn. See 6.2.2.1.2 Toggle Draw Edges and 6.2.2.1.4 Drawing Solid Coloured Faces and/or Edges and/or Shade Solids.

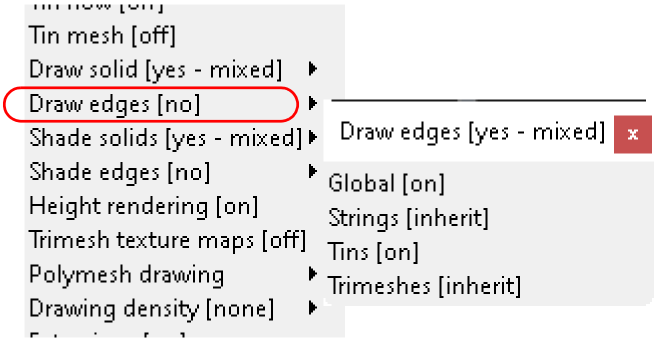
Continue to 6.2.2.1.2 Toggle Draw Edges or return to 6.2.2.1 Perspective Toggle.

6.2.2.1.2 Toggle Draw Edges

On Open GL views, the edges **solid colour filled faces** such as in super pipes, tins, trimeshes, water strings, and super alignment pipes can be displayed or not displayed.

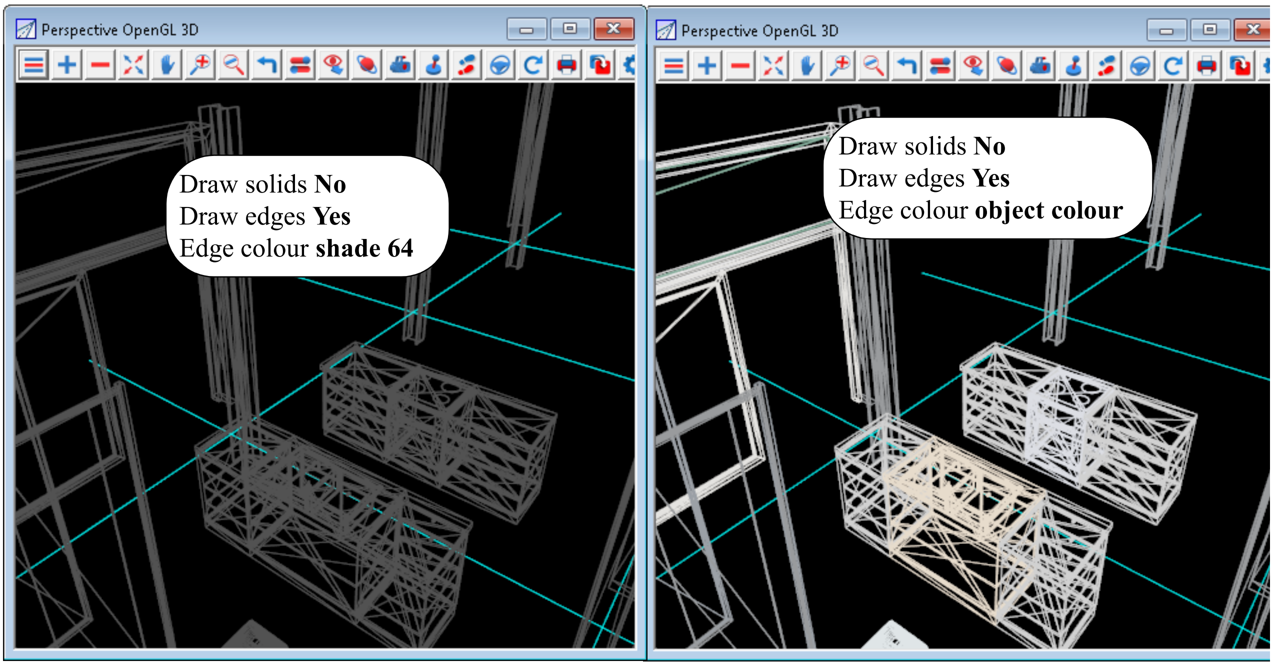
It is possible to separately define if the edges of super pipes, tins or trimeshes are **drawn** or **not drawn**.

So the **Draw edges** menu item has a walk-right menu as well:



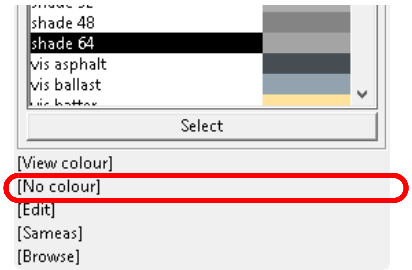
Clicking on **Draw edges** menu items itself toggles the **displaying of edges on** and **off**.

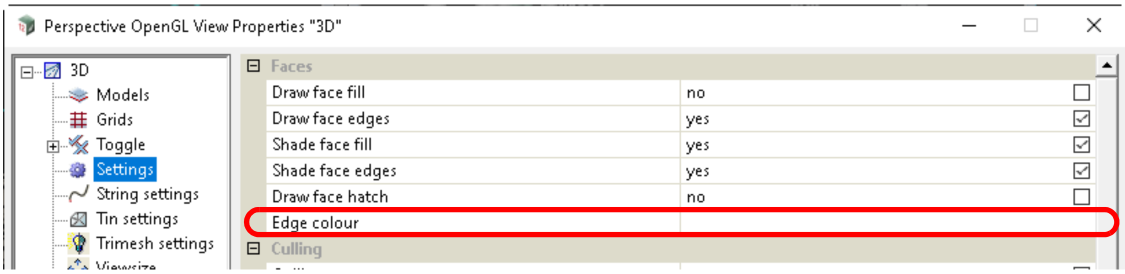
Note:
The colour of the edges can be a set colour, or the edges can be drawn in the colour of the object that it is an edge for.



The edge colour is set in the file **Settings > Edge colour** in the view **Properties**.

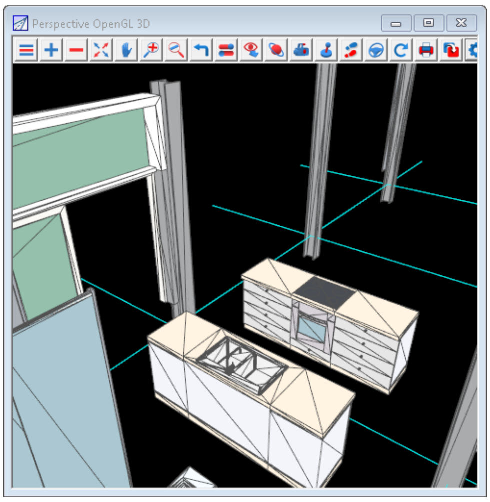
To select **object colour**, select **[No colour]** from the colour pop-up





This toggle is for the edges of faces but there is also a toggle for drawing the coloured faces.So even if the edges are not drawn, the solid faces can be drawn. See 6.2.2.1.1 Toggle Draw Solid Coloured Faces. and 6.2.2.1.4 Drawing Solid Coloured Faces and/or Edges and/or Shade Solids.

For situations where the edges and the solid coloured faces are **both** drawn, a very dark grey edge colour works well.



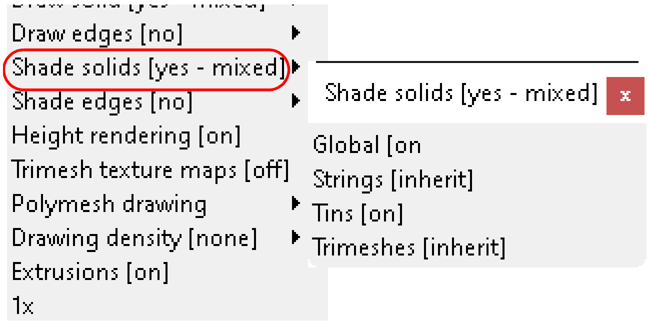
Continue to 6.2.2.1.3 Toggle Shade Solids or return to 6.2.2.1 Perspective Toggle or 6.2.2 Perspective View Settings.

6.2.2.1.3 Toggle Shade Solids

On Open GL views, **solid colour filled faces** such as in super pipes, tins, trimeshes, water strings, and super alignment pipes can be displayed as if there was a sun at a certain angle or position in the sky.

It is possible to separately define if super pipes, tins or trimeshes are shaded or not shaded.

So the **Shade solids** menu item has a walk-right menu as well:



Clicking on **Shade solids** menu items itself toggles the **drawing with shading on** and **off**.

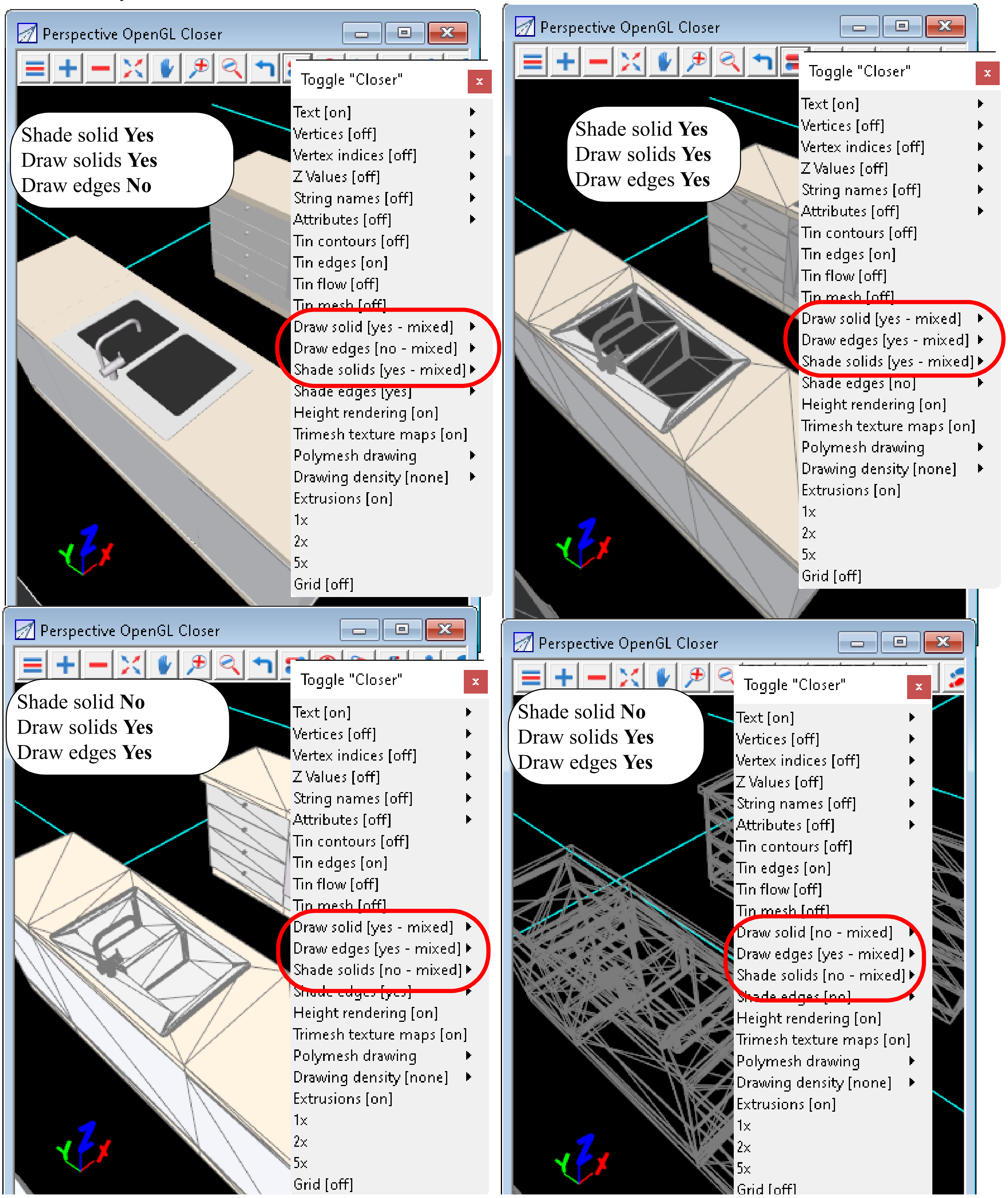
Continue to 6.2.2.1.4 Drawing Solid Coloured Faces and/or Edges and/or Shade Solids or return to 6.2.2.1 Perspective Toggle or 6.2.2 Perspective View Settings.

6.2.2.1.4 Drawing Solid Coloured Faces and/or Edges and/or Shade Solids

There are two important represent.tions of objects that can be displayed, or not displayed, in an Perspective OpenGL view:

1. objects with solid colour filled faces (super pipes, extrusions, tins, trimeshes, water strings and super alignment pipes) can have their faces drawn or not drawn.
2. objects can have their edges drawn or not drawn

Often when solid filled faces and edges are both drawn, **Shading** can be off and the objects are still very well defined.



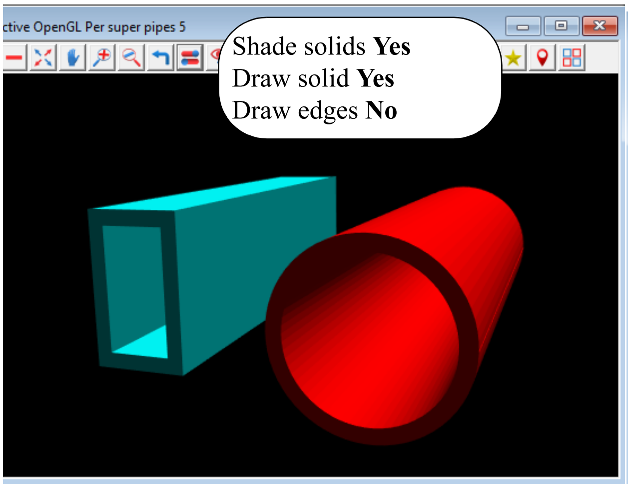
In the given example, the colour for drawing of the edges was set to a grey colour (pen 018). This stands out fairly well on most coloured solid faces.

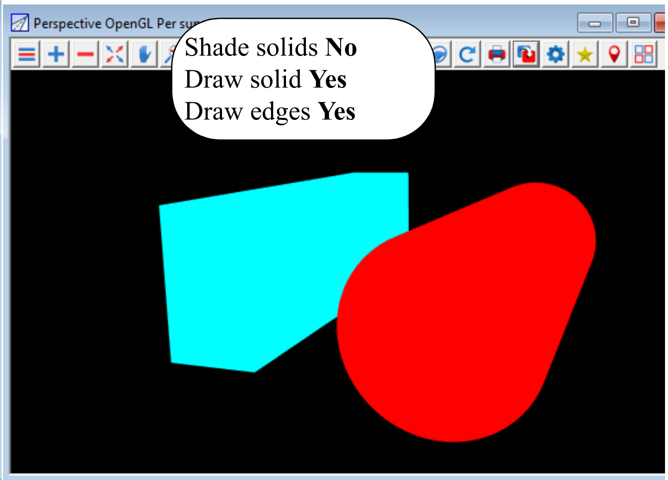
However, it is possible to change the colour that the edges are drawn in and when only the edges are drawn, it is useful to set the colour to draw the edges as the colour of faces themselves.

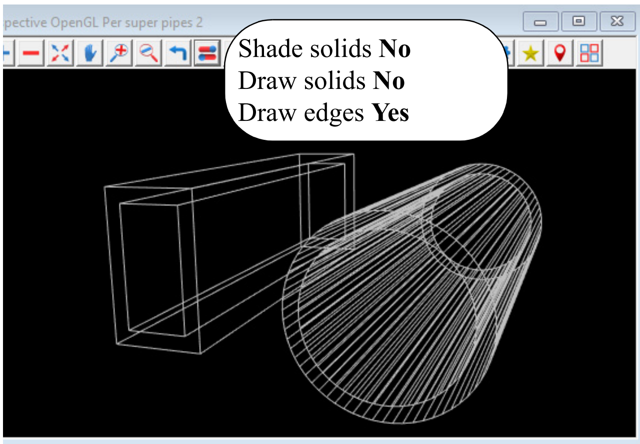
Which combination of toggles is best to use depends on what the view is for, the type of objects in the view, the viewing angle etc.

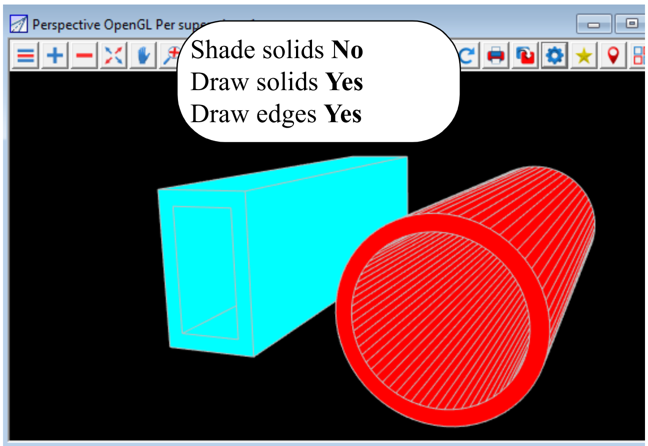
Examples of the effect of the different settings for a round and rectangular super pipe are:

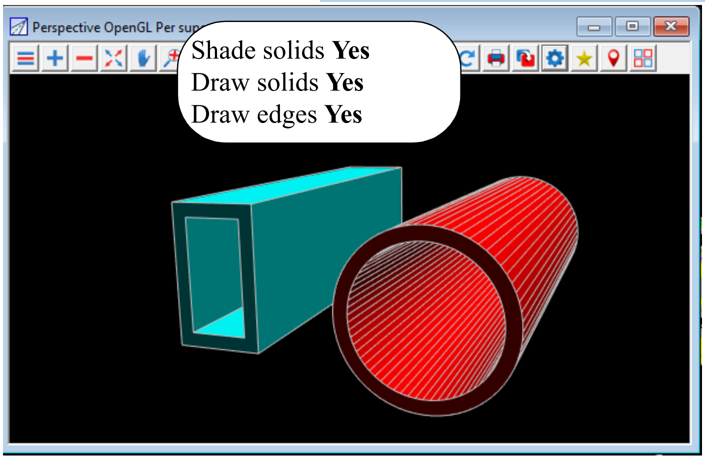
.





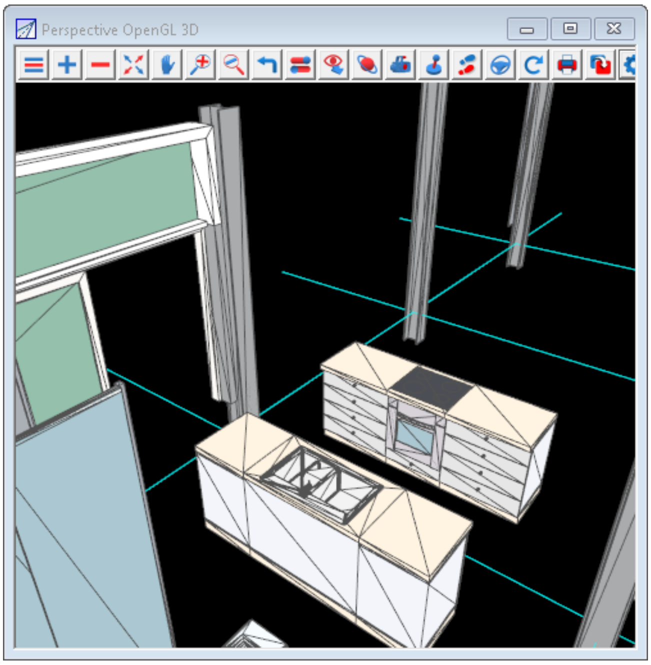




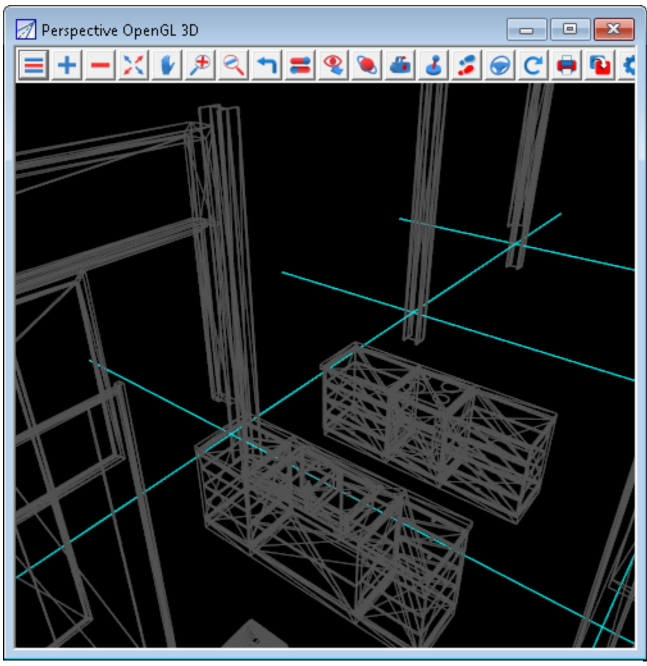


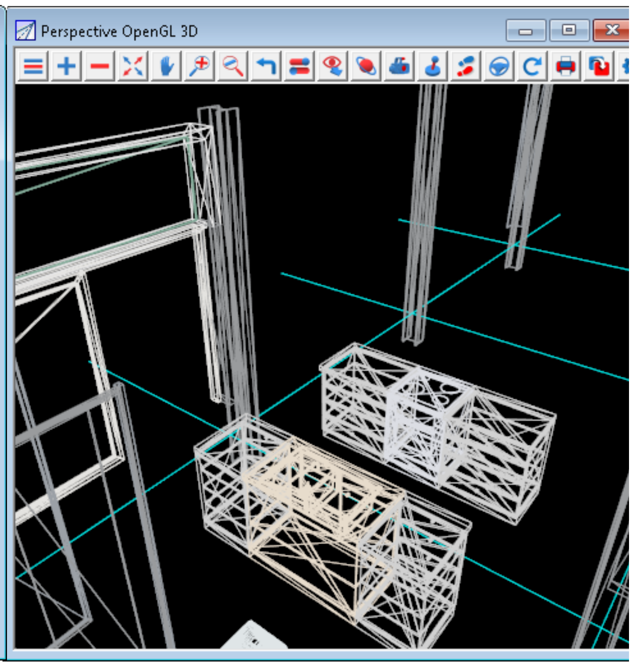
Note that for edges, the colour of the edges can be a set colour, or the edges are drawn in the colour of the object that it is an edge for.

For situations where the edges and the solid coloured faces are both drawn, a dark grey edge colour works well.



If only the edges are drawn, then have the edges drawn in the colour of the objects allows different coloured objects to be more easily differentiated.





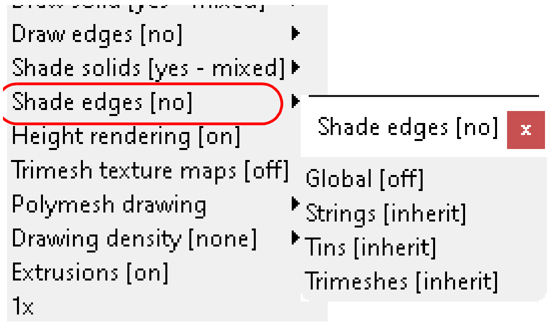
Continue to 6.2.2.1.5 Toggle Shade Edges or return to 6.2.2.1 Perspective Toggle or 6.2.2 Perspective View Settings.

6.2.2.1.5 Toggle Shade Edges

On Open GL views, edges if **solid colour filled faces** such as in super pipes, tins, trimeshes, water strings, and super alignment pipes can be displayed as if there was a sun at a certain angle or position in the sky.

It is possible to separately define if the edges of super pipes, tins or trimeshes are shaded or not shaded.

So the **Shade edges** menu item has a walk-right menu as well:



Clicking on the **Shade edges** menu item itself toggles the **drawing edges with shading on** and **off**.

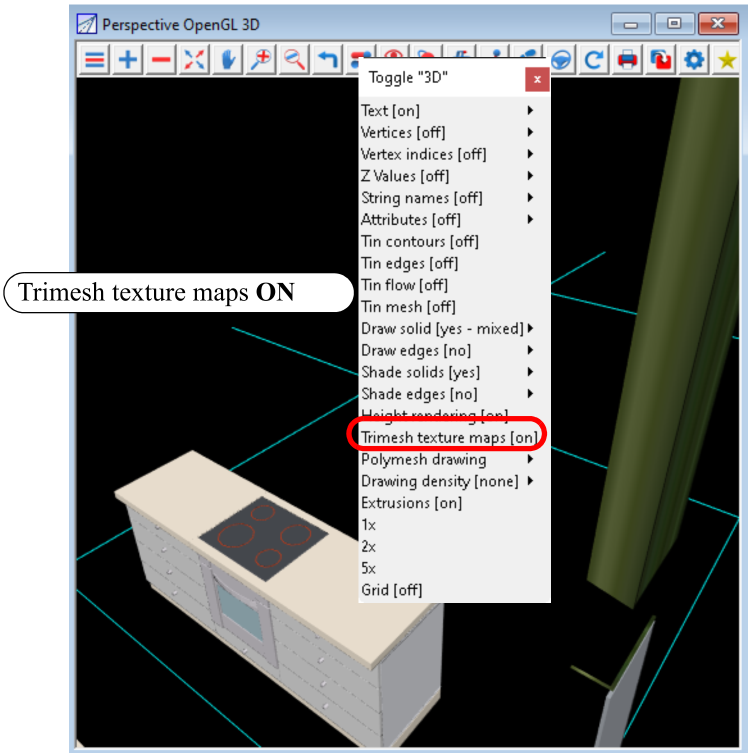
Continue to 6.2.2.1.6 Toggle Displaying Trimeshes with Texture Mapping or return to 6.2.2.1 Perspective Toggle or 6.2.2 Perspective View Settings.

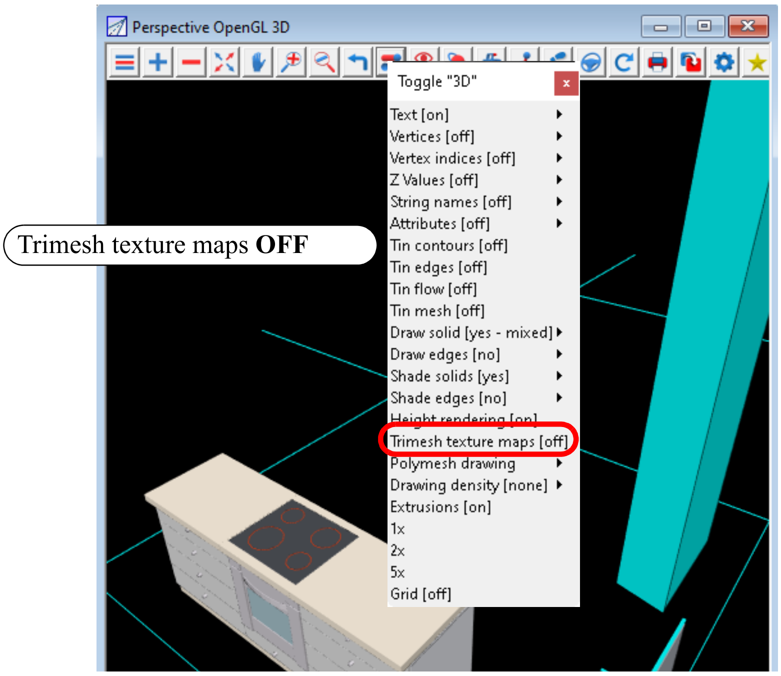
6.2.2.1.6 Toggle Displaying Trimeshes with Texture Mapping

When **Trimesh texture maps** is toggled **ON** (the **default**), the mapping of colours to textures is applied to the faces of the trimeshes.

When **Trimesh texture maps** is toggled **OFF**, the mapping of colours to textures is NOT applied to the faces of the trimeshes.

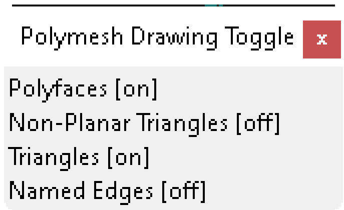
In the example below, the colour **cyan** is mapped to the texture **Grass1**





Continue to 6.2.2.1.7 Polymesh Drawing or return to 6.2.2.1 Perspective Toggle or 6.2.2 Perspective View Settings.

6.2.2.1.7 Polymesh Drawing



The three toggles on the **Polymesh drawing** walk-right menu **Polymesh Drawing Toggle** are:

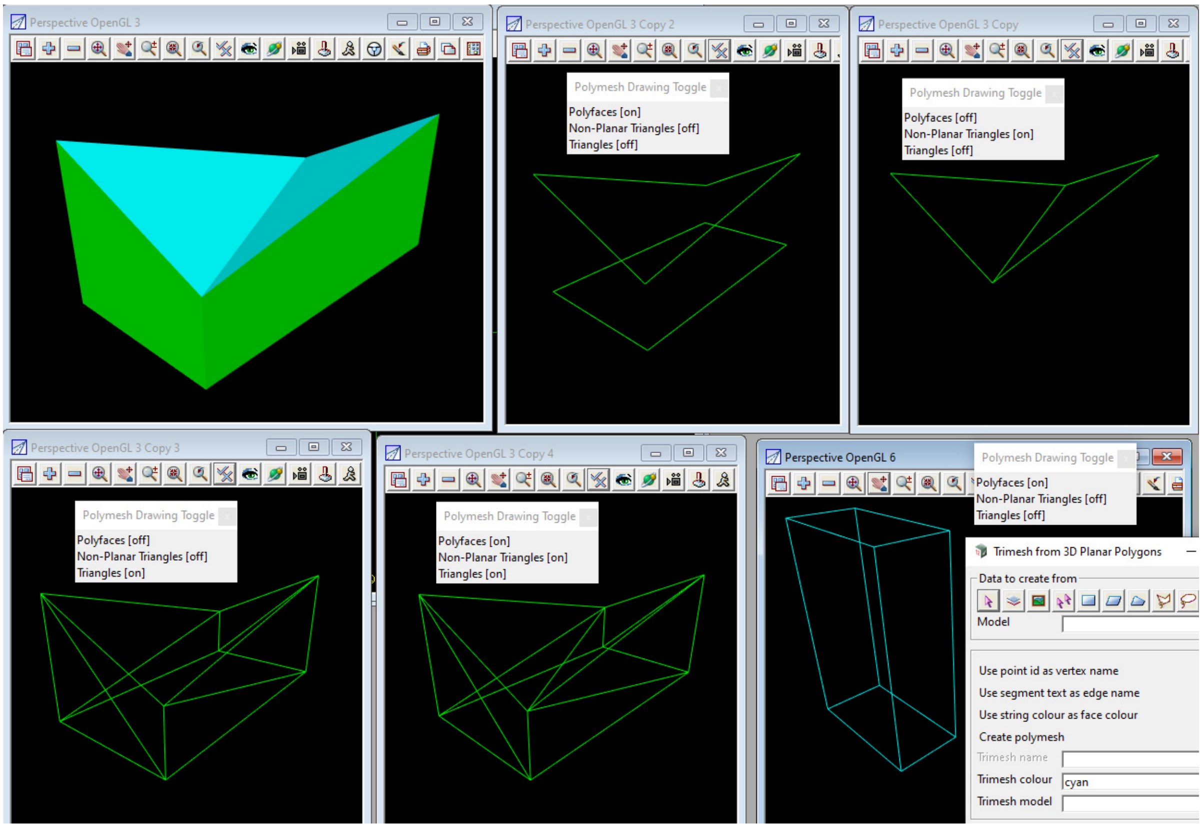
Polyfaces - when toggled on, the boundary polygon of any planar polyfaces are drawn on the view. This probably should say Planar polyfaces.

Non-Planar Triangles - when toggled on, the boundary polygon of any non-planar polyface, plus the enclosed triangles of the non-planar polyfaces, are drawn on the view. This probably should be Non-planar polyfaces and internal triangles.

Triangles - when toggled on, the triangles that are not polyfaces are drawn on the view.

So to see all the components that are contained in a polymesh, you need all three toggled on.

In the image below, the polymesh in view **3** consists of a non-planar face on the top (cyan) and a planar face on the bottom.



So in view ***3 Copy 2*** which has only ***Polyfaces turned on,*** you only see the bounding polygons of the top and the bottom of the object.

In view ***3 Copy*** which has only ***Non-Planar triangles turned on,*** you only see the bounding polygon of the top and its triangle decomposition.

In view ***3 Copy 3*** with only ***Triangles turned on,*** you only see the triangles that are not polyfaces which is how the sides of the object were constructed.

In view ***3 Copy 4, Polyfaces, Non-Planar triangles*** and ***Triangles*** are all ***turned on*** so you can see all the triangles that make up all the polyfaces of the polymesh.

For the definition of a polymesh, see 4.7.3.2 Polymesh.

Continue to 6.2.2.1.8 Drawing Density Toggle or return to 6.2.2.1 Perspective Toggle or 6.2.2 Perspective View Settings.

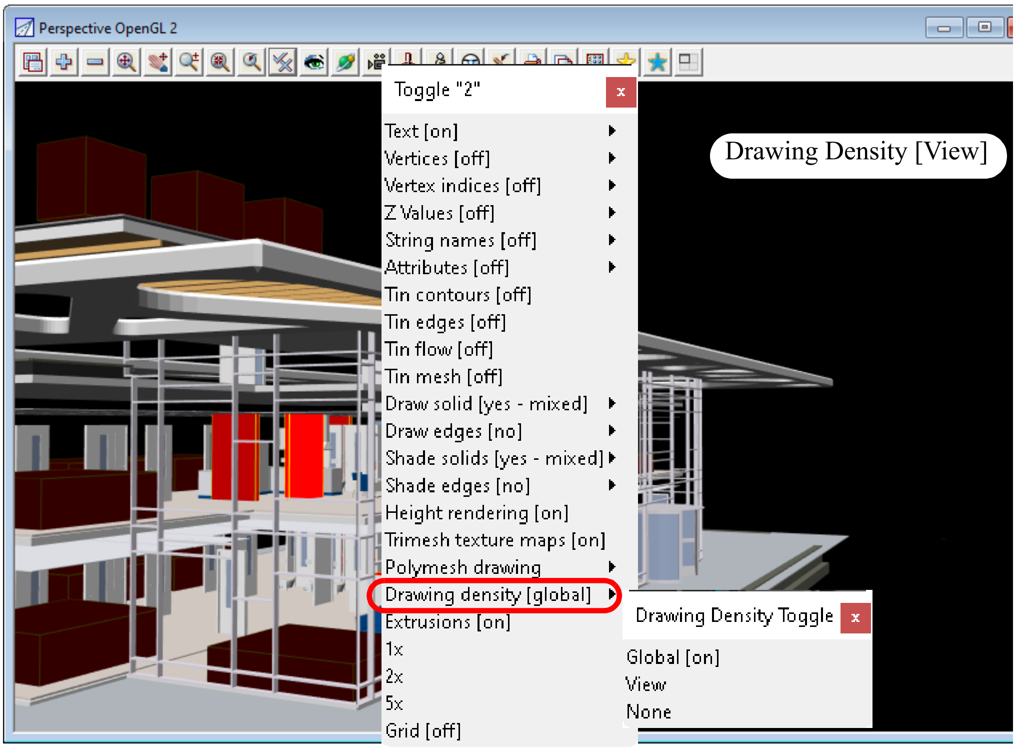
6.2.2.1.8 Drawing Density Toggle

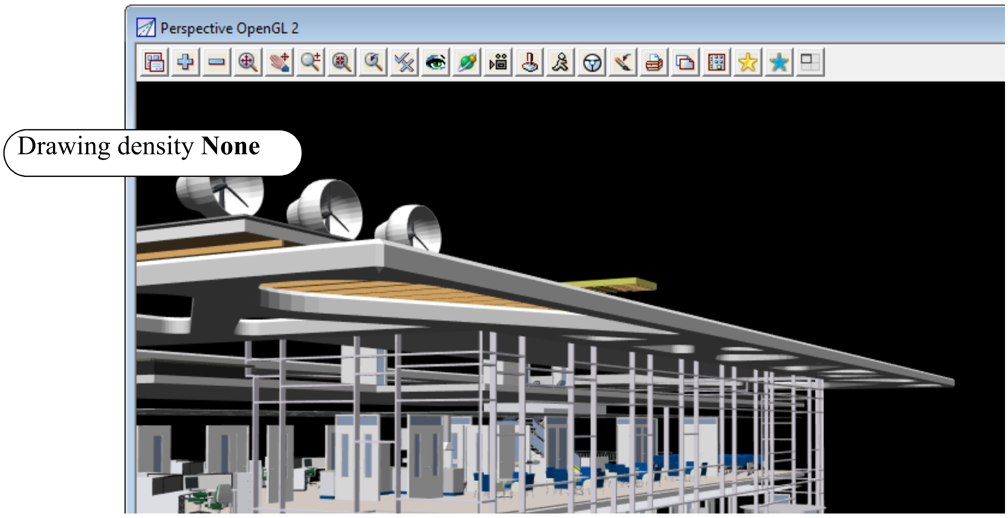
When **Drawing density** is set to **None**, Drawing Density is not used for the view.

When **Drawing density** is set to **View** the values from the **View Drawing Density** panel for the view are used. See 9.8 View Drawing Density.

When **Drawing density** is set to **Global**, the **Drawing Density** is taken from the environment variables used when the project is opened.

Changing the ***Drawing Density*** toggle also updates the **Mode** on the **View Drawing Density** panel (9.8 View Drawing Density).





Continue to 6.2.2.1.9 Toggle Extrusions or return to 6.2.2.1 Perspective Toggle or 6.2.2 Perspective View Settings.

6.2.2.1.9 Toggle Extrusions

12d Model super string extrusions are created in a number of ways:

(a) super string as a round pipe

(b) super string as a rectangular pipe

(c) super string with a 2D super string (with and without holes) swept along the super string

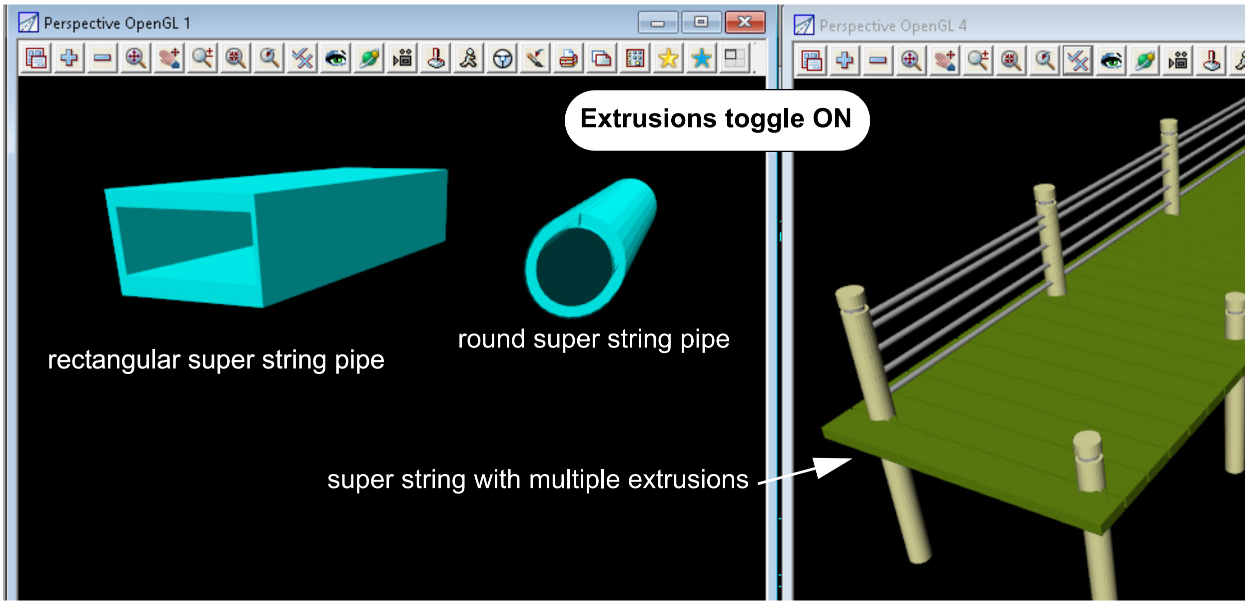
(d) super string with multiple extrusions

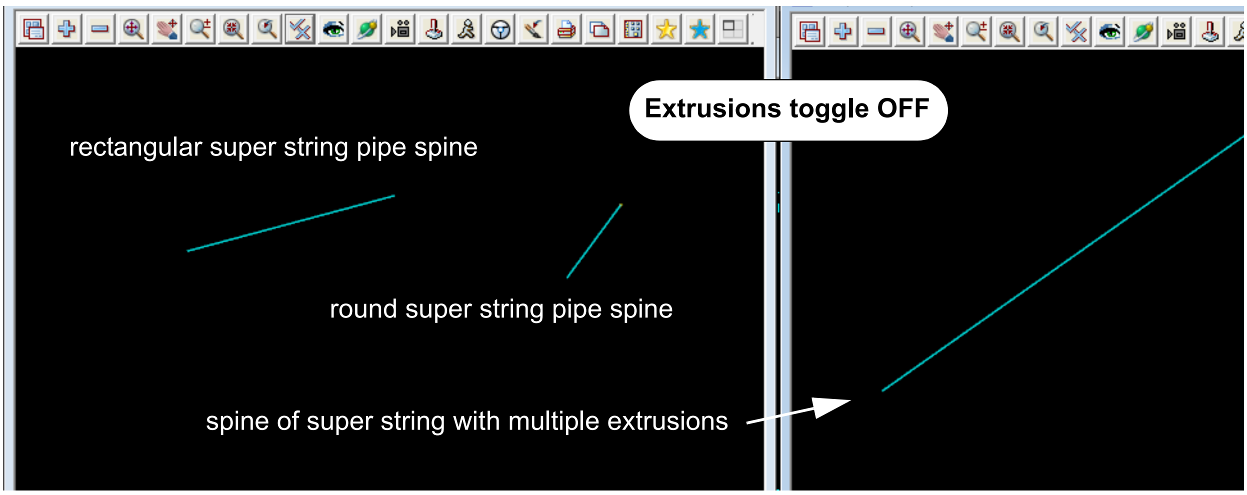
Round and rectangular pipes are special cases of (c) but because they are easily defined with a few parameters, they exist as special cases of the super string. Similarly multiple extrusions includes (c).

In each case there is only one super string which is called the **spine** of the extrusion.

When the **Extrusions toggle** is set to **on**, the extrusion is drawn on the view

When the **Extrusions toggle** is set to **off**, only the super string **spine** of the extrusion is drawn on the view

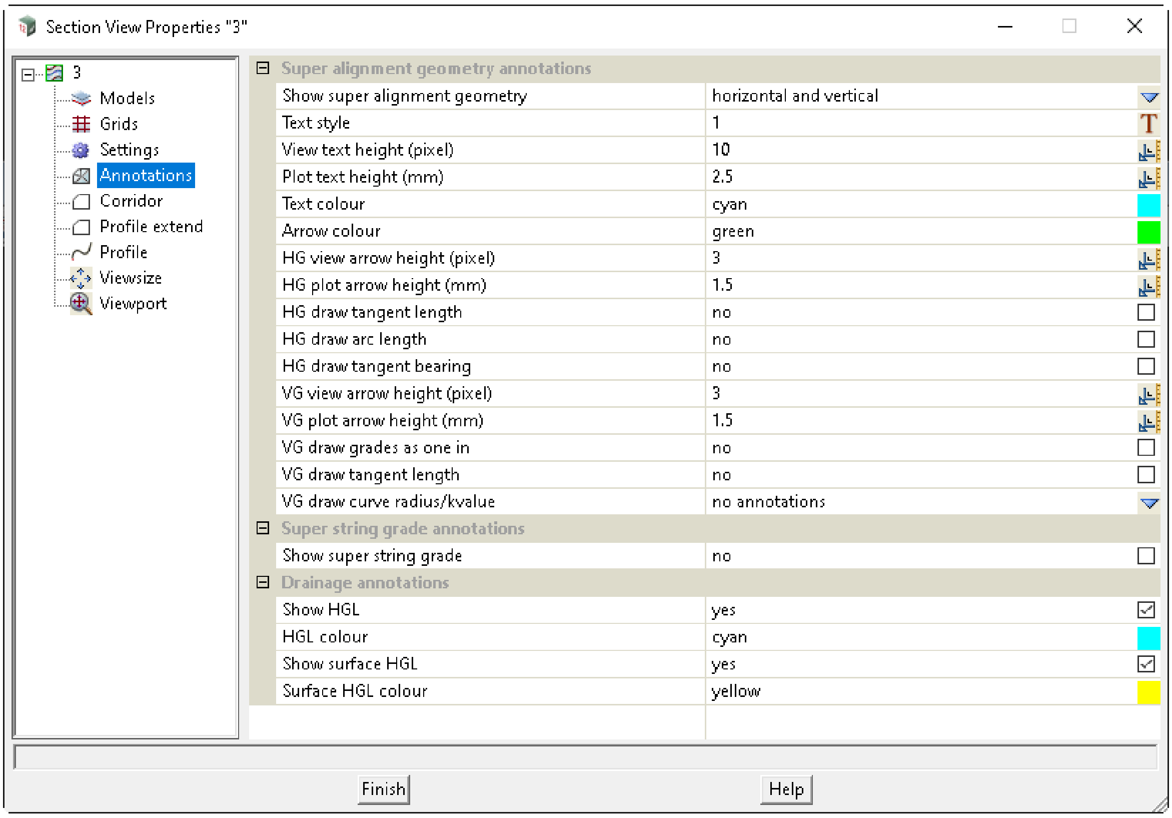




6.3 Section View Menu

6.3.1 Section View Properties

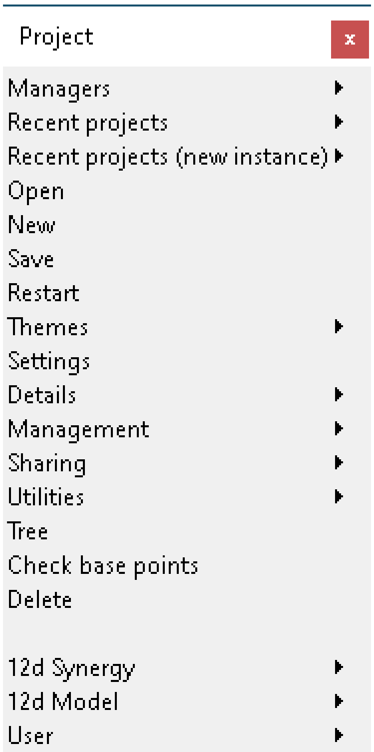
There are now more choices on the **Annotations** tab on the **Section View Properties** panel for setting what is displayed in the Section View for the Horizontal and Vertical geometry.



7 Project

There has been changes to the **Project** chapter in the ***12d Model Reference manual***.

The **V14** menu pinned menu was called **Projects** and in **V15** this has been renamed to **Project**.



The **Managers** menu from **Management**

7.1 Recent Projects - New Instance

7.2 Themes

7.3 Project Settings

7.4 Management

7.5 Project Sharing

See 7.4.1 Create/Edit env.4d

See 7.4.2 Projections

See 7.4.3.1 Create/Edit N-Value Definitions

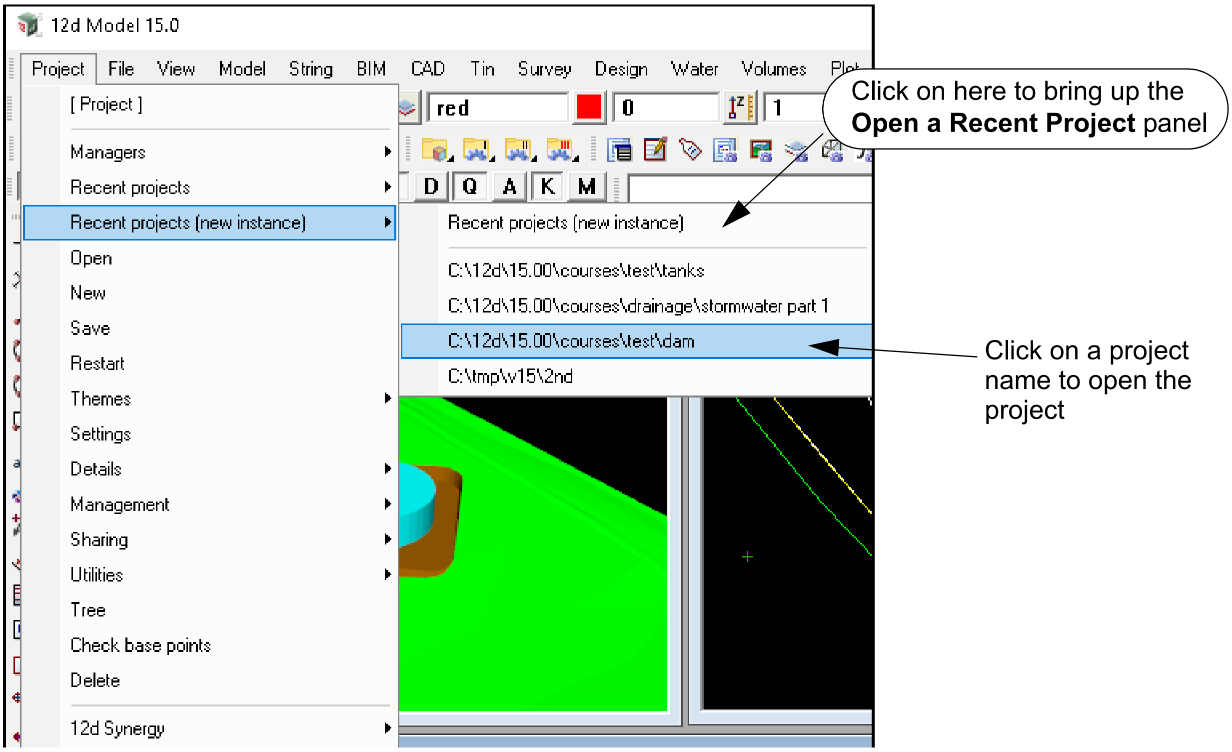
See 7.3 Project Settings

7.1 Recent Projects - New Instance

Position of option on menu: **Project =>Recent projects (new instance)**

Now documented In the v15 reference manual

Walking right on the ***Project =>Recent project (new instance)*** lists the projects recently accessed by ***12d Model***.



Clicking on a project in the list will start a new instance ***12d Model*** and open the project selected project. The existing instance of ***12d Model*** with the current project will still be left open.

Clicking on the ***Recent Projects*** heading on the ***Main Menu*** or on the **Recent projects** item when the **Projects** menu is pinned up, brings up the **Open a Recent Project** panel which shows the recent project list .
The list of recent projects is shared between all versions of ***12d Model***.and is recorded in the file "**Recent Projects.4d**" stored in the folder %APPDATA%. See 3.2.7 Recent Projects List.

7.2 Themes

Position of option on menu: **Project =>Themes**

Now documented In the v15 reference manual.

The **Themes** option changes the ***Theme*** being used for ***12d Model***.

Selecting a new Theme from the **Themes** menu removes all the menus and toolbars for the current Theme and replaces them with the selected Theme.

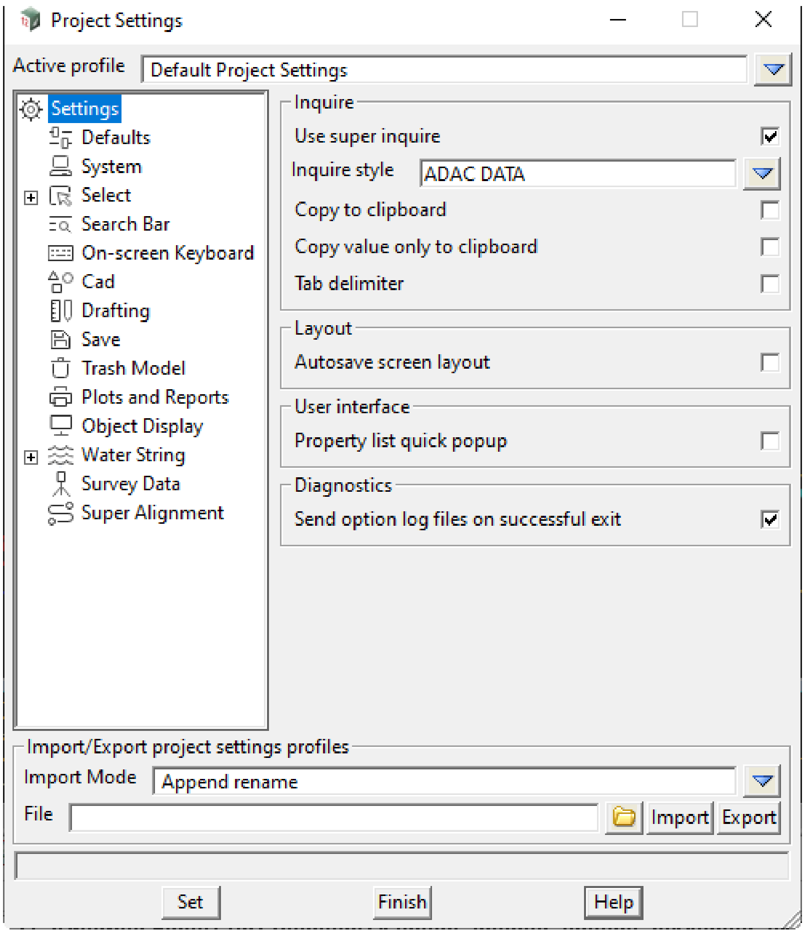
Continue to 7.3 Project Settings or return to 7 Project.

7.3 Project Settings

Position of option on menu: **Project =>Settings**

Now documented In the v15 reference manual

Selecting **Settings** brings up the **Project Settings** panel:



See

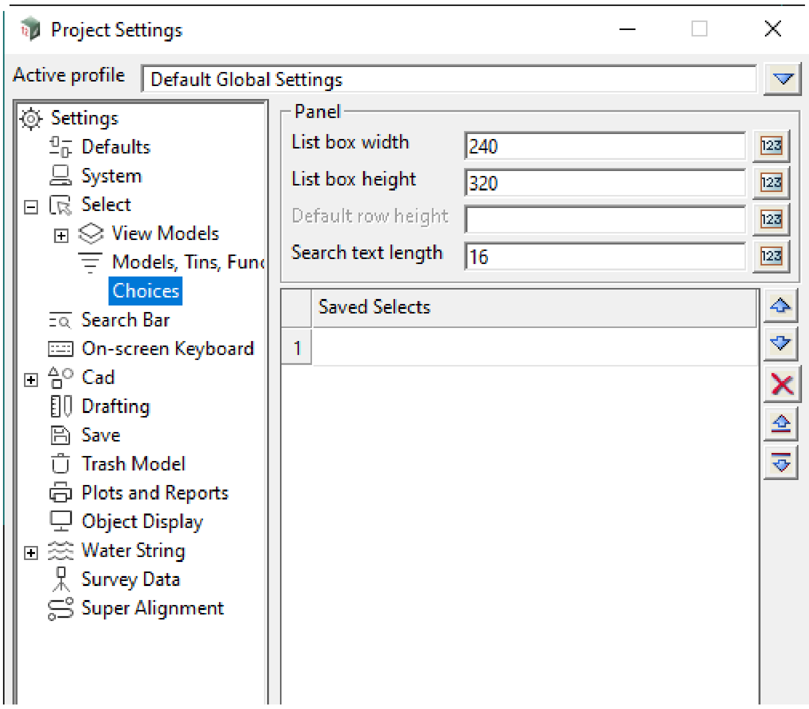
[7.3.1 Select >Choices]

[7.3.2 CAD >Heads-Up Display]

7.3.1 Select >Choices

this setting is used by the Select panels when clicking LB over the icon at the right hand end for Choice boxes.

If a setting is changed then the change is used for the icons on all the Choice boxes.



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

Field Description Type Defaults Pop-Up

Panel section

List box width/height Integer box

Width/height (in pixels) of the area listing the items displayed in the Select panel that comes up.

If the width or height is exceeded, a horizontal or vertical scroll bar is added to the panel.

Default row height Integer box

The height of each row (in pixels) in the list.

Search text length Integer box

The length (in characters) of the ***Select*** *box in the panel that comes up.*

Saved Selects

See .

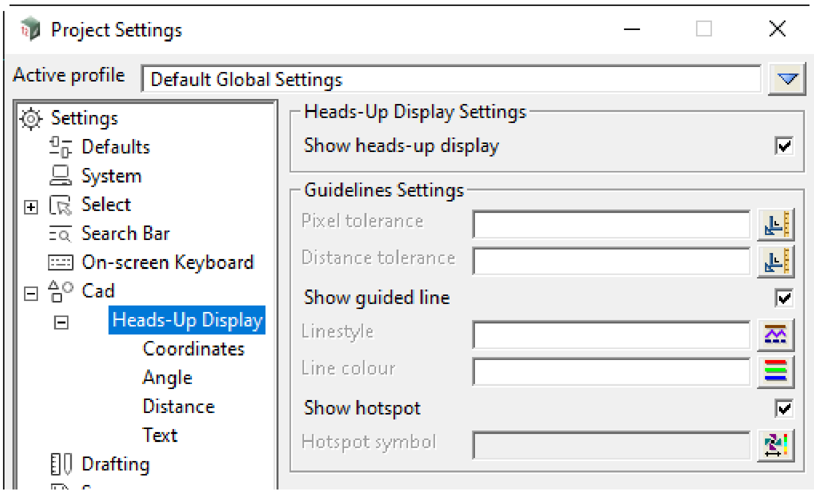
Important Note

When the values of any fields are changed on a right side page for a node, the ***Set*** *button must be pressed for the values in the displayed fields to become active and set as the values for the current Active Profile.*

7.3.2 CAD >Heads-Up Display

The Heads-Up Display has setting for CAD options to show coordinates and angles and distances as you are dynamically creating a new vertex or segment, and also guides for the values of angles and distances.

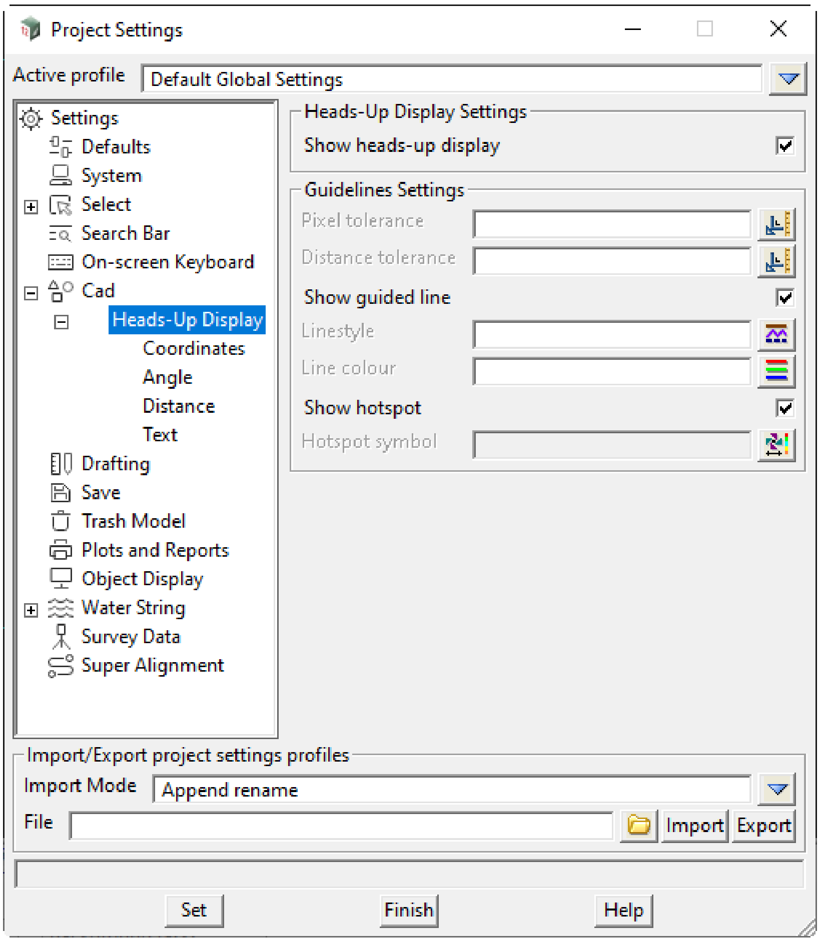
Note: ***Heads-Up Display*** is currently only implemented for ***CAD =>Point*** and ***CAD =>Line =>2 points***.



See

[7.3.2.1 CAD >Heads-Up Display - Main](#)
[7.3.2.2 CAD >Heads-Up Display >Coordinates](#)
[7.3.2.3 CAD >Heads-Up Display >Angle](#)
[7.3.2.4 CAD >Heads-Up Display >Distance](#)
[7.3.2.5 CAD >Heads-Up Display >Text](#)

7.3.2.1 CAD >Heads-Up Display - Main



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

Field Description Type Defaults Pop-Up

Heads-Up Display Settings section

Show heads-up display tick box ticked

*If **ticked**, the heads-up information is displayed near the cursor.*

for example, coordinates can be displayed, angle and distance when creating a new segment, and guide lines for angles, distances and text.

*If **not ticked**, no heads-up information is not displayed.*

Guidelines Settings section

Pixel tolerance real box

.

Distance tolerance real box

.

Show guide line tick box

*If **ticked**, guide lines are displayed for placing segments and text.*

*If **not ticked**, guide lines are not displayed.*

Linestyle linestyle box

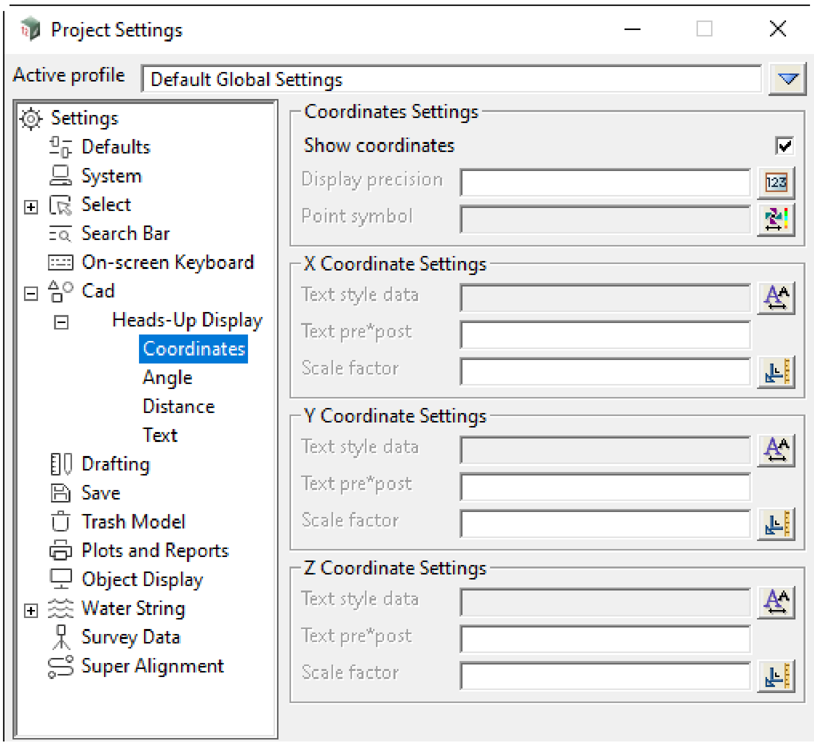
Linestyle for the guidelines.

Line colour colour box

Colour for the guidelines.

7.3.2.2 CAD >Heads-Up Display >Coordinates

This section defines how the X, Y and Z coordinates are displayed in the Heads-Up information.



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

Field Description	Type	Defaults	Pop-Up

Coordinate Settings section

Show coordinates tick box

*If **ticked**, the X, Y and Z coordinates are shown in the heads-up information*
*If **not ticked**, the X, Y and Z coordinates are **not** shown in the heads-up information*

Display precision integer box

The number of decimal places to show for the X, Y and Z coordinates.
*If **blank**, "2" is used.*

Point symbol symbol box

Symbol to use at the cursor position.

X/Y/Z Coordinate Settings section

Textstyle data textstyle data box

textstyle data to use for the X /Y/Z coordinate.
*If **blank**, a reasonable textstyle data is used so this can be left blank.*

Text pre*post input box

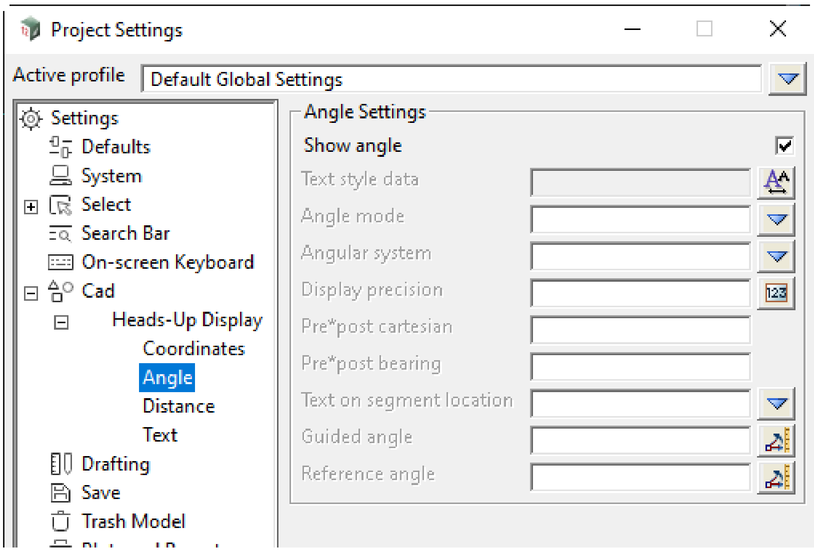
The text is use before and after the X/Y/Z coordinate value.
*If **blank**, "X /Y /Z " is used.*

Scale factor real box

*The value of the X/Y/Z coordinate is multiplied by **Scale factor** before being displayed.*
*If **blank**, "1" is used.*

7.3.2.3 CAD >Heads-Up Display >Angle

This section defines how the angle of a segment being drawn is displayed in the Heads-Up information.



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

Field Description	Type	Defaults	Pop-Up

Angle Settings section

Show angle tick box

*If **ticked**, the angle of the segment being drawn is shown in the heads-up information*

*If **not ticked**, the angle of the segment is **not** shown in the heads-up information*

Textstyle data textstyle data box

Textstyle data to use for angle.

*If **blank**, a reasonable textstyle data is used so this can be left blank.*

Angle mode choice box — cartesian, bearing

How the angle is calculated.

*If **cartesian**, the angle is measured from the positive x-axis and in a counter-clockwise direction.*

*If **bearing**, the angle is measured from the positive y-axis and in a clockwise direction.*

Angular system choice box — 360 deg min sec, 360 dec, 400 gons, 6400 mil, Circular

The system of units is used for the angle.

*If **blank**, " **360 deg min sec**" is used.*

*If **360 deg min sec**, the angle is measured degrees, minutes and decimal seconds.*

*If **360 dec**, the angle is measured in decimal degrees.*

*If **400 gons**, the angle is measured in decimal gons.*

*If **6400 mil**, the angle is measured in military mils.*

*If **Circular**, the angle is measured in radians.*

Display precision integer box

The number of decimal places used.

*If **blank**, "2" is used.*

Pre*post cartesian text box

*The text is use before and after the angle value when **Angle mode** is **cartesian**.*

*If **blank**, "c " is used.*

Pre*post bearing text box

*The text is use before and after the angle value when **Angle mode** is **bearing**.*

*If **blank**, "b " is used.*

Text on segment location choice box start, middle, end

The positioning of the angle text with respect to the segment being drawn. The Textstyle data is then applied to this position.

*If **blank**, the text is positioned at the end of the segment being drawn.*

*If **start**, the text is positioned at the start of the segment being drawn.*

*If **middle**, the text is positioned at the middle of the segment being drawn.*

*If **end**, the text is positioned at the end of the segment being drawn.*

Guide angle angle box

*If **not blank,** when the angle that the segment makes is close to*

***Reference angle** + **n*Guide angle** where n is an integer*

*then a guide line is drawn at that angle and the segment is snapped to the guide line and remains there until the cursor is outside the **Distance tolerance** or **Pixel Tolerance**. Note that guide angle will be cartesian or bearing depending on **Angle mode**.*

*If **blank**, no guide lines are shown.*

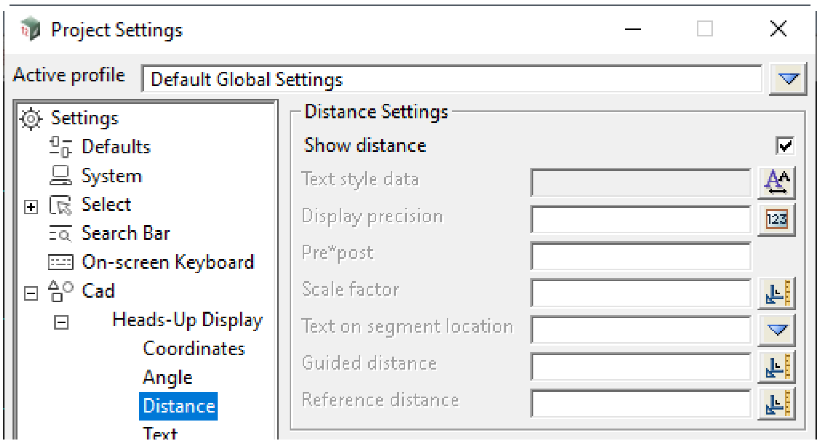
Reference angle angle box

*Used with **Guide angle** for calculating when a guide line is displayed.*

*If **blank**, "0" is used.*

7.3.2.4 CAD >Heads-Up Display >Distance

This section defines how the length of a segment being drawn is displayed in the Heads-Up information.



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

Field Description	Type	Defaults	Pop-Up

Distance Settings section

Show distance tick box

*If **ticked**, the length of the segment being dawn is shown in the heads-up information*

*if **not ticked**, the length of the segment is **not** shown in the heads-up information*

Textstyle data textstyle data box

Textstyle data to use for the length of the segment.

*If **blank**, a reasonable textstyle data is used so this can be left blank.*

Display precision integer box

The number of decimal places used.

*If **blank**, "2" is used.*

Pre*post text box

The text is use before and after the length value.

*If **blank**, "d " is used.*

Text on segment location choice box start, middle, end

The positioning of the distance text with respect to the segment being drawn. The Textstyle data is then applied to this position.

*If **blank**, the text is positioned at the end of the segment being drawn.*

*If **start**, the text is positioned at the start of the segment being drawn.*

*If **middle**, the text is positioned at the middle of the segment being drawn.*

*If **end**, the text is positioned at the end of the segment being drawn.*

Guide distance angle box

*If **not blank,** when the length of the segment is close to*

***Reference distance** + **n*Guide distance** where n is an integer*

*then the cursor is snapped to the point at that distance and remains there until the cursor is outside the **Distance tolerance** or **Pixel Tolerance**.*

*If **blank**, no guide lines are shown.*

Reference distance angle box

*Used with **Guide angle** for calculating when a guide line is displayed.*

*If **blank**, "0" is used.*

7.3.2.5 CAD >Heads-Up Display >Text

THIS TECXT SECTION IS A WORK IN PROGRESS AS I FIND OUT EXACLTY WHAT IT DOES

When CAD text is being created hots pots and guidelines drawn relative to nearby text to allow text to be easily lined up with respect to other text.

There are two guidelines:

(a) a base guideline that goes through the justify position of the nearby text and is parallel to the base line of the nearby text

(b) a vertical guideline that goes through the justify position of the nearby text and is perpendicular to the base line of the nearby text

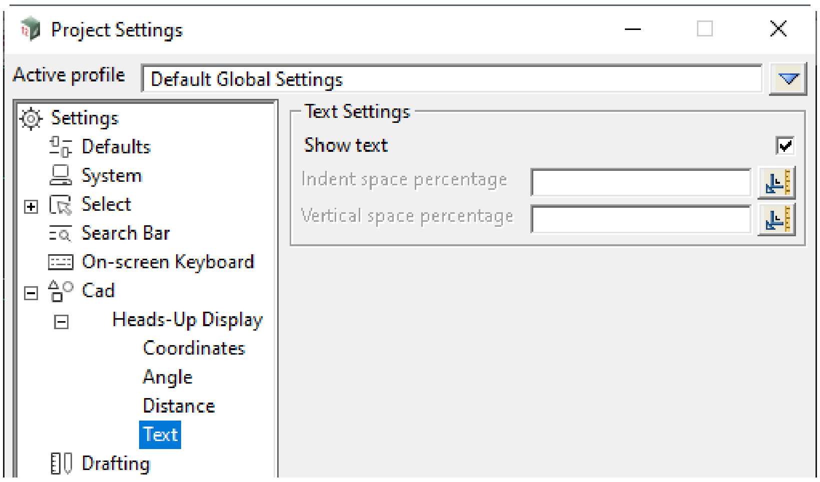
A Hotspot is then drawn relative to the two guidelines and is positioned:

(a) ***Indent space percentage*** along the base guideline

(b) ***Vertical space percentage + Character height*** along the vertical guideline when the cursor is above the guideline.

(c) ***Vertical space percentage + 2 x Character height*** along the vertical guideline when the cursor is below the base guideline

The base angle of the text is the taken from the nearest guideline.



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

Field Description	Type	Defaults	Pop-Up

Text Settings section

Use guideline and hotspot settings tick box

*If **ticked**, the guideline and hotspot settings on the main Heads-Up Display node are used.*

*If **not ticked**, no guidelines or hotspots are used when creating CAD text.*

Indent space percentage real box

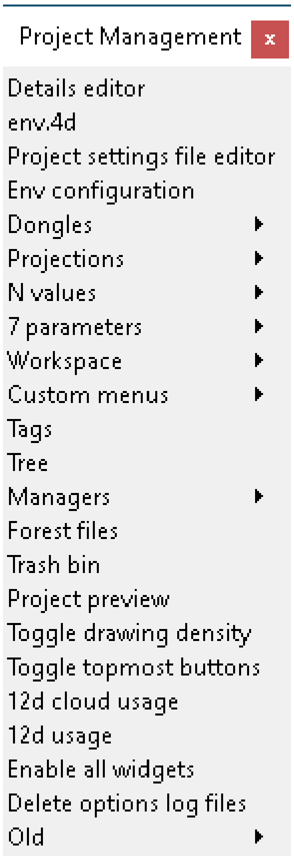
When placing text, the hotspot is indented this distance along the guideline.

Vertical space percentage real box

When placing text, the hotspot is displayed this distance up and down the guideline.

7.4 Management

There have been additions to Management.



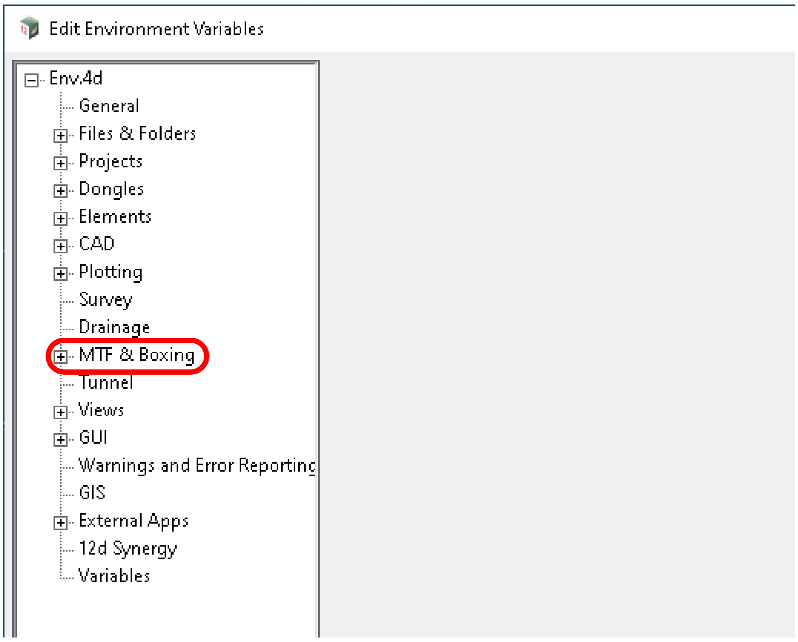
7.4.1 Create/Edit env.4d
7.4.2 Projections
7.4.3 N Values

7.4.1 Create/Edit env.4d

Now documented In the v15 reference manual

Position of option on menu: **Project =>Management =>env.4d**

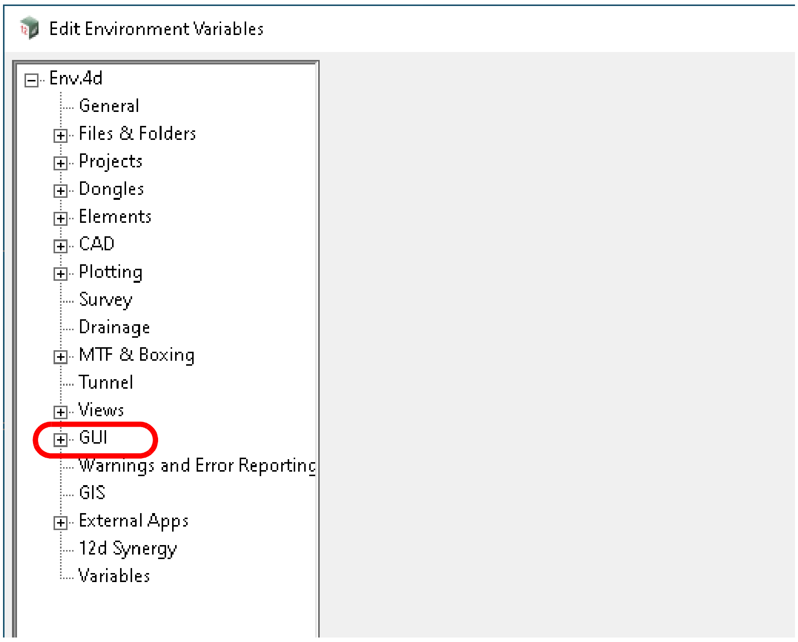
Selecting **env.4d** displays the **Edit Environmental Variables** panel.



Show convert chainages to dropped xy in ’Edit now’ menu tick box ticked

*If **ticked**, when RB on the row number column in the template modifiers edit panel the option to convert the highlighted chainage/s to Drop Point to Reference String smart chainages will be shown.*

Env variable and full documentation: see ALLOW_CONVERT_CHAINAGES_TO_DROPPED_XY_REF_4D



GUI > Topmost buttons

Use topmost buttons tick box

*If **ticked**, topmost buttons will be displayed.*

Env variable see USE_TOPMOST_BUTTONS_4D

Visible buttons/text input default blank

The list of buttons and screen text for the buttons to display.

Env variable see TOPMOST_BUTTON_LIST_4D

Position choice box

If basic orientation of the buttons, vertical left/right or horizontal from top of screen.

Env variable see TOPMOST_BUTTON_EDGE_4D

Side offset integer box

*If **not blank**, the offset from the left/right of the screen.*

Env variable see TOPMOST_BUTTON_OFFSET_X_4D

Top offset integer box

*If **not blank**, the offset from the top of the screen.*

Env variable see TOPMOST_BUTTON_OFFSET_Y_4D

Button width integer box

*If **not blank**, the width of the button.*

Env variable see TOPMOST_BUTTON_WIDTH_4D

Button height integer box

*If **not blank**, the height of the button.*

Env variable see TOPMOST_BUTTON_LIST_4D

Gap between buttons integer box

*If **not blank**, the gap between buttons.*

Env variable see TOPMOST_BUTTON_GAP_4D

Transparency (0-255) integer box

*If **not blank**, the transparency applied to the buttons.*

Env variable see TOPMOST_BUTTON_TRANSPARENCY_4D

7.4.2 Projections

Position of option on menu: **Project =>Management =>Projections**

Now documented In the v15 reference manual

In ***12d Model 14*,** the list of projections that could be selected were defined in the one file **carto.4d** which was searched for in the standard user search order **Working folder**, **Customer User folder** (if it exists), **User folder** and finally **set_ups** folder. As soon as a **carto.4d** was found, that one file was used and the search stopped.

This meant that if users wanted to add their own projections, or not include some that are in the shipped **carto.4d** in **set_ups,** users had to create their own carto.4d and place it in one of **Working folder**, **Customer User folder** (if it exists), or **User folder**.

This has been changed for ***12d Model 15***.

In ***12d Model 15***, **carto.4d** has been replaced by a new file **carto.12dcarto** which has more information about the projections than in **carto.4d.**

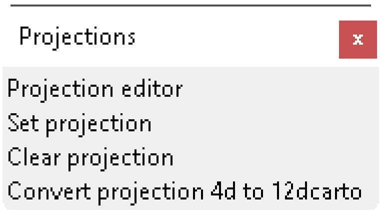
However the major difference is that the projection list is no longer coming from just the one file, but is accumulated from the **carto.12dcarto** files in **Working folder**, **Customer User folder** (if it exists), **User folder** and **set_ups folder**.

And if there is a projection of the same name, the one in **Working folder** takes priority over the one in **Customer User folder**, which takes priority over the one in **User folder,** which takes priority over the one in **Set_ups** folder.

Finally because of the accumulation, the projections in **set_ups** are always be included and so to limit the projections from **set_ups** appearing in the projection list, there are filters to restrict the ones that are included.

Consequently you no longer need to touch the ***carto.12dcarto*** file in ***set_ups***.

Similarly there are filters for the ones from the **Working folder**, **Customer User folder** and **User folder**.



See
7.4.2.1 Projection Editor
7.4.2.2 Set Projection
7.4.2.3 Clear Projection
7.4.2.4 4 Convert projection 4d to 12dcarto

7.4.2.1 Projection Editor

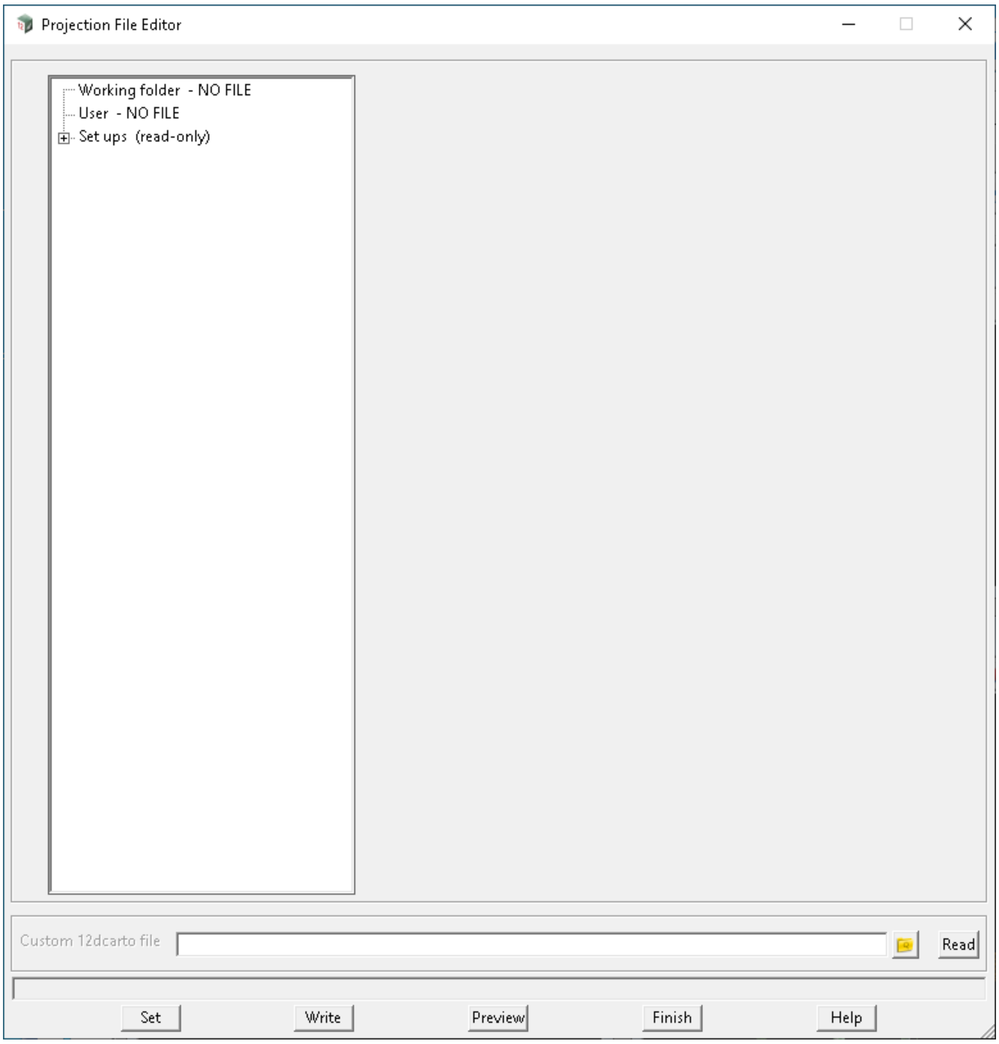
Position of option on menu: **Project => Management => Projections => Projection editor**

Now documented In the v15 reference manual

The ***Projection File Editor*** edits the ***12dcarto*** files in either the **Working folder**, **Customer User folder** (if it exists) or the **User folder**. No file can be edited in the **set_ups folder**.

However in the editor, projections in the **set_ups** folder can be copied into files in the other folders.

Selecting **Projection editor** brings up the **Projection File Editor** panel.



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

Field Description	Type	Defaults	Pop-Up
Custom projection .12dcarto	file box	*.12dcarto files	

A custom 12dcarto file can be imported for editing by using this file box.

Read	button		

Read in the custom projection file.

See 7.4.2.1.1 Root Folder.

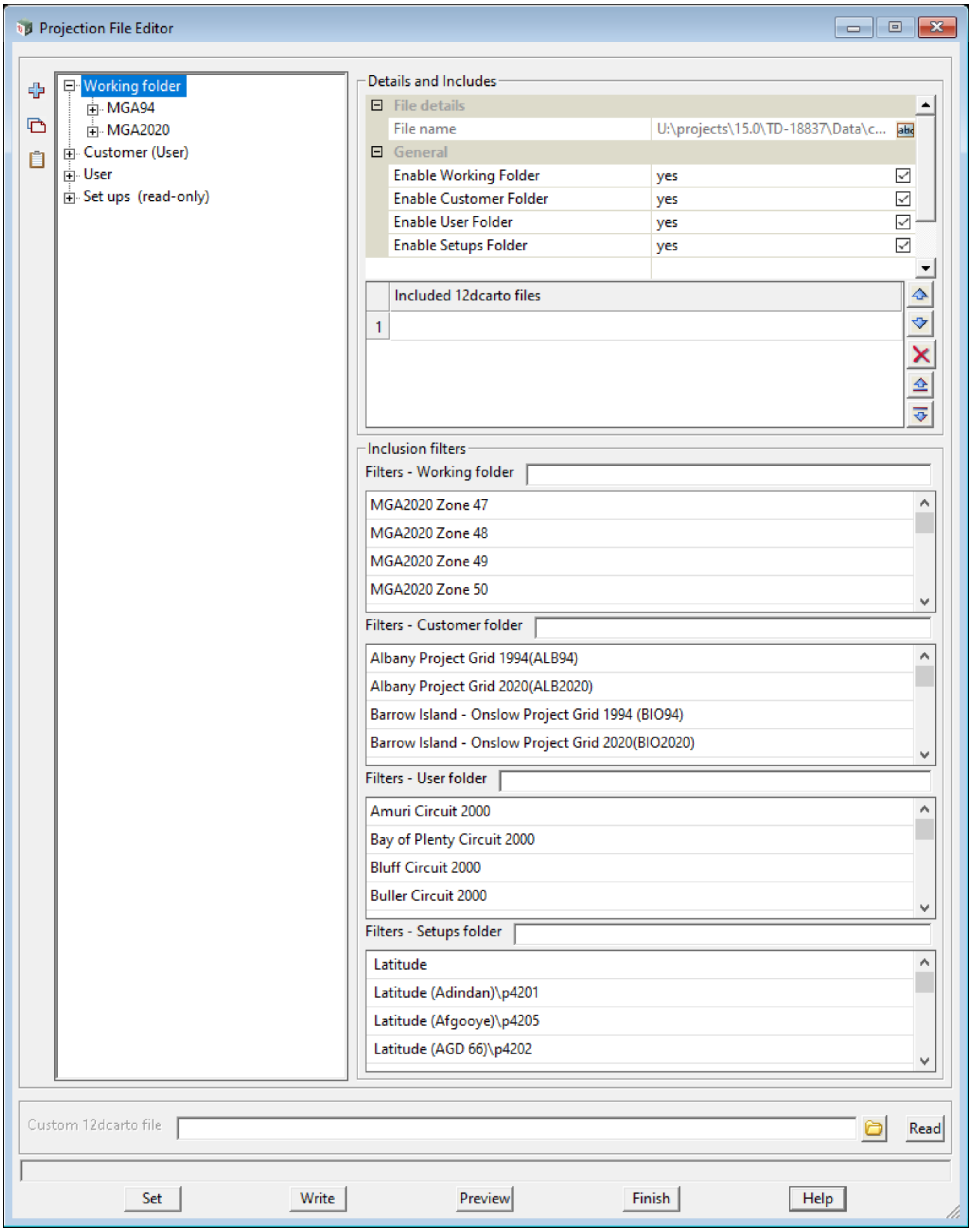
See 7.4.2.1.2 Group of Projections.

See 7.4.2.1.3 Projection.

See 7.4.2.1.4 Special Functionality.

7.4.2.1.1 Root Folder

If any folder is selected, the panel will display as:



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

Field Description	Type	Defaults	Pop-Up
Details and Includes			
File name	text box		
Showing the path to the file's location.			
Enable Working Folder	tick box	ticked	

*If **ticked**, all Projection from **Working folder** will be included in Projection choice box pop-up (Projection Box).*

Enable Customer Folder Folder tick box ticked

*If **ticked**, all Projection from User folder will be included in Projection choice box pop-up (Projection Box).*

Enable User Folder tick box ticked

*If **ticked**, all Projection from **User folder** will be included in Projection choice box pop-up (Projection Box).*

Enable Setups Folder tick box ticked

*If **ticked**, all Projection from **Setups folder** will be included in Projection choice box pop-up (Projection Box).*

***Note**: See* 7.4.2.1.4 Special Functionality *for more detail on Enable/disable each folder.*

Inclusion Filter

Filter - Working folder search box

*If **filled**, Projection Box will only include those projection from **Working Folder** that contain the filled content.*

Filter - User folder search box

*If **filled**, Projection Box will only include those projection from **User Folder** that contain the filled content.*

Filter - Setups folder search box

*If **filled**, Projection Box will only include those projection from **Setups Folder** that contain the filled content.*

Filter - Customer folder search box

*If **filled**, Projection Box will only include those projection from User Folder that contain the filled content.*

Buttons

Set button

Select this button after any change to the panel so set change.

Write button

Permanently saves all changes to the file.

Preview button

*Bring up **Preview Projection Choices** panel to check the origin of each projection in the choice box pop up Projection Box.*

***Note**: see* 7.4.2.1.4 Special Functionality *for more detail on **Preview Projection Choices** panel.*

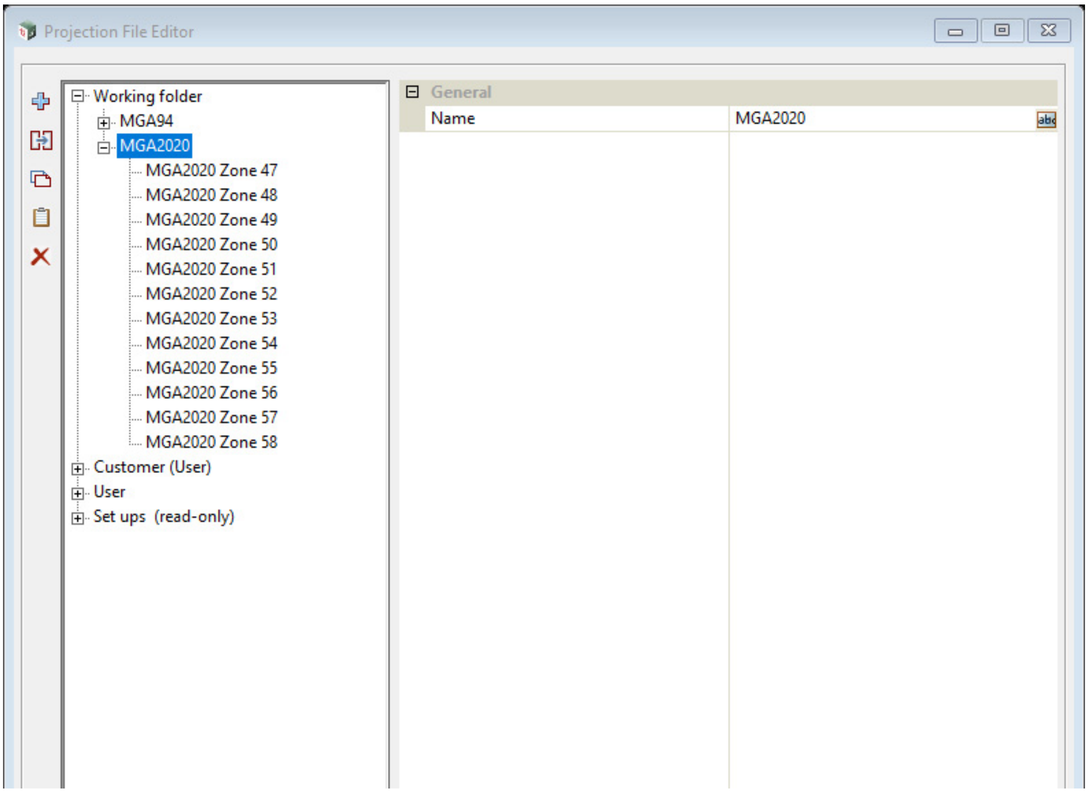
Finish button

Finish editing, close down the panel.

Note: The file is structured as a tree where the top node is the file itself. The top node can have 2 types of children as 7.4.2.1.3 Projection and/or 7.4.2.1.2 Group of Projections.

7.4.2.1.2 Group of Projections

When selecting a group the panel will display:



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

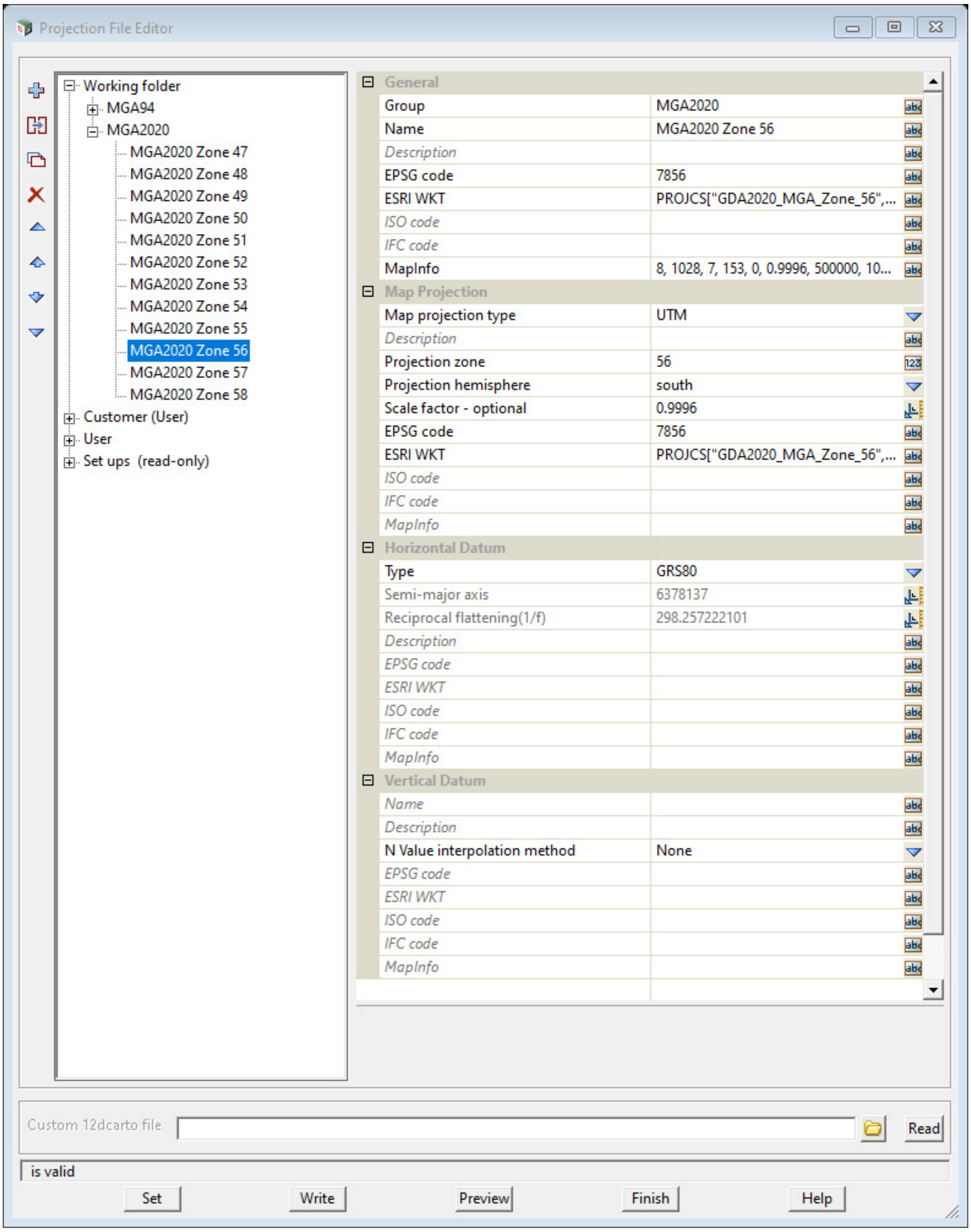
Field Description	Type	Defaults	Pop-Up
Name	text box		

The name of the group.

Note: Each of the **group of projections** node also has 1 or many 7.4.2.1.3 Projection.

7.4.2.1.3 Projection

Selecting **Projection** displays the **Project FIle Editor** panel:



When clicking on a projection on the left hand side, information about the selected projection is displayed on the right hand side of the panel.

The area on the right hand side are:

(a) General

General information about the projection. See General for more information.

(b) Map Projection

Information about map projection type used in this projection. See [Map Projection] for more information.

(c) Horizontal Datum

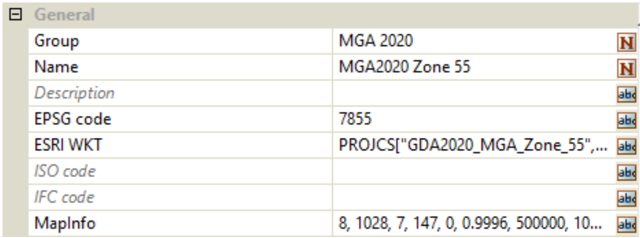
Information about ellipsoid used in this projection. See [Horizontal Datum] for more information.

(d) Vertical Datum

N value interpolation method used in this projection. See [Vertical Datum] for more information.

Depending on the type of ellipsoid and map projection, different fields need to be filled in.

General



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

Field Description	Type	Defaults	Pop-Up
Group	name box	optional	

Name of group where this projection belongs to.

Name	name box		

*Name of projection **(must be unique)**.*

Description	text box	optional	

Description of the projection.

EPSG code	text box	optional	

*The **EPSG** code for this projection.*

ISO code	text box	optional	

*The **ISO** code for this projection.*

ESRI WKT	text box	optional	

*The **ESRI WKT** format for this projection.*

IFC code	text box	optional	

*The **IFC code** for this projection.*

Map Info	text box	optional	

***MapInfo** for this projection.*

Map Projection

There are 4 supported types, 1 **General** type to support manual input of proj strings and 1 **None** type to show all available supported parameters.

4 supported types are:

Transverse Mercator - *see* Transverse Mercator

UTM - see UTM

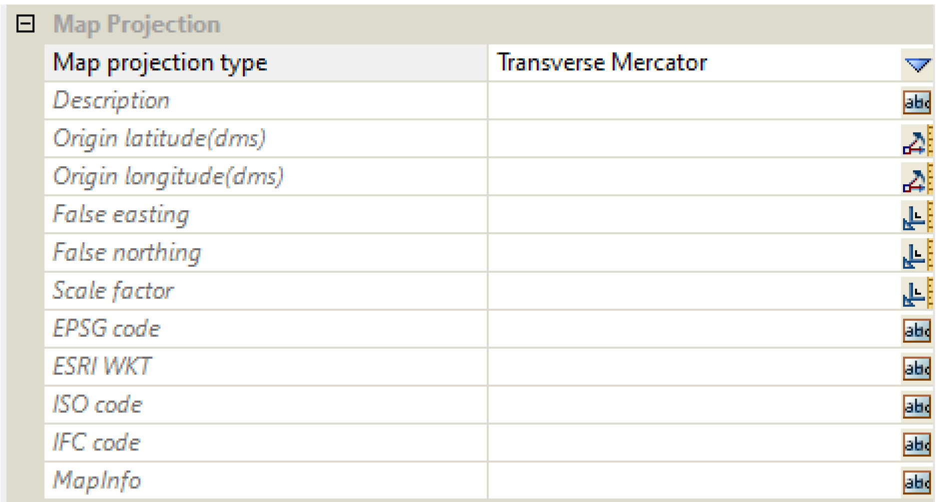
RSO - *see* RSO

Lambert Conformal - *see* Lambert Conformal

See Generals for information on **General** type.

See None Type for information on **None** type.

Transverse Mercator



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

Field Description	Type	Defaults	Pop-Up
Origin latitude (dms)	angle box	optional	

Latitude of projection centre (+lat_0). If blank, default to 0.0

Origin longitude (dms)	angle box	optional	

Longitude of projection centre (+lon_0). If blank, default to 0.0

False Easting	double box	optional	

False easting (+x_0). If blank, default to 0.0

False Northing	double box	optional	

False northing (+y_0). If blank, default to 0.0

Scale factor	double box	optional	

Scale factor used in the projection (+k_0).
*If **blank**, default to 1.0*

EPSG code	text box	optional	

The EPSG code of the projection.

ESRI WKT text box optional

The ESRI WKT format of proj for this projection.

ISO code text box optional

The ISO code of the projection.

IFC code text box optional

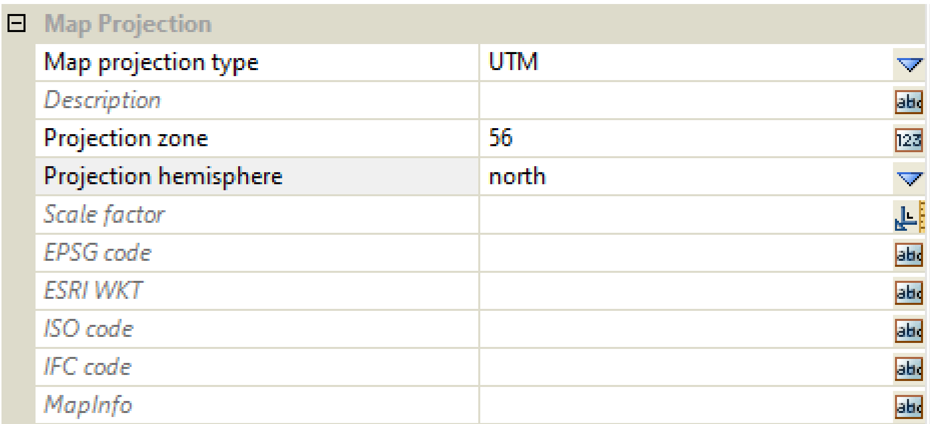
The IFC code of the projection.

Mapinfo text box optional

MapInfo of the projection.

For more information about Transverse Mercator, see https://proj.org/operations/projections/tmerc.html.

UTM



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

Field Description Type Defaults Pop-Up

Projection zone angle box optional

The UTM zone (+zone). Value can be from 1 to 60.

Projection hemisphere choice box north North, South

The hemisphere of which the projection is on.

Scale factor double box optional

Scale factor used in the projection (+k_0).
*If **blank**, default to 0.9996.*

EPSG code text box optional

The EPSG code of the projection.

ESRI WKT text box optional

The ESRI WKT format of proj for this projection.

ISO code text box optional

The ISO code of the projection.

IFC code text box optional

The IFC code of the projection.

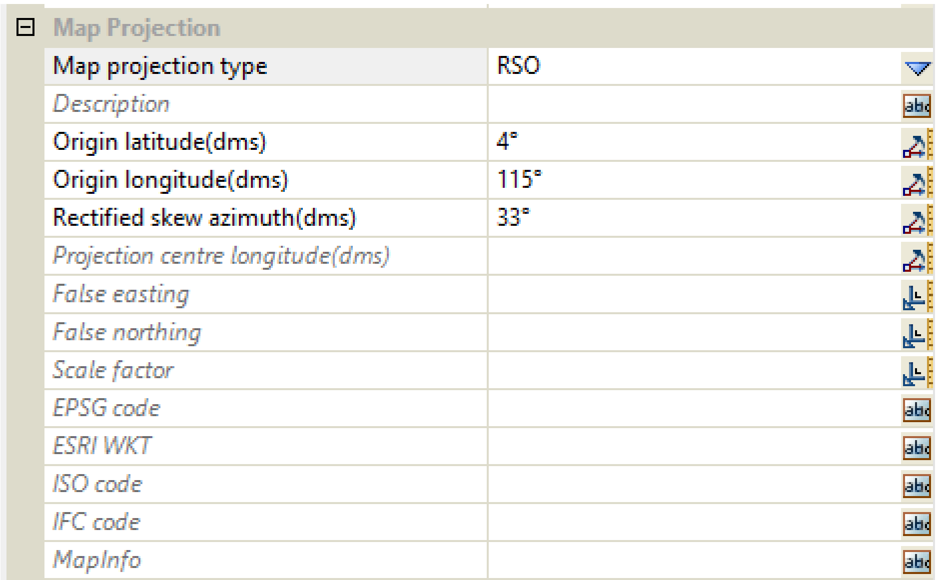
Mapinfo text box optional

MapInfo of the projection.

For more information about UTM projection, see [https://proj.org/operations/projections/utm.html.](https://proj.org/operations/projections/utm.html)

RSO

The editor can only handle Central point and azimuth method. For the use of Two point method, please use General type to manually input required parameters.



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

Field Description Type Defaults Pop-Up

Original latitude (dms) angle box optional

Latitude of central point (+lat_0).

Original longitude (dms) angle box optional

Longitude of central point (+lonc).

Rectified skew azimuth (dms) angle box optional

Azimuth of centreline clockwise from north at the centre point of the line (+alpha).

False Easting double box optional

False easting (+x_0). If blank, default to 0.0

False Northing double box optional

False northing (+y_0). If blank, default to 0.0

Scale factor double box optional

Scale factor used in the projection (+k_0).
*If **blank**, default to 1.0*

EPSG code text box optional

The EPSG code of the projection.

ESRI WKT text box optional

The ESRI WKT format of proj for this projection.

ISO code text box optional

The ISO code of the projection.

IFC code text box optional

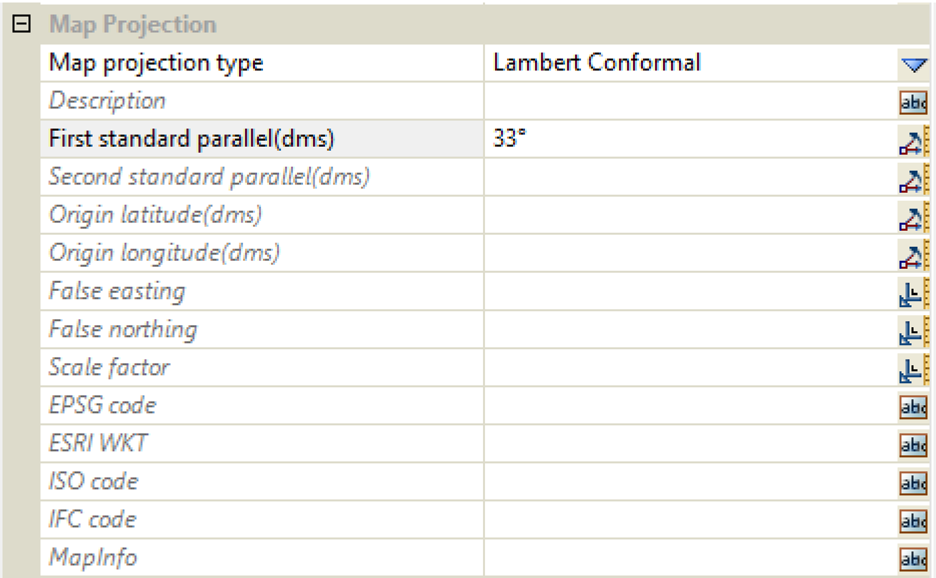
The IFC code of the projection.

Mapinfo text box optional

MapInfo of the projection.

For more information about RSO, see https://proj.org/operations/projections/omerc.html.

Lambert Conformal



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

Field Description Type Defaults Pop-Up

First standard parallel (dms) angle box optional

First standard parallel (+lat_1).

Second standard parallel (dms) angle box optional

*Second standard parallel (+lat_2). If **blank**, default to 0.0.*

Origin latitude (dms) angle box optional

*Latitude of projection centre (+lat_0). If **blank**, default to 0.0*

Origin longitude (dms) angle box optional

*Longitude of projection centre (+lon_0). If **blank**, default to 0.0*

False Easting double box optional

*False easting (+x_0). If **blank**, default to 0.0*

False Northing double box optional

*False northing (+y_0). If **blank**, default to 0.0*

Scale factor double box optional

*Scale factor used in the projection (+k_0). If **blank**, default to 1.0*

EPSG code text box optional

The EPSG code of the projection.

ESRI WKT text box optional

The ESRI WKT format of proj for this projection.

ISO code text box optional

The ISO code of the projection.

IFC code text box optional

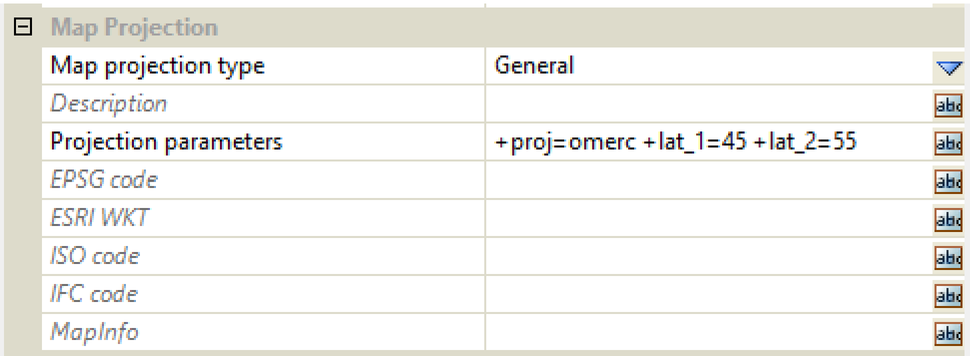
The IFC code of the projection.

Mapinfo text box optional

MapInfo of the projection.

For more information about Lambert Conformal, see https://proj.org/operations/projections/lcc.html.

Generals



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

Field Description Type Defaults Pop-Up

Projection parameter text box optional

Contains the proj string for any unavailable projections in **12d Model**.

EPSG code text box optional

The EPSG code of the projection.

ESRI WKT text box optional

The ESRI WKT format of proj for this projection.

ISO code text box optional

The ISO code of the projection.

IFC code text box optional

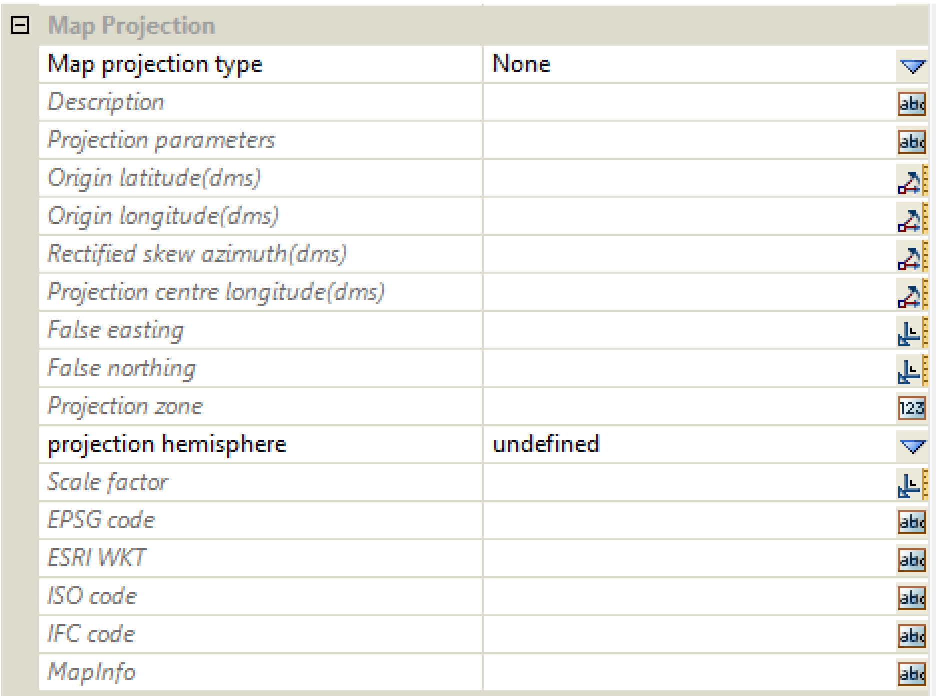
The IFC code of the projection.

Mapinfo text box optional

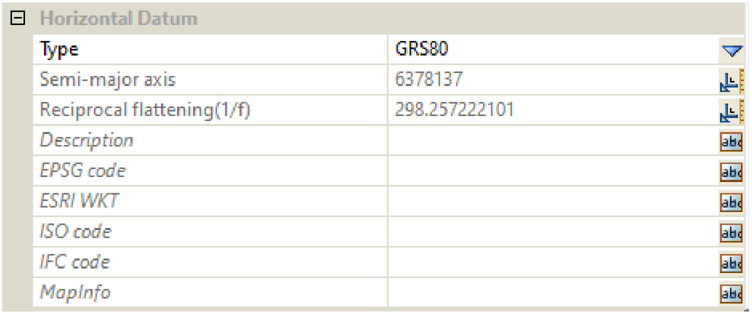
MapInfo of the projection.

None Type

None type shows all available parameters within ***12d Model***. However, if None type is used, 12d won't be able to generate proj string from input parameters. Please use **General** type for any unavailable types.



Horizontal Datum



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

Field Description	Type	Defaults	Pop-Up
Type	choice box		Airy1830, Airy1839(Modified) ANS, GRS80 International 1924(aka Hayford 1909) NZ Geodetic 1949(Adjusted) Timbalai Everest 1830(Modified) Everest 1830(1967 Definition) WGS72, WGS84, Custom

*if **Custom** is chosen, **Semi-major axis** and **Reciprocal flattening** can be defined by user.*

*If other ellipsoids are chosen, the parameters for that ellipsoid are displayed in **Semi-major axis** and **Reciprocal flattening**.*

Semi-major axis	double box	read only	

*If **Custom** is selected, read-write is enabled.*

Reciprocal flattening (1/f)	double box	read only	

*If **Custom** is selected, read-write is enabled.*

EPSG code	text box	optional	

EPSG code of the ellipsoid.

ISO code	text box	optional	

ISO code of the ellipsoid.

ESRI code	text box	optional	

ESRI WKT of the ellipsoid.

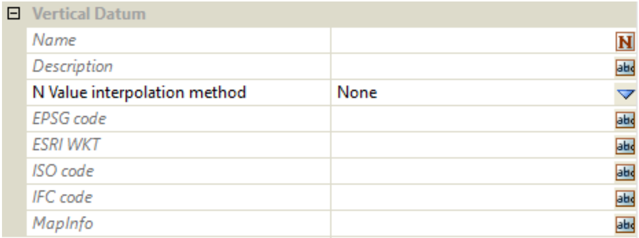
IFC code	text box	optional	

IFC code of the ellipsoid.

Map Info	text box	optional	

Mapinfo of the ellipsoid.

Vertical Datum



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

Field Description	Type	Defaults	Pop-Up
N value interpolation method	choice box	optional	all defined N values

N value interpolation method for projection. The choices can be setup using N value settings.

EPSG code	text box	optional	EPSG code

*The **EPSG** code of the vertical datum.*

ISO code	text box	optional	ISO code

*The **ISO** code of the vertical datum.*

ESRI code	text box	optional	ESRI code

*The **ESRI WKT** format of proj for this vertical datum.*

IFC code	text box	optional	IFC code

*The **IFC** code of the vertical datum.*

Map Info	text box	optional	Map Info

MapInfo of the vertical datum.

7.4.2.1.4 Special Functionality

Note: the priority of execution is **from top to bottom.**

That is, **Working folder** takes priority over **User folder** which takes priority over **Setups folder**.

The **Projection choice box** displays all the projections from the *Working folder*, *User Folder* and *Setups folder* subject to:

(a) If there are projections with the same name, the choice box will only display the one with higher priority.

(b) If a folder is disabled via the enable/disable functionality in the Projection editor, the choice box will ignore that folder.

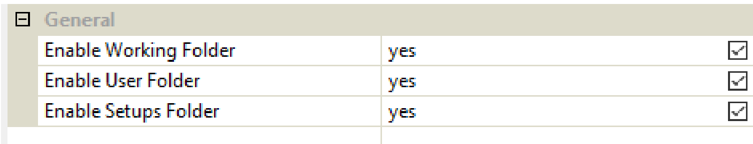
(c) If an **Inclusion filter** is used for a specific folder, the choice box will only include those from the folder which contain the inclusion filter content.

See Enable/Disable a Folder.

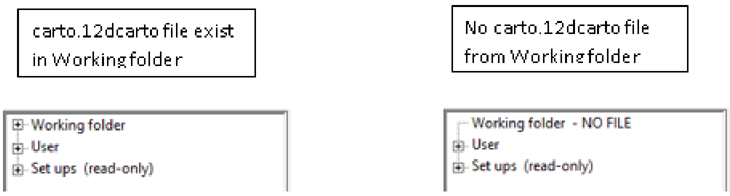
See Inclusion Filter.

See Preview Projection Choices Panel.

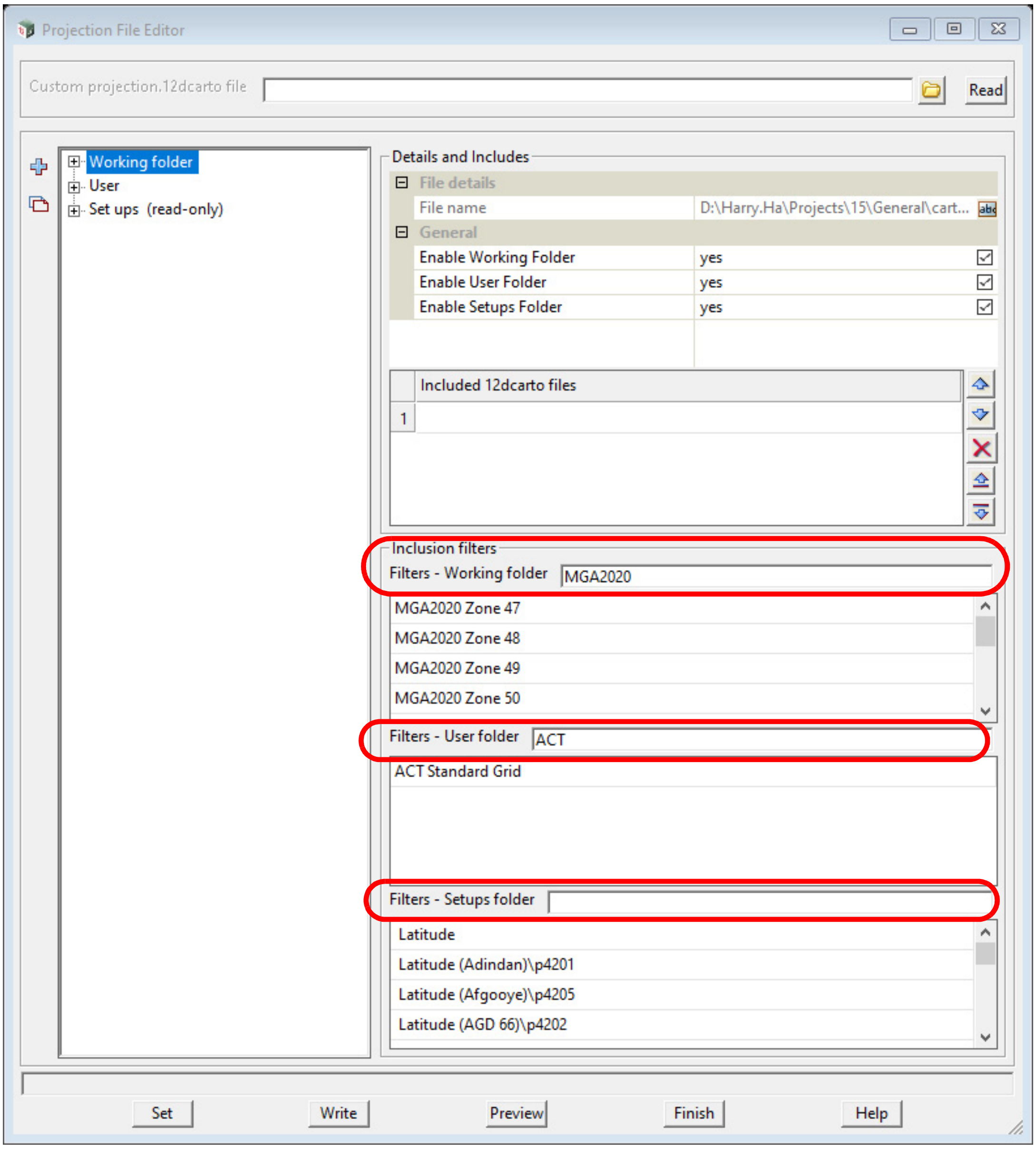
Enable/Disable a Folder



*The enable/disable setting will be used from the top priority folder that is available. For example, if **Working folder** exists, enable/disable will use the setting from **working folder**. If there is no **Working Folder** (indicate with "NO FILE", shown in image below), enable/disable functionality will use the setting from **User folder**.*



Inclusion Filter

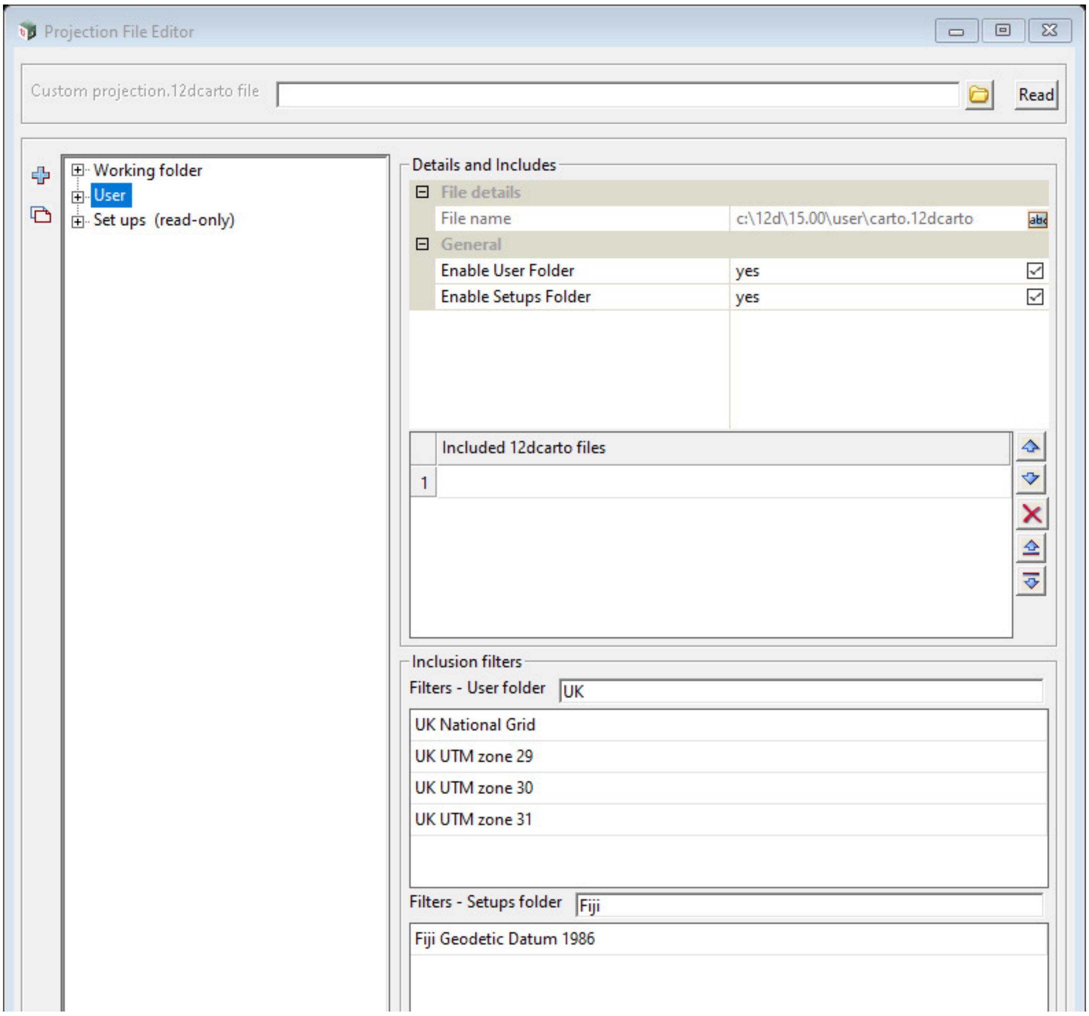


The Inclusion filter will get the filter from the top priority folder that is available first. In this case, the top priority is ***Working Folder****. How text typed into the Filters field is interpreted is described in* 7.4.2.1.5 Inclusion Filters Syntax.

In the example above, the ***Inclusion Filters*** *mean that*

> ***Working Folder****: only include projections in the carto12d file in the Working folder that contain the text "mga2020" in the projection name*
>
> ***User Folder****: only include projections in the carto12d file in the User folder that contain the text "ACT" in the projection name*
>
> *The filter for* ***Setups Folder*** *is empty.*

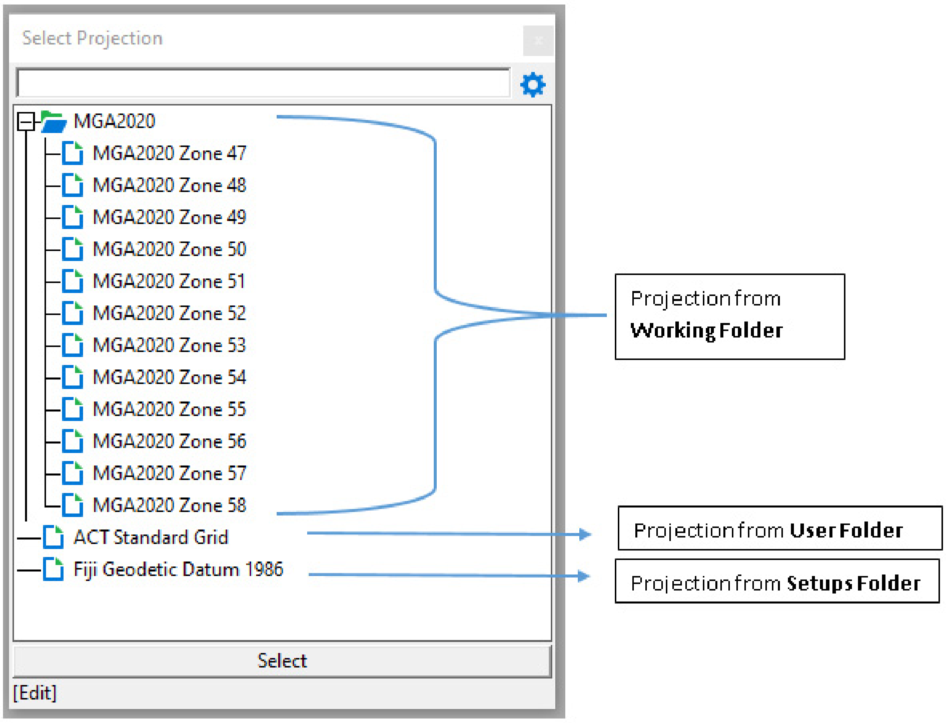
*If there is an empty filter (****Setups Folder*** *in this example), the projection choice box will look for the filter in the next priority location that is available (in this case,* ***User****).*



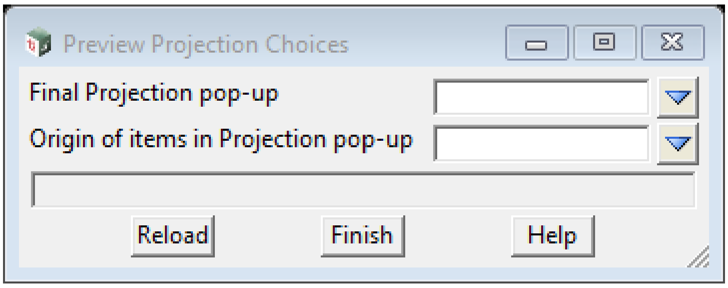
*In **User** (next priority location), there are 2 filters:*

> ***User Folder** has "UK" filter. However, this filter will be ignored because **User Folder filter** has been used by the higher priority folder*
>
> ***Setups Folder** has "Fiji" filter. The Projection choice box will use this filter because **Setups Folder filter** was not used in the higher priority location. The Projection choice box will take those **Setups folder** that contain the keyword "Fiji"*

The results of applying the filters in the example above are:


Select Projection
MGA2020
MGA2020 Zone 47
MGA2020 Zone 48
MGA2020 Zone 49
MGA2020 Zone 50
MGA2020 Zone 51
MGA2020 Zone 52
MGA2020 Zone 53
MGA2020 Zone 54
MGA2020 Zone 55
MGA2020 Zone 56
MGA2020 Zone 57
MGA2020 Zone 58
ACT Standard Grid
Fiji Geodetic Datum 1986
Select
[Edit]
Projection from Working Folder
Projection from User Folder
Projection from Setups Folder

Preview Projection Choices Panel



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

Field Description Type Defaults Pop-Up

Final Projection pop-up choice box

Show all projection with applied enable/disable setting, and filters.

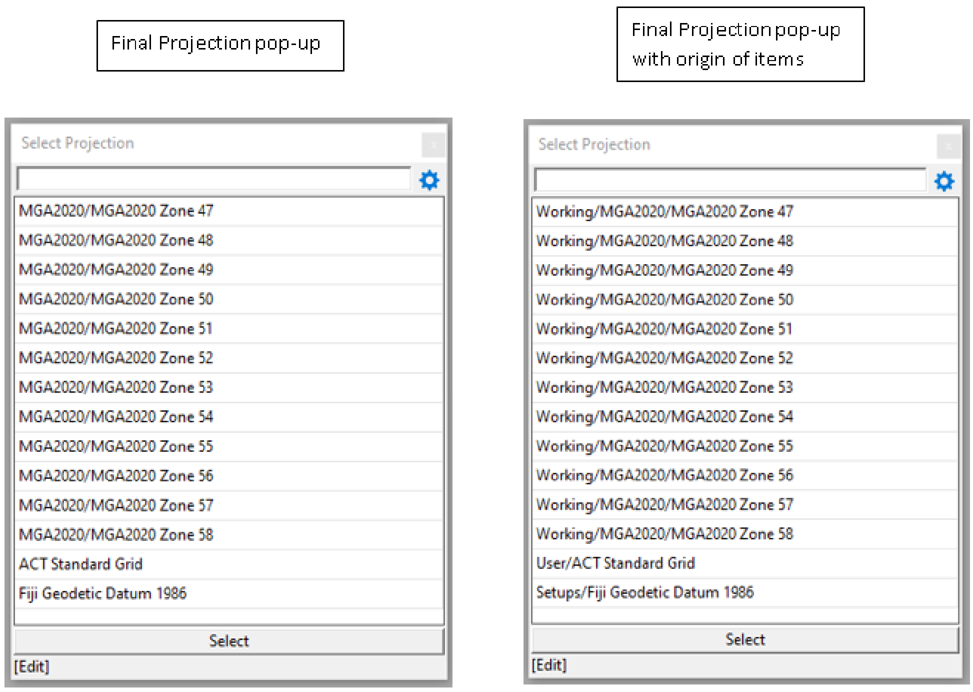
Origin of items in Projection pop-up choice box

Show all projection same as ***Final Projection pop-up****, with extra information about the origin of each projection.*

Buttons at Bottom

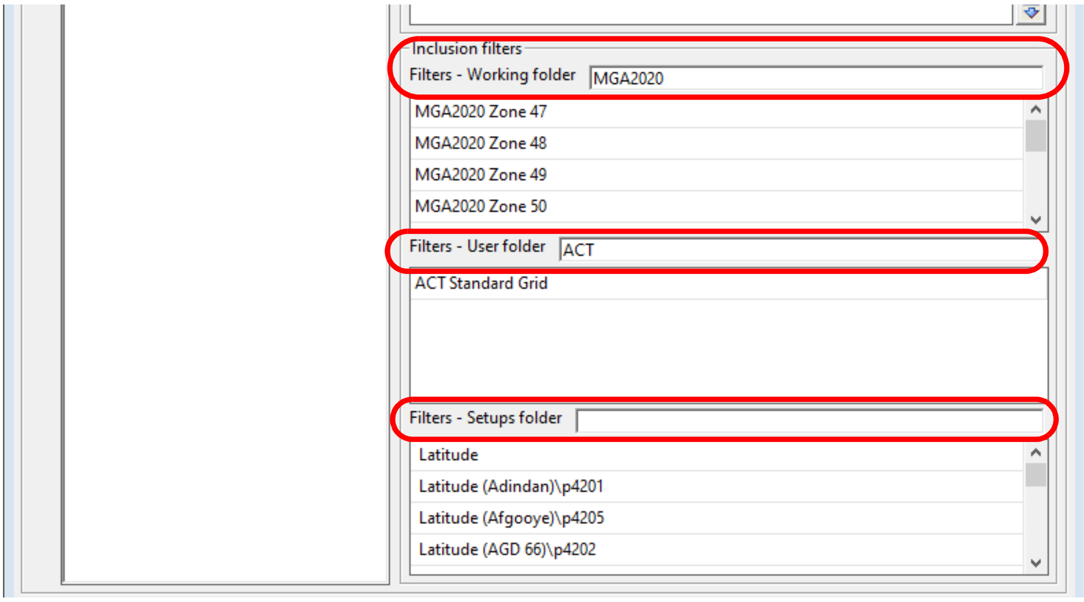
Reload button

To reload after changes/updates to projection editor settings.



7.4.2.1.5 Inclusion Filters Syntax

The text in the fields for the ***Inclusion Filters*** determine what projections are selected from the carto12d file that is in the corresponding folder ***Working***, ***Custom***, ***User*** or ***Setups***.



The **Filters** fields uses **key text** separated by the logic operators ***comma*** ",", ***plus*** "+" or ***minus*** "-", to determine a subset of matches amongst all the projections in the particular folder.

The matches for the **key text** are **case insensitive** and **partial**.

The key text can included spaces which must then be part of the match.

For example **MGA Zone 47** will **MGA Zone 47 (GDA 94)** but not **MGA Zone 48.**

The **logic operations** are interpreted as follows:

AND use **plus** '+'

For example:

X+Y will also search for text that contain **BOTH X and Y**.

That is, the search will return only results that have both X and Y in them.

OR use **comma** ','

For example:

X,Y will search for text that contain **EITHER X or Y** or **BOTH X and Y.**

That is, the search will return results that have X or Y, or both X and Y in them.

NOT use **minus** '-'

For example:

-X will exclude text that has **X in them**

That is, the search will return results that don’t contain X.

The syntax is evaluated from left to right.

That is, you can have things like:

X Y,Z-A

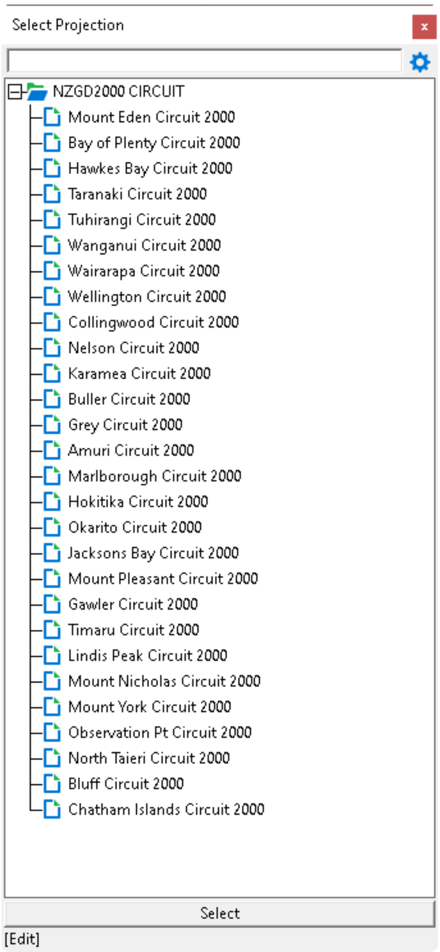
which means the search will find text with

(X space Y) or Z, but none of them containing A

For example, the text

circuit 2000-wellington

will select the New Zealand Circuits for 2000 but leave out the one for Wellington.



Important Notes

1. The match is **case insensitive** and **partial**.
2. It is **key text** and not **key words** as used in the **Options Search Bar**.

   The difference is crucial because **key text** can include spaces which **must be part of the match** whereas in the **Options Search Bar**, the space between **key words** is an **AND** logic operation.
3. **X Y** (that is X space Y) is different to **X+Y**

   X Y looks for projection names containing **X space Y** somewhere in the name

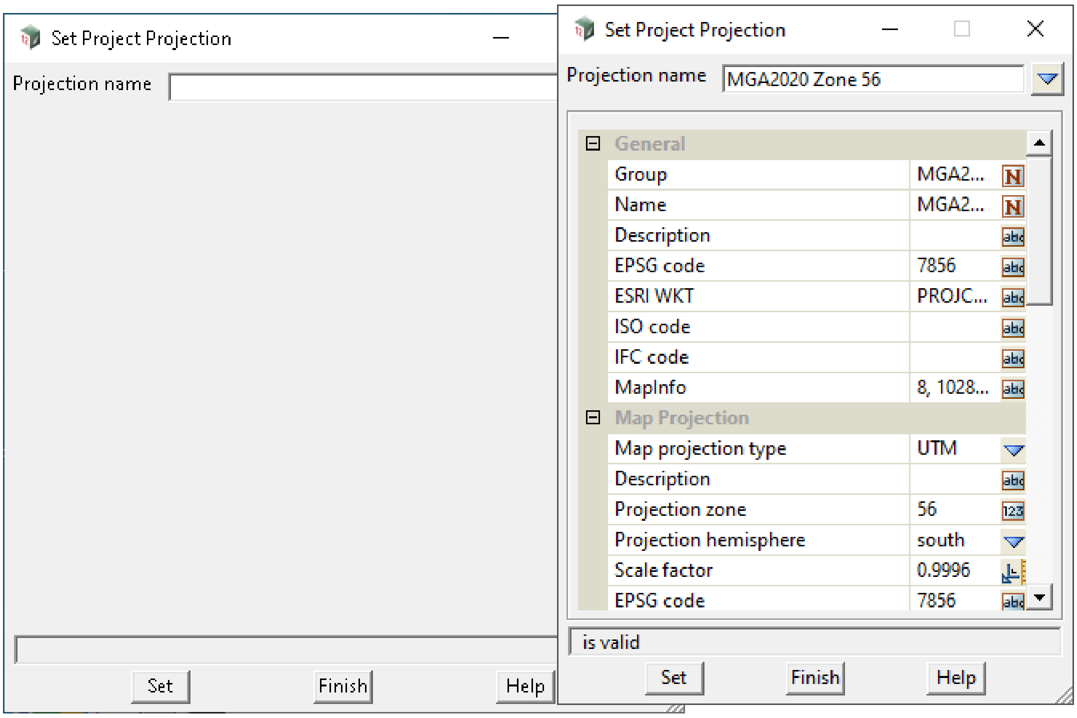
   X+Y looks for projection names that contain **X somewhere** in the names **and** also **Y somewhere** in the name.

7.4.2.2 Set Projection

Position of option on menu: **Project => Management => Projections => Set projections**

This option is used to set the projection for the project.

Selecting **Set projection** brings up the **Set project projection** panel.



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

Field Description	Type	Defaults	Pop-Up
Projection name	choice box		all defined projections

The projection that is to be saved at the projection for the project.

When a projection is selected from the pop-up of available projections, the information about the selected projection is displayed on the panel. See the above example for ***MGA2020 Zone 56***

Buttons at Bottom

Set	button

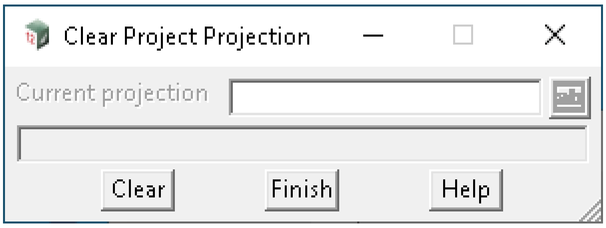
Set the projection for the project.

7.4.2.3 Clear Projection

Position of option on menu: **Project => Management => Projections => Clear projection**

This option removes the Project Projection.

Selecting **Clear projection** brings up the **Clear project projection** panel.



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

Field Description	Type	Defaults	Pop-Up
Current projection	choice box		

Name of the current projection set for the project.

Buttons at Bottom

Clear	button		

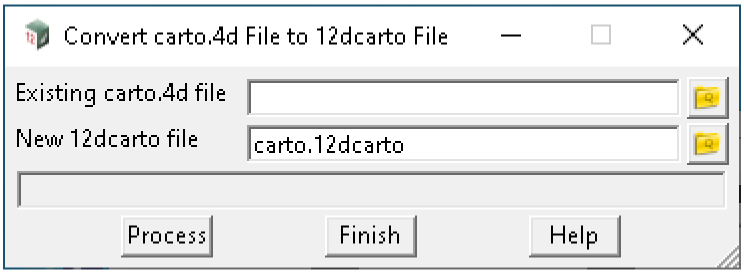
Remove the current projection from the project.

7.4.2.4 4 Convert projection 4d to 12dcarto

Position of option on menu: **Project => Management => Projections => Convert projection 4d to 12dcarto**

This option converts your custom file carto.4d to the XML file carto.12dcarto

Selecting **Convert projection 4d to 12dcarto** brings up the **Convert carto File from 4d to XML Format** panel.



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

Field Description	Type	Defaults	Pop-Up
Existing carto.4d file	file box		*.4d files

Choose old carto file (4d format) to convert into new carto file (12dcarto format).

New 12dcarto file	file box		*.12dcarto files

New name for the converted carto file. New carto file will have format 12dcarto.

Buttons at Bottom

Process button

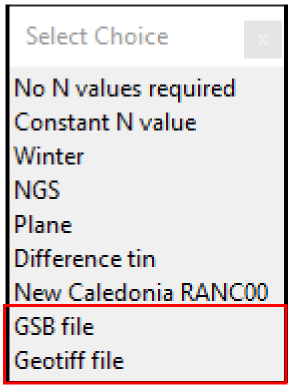
*On **process**, the old carto file will be converted into 12dcarto file with the XML format.*

7.4.3 N Values

7.4.3.1 Create/Edit N-Value Definitions

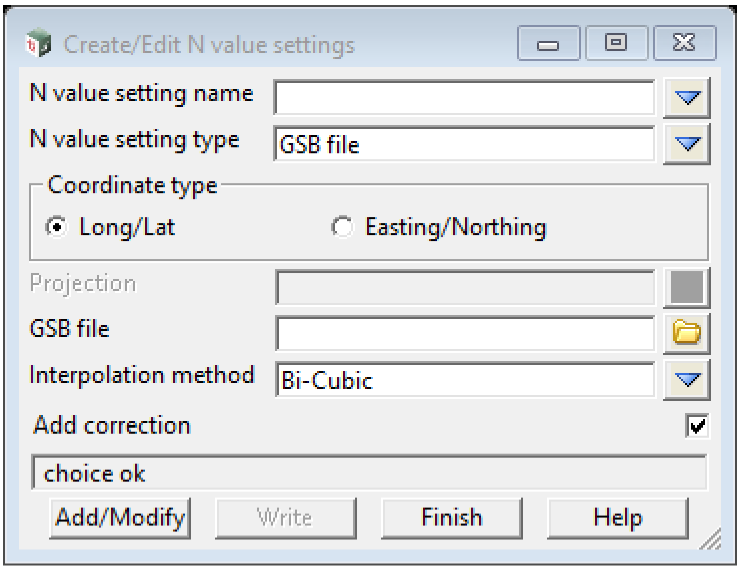
Now documented In the v15 reference manual

The options **GSB file** and **Geotiff file have** been added to the **create/edit N-value settings** panel.



GSB file
Geotiff file

GSB file



Field Description	Type	Defaults	Pop-Up
Long/Lat	radio button	ticked	

*If **ticked**, the expected coordination to be used with this setting is in longitude, latitude.*

Easting/Northing	radio button	not ticked	

*If **ticked**, the expected coordination to be used with this setting is in easting, northing. It will also requires a projection to work with.*

Projection	projection box		

*If **easting**, northing is used, a projection must be chosen for converting to longitude, latitude.*

GSB file file box *.gsb

A gsb file to find N value according to provided long/lat or easting/northing.

Interpolation method choice box Bi-Cubic Bi-Linear, Bi-Cubic

*If **Bi-Linear** is chosen, a 4-point-calculation is used to calculate the element's N value.*

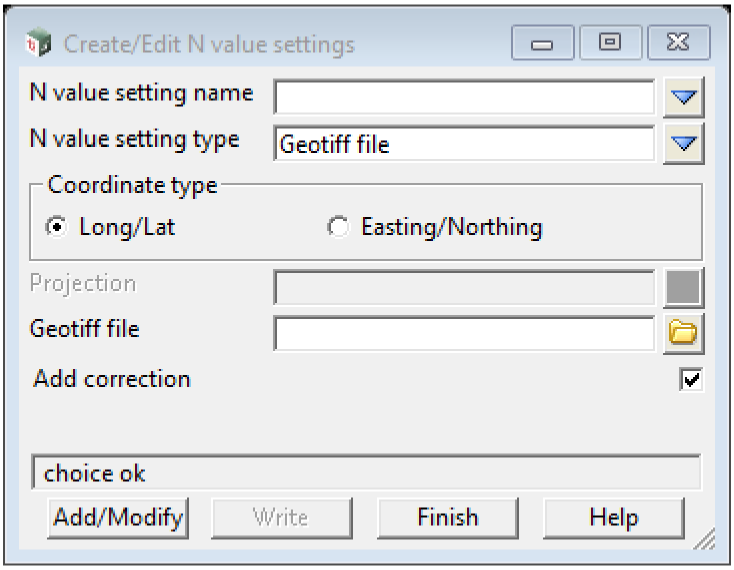
*If **Bi-Cubic** is chosen, a 16-point-calculation is used to calculate the element's N value.*

Add correction tick box ticked

*If **ticked**, N value is added to the height.*

*If **not ticked**, the N value is subtracted from the height.*

Geotiff file



Field Description Type Defaults Pop-Up

Long/Lat radio button ticked

*If **ticked**, the expected coordination to be used with this setting is in longitude, latitude.*

Easting/Northing radio button not ticked

*If **ticked**, the expected coordination to be used with this setting is in easting, northing. It will also requires a projection to work with.*

Projection projection box

*If **easting/northing** is used, a projection must be chosen for converting to longitude, latitude.*

GSB file file box *.gsb

A geotiff file to find N value according to provided coordinates. The calculation is to be done with bi-linear method (4-point-calculation).

Add correction tick box ticked

*If **ticked**, N value is added to the height.*

*If **not ticked**, the N value is subtracted from the height.*

7.5 Project Sharing

Position of menu: **Project =>Sharing**

Now documented In the V15 reference manual

Important note:

Sharing has been totally rewritten for V15.

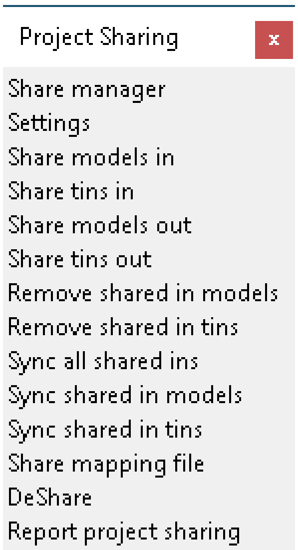
For information about sharing, see 7.5.1 Information on Sharing of Models and Tins.

The Sharing walk-right menu has been rearranged so that all the sharing options are in the one place.

***Share Manage*r** is a new option that creates and edits master share files. It also adds into the current project, the master share files that are to be used by the current project.

There are also options in the ***Share Manage*r** to shared out models and tins and to list the models and tins that are share into the current project.

The **Sharing** walk-right menu is:



7.5.2 Share Manager

7.5.3 Synchronize All Shared In Models and Tins

7.5.1 Information on Sharing of Models and Tins

Models and Tins can be **shared into your project** from other projects. That means that in your project, the models an tins that are shared in from another project are not created in your project, but are copies of the models and tins from the other project.

And when the models and/or tins are modified in the other project, they can be **automatically updated** in your project.

In your own project, you decide which models and tins are available to be shared into other peoples projects. That is, you say which or your models and tins can be **shared out to another project**.

It is possible to have Shares of Shares. That is, you share a model or tin **into your project**, and then that model or tin is **shared out to another project**.

When models and tins are being shared into your project, a copy of the models and tins are copied over into your project. And each time one of the models or tins is modified in the original project, a new copy is made in your project.

For more information on sharing, see 4.41 Sharing of Models and Tins.

Continue to 7.5.2 Share Manager or return to 7.5 Project Sharing.

7.5.2 Share Manager

Position of option on menu: **Project =>Sharing =>Share manage**

The **Share Manager**

(a) creates master share files that can be used by any project

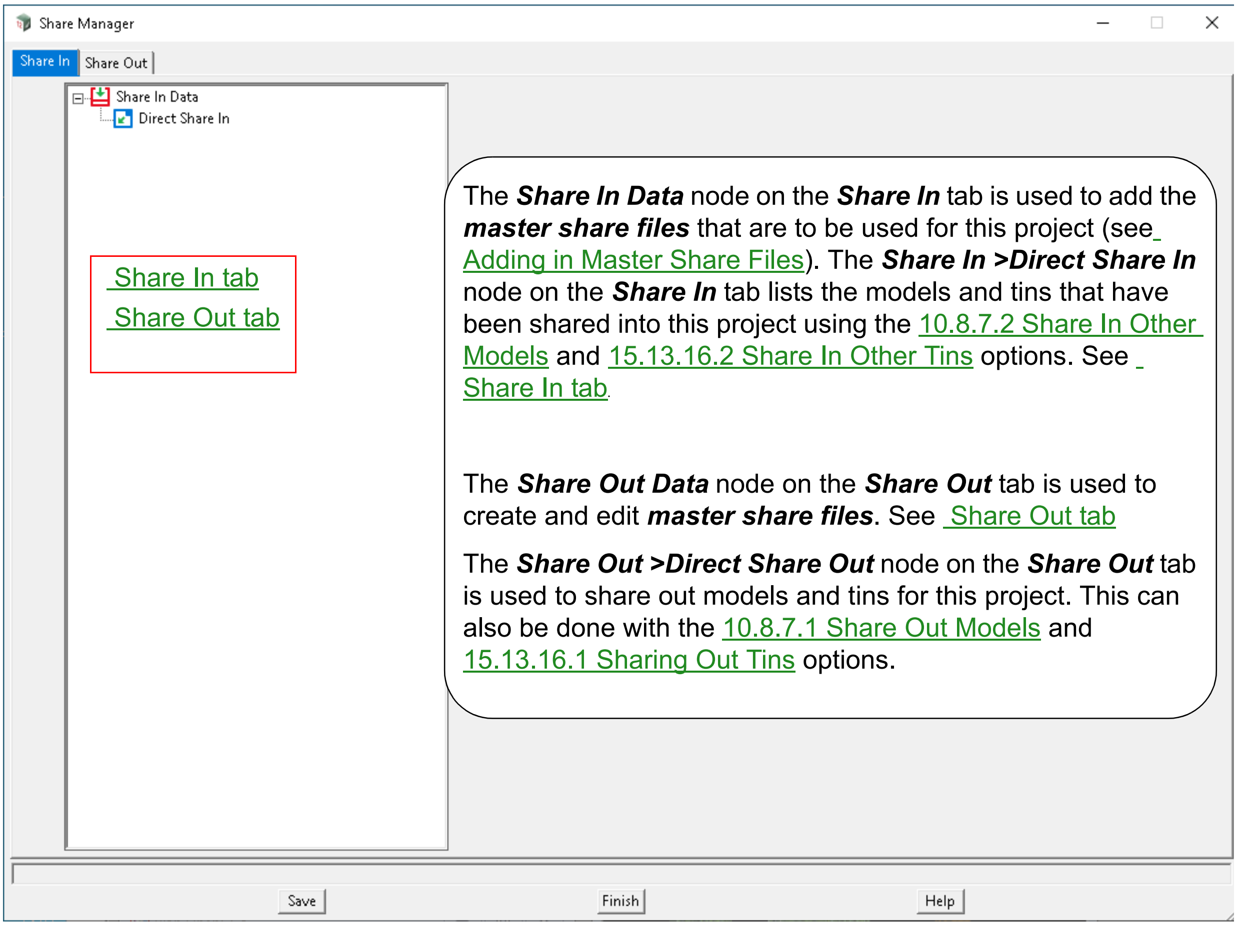
(b) for the current project: defines the master share files that are used for the project.

(c) for the current project: make models and tins available/not available for sharing out

(d) for other projects, lists the models and tins that have been made available for sharing out and hence available for sharing in to the current project.

For information on sharing of models and tins, and master share files, see 4.41 Sharing of Models and Tins.

Selecting **Share manage** brings up the **Share Manager** panel

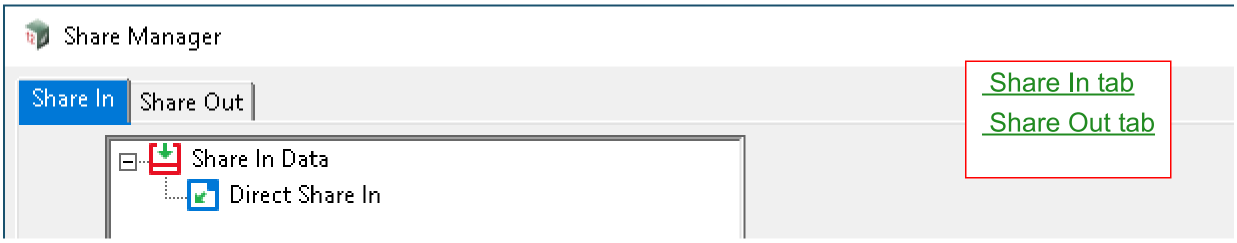


Button at Bottom

Field Description	Type	Defaults	Pop-Up
Save	button		

*Click **Save** to save the information in the panel.*

Share In tab

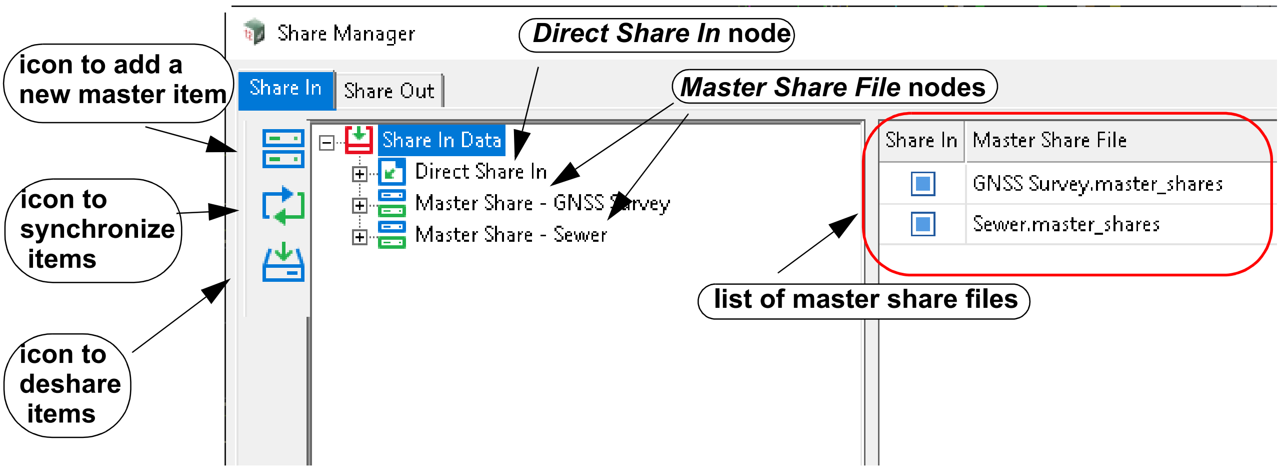


Models and tins can be shared into the current project in two ways:

1. **Direct Share In**
   Models and tins that have been shared into the current project using 10.8.7.2 Share In Other Models and 15.13.16.2 Share In Other Tins options are know as **Direct Share Ins** or just **Direct Shares**.
2. **Master Share FIles**
   For each ***master share files*** that has been added to the current project, the models and tins from other projects that are listed in the master share file are automatically shared in whenever the project is restarted. See Adding in Master Share Files.

Share in Data node

*The **Share in Data** tree has one **Direct Share In** node for displaying the models and tins that have been shared into the current project using the options* 10.8.7.2 Share In Other Models *and* 15.13.16.2 Share In Other Tins (*see* Share In Data >Direct Share In node), *and a **Master share file** node for each **master share file** being used for the current project (see* Adding in Master Share Files).



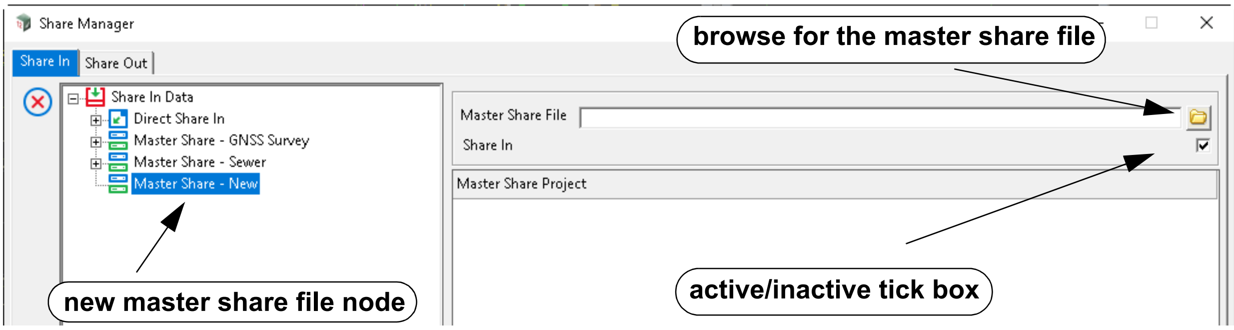
See

Adding in Master Share Files
Synchronize Items
DeShare Items

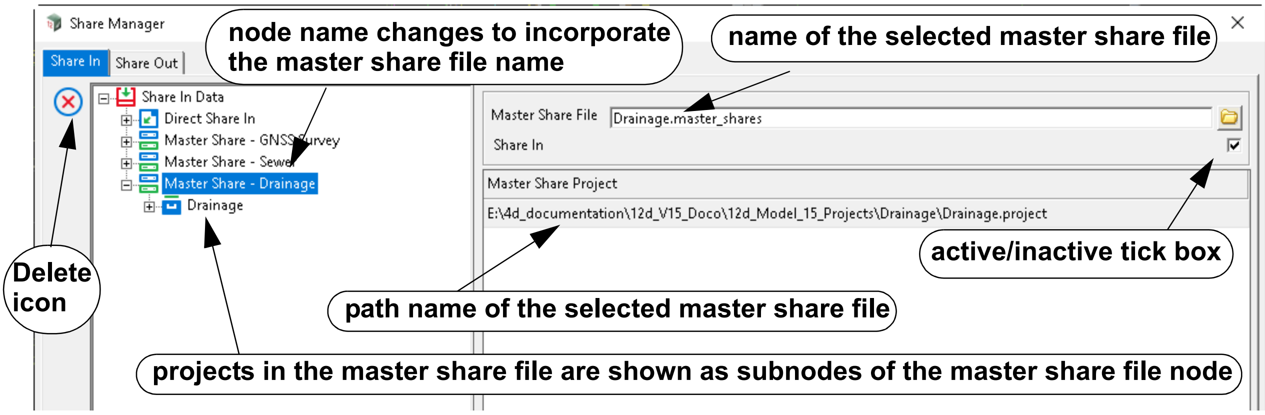
Adding in Master Share Files

*To add a master share file to the current project, click on the **Share in Data** node and the **New master item** icon will appear on the left hand side.*

*Clicking on the **New master item** icon creates a new **Master Share File** node with the name **Master share-new.** The panel fields **Master Share File** and **Active** are displayed on the right hand side.*



*Use the browse button on the **Master Share File** field to search for the master share file to be add to the current project.*



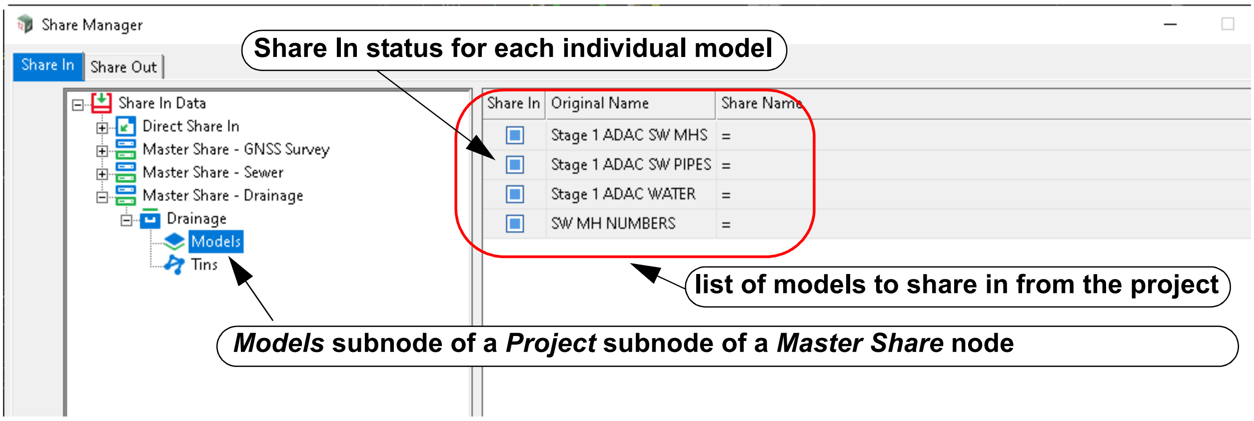
*After selecting a master share file, the master share file node changes to **Master share - master_share_file_name**, and the full path name of the selected master share file is displayed on the right hand side of the panel under the **Master Share Project** heading.*

*The **Active** tick box can be used to turn off the use of the master share file without having to delete it from the **Share In Data** subnodes.*

*The **Master Share File** node can be deleted by clicking on the node and then selecting the **Delete** icon that is then displayed on the left hand side.*

*Subnodes of the **Master Share File** node are created for each of the projects listed in the selected master share file, and each project node has **Models** and **Tins** subnodes showing the models and tins that will be shared in using the master share file.*

*The **Share In** status column is for **display purposes only**.*



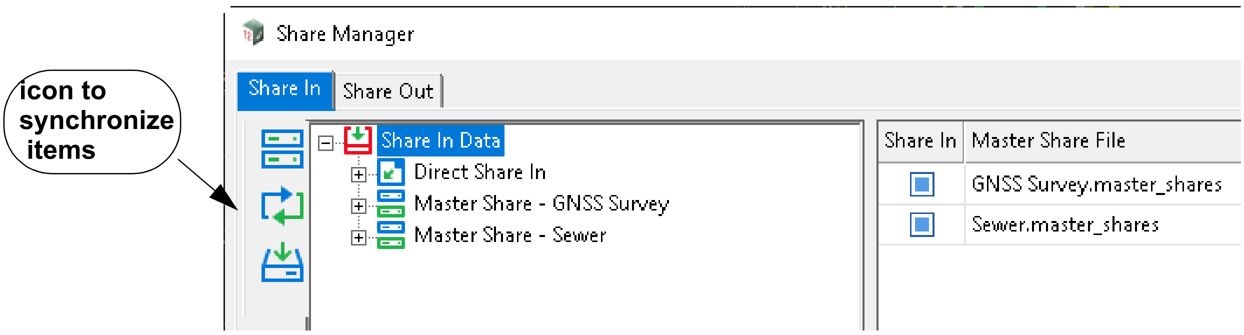
Continue to [Synchronize Items] or [Share In Data >Direct Share In node] or return to [7.5.2 Share Manager].

Synchronize Items

The ***synchronize item*** *icon is used to synchronise shared in models and/or shared in tins. That is, shared in models and/or shared in tins that are older that the original models and/or tins, can be updated to again be identical to the original models and/or tins.*

Which models and/or tins are synchronized depends on what part of the tree is highlighted when the ***synchronize item*** *icon is pressed.*

For example, when ***Share in Data*** *is highlighted, ALL direct shared in modes and tins and ALL master shared in models and tins, are synchronized.*



Continue to [DeShare Items] or [Share In Data >Direct Share In node] or return to [7.5.2 Share Manager].

DeShare Items

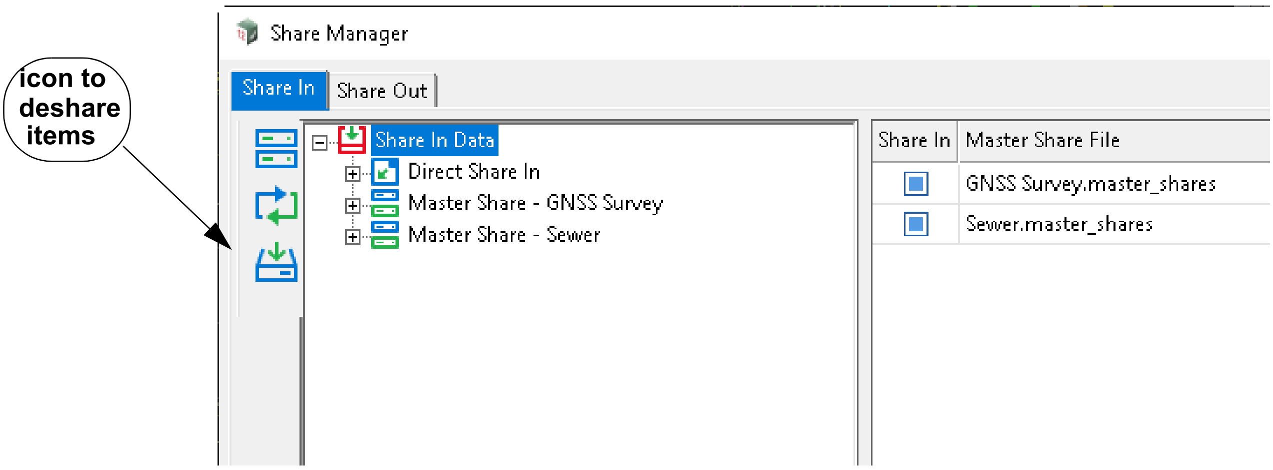
*The **deshare item** icon is used to create copies of shared in models and/or shared in tins in the current project and removed them from being shared in.*

*If a model and/or tin was **directly shared in**, then it is removed from being directly shared in.*

*If a model and/or tin was **shared in by a master share file**, then it is made **inactive** in the master share file.*

*Which models and/or tins are deshared depends on what part of the tree is highlighted when the **deshare item** icon is pressed.*

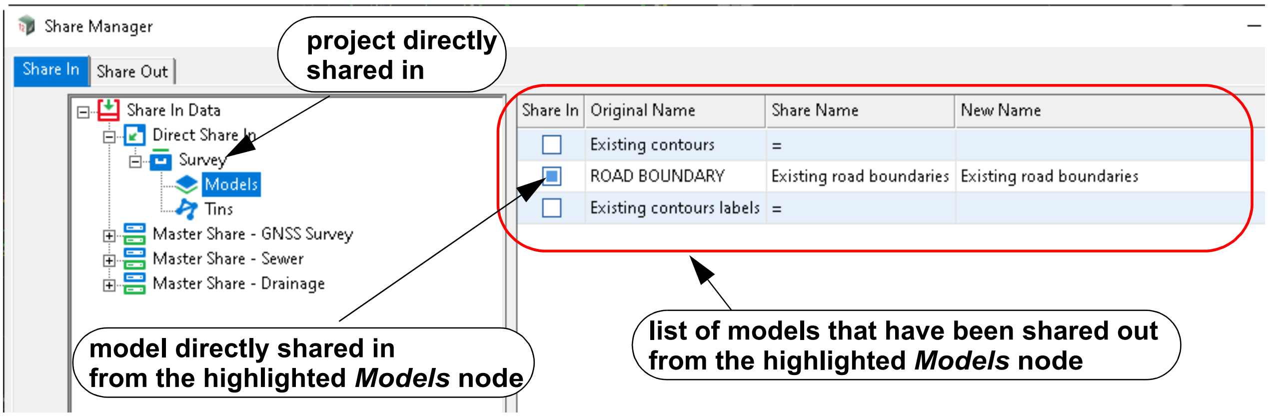
*For example, when **Share in Data** is highlighted, ALL direct shared in modes and tins and ALL master shared in models and tins, are deshared.*



Continue to Share In Data >Direct Share In node or return to 7.5.2 Share Manager.

Share In Data >Direct Share In node

*The **Direct Share In** node is used for displaying the models and tins that have been shared out from other projects and denote which ones have been shared into the current project using the options* 10.8.7.2 Share In Other Models *and* 15.13.16.2 Share In Other Tins. *These models and tins are known as **Direct Share Ins**, or just **Direct shares**.*



*All the listed models/tins have been shared out of the selected project but only the models/tins ticked **on** in the **Share In** column have been shared in by the* 10.8.7.2 Share In Other Models *and* 15.13.16.2 Share In Other Tins options.

***Note**: The **Share In**, **Original Name**, **Share Name** and **New Name** columns are display only.*

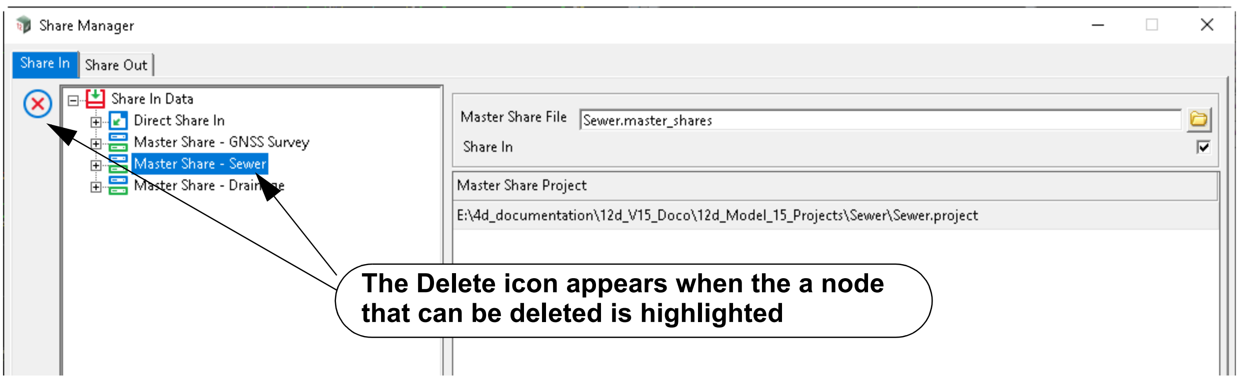
Deleting a Subnode of the *Share In Data* Node

*Currently only the **Master Share** nodes under the **Share In Data** node can be deleted.*

*To indicate that deleting a node is possible, a **Delete** icon appears on the left hand side whenever a node that can be deleted is highlighted.*

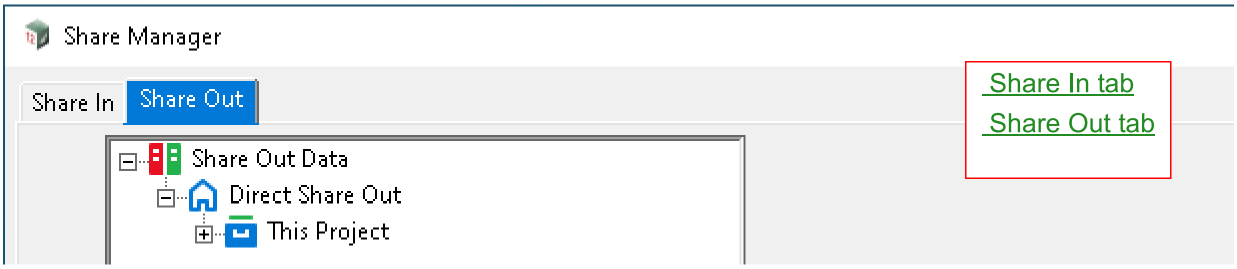
*For example, the **Delete** icon appears when the **Master Share** node **Master share - GNSS Survey** is highlighted.*

***NOTE**: deleting a Master Share File node **DOES NOT** delete the maser share file itself.*



Continue to Share Out tab or return to 7.5.2 Share Manager.

Share Out tab



Share In tab
Share Out tab

The ***Share Out*** tab is be used to make models and tins available for sharing out (see Share Out Data >Direct Share Out node), and also to create and edit master share files (see Creating a Master Share File and Editing a Master Share File). Some **nodes** under the ***Share Out Data*** node can also be deleted (see Deleting a Subnode of the Share Out Data Node).

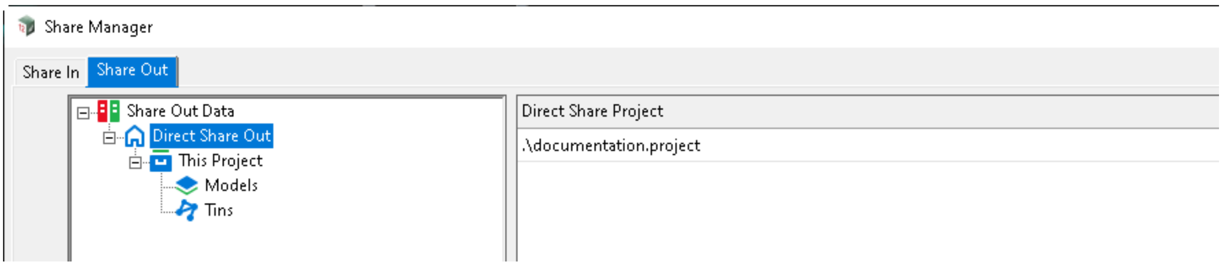
Share Out Data >Direct Share Out node

For a project, models and tins that have been made available for sharing out of a project are called ***Direct Share Outs,*** *or just* ***Direct Shares,*** *for the project. Models and tins can be shared out in two ways:*

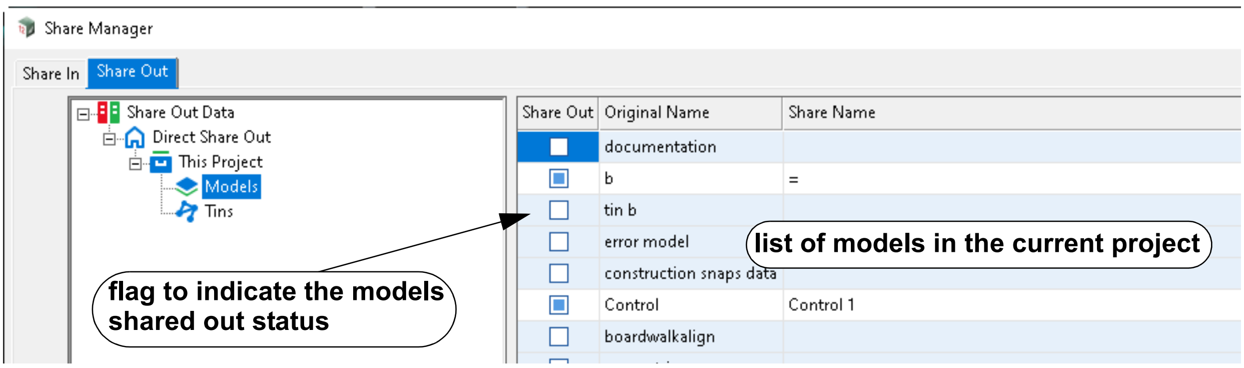
1. **Using the panels Share Out Models and Share Out Tins**
   See 10.8.7.1 Share Out Models and 15.13.16.1 Sharing Out Tins
2. **Using the Direct Share Out node in the Share Manager**
   Using the ***Direct Share Out*** node will now be discussed.

The ***This Project*** *node under the* ***Direct Share Out*** *node is used for making models and tins in the current project available for sharing out. When a model or tin is available for sharing out, the model or tin is said to be* ***shared out****.*

By clicking on the + on the left of the ***Direct Share Out*** *node, the* ***This Project*** *node is displayed. And clicking on the + on the left of the* ***This project*** *node displays* ***Models*** *and* ***Tins*** *nodes.*



Clicking on the ***Models/Tins*** *node displays a list of* ***models/tins*** *in the current project.*



*The **Share Out** flag indicates whether the mode/tin on the row has been shared out (on) or not shared out (off).*

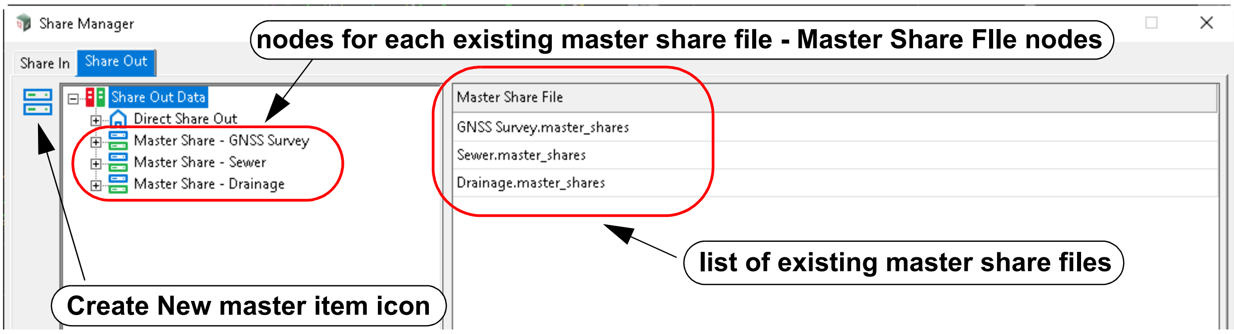
*To change the **Share Out** status for a mode/tin, click on the **Shard Out** flag to the status is required, and then click on **Save**.*

Creating a Master Share File

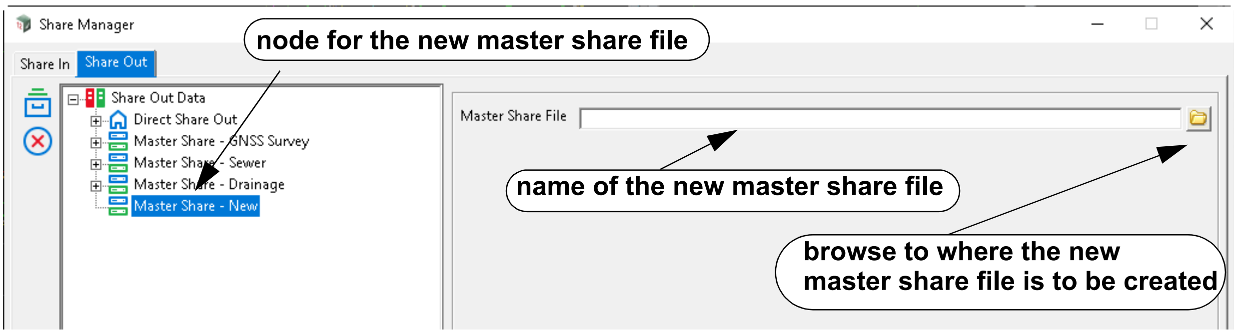
A master share file contains a list of projects, and the models and tins in those projects, that are to be automatically shared into any project that uses the master share file. When a master share file is used by a project, The sharing in occurs every time the project using the master share file is restarted.

*To create a **new master share file**, click on the **Share Out Data** node and the **New master item** icon will appear on the left hand side.*

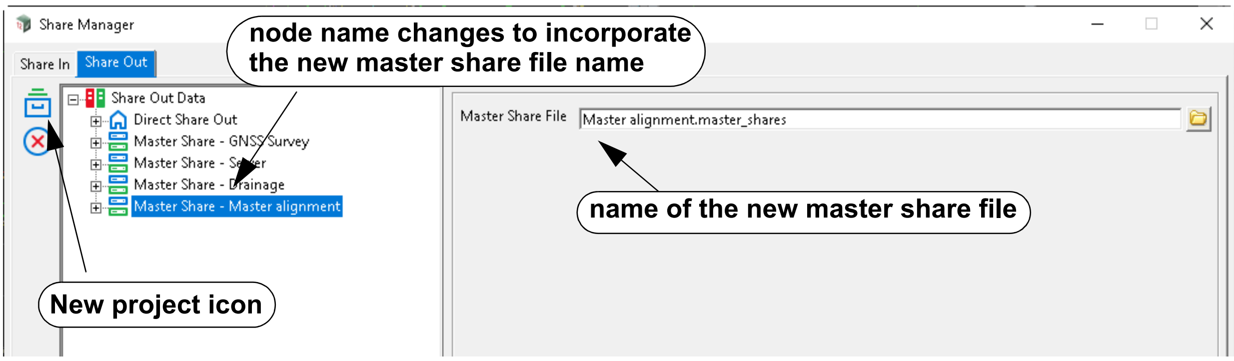
*Clicking on the **New master item** icon creates a new **Master Share File** node with the name **Master share-new.***



*Clicking on the **New master item** icon creates a new **Master Share File** node with the name **Master share-new.** The panel field **Master Share File** is displayed on the right hand side.*



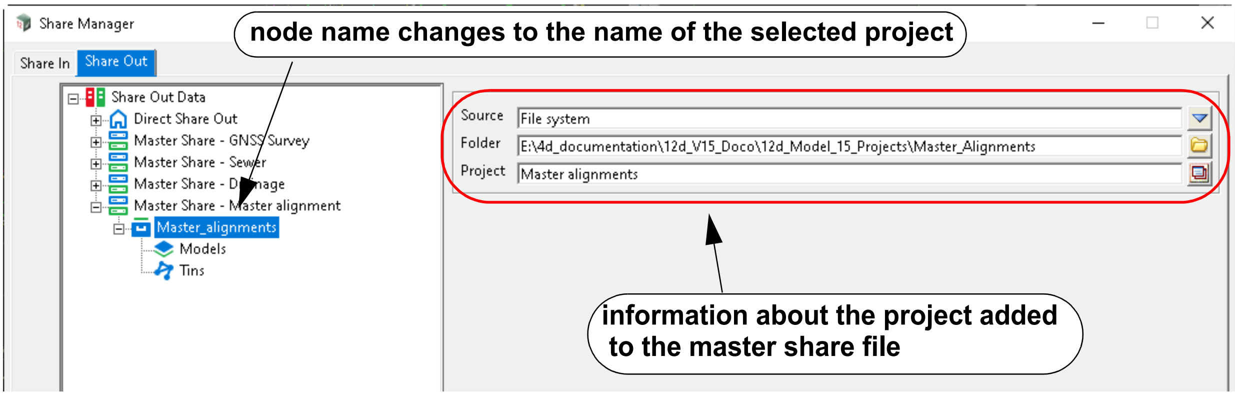
*Typed in a name for the new master share file into the **Master Share File** field and when <Enter> is pressed, the master share file node name changes to **Master share - master_share_file_name**.*



*Click on the **New project** icon on the left had side, to **add a project** to the master share file so that models* *and/or tins to add to the master share file can be selected from the project.*

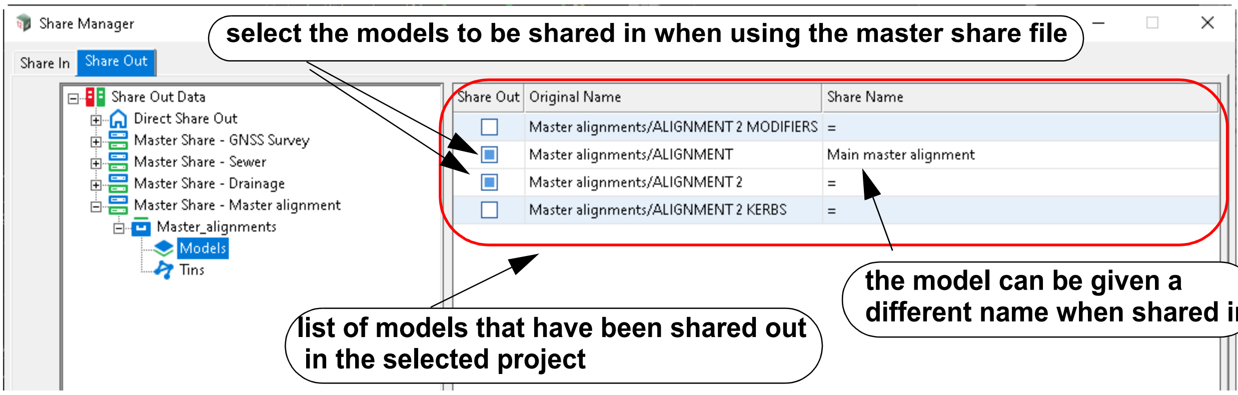
*A subnode called **New Project** is then added to the **Master Share File** node and the fields required to select a project, from either a file system or 12d Synergy, are displayed on the right had side of the panel.*

*After selecting a project, the **New project** node name changes to the name of the selected project, and the subnodes **Models** and **Tins** are created.*



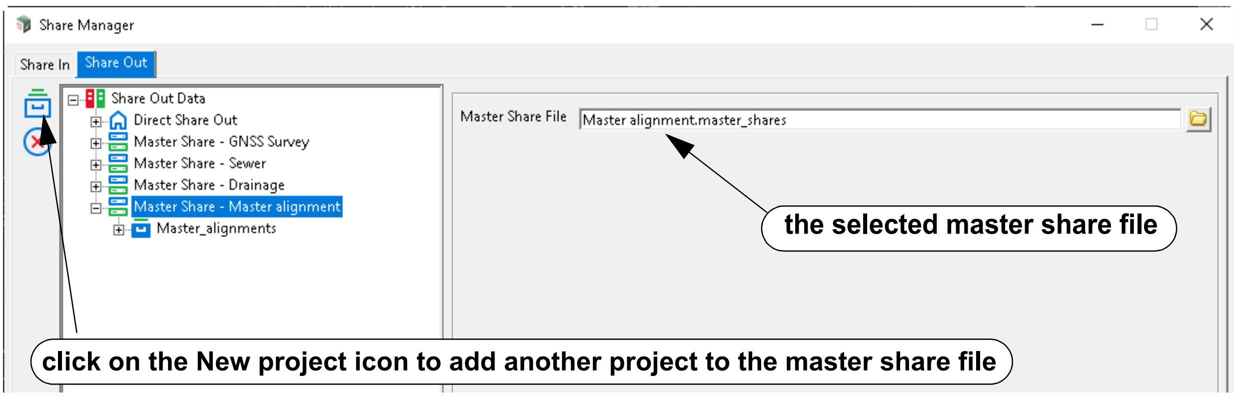
*Clicking on the **Models/Tins** node will show all the models/tins that have been shared out of the selected project and hence available to be shared into other projects.*

*Click the **Shared In** flags to **on** for all the models/tins that are required to be shared in to a project that uses this master share file.*

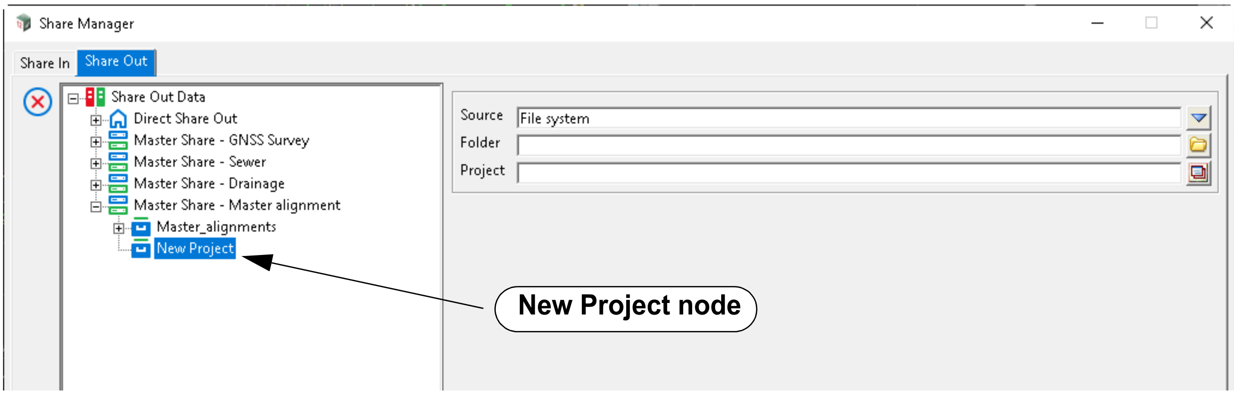


*Click on **Save** to update the master share file and the information in the **Share Manager.***

*More projects can be added to the share master file by clicking on the **Master Share File** node for the master share file, and then clicking the **New project item** icon again.*



*A **New Project** node is added to the highlighted **Master Share File** node.*



Continue as described before by first selecting a project, and then selecting for that project, the models and tins to be shared in when using this master share file.

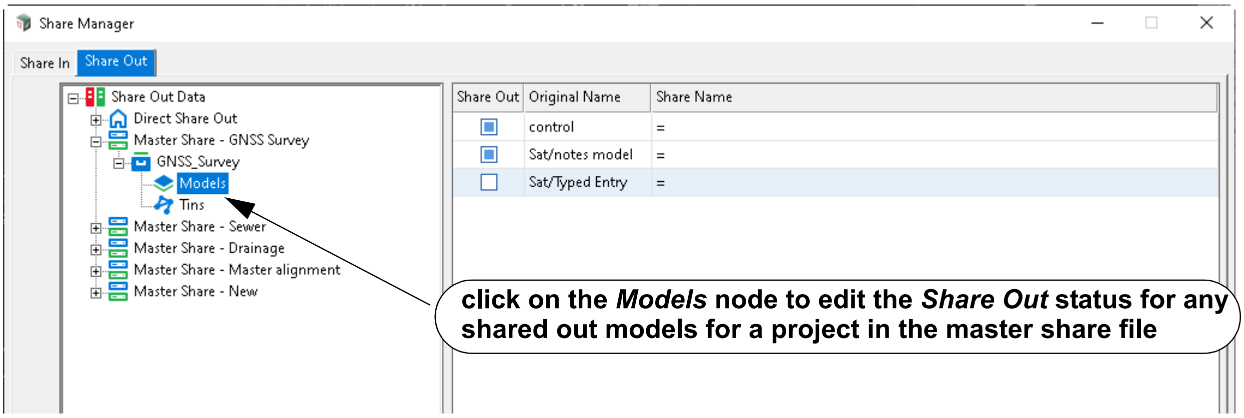
*Click on **Save** to update the master share file and the information in the **Share Manager**.*

Editing a Master Share File

*To edit an existing master share file, click on the appropriate subnode of the **Master Share File** node that displays the data that needs to be edited.*

*For example, click on the **Master Share File** node for a master share file if another project is be added to the master share file.*

*Or click on the **Models** node of the **Project** node of the **Master Share File** node if the **Share In** status of any model is to be modified.*



*After any edits are made, click on **Save** to update the master share file and the information in the **Share Manager**.*

***Note**: if the master share file to be edited is not listed under the Share Out Data tab, see* Editing an Existing Master Share File Not Under the Direct Share Out Node

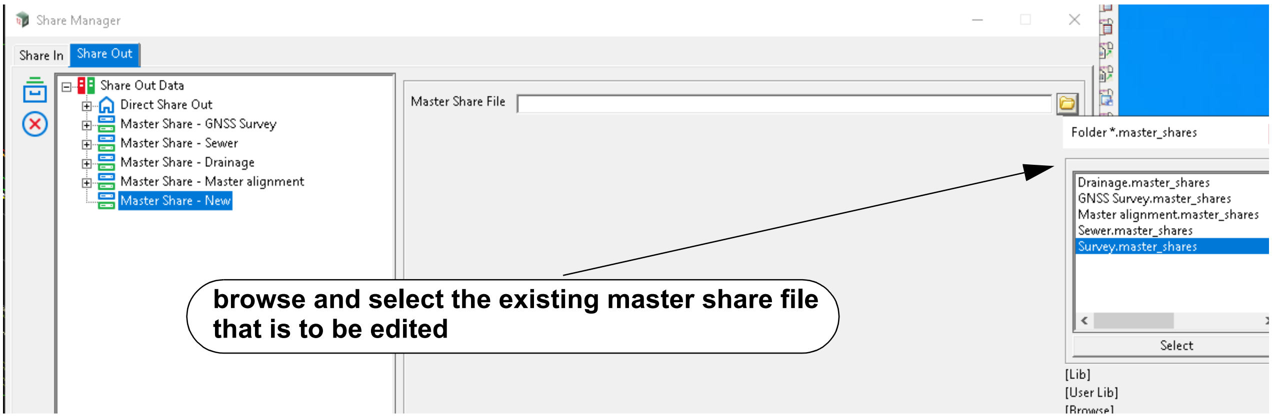
Editing an Existing Master Share File Not Under the Direct Share Out Node

*The master share file to be edited may not be under the **Share Out Data** node. If this is the case, the master share file must first be added to the **Share Out Data** node before it can be edited.*

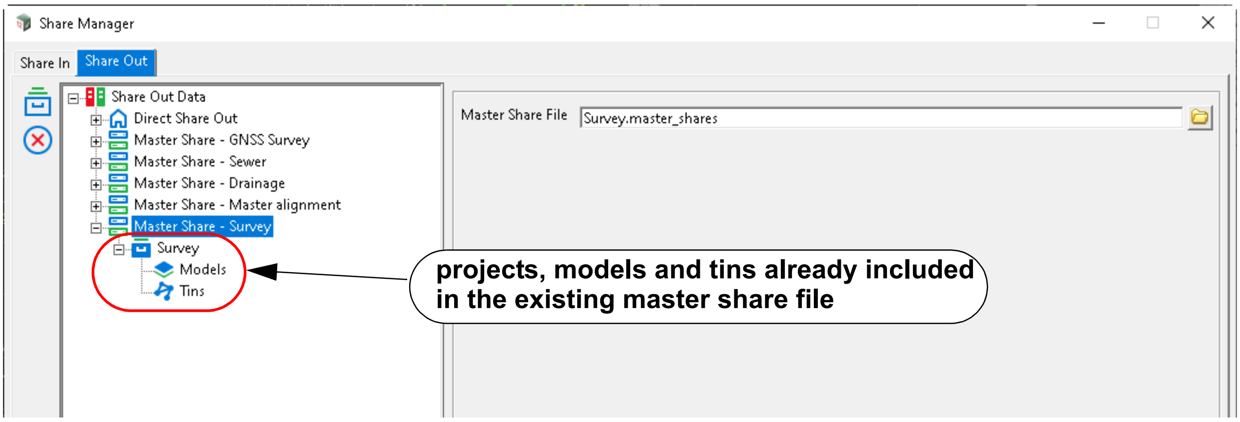
*To add an existing master share file to the **Direct Share Out** node, first click on the **Direct Share Out** node and then select the **New master item** icon that appears on the left had side of the panel.*

A new Master Share File node is then created and the Master Share File field displayed on the right hand side of he panel. So far the steps are the same as for creating a new master share file.

The difference is that instead of create a new master share file, the Browse button is used to find a select an existing master share file.



*When an existing master share file is selected, the **Master Share File** node name is changed to **Master Share - master_share_file_name** and the projects, models and tins already included in the existing master share file are added as subnodes.*



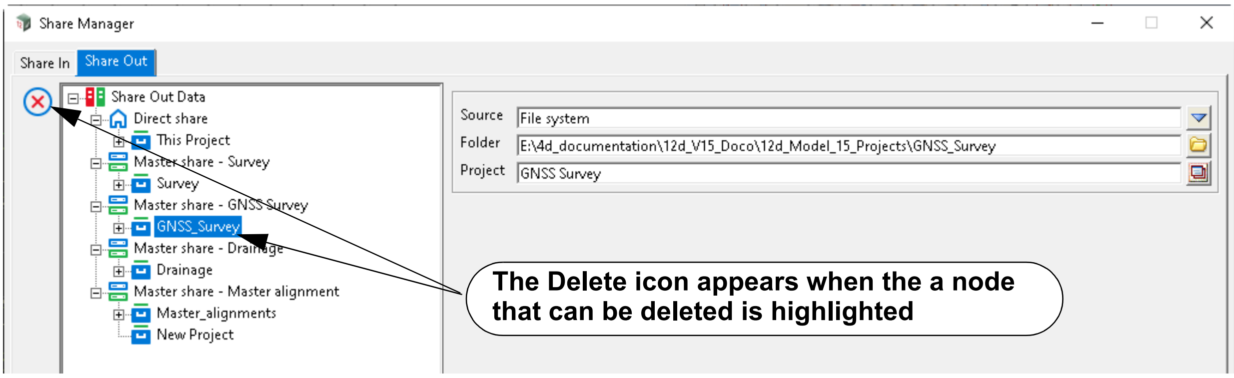
The master share file can then be edited. See [Editing a Master Share File](#).

Continue to [Deleting a Subnode of the Share Out Data Node](#) or return to [7.5.2 Share Manager](#).

Deleting a Subnode of the Share Out Data Node

*Some nodes under the **Share Out Data** node can be deleted, and to indicate that deleting a node is possible, a **Delete** icon appears on the left hand side whenever a node that can be deleted is highlighted.*

*For example, the **Project** subnode of a **Master Share** node.*



*The nodes that can't be deleted are the **Share Out Data** node, the **Direct Share Out** node, the **This Project** node and the **Models** and **Tins** nodes.*

7.5.3 Synchronize All Shared In Models and Tins

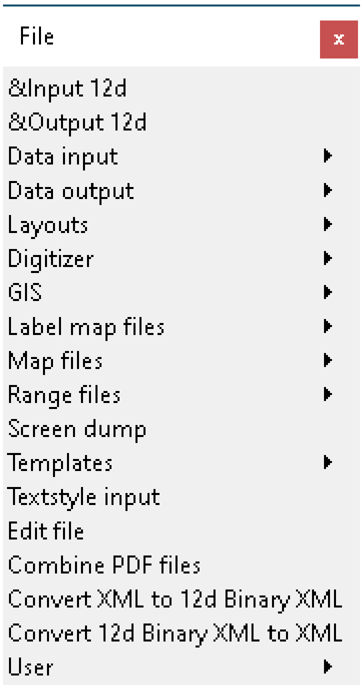
Position of option on menu: **Project =>Sharing =>Sync all share ins**

The **Sync all share ins** option is used to update any shared in models and tins in the project.

This includes models and tins that are directly shared in and models and tins that have been shared in using a master share file.

8 File

There has been changes to the **File** chapter in the ***12d Model Reference manual***.



See

8.1 Genio Input
8.2 Import LAS
8.3 ArcView SHP New Output
8.4 LINZ WFS Data Service Reader
8.5 MapInfo Write Tab/MIF Files
8.6 KML Reader
8.7 Map File Create/Edit
8.9 12d Binary XML Files

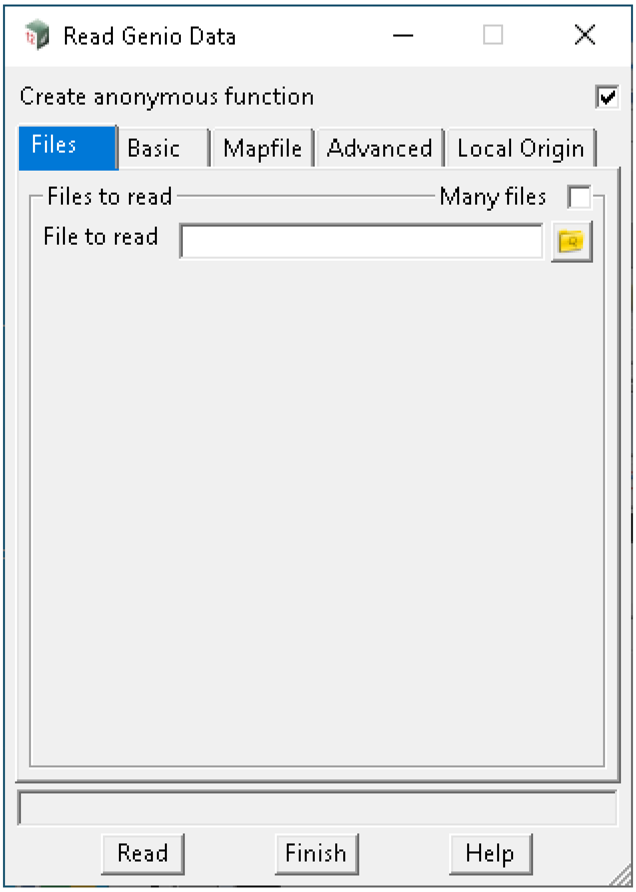
8.1 Genio Input

Position of option on menu: **File =>Data input =>Genio**

Now documented In the v15 reference manual

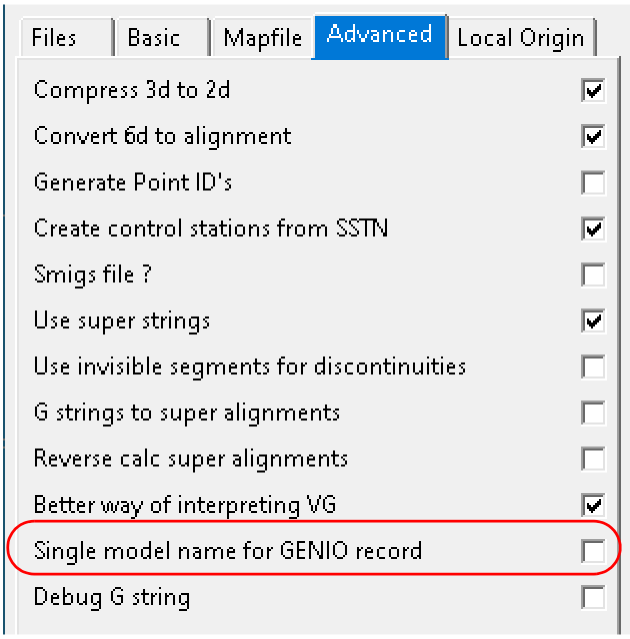
The option **Single model name for GENIO record** has been added to the panel under the Advanced tab.

On selecting the **Genio** option, the **Read Genio Data** panel is displayed.



Advanced tab

Advanced tab



Single model name for GENIO record tick box not ticked

*If **ticked**, the GENIO record defines a single model name.*

*If **not ticked**, the GENIO record defines two model names with maximum length of 29 characters.*

Remarks

The MOSS Genio record consists of two model names, a primary and secondary. This means that the 80 characters are split into two fields.

This places an upper limit of the allowable model names lengths. So this tick changes the behavour of the GENIO record to non-standard.

*Thus, if **ticked** and the GENIO record did infact have separate primary and secondary model names, the resulting model in 12d Model will look odd.*

8.2 Import LAS

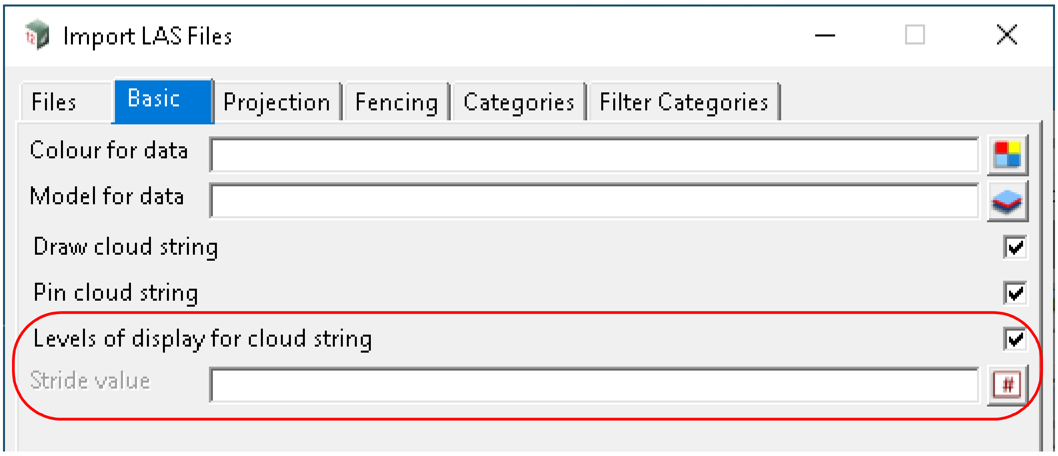
Now documented In the v15 reference manual

Position of option on menu: **File =>Data input =>Point clouds => LAS =>Import LAS**

Position of option on menu: **BIM =>Point clouds =>Import =>LAS =>Import LAS**

Now documented In the v15 reference manual

The options **Stride value** and **Levels of display for cloud string** have been added under Basic tab on the Import LAS Files panel.



Levels of display for cloud string tick box ticked

This tick controls whether less details version of point clouds are created for faster drawing.

*If **ticked**, for each point cloud created, an associated series of less detailed clouds is created.*

*If **not ticked**, no associated series of less detailed clouds is created.*

Stride value

This field is optional, and the default value is 1.

If a value of 2, then every second point from the LAS file is imported.

Value	*Even nth Points*
2	*2nd*
3	*3rd*
4	*4th*
5	*5th*
6	*6th*
7	*7th*
etc	

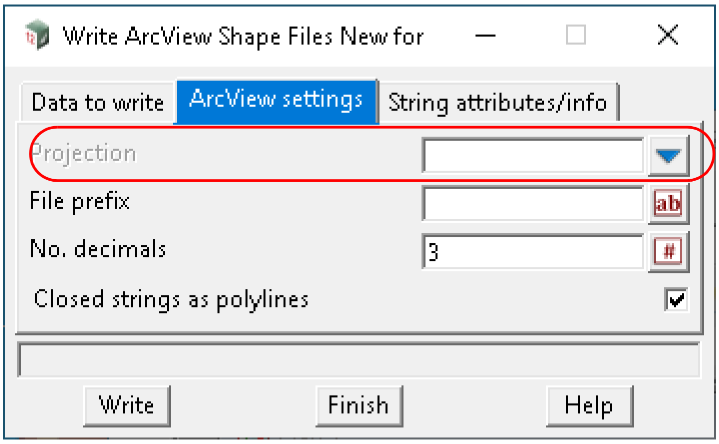
8.3 ArcView SHP New Output

Position of option on menu: **File =>Data output =>ArcView =>ArcView SHP (new)**

Now documented In the v15 reference manual

The option **Projection** has been added to the **ArcView settings** tab on the **Write ArcView Shape Files New** panel.

Selecting **ArcView SHP (New)** displays the **Write ArcView Shape Files New for** panel.



see ArcView Settings tab

The fields and buttons used in the **Write ArcView Shape Files New for** panel have the following functions.

Field Description	Type	Defaults	Pop-Up
ArcView Settings tab			
Projection	choice box		All defined projections

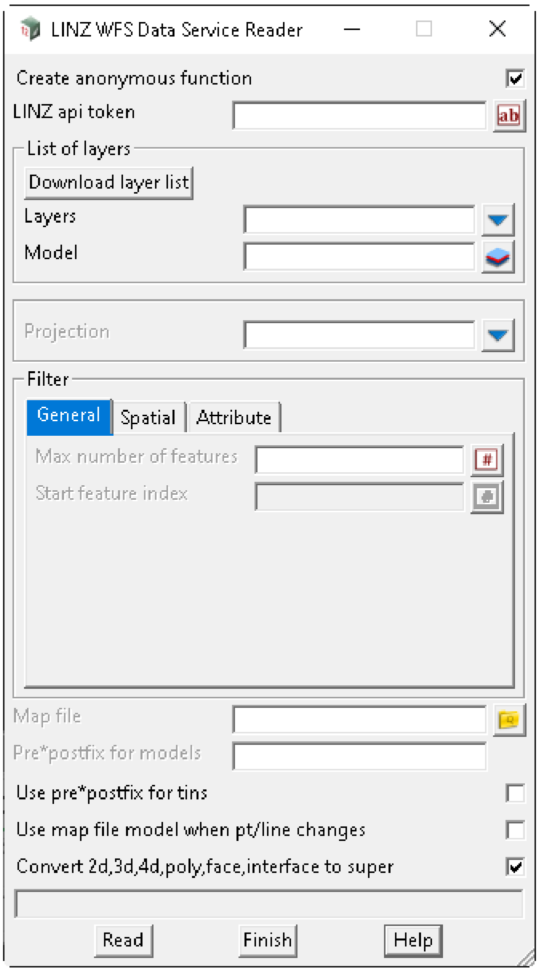
OPTIONAL - if a projection is chosen, the RSRI WKT string of the projection (if available) shall be written out to a .prj file.

8.4 LINZ WFS Data Service Reader

Position of option on menu: File =>GIS =>LINZ WFS data service

Now documented In the v15 reference manual

Selecting **LINZ WFS data service** brings up the **LINZ WFS Data Service Reader panel**.



General tab
Attribute tab
Spatial tab

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

Field Description	Type	Defaults	Pop-Up
Create anonymous function	tick box	ticked	

*If **ticked**, a function using all the fields in the panel is automatically created when the data is read in.*

LINZ api token	input		

*Set project attribute **LINZ_API_TOKEN** to auto fill the input at startup.*

List of layers

Download layer list	Button		

Download all feature layer names from LINZ data server.

Layers choice box list of layer names

Show list of layer names after downloading from LINZ server.

Model model box available models

Model name must not exist.

Name of model to store all imported data

Projection optional list of projections

??.

General tab

Max number of feature number box

The maximum amount of feature to be downloaded from a chosen layer.

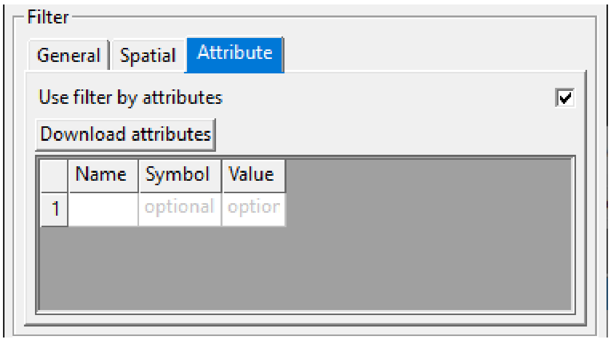
Start feature index button optional

Indicate which feature should the panel start reading in first.

Max number of feature must not be empty to use this field.

e.g. "Start index" is 10 and "max number of feature" is 50, panel will import all feature from 10 to 59 inclusively.

Attribute tab



Use filter by attributes tick box ticked

Turn on and off the filter by attributes functionality.

Download attributes button

Download a list of attribute names of a chosen layer.

Grid information

Name input

Name of an attribute downloaded from LINZ server.

Symbol choice box **= < >**

??.

Value optional

The value of an attribute of features to be imported.

Spatial tab

Use spatial filter	tick box	ticked	

Turn on and off the filter by attributes functionality.

Spatial operator	choice box	Bounding box	Bounding box, Intersecs, Disjoint, Contains, Within, Touches, Cross, Overlaps, Equals, Distance within, Beyond

Spatial predicate for data filtering. Details are divided into smaller section below. See 8.4.1 Spatial operator options

Geometry column	choice box	Geometry	Shape, Geometry

"Shape" is used to get property and ownership, street address and geodetic data.

"Geometry" can be used for most other layers, including hydrographic and topographic data.

8.4.1 Spatial operator options

See Bounding box

See Intersects

See Disjoint

See Contains

See Within

See Touches

See Crosses

See Overlaps

See Equals

See Distance within

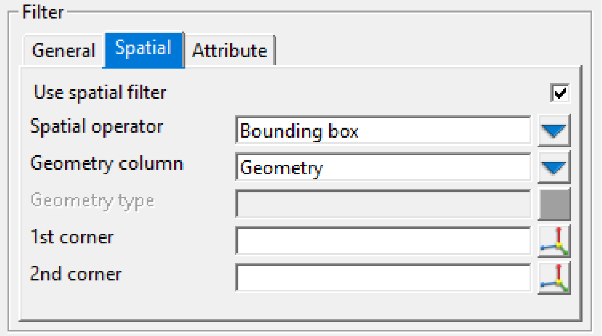
See Beyond

Bounding box

Functionality: Data to be imported using Bounding box are:

Within the bounding box and

Intersects with the bounding box



1st corner XYZ box

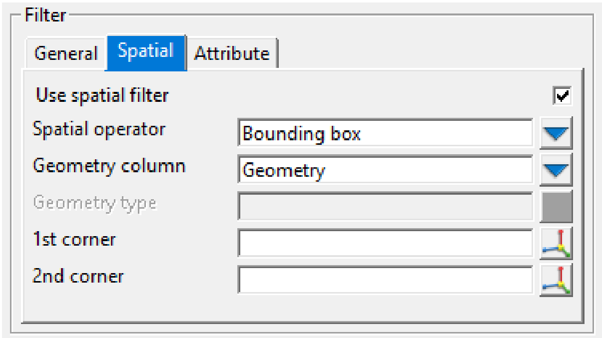
"X Y Z value of first corner of the box.

2nd corner XYZ box

X Y Z value of second corner of the box.

Intersects

Functionality: Data to be imported are intersecting with the referencing geometry.



Geometry type choice box Point, Line, Polygon

Type of geometry to use as reference for filtering.

Point XYZ box

Coordinate of point.

Line select box

Selecting line to use as reference for filtering.

Polygon select box

Selecting polygon to use as reference for filtering.

Disjoint

*Functionality: The converse of **Intersects**.*

Same data fields as Intersects.

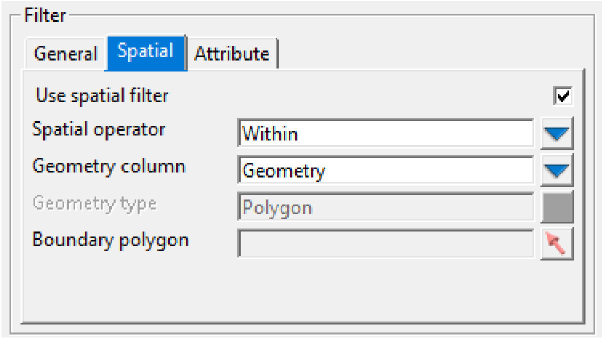
Contains

*Functionality: Importing any data that **contains** the chosen reference geometry.*

Same data fields as Intersects.

Within

*Functionality: Importing any data that is **within** the chosen polygon.*



Geometry type	choice box	Polygon	Disable

Can only be polygon type (a closed string supers).

Boundary polygon	select box

Polygon to be used as the boundary for imported data.

Touches

Functionality: importing any data that touches, which has at least 1 point in common but doesn't intersect in the interior with, the reference geometry.

Same data fields as Intersects.

Crosses

Functionality: importing any data that have some but not all interior points in common with reference geometry.

Same data fields as Intersects.

Overlaps

Functionality: Data to be imported and the reference data must have the same dimension (same Z value), have at least 1 point each not shared by the other, and the intersection of the interiors of the 2 has the same dimension (same Z value) as the data themselves.

Same data fields as Intersects.

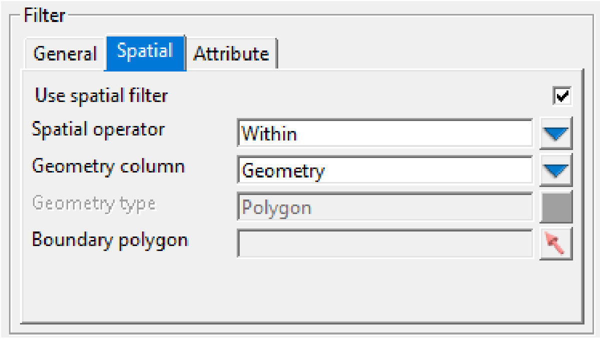
Equals

Functionality: Imported data and reference data must be topologically equal.

Same data fields as Intersects.

Distance within

Functionality: Importing all data lies within the distance of a coordinate.



Geometry type	choice box	Point	Disable

Can only be point type.

Point coordinate XYZ box

Coordinate of a point to be used as reference geometry for filtering.

Distance double box

The radius in metre from the point coordinate.

Beyond

Functionality: importing any data that is outside of the distance from a chosen coordinate

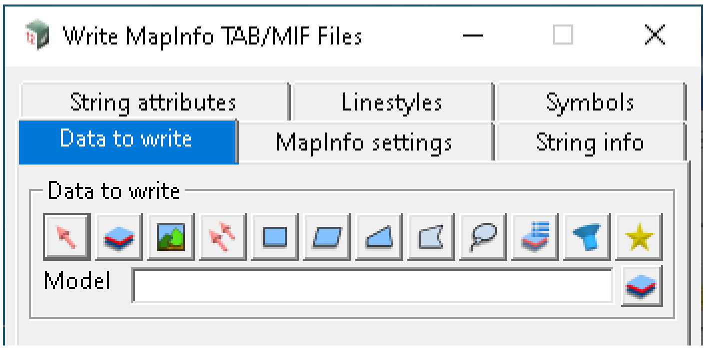
Same data fields as Distance within.

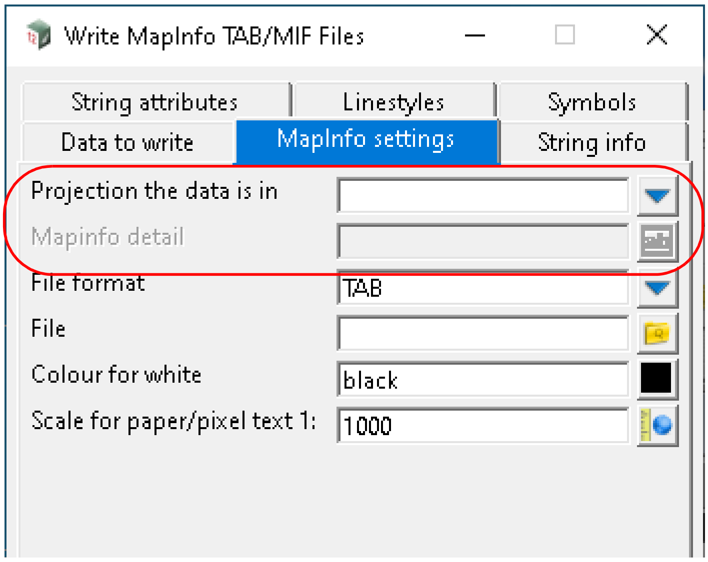
8.5 MapInfo Write Tab/MIF Files

This panel uses the new Projection file (carto.12dcaro) for the field **Projection the data is in** which replaces the old field **Coordinate system**.

When selecting a projection form this file, the Mapinfo required for that particular projection can also be in the file and if so, it is written to the **Mapinfo detail** field and the information in that field is written to the Map Info file.

Selecting **Mapinfo** brings up the **Write MapInfo Tab/Mif Files** panel.





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

Field Description	Type	Defaults	Pop-Up

8.6 KML Reader

Now documented In the v15 reference manual

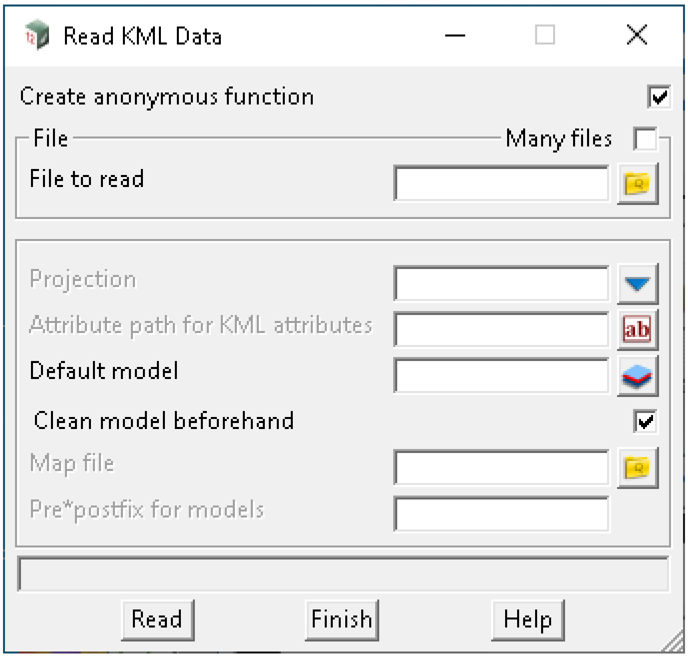
Position of option on menu: **File =>Data input =>KML**

Position of option on menu: **BIM =>Import =>KML**

Now documented In the v15 reference manual

The ***Read KML Data*** option reads in KML files.

Selecting **KML reader** brings up the **Read KML Data** panel.



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

Field Description	Type	Defaults	Pop-Up
Panel Fields			
Create anonymous function	tick box	ticked	

*If **ticked**, a function using all the fields in the panel is automatically created when the data is read in.*

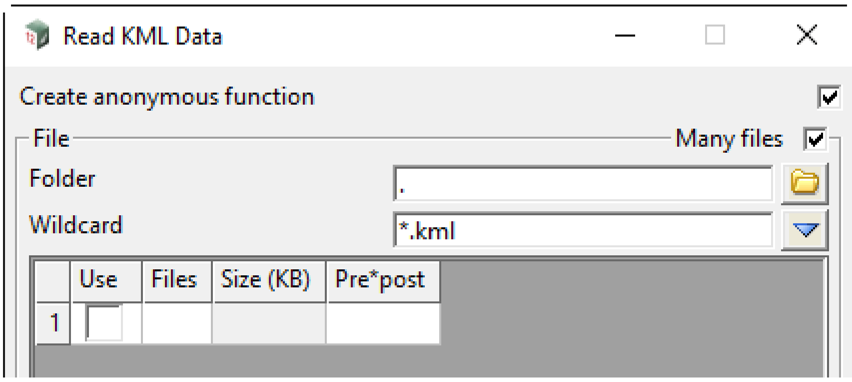
File section			
Many files	tick box	not ticked	

*If **not ticked**, **File To Read** field is visible.*

File to read	file box		kml, kmlz files

*name of the file to process. This is only displayed and used if **Many files** is **NOT** ticked.*

*If **ticked**, the **Many Files** grid is displayed and used to select many files to process.*



Folder folder box .

Folder to search for files to process.

Wildcard text box *.kml, *.kmlz, *

*Wildcard to restrict files select from **Folder**.*

Files file column

Name of the file to process.

Pre*post text column

*Note that this grid has a **Pre*post** column and if it is blank then the **Pre*postfix for models** field is used.*

Other Panel Fields

Projection Projection box

The project to use to convert the longitude and latitude in the KML file to Easting and Northing (x and y) coordinates.

Attribute path for KML attributes text box

The path name of the attribute node to put all the KML attributes into.

Default model model box available models

Name of the model to add the KML data to.

Clean Default model beforehand? tick box not ticked

*If **ticked**, the Default model to put the KML data into is cleaned out before the KML file is read in.*

Map file file box *.mapfile, *.mf files

*If **not blank**, the name of the 12d Map File to be used for all strings read in.*
When using a map file, the name of the KML object is used as the entity-name for matching with the keys in the map file.

Pre*postfix for models pre*postfix box

*If **not blank**, a prefix and a postfix to be applied to the model names used in the map file.*
Go to the section 4.24.2 Pre*Postfix in Panel Fields *for information on using pre*postfix.*

Buttons at Bottom

Read button

Read in the KML file.

8.7 Map File Create/Edit

Now documented In the v15 reference manual

Position of option on menu: **File =>Map files =>Create/Edit**

There is a new ***Segment Properties*** node in the **Map File Create/Edit** panel which can be used to change the colour or linestyle of a super string segment or a water link by using:

(a) String name and/or string attribute name and/or ***vertex attribute*** from the ***vertex at the start of the segment***

(b) String name and/or string attribute name and/or ***segment attribute*** *of the segment*

For more information, go to 8.7.0.1 Segment/Link Properties.

8.7.0.1 Segment/Link Properties

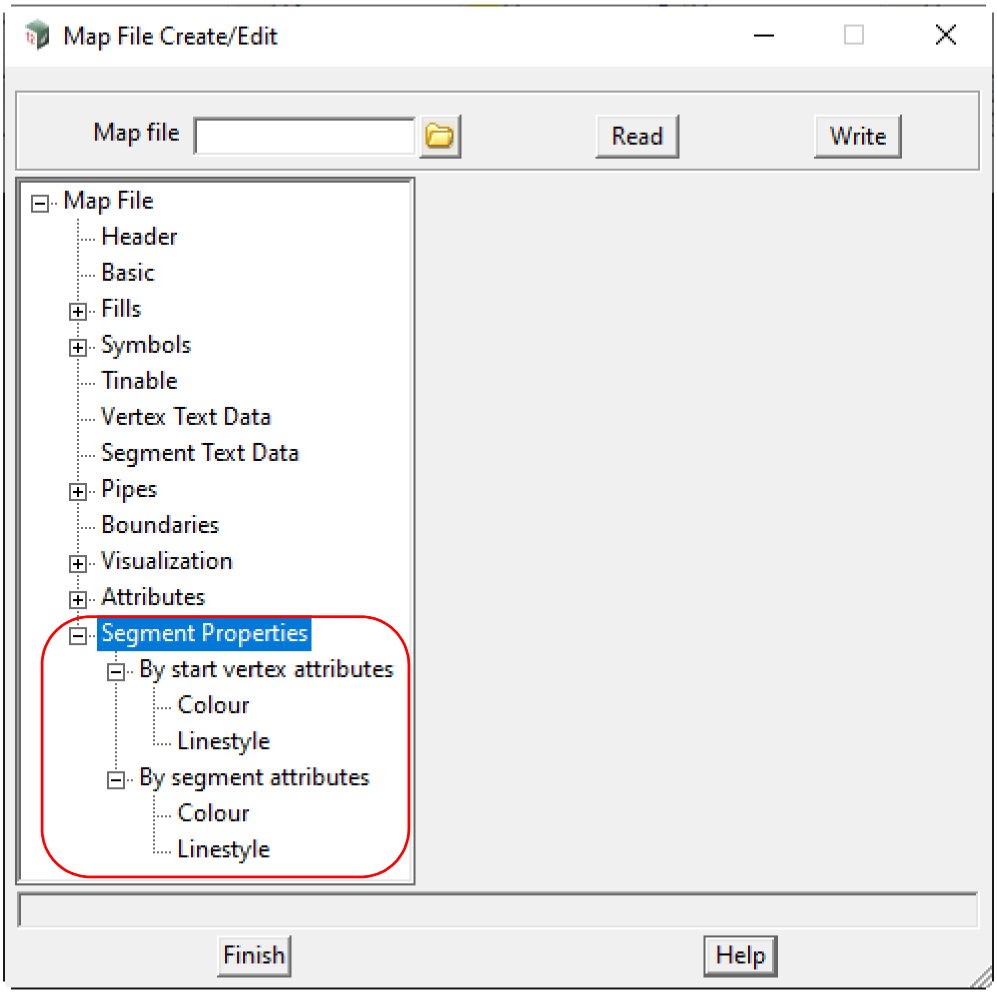
The ***Segment Properties*** node in the **Map File Create/Edit** panel is used to change the colour or linestyle of a super string segment by using:

(a) String name and/or string attribute name and/or ***vertex attribute*** from the ***vertex at the start of the segment***

See 8.7.0.2 By Start Vertex Attribute - Colour/Linestyle

(b) String name and/or string attribute name and/or ***segment attribute*** *of the segment*

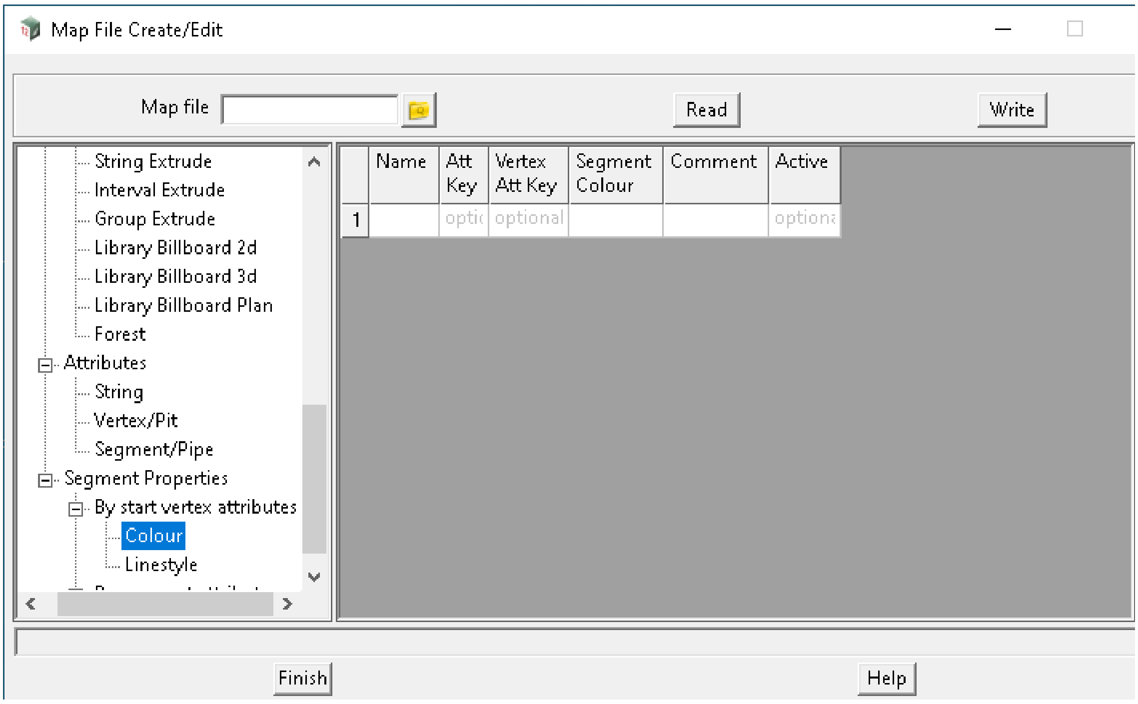
See 8.7.0.2 By Start Vertex Attribute - Colour/Linestyle

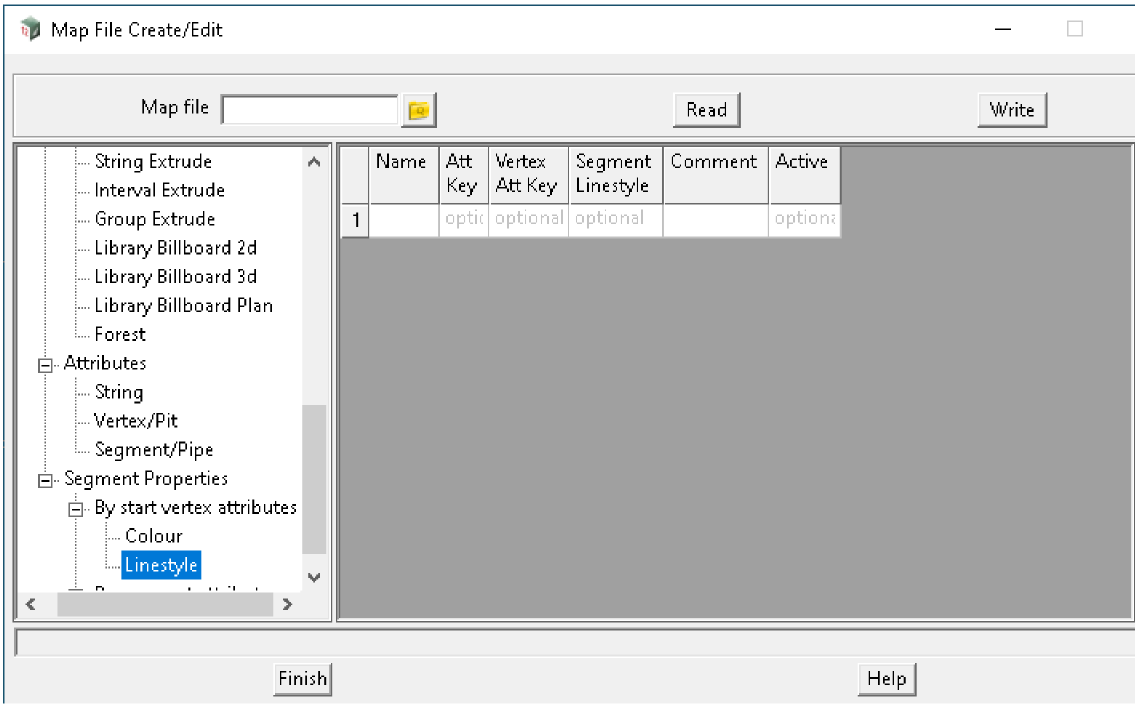

Map File Create/Edit
Map file
Read
Write
Map File
Header
Basic
Fills
Symbols
Tinable
Vertex Text Data
Segment Text Data
Pipes
Boundaries
Visualization
Attributes
Segment Properties
By start vertex attributes
Colour
Linestyle
By segment attributes
Colour
Linestyle
Finish
Help

8.7.0.2 By Start Vertex Attribute - Colour/Linestyle

Colour sets the colour of a given segment of a super string or link of a water string, that matches a string name and/or a string attribute value and/or a vertex/node attribute value for the vertex/node at the start of the segment/link.

Linestyle sets the linestyle of a given segment of a super string that matches a string name and/or a string attribute value and/or a vertex attribute value for the vertex at the start of the segment. This has no effect on a water string link.





Processing Using Name, Att Key and Vertex Att Key

When a string finds a first match in the grid with **Name**, **Att Key** *and* **Vertex Att Key** *for the vertex attribute of the start of a segment (see* Matching Using Name, Att Key and Vertex Att Key:*), each matching segment/link of the string is given the colour/linestyle (not linestyle for water string) as defined in the* ***Segment Colour/Linestyle*** *parameter of the matching row in the grid.*

Name, Att Key and Vertex Att Key

Name *is a Text grid cell and the text entered into* **Name** *can include wild cards* ***** *and wild characters* ***?***.

The string name is matched against **Name**. *This field can not be blank.*

Att Key *is an Attribute Data grid cell which contains the definition of the attributes and their values that are to be matched against. There can be more than one attribute in the Attribute Data but they must have unique names.*

The ***string*** *attributes are matched against the attribute details in* **Att Key.**

Vertex Att Key *is an Attribute Data grid cell which contains the definition of the vertex attributes and their values that are to be matched against the vertex attributes at the* ***start of a string segment***. *There can be more than one vertex attribute in the Attribute Data but they must have unique names.*

The ***vertex*** *attributes at the start of the string segment are matched against the attribute details in* **Vertex Att Key**.

To access ***Att Key*** *or* **Vertex Att Key** *data, click LB on the* ***Att Key/*** **Vertex Att Key** *field to highlight the field, then click LB again to bring up the* **Attribute Data** *panel. To enter data, see* 4.8.3 Attribute Data Panel.

Matching Using Name, Att Key and Vertex Att Key:

Starting with the row line of the grid, matching and processing occurs as follows

If **Name, Att Key** *and* **Vertex Att Key** *are not blank, and a match of the string name occurs with* **Name**, *a match of the string attributes occurs with* **Att Key** *and a match of the vertex of the start of the segment occurs with* **Vertex Att Key**, *then the rest of the fields for this row of the Map File grid are used on this string segment.*

If **Name** *and* **Att Key** *are not blank, and* **Vertex Att Key** *is* ***blank****, and a match of the string name occurs with* **Name** *and a match of the string attributes occurs with* **Att Key***, then the rest of the fields for this row of the Map File grid are used on each string segment.*

If **Name** *and* **Vertex Att Key** *are not blank, and* **Att Key** *is blank, and a match of the string name occurs with* **Name** *and a match of a vertex attribute at the start of a string segment occurs with* **Vertex Att Key***, then the rest of the fields for this row of the Map File grid are used on this string segment.*

If **Name** *in not blank and* **Att Key** *and* **Vertex Att Key** *are blank, and a match of the string name occurs with* **Name***, then the rest of the fields for this row of the Map File grid are used on each string segment.*

If **Name** *in blank then no match occurs and this row of the Map File grid is ignored.*

If a ***match occurs****, then no further tests for matches against* **Name***,* **Att Key** *and* **Vertex Att Key** *are made. That is, no rows further down in the grid are used.*

If ***no match occurs****, then this row of the map file grid is ignored and a test for a match is made against the next row of the grid.*

Colour/Linestyle **select Colour/Linestyle**

The colour/linestyle of the super string segment is set to **Colour/Linestyle.**

To access ***Colours/Linestyles****, click LB on the* ***Colour/Linestyle*** *field to highlight the field, then click LB again to bring up the* **Select Colour/Choice** *panel.*

Comment and Active

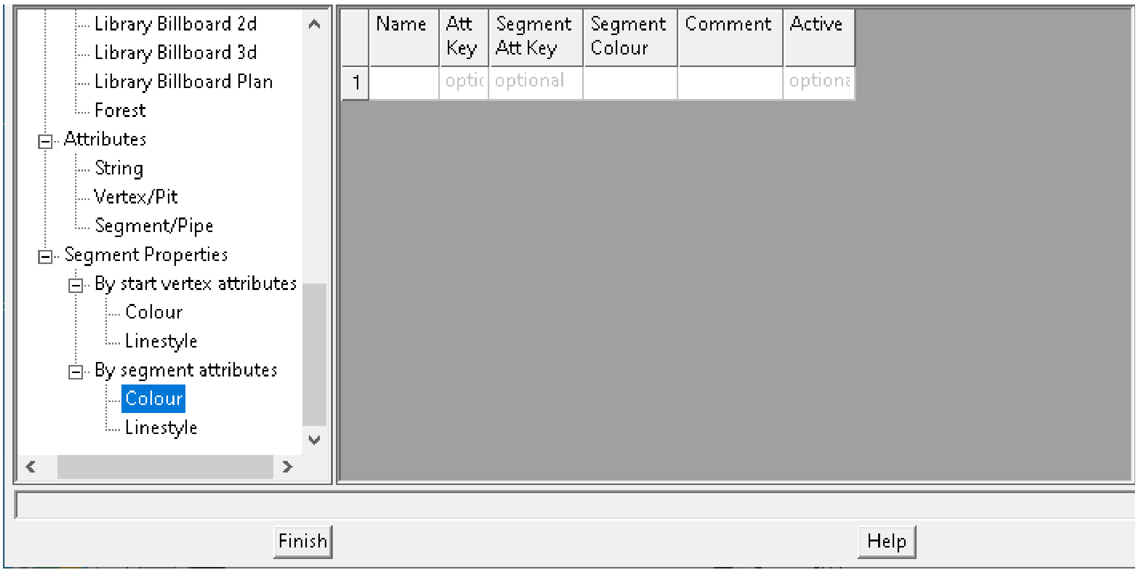
See .

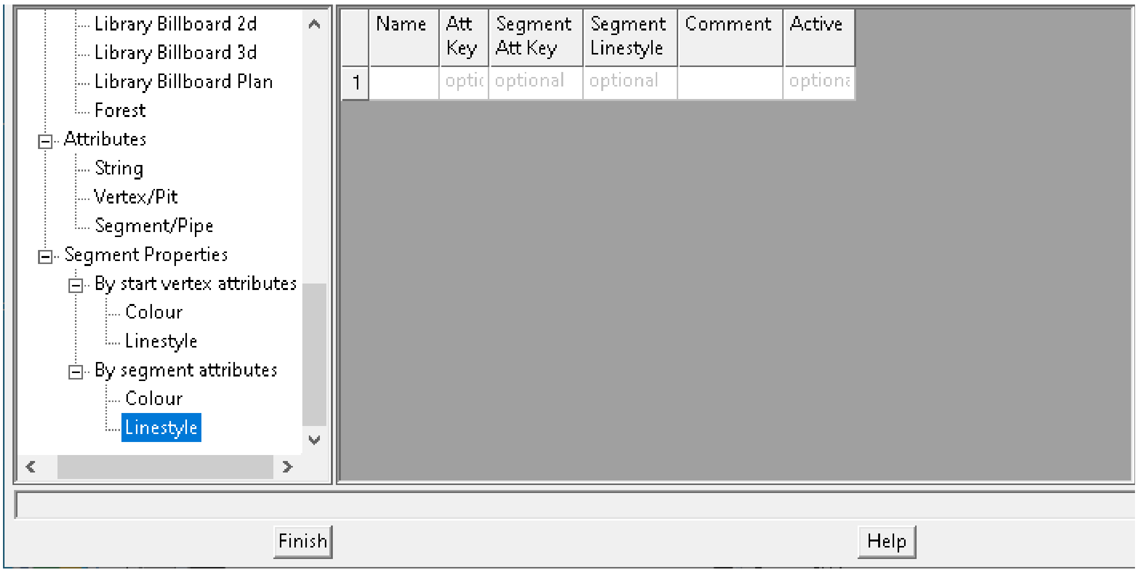
To assist is debugging a ***Map File***, match logging can be turned on.

Continue to 8.7.0.3 By Segment Attributes - Colour or Linestyle or return to 8.7.0.1 Segment/Link Properties or 8.7 Map File Create/Edit.

8.7.0.3 By Segment Attributes - Colour or Linestyle

Colour/Linestyle sets the colour/linestyle of a super string segment that matches a string name and/or a string attribute value and/or a segment attribute value for the string segment.





Processing Using Name, Att Key and Segment Att Key

When a string finds a first match in the grid with **Name**, **Att Key** *and* **Segment Att Key** *for the segment attribute of the super string (see* Matching Using Name, Att Key and Vertex Att Key:*), each matching segment of the string is given the colour/linestyle as defined in the* ***Segment Colour/Linestyle*** *parameter of the matching grid row.*

Name, Att Key and Segment Att Key

Name *is a Text grid cell and the text entered into* **Name** *can include wild cards* ***** *and wild characters* ***?***.

The string name is matched against **Name**. *This field can not be blank.*

Att Key *is an Attribute Data grid cell which contains the definition of the attributes and their values that are to be matched against. There can be more than one attribute in the Attribute Data but they must have unique names.*

The ***string*** *attributes are matched against the attribute details in* **Att Key.**

Segment Att Key *is an Attribute Data grid cell which contains the definition of the segment attributes and their values that are to be matched against the segment attributes a super string segment. There can be more than one segment attribute in the Attribute Data but they must have unique names.*

The ***segment*** *attributes are matched against the attribute details in* **Segment Att Key**.

To access ***Att Key*** *or* **Segment Att Key** *data, click LB on the* ***Att Key/*** **Segment Att Key** *field to highlight the field, then click LB again to bring up the* **Attribute Data** *panel. To enter data, see* 4.8.3 Attribute Data Panel.

Matching Using Name, Att Key and Segment Att Key:

Starting with the first row of the grid, matching and processing occurs as follows

If **Name, Att Key** *and* **Segment Att Key** *are not blank, and a match of the string name occurs with* **Name**, *a match of the string attributes occurs with* **Att Key** *and a match of the segment attribute with* **Segment Att Key**, *then the rest of the fields for this row of the Map File grid are used on this string segment.*

If **Name** *and* **Att Key** *are not blank, and* **Segment Att Key** *is blank, and a match of the string name occurs with* **Name** *and a match of the string attributes occurs with* **Att Key**, *then the rest of the fields for this row of the Map File grid are used on each string segment.*

If **Name** *and* **Segment Att Key** *are not blank, and* **Att Key** *is blank, and a match of the string name occurs with* **Name** *and a match of a segment attribute occurs with* **Segment Att Key**, *then the rest of the fields for this row of the Map File grid are used on this string segment.*

If **Name** *in not blank and* **Att Key** *and* **Segment Att Key** *are blank, and a match of the string name occurs with* **Name**, *then the rest of the fields for this row of the Map File grid are used on each string segment.*

If **Name** *in blank then no match occurs and this row of the Map File grid is ignored.*

If a ***match occurs***, *then no further tests for matches against* **Name**, **Att Key** *and* **Vertex Att Key** *are made. That is, no rows further down in the grid are used.*

If ***no match occurs***, *then this row of the map file grid is ignored and a test for a match is made against the next row of the grid.*

Colour/Linestyle

select Colour/Linestyle

The colour/linestyle of the super string segment is set to **Colour/Linestyle.**

To access ***Colours/Linestyles***, *click LB on the* ***Colour/Linestyle*** *field to highlight the field, then click LB again to bring up the* **Select Colour*/Choice*** *panel.*

Comment and Active

See .

To assist is debugging a ***Map File***, match logging can be turned on.

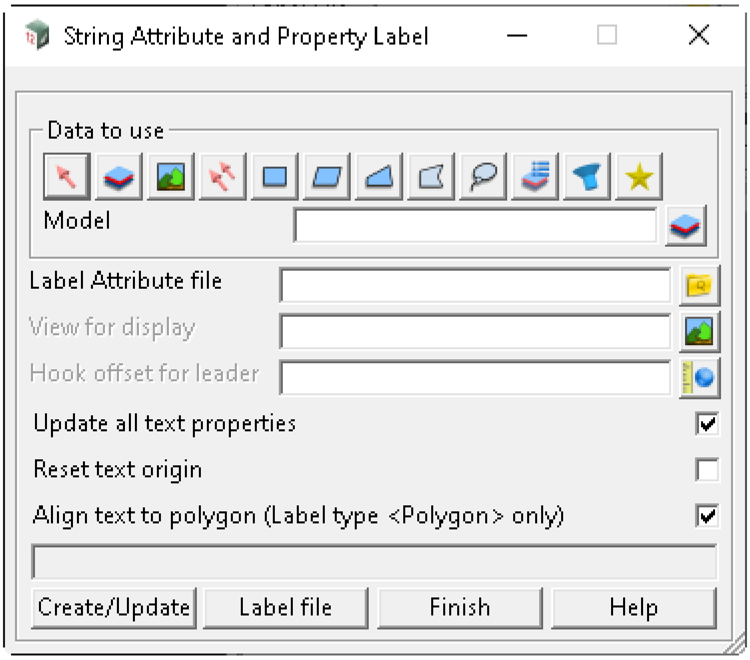
8.8 Apply String Attribute and Property Label

Position of option on menu: **File =>Label Map files =>Apply string attribute/property label file**

Now documented In the v15 reference manual

This option runs the string and properties label map file to label string attributes and properties with leaders and dimensions.

Selecting **Apply string attribute/property label file** displays the **String Attribute and Property Label** panel.



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

Field Description Type DefaultsPop-Up

Data to use data source

Data selection type - for a full description go to 4.24.3 Data Source.

Label Attribute file file box *.12dlf

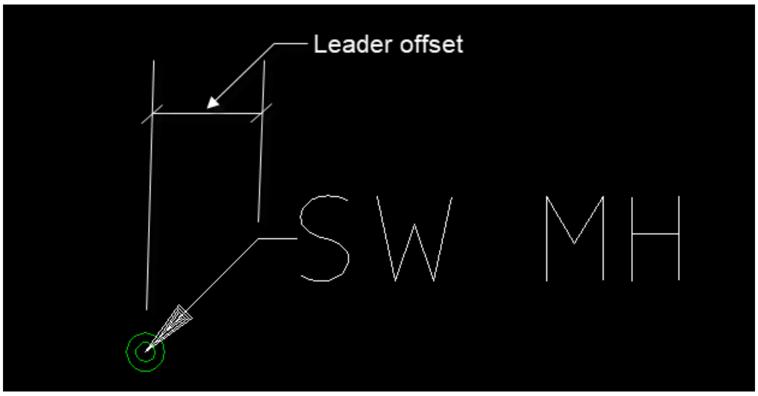
Label file to be applied.

View for display view box

View for displaying the result.

Hooks offset for leader tick box ticked

*If **not blank**, entry will be used as the hook offset when a leader is used.*



Update all text properties tick box ticked

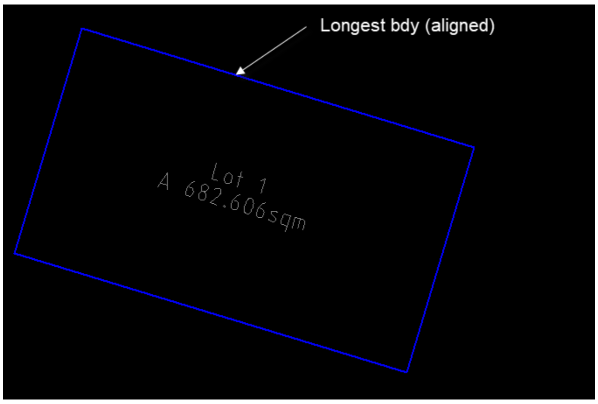
*If **ticked**, any changes to text parameters (Style, Height etc) that may have been set in the label file, will be applied to any existing text.*

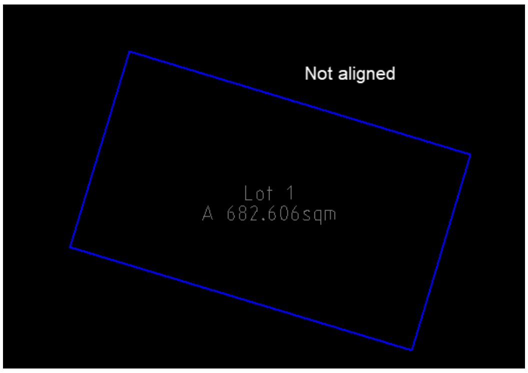
Reset text origin tick box not ticked

*If **ticked**, any text that had been moved using the cad text edits after creation, will be re-positioned back to the standard location.*

Align text to polygon (Label type <Polygon> only) tick box ticked

*If **ticked**, labels for Polygon will be aligned to the longest side of the polygon.*





Buttons at Bottom

Create/Update button

Create or update the result.

8.9 12d Binary XML Files

Position of option on menu: **File =>Convert 12d Binary XML Files**

Now documented In the v15 reference manual

XML is a W3C standard. W3C does not define the concept of binary XML files. It has been thrown about for 15 years now.

12d Binary XML files are a proprietary format with the following goals.

1) Much faster load times

2) Smaller files

3) Cannot be altered

4) The potential for security attributes to prevent IP theft, limiting time frames of usage in Joint Ventures

5) A subset of 5 is preventing the conversion from binary to text.

At the current time, #4 and #5 has not been implemented.

First, good practise. Always keep safe copies of the text XML somewhere.

If anything goes wrong with binary files, they are usually lost for ever.

Warning: 12d Binary XML files cannot be used by external tools.

So XSLT processing is not possible.

For Information on converting **XML** to **12d Binary XML** see 8.9.1 Convert XML File to 12d Binary XML File.

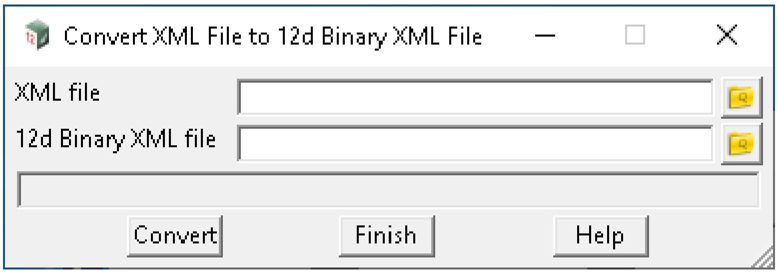
For information on converting 1**2d Binary XML** file to **XML** see 8.9.2 Convert 12d Binary XML File to XML File.

8.9.1 Convert XML File to 12d Binary XML File

Position of option on menu: **File =>Convert XML to 12d Binary XML**

The ***Convert XML to 12d Binary XML*** option converts **XML** file to a **12d Binary XML** file.

On selecting the **Convert XML to 12d Binary XML** option, the **Convert XML File to 12d Binary XML File** panel is displayed.



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

Field Description	Type	Defaults	Pop-Up
XML file	file box		*.xml files

The file to be converted into binary.

12d Binary XML file	file box		*.xml files

The resulting binary file.

Buttons at Bottom

Convert	button

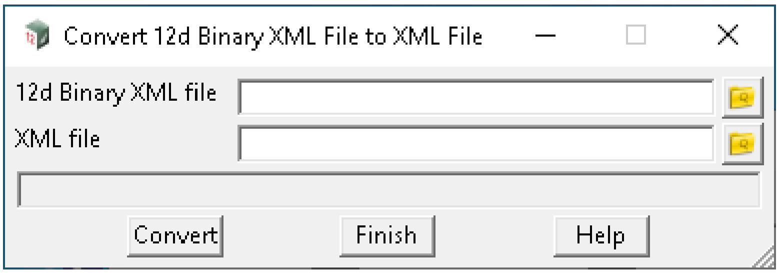
The resulting text file.

8.9.2 Convert 12d Binary XML File to XML File

Position of option on menu: **File =>Convert 12d Binary XML to XML**

The ***Convert 12d Binary XML to XML*** option converts **12d Binary XML** file to a **XML** file.

On selecting the **Convert 12d Binary XML to XML** option, the **Convert 12d Binary XML File to XML File** panel is displayed.



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

Field Description	Type	Defaults	Pop-Up
12d Binary XML file	file box		*.xml files

The file to be converted into text.

Field Description	Type	Defaults	Pop-Up
XML file	file box		*.xml files

The file to be converted into binary.

Buttons at Bottom

Convert button

The resulting text file.

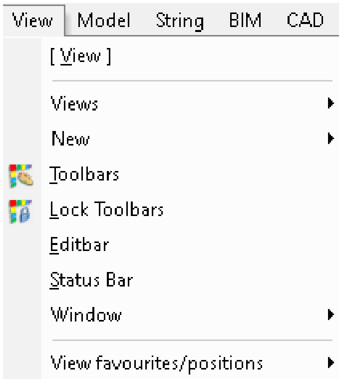
9 View

There has been changes to the **View** chapter in the ***12d Model Reference manual***.

In **V14** the menu was called **Views** and this has been renamed to **View**.

The **View** menu is

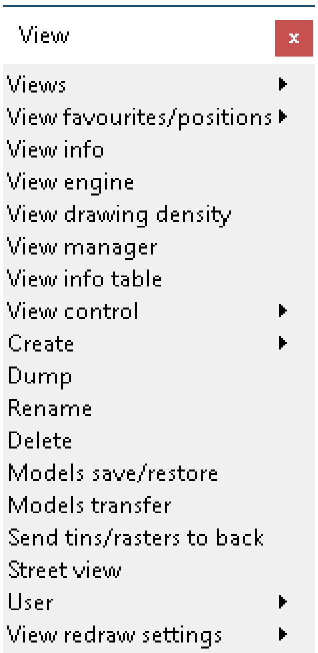
on Main menu



Create floating **View** menu
walk-right list of views
create new views
turn toolbars on/off
Lock toolbars so that they can't be moved

turn the status bar on/off
arrange (eg cascade) the views

floating View menu



9.1 Street View display a Google Map Street View

9.1 Street View

Position of option on menu: **View =>Street view**

Now documented In the v15 reference manual

This option allows the user to select one or two points with map coordinates and will then display the Google Maps street View using the selected point or points.

Selecting the **Street view** displays the **Show Street View** panel.

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

Field Description	Type	Defaults	Pop-Up
Projection	projection box	project projection	available projections

The Projection that the picked point, or points, is in.

This is necessary so that when a point is selected, its longitude and latitude can be calculated. If a Projection has been set for the project then that Projection is automatically entered into the field. See 7.12.6.2 Set Projection.

Use two points for direction tick box

*If **ticked** then when **Pick** is selected, two points are selected to determine the Street View.*

*If **not ticked** then when **Pick** is selected, one point is selected to determine the Street View.*

Pick button

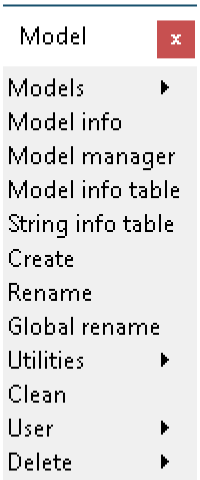
*If **User two points for direction** is **ticked**, then a Street View from Google Earth is displayed looking in the direction from the first picked point to the second picked point.*

*If **User two points for direction** is **not ticked**, then a Street View from Google Earth is displayed for the picked point.*

10 Model

There has been changes to the **Model** chapter in the ***12d Model Reference manual***.

In **V14** the menu was called **Models** and this has been renamed to **Model**.



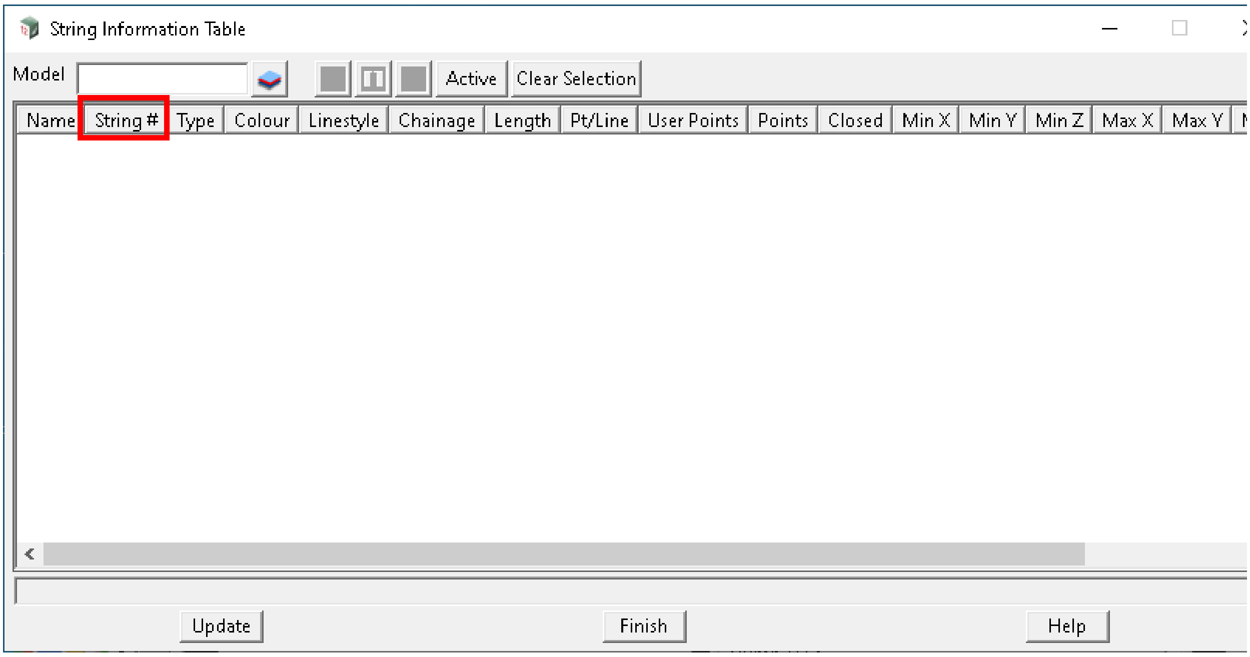
See 10.1 Strings in Model Information Table

10.1 Strings in Model Information Table

Position of option on menu: **Model =>String info table**

Now documented In the v15 reference manual

The option **String #** has been added to the column between Name and Type.



String # column **sort** menu

This column displays any string number that is available for the object.

*If **blank**, either no string number is available or it is blank.*

*If **non blank**, it usually will be a positive integer number, or zero for a point string.*

***Note**: string numbers are allowed to be alpha numeric, so could be something like S7.*

11 String

There has been changes to the **String** chapter in the ***12d Model Reference manual***.

In **V14** the menu was called **Strings** has been renamed to **String**.

Position of menu: **String**

See

11.1 Create/Edit Service Conduit
11.2 Create - Pipe Super
11.3 Create - Super
11.4 Create Super Alignment
11.5 Equality Query
11.6 Chainage Query
11.7 Grids and DEMS
11.8 Super Edit - Properties Toolbar

11.1 Create/Edit Service Conduit

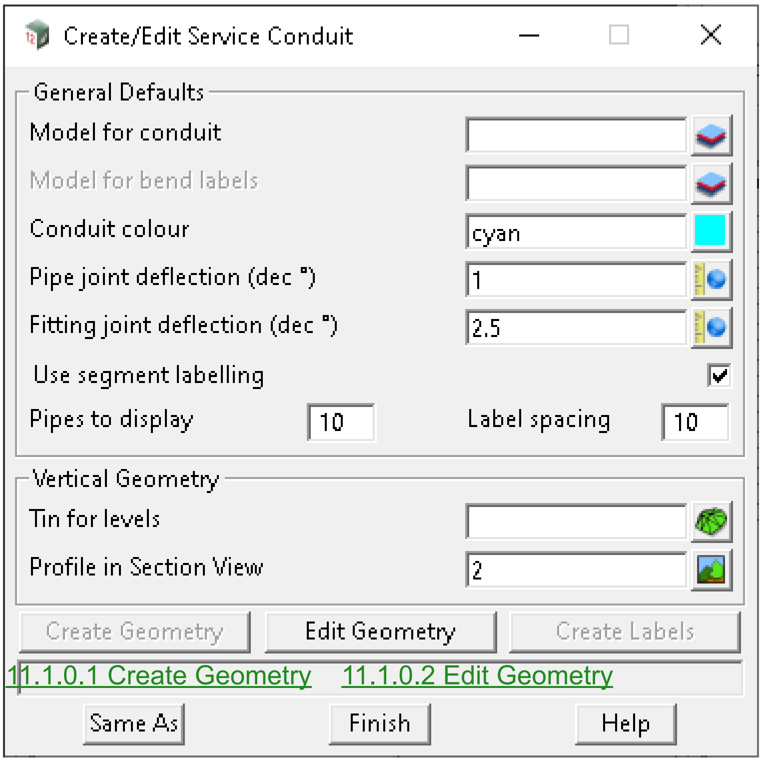
Position of menu: **String =>Create =>Conduit-service**

Now documented In the v15 reference manual

Create/edit service conduit is used to generate a string which defines the horizontal and vertical geometry for service conduits. Standard bend angles are able to be turned on/off for the string creation and a default pipe length is used to assist with bend positioning.

The **main panel** has basic defaults for creation of the service conduit. It allows for parameters such as the angle labels for geometry option strings to be used and the spacing of the labels to be controlled. The number of standard pipe lengths created for the geometry option strings is also controlled by the defaults. Note that larger numbers of pipe lengths will result in slower update of geometry options. The defaults can be dynamically updated during string creation.

On selecting the **Conduit-service** option, the **Create/Edit Service Conduit** panel is displayed.



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

Field Description	Type	Defaults	Pop-Up
General defaults			
Model for conduit	model box		
The model that the string will be added to.			
Model for bend labels	model box		available colours
[Optional] The model that bend labels will be added to.			
Conduit colour	colour box	cyan	available colours
The colour the new string will have.			

Pipe joint deflection (dec*) real box 1.0

The maximum deflection allowable for pipe joints.

Fitting joint deflection (dec*) real box 1.0

The maximum deflection allowable through fitting (i.e. bend) sockets.

Use segment labelling tick box ticked

Is segment labelling required for geometry options strings.

Pipe lengths to display Integer box 10

Number of standard pipe lengths to use for geometry options strings.

Segment label spacing Integer box 10

For geometry options string labels, what segment spacing is required.

Vertical Geometry

Tin for levels tin box

The tin to be used for vertical geometry calculations.

Profile in Section View tin box

The view to display a profile of the conduit as it's created.

Create Geometry button

Opens the Create Geometry panel. See 11.1.0.1 Create Geometry.

***Note**: Not active until a Model and Tin have been selected.*

Edit Geometry button

Opens the Edit Geometry panel. See 11.1.0.2 Edit Geometry.

Create Labels button

Opens the Edit Geometry panel. See 11.1.0.2 Edit Geometry.

***Note**: Not active until geometry has been created.*

Buttons at Bottom

Same As button

Sets the defaults widgets to match the selected service conduit properties (if applicable).

Finish button

Close the panel.

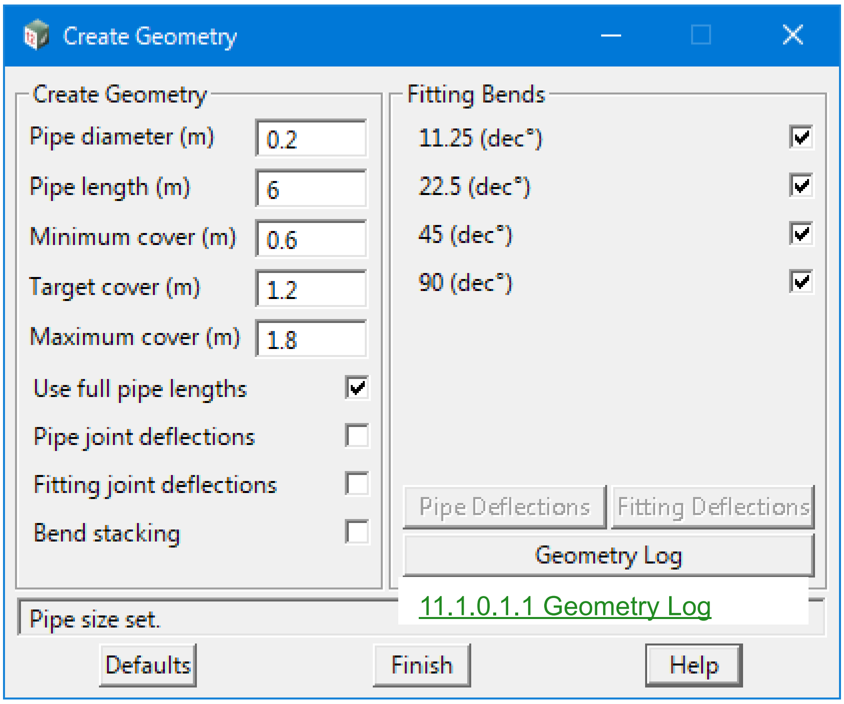
Help button

Opens the reference manual.

Continue to 11.1.0.1 Create Geometry

11.1.0.1 Create Geometry

The **Create Geometry** panel contains widgets related to creation of the service conduit. Widgets on this page may be dynamically adjusted during string creation. Typical bend sizes can be selected, along with the default conduit diameter and conduit length. Cover settings for the vertical grading are also assigned on this panel.



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

Field Description	Type	Defaults	Pop-Up

Create Geometry

Pipe Diameter (m) real box 0.2

The diameter of the conduit.

Pipe length (m) real box 6

The standard length of one pipe.

Minimum cover (m) real box 0.6

The minimum allowable cover for the conduit. This will form the upper limit of the vertical corridor.

Target cover (m) real box 1.2

The target for grading. It is recommended that this value be kept as close as practicable to the centre of the vertical corridor.

Maximum cover (m) real box 1.8

The maximum allowable cover for the conduit. This forms the lower limit of the vertical corridor.

Use full pipe lengths tick box ticked

Determines whether full pipe lengths or partial pipe lengths may be used for the geometry

Pipe joint deflections tick box not ticked

Determines whether pipe joint deflections should be used for the geometry. If selected then standard bends, stacking and fitting joint deflections are disabled.

Fitting joint deflections tick box not ticked

Determines whether pipe fitting socket deflections should be allowed. Geometry strings will reflect the limits of the socket deflections.

Bend Stacking tick box not ticked

Determines whether bends may be stacked. Geometry strings will reflect angles available with bends stacked. May be used in conjunction with fitting joint deflections.

Fitting Bends

11.25 (dec) tick box ticked

Determines whether 11.25 decimal degree bends will be included in the geometry.

22.5 (dec) tick box ticked

Determines whether 22.5 decimal degree bends will be included in the geometry.

45 (dec) tick box ticked

Determines whether 45 decimal degree bends will be included in the geometry.

90 (dec) tick box ticked

Determines whether 90 decimal degree bends will be included in the geometry.

Pipe Deflections button

Allows the vertical and horizontal components of the pipe socket deflections to be specifically set. Only available when Pipe joint deflections are selected.

Fitting Deflections button

Allows the vertical and horizontal components of the fitting socket deflections to be set. Only available when Fitting joint deflections are selected.

Geometry Log button

Opens the Geometry Log panel. See 11.1.0.1.1 Geometry Log.

Buttons at Bottom

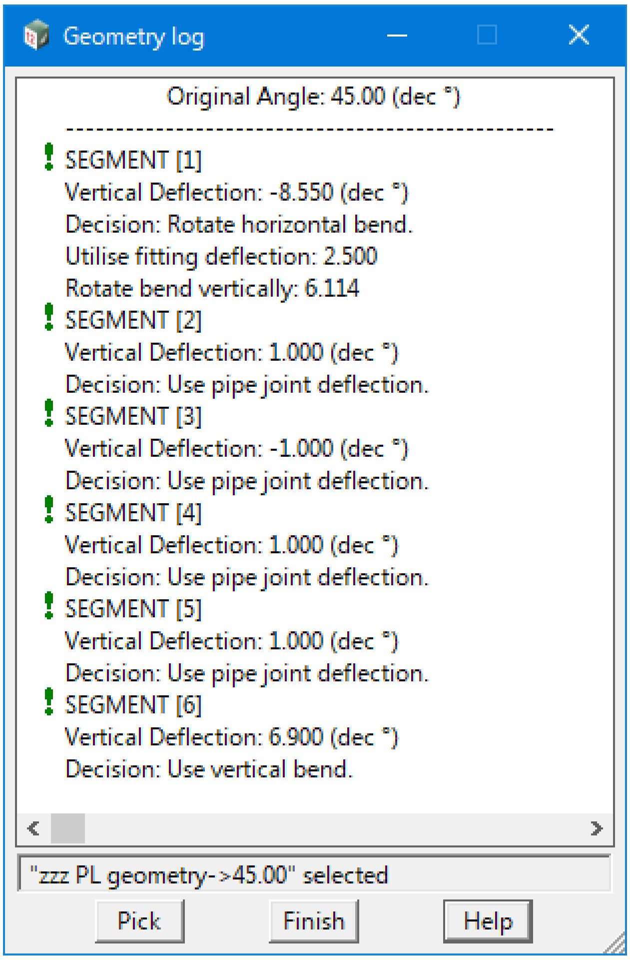
Defaults button

Returns to the General Defaults (main) panel.

Continue to 11.1.0.1.1 Geometry Log .

11.1.0.1.1 Geometry Log

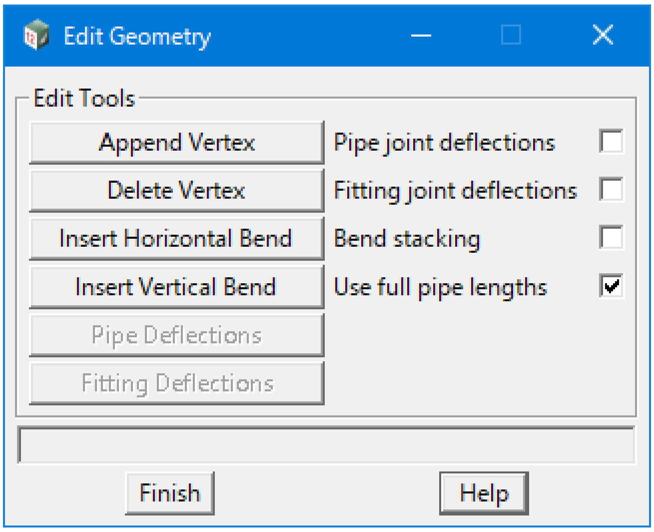
The **Geometry Log** panel allows the constraints and decision behind each segment of the geometry options strings to be reviewed prior to selecting the next fitting location. The original angle of the geometry option string is displayed at the top. Each segment of the geometry option string is then recorded with its vertical deflection and geometric decisions associated with the end result. Selecting the Segment number in the list (with a green exclamation point beside it) will highlight the segment in the plan and section views. The user may select the various geometry option strings to review the geometry and decisions for each.



Continue to 11.1.0.2 Edit Geometry or go back to 11.1.0.1 Create Geometry.

11.1.0.2 Edit Geometry

The **Edit Geometry** page contains widgets related to editing existing service conduit geometry. This includes insertion of horizontal and vertical bends within the current geometry along with appending vertices to the end of the current geometry and deleting vertices.



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

Field Description Type Defaults Pop-Up

Edit Tools

Append Vertex button

Allows the user to append a vertex to the end of the current geometry.

Delete Vertex button

Allows the user to delete a vertex from the current geometry.

Insert Horizontal Bend button

Allows the user to insert a horizontal bend within the current geometry.

Insert Vertical Bend button

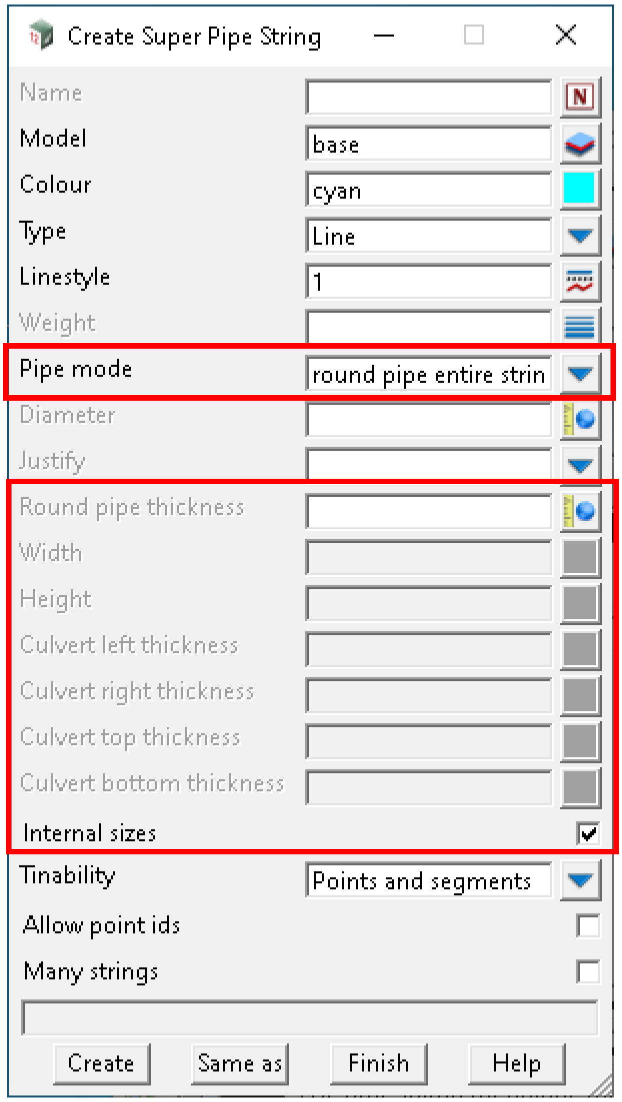
Allows the user to insert a vertical bend within the current geometry.

The remaining widgets on the Edit Geometry panel operate in the same manner as described for the Create Geometry panel above. See 11.1.0.1 Create Geometry.

11.2 Create - Pipe Super

Position of option on menu: **Strings =>Create =>Pipe**

Now documented In the v15 reference manual



The fields and buttons used in the **Create Super Pipe String** panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Pipe mode	choice box	Round Pipe entire string	round pipe entire string, pipe each segment, culvert entire string, culvert each segment

*If **round pipe entire string**, there is one diameter for all segments in the string.*
*if **round pipe each segment**, here is a different diameter for each segments of the string.*
*if **culvert entire string**, there is one width and a height for all segments in the string.*
*if **culvert each segment**, there is a different width and height for each segment of the string.*

*If the **Pipe mode** choice is round pipe entire string then the fields **Diameter** and **Round pipe thickness** are* *enabled.*

Round pipe thickness real box

*The thickness of the pipe for every segment of the string. This is added or subtracted from the **Diameter** depending on the tick box **Internal sizes**.*

Width/Height real box

Width/height to use for every segment of the culvert pipe.

Culvert left/right/top/bottom/thickness real box

*The thickness of the left/right/top/bottom of the culvert. The values are added or subtracted from the **Width/Height** depending on the tick box Internal sizes.*

Internal sizes tick box not ticked

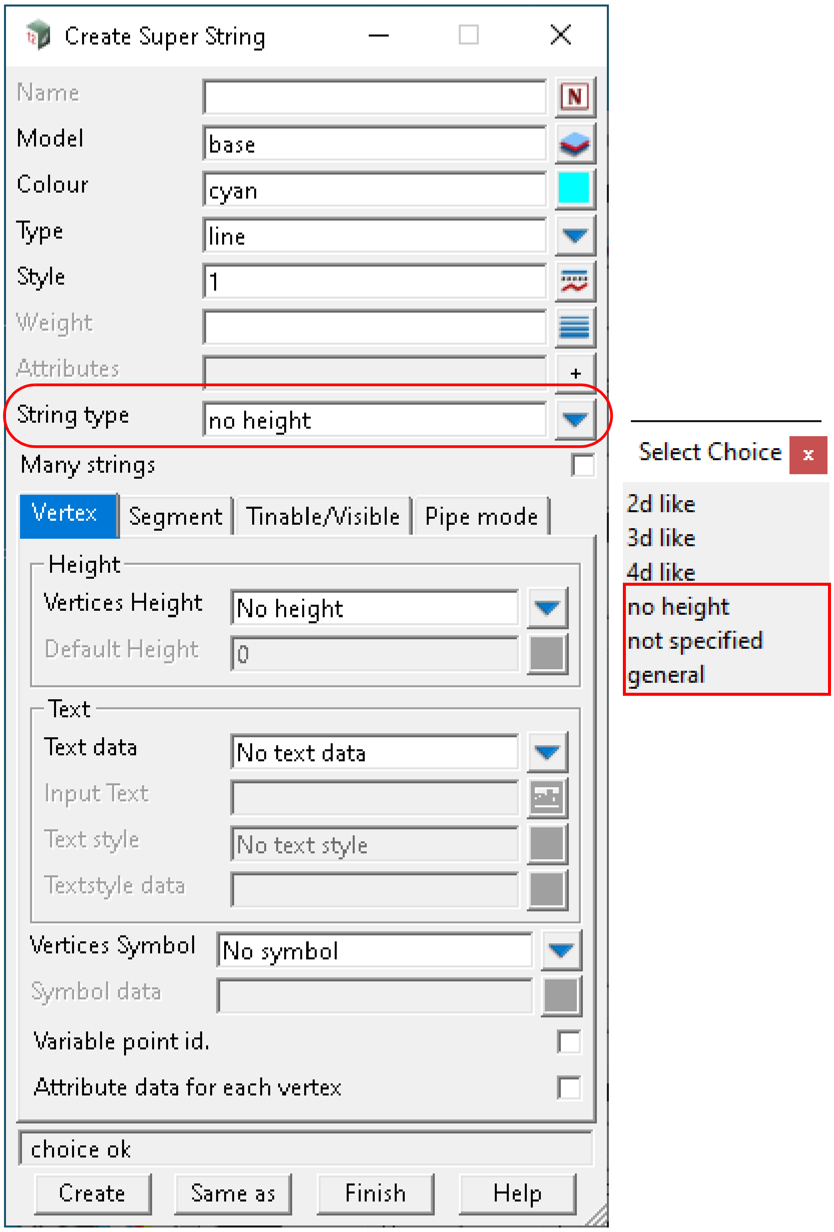
*If **ticked**, the thickness are **added** to Diameter/Width/Height to give the external Diameter/Width/ Height. Hence the values of Diameter/Width/Height are the **internal** values.*
*If **not ticked**, the thickness are **subtracted** from Diameter/Width/Height to give the internal Diameter/ Width/Height. Hence the values of Diameter/Width/Height are the **external** values.*

11.3 Create - Super

Position of option on menu: **Strings =>Create =>Super**

Now documented In the v15 reference manual

On selecting the **Super string** option, the **Create Super String** panel is displayed.



clicked.

The new fields and buttons used in the **Create Super String** panel have the following functions.

Field Description	Type	Defaults	Pop-Up
String type	choice box	no height	2d like, 3d like, 4d like, no height, not specified,

general

*If **2d like**,* **Variable Height** *is set to "Varied" and* **Default Height** *to "0",*
Text data *is set to "No text data" and* **Vertices Symbol** *is set to "No symbol",*
Pipe mode *is set to "no round pipe or culvert".*
*So a **2d like** super string simulates a Genio 2D string. For example, a contour string.*

*If **3d like**,* **Variable Height** *is set to "Varied",*
Text data *is set to "No text data" and* **Vertices Symbol** *is set to "No symbol",*
Pipe mode *is set to "no round pipe or culvert".*
*So a **3d like** super string simulates a Genio 3D string.*

*If **4d like**,* **Variable Height** *is set to "Varied",*
Text data *is set to "Constant for all",* **Text style** *set to "Varied"*
Vertices Symbol *is set to "No symbol",*
Pipe mode *is set to "no round pipe or culvert".*
*So a **4d like** super string simulates a Genio 4D string which can have text at each vertex.*

*If **no height**, vertices height is set to "no height",*
text data is set to "no text data", Vertices Symbol is set to "No symbol"
Pipe Mode is set to "no round pipe or culvert"
There is no definite String type

*If **not specified**, the setup is the same with no height except Vertices Height is set to "Varied"*
There is no definite String type either

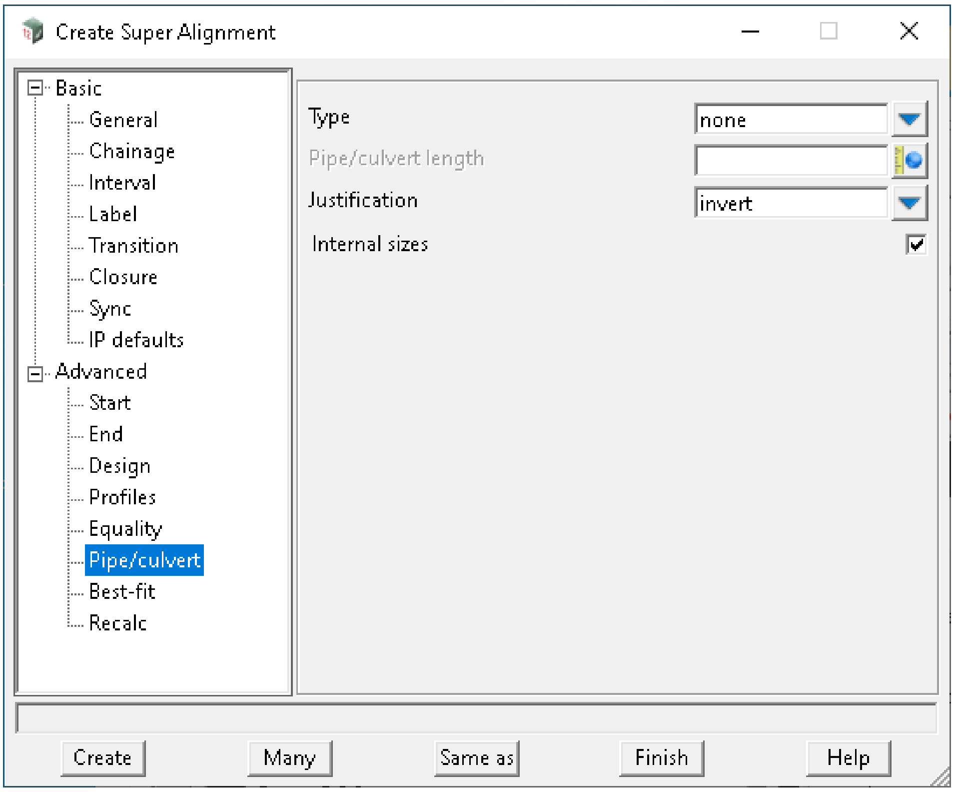
*If **general**, most of the fields are set to "varied"*
`Variable point id` and `Attribute data for each vertex` are ticked
`Radius/Major` and `Attribute data for each segment` are ticked
`Visibility` attributes are all set to "yes"
`Pipe mode` is set to "round pipe entire string", `Justify` is set to centre and Internal size is unticked.

11.4 Create Super Alignment

Position of option on menu: **String =>Super Alignments =>Create super alignment**

Now documented In the v15 reference manual

Advanced > Pipe/culvert node



The fields and buttons used in the **Advanced > Pipe/culvert** node of the **Create Super Alignment** panel or the **Super Alignment Properties** panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Internal sizes	tick box	ticked	

*If **ticked**, sizing parameters are for the inside, otherwise they are for the outside.*

Type: Pipe

Field Description	Type	Defaults	Pop-Up
Internal sizes	tick box	ticked	

*If **ticked**, pipe diameter is for the inside of the pipe, otherwise it is for the outside.*

Field Description	Type	Defaults	Pop-Up
Pipe thickness	real box		measure box

*This field only appears if Type is **pipe**.*

The thickness of the pipe. Pipe thickness is in metres.

Type: Culvert

Field Description	Type	Defaults	Pop-Up
Culvert left thickness	real box		measure box

*This field only appears if Type is **culvert**.*

The left thickness of the culvert. Culvert left thickness is in metres.

Culvert right thickness real box measure box

*This field only appears if Type is **culvert**.*

The right thickness of the culvert. Culvert right thickness is in metres.

Culvert top thickness real box measure box

*This field only appears if Type is **culvert**.*

The top thickness of the culvert. Culvert top thickness is in metres.

Culvert bottom thickness real box measure box

*This field only appears if Type is **culvert**.*

The bottom thickness of the culvert. Culvert bottom thickness is in metres.

11.5 Equality Query

Position of option on menu: **Strings =>Super alignments =>Tools =>Equality query**

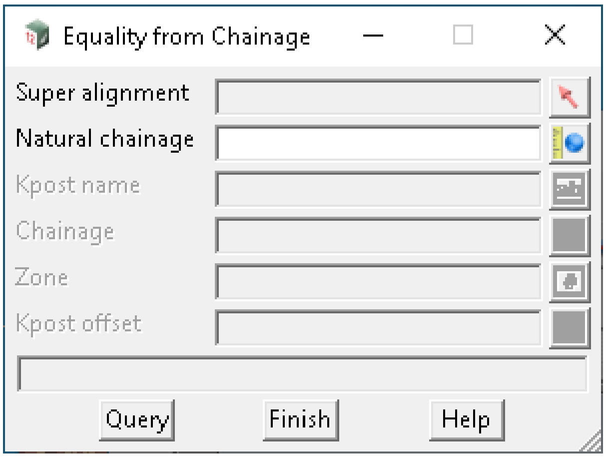
Now documented In the v15 reference manual

When position is selected on a super alignment the panel displays the natural chainage, K-post name, equality chainage, chainage equality zone and offset horizontal distance from the previous K-post.

After a super alignment is selected, filling in a natural chainage and selecting **Query** will find the K-post name, equality chain, Zone and K-post offset for the natural chainage.

For information on chainage equalities, internal equalities and K-posts, see 4.40 Chainage Equalities.

Selecting **Equality query** displays the **Equality From Chainage** 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 the super alignment to display chainage equality information for. The natural chainage and chainage equality information for the position where the super alignment is selected is display.

Natural chainage	real box		

*The selected raw chainage to get the **Kpost name**, **Chainage**, **Zone** and **Kpost offset**.*

Kpost name

Prefix for interval labels for a given chainage on a super alignment defined by a K-post. For more information see 4.40.4 K-Post.

Chainage

The chainage length from the selected chainage to previous chainage equality.

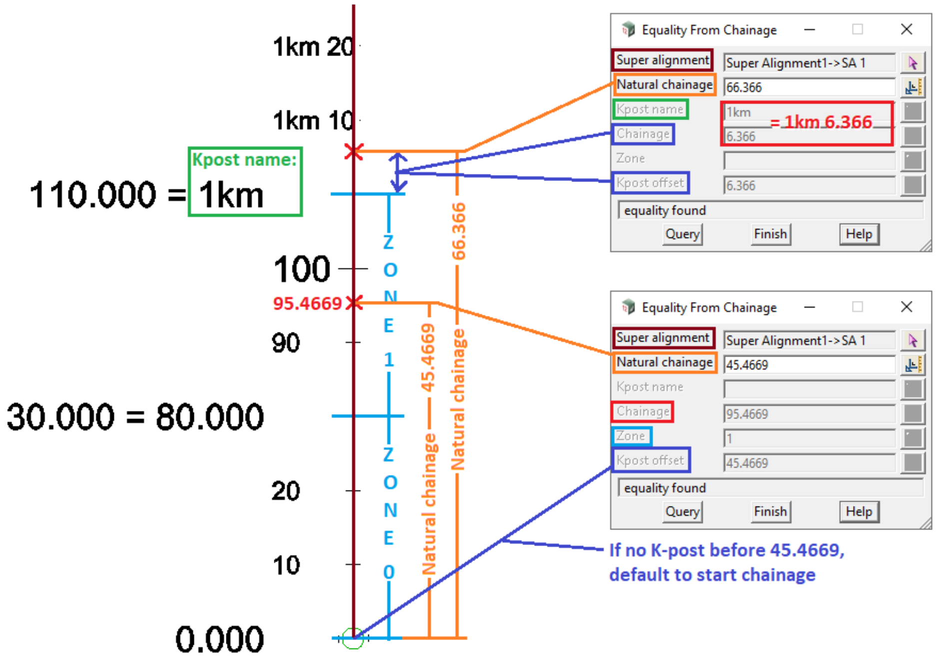
Zone

Displays chainage region the selected chainage is located in. For more information see 4.40.5 Zones.

Kpost offset

The chainage length from the selected chainage to previous K-post chainage equality. If there are no K-posts, the chainage length is measured from the start of the super alignment.

Two examples:



Buttons at Bottom

Query button

*Using the **Natural chainage**, get the K-post name, modified chainage, zone for chainage equalities and offset from K-post.*

11.6 Chainage Query

Position of option on menu: **Strings =>Super alignments =>Tools =>Chainage query**

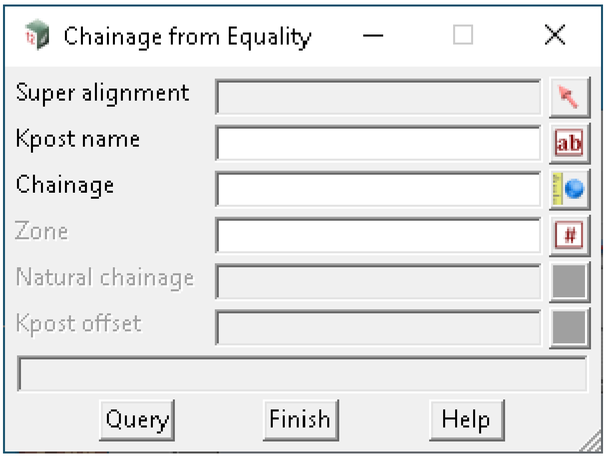
Now documented In the v15 reference manual

When a super alignment is selected, the panel displays the breakup of the equality chainage for that position.

After a super alignment is selected, filling in Kpost name (could be blank), chainage from the chainage equality and zone selecting **Query** will find for those values, the natural chainage of that position on the super alignment.

For information on chainage equalities, internal equalities and K-posts, see 4.40 Chainage Equalities.

Selecting **Chainage query** displays the **Chainage From Equality** 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 the super alignment to display chainage information for. The natural chainage and chainage equality information for the position where the super alignment is selected is display.

Kpost name input box disabled

Prefix for interval labels for a given chainage on a super alignment defined by a K-post. For more information see 4.40.4 K-Post.

Chainage

The chainage length from the selected chainage to previous chainage equality.

Zone

Displays chainage region the selected chainage is located in. For more information see 4.40.5 Zones.

Natural chainage

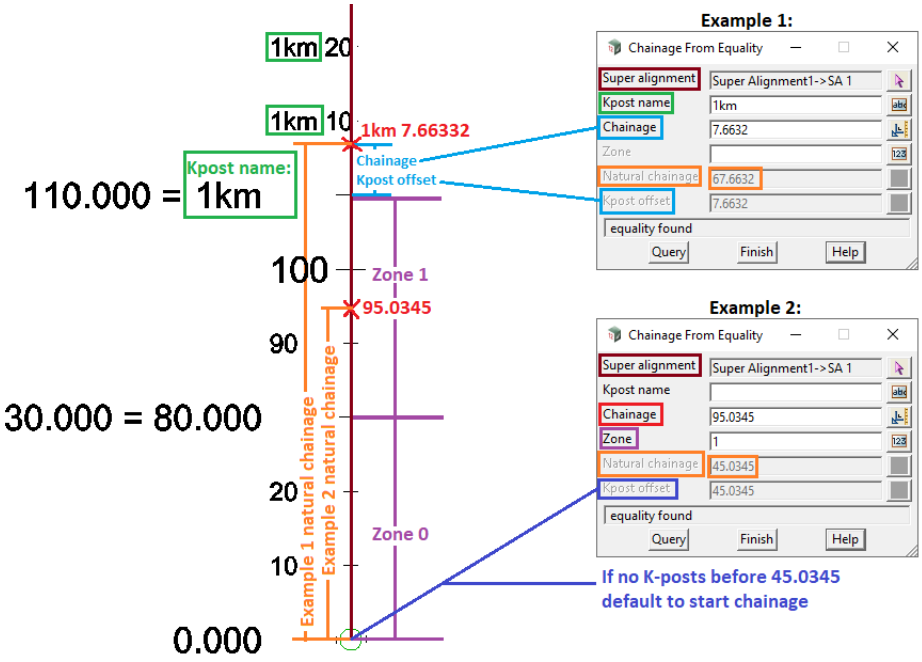
The raw chainage of the selected point on the super alignment.

Kpost offset

The chainage length from the selected chainage to previous K-post chainage equality. If there are no K-

posts, the chainage length is measured from the start chainage.

Two examples:



Button at Bottom

Query button

Measure the raw chainage of a point on the given super alignment using: K-post name, chainage length from previous chainage equality and Zone.

11.7 Grids and DEMS

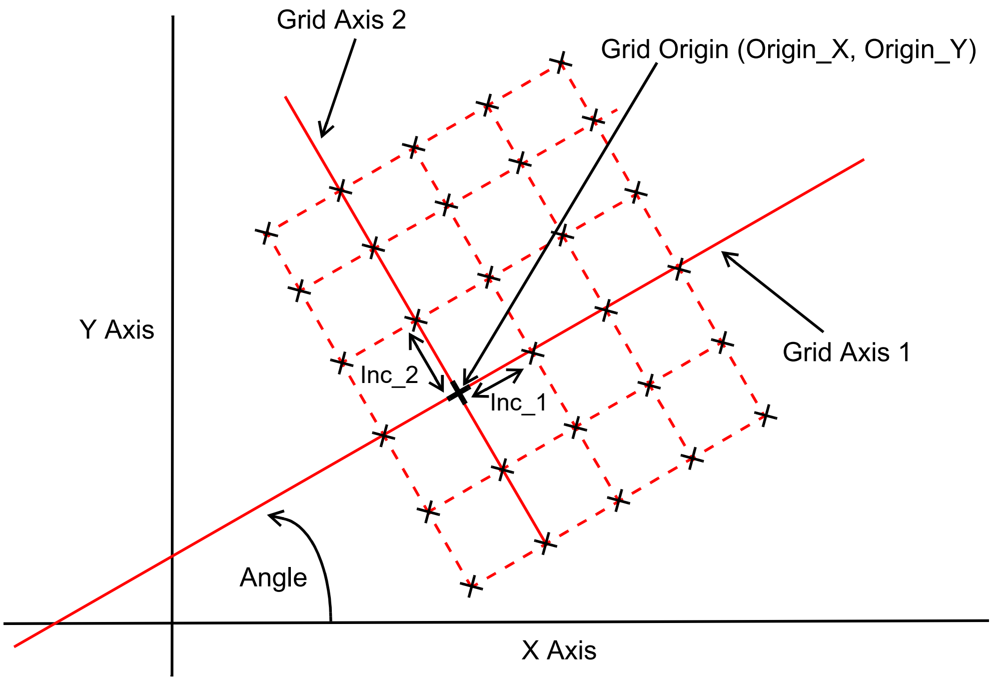
11.7.1 12d Grid, Grid String and Grid Tin

A ***12d Model*** Grid consists of z-values at points that are spaced at regular increments in two perpendicular axis about a particular point of the grid (the Grid Origin).

That is, there are two axis at right angles, Grid Axis 1 and Grid Axis 2, with their origin at the Grid origin, and with Axis 1 making an angle Angle with the X Axis. The increment in the Axis 1 direction is Inc_1 and the increment in the Axis 2 direction is Inc_2.

Note that Inc_1 and Inc_2 do not have to be the same value.

.



For the moment it is probably easier to ignore the rotation angle and take it to be zero. Axis 1 and Axis 2 are then the X and Y axes respectively.

In that case the ***12d Model*** Grid consists of z-values at regular X increment (Inc_X) and regular Y increment (Inc_Y).

The (x,y) position of the grid points are then:

X Grid point = Origin_X + N * Inc_X where N is an integer (positive or negative)

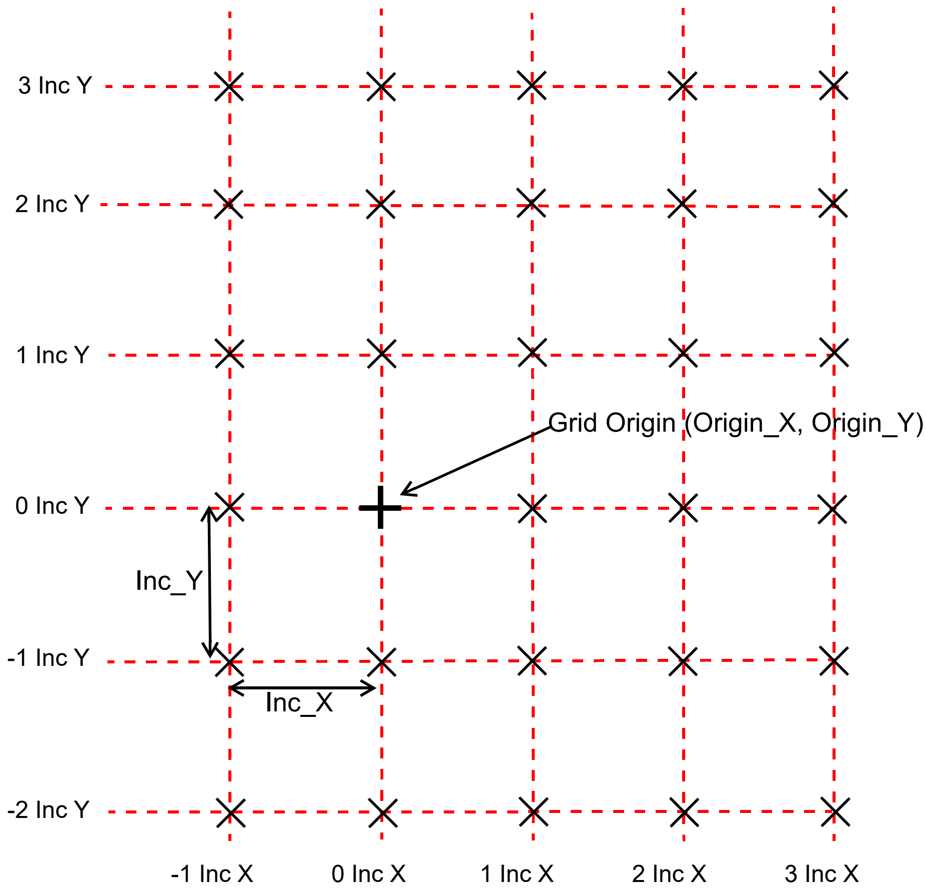
Y Grid point = Origin_Y + M * Inc_Y where M is an integer (positive or negative)

The Grid Origin is at 0 increments in X and Y.

The Range of the ***12d Model*** Grid is specified by giving the minimum and maximum number of Increments of X and the minimum and maximum number of increments of Y.

For example, in the ***12d Model*** Grid drawn below, points of the grid are denoted by **X**. The angle of the Grid is 0 and the grid goes from -1 to 3 increments in X, and -2 to 3 increments in Y.

.

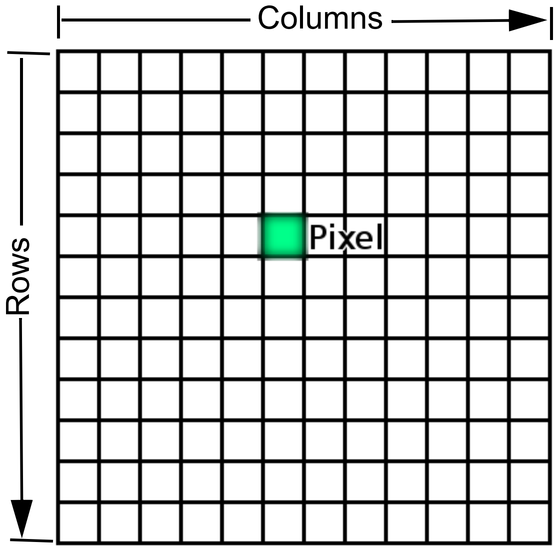


A ***Grid String*** is a special type of string where each of the vertices is a point of a ***12d Model*** Grid. The values for a Grid string often come from a tin.

A ***Grid Tin*** is a special type of tin where each of the vertices of the tin is a point of a ***12d Model*** Grid.

11.7.2 Raster and Cell-Based Systems

A Raster consists of a matrix of cells organised into rows and columns where each cell (pixel) contains one value representing information. The numbering for the cells is from the top left corner of the cells.



Raster

What the value in each cell represents depends on the application.

The value in the cell may be a discrete value or it may be a sample from continuous data. In either case, depending on the application, the value may apply to the entire cell, or only apply at a particular position in the cell.

Digital aerial photographs are rasters where the value for each cell is a colour and the colour applies to the entire cell. Similarly for imagery from satellites, digital pictures and most computer screens where each cell (pixel) on the screen has one colour (see 11.7.2.1 Rasters as Background Images).

For other applications where the cell value represents a measured value and does not apply to the entire cell then that position within the cell must be specified. Usually the cell value representing a measured value is at the centre point of the cell (see 11.7.2.2 Rasters as Elevation Models).

11.7.2.1 Rasters as Background Images

The most common use for rasters in ***12d Model*** is as a background image to other data being displayed. For example an aerial photograph.

However before a raster can be displayed with other data in a given coordinate system, the raster data must be mapped to the same coordinate system as the other data and this may involve a translation, rotation and possibly scales in two directions being applied to the raster. This process is referred to as geolocating the raster.

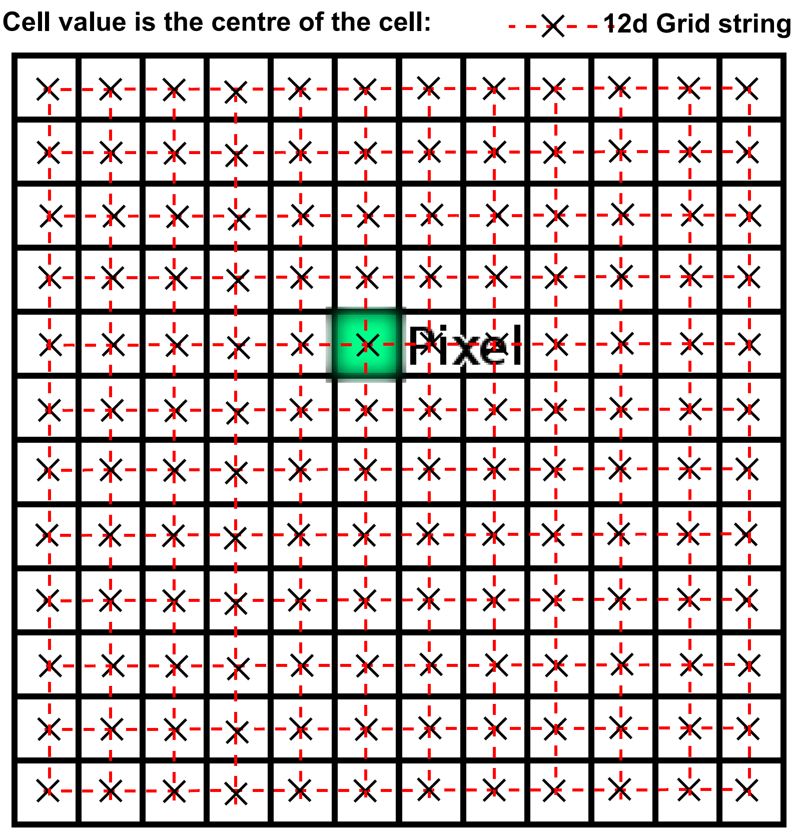
Sometimes this geolocation information is part of the raster format, at other times it is in a separate file and often it is entirely missing and must be calculated after the raster is loaded into ***12d Model***.

11.7.2.2 Rasters as Elevation Models

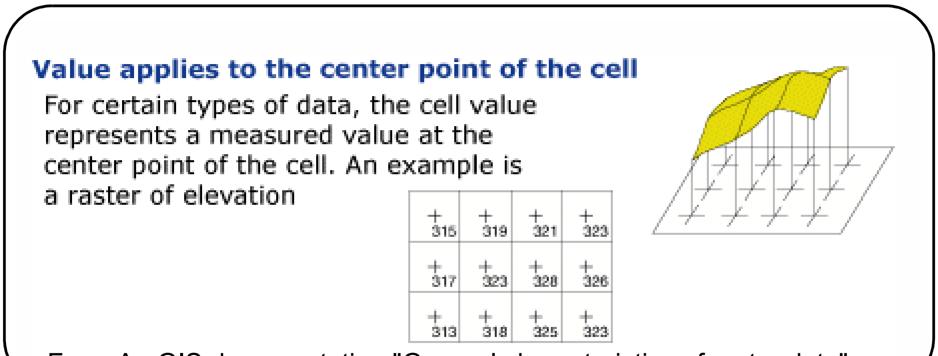
Another application of rasters is where the cell value represents a continuous measurement such as a z-value (height or elevation).

In this case the data could be read in as a ***12d Model*** Grid String or Grid Tin, but the user must be certain of where in the cell the z-value is located.

For example, if the value of the cell is the z-value at the centre of the pixel, the ***12d Model*** Grid string and Grid tin consists of the z-value at the **X** in the cells in the raster diagram.



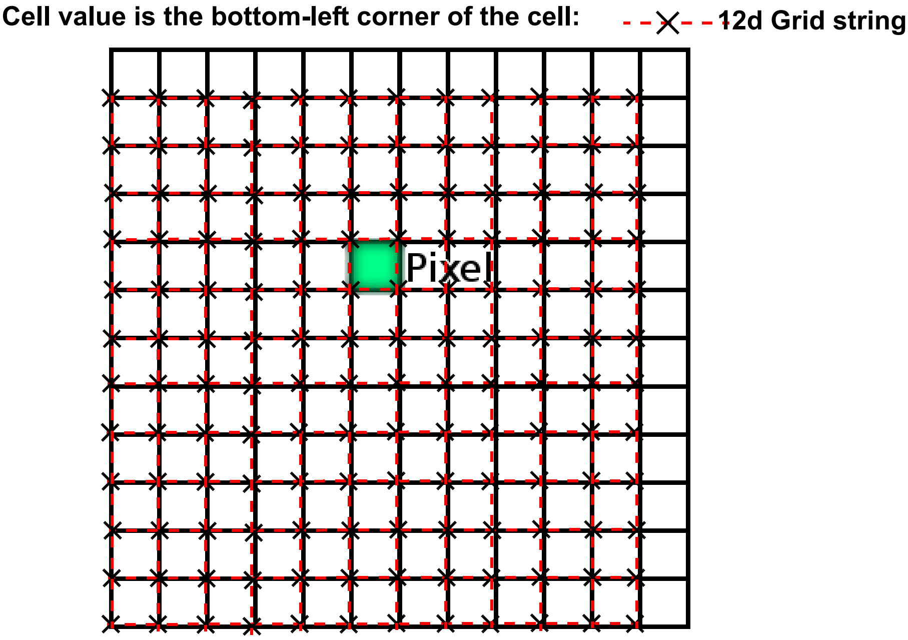
This is how an ESRI raster file is to be interpreted when the data is considered to represent a measured value.



From ArcGIS documentation "General characteristics of raster data"

Note that the lines of the ***12d Model*** Grid string and Grid tin DO NOT line up with the edges of the cells (pixels). In fact the z-values anywhere in the cell except at the centre are meaningless.

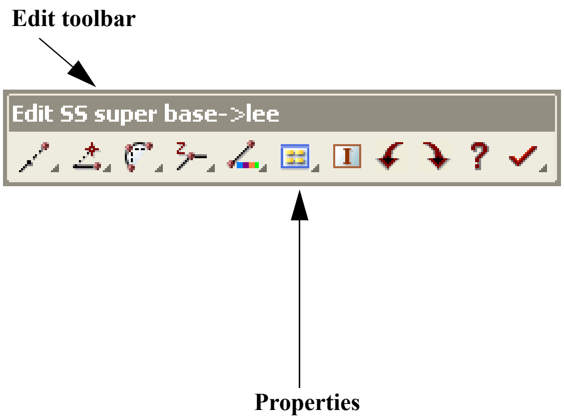
If the value of the cell is the z-value at the bottom-left hand corner of the cell (pixel), the ***12d Model*** Grid string and Grid tin consists of the z-value at the X in the cells in the raster diagram.

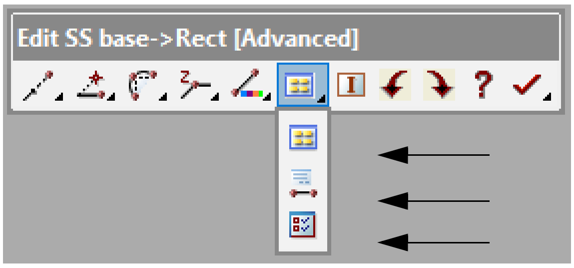


In this case the lines of the ***12d Model*** Grid string and Grid tin do line up with the edges of the cells (pixels) except there is no grid lines at the top and bottom of the cells. The z-values in the cell are meaningless anywhere in the cell except at the bottom-left corner.

11.8 Super Edit - Properties Toolbar

The option **Super String User Attributes** has been added to the properties toolbar, located under the **Super Edit** menu.





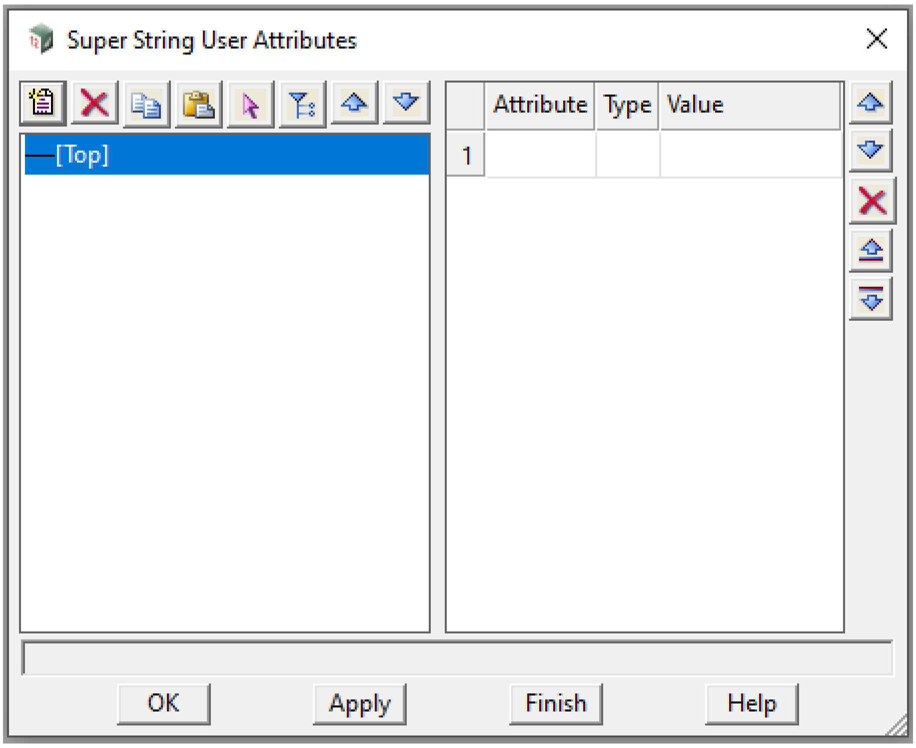
See

11.8.1 Super String User Attributes

11.8.1 Super String User Attributes

Selecting **String Attribute** brings up the **Super String User Attributes** panel which is used to display and edit user define attributes of the whole string.

As soon as the attribute is chosen, the attributes for the whole string is shown.



The string's attribute information is written to the appropriate panel fields. If any panel fields are modified, selecting either **Apply** or **OK** will store the new attribute information for the string.

General information on attributes is given in 4.8 Attributes (Meta Data) and the description of how to add attributes and groups of attributes in an Attributes panel is given in the section 4.8.3 Attribute Data Panel. In these descriptions, the Set button replaces the OK and Apply button used in this panel.

The fields and button that are different from Attributes Data panel have the following functions:

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.*

12 BIM

There has been changes to the **Bim** chapter in the ***12d Model Reference manual***.

See

12.1 Import

12.1.1 IFC Express Reader

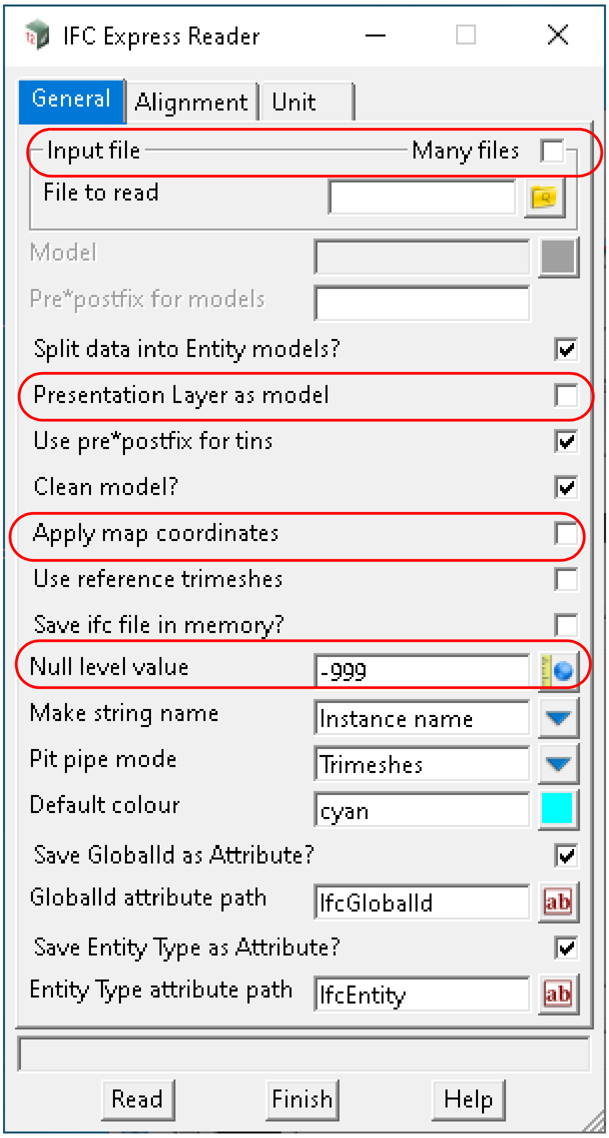
Position of option in menu: **BIM =>Import =>IFC Express Reader**

Now documented In the v15 reference manual

The IFC file under general tab has been replaced with the **Input file** option.

The options **Presentation Layer as model**, **Apply map coordinates** and **Null level value** have been added to the panel.

Selecting **IFC Express Reader** brings up the **IFC Express Reader** panel.



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

Field Description	Type	Defaults	Pop-Up

General tab

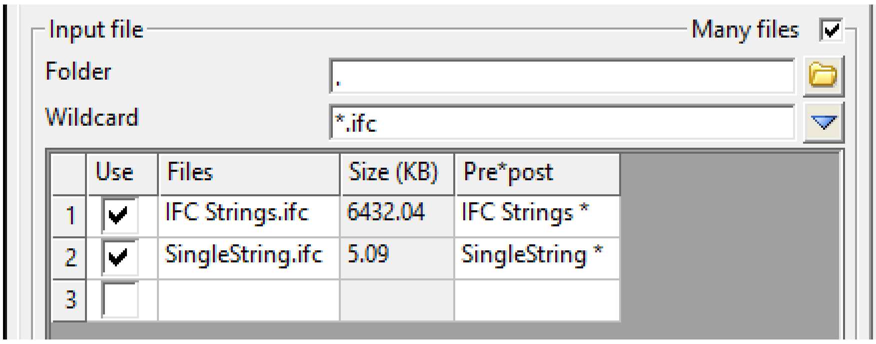
Many files tick box not ticked

*If **not ticked**, **File To Read** field is visible.*

File to read file box *ifc, *ifczip, *ifcxml files

*Name of the IFC 2x3, IFC 2x4, IFC 4, IFC 4x1, or IFC 4x3 file to read in. This is only displayed and used if **Many files** is **NOT** ticked.*

*If **ticked**, the **Many Files** grid is displayed and used to select many files to process. See* [4.24.9 Many Files Box](#).



Files file column *ifc, *ifczip, *ifcxml files

Name of the file to process.

Pre*post text column

***Note** that this grid has a **Pre*post** column and if it is blank then the **Pre*postfix for models** field is used.*

Presentation Layer as model tick box not ticked

*If **ticked**, if the ifc data is part of a presentation layer the data is read into a model with the same name as the layer.*
***NOTE** if any ifc data is not part of a layer then either the **Entity model** or the **Model** will be used to store the ifc data depending on whether **Split data into Entity Models** is **ticked**.*

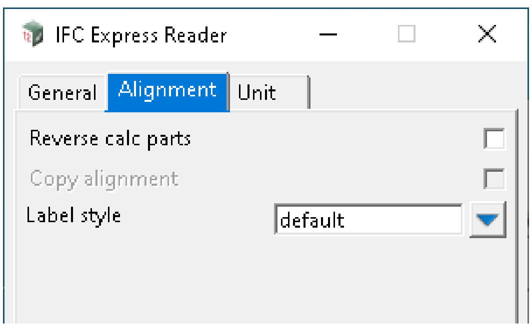
Apply map coordinates tick box not ticked

*If **ticked**, the map coordinates that are specified in the ifc file are applied to the imported ifc data.*

Null level value real box -999

When reading in 12d elements, if there is a z-value with the given null level value, replace it with the default 12d Model null level value.

Alignment tab



Copy alignment tick box not ticked

If ***ticked****, for any IFC Alignments with IFC Horizontal and/or IFC Vertical Geometry, a copy of the alignment with the suffix ' copy' added to the string name will be stored before attempting to create Horizontal and Vertical parts for the alignment.*

Label style choice box available label styles

The super alignment style controls the way the super alignment draws and highlights on the screen. For more information please go to the section .
Sets the label style for any imported IFC Alignments.

12.2 Export

12.2.1 IFC Infrastructure Express Writer

Position of option on menu: **BIM =>Export =>IFC write infrastructure**

Now documented In the v15 reference manual

The **Write IFC IFC FIle** option is a rewrite of the **V14 IFC Write IFC File**.

More tabs have been added to group settings in hopefully a more logical fashion.

As we learn more about IFC files, more fields and functionality are added to the **Write Infrastructure IFC File** option.

The **Write Infrastructure IFC File** option has all the capabilities as the **Write IFC File** plus the additional capabilities that data can be written out in **IFC 4x3** format which is the format for ***CIvil BIM*** and includes IFC entities for **alignments**, **tins** and **trimeshes**.

NOTE

The Write IFC File option has been kept for upwards compatibility from V14.

Things to be Careful About When Writing Out IFC Files

Unfortunately not all software read in IFC's in the same way so how 12d objects need to be written out to an IFC file depends on the software that is being used to read in the IFC file.

The IFC Reader in **Solibri** is one of the most comprehensive IFC Readers unto and include IFC 4 and it is used to test out the IFC files produced by ***12d Model*** although even Solibri has limitations (e.g. Solibri can not display strings unless they have a non-zero diameter).

The IFC Readers in **Revit** and **NavisWorks** are not as comprehensive as the IFC Reader in **Solibri** and unfortunately the IFC Reader in **Revit** does not work the same way as the IFC Reader in **NavisWorks**.

The handle these differences in IFC Readers, there are a number of tick boxes on the **Write Infrastructure IFC File Writer** that will determine how the 12d object is written to the IFC file.

As an example, using the **Infrastructure IFC File Writer,** the data in each model is placed in the IFC Spatial Structure IFCFACILITY with the name of the model as the name of the instance of IfcFacility except for Tins that will have to be written out as IfcSite if the data is going to **Revit**.

And **Output polylines as tiny pipes?** needs to be ticked and the value in **Tiny pipe diameter** used if data is to go out to **Solibri**, **Revit** and **NavisWorks**.

Also IFC's have mainly been defined for vertical buildings and do not have special entities to cover Civil objects such as Alignments and Tins. So for example, an Alignment can only be written out as a 3d string and Tins as ifcBuildingElementProxy (see 35.2.7 Representation of 12d Model Objects as IFCs).

However as we learn more about IFC's, and how other software reads them in, we will upgrade our IFC Writer.

Warnings for Large Horizontal Civil Projects

IFC's have no limitation on the size or coordinates or the horizontal or vertical size of projects but be aware that not all software is like ***12d Model*** and may not be able handle data for large horizontal projects and display such data correctly. For example **Revit** and **Solibri** have problems with data that extends over more than a 10 Km circle.

Also not all software supports the concept of null z-values and so null z-values need to be substituted with some other z-value as the data is written out to ifcs.

Attributes

IFC entities have attributes and they are the stored in **IFC Property Sets** and each IFC Property Set must have a non blank name.

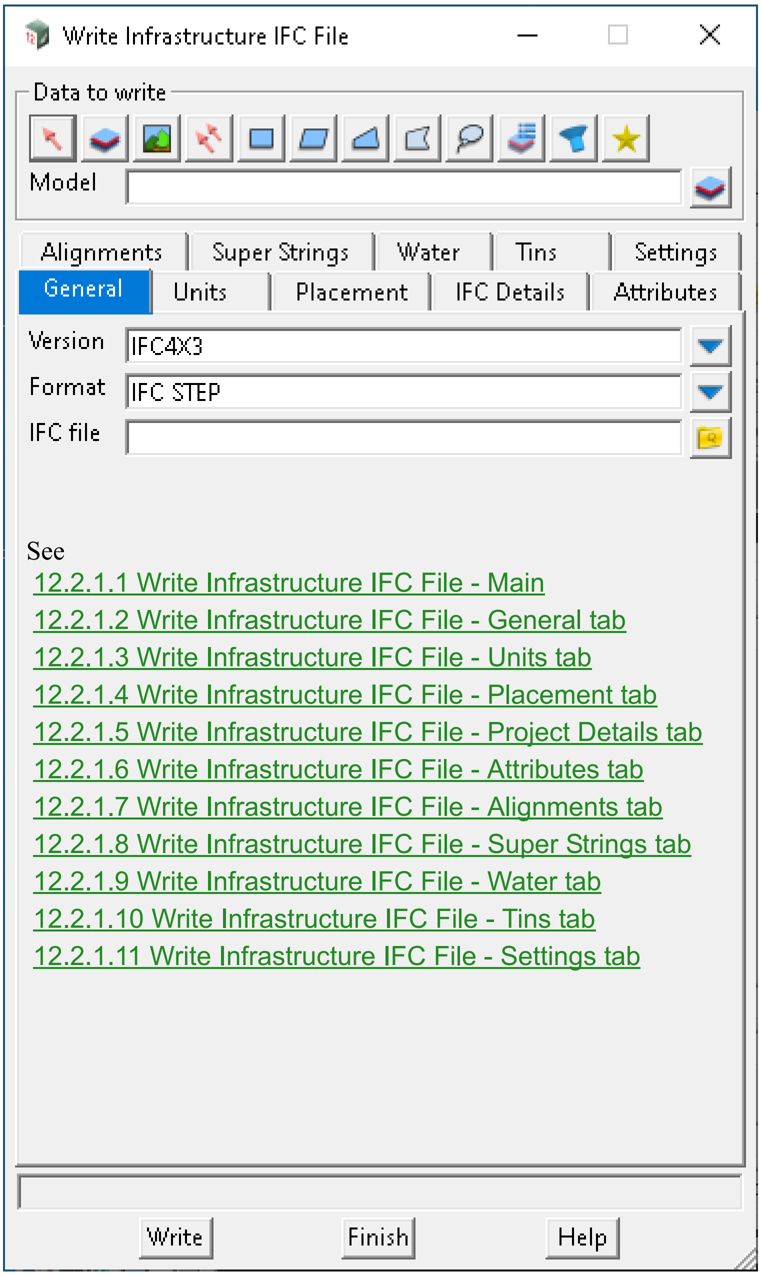
For each 12d object written out as an IFC entity, an IFC property set called **12d Model** is created and has the three Text attributes written to it:

FileName	name of the file being written out
Date	date and time that the object was written out
StepId	the # number of the object in the file

This is to provide some history for the 12d object being written out.

If **Export attributes** is ticked, then the attribute tree of the 12d Object (string attributes for a string) are also written out. What IFC Property Sets they are written to depends on whether **Use IFC attributes tree** is ticked on or not.

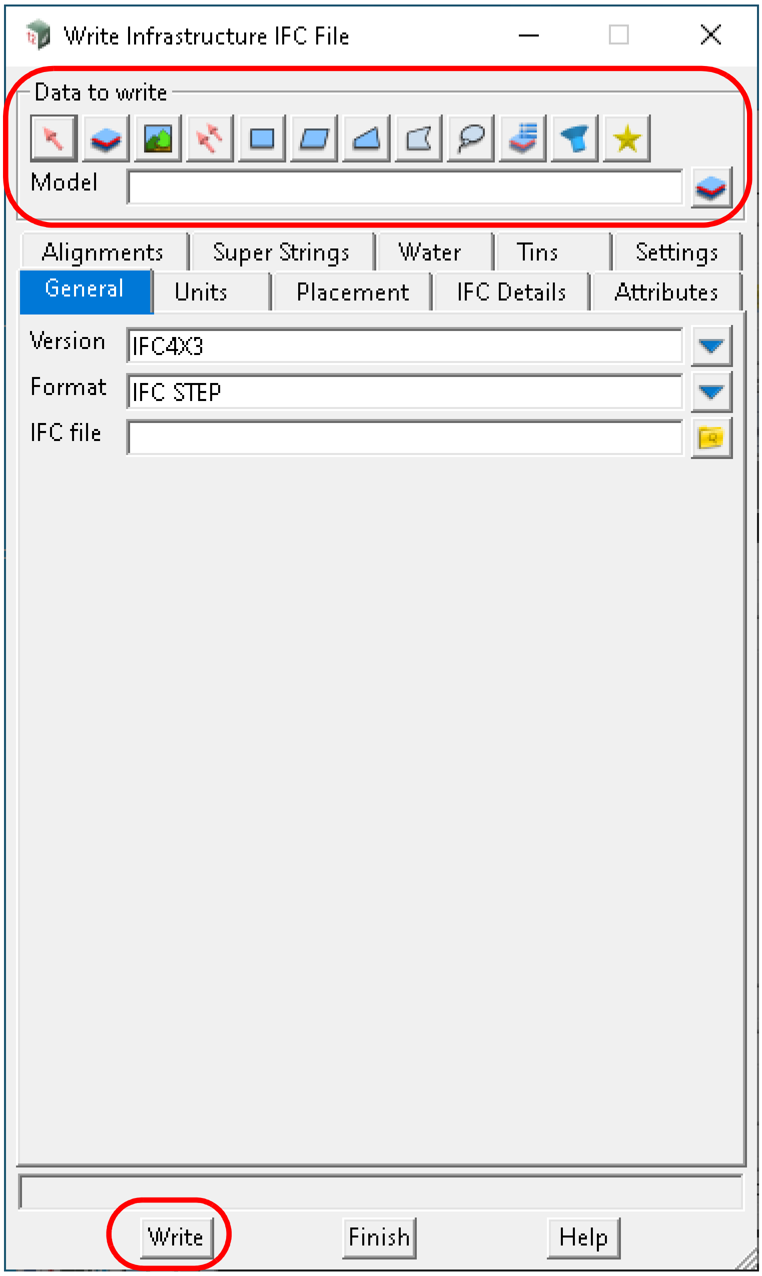
Selecting **IFC Write Infrastructure** brings up the **Write Infrastructure IFC File** panel.



See
12.2.1.1 Write Infrastructure IFC File - Main
12.2.1.2 Write Infrastructure IFC File - General tab
12.2.1.3 Write Infrastructure IFC File - Units tab
12.2.1.4 Write Infrastructure IFC File - Placement tab
12.2.1.5 Write Infrastructure IFC File - Project Details tab
12.2.1.6 Write Infrastructure IFC File - Attributes tab
12.2.1.7 Write Infrastructure IFC File - Alignments tab
12.2.1.8 Write Infrastructure IFC File - Super Strings tab
12.2.1.9 Write Infrastructure IFC File - Water tab
12.2.1.10 Write Infrastructure IFC File - Tins tab
12.2.1.11 Write Infrastructure IFC File - Settings tab

Main tab
General tab
Units tab
Placement tab
Project Details tab
Attribute tab
Alignment tab
Super Strings tab
Water tab
Tins tab
Settings tab

12.2.1.1 Write Infrastructure IFC File - Main



[Main tab](#)
[General tab](#)
[Units tab](#)
[Placement tab](#)
[Project Details tab](#)
[Attribute tab](#)
[Alignment tab](#)
[Super Strings tab](#)
[Water tab](#)
[Tins tab](#)
[Settings tab](#)

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

Field Description	Type	Defaults	Pop-Up

Main tab

Data to write	data source		

Data selection type - for a full description go to 4.24.3 Data Source.

Selected data source	input	Model	

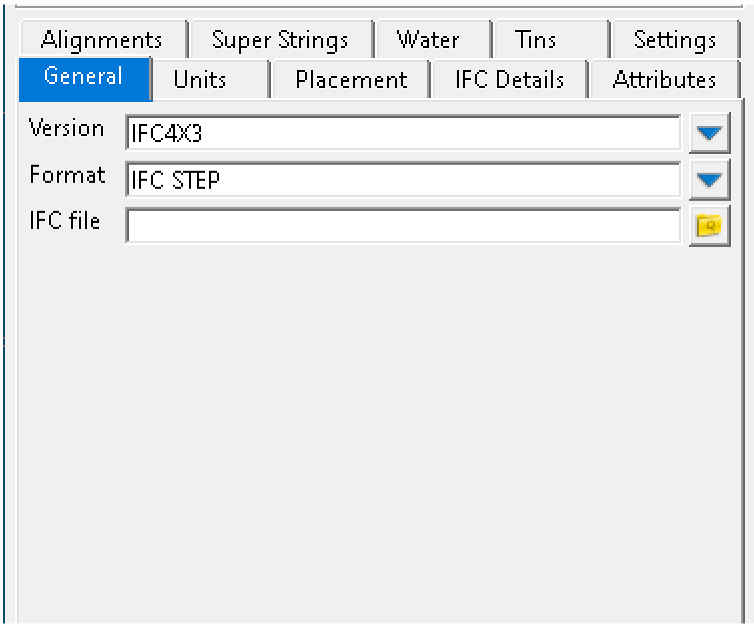
Data source of data to be written out to IFC.

Buttons at Bottom

Write button

Write out the IFC file.

12.2.1.2 Write Infrastructure IFC File - General tab



Main tab
General tab
Units tab
Placement tab
Project Details tab
Attribute tab
Alignment tab
Super Strings tab
Water tab
Tins tab
Settings tab

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

General tab

Version choice box IFC2x3, IFC4, FC4x3

*If **IFC 2x3**, the data is written out as an **IFC 2x3** file.*

*If **IFC 4**, the data is written out as an **IFC 4** file.*

*If **IFC 4x3**, the data is written out as an **IFC 4x3** file.*

***Note**: for versions **IFC 4x3** and later there are specific ifcEntities for Super Alignments and Tins.*

Format choice box IFC STEP, IFC XML
IFC STEP ZIP, IFC XML ZIP

*If **IFC STEP,** the data is written out in the IFC STEP format.*
*If **IFC XML,** the data is written out in the IFC XML format.*
*If **IFC STEP ZIP,** the data is written out in the IFC STEP format, then compressed to a zip file.*
*If **IFC XML ZIP,** the data is written out in the IFC XML format, then compressed to a zip file.*

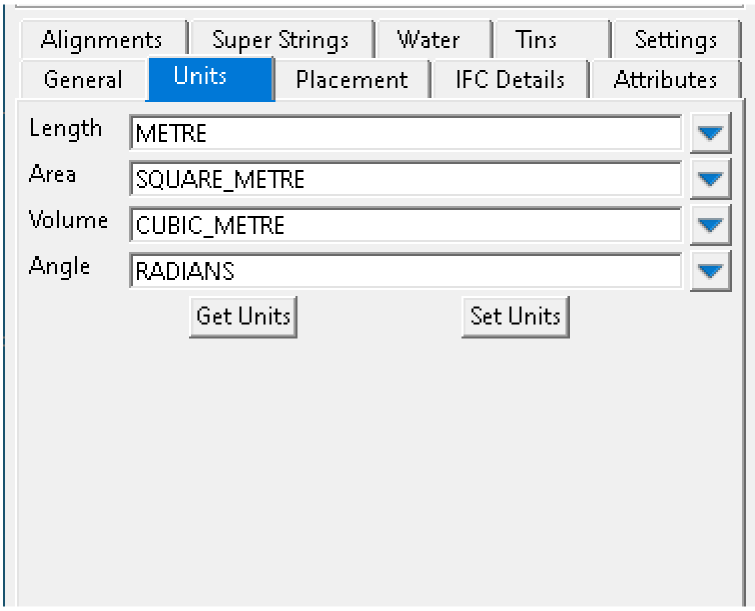
IFC file input *.ifc file

Name for the file to write the IFC data to.

12.2.1.3 Write Infrastructure IFC File - Units tab

The ***Units*** tab is used to supply data that is used in the Units section of the IFC file.

Note: when the **Write Infrastructure IFC File** panel is started, the values from the **Project** attribute group ***ifc_attributes/ifc_project_units*** are automatically loaded into the fields of the ***Units*** tab.



Main tab
General tab
Units tab
Placement tab
Project Details tab
Attribute tab
Alignment tab
Super Strings tab
Water tab
Tins tab
Settings tab

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

Units tab

Length choice box METRE, MILLIMETRE, KILOMETRE

*If **METRE**, the lengths are written out in metres.*

*If **MILLIMETRE**, the lengths are written out in millimetres.*

*If **KILOMETRE**, the lengths are written out in kilometres.*

Area choice box SQUARE_METRE, SQUARE_MILLIMETRE, SQUARE_KILOMETRE Aq

*If **SQUARE_METRE**, the areas are written out in* $metre^2$.

*If **SQUARE_MILLIMETRE**, the areas are written out in* $millimetre^2$.

*If **SQUARE_KILOMETRE**, the areas are written out in* $kilometre^2$.

Volume choice box CUBIC_METRE, CUBIC_MILLIMETRE, CUBIC_KILOMETRE

*If **CUBIC_METRE**, the volumes are written out in* $metre^3$

*If **CUBIC_MILLIMETRE**, the volumes are written out in* $millimetre^3$.

*If **CUBIC_KILOMETRE**, the volumes are written out in* $kilometre^3$.

Angle choice box RADIANS, DEGREES

*If **RADIANS**, the plane angles are written out in radians.*

*If **DEGREES**, the plane angles are written out in degrees.*

Get Units button

*Pressing the button loads the values from the **Project** attribute group **ifc_attributes/ifc_project_units** into the fields of this tab.*

Note: *when the* **Write Infrastructure IFC File** *is started, the values from the* ***Project*** *attribute group* ***ifc_attributes/ifc_project_units*** *are automatically loaded into the fields of* ***Units*** *tab so this button only needs to be used if the Project attributes have been modified after the panel has started and the new values are required.*

Set Units button

After pressing the button, the values in the ***Units*** *tab are loaded into the* ***Project*** *attributes group* ***ifc_attributes/ifc_project_units***

Note: *this is only necessary if you have changed any values in the* ***Units*** *tab and the new values are to be stored in the Project attribute group* ***ifc_attributes/ifc_project_units***

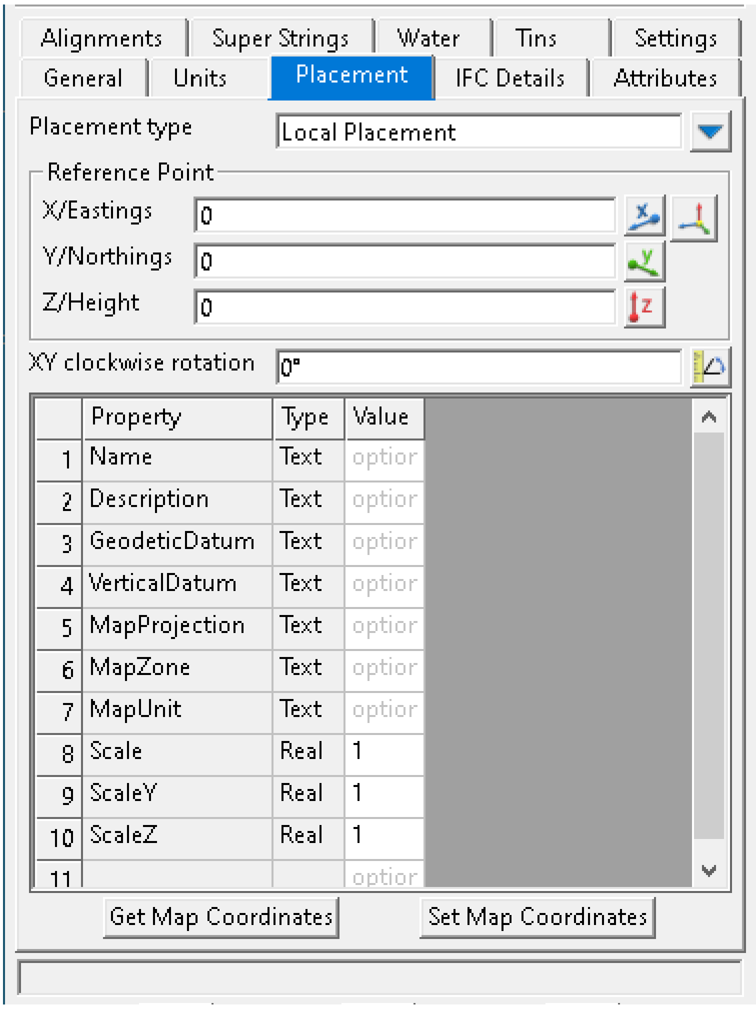
12.2.1.4 Write Infrastructure IFC File - Placement tab

When the ***12d Model*** data is written to an IFC file, the coordinates can be written out with the same x,y and z values as they have in ***12d Model*** or they can be translated with respect to a user given ***Reference point*** *and* ***XY rotation*** *which by default is (0,0,0) and 0° respectively.*

If the data is in a map projection then there are fields in the IFC file to record the Horizontal datum (Geodetic datum), the Vertical Datum, the Map Projection and Zone, and Scale factors for X, Y and Z.

In IFC 4x3 the information for the map projection is recorded in the entities ***IfcProjectedCRS*** and ***IfcMapConversion*** and in IFC 2x3 the information is written to property sets attached to the main ***IfcSite***.

This information about the map projection can also be written to ***12d Model*** project attributes group ***ifc_attributes/Map Coordinates*** and when the **Write Infrastructure IFC File** panel is started, the values from the **Project** attribute group ***ifc_attributes/Map Coordinates*** are automatically loaded into the fields of the ***Placement*** tab.



Main tab
General tab
Units tab
Placement tab
Project Details tab
Attribute tab
Alignment tab
Super Strings tab
Water tab
Tins tab
Settings tab

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

Placement tab

Placement type choice box Local Placement, Map Coordinates

In all cases the ***Reference point*** *values for x, y and z are subtracted from the (x,y,z) coordinates of the data and rotated clockwise by the* ***XY rotation*** *before it is written out to the IFC file. The other system may or may not use the* ***Reference point*** *values.*

*If **Local Placement**, the **Reference point** and **XY rotation** values are written out to an **IfcLocalPlacement** so that when the data is read into another system, the other system knows what the **Reference point** is. The entities **ifcProjectedCRS** and **ifcMapConversion** are **NOT** used.*

This is often used if the IFC reading system cannot handle large coordinates and needs a "local origin".

*If **Map Coordinates** and **IFC 4x3,** the* **Reference point** *values **AND** the data in the grid box are written out to the appropriate parameters for **ifcProjectedCRS** and **ifcMapConversion**.*

*If **Map Coordinates** and **IFC 2x3,** the* **Reference point** *values **AND** the data in the grid box are written out to the property sets 'EPset_ProjectedCRS' and 'EPset_MapConversion' attached to the top level IfcSite.*

This is often used when the data is to be written out as truncated map coordinates.

Reference Point group

X/Easting measure box

Value to be subtracted from the x coordinate of all the data before the value is written to the IFC file.

Y/Northing measure box

Value to be subtracted from the y coordinate of all the data before the value is written to the IFC file.

Z/Height measure box

Value to be subtracted from the z coordinate of all the data before the value is written to the IFC file.

If (X coordinate, Y coordinate) are defined but not Z coordinate then the value of z will be set to zero ???.

XY clockwise rotation angle box

Rotates the exported data by the specified amount.

Grid box

***Property:** the name of the property or parameter for the ifcProjectedCRS or ifcMapConversion EPset or IfcEntity respectively. The property can not be changed.*

***Type:** the type of the property or parameter. The **Type** can not be changed.*

***Value:** the value to use for the ifcProjectedCRS or ifcMapConversion EPset or ifcEntity.*

Get Map Coordinates button

*Pressing the button loads the values from the **Project** attribute group **ifc_attributes/Map Coordinates** into the fields of this tab.*

***Note:** when the* **Write Infrastructure IFC File** *is started, the values from the **Project** attribute group **ifc_attributes/Map Coordinates** are automatically loaded into the fields of **Placement** tab so this button only needs to be used if the Project attributes have been modified after the panel has started and the new values are required.*

Set Map Coordinates button

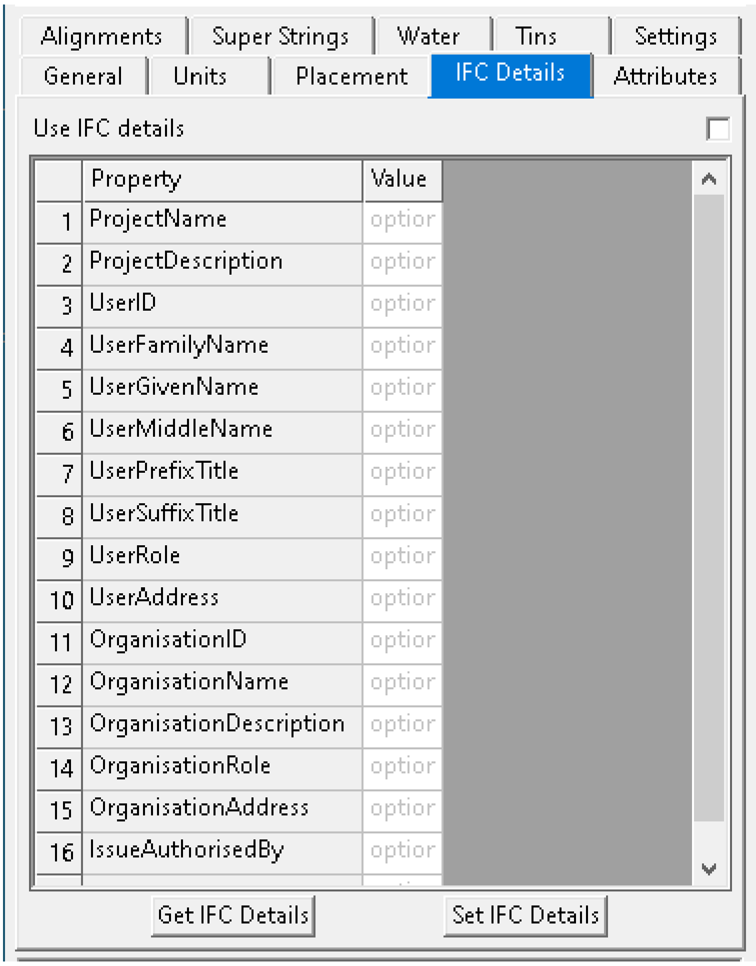
*After pressing the button, the values in the **Placement** tab are loaded into the **Project** attributes group **ifc_attributes/Map Coordinates***

Note:** this is only necessary if you have changed any values in the **Placement** tab and the new values are to be stored in the Project attribute group **ifc_attributes/Map Coordinates.

12.2.1.5 Write Infrastructure IFC File - Project Details tab

The ***Project Details*** tab is used to supply data used in the header records of the IFC file.

Note: when the **Write Infrastructure IFC File** panel is started, the values from the **Project** attribute group ***ifc_attributes/Project Details*** are automatically loaded into the fields of **Project Details** tab.



Main tab
General tab
Units tab
Placement tab
Project Details tab
Attribute tab
Alignment tab
Super Strings tab
Water tab
Tins tab
Settings tab

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

Project Details tab

Use IFC details tick box not ticked

*If **ticked**, IFC files will include information specified by the Grid box.*

***Note**: When exporting project details the details will be updated when exporting the IFC file for the current project.*

Get IFC Details button

*Pressing the button loads the values from the **Project** attribute group **ifc_attributes/Project Details** into the fields of this tab.*

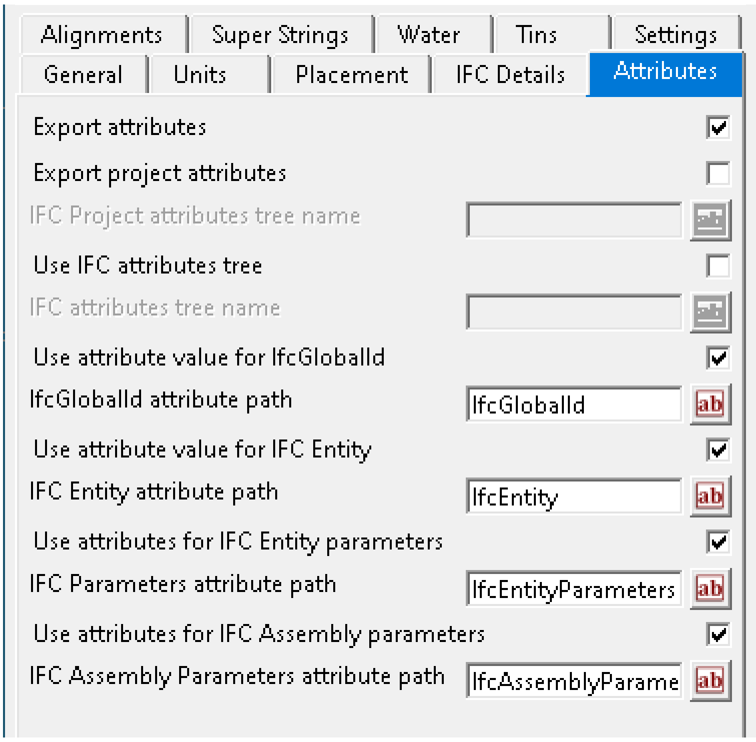
***Note:** when the* **Write Infrastructure IFC File** *is started, the values from the **Project** attribute group **ifc_attributes/Project Details** are automatically loaded into the fields of **Project Details** tab so this button only needs to be used if the Project attributes have been modified after the panel has started and the new values are required.*

Set IFC Details button

*After pressing the button, the values in the **Project Details** tab are loaded into **Project** attributes group **ifc_attributes/Project Details***

Note: *this is only necessary if you have changed any values in the* ***Project Details*** *tab and the new values are to be stored in the Project attribute group* ***ifc_attributes/Project Details****.*

12.2.1.6 Write Infrastructure IFC File - Attributes tab



Main tab
General tab
Units tab
Placement tab
Project Details tab
Attribute tab
Alignment tab
Super Strings tab
Water tab
Tins tab
Settings tab

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

Attribute tab

Export attributes tick box ticked

*If **ticked**, the* **12d Model** *Project Attributes and attributes on entities are written to the IFC file.*

Project attributes will be exported to the IFC file as a property set on the ifcProject. For **12d Model** *Objects that are represented as ifcBuildingElementProxy elements, the string/tin/trimesh attributes are exported as an ifcPropertySet. What the Property Set is called depends on* **Use IFC attribute tree.**

Export project attributes tick box not ticked

*If **Export project attributes** is **ticked**, then the Project attributes in the attributes tree given in **IFC Project attributes tree name**, are written out. See the field* **IFC attributes tree name** *for more details.*

IFC project attributes tree name text box

If **Export attributes** and **Export project attributes** *are **ticked**, then those project attributes in the nodes under the attribute tree* **IFC Project attributes tree name** *are written out to the IFC file. And for **each node** a Property set is created with that **node name**, and all the attributes **under that node are written out** to that property set. See IFC attribute tree name for more details.*

If **Export project attributes** *is **not ticked**, then no project attributes are written out to the IFC file.*

Use IFC attributes tree tick box not ticked

*If **Use IFC attributes tree** is **NOT ticked**, then the string attributes of a* **12d Model** *element that is written out, are written to a Property Set called **12d Model**. The attributes have the same tree structure in the Property Set as they have inside* **12d Model**.

*If **Use IFC attributes tree** is **ticked**, then only the string attributes that are in the attributes tree beginning from the tree given in **IFC attributes tree name**, are written out. For more information, see the documentation on the field* **IFC attributes tree name**.

IFC attributes tree name text box

*If **Export attributes** and* **Use IFC attribute tree** *are ticked, then only those string attributes in the nodes under the attribute tree* **IFC attributes tree name** *are written out to the IFC file.*

*And then for **each node** under the attribute tree given in I***FC attributes tree name***, a Property set is created with that **node name**, and all the attributes **under that node are written out** to that property set.*

For example, if For example, if you had the following string attributes:

Description/Name
Water/Type
Water/SEW/Owner
Water/SH/Properties/Name
Water/SH/Properties/Diameter
Water/SH/Connections/Type

then if **IFC attributes tree name** *was **Water/SH** then there would be **two** Property Sets created called **Properties** (with the attributes **Name** and **Diameter**) and **Connections** (with the attribute **Type**).*

*The attributes **Water/SEW/Owner**, **Description/Name** and **Water/Type** would not be written out.*

Use attributes as IFC GlobalId tick box ticked

*If **Use attributes as IFC GlobalId** is **ticked**, then when writing out an object, the value in the* **GlobalId attribute path** *is checked and if it is **not blank**, its value is used as the IFC GlobalId. when writing the object out. If* **GlobalId attribute path** *is **blank**, the GlobalId is calculated and used as the IFC GlobalId when writing the object out. The calculated GlobalId is also saved to the attribute* **GlobalId attribute path** *of the* **12d Model** *object.*

*If **Use attributes as IFC GlobalId** is **not ticked**, then when writing out an object, a GlobalId is calculated and used as the IFC GlobalId when writing the object out. The calculated GlobalId is not saved in the attribute* **GlobalId attribute path.**

GlobalId attribute path text box ifcGlobalId

Attribute to use/saving for the IFC GlobalId.

Use attributes as IFC Element Type tick box ticked

*If **Use attributes as IFC Element Type** is **ticked**, then when writing out an element, the value in the **Element Type attribute Path** is checked and if it is **not blank**, its value is used as the IFC Element type when writing the object out. If **Element Type attribute Path** is **blank** or **invalid**, then the general Element type defaults to the standard output type for the object, namely **ifcBuildingElementProxy** for most objects. An Element type may be **invalid** due to the IfcElement not existing or not being applicable to the version of IFC.*

***Note**: this does **not** include Super Alignments in **IFC4x1** and later.*

*If **Use attributes as IFC Element Type** is **not ticked**, then the standard Element type for the object is used.*

Use attributes as IFC Element Type tick box ticked

*If **Use attributes as IFC Element Type** is **ticked**, then when writing out a **trimesh** or **string** type, the value in the **Element Type attribute Path** is checked and if it is **not blank**, its value is used as the IFC Element type when writing the object out, if the IFC Element type exists for the IFC version being written out. If **Element Type attribute path** is **blank** or invalid, then the general Element type defaults to the standard output type for the object, namely **ifcBuildingElementProxy** for most objects.*

***Note:** that this does **not** include Super Alignments or Tins.*

*If **Use attributes as IFC Element Type** is **not ticked**, then when writing out a **trimesh** or **string** type, the standard Element type for the object used.*

Element type attribute path text box ifcElementType

Attribute to use as the IFC Element Type.

Use attributes as IFC Element parameters tick box ticked

*if **ticked**, the parameters of the ifcElement can be set using the attribute group specified by the IFC **Parameters attribute path**. Only valid parameters will be set as the ifcElement parameter - to check which attributes you can set see https://standards.buildingsmart.org/IFC/RELEASE/ and pick the IFC version and ifcElement type.*

***Note**: only numeric and text attributes, such as Enums, can be set.*

IFC Parameters attribute path text box IfcElementParameters

Path to the attribute group where the ifcElement parameters are defined.

Use attributes as IFC Assembly parameters tick box ticked

*If **ticked**, the parameters of the ifcElementAssembly can be set using the attribute group specified by the IFC Assembly Parameters attribute path. Only valid parameters will be set for the ifcElementAssembly.*

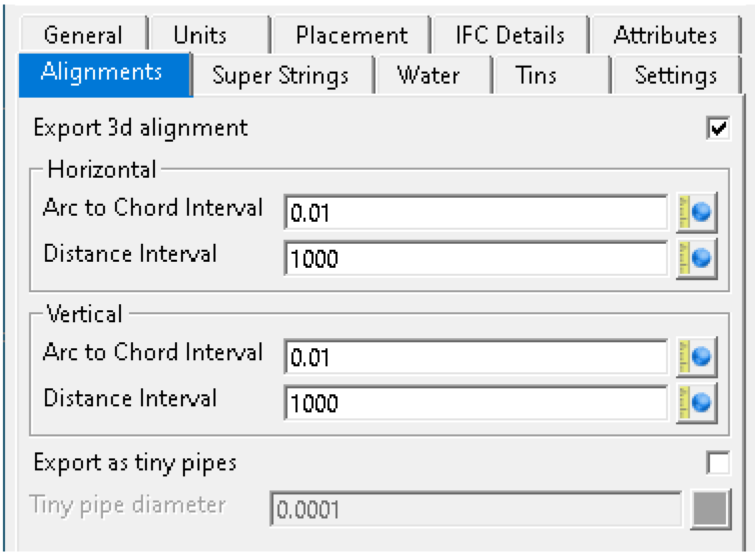
***Note**: only numeric and text attributes, such as Enums, can be set.*

To see how to setup an element assembly for IFC see 11.2.1.1.2 IFC Element Assembly.

IFC Assembly Parameters attribute path text box IfcAssemblyParameters

Path to the attribute group where the ifcElementAssembly parameters are defined.

12.2.1.7 Write Infrastructure IFC File - Alignments tab



[Main tab]
[General tab]
[Units tab]
[Placement tab]
[Project Details tab]
[Attribute tab]
[Alignment tab]
[Super Strings tab]
[Water tab]
[Tins tab]
[Settings tab]

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

Alignment tab

Export 3d alignment tick box not ticked

*If **ticked**, an IFC 3d alignment is also written out for each super alignment.*
*if **not ticked**, an IFC 3d alignment is not written out for each super alignment.*

Horizontal

Arc to Chord Interval real box

*If **Output 3d alignment** is **ticked** and the Version is **not** IFC 4x3, a super alignment is broken up by this chainage interval when written as an IFC 3d alignment (basically a series of 3d straights).*
*If the version **is** IFC 4x3, then this option is ignored and a parametric representation of the alignment's horizontal and vertical geometry is used for the 3d alignment.*

Distance Interval real box

*If **Output 3d alignment** is **ticked** and the Version is **not** IFC 4x3, a super alignment is broken up by this chainage interval when written as an IFC 3d alignment (basically a series of 3d straights).*
*If the version **is** IFC 4x3, then this option is ignored and a parametric representation of the alignment's horizontal and vertical geometry is used for the 3d alignment.*

Vertical

Arc to chord interval real box 0.01

*If **Output 3d alignment** is **ticked** and the Version is **not** IFC 4x3, a super alignment is broken up by this chainage interval when written as an IFC 3d alignment (basically a series of 3d straights).*
*If the version **is** IFC 4x3, then this option is ignored and a parametric representation of the alignment's horizontal and vertical geometry is used for the 3d alignment.*

Distance interval real box 10

*If **Output 3d alignment** is **ticked** and the Version is **not** IFC 4x3, a super alignment is broken up by this chainage interval when written as an IFC 3d alignment (basically a series of 3d straights).*
*If the version **is** IFC 4x3, then this option is ignored and a parametric representation of the alignment's horizontal and vertical geometry is used for the 3d alignment.*

Export as tiny pipes tick box not ticked

*If **ticked**, all super alignments with zero diameter are written out with the diameter given in* **Tiny pipe**

diameter.

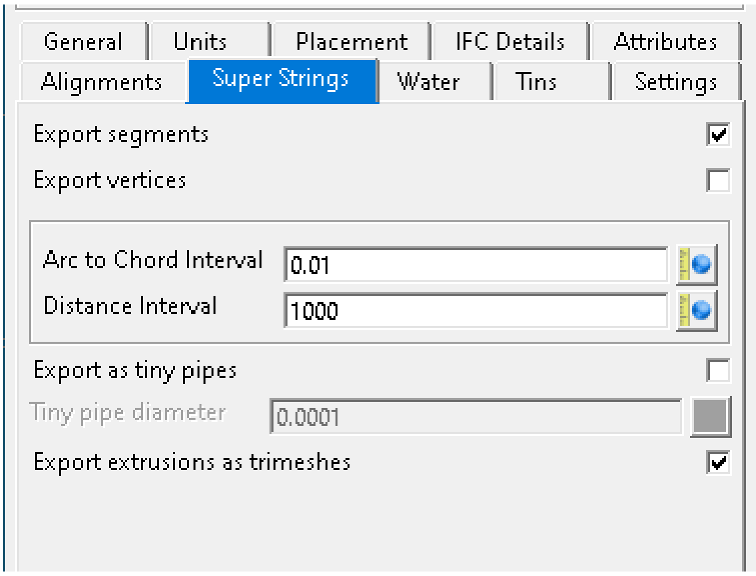
*This is needed because some software (for example **Solibri**, **Revit** and **NavisWorks**) can not display IFC's of strings with no diameter.*

*So this needs to be **ticked** when writing out IFC's to **Solibri**, **Revit** and **NavisWorks**.*

Tiny pipe diameter real box 0.0001

A small diameter for super strings without an actual diameter.

12.2.1.8 Write Infrastructure IFC File - Super Strings tab



Main tab
General tab
Units tab
Placement tab
Project Details tab
Attribute tab
Alignment tab
Super Strings tab
Water tab
Tins tab
Settings tab

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

Super Strings tab

Export pipe/culvert in segments tick box ticked

*If **ticked**, all super strings with non-zero diameter will be exported in segments with segment attributes attached.*

*If **not ticked**, all super strings (and string alignments) with non-zero diameter will be exported as a single ifcEntity extruded along the string with string attributes attached.*

*When this option is set as **not ticked** the **Arc to chord** option will also be set to **not ticked**.*

Arc to chord interval real box 0.01

The interval in which arcs will be broken into straight segments.

Distance interval real box 10

The chainage interval in which strings will be split.

Export as tiny pipes tick box not ticked

*If **ticked**, all super alignments with zero diameter are written out with the diameter given in* **Tiny pipe diameter**.

*This is needed because some software (for example **Solibri**, **Revit** and **NavisWorks**) can not display IFC's of strings with no diameter.*

*So this needs to be **ticked** when writing out IFC's to **Solibri**, **Revit** and **NavisWorks**.*

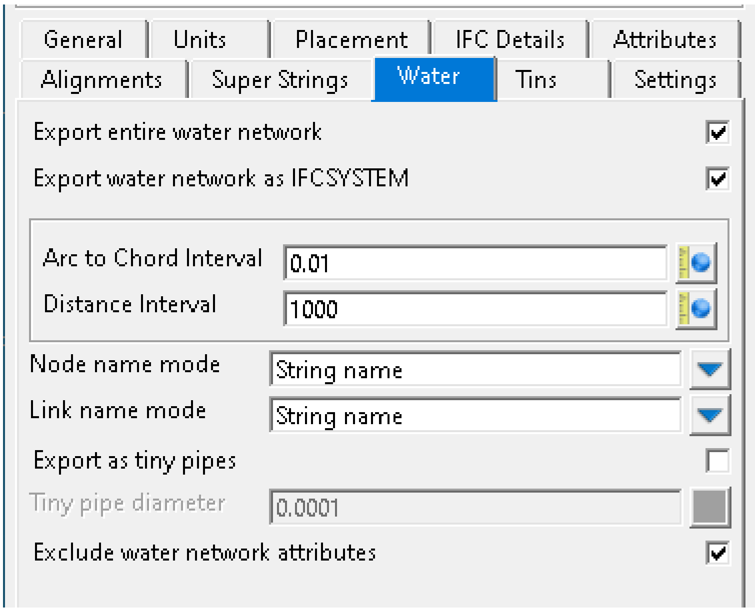
Tiny pipe diameter real box 0.0001

A small diameter for super strings without an actual diameter.

Export extrusions as trimeshes tick box ticked

*If **ticked**, convert string extrusions to trimeshes before exporting.*
*If **not ticked**, export the string extrusion as a swept solid with the profile defined by the extrude for the string.*

12.2.1.9 Write Infrastructure IFC File - Water tab



Main tab
General tab
Units tab
Placement tab
Project Details tab
Attribute tab
Alignment tab
Super Strings tab
Water tab
Tins tab
Settings tab

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

Water tab

Export entire water network tick box ticked

*If **ticked**, allows uses to export the whole drainage network if only a part of it is selected for export, otherwise individual drainage strings get exported.*

Export water as IFCSYSTEM tick box ticked

*If **ticked**, water links and nodes are written out as IfcDistributionChamberElement in IFC 4+ and IfcFlowStorageDevice in version IFC2x3.*

*If **not ticked**, water links and nodes are written out as IfcBuildingElementProxy.*

This is needed because some software (for example Revit and NavisWorks) will not read in all of the entities in IfcSystem

*When writing out IFC's to **NavisWorks** this needs to be **not ticked** because **NavisWorks** does not support IfcFlowStorageDevice. See* 35.2.8.6 ifcBuildingElementProxy *and* 35.2.8.7 ifcFlowStorageDevice.

Arc to Chord Interval real box

*If **Output 3d alignment** is ticked and the Version is IFC 4x1, a super alignment is broken up by this chainage interval when written as an IFC 3d alignment (basically a series of 3d straights).*

Distance Interval real box

*If **Output 3d alignment** is ticked and the Version is IFC 4x1, a super alignment is broken up by this chainage interval when written as an IFC 3d alignment (basically a series of 3d straights).*

Node name mode choice box String name,
String name ->Node name, Node name

Naming convention to use when writing out nodes for a Water string.

Link name mode choice box String name,
String name ->Link name, Link name

Naming convention to use when writing out links for a Water string.

Export as tiny pipes tick box not ticked

*If **ticked**, all links with zero diameter are written out with the diameter given in* **Tiny pipe diameter**.

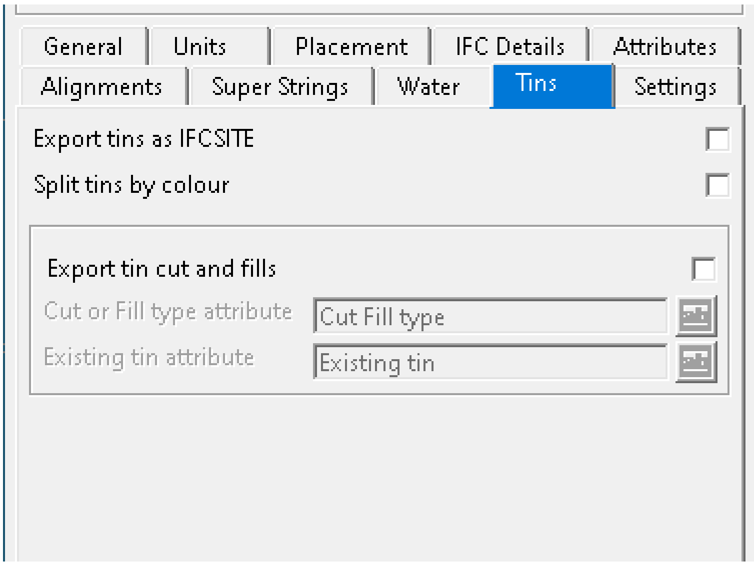
Tiny pipe diameter real box 0.0001

A small diameter for super strings without an actual diameter.

Exclude water network attributes tick box not ticked

*If **ticked**, the water network attributes are **not** written out.*
*If **not ticked**, the water network attributes are written out.*

12.2.1.10 Write Infrastructure IFC File - Tins tab



Main tab
General tab
Units tab
Placement tab
Project Details tab
Attribute tab
Alignment tab
Super Strings tab
Water tab
Tins tab
Settings tab

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

Tins tab

Export tins as IFCSITE tick box not ticked

*If **ticked**, tins are written out to the Spatial Structure IFCSITE.*
*This needs to be **ticked** when writing out IFC's to **Revit**.*

Split tins by colour tick box not ticked

*If **ticked**, tins are split into triangulations of each unique colour.*

*This option is only valid when exporting in versions **IFC4x1**+.*

Export tin cut and fills tick box not ticked

*If **ticked**, trimeshes tagged with attributes from Cut or Fill type attribute and Existing tin attribute will exported as IfcFeatureElementSubtraction or IfcFeatureElementAddition entities for cut and fills respectively.*

***Note**: elements that contain an ifc element mapping that is not an IfcFeatureElement will be overridden.*

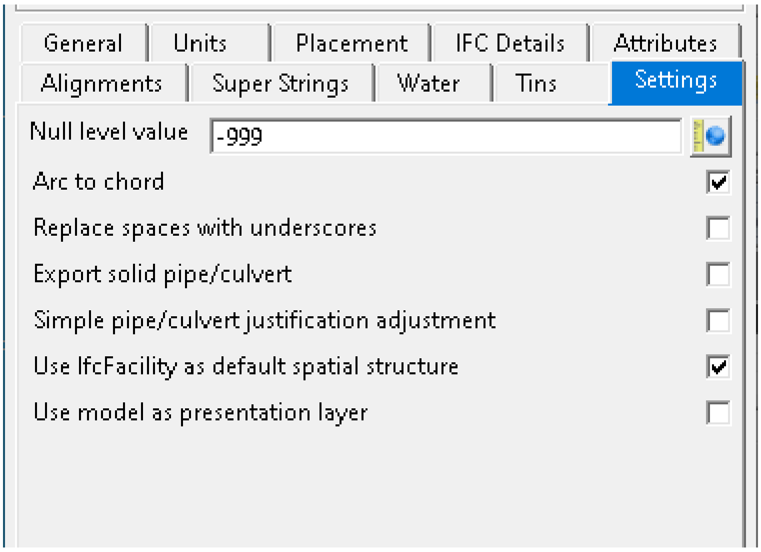
Cut or Fill type attribute text box Cut Fill type

Path to the attribute that holds either 'cut' or 'fill' depending on whether the element is a cut or a fill.

Existing tin attribute text box Existing tin

Path to the attribute that holds the name of the tin which the element is a cut or fill.

12.2.1.11 Write Infrastructure IFC File - Settings tab



Main tab
General tab
Units tab
Placement tab
Project Details tab
Attribute tab
Alignment tab
Super Strings tab
Water tab
Tins tab
Settings tab

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

Settings tab

Null level value real box -999

Use this value in IFC for writing out **12d Model** *null levels.*

Warning: *many IFC reading software packages do not support null values.*

Arc to chord tick box ticked

If ***ticked****, super strings will be broken into straight segments according to* ***Arc to chord interval*** *and* ***Distance Interval*** *values.*

If ***not ticked****, curved segments of the super string will be exported as a profile swept along the segment or string.*

When ***Export string as segments*** *is* ***not ticked*** *the string profile will be swept over the whole string.*

Warning*: Many IFC viewers do not support profiles swept along a defined path.*

Replace spaces with underscores tick box not ticked

If ***ticked****, replace the spaces in the element name with underscores for the exported IFC element.*

Export solid pipe/culvert tick box not ticked

If ***ticked****, super string pipes and culverts are written out as solid IFC elements.*

If ***not ticked****, super string pipes and culverts are written out as hollow IFC elements.*

Simple pipe/culvert justification adjustment tick box not ticked

If ***ticked****, super string pipes and culverts are adjusted vertically.*
If ***not ticked****, super string pipes and culverts are shifted along the direction of the pipe/culvert segment according to their grade.*

For a pipe/culvert defined along the invert, the first position of the pipe/culvert is taken as the physical invert of the profile.

Use IfcFacility as default spatial structure tick box ticked

This is a 4x3 only option that will replace IfcBuilding with IfcFacility as the default spatial structure for exported models.

Use model as presentation layer tick box not ticked

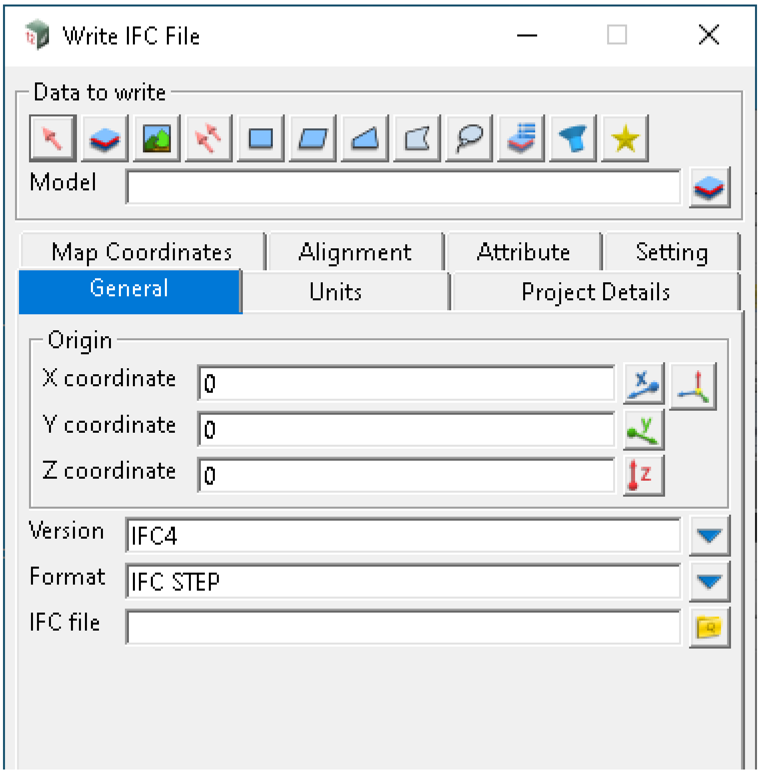
*If **ticked**, export the elements into an IfcPresentationLayerAssignment with the name of the model that contains the element.*

12.2.2 IFC Express Writer

Position of option on menu: **BIM =>Export =>IFC =>Old =>IFC express writer V14**

This is the V14 option and has now been replaced by the 12.2.1 IFC Infrastructure Express Writer.

Selecting **IFC express writer** brings up the **Write IFC File** panel.



Units tab

Length choice box METRE, MILLIMETRE, KILOMETRE

*If **METRE**, the lengths are written out in metres.*

*If **MILLIMETRE**, the lengths are written out in millimetres.*

*If **KILOMETRE**, the lengths are written out in kilometres.*

Area choice box SQUARE_METRE, SQUARE_MILLIMETRE, SQUARE_KILOMETRE

*If **SQUARE_METRE**, the areas are written out in metre^2.*

*If **SQUARE_MILLIMETRE**, the areas are written out in millimetre^2.*

*If **SQUARE_KILOMETRE**, the areas are written out in kilometre^2.*

Volume choice box CUBIC_METRE, CUBIC_MILLIMETRE, CUBIC_KILOMETRE

*If **CUBIC_METRE**, the volumes are written out in metre^3.*

*If **CUBIC_MILLIMETRE**, the volumes are written out in millimetre^3.*

*If **CUBIC_KILOMETRE**, the volumes are written out in kilometre^3.*

Angle choice box RADIANS, DEGREES

*If **RADIANS**, the plane angles are written out in radians.*

*If **DEGREES**, the plane angles are written out in degrees.*

Project Details tab

Use project details tick box not ticked

*If **ticked**, IFC files will include information specified by the Grid box.*

***Note**: When exporting project details the details will be updated when exporting the IFC file for the current project.*

Map Coordinates tab

Use project CRS tick box not ticked

*If **ticked**, use the grid box to set the parameters for ifcProjectedCRS and ifcMapConversion entities. The values will be saved as project attributes so can be reused for future exports for the current project.*

*If **not ticked**, the values will be ignored and will not be saved as project attributes.*

***Note**: if exporting in IFC version 2x3, these entities will be replaced with a property sets, 'EPset_ProjectedCRS' and 'EPset_MapConversion', attached to the top level ifcSite.*

Grid box

***Property:** the name of the property or parameter for the ifcProjectedCRS or ifcMapConversion EPset or ifcEntity respectively.*

***Value:** the value to use for the ifcProjectedCRS or ifcMapConversion EPset or ifcEntity.*

***Set** - Saves the current state of the grid box to project attributes.*

***Update** - Fills the grid box with the project attributes for the project map coordinates from ifc_attributes/ Map Coordinates*

Attribute tab

Use attributes as IFC Element Type tick box ticked

*If **Use attributes as IFC Element Type** is **ticked**, then when writing out an element, the value in the **Element Type attribute Path** is checked and if it is **not blank**, its value is used as the IFC Element type when writing the object out. If **Element Type attribute Path** is **blank** or **invalid**, then the general Element type defaults to the standard output type for the object, namely **ifcBuildingElementProxy** for most objects. An Element type may be **invalid** due to the IfcElement not existing or not being applicable to the version of IFC.*

***Note**: this does **not** include Super Alignments in **IFC4x1** and later.*

*If **Use attributes as IFC Element Type** is **not ticked**, then the standard Element type for the object is used.*

Use attributes as IFC Element parameters tick box ticked

*If **ticked**, the parameters of the ifcElement can be set using the attribute group specified by the IFC **Parameters attribute path**. Only valid parameters will be set as the ifcElement parameter - to check which attributes you can set see https://standards.buildingsmart.org/IFC/RELEASE/ and pick the IFC version and ifcElement type.*

***Note**: only numeric and text attributes, such as Enums, can be set.*

IFC Parameters attribute path text box IfcElementParameters

The path to the attribute group where the ifcElement parameters are defined.

Use attributes as IFC Assembly parameters tick box ticked

*If **ticked**, the parameters of the ifcElementAssembly can be set using the attribute group specified by the IFC Assembly Parameters attribute path. Only valid parameters will be set for the ifcElementAssembly.*

***Note**: only numeric and text attributes, such as Enums, can be set.*

To see how to setup an element assembly for IFC see 11.2.1.1.2 IFC Element Assembly.

IFC Assembly Parameters attribute path text box IfcAssemblyParameters

The path to the attribute group where the ifcElementAssembly parameters are defined.

Settings tab

Export string as segments tick box ticked

*If **ticked**, all super strings with non-zero diameter will be exported in segments with segment attributes attached.*

*If **not ticked**, all super strings (and string alignments) with non-zero diameter will be exported as a single ifcEntity extruded along the string with string attributes attached.*

*When this option is set as **not ticked** the **Arc to chord** option will also be set to **not ticked**.*

Arc to chord tick box ticked

*If **ticked**, super strings will be broken into straight segments according to **Arc to chord interval** and*

***Distance Interval** values.*

*If **not ticked**, curved segments of the super string will be exported as a profile swept along the segment*

or string.

*When **Export string as segments** is **not ticked** the string profile will be swept over the whole string.*

***Warning**: Many IFC viewers do not support profiles swept along a defined path.*

12.3 Trimesh

The **Trimesh** Menu has been completely rearranged and many new options added.

The options in the Trimesh menu create trimeshes and perform various operations on trimeshes such as contouring and flipping the normals of the triangles in a trimesh.

See

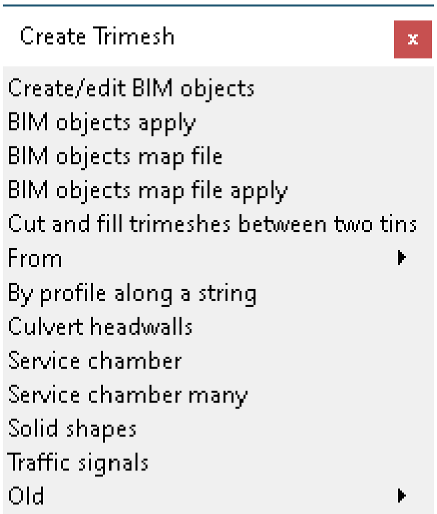
info abourt a trimesh

12.3.1 Create Trimesh
12.3.2 Trimesh Edit
12.3.3 Convert Trimesh
12.3.4 Trimesh Union/Difference
12.3.5 Contour Trimeshes
12.3.6 Trimesh Intersection Lines
12.3.7 Trimesh Utilities

12.3.1 Create Trimesh

Position of option on menu: **BIM =>Trimesh =>Create**

The Create Trimesh options create trimeshes directly, or create snippets that create trimeshes, when used in an Apply MTF.



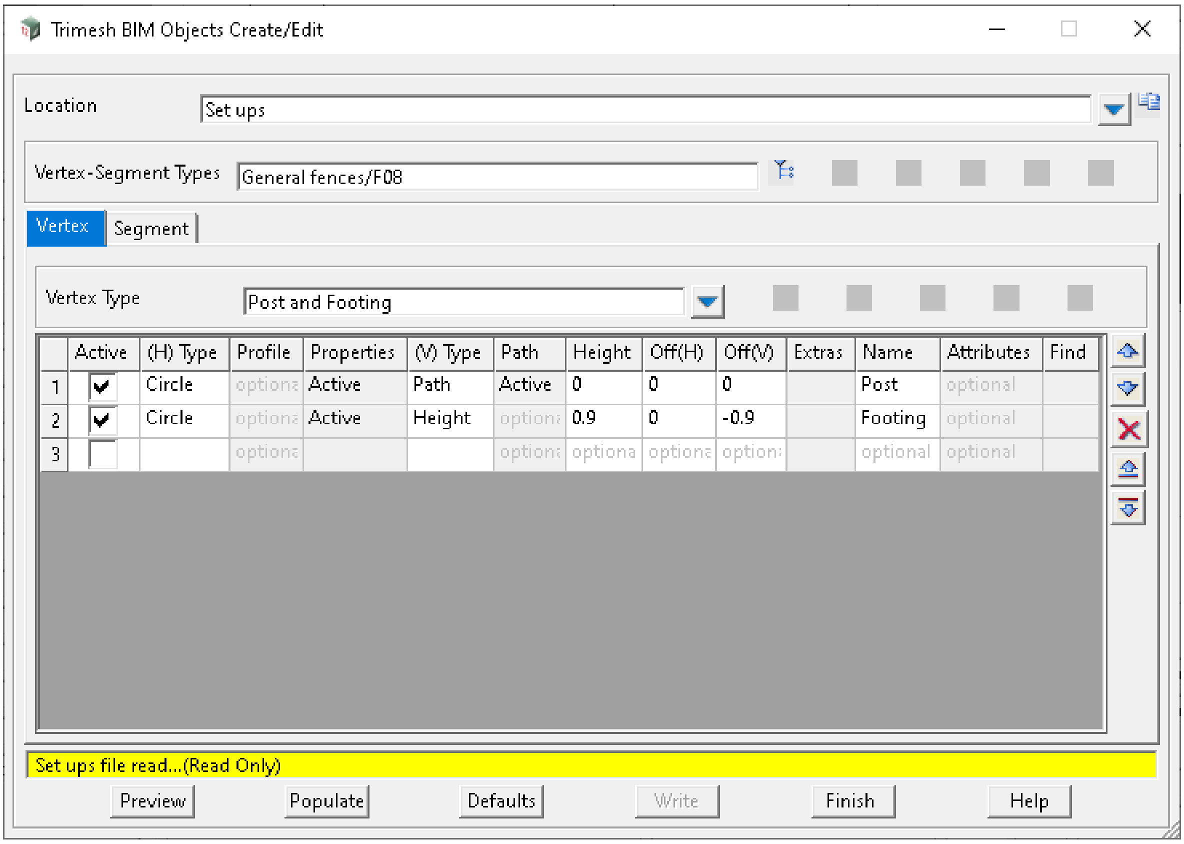
See
12.3.1.1 Trimesh BIM Create/Edit
12.3.1.2 BIM Objects Map File
12.3.1.3 Cut and Fill Trimeshes Between Two Tins
12.3.1.4 Create Trimesh From
21.5.14 Create Culvert Headwalls
12.3.1.6 Trimesh Traffic Signals

12.3.1.1 Trimesh BIM Create/Edit

Position of option on menu: **BIM =>Trimesh =>Create =>Create/edit BIM objects**

Now documented In the v15 reference manual

Selecting **Trimesh BIM create/edit** brings up the **Trimesh BIM Create/Edit** panel.



This option can create a variety of user defined Trimesh combinations, to form such features as:

Construction fences (with footings)

Safety Barriers (Guard rail, Wire rope & Concrete)

Retaining walls

Bridge profiles (decking, headstocks & piles)

Road profiles (Kerb, Pavement)

Service / drainage trenches etc

The features are stored in a standard file **12d_Trimesh_Node_Link.4d.**

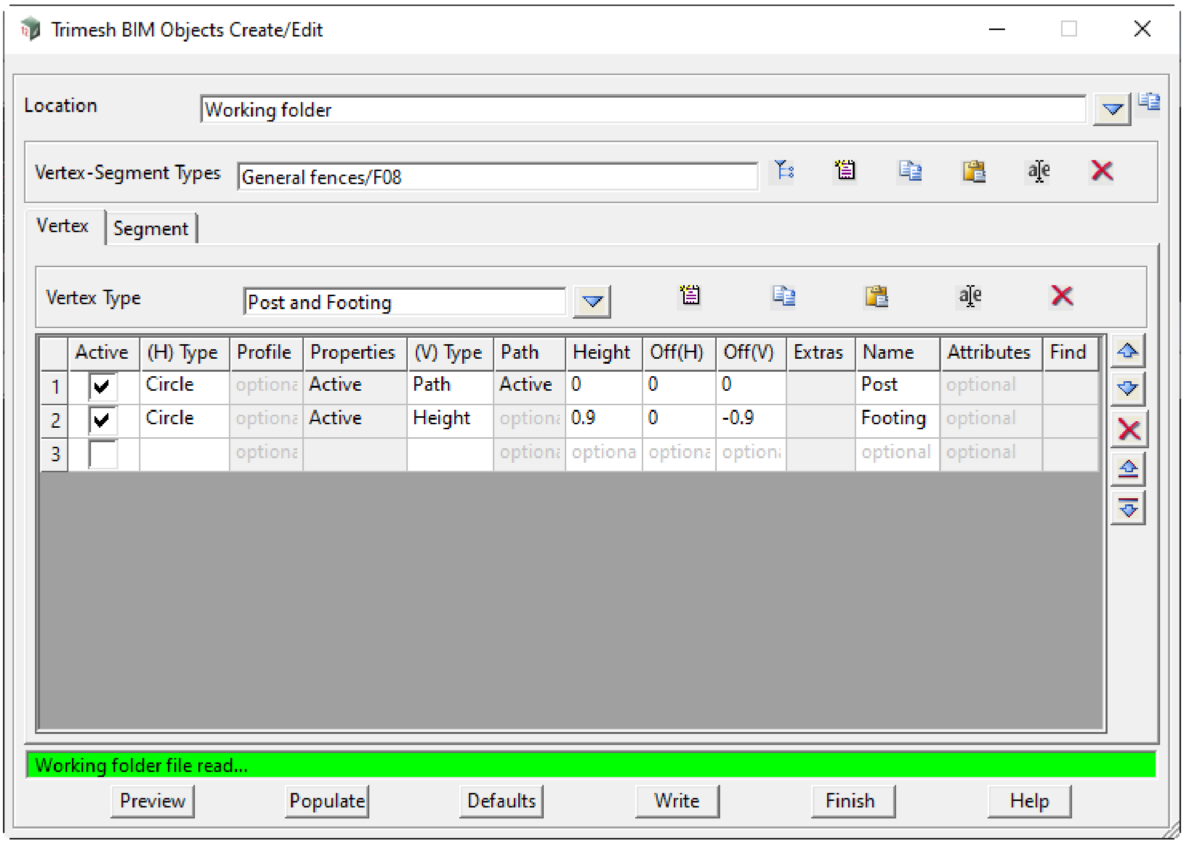
A selection of Trimesh features are shipped and reside in the **Set ups** area.

The file can be copied from here and saved in your **$user** area or the local **Working Folder**.

The panel above shows the **Location** as **Set up**.

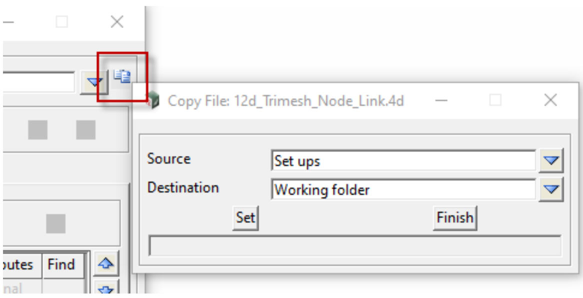
It should be noted that it is **Read Only**, and that all icons are greyed out

The panel **below** shows **Location** as **Working folder**, where all edit options are available as are icons.



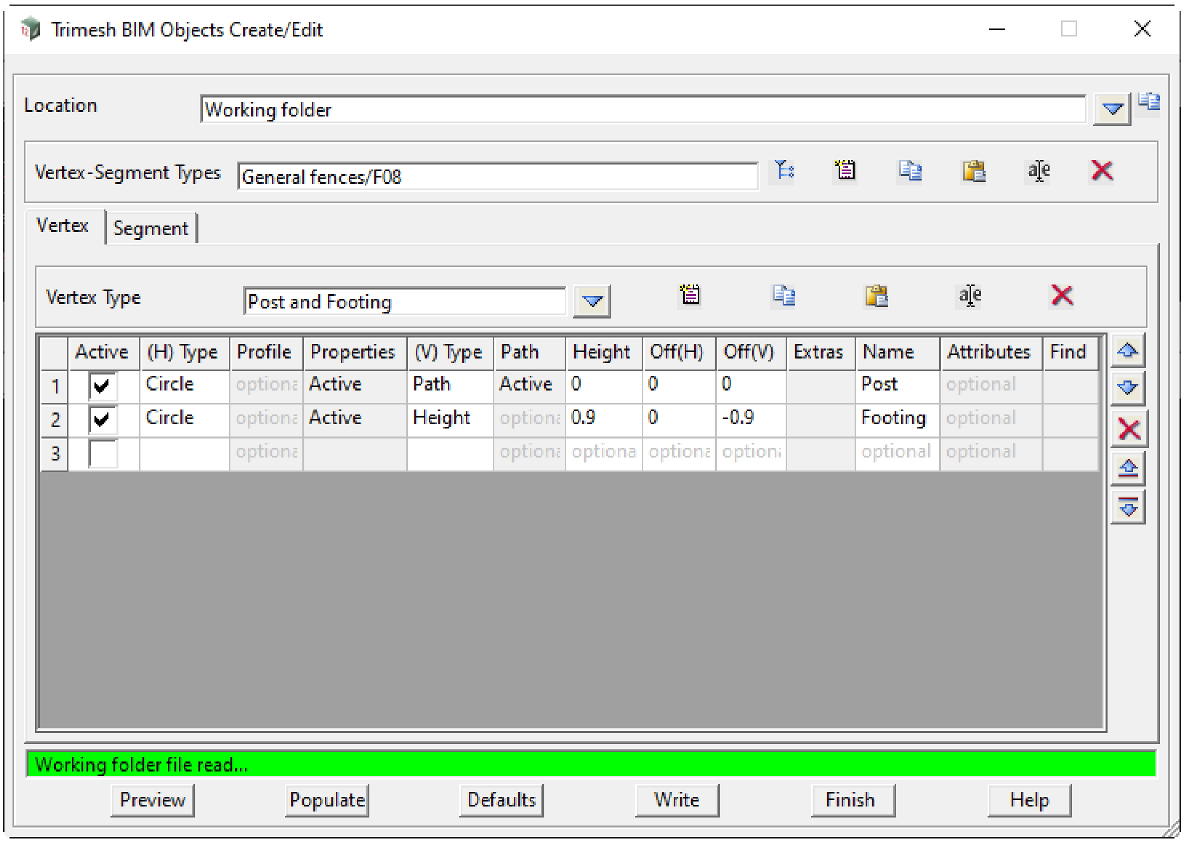
The entire standard file **12d_Trimesh_Node_Link.4d** can be copied to either of your $user or Working folder.

A **Customer_user** choice will appear if being used.



Once we have made a copy into our Working folder, reselect the Location from the drop-down list.

Location: Working folder

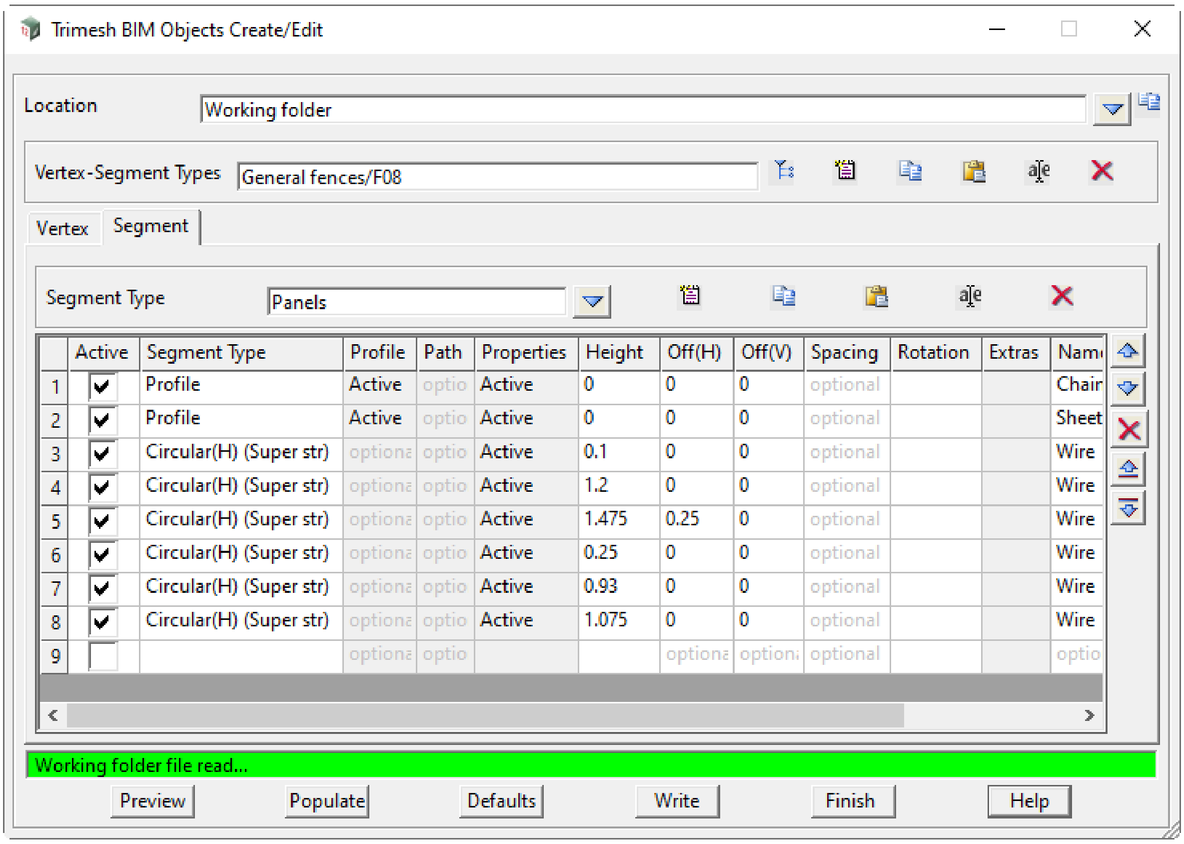


The **Vertex-Segment Type** contains a combination of Vertex & Segment definitions.

The drop-down lists for the **Vertex Type** & **Segment Type**, are read and the grids populated.

In the previous image, the **Vertex Type** displayed is "Post and Footing", which has two active entries in the grid.

In the image below, the **Segment** tab has been selected, where the **Segment Type** called "Panels" is displayed with 8 active entries in the grid.



Vertex-Segment Type edits:

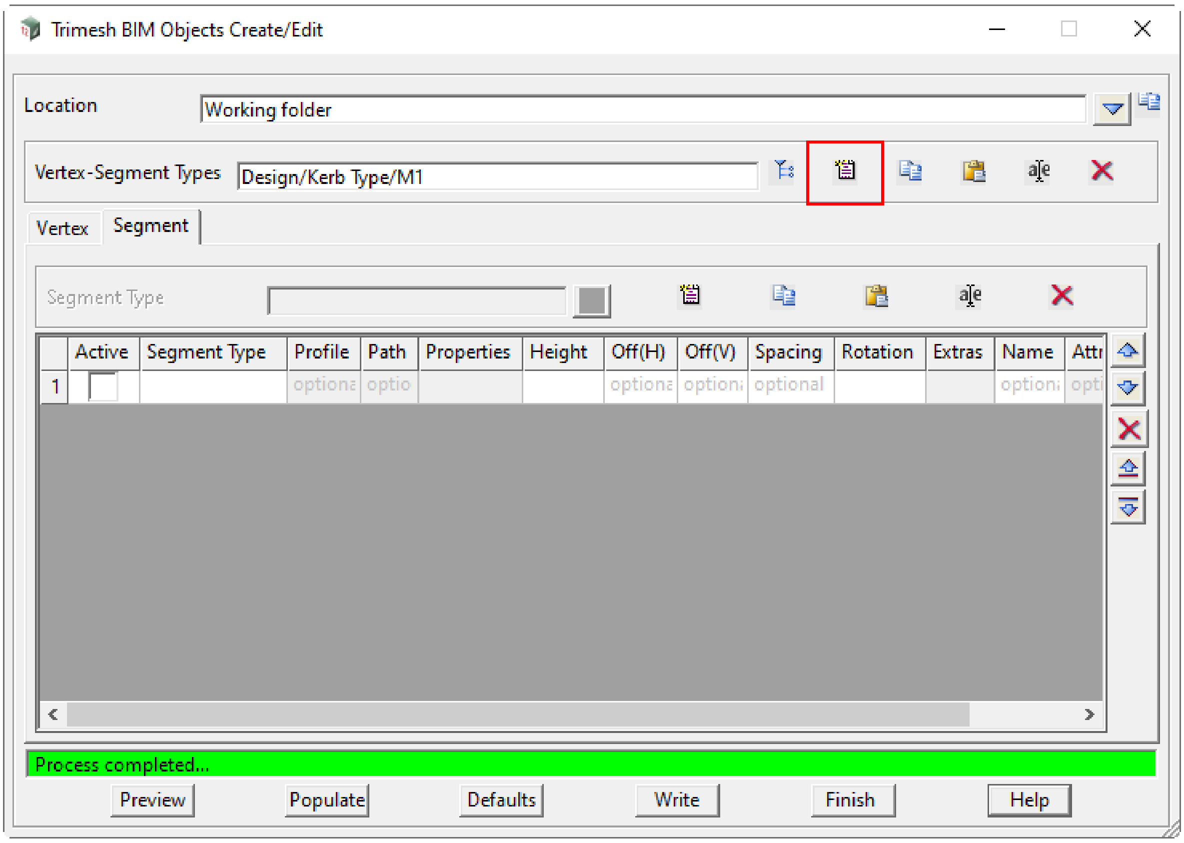
Create

Once selected the panel below will be displayed.

A valid name should explain what type of feature you are creating e.g Design/Kerb Type/M1.

Once Set the panel below will be displayed, where your choice is displayed in Vertex-Segment Types and the Vertex and Segment grids are empty.

Your heading above is available on the drop-down list even if you change from one choice to another ...BUT must be ***Written*** *out before finishing or changing your "Location" to another.*

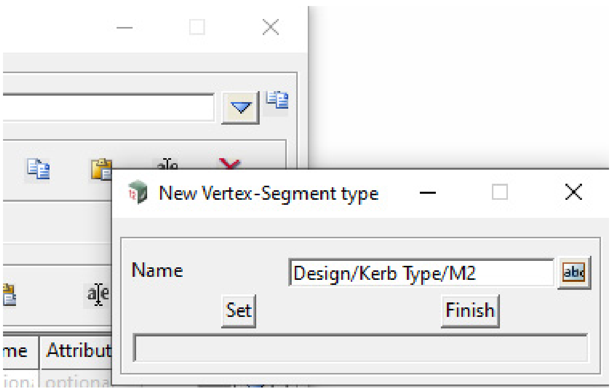


Copy button

Makes a copy of whatever is in the Vertex-Segment Types field.

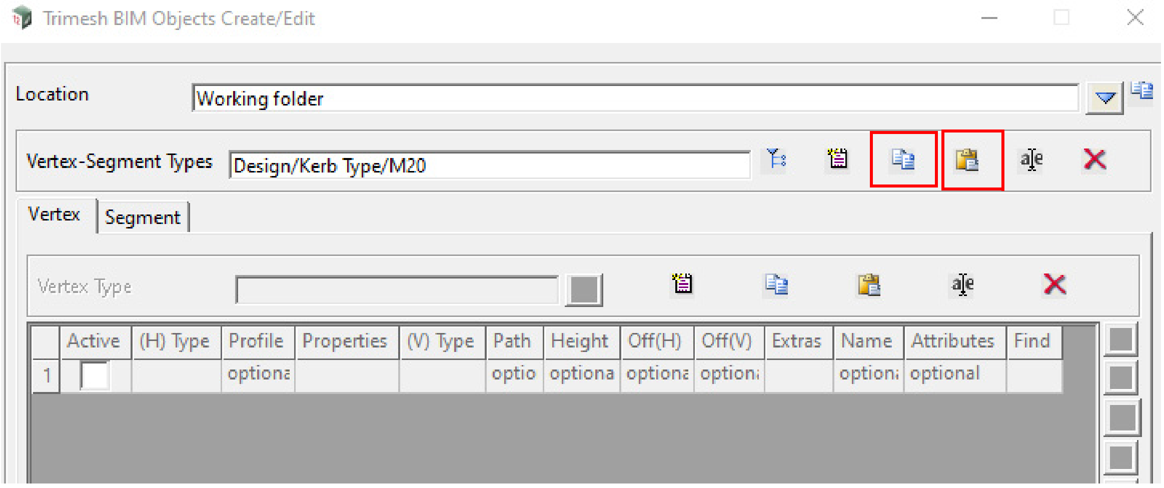
Paste button

Will display the panel below, allowing you to enter an appropriate name for your new type.



A check is done as to whether or not that entry already exists.

If so, a warning will be given as to whether or not you wish to overwrite.



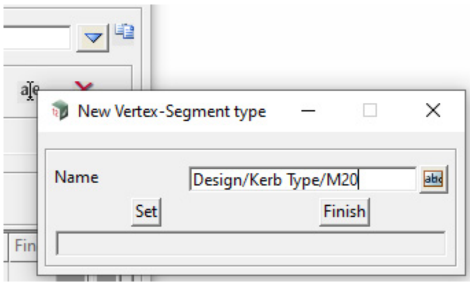
*Your heading above is available on the drop-down list even if you change from one choice to another…**BUT** must be **Written** out before finishing or changing your "Location" to another.*

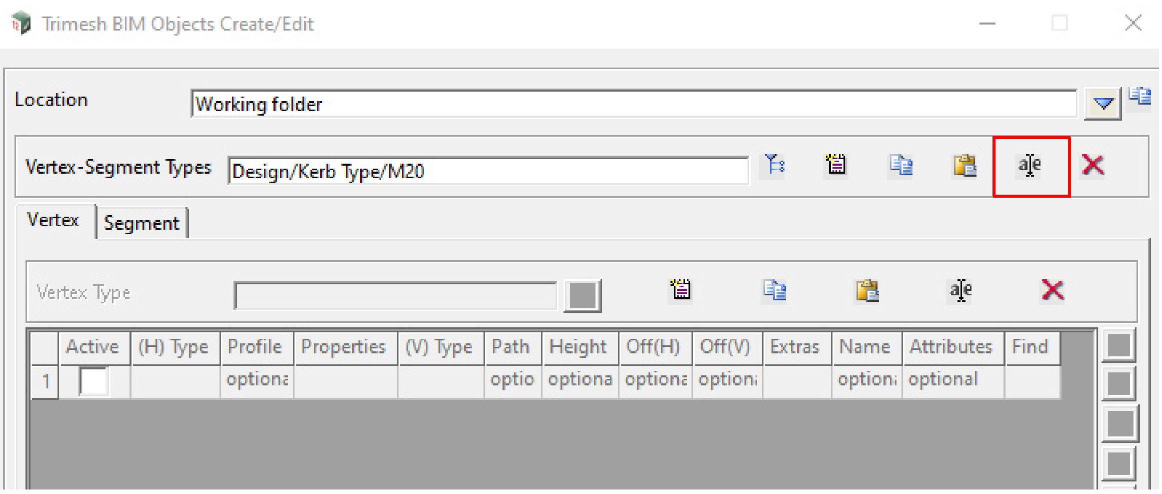
Rename button

The panel below will be displayed. A new field can be entered.

A check is done as to whether or not that entry already exists.

If so, a warning will be given as to whether or not you wish to overwrite

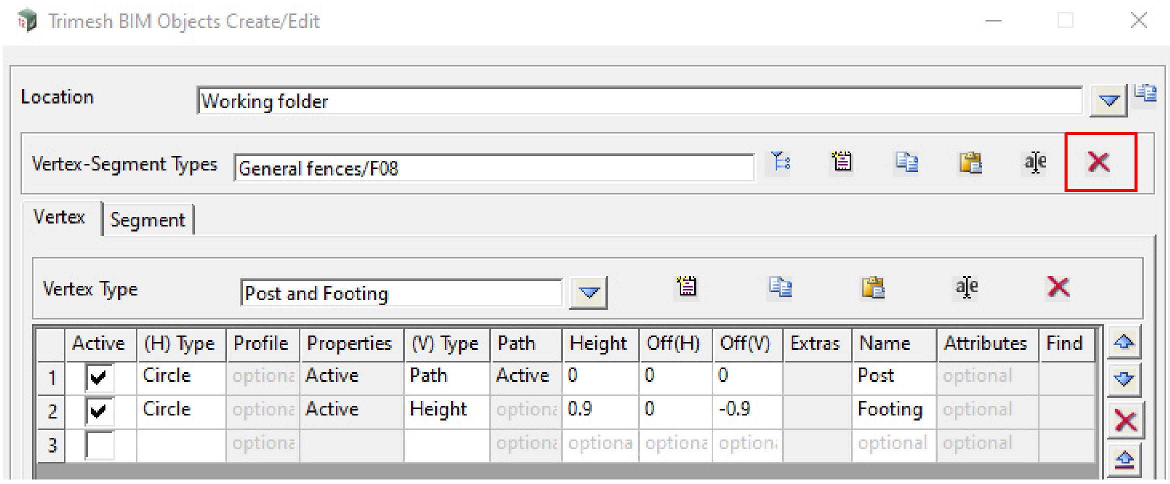




Your heading above is available on the drop-down list even if you change from one choice to *another…**BUT** must be **Written** out before finishing or changing your "Location" to another.*

Delete button

Will delete the current type displayed in the field and return you to the first listing in the Vertex-Segment Types field as per below.



*The deleted entry is now not available on the drop-down list even if you change from one choice to another…**BUT** must be **Written** out before finishing or changing your "Location" to another.*

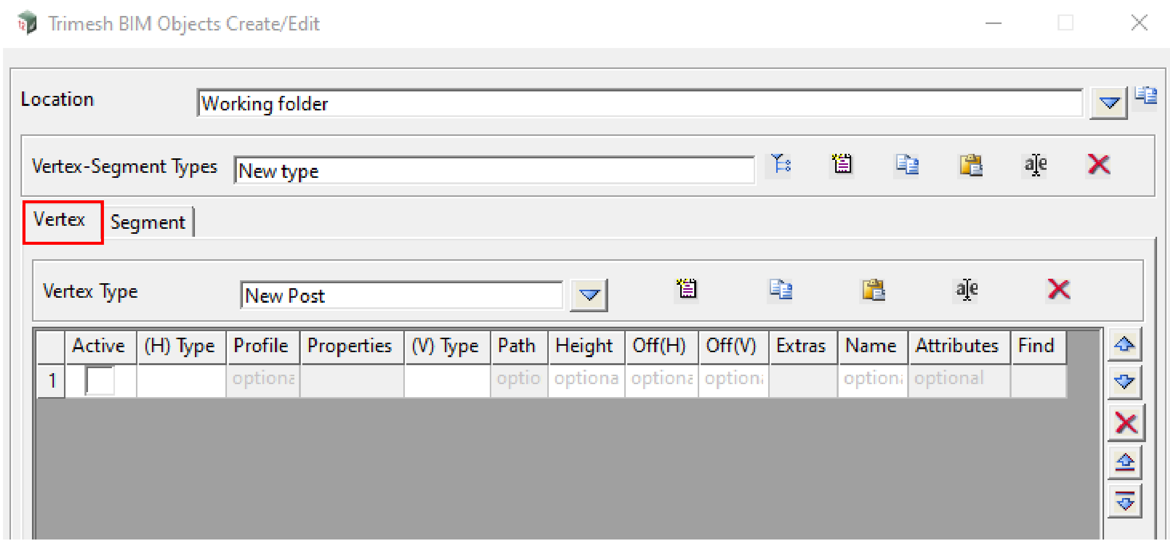
Vertex edits:

***NOTE**: Edits in this grid area **MUST** be **written** out in order to **Save** any data, before **changing types** or **Location**.*

Edits: Similar to the previous create, copy, paste, rename and delete for Vertex-Segment Types. See Vertex-Segment Type edits:.

Create button

Example panel displayed below, where grid is empty.



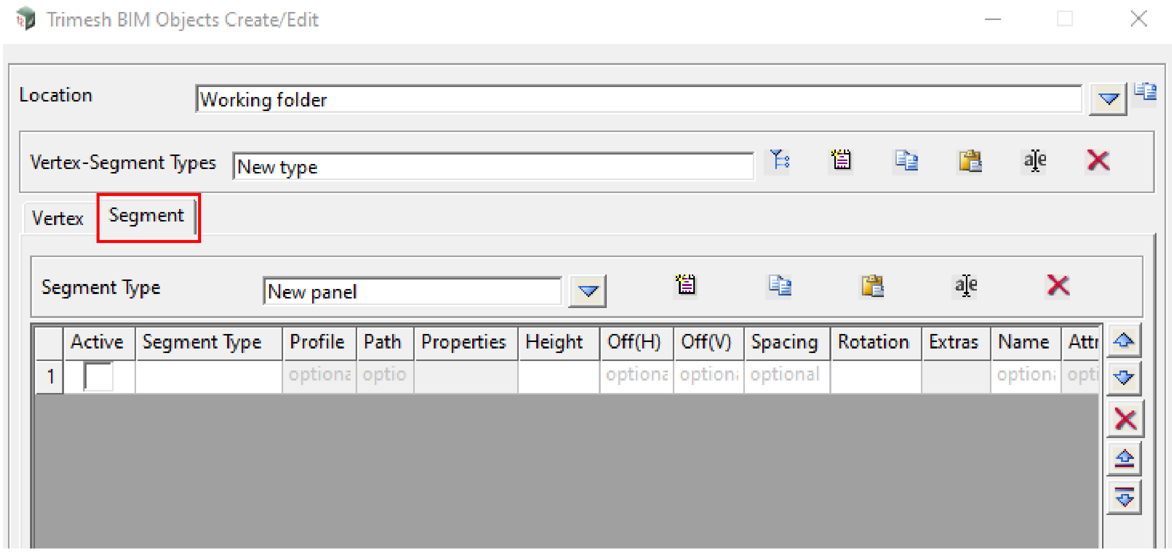
Segment edits:

__NOTE__: Edits in this grid area __MUST__ be __written__ out in order to __Save__ any data, before __changing types__ or __Location__.

Edits: Similar to the previous create, copy, paste, rename and delete for Vertex-Segment Types. See Vertex-Segment Type edits:.

Create button

Example panel displayed below, where grid is empty.



Buttons at Bottom

Write button

Write out the displayed data to the file __12d_Trimesh_Node_Link.4d__.

Its location is as per the folder name, displayed in the __Location__ field.

The Write button is required to save, not only a newly created feature, but any changes done in the Vertex & Segment grids, to an existing feature.

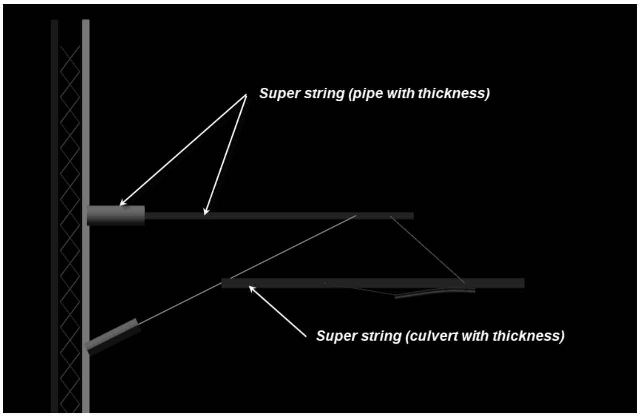
Populate button

The __Populate__ button on the Vertex & Segment tabs.

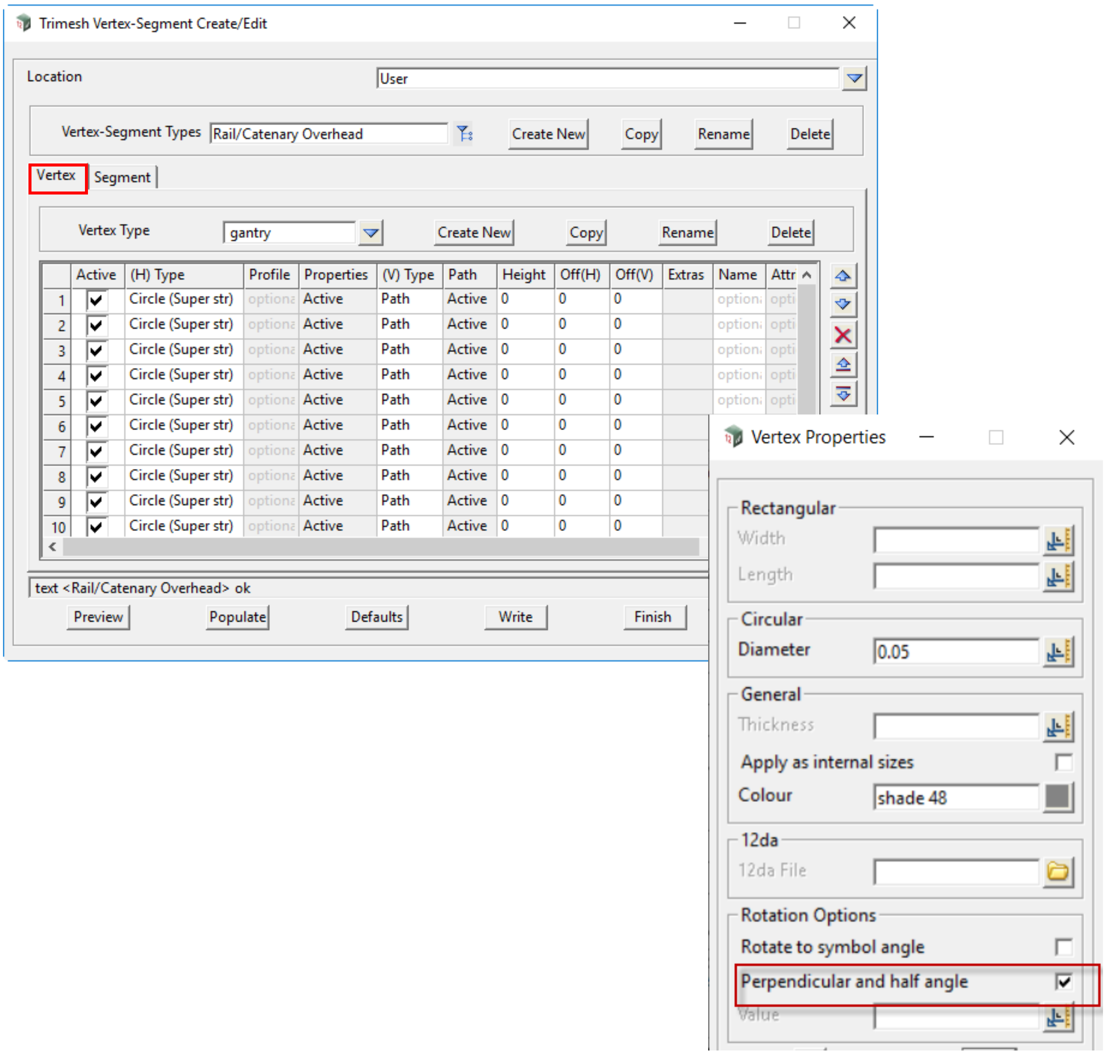
Vertex Tab:

Once selected the panel below is displayed. This feature will allow the multiple selection of path shapes, normally drawn on a model relative to origin 0,0.

Rail overhead e.g



Once completed, "**(H) Type**" and "**Path**" entries are made in the **Vertex** grid e.g



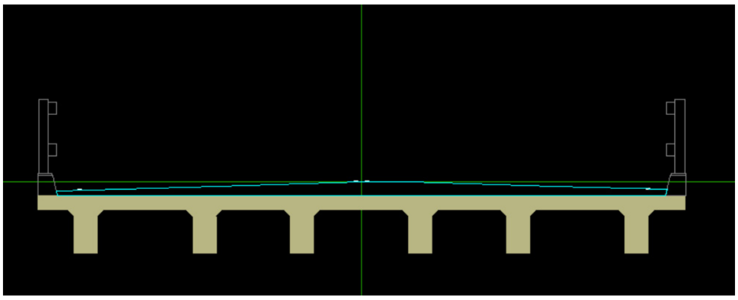
Most profiles that are drawn in plan view, require a rotation at each vertex when applied. **Perpendicular** to the selected string (90 degrees) or at the **half vertex angle**, if a bend is encountered.

If **not ticked**, then no rotation is done.

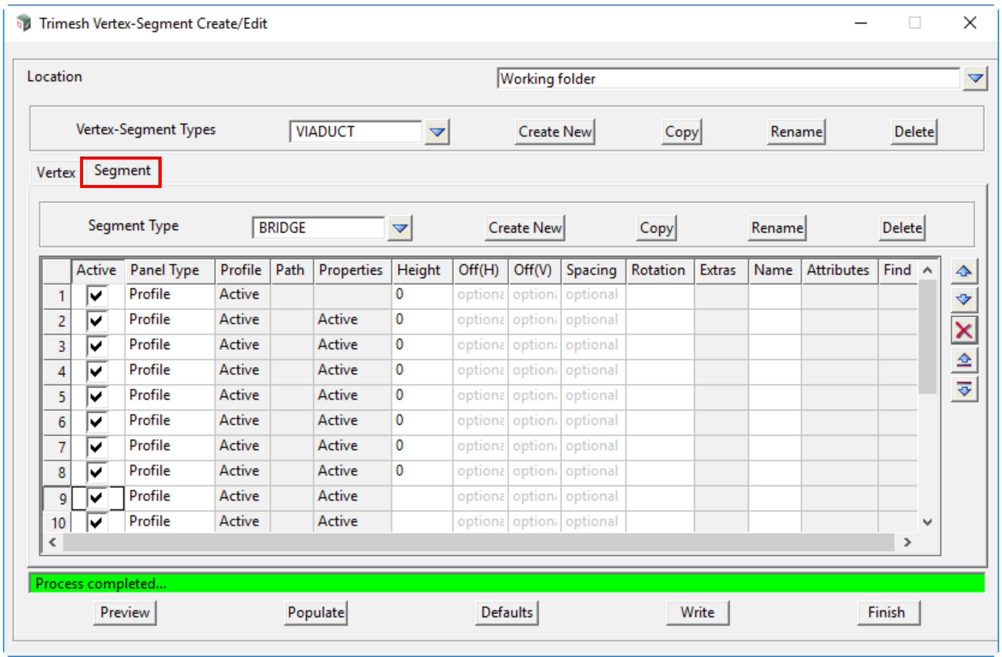
Value: Refers to any additional rotational angle required. A 90 degree extra rotation is sometimes required if rotating to a symbol

Segment Tab:

Once selected the panel below is displayed. This feature will allow the multiple selection of profile shapes, normally drawn on a model at origin 0,0.



Once completed, "Profile" entries are made in the Segment grid e.g



Vertex Tab:

The Vertex tab has a selection of **Shape(H)** that can be extruded along a **Shape(V)**…Path or Height.

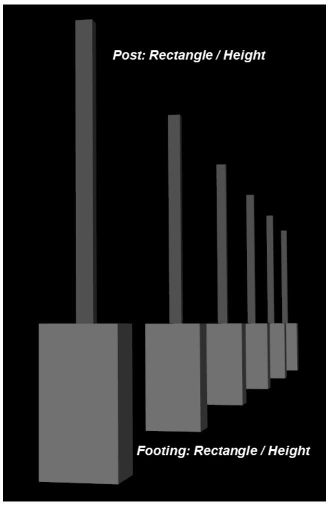
Height is a real value (2m high fence post e.g.)

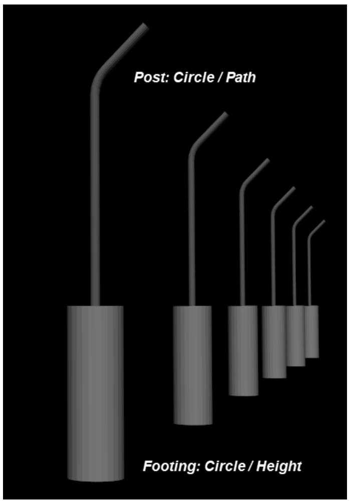
Path is a user defined and selected string, with an origin typically at 0,0.

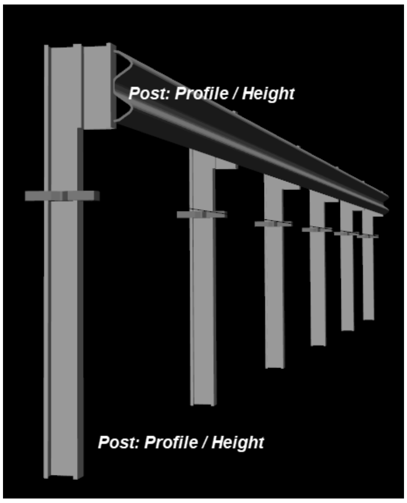
The other parameters like Offsets, Extras, Attributes etc are used to define the vertex Trimesh in more detail.

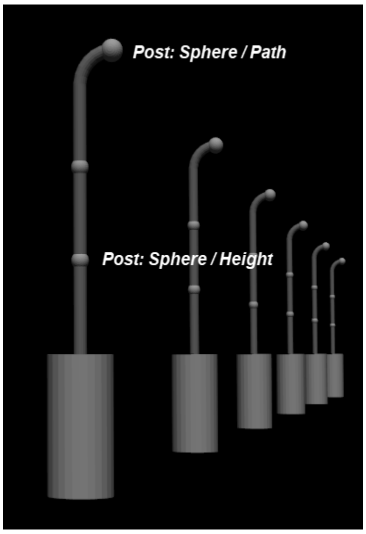
Vertex Examples:

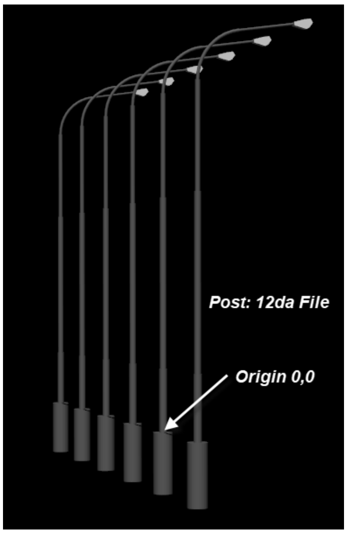
Post: Rectangle **[Shape(H)]** / Height **[Shape(V)]**











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

Field Description	Type	Defaults	Pop-Up
Active	tick box		

*If **ticked**, line is active.*

Field Description	Type	Defaults	Pop-Up
Shape(H)	choice box		

A list of types of shapes that can be used, in combination with a type from Shape(V) to form a Trimesh (except 12da File).

Rectangle *(Width & Depth required)*

Rectangle (Super str) *(Width & Depth required)*

Circle *(Diameter required)*

Circle (Super str) *(Diameter required)*

Sphere *(Diameter required)*

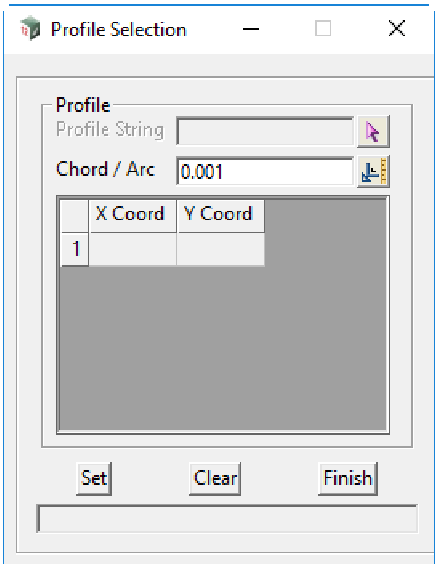
Profile *(String shape required)*

Capping *(Width & Depth or Diameter required)*

12da File

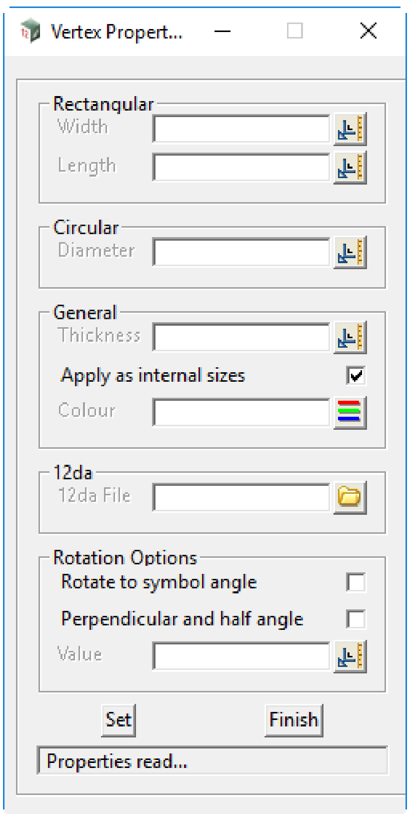
Profile select

LMB will activate the panel below in order to select a profile string (usually drawn at origin 0,0).



Properties select

LMB will activate the panel below to enter a selection of properties used to define the Shape(H) and the Trimesh features.



Fields required for Shape(H) type Rectangle

Field required for Shape(H) type Circle

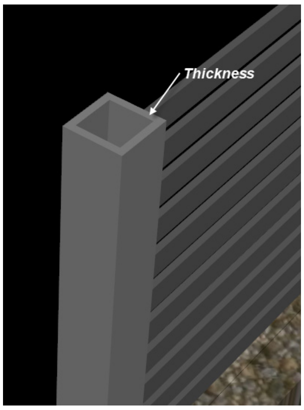
General properties for Trimesh

File input where data is usually created at an origin of 0,0

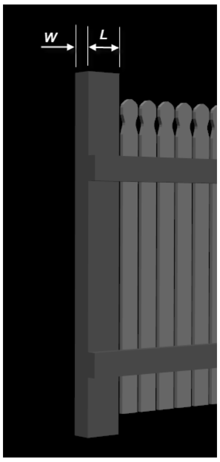
Rotate to a symbol

Rotate perpendicular & half angle refers to the angle at a vertex when placed

Rotation value at a vertex when placed



Thickness can be applied to Rectangles, Circles, Profiles & Capping



Fields required for **Shape(H)** type Rectangle

Length is defined as "along the string", on which the Trimesh is finally placed

Shape choice box

LMB will activate the panel below to enter a selection of properties used to define the Shape(H) and the Trimesh features.

two choices that define what vertical source is used to form the Trimesh using the Shape(H) chosen.

Height

Path

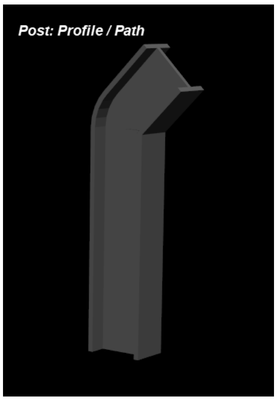
Height real box

Height measured from the final placement string of the Trimesh.

+ve and -ve values allowed.

Path select

LMB will activate the panel below in order to select a path string (usually drawn at origin 0,0).



Off(H) real box

Horizontal offset measured from the final placement string of the Trimesh.

+ve and -ve values allowed.

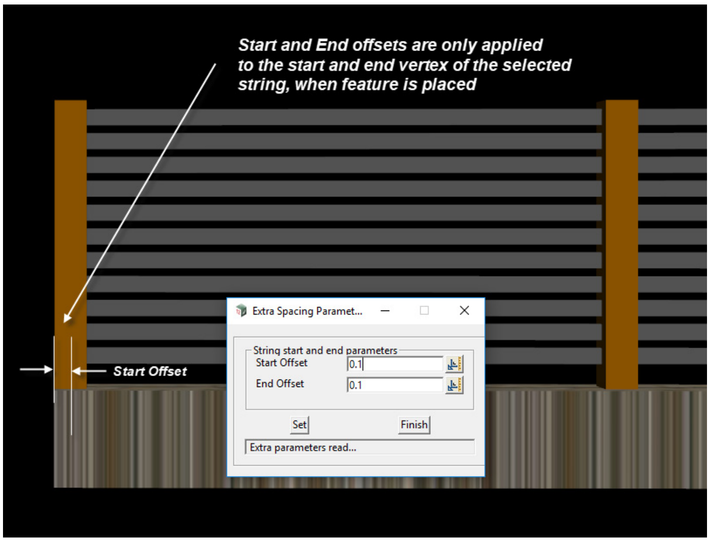
Off(V) real box

Vertical offset measured from the final placement string of the Trimesh.

+ve and -ve values allowed.

Extras select

LMB will activate the panel below.



Name input

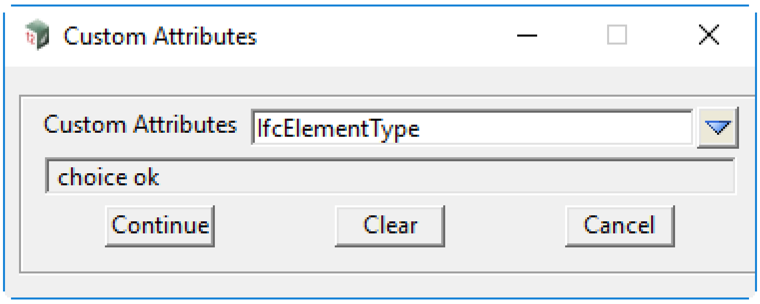
Name of the trimesh.

Attributes select

This option will activate a selection of attributes created from the option below.

Menu: Utilities->Attributes->Global Attributes->Set global attributes

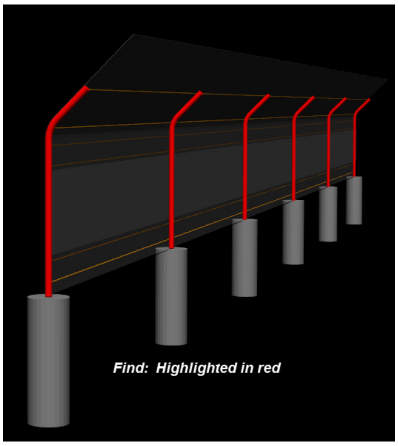
The attributes are set to all the Trimesh elements and are typically BIM attributes.



Find select

This option will highlight the Trimesh created from the row in the grid.

The Preview button must be activated first though.

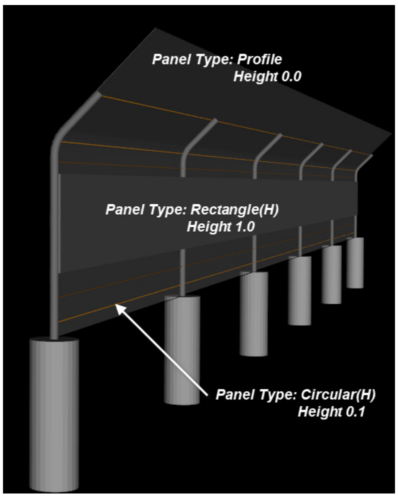


Segment Tab

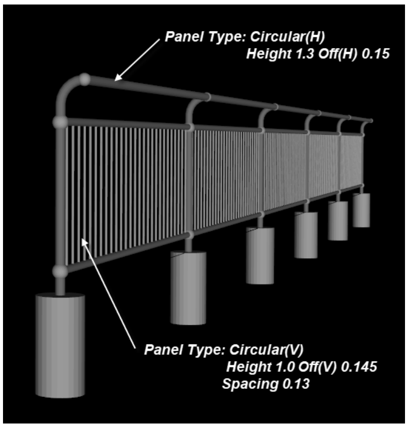
The Segment tab has a selection of **Panel types** that can be extruded along a selected string.

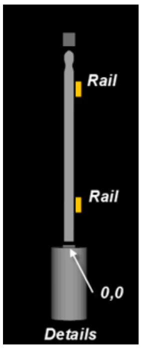
The panel type (or shape) is positioned along that string using the **Height** & **Offsets**, all referenced to the selected string.

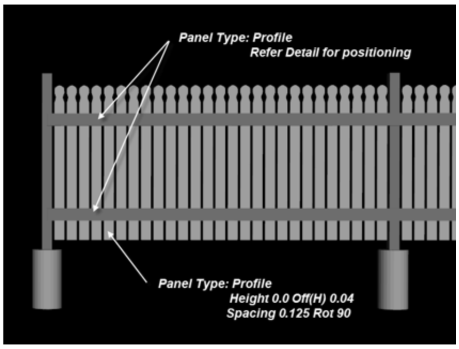
The **Spacing** parameter can also be used to array shapes [Rectangle(H), Rectangle(V) e.g.] in the vertical and longitudinally along the selected string.



Segment Examples:



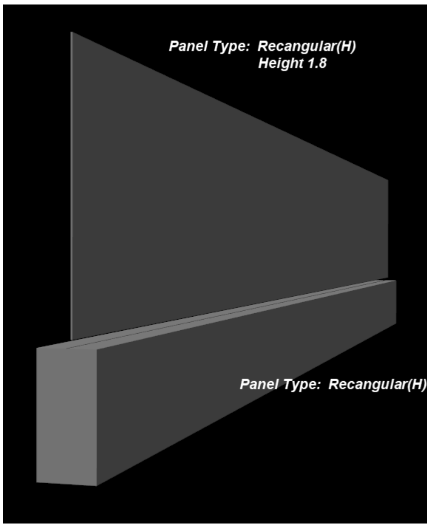




Rails and palings above, were drawn in position, referenced to 0,0

Profiles with a low level of detail

This feature can be used at the preliminary or concept stage and replaced with a more detailed one later.



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

Field Description	Type	Defaults	Pop-Up

Active tick box

*If **ticked**, line is active.*

Panel Type choice box

A list of types of shapes that can be used, to form a Trimesh along a selected string.

Rectangle(H) *(Width & Depth required)*

Rectangle(V) *(Width & Depth required)*

Circular(H) *(Diameter required)*

Circular(V) *(Diameter required)*

Profile *(String shape required)*

Path *(String shape required)*

Rectangle(H) (Super str) *(Width & Depth required)*

Rectangle(V) (Super str) *(Width & Depth required)*

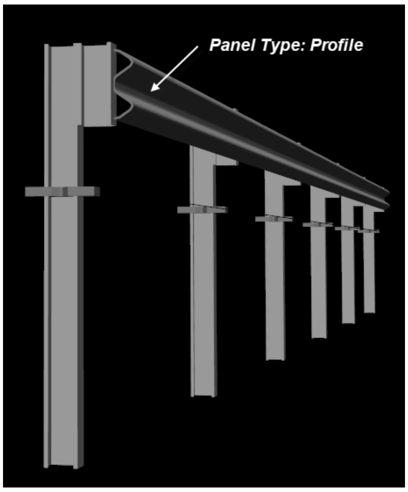
Circular(H) (Super strr) *(Diameter required)*

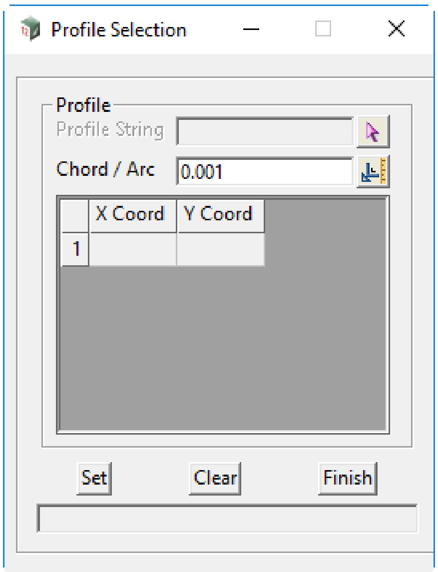
Circular(V) (Super str) *(Diameter required)*

12da Profile(s)

Profile select

LMB will activate the panel below in order to select a profile string (usually drawn at origin 0,0).

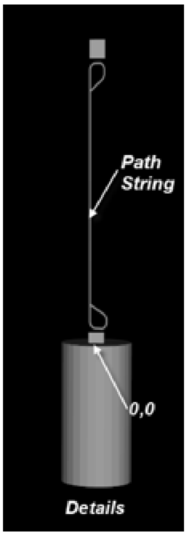


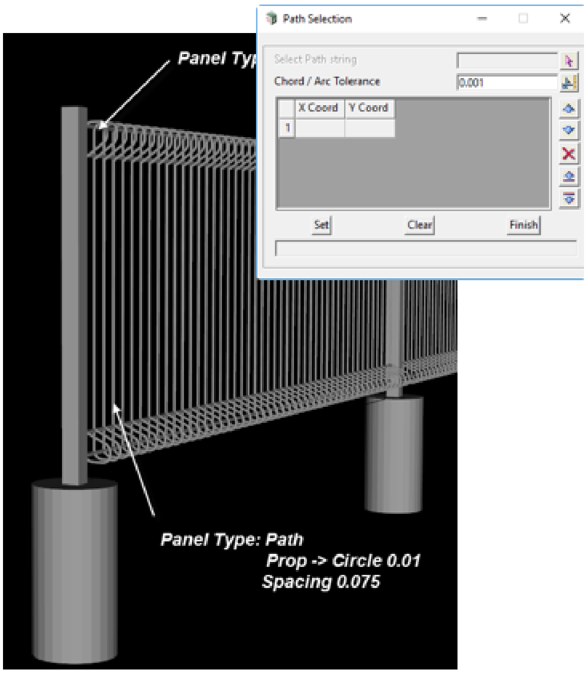


Profile string (W Beam) was drawn in position, referenced to 0,0

Path select

LMB will activate the panel below in order to select a path string (usually drawn at origin 0,0).

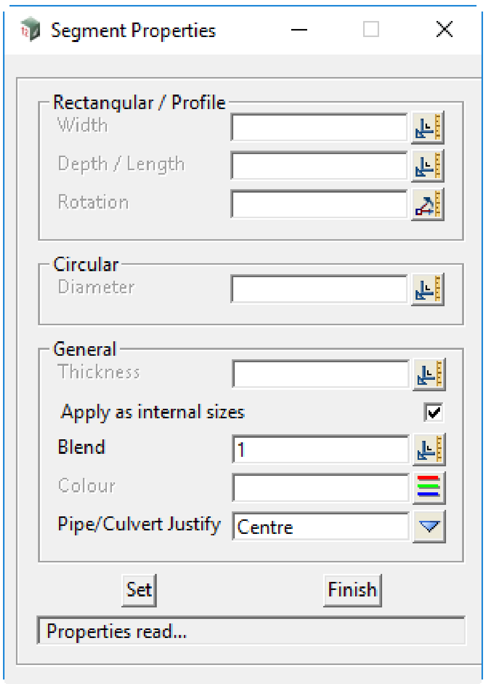




Path string was drawn in position, referenced to 0,0

Properties select

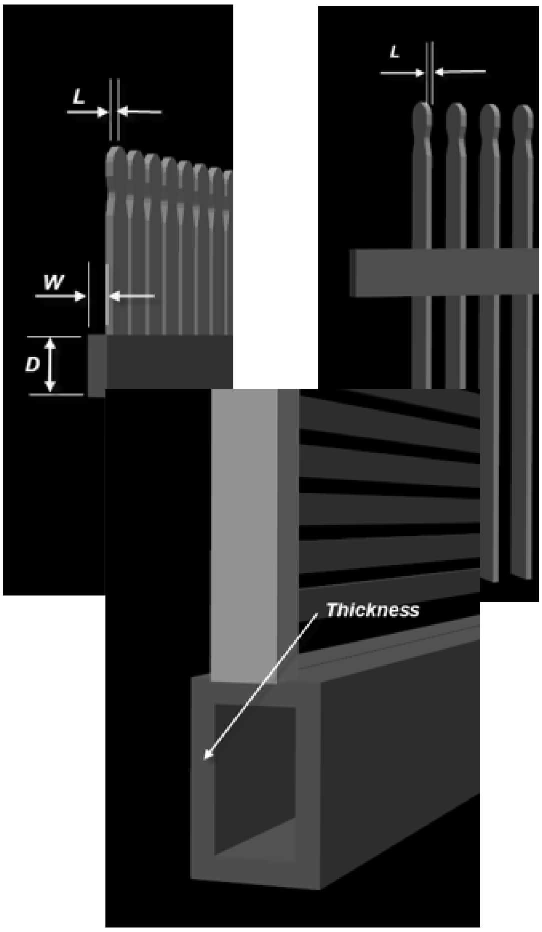
LMB will activate the panel below to enter a selection of properties used to define the Shape(H) and the Trimesh features.



Fields required for type **Rectangle**
Depth is vertical, "along the string"
Length of profile "along the string",
if spacing is used.

Field required for type **Circular**
General properties for Trimesh
Thickness application
Blend range 0 -> 1.

Rotation property is for the ***Rectangle*** *or* ***Profile*** *shape only.*



Rectangle & Profile parameters

Rectangle Width & Depth as shown

Profile thickness is measured as a length along the selected string

A **rotation** can be applied after **<L>** parameter has been set

Thickness can be applied to Rectangles, Circles & Profiles

Height real box

Height measured from the final placement string of the Trimesh.

+ve and -ve values allowed.

Off(H) real box

Horizontal offset measured from the final placement string of the Trimesh.

+ve and -ve values allowed.

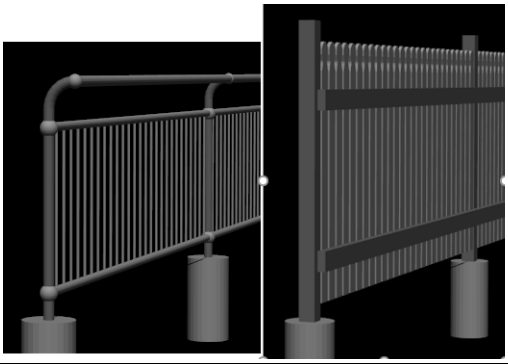
Off(V) real box

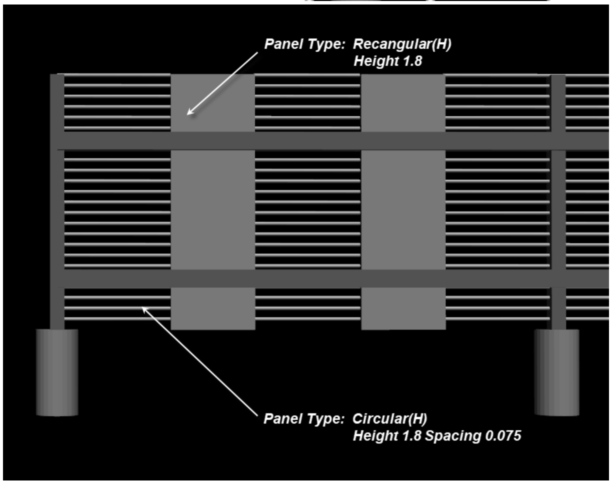
Vertical offset measured from the final placement string of the Trimesh.

+ve and -ve values allowed.

Spacing real box

Distance between Rectangular, Circular and Profile shapes (typically palings & bars).





Rotation angle box

Rotation in the vertical, along the direction of selected string.

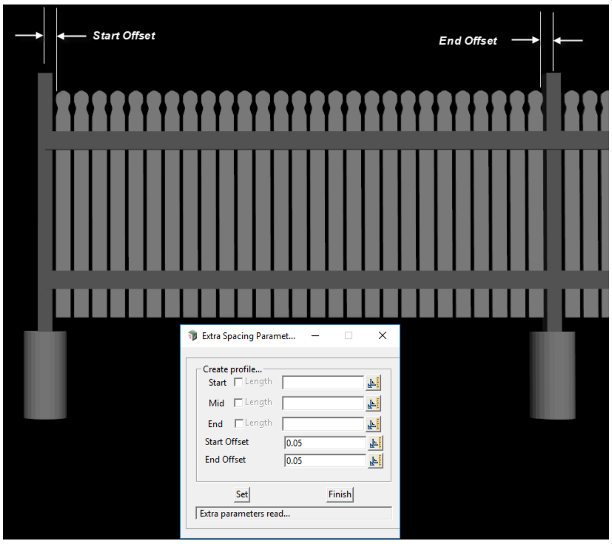
Extras select

LMB will activate the panel below.

Segment Extras:

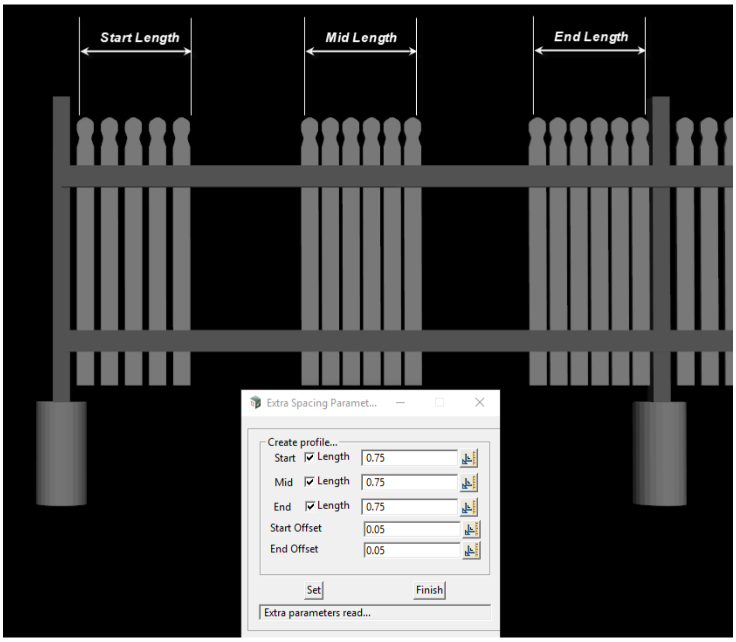
Extra parameters are used to space any Panel Type, between two vertices.

Start Offset and End offset



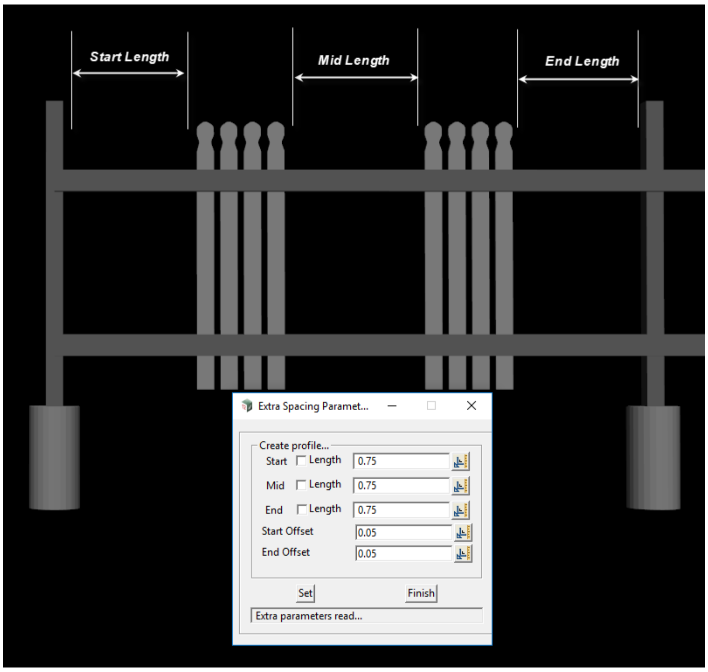
The **Start & End Offsets** are measured from each vertex, or in this case the centre of the post.

Start Mid and End



The **Start, Mid & End parameters** can be used together, on their own or any combination thereof.

Start Mid and End (Intermediate)

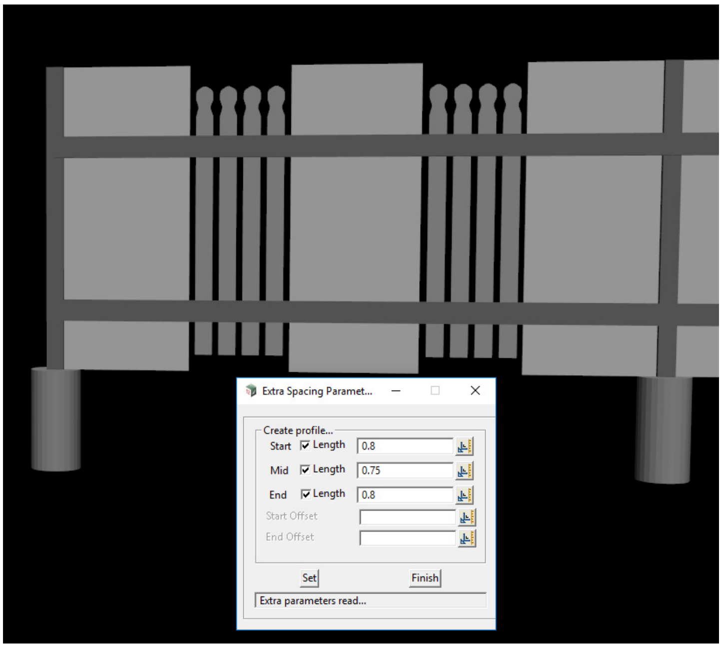


When the **Start, Mid & End** boxes are **inactive**, then intermediate distances are calculated, and the panel type is applied over those distances **only**.

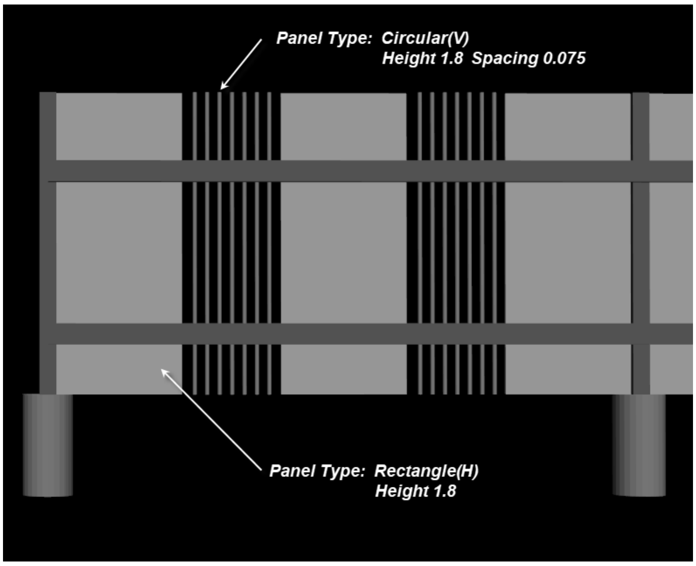
The **Start, Mid & End** parameters can be used in this way either together, on their own or any combination thereof.

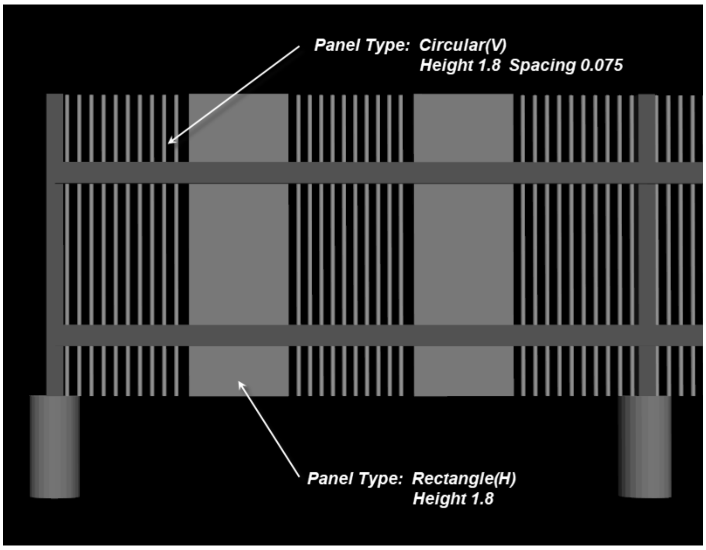
Combining two Panel types using

Start Mid and End (Intermediate)



The sold panels are type **Rectangle(H)** and use similar **Extras** as the paling type. This allows a seamless combination as long as the segment length of the selected string, can accommodate the length combination, set in the extras.



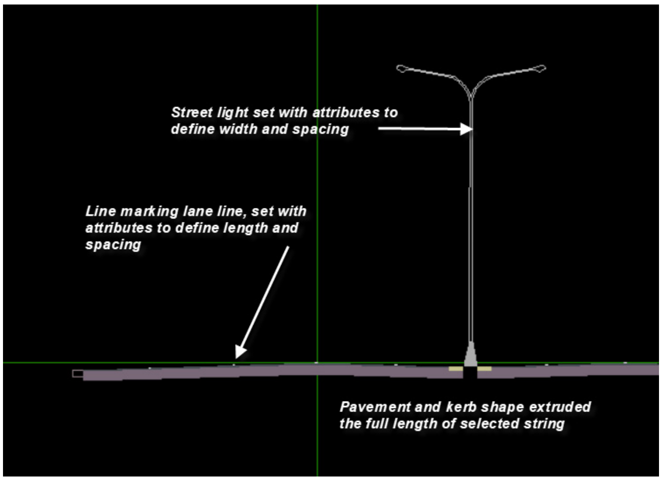


12da Profiles(s) select

Profiles generally drawn at origin 0,0 and define shapes that are to extruded along a selected string.

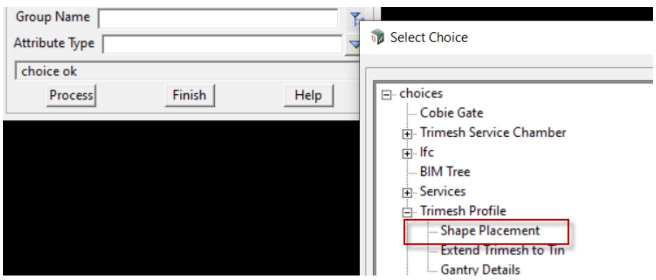
Attributes can also be set to shapes that like street lights in the example below, that define a thickness and placement interval.

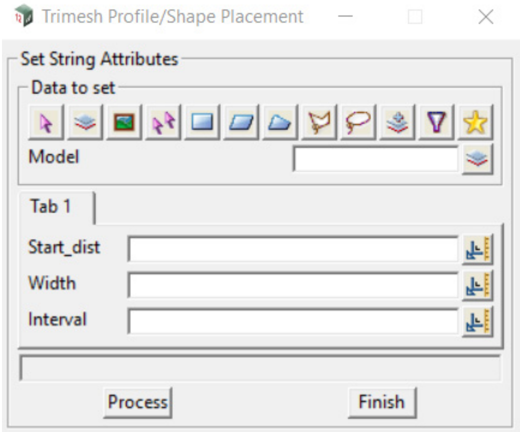
The same can be set for linemarking.

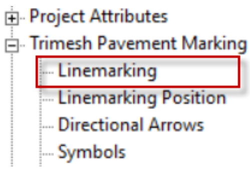


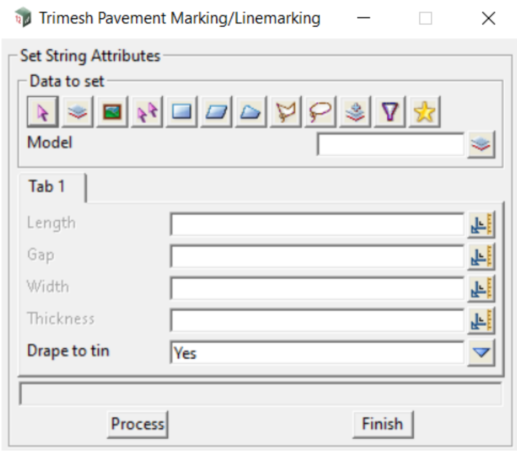
Attributes for the above settings are available from the menu item below

Menu: Utilities->Attributes->Global Attributes->Set global attributes









Name input

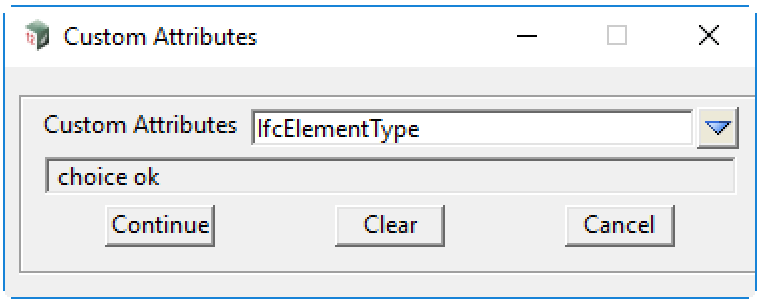
Name of the Trimesh.

Attributes select

This option will activate a selection of attributes created from the option below.

Menu: Utilities->Attributes->Global Attributes->Set global attributes

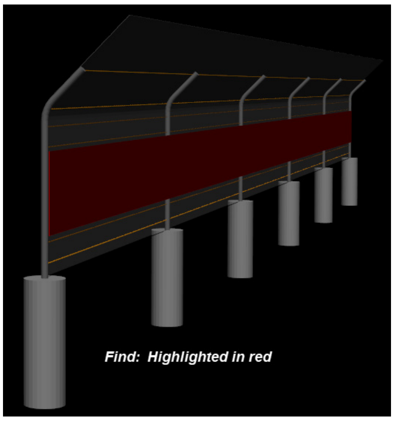
The attributes are set to all the Trimesh elements and are typically BIM attributes.



Find select

This option will highlight the Trimesh created from the row in the grid.

*The **Preview** button must be activated first though.*



Process button

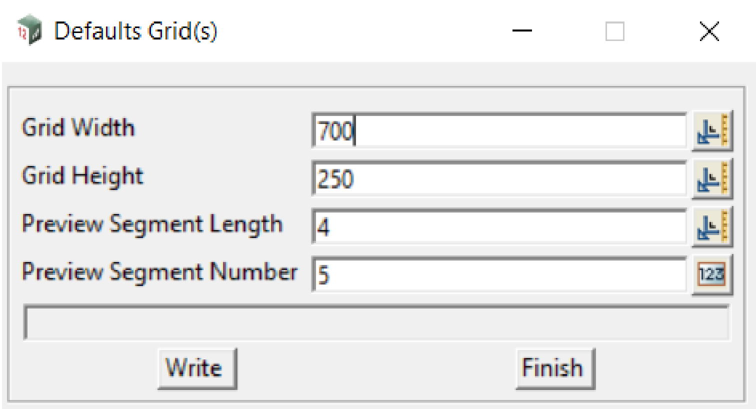
Creates an open GL perspective view titled "Preview".

The Trimesh(s) are created from the active Vertex & Segment grids, and added to the view.

Defaults button

LMB will activate the panel below to enter defaults for the size of the main panel. These will take effect the next time the panel is opened from the menu.

Preview details for segment length and number displayed.



Finish button

Finish button.

Continue to 12.3.1.2 BIM Objects Map File or return to 12.3.1 Create Trimesh.

12.3.1.2 BIM Objects Map File

Position of option on menu: **BIM =>Trimesh =>Create =>BIM objects map file**

Now documented In the v15 reference manual

Selecting **BIM objects map file** brings up the **BIM object Mapfile** panel.

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

Field Description	Type	Defaults	Pop-Up
File	file box		*.bim_mapfile

The file to read/write.

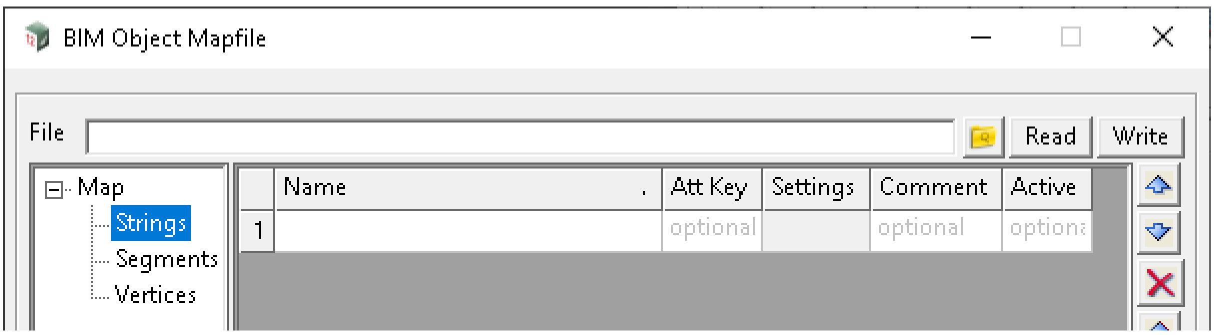
Read	button		

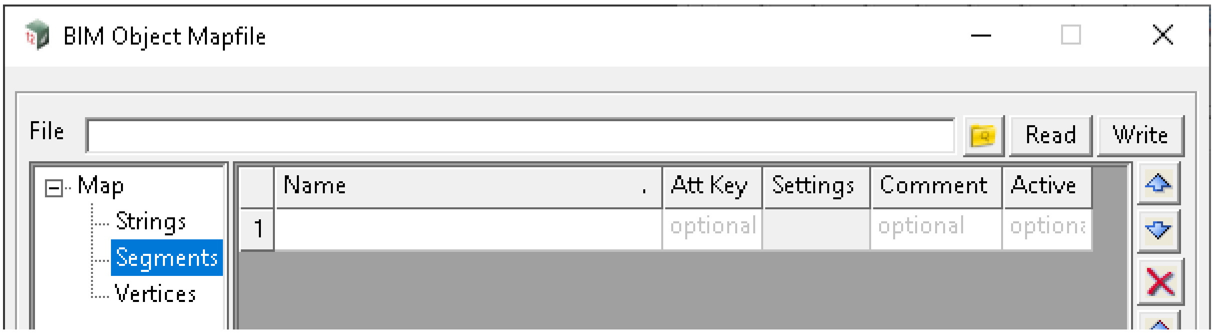
*Reads a *bim_mapfile.*

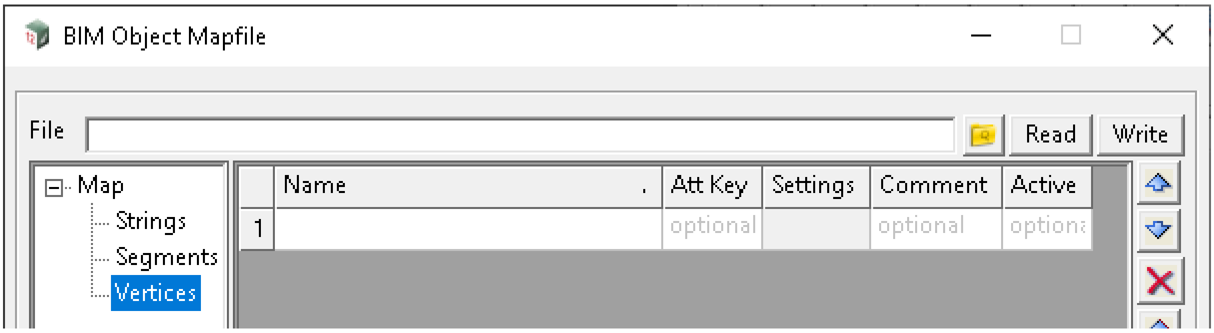
Write	button		

*Writes a *bim_mapfile.*

String/Segment/Vertices Grid cell







Name input .

Att Key input optional

??

Settings pop up panel

For information on the Settings pop up panel see.

Comment input optional

??

Active input optional

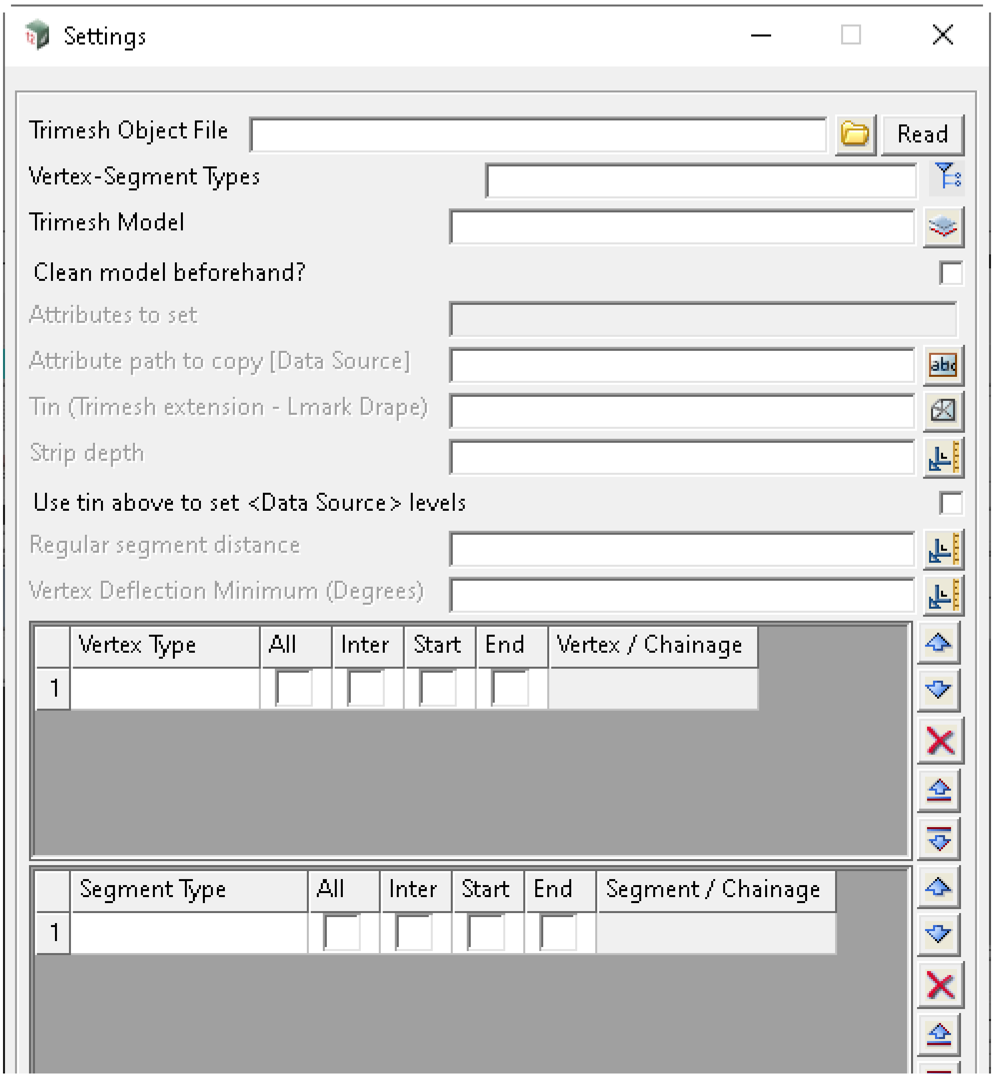
??

Buttons at Bottom

Finish button

*Closes the **BIM object mapfile** panel.*

12.3.1.2.1 Settings Panel



Trimesh Object File file box *.bim_objects files

??

Vertex-Segment Types

The choice list is created from the above file selected.

Trimesh Model input

Model to place Trimesh(s) on.

Be aware that there is a ***"Clean model beforehand"*** *following.*

Clean model beforehand? tick box

If ***ticked****, the model for trimeshes is cleaned before the trimeshes are calculated.*

Attributes to set select box optional

This option will activate a selection of attributes created from the option below:

Menu: Utilities->Attributes->Global Attributes->Set global attributes

The attributes are set to all the Trimesh elements and are typically BIM attributes.

Attribute path to copy (Data source) select box optional

If the data source has some attribute information, those attributes can be copied onto any trimesh created.

Example: ***Survey****/Surveyor* ***Survey****/Date of survey*

In the case above type the heading ***Survey*** *in the field.*

Tin (Trimesh extension - Lmark Drape tin box optional

Pavement markings will be draped onto the tin.

Any trimesh (typically) trenches etc can have the top or bottom of the trimesh surface extended to the tin.

Strip depth real input optional

Strip applied to tin (+ve down).

Use tin above to set <Data Source> levels toggle active

All strings in the data source selected will be draped onto the tin before a trimesh is created. The data string levels are not actually altered however.

Regular segment distance real input optional

This value is used to place vertex and segment types.

e.g. Fence posts / Railings and Palings

If ***blank****, then vertex intervals on the data string is used.*

Vertex Deflection Minimum (Degreest real input optional

A default value is used that caters for small changes of direction along a string.

So small defections are ignored e.g.

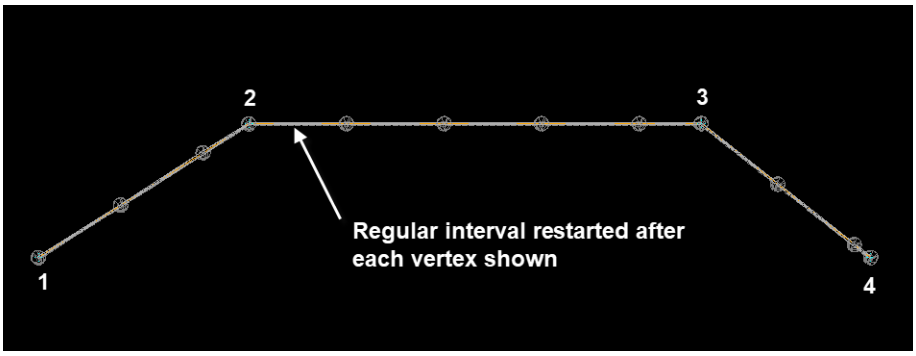
An Apply Many string (created around a large radius curve).

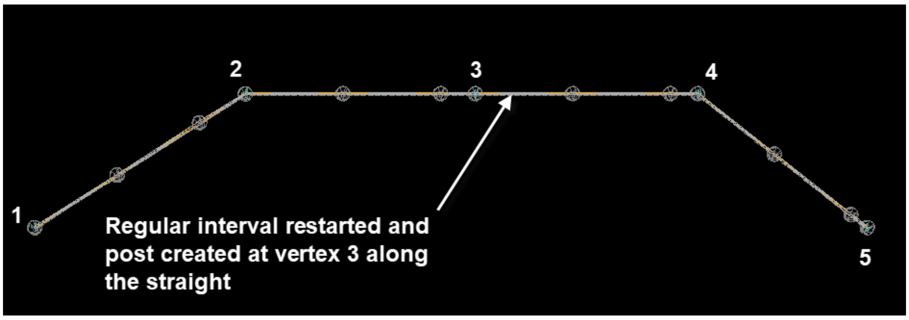
A value can be set at the user's discretion.

Zero *(0) can be set as the value if you require all horizontal points to be included.*

The regular segment distance is restarted after each horizontal point.

Hint*: Particularly useful, if e.g. you require a vertex post at a HIP that falls on a straight.*





Continue to 12.3.1.3 Cut and Fill Trimeshes Between Two Tins or return to 12.3.1 Create Trimesh.

12.3.1.3 Cut and Fill Trimeshes Between Two Tins

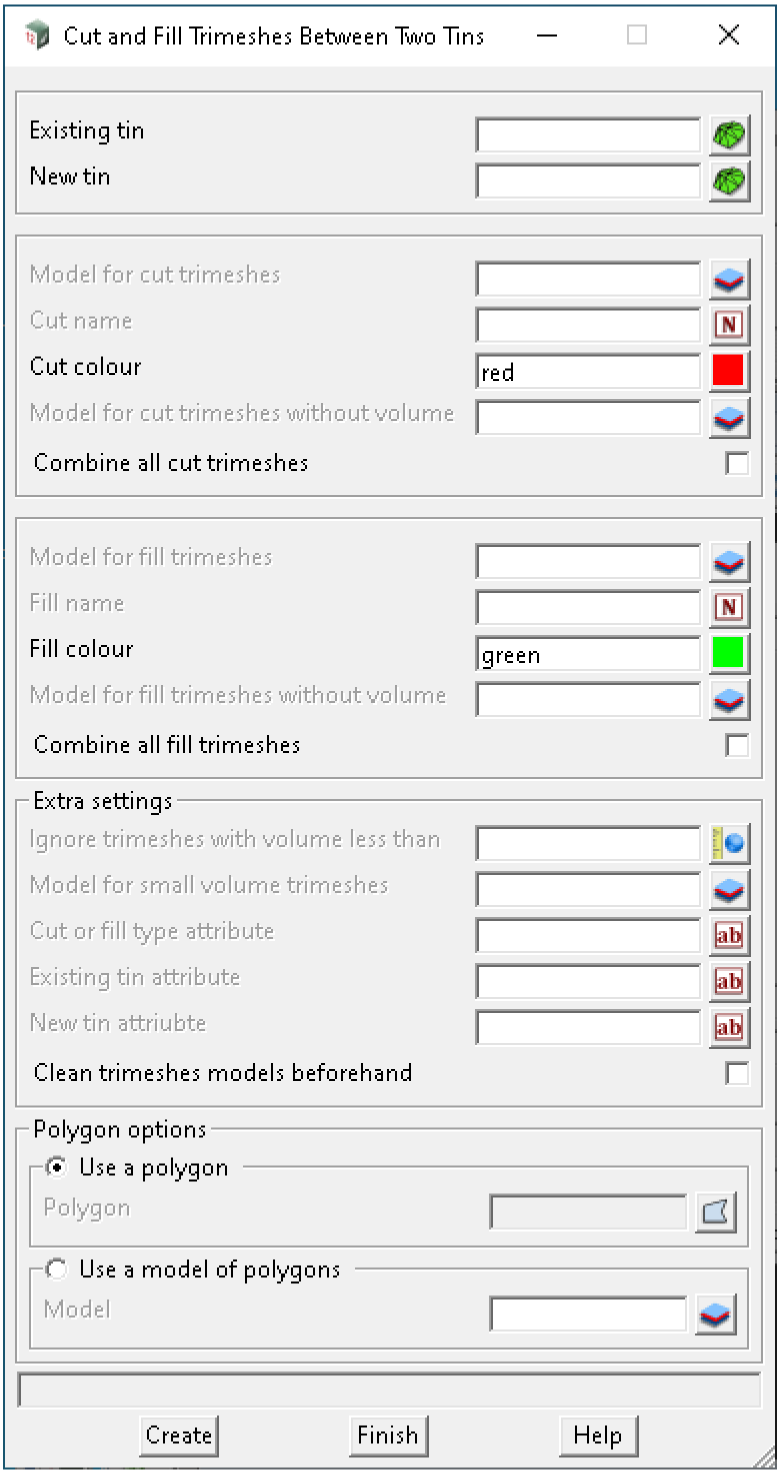
Position of option on menu: **BIM =>Create =>Cut and fill trimeshes between two tins**

Now documented In the v15 reference manual

This option creates the cut trimeshes and fill trimeshes between two tins.

The area to process for cut and fill can be restricted by a single polygon or a model of polygons.

Selecting **Cut and fill trimesh between two tins** displays the **Cut and Fill Trimesh Between Two Tins** panel



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

Field Description	Type	Defaults	Pop-Up
Existing tin	tin box		available tins

Name of the tin to be considered to be the existing surface.
z-values below this surface are in cut and z-values above this surface are in fill.

New tin	tin box		available tins

Name of the tin to be considered the design or modified surface.

Model for cut trimeshes	model box		available models

Model for the resulting cut trimeshes.

Cut name	name box		names.4d

Name for the cut trimeshes.

Cut colour	colour box		available models

Colour of the resulting cut trimeshes.

Model for cut trimeshes without volume model box available models

If a trimesh does not closed then it will have no volume.

*If **not blank** any cut trimeshes that are not closed will be added to this model.*

***Note**: this is for checking if there are any ill-formed trimeshes.*

Combine all cut trimeshes	tick box		not ticked

*If **ticked**, all the cut trimeshes will combined into the one trimesh.*

Model for fill trimeshes	model box		available models

Model for the resulting fill trimeshes.

Fill name	name box		names.4d

Name for the fill trimeshes.

Fill colour	colour box		available models

Colour of the resulting fill trimeshes.

Model for fill trimeshes without volume model box available models

If a trimesh does not closed then it will have no volume.

*If **not blank** any fill trimeshes that are not closed will be added to this model.*

***Note**: this is for checking if there are any ill-formed trimeshes.*

Combine all fill trimeshes	tick box		not ticked

*If **ticked**, all the fill trimeshes will combined into the one trimesh.*

Extra settings

Ignore trimeshes with volume less than real box

*If **not blank**, all cut and fill trimeshes with volume less than this value will not be added to the cut and fill models.*

Model for small volume trimeshes model box available models

*If **not blank** any trimesh with volume less than **Ignore trimeshes with volume less** that will be added to this model.*

Clean trimeshes models beforehand tick box not ticked

*If **ticked**, the models are cleaned before the cut and fill calculations are done.*

Polygon options

Use a polygon radio button

*If **set**, and a string has been selected or a polygon is selected, the polygon is used to restrict the area for calculating cut and fill trimeshes. If no string is selected, the area common to both the Existing tin and the new tin is used.*

Polygon polygon select polygon pop-up

Polygon to restrict the calculations.

For information on selecting a polygon and the polygon pop-up, see 4.24.14 Polygon Select Box.

Use a model of polygons radio button

*If **set**, a model of strings will be used as the polygons to restricted where the cut and fill trimeshes will be calculated.*

Model model box available models

Model of strings to provide the polygons used to restrict the calculating of cut and fill.

Buttons at Bottom

Create button

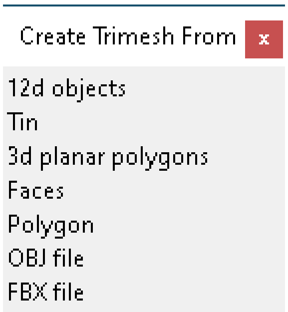
The option is run when **Create** *is pressed.*

Continue to 12.3.1.4 Create Trimesh From or return to 12.3.1 Create Trimesh.

12.3.1.4 Create Trimesh From

Position of option on menu: **BIM =>Trimesh =>Create =>From**

All the options on this menu were in **V14**.



See

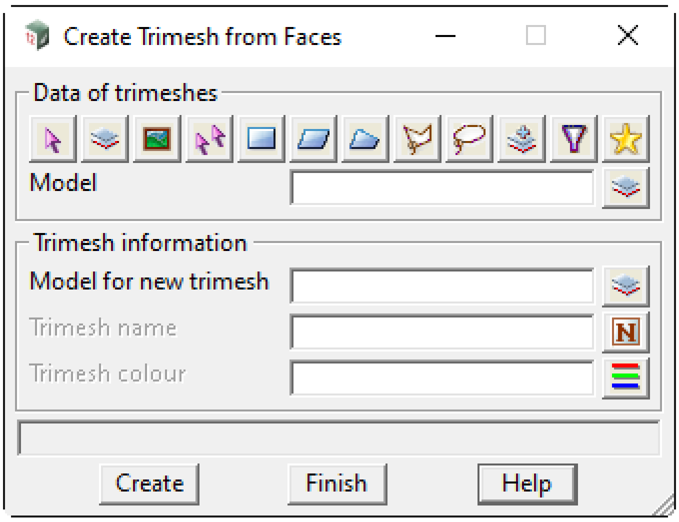
12.3.1.5 Trimesh From Faces

12.3.1.5 Trimesh From Faces

Position of option on menu:

Now documented In the v15 reference manual

Selecting **Create Trimesh from Faces** displays the **Create Trimesh from Faces** panel



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

Field Description Type Defaults Pop-Up

Data of trimeshes

Data selection type - selects the trimeshes that are to have their edge info's modified.

Trimesh information

Model for new trimesh model box available models

Model for the created trimesh.

Trimesh name	name box	

Name for the created trimesh.

Trimesh colour	colour box	available colours

Colour for the created trimesh.

Buttons at bottom

Create	button

Create trimesh.

Continue to 12.3.1.6 Trimesh Traffic Signals or return to 12.3.1 Create Trimesh.

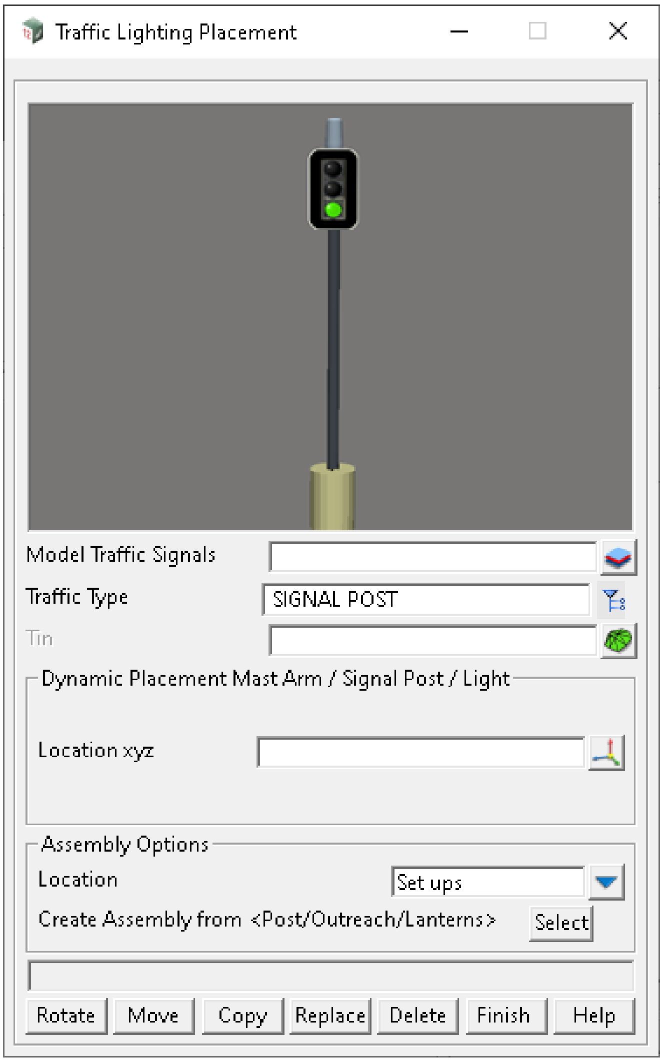
12.3.1.6 Trimesh Traffic Signals

Position of option on menu: **BIM =>Trimesh =>Create =>Traffic signals**

Now documented In the v15 reference manual

This option creates trimeshes representing traffic signals.

Selecting **Traffic signals** brings up the **Traffic Light Placement** panel.



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

Field Description	Type	Defaults	Pop-Up
Model Traffic Signals	model box		available models

Model to place signals on.

Traffic type	choice box	SIGNAL POST	

Selection of signals posts, outreach and lanterns.

Tin	tin box		

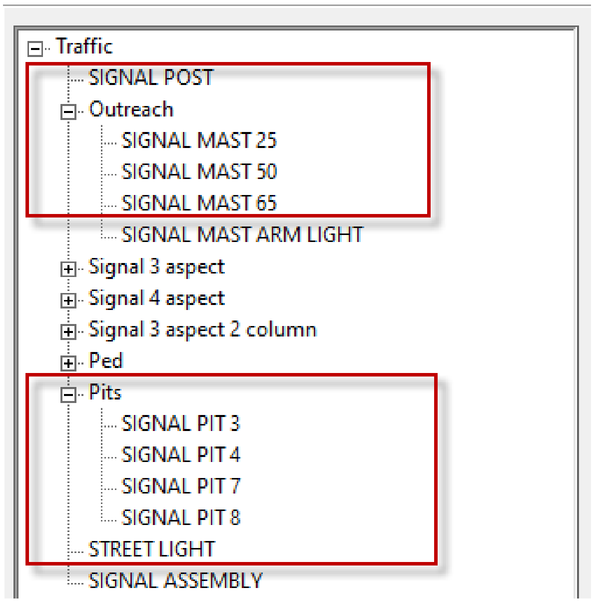
If tin is used then the level insert selection point is taken from the tin, otherwise a selection with a valid x,y and z is required.

Dynamic Placement (Mast Arm/Signal Post and Light)

Location xyz pick

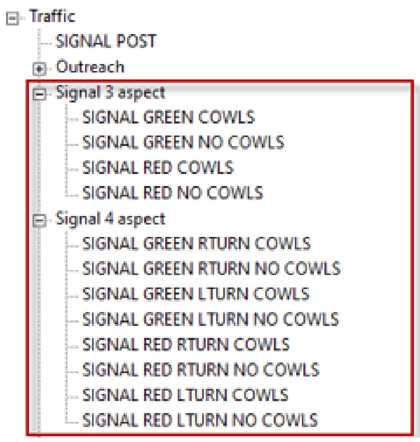
The Traffic types below require a "Location xyz".

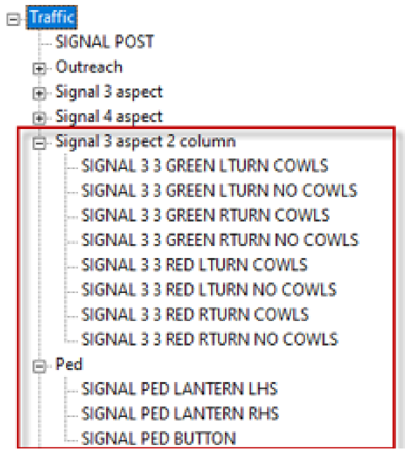
For ease of operation, select from a plan view, as once the position point is accepted, a dynamic rotation of the part is activated. A second selection is required to finalise the rotation.



Select Arm, Post or Light pick

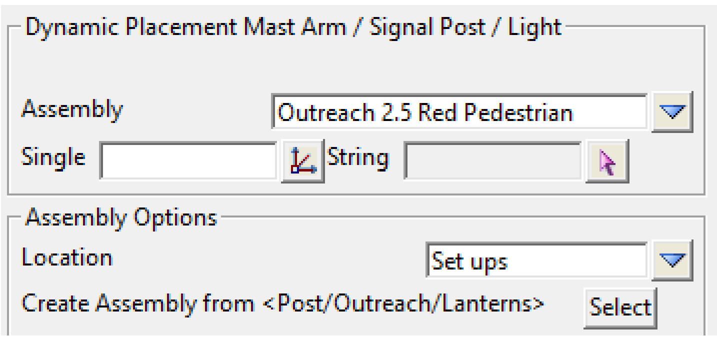
The Traffic types below require you to select a trimesh already placed from the previous list.





Signal Assembly pick

The Traffic type (Signal assembly) displays the options below:



Dynamic Placement Mast Arm/Signal Post and Light

Assembly choice box

Choice list from the location option under Assembly Options.

Single real box

Location xyz selection.

String string select

String selection where assembly is placed at each vertex.

Assembly Options

Location choice box

Location of assembly file: Setups, User or Working folder.

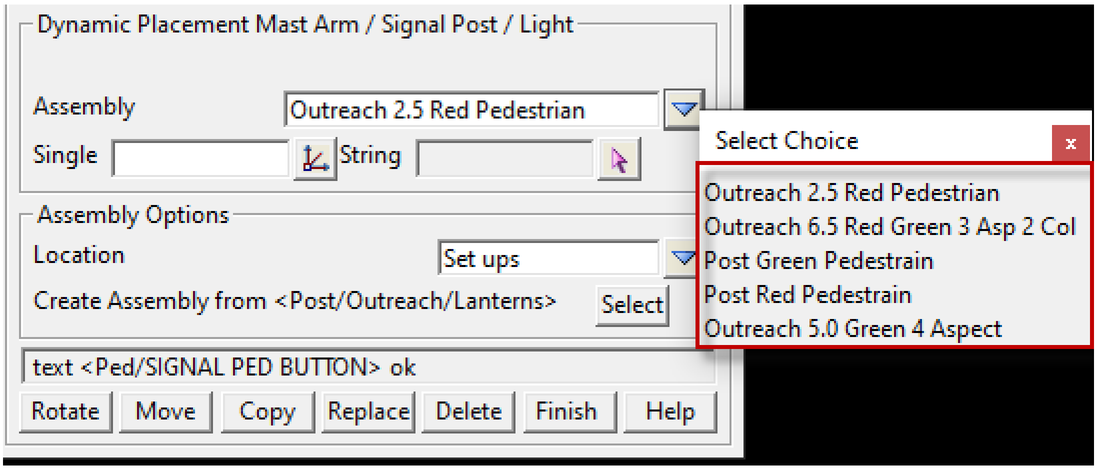
Assembly file: 12d_Traffic_Assembly.

Create Assembly from <Post/Outreach/Lanterns>

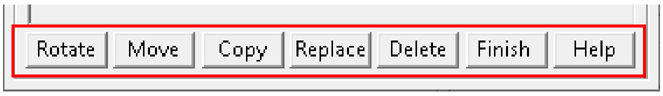
Select button

An assembly can be created and saved by selecting a group of trimesh parts that make up the assembly.

Examples shown below from the install setups area.



Edit Buttons



Rotate button

Signal parts can be rotated as one complete object or as individual parts

If a post or outreach is selected then the complete signal will rotate about its insertion point. (Any lanterns or crossing buttons will rotate with it)

If a lantern is selected, it will rotate independent of the post or outreach, but maintain its connection and insertion point.

Move button

The entire signal assembly, is able to be moved, not as individual parts.

A valid xyz point is required as the final position.

Copy button

The entire signal assembly, is able to be copied, not as individual parts.

A valid xyz point is required as the final position.

Replace button

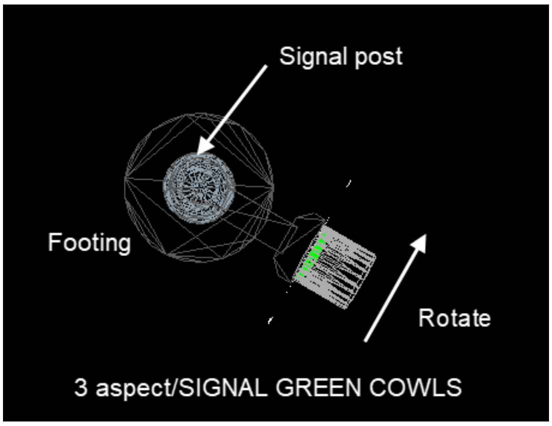
Parts of the entire signal assembly, can be replaced by another.

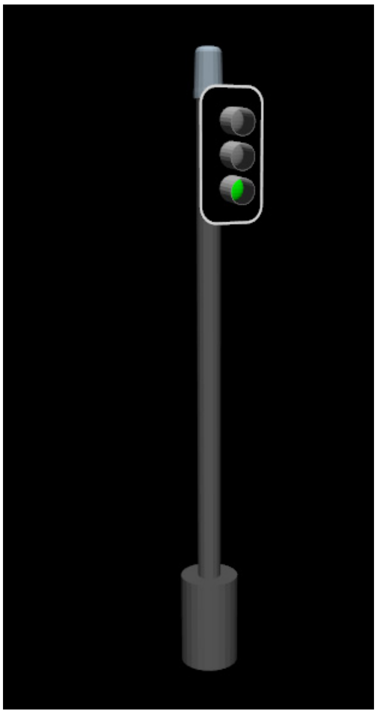
e.g., a 3-phase lantern could be replaced with a 4 phase etc.

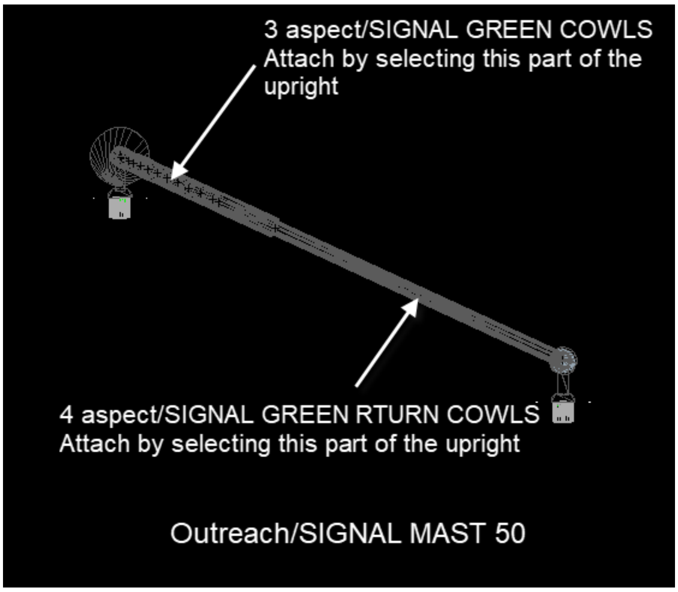
Delete button

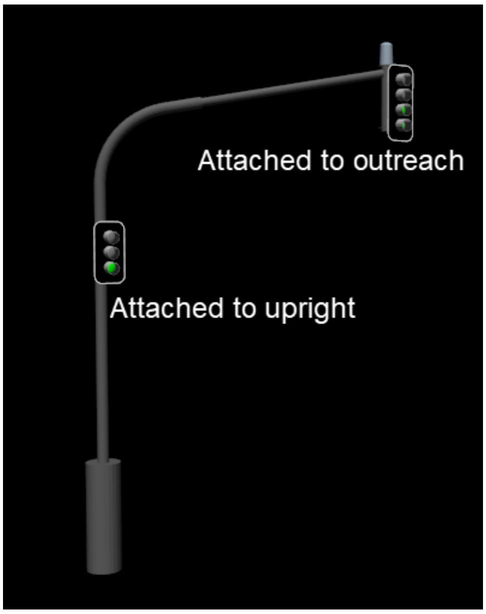
Individual parts can be deleted from a signal assembly, already placed.

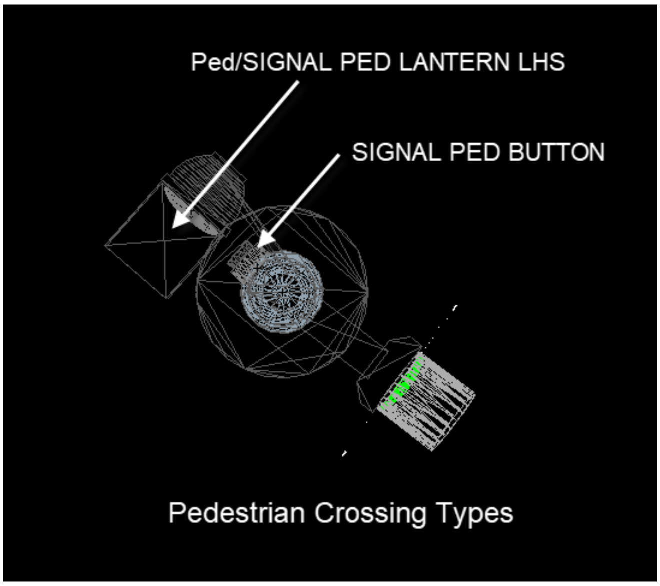
General Placement

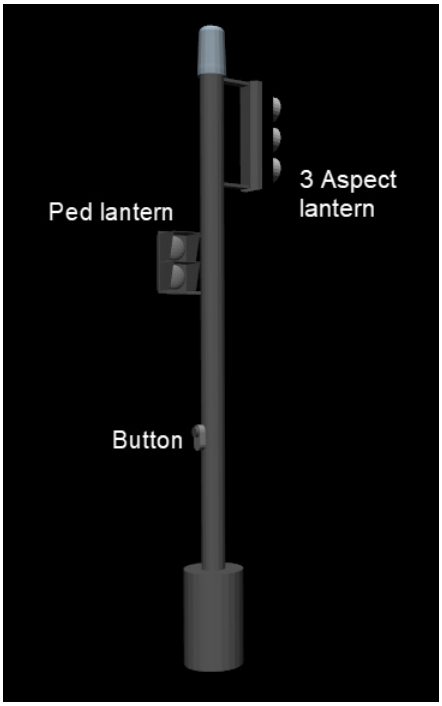





3 aspect/SIGNAL GREEN COWLS
Attach by selecting this part of the upright
4 aspect/SIGNAL GREEN RTURN COWLS
Attach by selecting this part of the upright
Outreach/SIGNAL MAST 50


Attached to outreach
Attached to upright

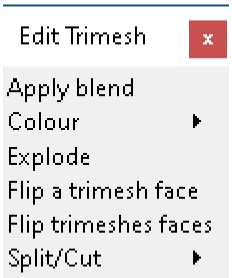

Ped/SIGNAL PED LANTERN LHS
SIGNAL PED BUTTON
Pedestrian Crossing Types


3 Aspect lantern
Ped lantern
Button

12.3.2 Trimesh Edit

Position of option on menu: **BIM =>Trimesh =>Edit**

The Edit Trimesh options edits trimeshes directly.



See

12.3.2.4 Colour Trimesh

12.3.2.1 Flip a Trimesh Face
12.3.2.2 Flip Trimeshes Faces
12.3.2.3 Split Trimesh

Continue to 12.3.2.1 Flip a Trimesh Face or return to 12.3.2 Trimesh Edit.

12.3.2.1 Flip a Trimesh Face

Position of menu: **BIM =>Trimesh =>Edit =>Flip a trimesh face**

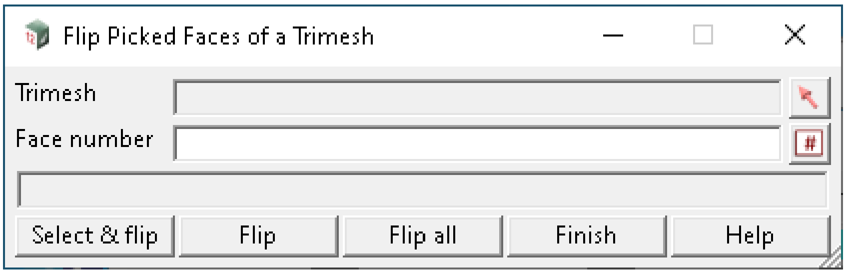
Now documented In the v15 reference manual

This option reverses the order of the vertices in a selected face in a trimesh.

That means that the normal of the face is reversed and hence whether the face is pointing towards the eye, or away from the eye, is reversed.

This is needed when the normal to a face in the trimesh is pointing the wrong way and it shows up as being very dark in an OpenGL Perspective view with **Shade ON**.

Selecting **Flip a trimesh face** brings up the **Flip Picked Faces of a Trimesh** panel.



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

Field Description Type Defaults Pop-Up

When the option is started, the ***Select and flip*** *mode is already running.*

Trimesh trimesh pick box

If the Select icon is pressed, the user then picks the face of a a trimesh and the Face number is displayed in the Face Number box and the model and name of the trimesh displayed in the Trimesh box.

Face number integer box

The number of the face in the trimesh given in the ***Trimesh*** *field. This value can be changed.*

Flip button

When ***Flip*** *is pressed, the face* ***Face number*** *of the trimesh given in the* ***Trimesh*** *field, is reversed.*

Flip all button

When ***Flip all*** *is pressed, all the faces of the trimesh given in the* ***Trimesh*** *field are reversed.*

Select & flip button

When pressed the ***Select and flip*** *mode is started and the user only needs to select a face of a trimesh and when accepted, the select face is reversed (the Pick only picks trimeshes).*

After a face is accepted, the ***Select and flip*** *sequence starts again and another face can be selected. The cycle continues until either <ESC > is pressed or RMB is pressed and* ***Cancel*** *selected from the* ***Pick Ops*** *menu.*

Continue to 12.3.2.2 Flip Trimeshes Faces or return to 12.3.2 Trimesh Edit.

12.3.2.2 Flip Trimeshes Faces

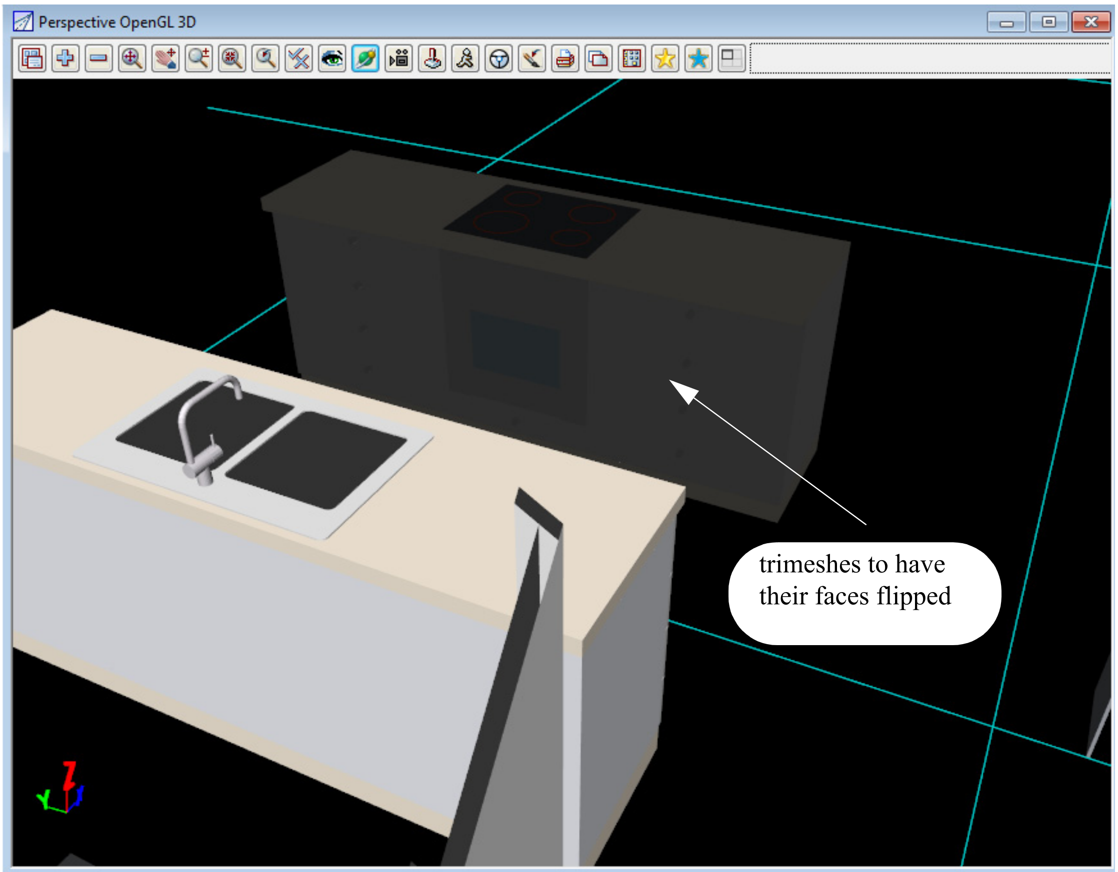
Position of menu: **BIM =>Trimesh =>Edit =>Flip trimeshes faces**

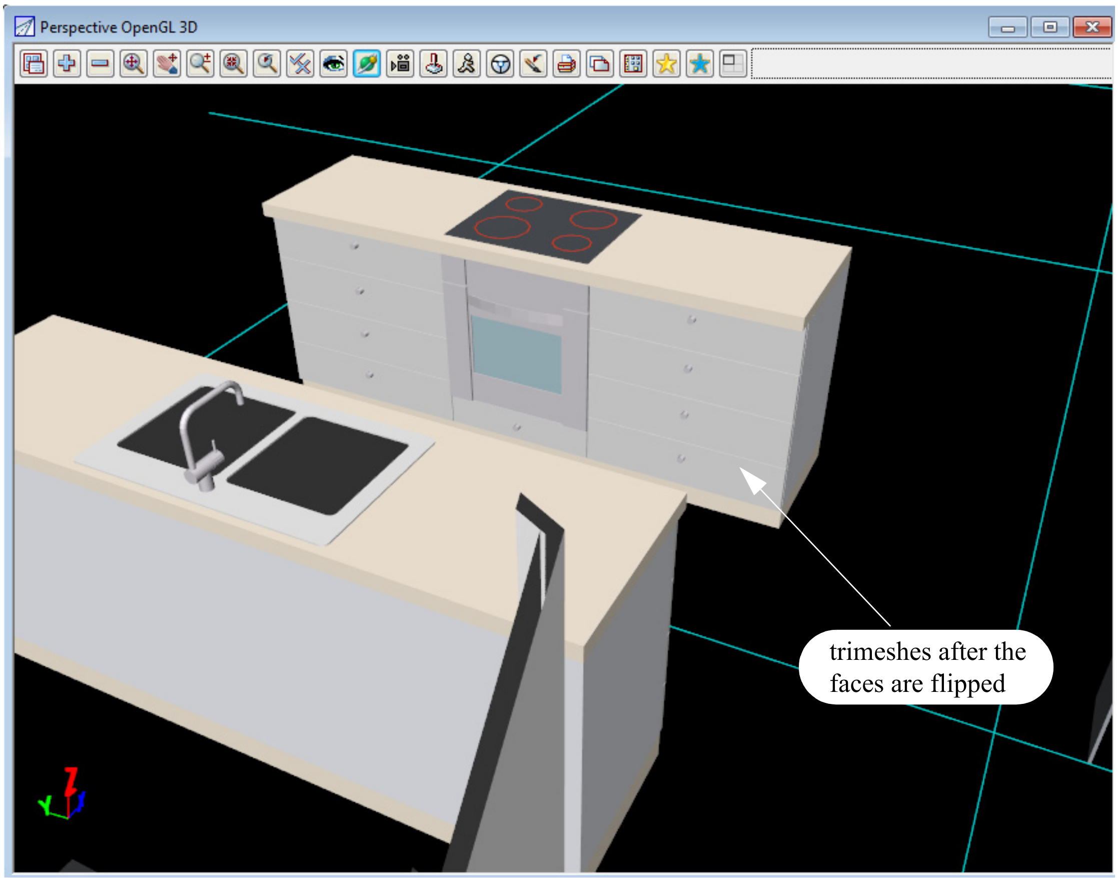
Now documented In the v15 reference manual

This option reverses the order of the vertices in **all** the triangles in a trimesh.

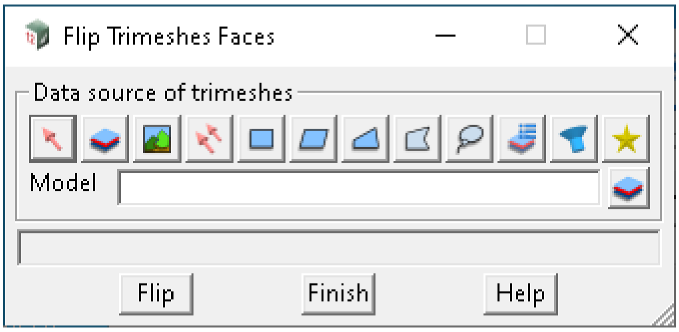
This is often needed when the triangles in the trimesh are ordered the wrong way and the normal to the triangles face inward instead of outward.

This would show up as being very dark in an OpenGL Perspective view with **Shade ON**.





Selecting **Flip trimeshes faces** brings up the **Flip Trimeshes Faces** panel.



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

Field Description	Type	Defaults	Pop-Up
Data source of trimeshes	data source		

Data selection type - for a full description go to 4.24.3 Data Source.

Selected data source	input	Model	

Data source of trimeshes to be have all their faces flipped.

Flip	button		

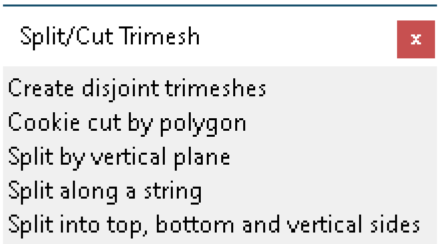
Reverse the order of the vertices in all the triangles in the selected trimeshes.

Continue to 12.3.2.3 Split Trimesh or return to 12.3.2 Trimesh Edit.

12.3.2.3 Split Trimesh

Position of option on menu: **BIM =>Trimesh =>Edit =>Split/Cut**

These options are for splitting trimeshes into smaller trimeshes etc.



See

New

Continue to 12.3.2.4 Colour Trimesh or return to 12.3.2.3 Split Trimesh.

12.3.2.4 Colour Trimesh

Position of option on menu: **BIM =>Trimesh =>Edit => Colour**

These options are to colour trimeshes.

Colour Trimesh	See
Colour by slope	12.3.2.4.1 Colour Trimesh By Slope
Colour by aspect	12.3.2.4.2 Colour Trimesh by Aspect
Replace colour by colour	
Colour sides	12.3.2.4.3 Colour Trimesh Sides

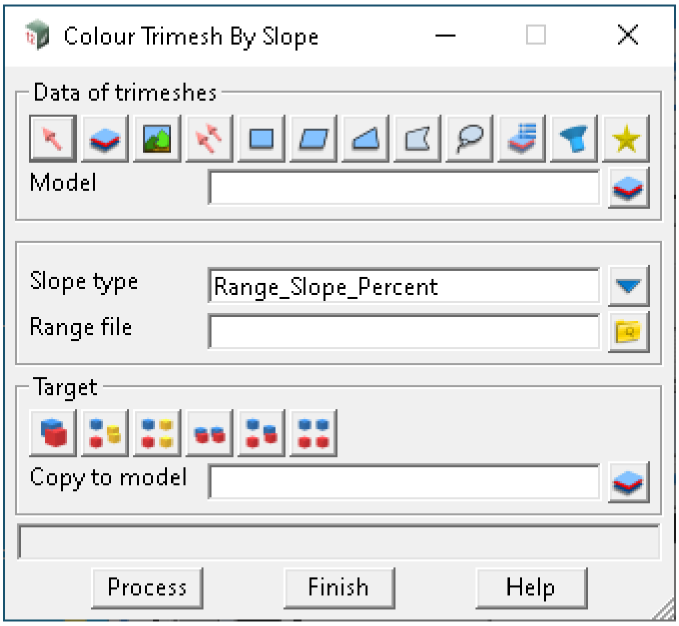
12.3.2.4.1 Colour Trimesh By Slope

Position of option on menu: **BIM =>Trimesh =>Edit =>Colour =>Colour by slope**

Now documented In the v15 reference manual

The ***Colour Trimesh by Slope*** option calculates the slope of each face of the trimesh and uses the slope range file to define a colour for the face.

Selecting **Colour Trimesh by slope** displays the **Colour Trimesh By Slope** panel



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

Field Description	Type	Defaults	Pop-Up

Data of trimeshes

Data selection type - selects the trimeshes to get the slope of. For a full description go to 4.24.3 Data Source.

Selected data source	Input	Model	

Data source

Slope type	choice box		Range_Slope_Percent, Range_Slope_1v in, Range_Slope_Degrees

The units used for slope in the range file.

Range file	slope range file		*.srf

The user supplied range file is used to define the range colours used for colouring the trimesh faces. See 8.11 Range Files.

Target type

Sets where the processed data goes to. For a full description go to 4.24.3 Data Source.

Target info	input	Copy to model	

Extra information required to fully define where the processed data is going to. For example ***Copy to model*** *or* ***Replace existing data.***

Buttons at bottom

Process button

The option is run when **Process** *is pressed.*

Continue to 12.3.2.4.2 Colour Trimesh by Aspect or return to 12.3.2.4 Colour Trimesh.

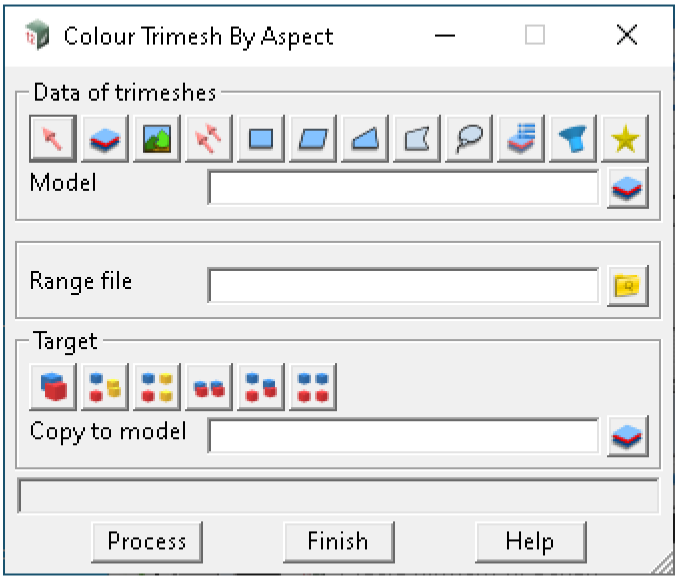
12.3.2.4.2 Colour Trimesh by Aspect

Position of option on menu: **BIM =>Trimesh =>Edit =>Colour =>Colour by aspect**

Now documented In the v15 reference manual

The ***Colour Trimesh by Aspect*** option calculates the aspect of each face of the trimesh and uses the aspect range file to define a colour for the face.

Selecting **Colour trimesh by aspect** displays the **Colour Trimesh By Aspect** panel



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

Field Description	Type	Defaults	Pop-Up
Data of trimeshes			

Data selection type - selects the trimeshes that are to have their edge info's modified. For a full description go to 4.24.3 Data Source.

Selected data source	Input	Model	

Data source

Range file	slope range file		*.srf

The user supplied range file is used to define the range colours used for colouring the trimesh faces. See 8.11 Range Files.

Target type

Sets where the processed data goes to. For a full description go to 4.24.3 Data Source.

Target info	input	Copy to model	

*Extra information required to fully define where the processed data is going to. For example **Copy to model** or **Replace existing data.***

Buttons at bottom

Process	button		

The option is run when **Process** *is pressed.*

Continue to 12.3.2.4.3 Colour Trimesh Sides or return to 12.3.2.4 Colour Trimesh.

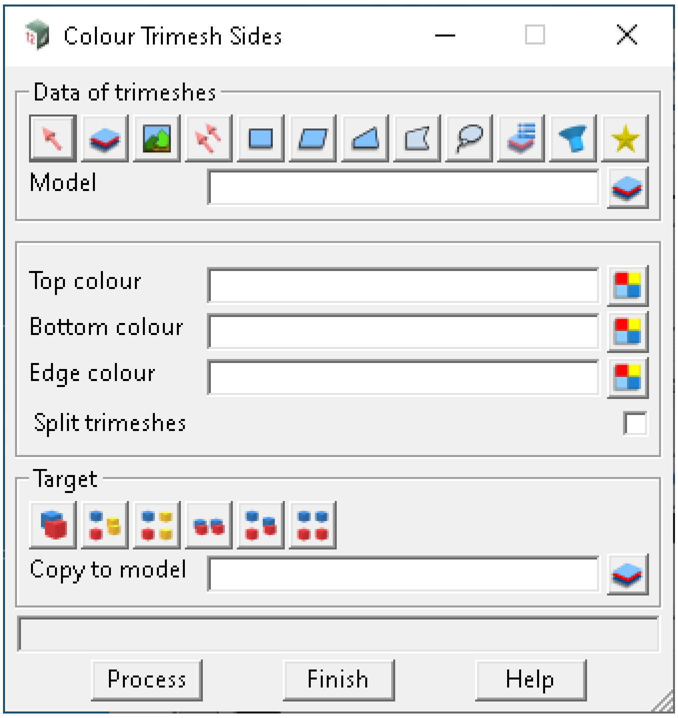
12.3.2.4.3 Colour Trimesh Sides

Position of option on menu: **BIM =>Trimesh =>Edit =>Colour =>Colour sides**

Now documented In the v15 reference manual

The ***Colour Trimesh Sides*** option calculates whether a face of a trimesh is on the top, the bottom or on the side of the trimesh, and coloured accordingly.

Selecting **Colour trimesh sides** displays the **Colour Trimesh Sides** panel



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

Field Description	Type	Defaults	Pop-Up
Data of trimeshes		Model	

data selection type - selects the trimeshes to get the top, bottom and sides for. For a full description go to 4.24.3 Data Source.

Selected data source	Input	Model	

Data source.

Top colour	colour box		available colours

Colour for the top faces of the trimeshes.

Bottom colour	colour box		available colours

Colour for the bottom faces of the trimeshes.

Edge colour	colour box		available colours

Colour for the side faces of the trimeshes.

Target type

Sets where the processed data goes to. For a full description go to 4.24.3 Data Source.

Target info	input	Copy to model	

*Extra information required to fully define where the processed data is going to. For example **Copy to model** or **Replace existing data.***

Buttons at Bottom

Process button

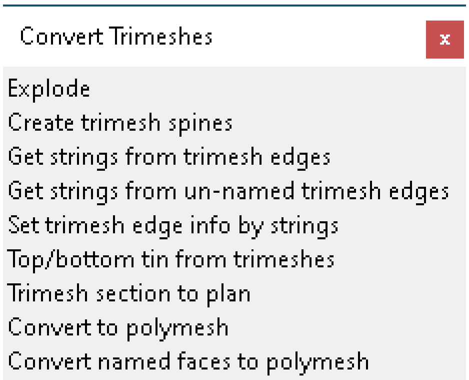
The option is run when **Process** *is pressed.*

Continue to 12.3.3 Convert Trimesh or return to 12.3.2.4 Colour Trimesh.

12.3.3 Convert Trimesh

Position of option on menu: **BIM =>Trimesh =>Edit => Colour**

These options that work on trimeshes.



See

12.3.3.1 Get Spines from Trimeshes

12.3.3.2 Top and Bottom Tins From Trimeshes

12.3.3.3 Convert Trimesh to Polymesh

12.3.3.4 Convert Trimesh Named Faces to Polymesh

12.3.3.1 Get Spines from Trimeshes

Position of menu: **BIM =>Trimesh =>Convert =>Create trimesh spine**

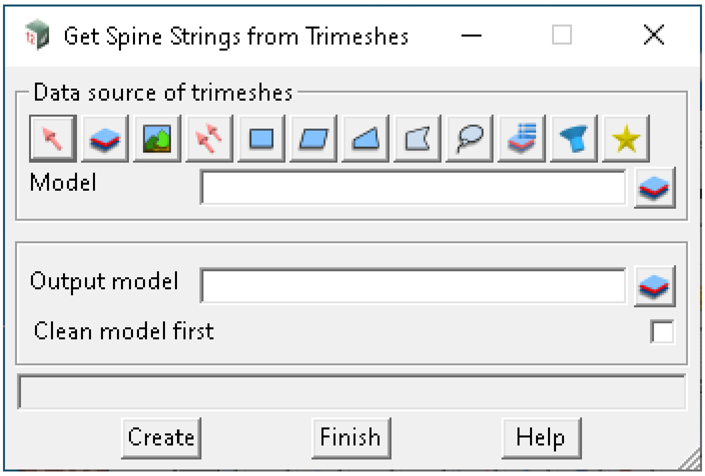
Now documented In the v15 reference manual

For each trimesh in the data source of trimeshes, the option tries to create a super string that is the **spine** of the trimesh.

For example, if the trimesh is a vertical pole, the option tries to create a super string that is at the centre of the pole.

The option works beat on when the trimesh represents a one segment round or rectangular pipe.

Selecting **Create trimesh spines** brings up the **Get Spine Strings from Trimeshes** panel.



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

Field Description	Type	Defaults	Pop-Up
Data source of trimeshes	data source		

Data selection type - selects the trimeshes that super strings spines are to be calculated for. For more information on Data Sources, go to 4.24.3 Data Source.

Selected data source	input	Model	

Source of trimeshes.

Output model	model box		available models

The model to put the created spine strings into.

Clean model first	tick box	not ticked	

*If **ticked**, the **Output model** is cleaned before the option is run.*

*If **not ticked,** the **Output model** is not cleaned before the option is run*

Create	button		

The option is run when **Create** *is pressed.*

Continue to 12.3.3.2 Top and Bottom Tins From Trimeshes or return to 12.3.3 Convert Trimesh.

12.3.3.2 Top and Bottom Tins From Trimeshes

Position of option on menu: **BIM =>Trimesh =>Convert =>Top/bottom tin from trimesh**

Position of option on menu: **BIM =>Trimesh =>Convert =>Top/bottom tin from trimesh**

Now documented In the v15 reference manual

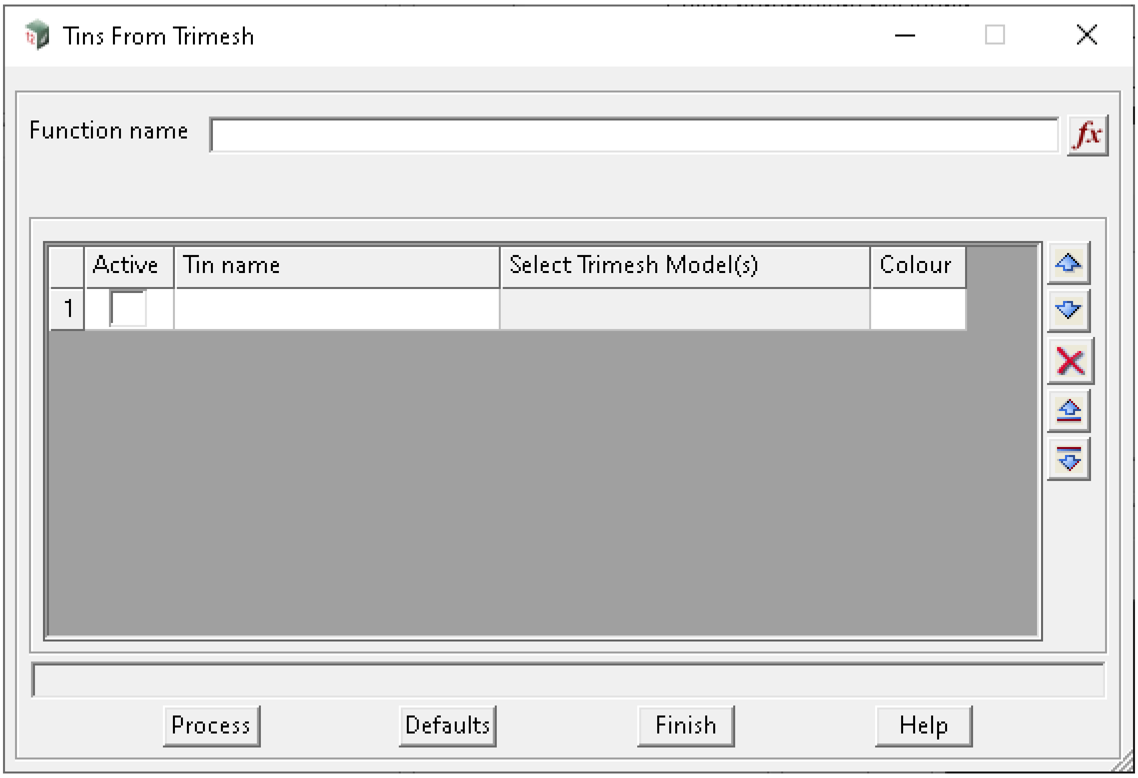
Trimeshes are now often created, or provided from another source, for many objects including the various pavement layers for a road.

However in that case, and other cases, it is often convenient to be able to create a tin that represents the top or the bottom of certain trimeshes.

For example, you have all the trimeshes for the bottom of the road formation but want a subgrade tin that is bottom of all the trimeshes.

Similarly you may have all the trimeshes for the top of the road formation and want a road surface tin that is top of all the trimeshes.

Selecting **Create tin from trimeshes top/bottom** brings up the **Tins from Trimesh** panel:



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

Field Description Type Defaults Pop-Up

Function name function box

Save as a function that can be recalced at anytime.

Main Grid information

Active toggle

Make line in grid active or inactive.

Tin name tin select available tins

Name of the tin to be created from this row of information.

***Note:** Refer to "Defaults" button info below for any Prefix/Suffix naming.*

Colour colour column cyan available colours

Colour for the tin.
*If **blank**, a default of cyan is used.*

Select Trimesh model(s) grid column

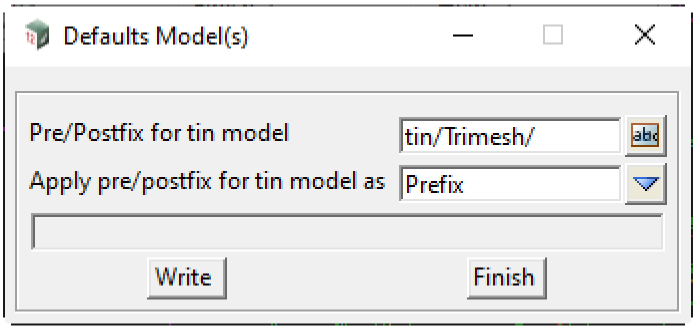
***Click** in this column to bring up the **Trimesh Selection** grid to define the trimeshes used to create the tin or this row. See* 12.3.3.2.1 Trimesh Selection Panel.

Buttons at Bottom

Process button

Process data selected with values entered.

Defaults button



Pre/Postfix for tin model input box tin/Trimesh/

[Object tree shown above].

Apply tin model Pre/Postfix as choice box Prefix, Suffix

*If **Prefix**, use the text in* **Pre/Postfix for Tin model** *as a prefix.*
*If **Suffix**, use the text in* **Pre/Postfix for Tin model** *as a suffix.*

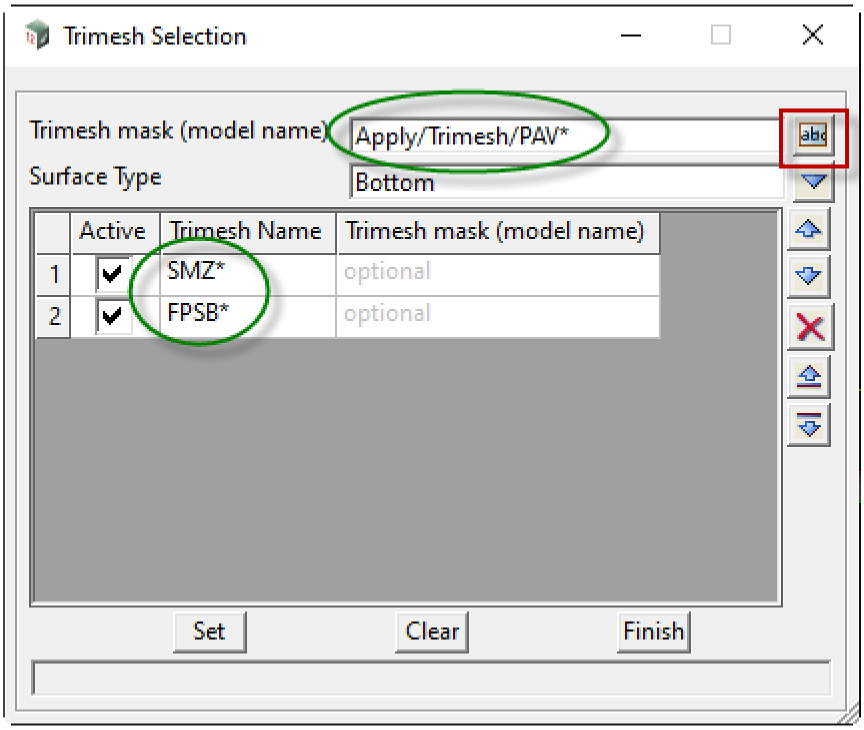
Buttons at Bottom

Write button

Defaults entered will be written to the <.project> folder
Tins_From_Trimesh_Panel.def
This file can be copied into the $user folder, as a default.

Continue to 12.3.3.2.1 Trimesh Selection Panel or return to 12.3.3 Convert Trimesh.

12.3.3.2.1 Trimesh Selection Panel



Trimesh mask (model name) text box optional

Used as a global Trimesh model for any Trimesh names entered in the grid below.

Any Trimesh model entered in the grid however will be used instead.

*Wildcard can be used e.g. Apply/Trimesh/Pav/RS**

Use the "abc" icon on the RHS to select a trimesh.

Surface type choice box Bottom Top, Bottom

Surface used to create the tin.

Grid information

Active toggle

Make line in grid active or inactive.

Trimesh name text column

Name of Trimesh (wildcard can be used e.g. SMZ).*

Middle mouse button in this field will allow you to select a trimesh.

*Its details will be displayed in the message bar below the **Set**, **Clear** and **Finish**.*

e.g. "Apply/Trimesh/PAV RS2B01->SMZ-R-A-RS2B01" selected enabling cut and paste.

Trimesh Model text column optional

Can be used instead of any global model entered previously.

*Wildcard can be used e.g. Apply/Pav/RS**

Buttons at Bottom

Set button

Set all the entries above.

Clear button

Clear all the entries above.

Finish button

Closes the **Trimesh Selection** *panel. All the information from the last* ***Set*** *is saved in the function.*

Continue to 12.3.3.3 Convert Trimesh to Polymesh or return to 12.3.3 Convert Trimesh.

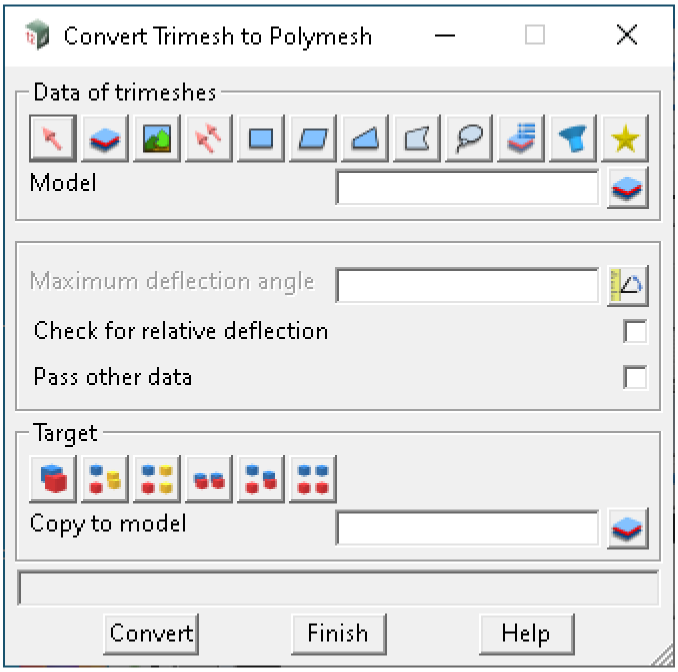
12.3.3.3 Convert Trimesh to Polymesh

Position of option on menu: **BIM =>Trimesh =>Convert =>Convert to polymesh**

Now documented In the v15 reference manual

This option takes a trimesh and joins adjacent triangles that are in the same plane (or close to it) and replaces them with a polyface. See 4.7.3 Trimesh and Polymesh.

Selecting **Convert to polymesh** brings up the **Convert Trimesh to Polymesh** panel.



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

Field Description Type Defaults Pop-Up

Data of trimeshes source box mode

Trimeshes to process. For more info 4.24.3 Data Source.

Selected data source input Model

Source of data to process.

Check for relative deflection tick box not ticked

*If **ticked**,??*

Maximum deflection angle angle box 0 measures menu

??

Target type

Sets where the processed data goes to. For a full description go to 4.24.3 Data Source.

Target info input Copy to model

*Extra information required to fully define where the processed data is going to. For example **Copy to model** or **Replace existing data.***

Buttons at Bottom

Convert button

Run the option.

Continue to 12.3.3.4 Convert Trimesh Named Faces to Polymesh or return to 12.3.3 Convert Trimesh.

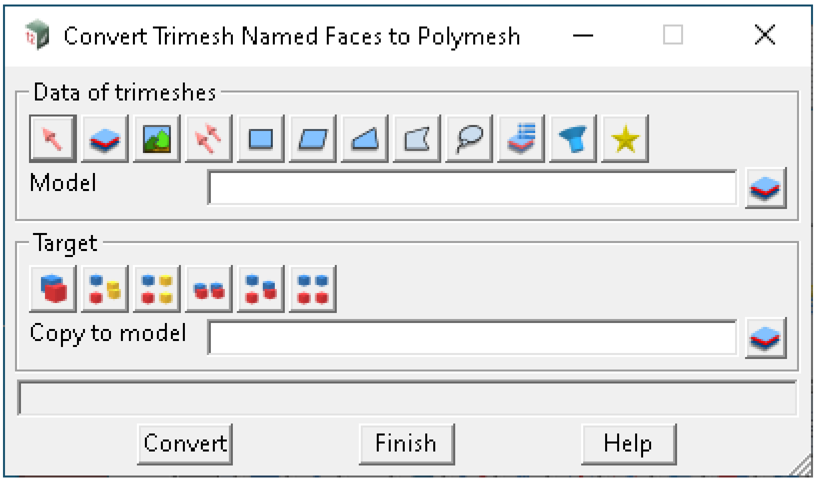
12.3.3.4 Convert Trimesh Named Faces to Polymesh

Position of option on menu: **BIM =>Trimesh =>Convert =>Convert named faces to polymesh**

Now documented In the v15 reference manual

This option takes a trimesh and joins adjacent named triangles of the same name and replaces them with a polyface. See 4.7.3 Trimesh and Polymesh.

Selecting **Convert named faces to polymesh** brings up the **Convert Trimesh Named faces to Polymesh** panel.



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

Field Description	Type	Defaults	Pop-Up
Data of trimeshes	source box	mode	

Trimeshes to process. For more info 4.24.3 Data Source.

Selected data source	input	Model	

Source of data to process.

Target type

Sets where the processed data goes to. For a full description go to 4.24.3 Data Source.

Target info	input	Copy to model	

*Extra information required to fully define where the processed data is going to. For example **Copy to model** or **Replace existing data.***

Buttons at Bottom

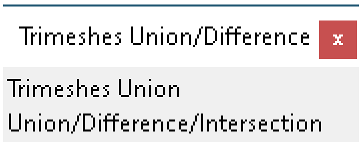
Convert	button

Run the option

Continue to 12.3.4 Trimesh Union/Difference or return to 12.3.3 Convert Trimesh.

12.3.4 Trimesh Union/Difference

Position of option on menu: **BIM =>Trimesh =>Union/Difference**



See
12.3.4.1 Trimeshes Union

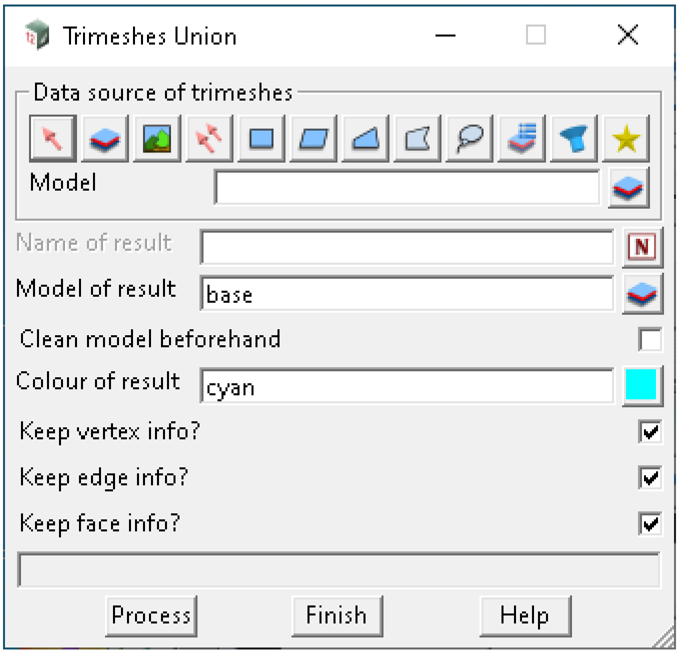
12.3.4.1 Trimeshes Union

Position of option on menu: **BIM =>Trimesh =>Union/Difference =>Trimeshes union**

Now documented In the v15 reference manual

This option performs the union of all the selected trimeshes.

Selecting **Trimeshes Union** displays the **Trimeshes Union** panel



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

Field Description	Type	Defaults	Pop-Up
Data source of trimeshes		Model	

Data selection of trimeshes - for a full description go to 4.24.3 Data Source.

Data source	input		

Data source of trimeshes to union.

Name of result	names box	CAD name	names.4d

Name of the resulting trimesh.

Model of result	model box	CAD model	available models

Model for the resulting trimesh.

Colour of result	colour box	CAD colour	available models

Colour of the resulting trimesh.

Keep vertex info	tick box	ticked	

*If **ticked**, as much as possible keep the **vertex info** from the original trimeshes in the resultant trimesh.*

*If **not ticked**, don't keep the **vertex info** from the original trimeshes in the resultant trimesh.*

Keep edge info	tick box	ticked	

*If **ticked**, as much as possible keep the **edge info** from the original trimeshes in the resultant trimesh.*

*If **not ticked**, don't keep the **edge info** from the original trimeshes in the resultant trimesh.*

Keep face info tick box ticked

*If **ticked**, as much as possible keep the **face info** from the original trimeshes in the resultant trimesh.*

*If **not ticked**, don't keep the **face info** from the original trimeshes in the resultant trimesh.*

Process button

The option is run when **Process** *is pressed.*

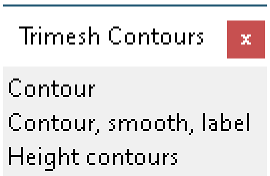
Continue to 12.3.5 Contour Trimeshes or return to 12.3.4 Trimesh Union/Difference.

12.3.5 Contour Trimeshes

Position of option on menu: **BIM =>Trimesh =>Contours**

This menu is the same as in **V14**

.



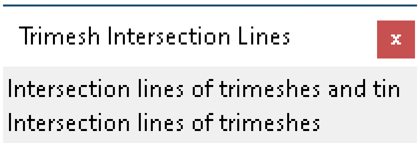
See

Continue to 12.3.6 Trimesh Intersection Lines or return to 12.3 Trimesh.

12.3.6 Trimesh Intersection Lines

Position of option on menu: **BIM =>Trimesh =>Intersection Lines**

This menu is the same as in **V14**.

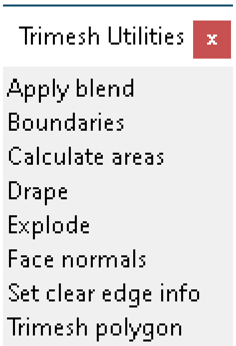


See

Continue to 12.3.7 Trimesh Utilities or return to 12.3.6 Trimesh Intersection Lines.

12.3.7 Trimesh Utilities

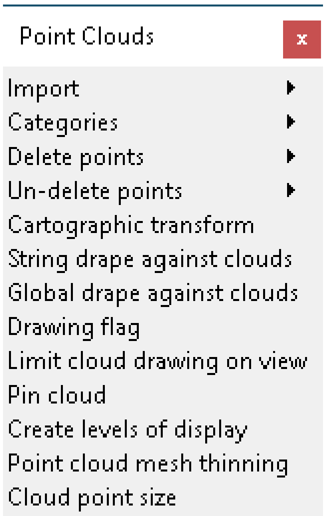
Position of option on menu: **BIM =>Trimesh =>Utilities**



See

12.4 Point Clouds

There has been additions to Point Clouds.



See

12.4.1 Create Levels of Display

12.4.1 Create Levels of Display

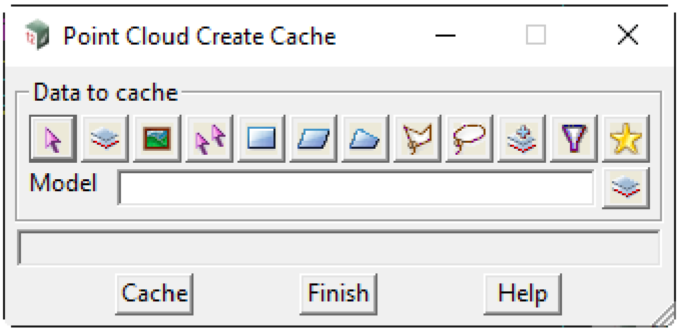
Position of option on menu: **Bim =>Point clouds =>Cache clouds**

Position of option on menu: **String =>Point clouds =>Cache clouds**

Now documented in the v15 reference manual

Imported point cloud strings can be processed to cache information that may speed drawing.

Selecting **Create Levels of Display** fires up the **Point cloud create cache** panel.



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

Field Description	Type	Defaults	Pop-Up
Data to cache	data source		

Data selection type - for a full description go to 4.24.3 Data Source.

Selected data source	input	Model	

Source of data to be processed.

Buttons at bottom

Cache button

Attempts to create caching information for all the points clouds points in the selected point clouds.

Additional information

Benefits split into:

1)Plan Views

2)Perspective Views

3)Non view based "options"

First for (3), caching is not used at all. Who knows if there are good uses?

Now generally, for any individual point cloud string, there is a set of cache levels. So if you do a "Fit" on a plan view, it may be able to choose the most "course" level.

Note, only one level can be selected for a cloud string. (see footnote 1).

Now

For (1), this is fine since it is an orthographic projection, hence the entire view has the same "level of display".

For (2), this is not true since it depends on whether you are looking at something close, or something far away. Doing the calculations on both of these yield very different levels of display. Alas we can only select 1, thus we have to “be conservative” and choose a level of display – displaying more.

In the case that Peter Murray reported, where draw times on a plan view went from 75 seconds to 1, and 100+ seconds on a perspective view to about 2 seconds, the massive gains here was because his job was not 1 single cloud string. Peter had a hundred cloud strings.

So instead of 1 cloud string with 7 billion points, he had 100 cloud strings with an average of 70 million points. This came about because they did 100 odd scanner setups with the scanner (over may days) and when reading the E57 file, chose to create 1 cloud string for each setup, (i.e.) choosing not to combine them all into one cloud string. Since each cloud string was only covering a “constant” or “limited” distance from the set up point, this means when the entire cloud string is completely off the plan view, or not in the view volume of a perspective view, the drawing is instantly rejected, and you get a massive “speed up”. When it’s all jammed into one string, that optimization is lost.

Now getting back to (2), for cloud strings that are far off into the distance on a perspective view, a much courser level of display will be chosen, and thus draw much faster. For cloud strings up close to the eye, yes way more points are drawn, but that’s what we want. A close up cloud string, draws with more detail, a faraway cloud string, much less detail.

12.5 Remove all Duplicate Extrudes in Project

Position of option on menu: **BIM =>Visualisation => Extrusions =>Remove duplicates**

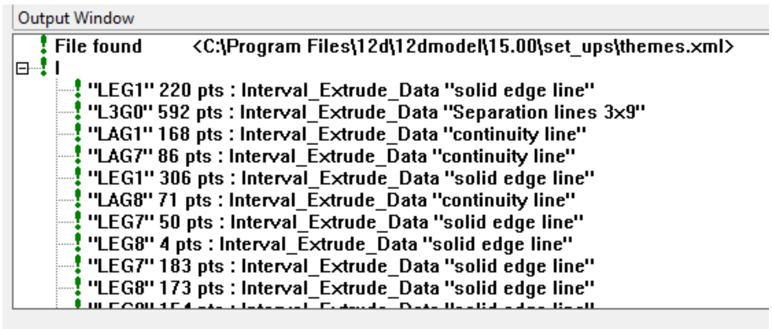
Now documented in the v15 reference manual

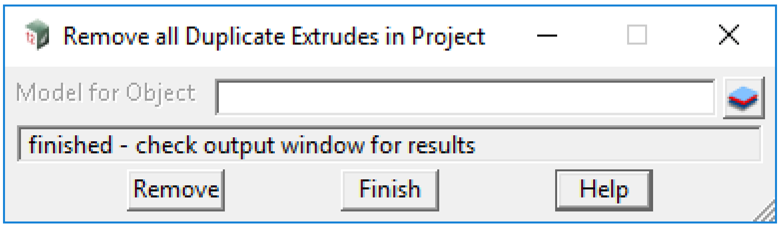
The model or entire project is scanned for duplicate extrudes on individual strings.

If a string has 2 identical "string extrudes", one of them is removed since drawing the same thing twice does not change the result,

but just takes twice as long. The same applies for interval extrudes, and group extrudes.

As an example, the drawing time of a model which had extrudes duplicated upwards of 900 times, dropped from 20 seconds down to sub-second.





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

Field Description	Type	Defaults	Pop-Up
Model for Object	model box		available models

Input the name of the model to remove duplicate extrudes. If left blank, the entire project is searched.

Buttons at Bottom

Remove	button

Processes the model given in the Model field, or the entire project.

12.6 ADAC

13 CAD

Position of menu: CAD

There has been changes to the **CAD** chapter in the ***12d Model Reference manual***.

See

13.1 Create Incremental Text
13.2 Remove Drafting Association

13.1 Create Incremental Text

Position of option on menu: **CAD =>Text =>Create incremental text**

Now documented In the v15 reference manual

The **create incremental text** option allows you to place text that has an incremental integer component.

The integer part of the text is incremented each time another text is placed.

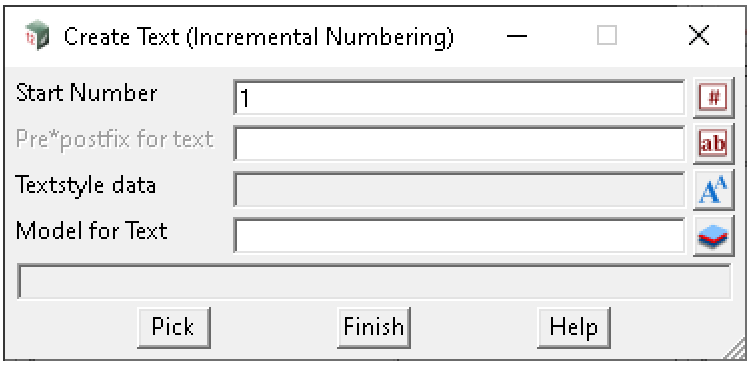
The text can have a Pre*postfix, which can include "\n", for a new line

e.g. Lot * \n RP 23456

Result: Lot 1

RP 23456

Selecting **Create incremental text** brings up the **Create Text (Incremental Numbering)** panel.



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

Field Description	Type	Defaults	Pop-Up
Start number	integer box	1	
Enter start number (default set to 1).			
Pre*postfix for text	text box	optional	
*If **blank**, only number is used.*			
Textstyle data	textstyle box		
Font, height etc for text.			
Model for Text	model box		available models
Model to place text on.			

Buttons at Bottom

Pick button

Select a position for text insertion <RMB to cancel>

Cursor snap only

As each pick is completed, the Start Number is incremented on the panel

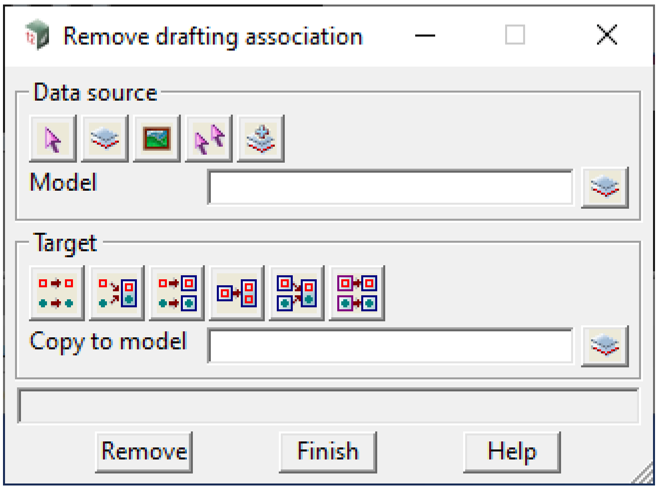
13.2 Remove Drafting Association

Position of option on menu: CAD =>Dimension =>Utilities =>Remove drafting association
CAD =>Leader =>Utilities =>Remove drafting association
CAD =>Table =>Remove drafting association

Now documented In the v15 reference manual

This option removes the associations that exists for the selected drafting elements.

Selecting **Remove drafting association** displays the **Remove Drafting Association** panel



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

Field Description	Type	Defaults	Pop-Up
Data to cache	data source		

data selection type - for a full description go to 4.24.3 Data Source.

Selected data source	input	Model	

source of drafting elements to be processed.

Target type

sets where the processed data goes to.

Target info	input	Copy to model	

extra information required to fully define where the processed drafting elements are going to.

Buttons at bottom

Remove	button		

remove the associations of the selected drafting elements.

14 Tin

There has been changes to the **Tin** chapter in the ***12d Model Reference manual***.

In **V14** the menu was called **Tins** and the pinned menu was called **Triangles**. In V15 these have both been to **Tin**.

See

See

[14.1 Deconstruct Tin]
[14.2 Adding Removed Tins]
[14.3 Tin Aspect Colouring]
[14.4 Tin Slope Colouring]
[14.5 Drape Strings]
[14.6 Depth Range Polygons]
[14.7 Label Flow Arrow]

14.1 Deconstruct Tin

Position of option on menu: **Tin =>Utilities =>Deconstruct tin**

Now documented In the v15 reference manual

A tin is made up of a network of non-overlapping triangles and each triangle is a set of three clockwise vertices connected by edges.

Some of the triangles are not used for any processes and are effectively not there. These triangles are called **null triangles**.

The other triangles, which are used in all processing, are the **non-null triangles**.

An each of a non-null triangle may be a segment of a breakline in the data that was used for constructing the tin. Such an edge is called a **breakline segment**. The vertices of a non-null triangle that are not part of breakline segments are called **non-breakline points**.

So the vertices of non-null triangle are either included in the breakline segments or the non-breakline points.

Even through a triangle is null, some of its vertices may also be vertices of non-null triangles and so included in either the breakline segments or the non-breakline points.

The vertices of a null triangle that are not shared with any non-null triangles are called **isolated points**. So an isolated point is surrounded by null triangles.

Hence the triangles of a tin are either null or non-null triangles and the vertices of any triangle will be either a breakline edge, a non-breakline point or an isolated point.

The **Deconstruct Tin** option breaks a tin into these various parts.

(a) non-null triangles

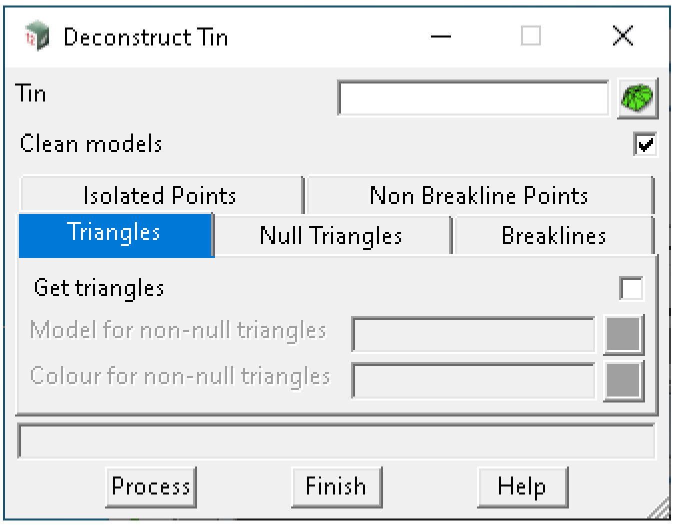
(b) null triangles

(c) breakline edges of non-null triangles

(d) non-breakline points of non-null triangles

(e) isolated points of null triangles

Selecting **Deconstruct Tin** displays the **Deconstruct Tin** panel



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

Field Description	Type	Defaults	Pop-Up
Clean models	tick box		

*If **ticked**, all the models referred to in the panel are cleaned before processing occurs.*

Triangles

Get triangles	tick box		

*If **ticked**, a closed super string is created for each of the non-null triangles in the tin.*

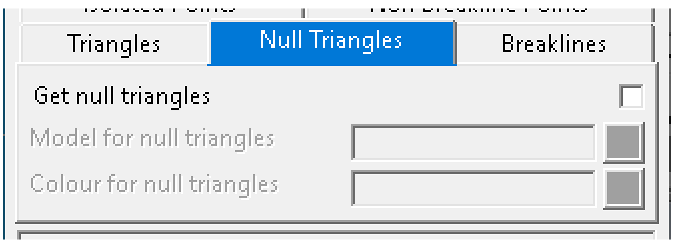
Model for non-null triangles	model box		available models

Model for the super strings of non-null triangles.

Colour for non-null triangles	colour box		available colours

Colour for the super strings of non-null triangles.

Null Triangles



Get null triangles	tick box		

*If **ticked**, a closed super string is created for each of the null triangles in the tin.*

Model for null triangles	model box		available models

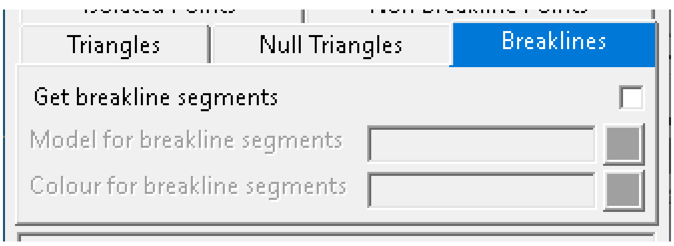
Model for the super strings of null triangles.

Colour for null triangles	colour box		available colours

Colour for the super strings of null triangles.

Breaklines

Null Triangles



Get breakline segments	tick box		

*If **ticked**, a super string segment is created for each edge of a triangle in the tin that is flagged as being a breakline edge.*

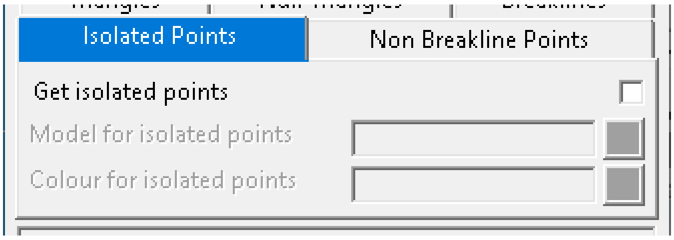
Model for breakline segments	model box		available models

Model for the breakline segments.

Colour for breakline segments	colour box		available colours

Colour for the breakline segments.

Isolated Points



Get tin points tick box

*If **ticked**, a super string point is created for each vertex of a null triangle that is NOT part of any non-null triangle. That is, the vertex is only a vertex of null triangles.*

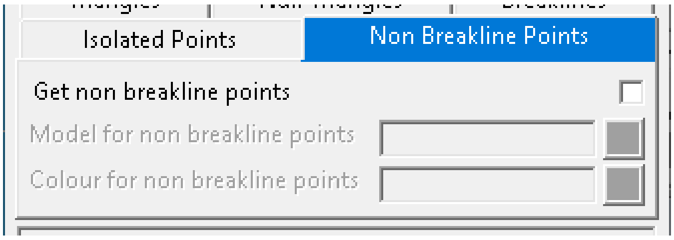
Model for isolated points model box available models

Model for the isolated points.

Colour for isolated points colour box available colours

Colour for the isolated points.

Non-Breakline Points



Get tin points tick box

*If **ticked**, a super string point is created for each vertex of a non-null triangle that is NOT part of a breakline edge.*

Model for non-breakline points model box available models

Model for the non-breakline points.

Colour for non breakline points colour box available colours

Colour for the non-breakline points.

Button at bottom

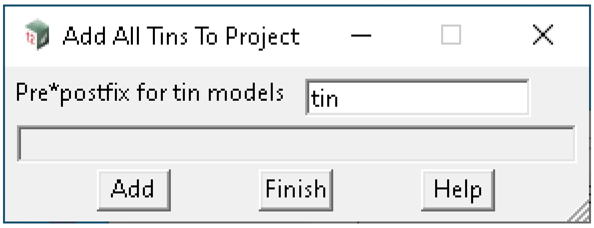
Process button

Run the option.

14.2 Adding Removed Tins

Also updated in V15 Reference manual.

Pre*postfix filed added that is used to create the models for the added tins.



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

Field Description	Type	Defaults	Pop-Up
Pre*postfix for tins modelst	text box		

*If **blank**, tins added to the project are not added to any model.*
*If **non blank**, for each tin added to the project, the tin is added to the model based on the tin name.*

*So if the value is "Fred * Joe" and the tin name is "Bob", the tin "Bob" is added to the model "Fred Bob Joe".*

Note:
the initial value of the field comes from the environment variable MODEL_FOR_TIN_PREFIX_4D.

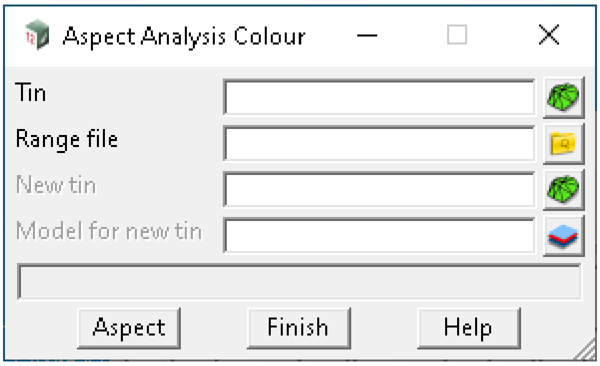
14.3 Tin Aspect Colouring

Position of option on menu: **Tin =>Colour =>Aspect colouring**

Now documented In the v15 reference manual

The **aspect colouring** option has been enhanced so that rather than colouring the selected tin, a new tin can be created and coloured.

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	tin box		available tins

Name of the tin for which the aspects of the triangles will be calculated and either this tin or New tin is coloured.

Range file	aspect range file box		*.arf

The user supplied range file is used to give the colour ranges for aspects to use to colour the triangles.

New tin	tin box		available tins

*If **not blank**, a new tin of this name is created and it is this new tin that is coloured.*
*If **blank**, the tin given in **Tin** is coloured.*

Model for new tin	tin box		available tins

*If **not blank** and a new Tin is created, the new tin is added to this model.*
*If **blank** and a new Tin is to be created then the option won't run.*

Buttons on bottom

Aspect	button		

On selecting this button, the aspects of the triangles of the tin are calculated and the triangle coloured according to the range file.

<esc> can be used to terminate the option during aspect calculations.

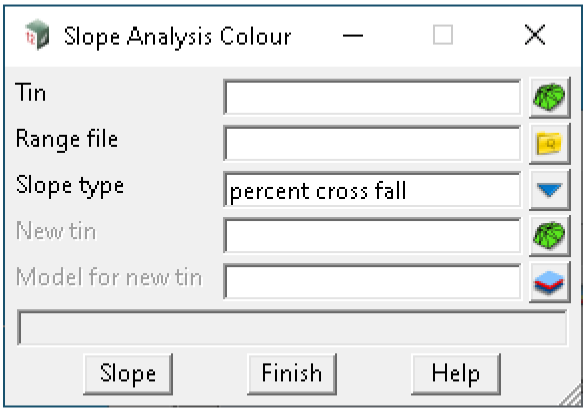
14.4 Tin Slope Colouring

Position of option on menu: **Tin =>Colour =>Slope colouring**

Now documented In the v15 reference manual

The **slope colouring** option has been enhanced so that rather than colouring the selected tin, a new tin can be created and coloured.

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	tin box		available tins

Name of the tin for which the slope of the triangles will be calculated and either this tin or ***New tin*** *is coloured.*

Range file	slope range file		*.srf

The user supplied range file is used to give the colour ranges for slopes to use to colour the triangles.

Slope type	input	percent cross fall	percent cross fall, degrees, 1v in

The units used for slope in the range file.

New tin	tin box		available tins

If ***not blank****, a new tin of this name is created and it is this new tin that is coloured.*

If ***blank****, the tin given in* ***Tin*** *is coloured.*

Model for new tin	model box		available tins

If ***not blank*** *and a new Tin is created, the new tin is added to this model.*

If ***blank*** *and a new Tin is to be created then the option won't run.*

Buttons on bottom

Slope	button		

On selecting this button, the slopes of the triangles of the tin are calculated and coloured according to the slope range file.

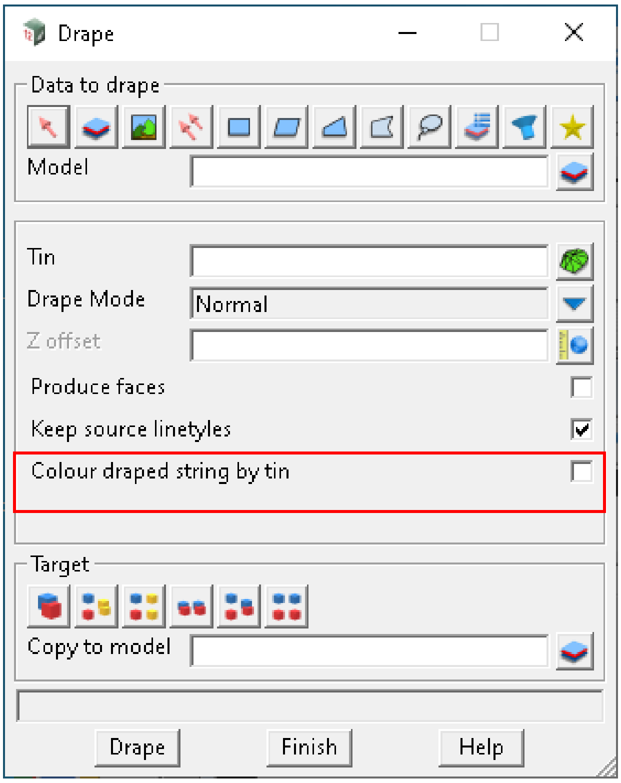
<esc> can be used to terminate the option during aspect calculations.

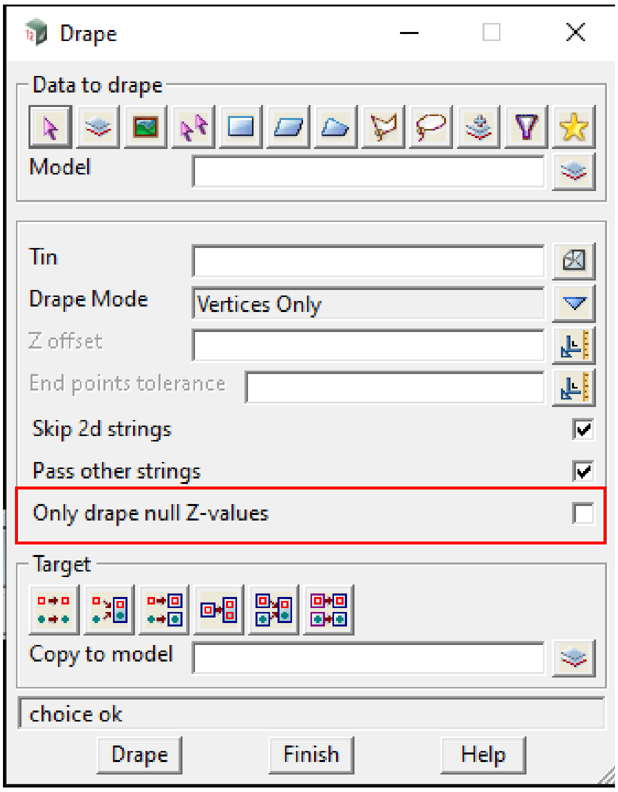
14.5 Drape Strings

Position of option on menu: **Tin =>Drape =>Drape**

Now documented In the v15 reference manual

Selecting **Drape** displays the **Drape** panel.





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

Field Description	Type	Defaults	Pop-Up

If *Drape mode* is Normal

Colour draped string by tin tick box not ticked

*If **ticked**, each segment of draped string is given the colour of the triangle that it is on.*

If *Drape mode* is Vertices Only

Only drape null Z-values tick box not ticked

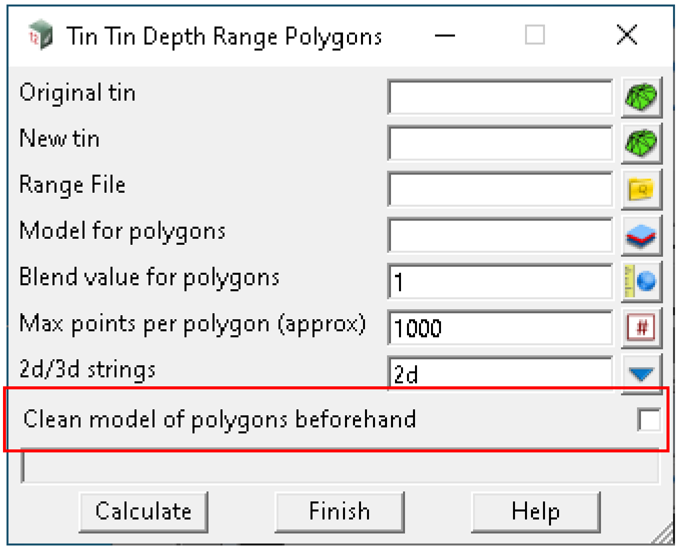
*If **ticked**, the panel will still include entire data source but only vertices with null Z-values will be draped. Non-null vertices remain unchanged.*

14.6 Depth Range Polygons

Position of option on menu: **Tin =>Tin analysis =>Depth range polygons**

Now documented In the v15 reference manual

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
Clean model of polygons beforehand	tick box	not ticked	

*If **ticked**, the model will be clean before drawing a new polygon. If the model is locked, error will appears preventing the cleaning model and drawing polygons action from proceeding.*

14.7 Label Flow Arrow

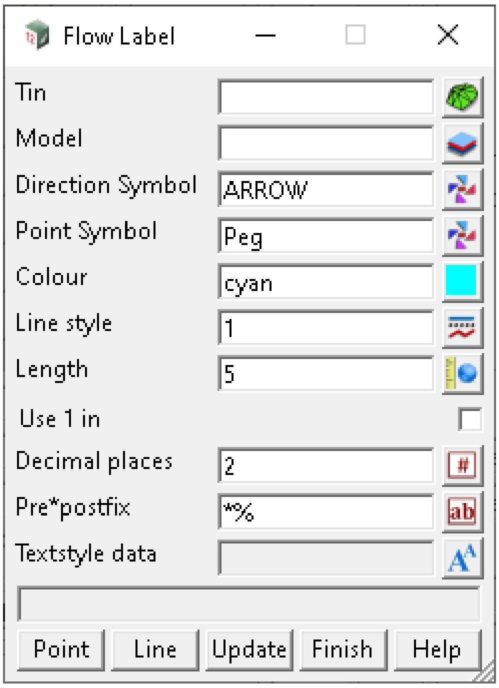
Position of option on menu: Tin =>Tin analysis =>Label flow arrow

Now documented In the v15 reference manual

The Label flow arrows option draws arrows and labels the grade indicating the flow direction across triangles of the tin selected.

The flow arrows are only drawn at a selected "Point", or the user can draw a "Line" (nominate two points) to nominate the labelling locations.

On selecting the **Label flow arrows** option, the **Flow label** 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

Name of the tin to calculate flow arrows label values.

Model	model box		available models

Model name of the produced arrows and labels. Must not be blank.

Direction Symbol	symbol box		available symbols

Symbol name of the produced arrow (at the end of the line) to indicate the direction of slope or crossfall.

Point Symbol	symbol box		available symbols

Symbol name at the selected coordinate if the user selects the "Point" method to label the tin. The label and line produced indicate the direction of slope or crossfall at the point.

If you don't wish for a "peg", "cross" or other symbol to be displayed at the coordinate selected, place the number "0" in the field and no symbol will be applied.

Colour	colour box	cyan	available colours

The colour selected is used for the symbols and line work at all locations using either the "point" or "line" method.

Linestyle	linestyle box	1	available linestyles

The line style selected is used for the line produced to indicate the direction of slope or crossfall.

Length	measure box	5	length value

Is the length of the line produced to indicate the direction of slope or crossfall. Some though should be given to plotting size as the length is in world units and will not scale given changes to plotting scale. This field cannot be left blank.

Use 1 in	tick box	not ticked	

When not ticked (default) the text label value for the slope/crossfall will be calculated and display as a percentage (%). If ticked, the text label value will be calculated and displayed as a 1v / ?? h value.

Decimal places	number box	2	

The number of decimal places to be displayed for the text label produced when calculated. This field cannot be blank.

Pre*postfix	text box	*%	

When displaying the text label calculated as either a percentage % or a 1 in value. The user can add additional pre or post text information to the value and have this displayed in the label.

Textstyle data	textstyle data box		available textstyles

The user must select a textstyle to be used to label the slope or grade at the point or line as nominated. The usual edits to font, colour, height, offset etc can all be further set as per the standard 12d textstyle settings. This field cannot be left blank.

Buttons on Bottom

Point	button

*After selecting **Point**, a flow arrow is drawn at each selected point (x,y) location in a plan view. This continues until cancel is selected from the menu or the user "Esc" the command.*

Line	button

After selecting the Line option, the user is required to select two points (x,y) locations in a plan view. Between these two points a line with the arrow will be drawn and the grade labelled from the heights of the tin calculated from either end of the line.

Update	button

When the Flow labels are first produced (for both Point and Line methods) an attribute is stored on the elements produced. When the "Update" button is selected the Model (as selected within the panel) containing any labels is recalculated against the tin selected and grade information will be updated if the levels or grades of the surface have been changed.

15 Survey

There has been changes to the **Survey** chapter in the ***12d Model Reference manual***.

The section 25 12d Survey Guide has been totally rewritten for V15.

The format of the ***12dfield*** file, as well the ***fld*** file, is now included in the chapter 26 12d Field File Format.

The section 27 Geodetics Summary has been substantially updated for V15.

The **Survey** menu in the ***Classic*** Theme is:

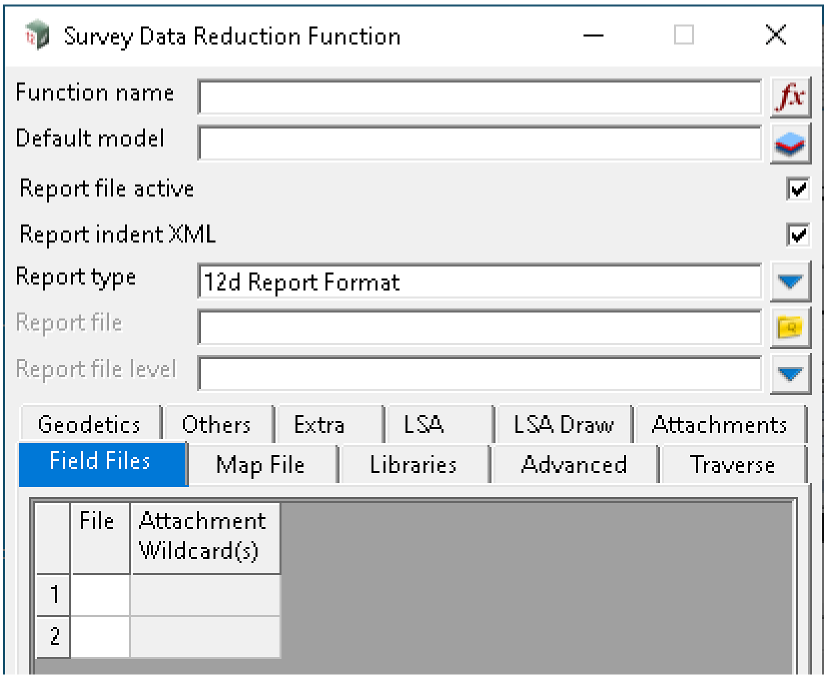
See

See

15.1 Reduction Quick Start and Config Start

Now documented in the V15 reference manual

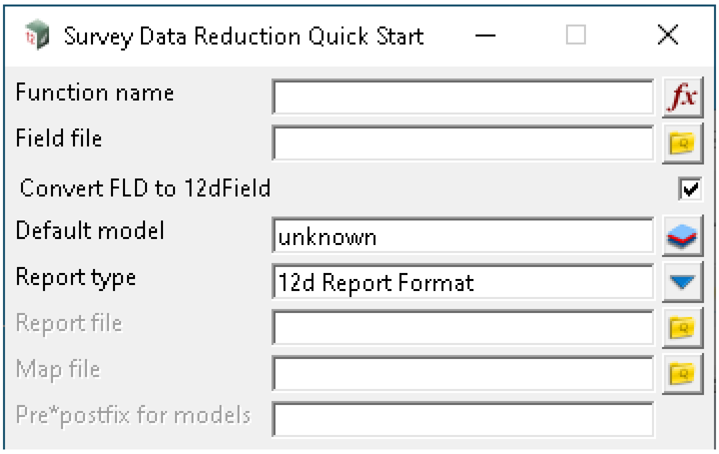
For ***12d Model 14***, the **Field file** option for reducing survey data brings up the **Survey Data Reduction Function** panel which has tabs for **all** the possible settings that a user could use in a reduction.



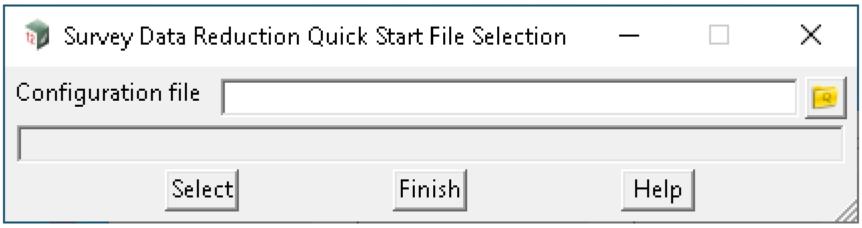
In ***12d Model 15***, a SDR configuration file (.12d_sdr_config) can be used to supply in advance many of the answers and reduce the amount of information displayed.

There are two options that use the ***12d_sdr_config*** file, ***Quick start*** and ***Config Start.***

Quick Start brings up the **Survey Data Reduction Quick Start** panel using the config file ***default.12d_sdr_config***:



Config Start brings up the **Survey Data Reduction Quick Start File Selection** panel:



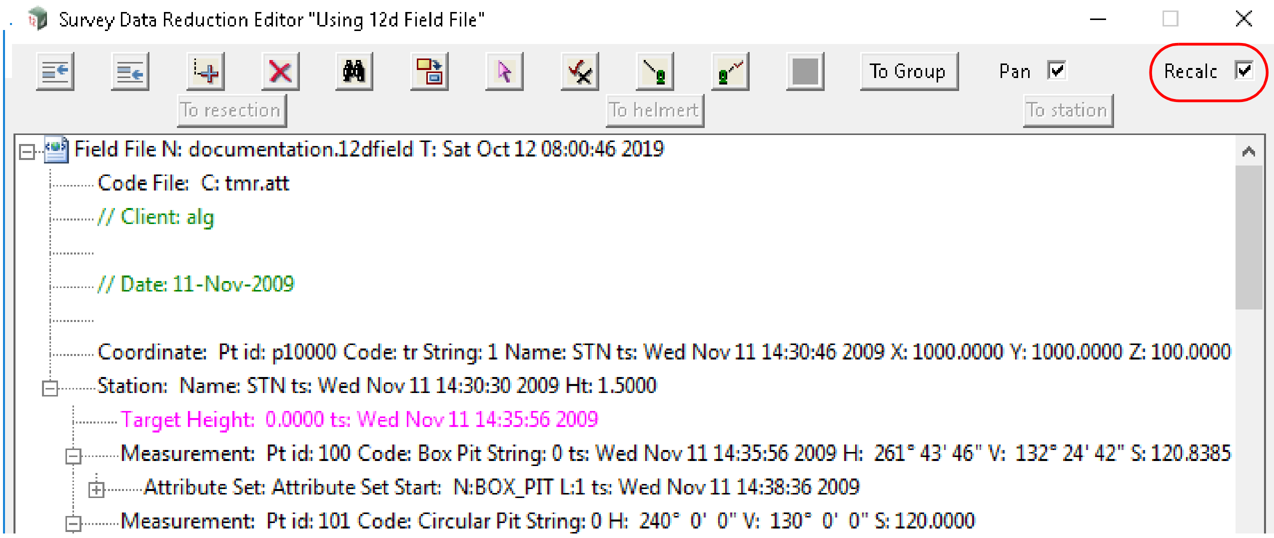
A ***12d_sdr_config*** file is then selected using the **Configuration file** pop-up and when **Select** is pressed, the **Survey Data Reduction Quick Start** panel is brought up using the selected config file.

15.2 Recalc Tick on Survey Data Reduction Editor

Now documented In the v15 reference manual

The **Survey Data Reduction Editor** is used to edit the field data commands in a ***Survey Data Reduction Function*** that has been created from ***12d Field Pickup*** or a ***12dfield*** file (not a ***fld*** file).

A ***Recalc*** tick box has been added to the top of the **Survey Data Reduction Editor**.



In V14, when a change was made to the field data commands in the **Survey Data Reduction Editor**, the associated ***SDR Function*** automatically recalcs so that effect of the edit can be immediately seen and checked.

For ***V15***, with the ***Recalc*** box, when changes are made and the ***Recalc*** tick box is ***ticked***, the ***SDR Function*** automatically recalcs.

However if changes are made and the ***Recalc*** tick box is ***not ticked***, the ***SDR Function*** does **not** automatically recalc.

15.3 Height Adjustment

Position of option on menu: **Survey =>Adjustments =>Height adjustment**

Now documented In the v15 reference manual

GSB file has been added to the adjust method choice box options.

Add value to height and **Subtract value from height** have been added to the following adjust method options:

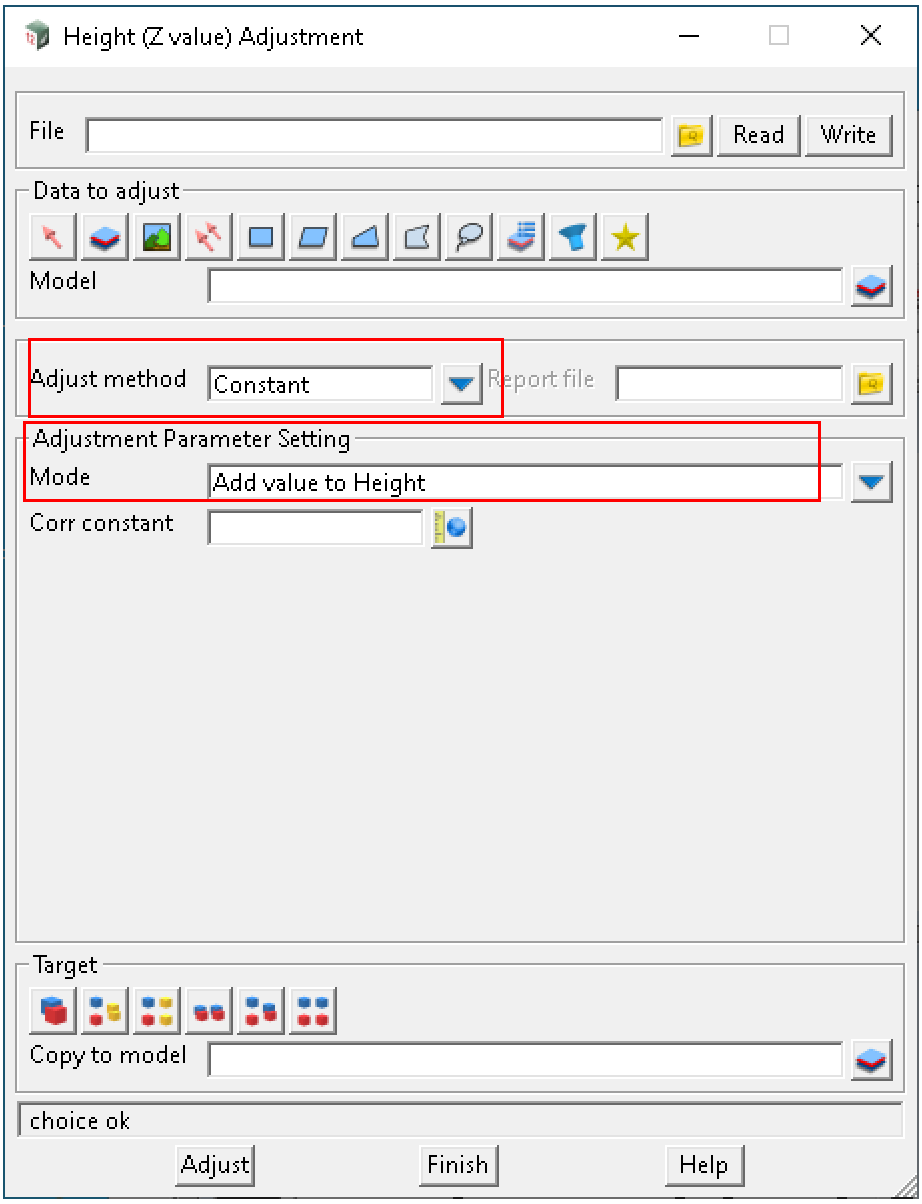
Constant adjustment method

Plane parameters adjustment method

Plane by points adjustment method

GSB file

Selecting **Height adjustment** brings up the **Height (Z value) Adjustment** panel



Adjustment Parameter Setting

Add value to height radio box ticked

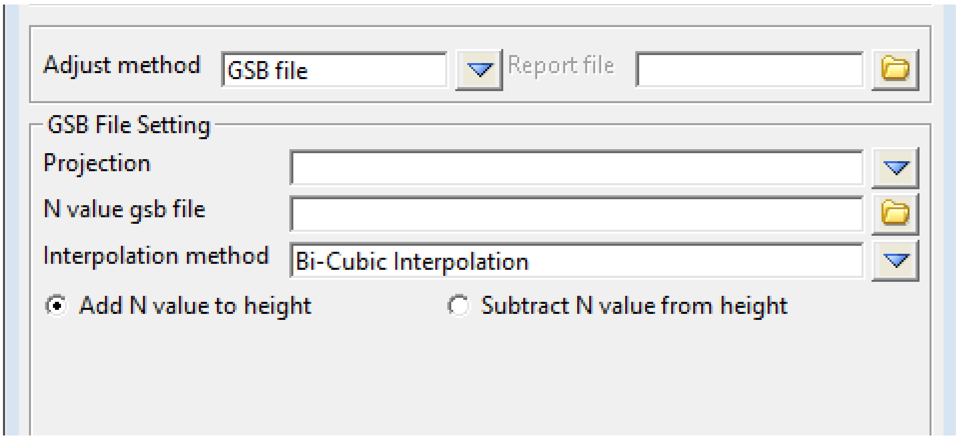
*if **ticked**, the **Corr constant** will be added to element's Z value.*

Subtract value from height radio box unticked

*if **ticked**, the **Corr constant** will be subtracted from element's Z value.*

GSB file adjustment method

This option allows a GSB file to be used to collect the N value based on the coordinate of each element in the data source. The N value can then be added to or subtracted from the height of each element from the data source.



Field Description	Type	Defaults	Pop-Up
Projection	projection box		all projection data

Projection is used to determine the Lat/Long values from Element coordinates (Assuming they are in Easting/Northing).

N value GSB File	file box		

GSB file to extract N values at the element coordinates.

Interpolation method	choice box		Bi-Cubic Interpolation Bi-Linear Interpolation

*If **Bi-Linear** is chosen, the calculation is done on 4 points around each element coordinate.*

*If **Bi-Cubic** is chosen, the calculation is done on 16 points around each element coordinate.*

Add N value to height	radio button	ticked	

*If **ticked**, the N value is added to the element's Z value.*

Subtract N value from height	radio button	un-ticked	

*If **ticked**, the N value is subtracted from the element's Z value.*

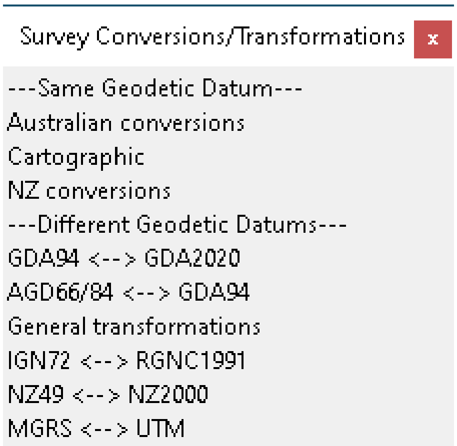
15.4 Conversions/Transformations

Now documented In the v15 reference manual

The name of the **Survey Conversions** menu has been changed to **Survey Conversions/ Transformation** and the wording **Same Ellipsoid** and **Different Ellipsoid** on the panel have been changed to **Same Geodetic Datum** and **Different Geodetic Datums**.

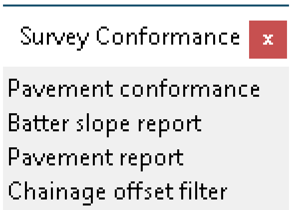
This is to reflect the fact that although two geodetic datums may have the same ellipsoid (eg GRS80), they are different geodetic datums and a cartographic conversion can not be used to go between a projections on one geodetic datum to projections on the other different geodetic datum.

For example, GDA94 and GDA2020 have the same ellipsoid but the coordinates are defined to be where the positions on the earth are at the different epochs 1st January 1994 and 1st January 2020.



See

15.5 Conformance



See

15.5.1 Pavement Conformance

15.5.2 Chainage Offset Filter

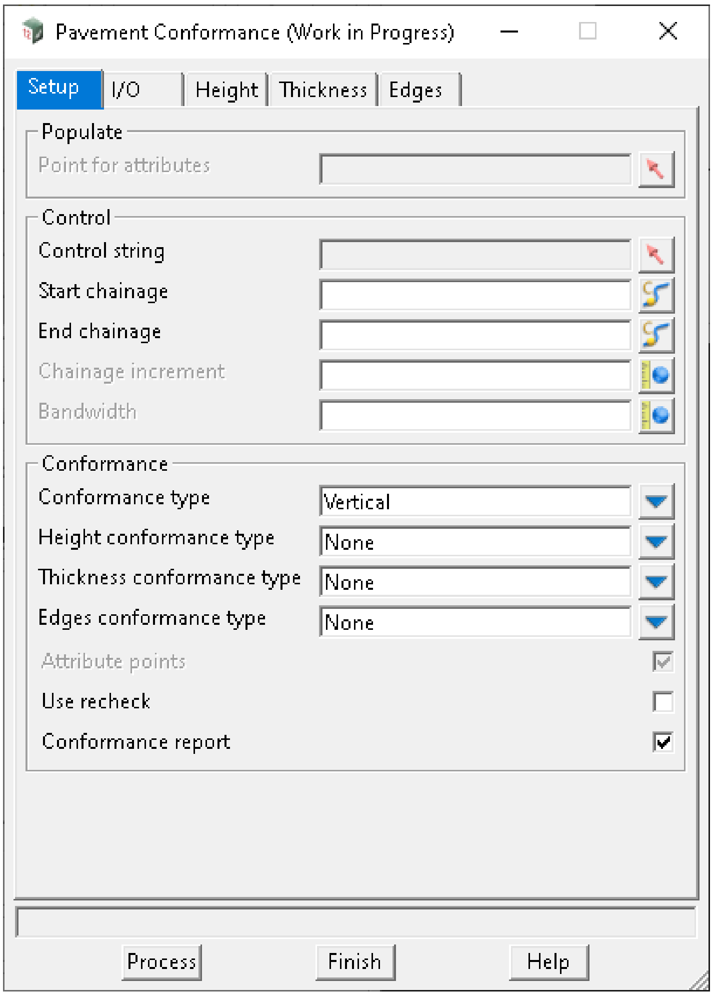
15.5.1 Pavement Conformance

Position on menu: **Survey =>Conformance =>Pavement conformance**

Now documented In the v15 reference manual

This panel has the inputs of a control string, survey points and (string/s or surface/s) to conform to. There are three different types of conformances that can be applied to the survey points. The conformance types are the Height conformance, the **Thickness conformance** and the **Horizontal conformance**. Each conformance type has its own respective tab that is dynamically populated based on the corresponding choice box on the Setup tab. When the Process button is pressed the panel will by default attribute the survey points with ***12d Field*** data and output an XML report with optionally another report type if an XSLT is provided.

Selecting **Pavement conformance** brings up the **Pavement Conformance Panel**



Setup Tab
I/O Tab
Height Tab
Thickness Tab
Edges Tab

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

Field Description	Type	Defaults	Pop-Up

Setup Tab

Populate

Point for attributes select box

*The point that is used to populate the panel with **12d Field** attribute data.*

Control

Control string select box

The control string that all chainage and offset calculations will be relative to.

Start chainage chainage box start chainage of control string

If the chainage of a given point dropped to the control string is less than the Start chainage then that point is not included in the report and will not be attributed.

End chainage chainage box end chainage of control string

If the chainage of a given point dropped to the control string is greater than the End chainage then that point is not included in the report and will not be attributed.

Chainage increment real box

The interval distance that the bandwidth is applied to.

Bandwidth real box

If a point chainage is not within bandwidth/2 on the left and right of an interval chainage the point is not included in the report and will not be attributed.

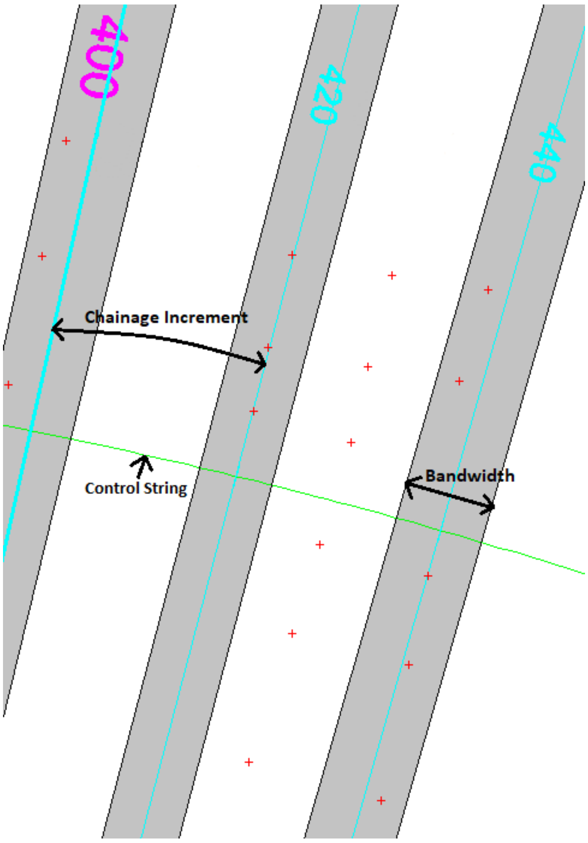
If the following equalities are not true for a point chainage the point is not included in the report and will not be attributed:

$$(1) \rightarrow start\_ch + N \times \left(ch\_inc - \frac{band}{2}\right) \leq point\_ch \leq start\_ch + N \times \left(ch\_inc - \frac{band}{2}\right)$$

$Where\ N\ is\ any\ integer$

$$(2) \rightarrow start\_ch \leq point\_ch \leq end\_ch$$

This is represented is the following diagram:



Conformance

Conformance type	choice box	vertical	Vertical, Perpendicular

*If **Vertical**, when a given point is dropped to a surface for calculation it is a 2d drop where the x & y coordinates of the point retain the same value after the drop.*

*If **Perpendicular**, when a given point is dropped to a surface for calculation it is a 3d drop where the point is dropped normal to the surface.*

Height conformance type	choice box	None	None, Height, Tin, 2 strings/edges, Crown, 2 polymesh named edges Polymesh, Polyface, Points xy&z

Types of Height conformances to populate Height tab.

For more information on Height conformances see Height tab

Thickness conformance type	choice box	None	None, Height, Tin, Polymesh, Polyface, Points

Types of Thickness conformances to populate Thickness tab.

For more information on Thickness conformances see Thickness tab.

Edges Conformance type	choice box	None	None 1 string/edge 2 strings/edges 1 polymesh named edge 2 polymesh named edges

Types of Edges conformances to populate Edges tab.

For more information on Edges conformances see Edges tab

Attribute points tick box ticked

*If **ticked**, 12d **Field** attributes will be generated for all processed points*

*If **unticked**, attributes on processed points will stay unchanged unless Use recheck is ticked.*

Use recheck tick box not ticked

*If **ticked**, display the Recheck points group on the I/O tab.*

*If **unticked**, hide the Recheck points group on the I/O tab.*

For more information on Recheck points see Recheck points

Conformance report tick box ticked

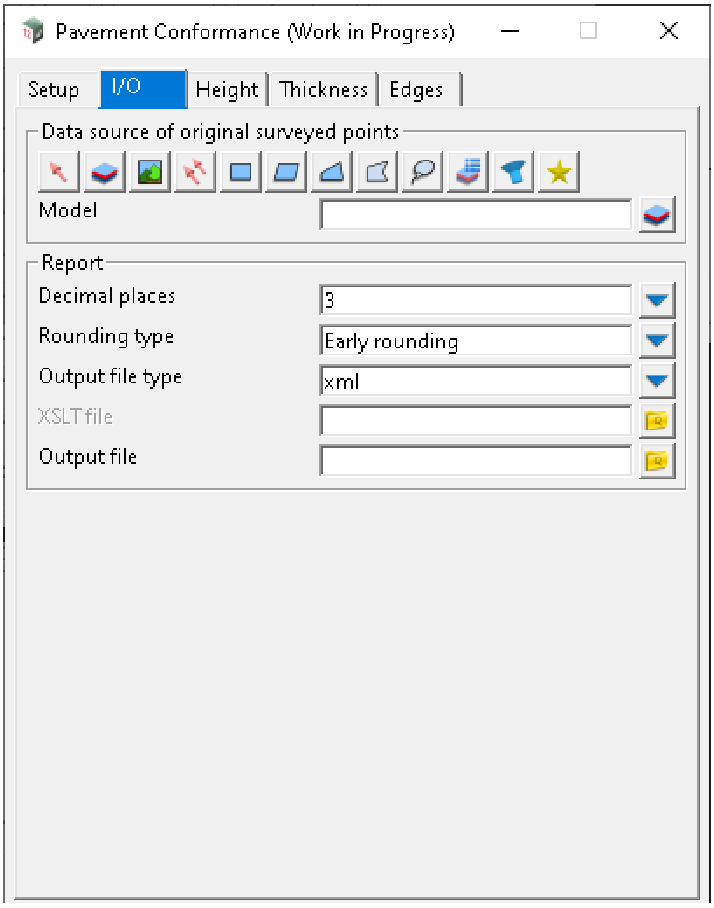
*If **ticked**, display the Report group on the I/O tab.*

*If **unticked**, hide the Report group on the I/O tab.*

For more information on Report see Report

I/O Tab

***Note**: to see this configuration of the I/O tab the Use recheck and Conformance report tick boxes must be both be checked.*



Setup Tab
I/O Tab
Height Tab
Thickness Tab
Edges Tab

Data source of original surveyed points source box model

The points to be conformed against the string/s or surface/s from the Height, Thickness and Edges tabs.

For a full description go to 4.24.3 Data Source.

Recheck points

Data source of recheck surveyed points source box model

The points that will be compared against each original surveyed point to perform a recheck.

For a full description go to 4.24.3 Data Source.

Radius tolerance real box

If a recheck point lies within the Radius tolerance of an original surveyed point, the recheck point will replace the original surveyed point. All attributes of the original point are moved to an attribute group named "Original_Points".

Target output target output Move to original model/s
Copy to one model

How the recheck points merge with the original surveyed points. The recheck points will remain constant.

*If **Move to original model/s**, a given original survey point will be replaced with the recheck point if the points are within the Radius tolerance of each other.*

*If **Copy to one model**, all original survey points will be copied to a new model. A given survey point in the new model will be replaced with the recheck point if the points are within the Radius tolerance of each other.*

For a full description go to 4.24.4 Data Target.

Clean output model tick box not ticked

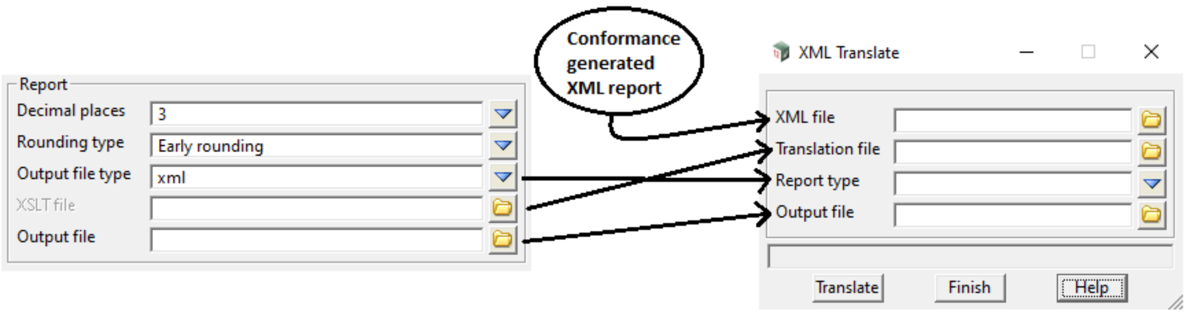
***Note**: This box is only enabled if the Target output mode is set to Copy to one model.*

*If **ticked**, clean the model before the original survey points are copied to the model.*

*If **unticked**, copy the original survey points to the model regardless of whether there is existing.*

Report

*This panel uses Report =>Utilities =>XML translate to produce the **Output report file** via a provided XSLT from the basic XML report that is always produced if the **Conformance report** box is **ticked**.*



For more information see 28.9.2 XML Translate.

Decimal places choice box 3 0, 1, 2, 3, 4, 5, 6

*The number of decimal places to be outputted to the XML report for all **Real** type numbers.*

Rounding type choice box Early rounding Early rounding
Late rounding

*If **Early rounding**, the input data will be rounded before internal calculations are performed. This will result in a report where all the numbers look visually correct.*

*If **Late rounding**, the input data will be rounded after internal calculations are performed. The report* *numbers produced by Late rounding are more accurate than Early rounding however these numbers may appear visually incorrect due to the limitations of floating point numbers on computers.*

Output file type	choice box	xml	xml, htm, pdf, txt, csv, rpt

The name of the outputted report file.

XSLT file	file box		*.xslt files

Note*: If the Output file type is not xml, txt or csv then the XSLT file is not optional.*

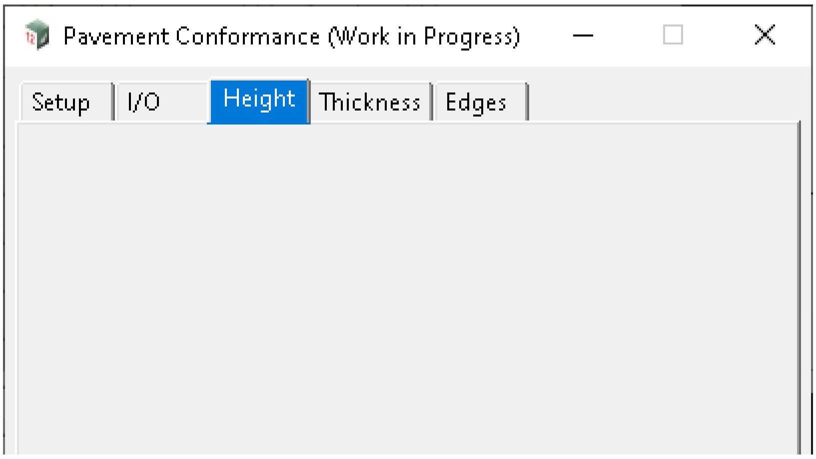
If ***blank****, use the default XSLT for the given Output file type.*

If ***not blank****, use the given XSLT that must be compatible with the Output file type.*

Output file	file box	*.(output file type)	file directory

The name of the outputted report file.

Height Tab



Setup Tab
I/O Tab
Height Tab
Thickness Tab
Edges Tab

See Common height widgets.

See Height.

See Tin.

See 2 strings/edges.

See Crown.

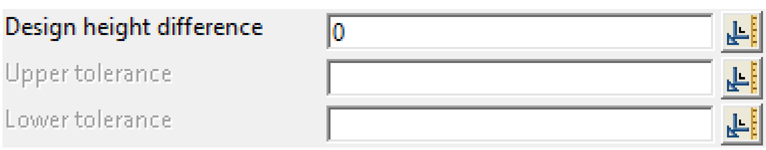
See 2 polymesh named edges.

See Polymesh.

See Polyface.

See Points XY & Z.

Common height widgets



Design height difference	real box	0

An adjustment to all height conformance numbers.

Upper tolerance real box

An upper tolerance of how far above a given point can deviate from the design surface.

If left blank, there is no upper limit to any deviation from the design surface.

Lower tolerance real box

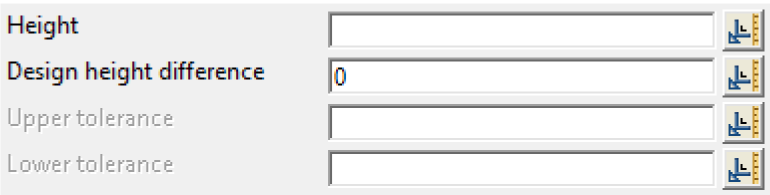
A lower tolerance of how far below a given point can deviate from the design surface.

If left blank, there is no lower limit to any deviation from the design surface.

None

A blank page is displayed, and no height conformance data is outputted.

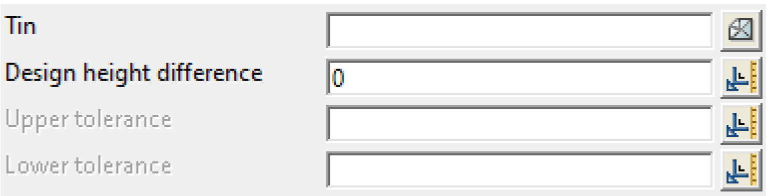
Height



All points will be conformed against a constant z value.

For more information on the other widgets, see Common height widgets.

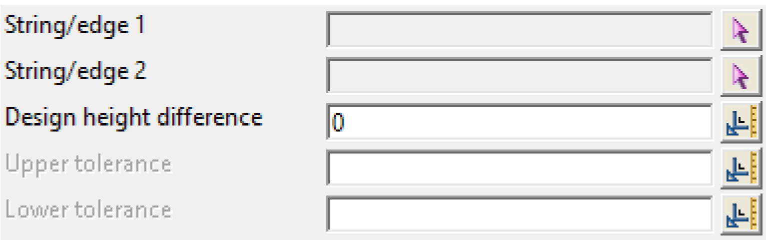
Tin



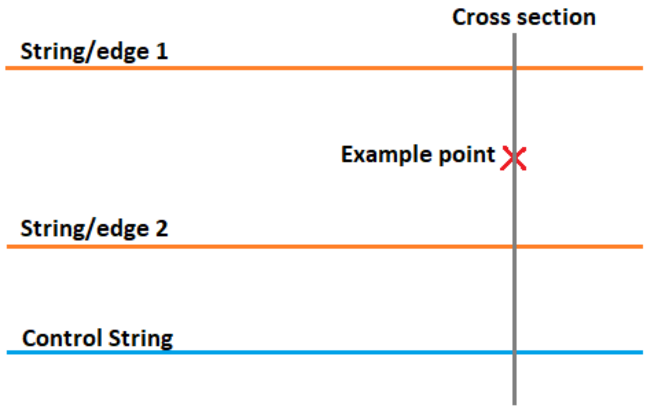
All points will be conformed against a tin surface.

For more information on the other widgets, see Common height widgets.

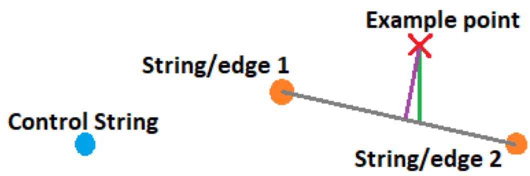
2 strings/edges



Plan View:



Cross section view:



Note: The green line represents the 2d drop, the purple line represents the 3d drop determined by the option chosen in the Conformance type choice box on the Setup tab.

String/edge 1 select box

Edge of surface that points are conformed against.

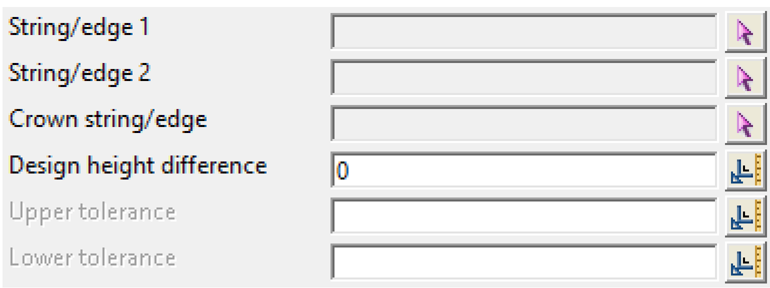
String/edge 2 select box

Edge of surface that points are conformed against.

For more information on the other widgets, see Common height widgets.

Crown

Note: This is conceptually a highly similar conformance to the 2 strings/edges.



String/edge 1 select box

Edge of surface that points are conformed against.

String/edge 2 select box

Edge of surface that points are conformed against.

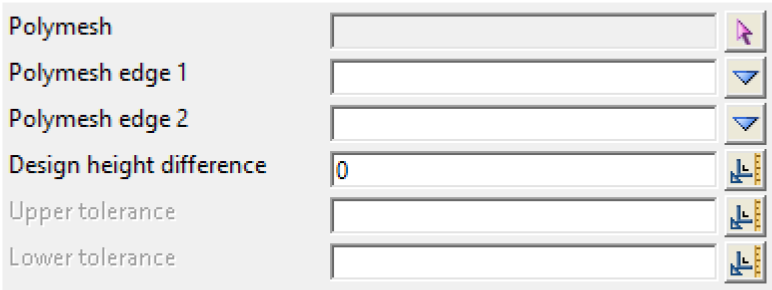
Crown string/edge select box

Crown edge of surface that points are conformed against.

For more information on the other widgets, see [Common height widgets](#).

2 polymesh named edges

Note*: This is conceptually a highly similar conformance to the* [2 strings/edges](#).



Polymesh select box

The polymesh from which the polymesh edge choice boxes are populated from.

Polymesh edge 1 choice box Selected polymesh’s edges

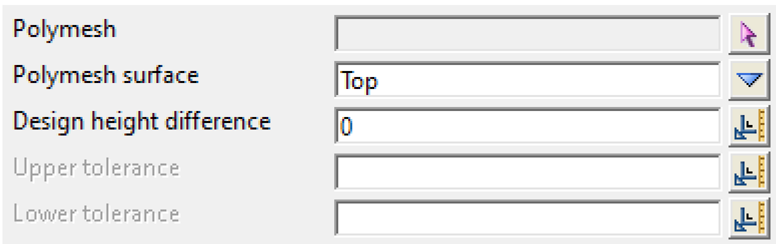
Polymesh edge of surface that points are conformed against.

Polymesh edge 2 choice box Selected polymesh’s edges

Polymesh edge of surface that points are conformed against.

For more information on the other widgets, see [Common height widgets](#).

Polymesh



Polymesh select box

All points will be conformed against a polymesh.

Polymesh surface choice box Top Top, Bottom

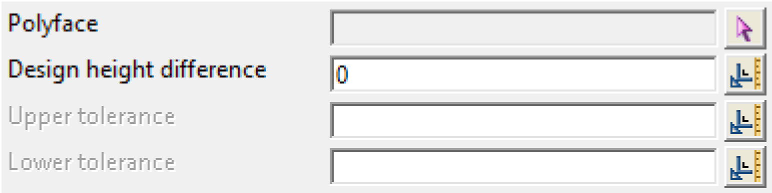
This choice box is important when a given point is dropped to the polymesh and there is more than one valid surface the point can be dropped to.

Top*, corresponds to the nearest drop to the polymesh surface.*

Bottom *corresponds to the furthest drop to the polymesh surface.*

For more information on the other widgets, see [Common height widgets](#).

Polyface



Polyface select box

All points will be conformed against a polyface.

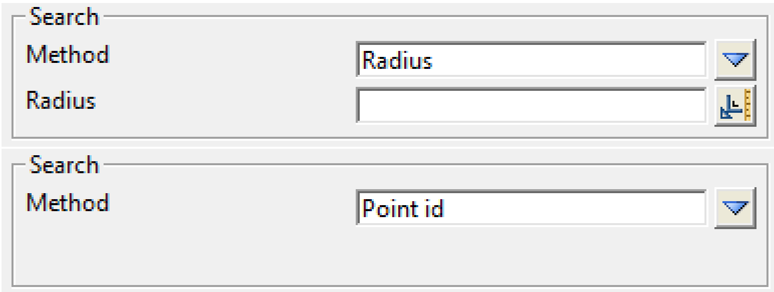
For more information on the other widgets, see Common height widgets.

Points XY & Z

Data source of points source box model

The points that the original surveyed points will be conformed against.

For a full description go to 4.24.3 Data Source.



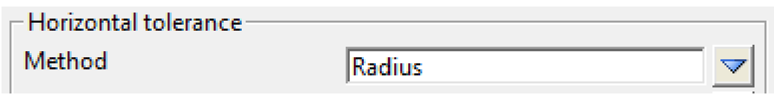
Method choice box Radius Radius, Point id

*If **Radius**, each point will be compared against each original survey point. If any pair of points is within the radius of each other then the original survey point will become a candidate for the conformance.*

*If **Point id**, match the point ids of the points against the point ids original survey points. If there is a match, then the original survey point will become a candidate for the conformance.*

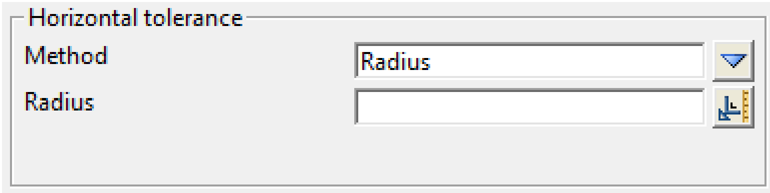
Radius real box

The original survey point will be included in the conformance if it falls within the Radius of the other point.



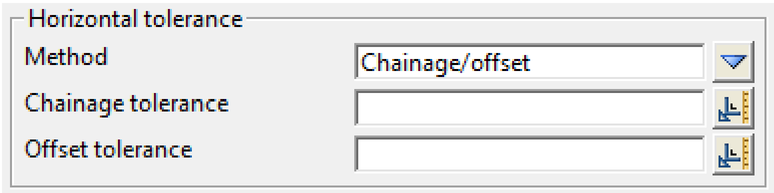
Method choice box Radius Radius, Chainage/offset, X/Y

Types of horizontal tolerancing methods original survey points accepted for conformance.



Radius real box

The original survey point will be within horizontal tolerance if it falls within the Radius of the other point.

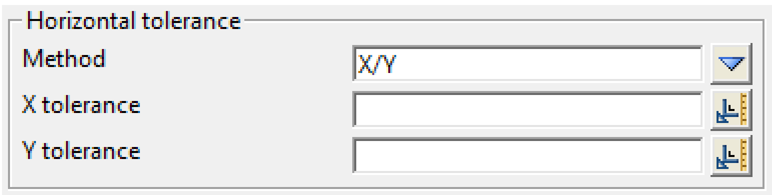


Chainage tolerance real box

The original survey point will not be within the horizontal tolerance if it's chainage falls outside ± the Chainage tolerance of the chainage of the other point.

Offset tolerance real box

The original survey point will not be within the horizontal tolerance if it's offset falls outside ± the Offset tolerance of the offset of the other point.

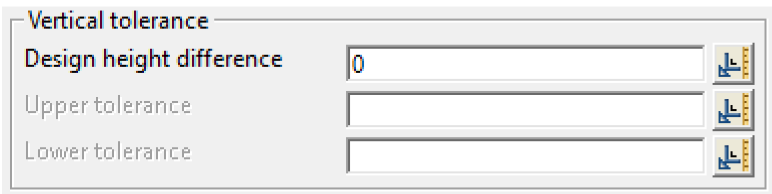


X tolerance real box

The original survey point will not be within the horizontal tolerance if it's x-coordinate falls outside ± the X tolerance of the x-coordinate of the other point.

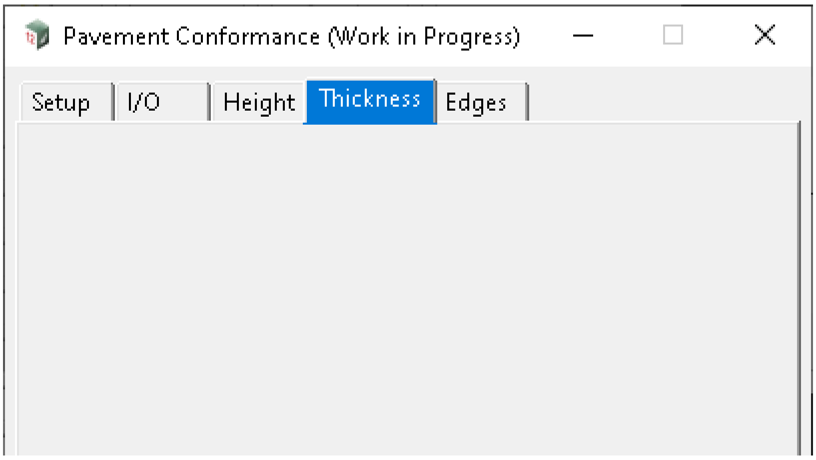
Y tolerance real box

The original survey point will not be within the horizontal tolerance if it's y-coordinate falls outside ± the Y tolerance of the y-coordinate of the other point.



For more information on the other widgets, see Common height widgets.

Thickness Tab



Setup Tab
I/O Tab
Height Tab
Thickness Tab
Edges Tab

See Common thickness widgets.

See Height.

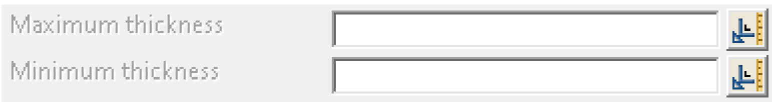
See Tin.

See Polymesh.

See Polyface.

See Points.

Common thickness widgets



Maximum thickness real box

An upper tolerance of how far above a given point can deviate from the design surface.

If left blank, there is no upper limit to any deviation from the design surface.

Minimum thickness real box

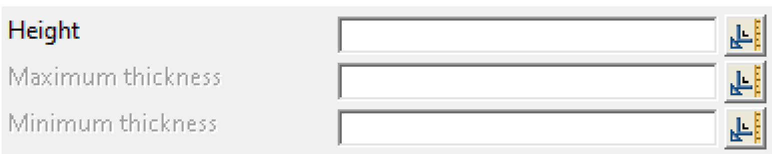
A lower tolerance of how far below a given point can deviate from the design surface.

If left blank, there is no lower limit to any deviation from the design surface.

None

*A blank page is displayed, and no **thickness conformance** data is outputted.*

Height

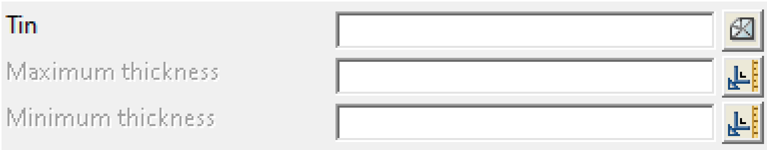


Height real box

All points will be conformed against a constant z value.

For more information on the other widgets, see [Common thickness widgets](#).

Tin

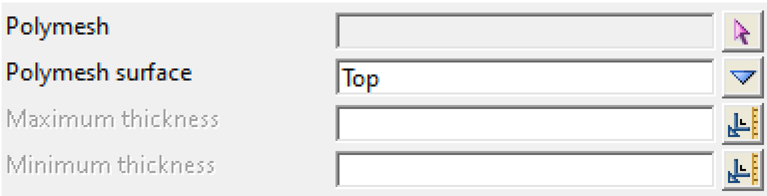


Tin tin box

All points will be conformed against a tin surface.

For more information on the other widgets, see [Common thickness widgets](#).

Polymesh



Polymesh select box

All points will be conformed against a polymesh.

Polymesh surface choice box Top Top, Bottom

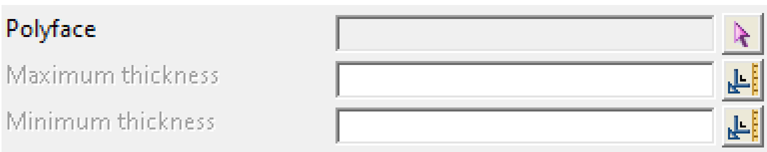
This choice box is important when a given point is dropped to the polymesh and there is more than one valid surface the point can be dropped to.

Top*, corresponds to the nearest drop to the polymesh surface.*

Bottom*. corresponds to the furthest drop to the polymesh surface.*

For more information on the other widgets, see [Common thickness widgets](#).

Polyface



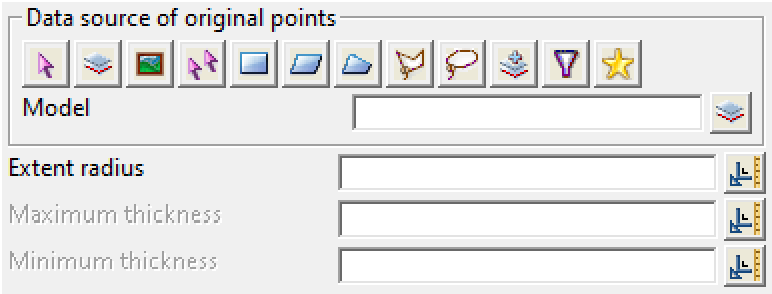
Polyface select box

All points will be conformed against a polyface.

For more information on the other widgets, see [Common thickness widgets](#).

Points

Note*: Thicknesses are calculated here as: (Design - Original) - (Design - Survey)*



Data source of original points source box model

Points that will be compared against the survey points.

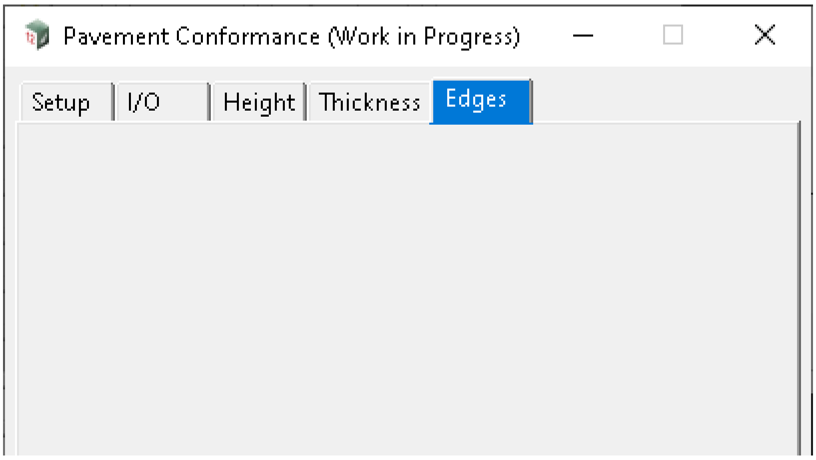
For a full description go to 4.24.3 Data Source.

Extent radius real box

If the surveyed point is within the Extent radius of the original point, then the survey point will become a candidate for the conformance.

For more information on the other widgets, see Common thickness widgets.

Edges Tab



Setup Tab
I/O Tab
Height Tab
Thickness Tab
Edges Tab

See Common edges widgets.

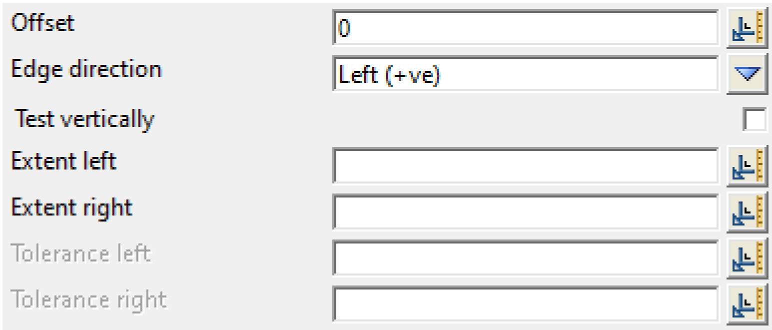
See 1 string/edge.

See 2 strings/edges.

See 1 polymesh named edge.

See 2 polymesh named edges.

Common edges widgets

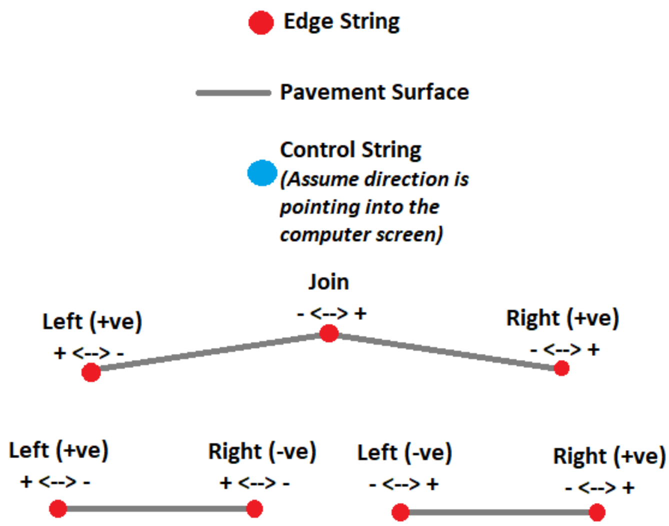


Offset real box

Calculation when an edge conformance is run will have their offset shifted by this value.

Edge direction choice box Left or Right (+ve) Left (+ve), Join Right (+ve), Left (-ve), Right (-ve)

Determines how the edge difference calculations will be plus or minus signed on the report and attributes for a given edge string.



Test vertically tick box not ticked

*If **ticked**, vertical conformances such as the **Height conformance** and **Thickness Conformance** can be run on an edge point.*

Extent left real box

*If a given survey point falls within this distance left of the edge string, it will be considered an edge point and an **Edge conformance** can be run on this point.*

Extent right real box

*If a given survey point falls within this distance right of the edge string, it will be considered an edge point and an **Edge conformance** can be run on this point.*

Tolerance left real box

If a given edge point falls within this distance left of the edge string, it will be reported as within tolerance.

If blank, all points left of the edge string will be reported as within tolerance.

Tolerance right real box

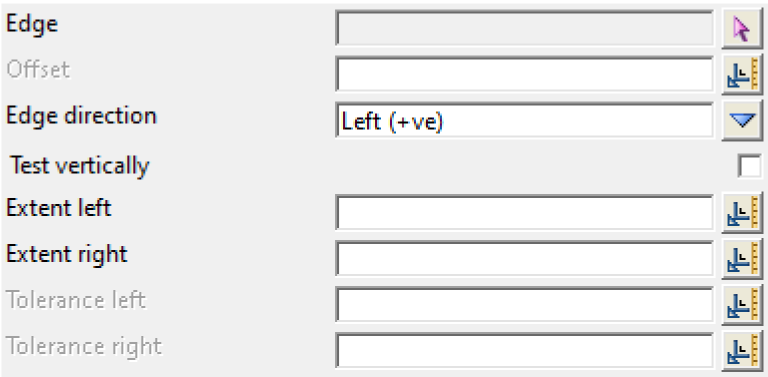
If a given edge point falls within this distance right of the edge string, it will be reported as within tolerance.

If blank, all points right of the edge string will be reported as within tolerance.

None

A blank page is displayed, and no edge conformance data is outputted.

1 string/edge

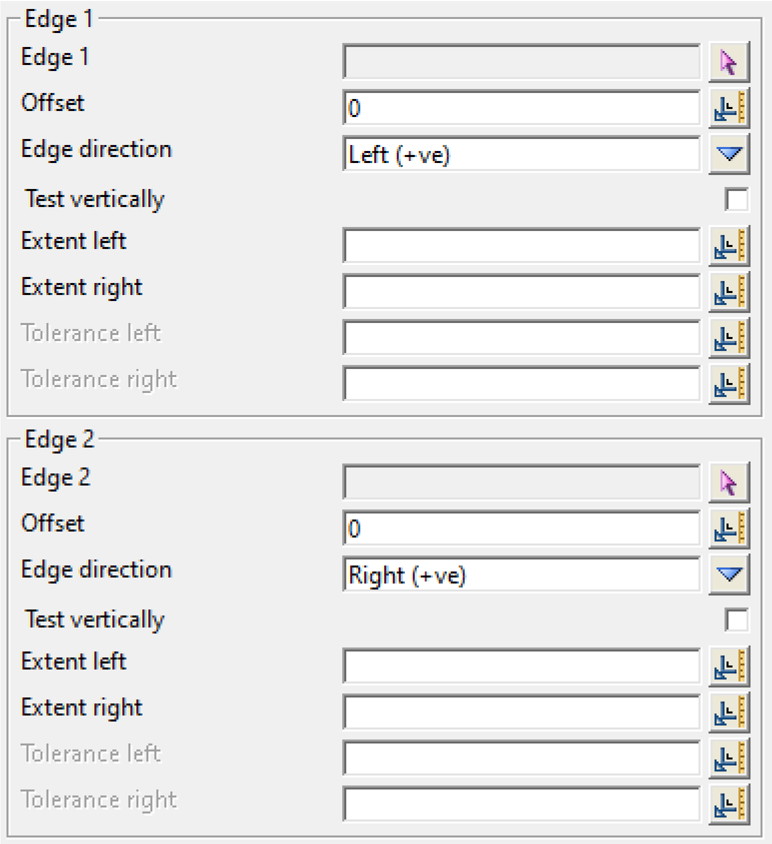


Edge

Surveyed points within extent range with be horizontally conformed to this edge.

For more information on the other widgets, see Common edges widgets.

2 strings/edges



Edge 1

Edge 1

Surveyed points within extent range with be horizontally conformed to this edge.

For more information on the other widgets, see Common edges widgets.

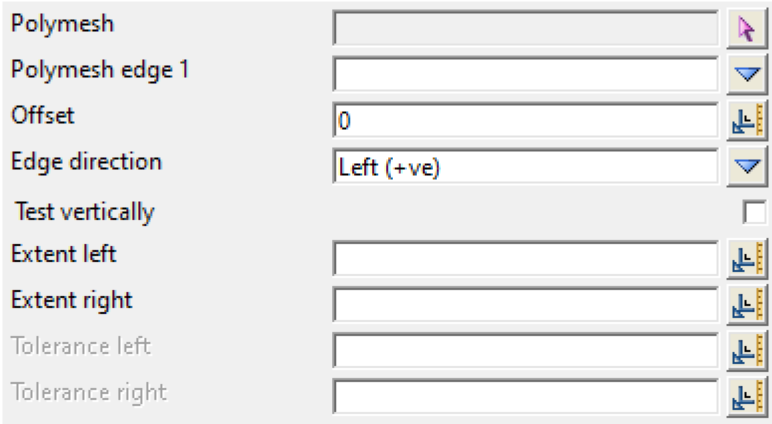
Edge 2

Edge 2

Surveyed points within extent range with be horizontally conformed to this edge.

For more information on the other widgets, see Common edges widgets.

1 polymesh named edge



Polymesh select box

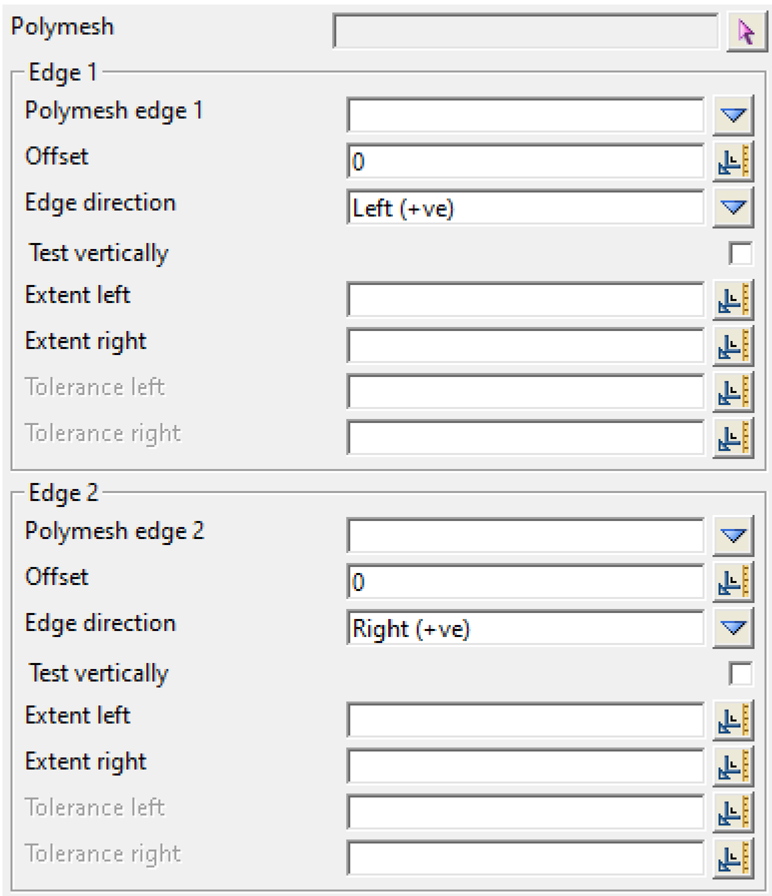
The polymesh from which the polymesh edge choice boxes are populated from.

Polymesh Edge 1 select box selected polymesh’s edges

Surveyed points within extent range with be horizontally conformed to this edge.

For more information on the other widgets, see Common edges widgets.

2 polymesh named edges



Polymesh	select box	

The polymesh from which the polymesh edge choice boxes are populated from.

Polymesh Edge 1	select box	selected polymesh's edges

Surveyed points within extent range with be horizontally conformed to this edge.

Polymesh Edge 2	select box	selected polymesh's edges

Surveyed points within extent range with be horizontally conformed to this edge.

15.5.2 Chainage Offset Filter

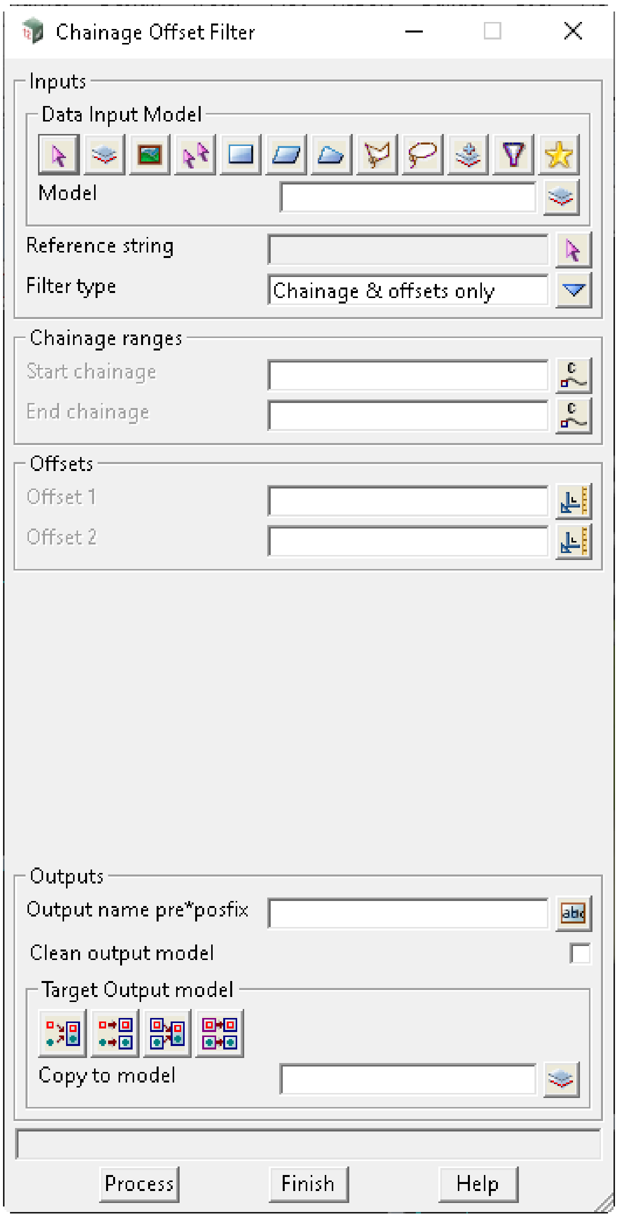
Position

Now documented In the v15 reference manual

Chainage Offset Filter filers vertices of strings according to user supplied restrictions involving a chainages and offsets from a user supplied reference string.

has inputs of an input model, reference string and filter type. The input model is the data that will be filtered by the panel. The reference string is what the input model will be filtered against. The filter type is how the model will be filtered. After the filtering process the user can choose how the data should be outputted using the target box. The filtered data can be moved or copied to one or many models.

Selecting the **Chainage Offset Filter** brings up the **Chainage Offset Filter** panel.



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

Field Description	Type	Defaults	Pop-Up

Inputs

Data to filer Model	source box	model	

Strings with vertices to filter.

Selected data source	input	Model	

Source of data to process.

Reference string	select box		

Reference string to be used for chainage and offset used to filer vertices of strings in the data source.

Filter type	choice box		Chainage & offsets only Increment Between strings Increment between strings

Filters for the vertices.
For information on filter types see Filter types.

Outputs

Output name pre*postfix	text box		
Clean output models	tick box		

if ***ticked****, the output models are cleaned before any data is added to them.*

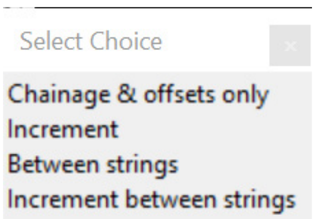
If ***not ticked****, the output models are not cleaned.*

Target output model	target box	Move to model	Move to model Move to model prefix Copy to model Copy to model prefix

If ***Move to model****, remove vertices from input strings and place them in the output model.*
if ***Move to model prefix****, remove vertices from input strings and place in many output models.*
if ***Copy to model****, copy vertices from input strings and place in output model.*
if ***Copy to model prefix****, copy vertices from input strings and place in many output models.*

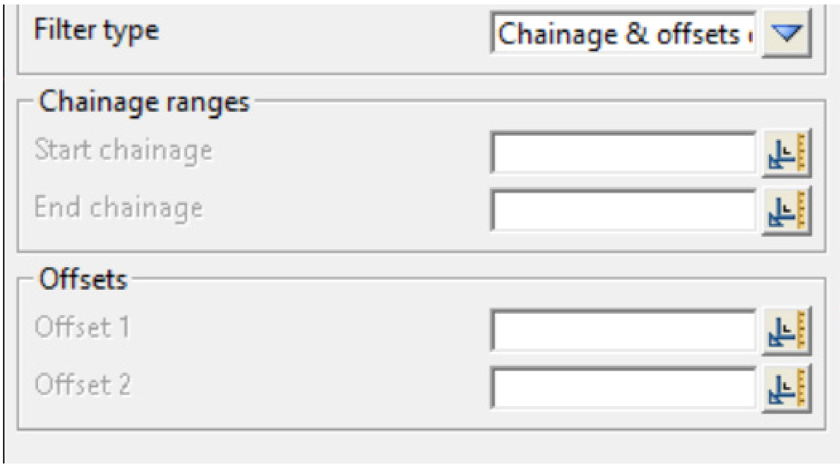
Find more info 2.23.4 Data Target

Filter types



Chainage & offsets only
Increment: (Includes optional chainages and offsets)
Between strings: (Includes optional chainages)
Increment between strings: (Includes optional chainages)

Chainage & offsets only



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

Field Description	Type	Defaults	Pop-Up
Start chainage	real box	Start chainage of Reference String	

*If **not blank**, select the vertices of strings whose chainage when dropped onto the reference string are greater than **Start chainage**.*

*If **blank**, select the vertices of string whose chainage when dropped onto the reference string are greater than the start chainage of the reference string.*

Field Description	Type	Defaults	Pop-Up
End chainage	real box	End chainage of Reference String	

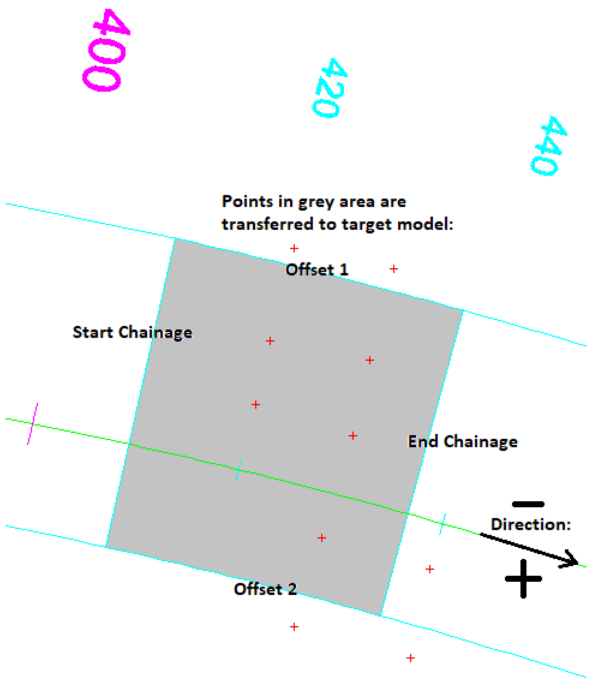
*If **not blank**, select the vertices of strings whose chainage when dropped onto the reference string are less than **End chainage**.*

*If **blank**, select the vertices of string whose chainage when dropped onto the reference string are less than the end chainage of the reference string.*

Field Description	Type	Defaults	Pop-Up
Offset 1 & 2	real box	0	

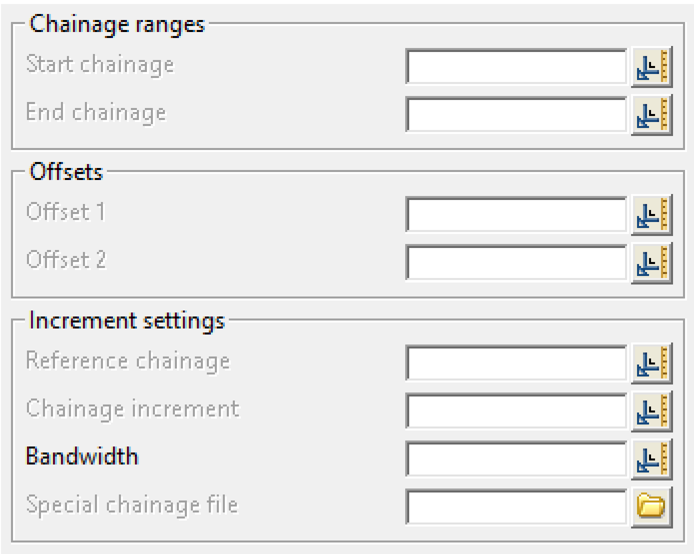
*Select the vertices of strings whose offset from the reference string is between **Offset 1** and **Offset 2**.*

***Note:** when going in the chainage direction of the reference string, left of the reference string is negative and right of the reference string is positive.*



Increment: (Includes optional chainages and offsets)

See **Chainage & offsets only** for information on the ***Chainage Ranges*** and ***Offsets*** part of the panel.



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

Field Description	Type	Defaults	Pop-Up
Reference chainage	real box		

*If **not blank**, used if start chainage box is left default to set start chainage of the increment filter.*

Chainage increment (opt)	real box		

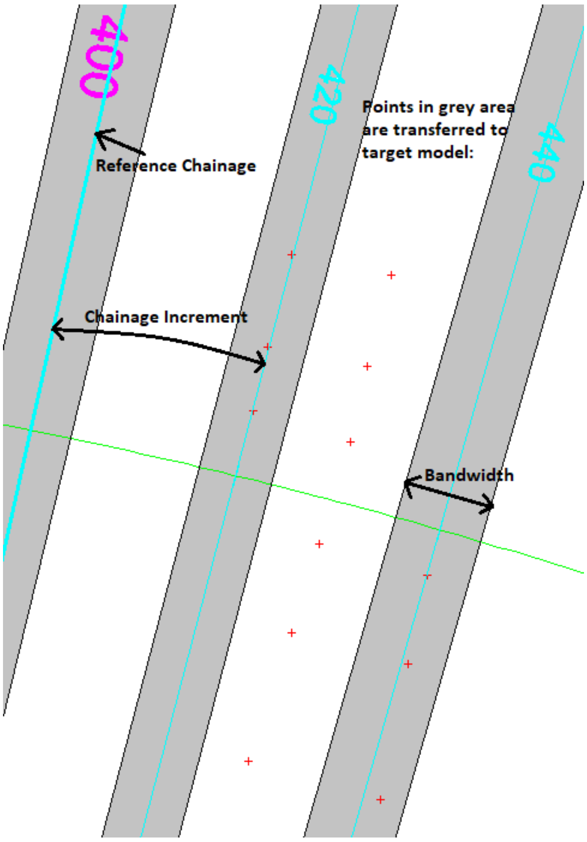
Distance between each chainage the bandwidth is applied to filter points.

Bandwidth real box

Points bandwidth/2 on the left and right of the chainages are filtered.

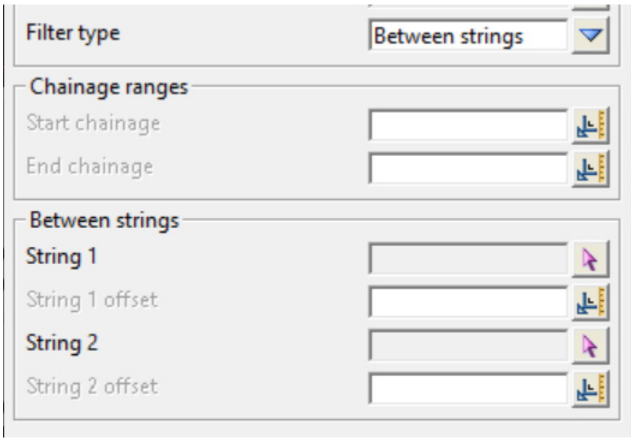
Special chainage file (opt) file box *spf File directory

File that contains chainages that can be have the bandwidth applied to filter points.



Between strings: (Includes optional chainages)

See **Chainage & offsets only** for information on the Chainage Ranges part of the panel.



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

Field Description Type Defaults Pop-Up

String 1, String 2 select box

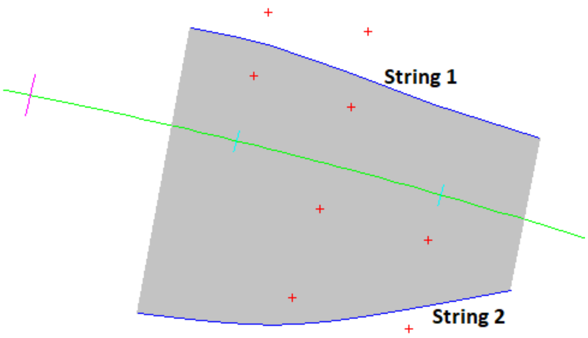
Strings to filter between.

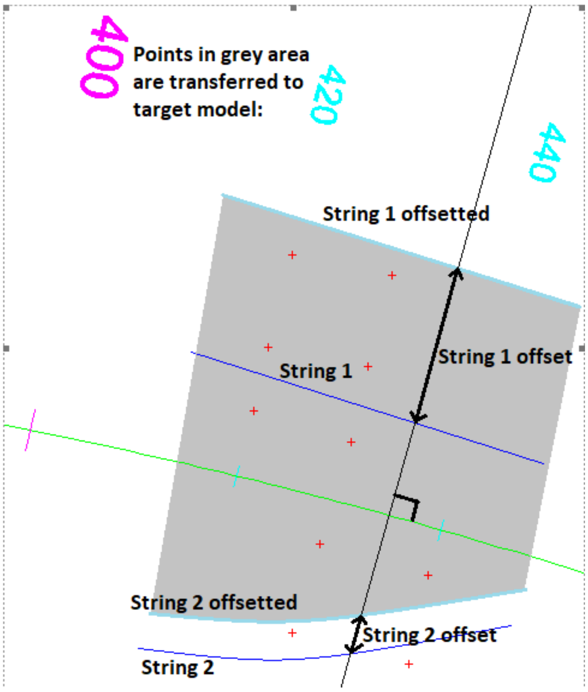
String 1 & String 2 offset real box

Offsets of the strings.

Direction of the Offsets are also determined by direction of the Reference string.

***Left** of the reference string is **negative**, **right** of the reference string is **positive**.*



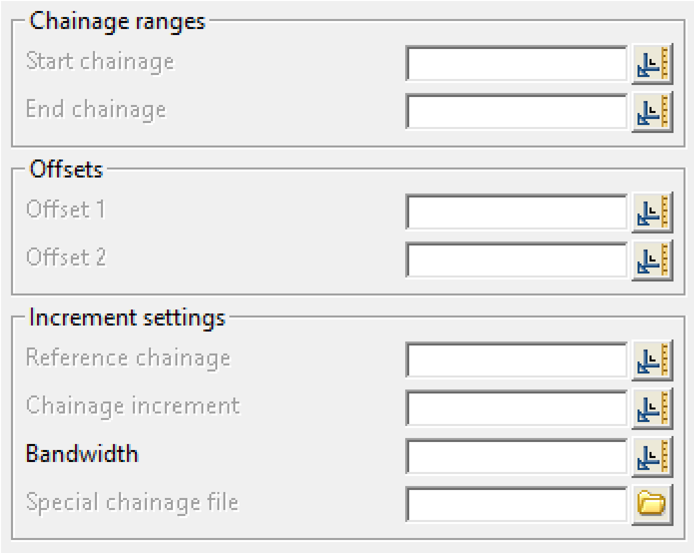


Increment between strings: (Includes optional chainages)

See **Chainage & offsets only** for information on the Chainage ranges part of the panel.

See **Increment** for information on the Increment settings part of the panel.

See **Between strings** for information on the Between strings part of the panel.



Buttons at Bottom

Process button

Run the option.

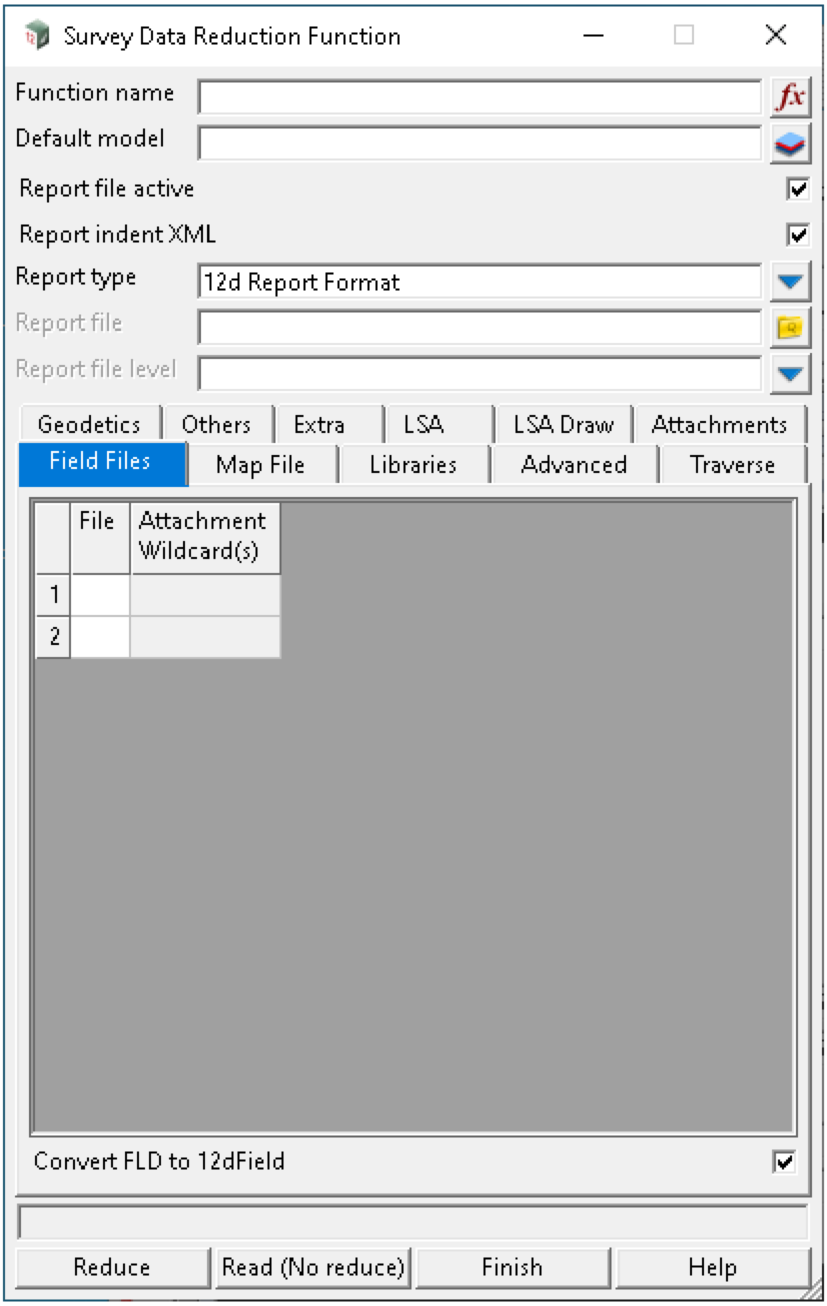
15.6 Create SDR Function from a 12d Field File

Position on menu: **Survey =>Create =>Field file**

Now documented In the v15 reference manual

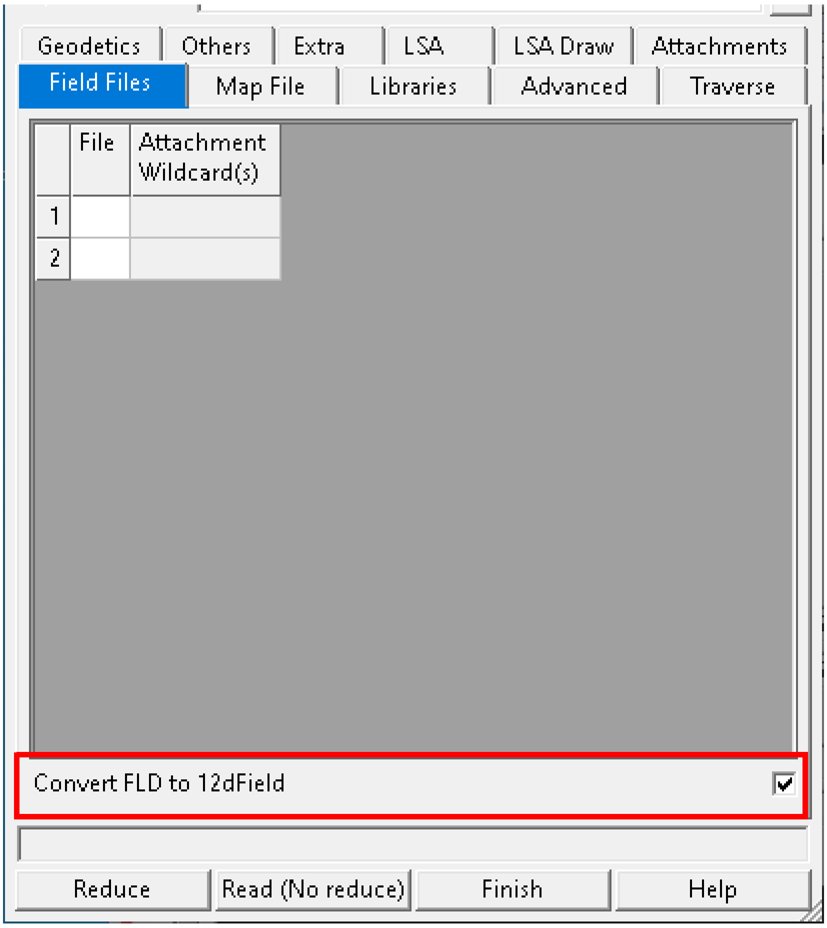
The option **Convert FLD to 12dField** has been added to the **Field Files** tab on the **Survey Data Reduction Function** panel**.**

Selecting **Field file** brings up the **Survey Data Reduction Function** panel:



Field Files tab

List of field files to read in.



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

Field Description	Type	Defaults	Pop-Up
Convert FLD to 12dField	tick box	ticked	

The SDR function is converted from FLD (flat) to 12dField (tree) format.

For all .FLD files, equivalent .12dField files are created.

If any .12dField files already exist, the convert fails.

16 12d Field

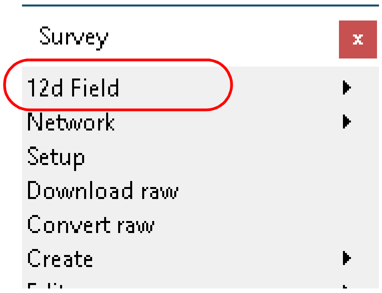
See

16.1 Overview of 12d Field
16.2 12d Field Menu

16.1 Overview of 12d Field

Position of menu: **Survey =>12d Field=>12d Field**

.



The ***12d Field*** module is designed for surveyors, engineers and others to be able to create and/or work with ***12d Model*** projects out on site and perform real time tasks with those project on site.

12d Field consists of two sub parts:

(a) ***12d Field Pickup*** (***12d Pickup***) for collecting data in the field such as for detailed pickups.

(a) ***12d Field Setout*** (***12d Setout***) for using the ***12d Model*** project for setting out for construction or collecting data for as-exists or as-constructed purposes.

12d Field is an attribute rich system using string, vertex and segment attributes. All relevant information in collecting data or setting out is stored as attributes which means every ***12d Field*** point in a model has the full details of it's creation.

To perform these tasks, ***12d Field*** connects to either a **Total Station** (**TPS**), the modern electronic/ robotic theodolite, or to high accuracy **Global Navigation Satellite System** units (**GNSS**). See 16.1.1 TPS Instruments and 16.1.2 GNSS Instruments.

12d Field can also connect to a primary TPS instrument and a secondary GNSS instrument concurrently. This is primarily used in TPS robotic surveying modes.

Notes:

1. **GNSS** instruments are often referred to (sometimes even in this manual and in ***12d Model***) as GPS instruments but GPS is actually the name of the original USA system and modern instruments can use satellites from multiple constellations other than the original GPS system. That is, modern instruments use many Global Navigation Satellite Systems (GNSS).
2. Prior to ***12d Model 14***, ***12d Field Setout*** and ***12d Field Pickup*** were separate options but from ***12d Model 14*** onwards, the two were unified into the one ***12d Field*** option.

16.1.1 TPS Instruments

Modern Total Stations can measure to either tradition prisms or to any surface without a prism.

12d Field connects to multiple manufacturers of Total Stations and provides a comprehensive range of functionality for controlling these units for the vast array of tasks the modern instrument can perform.

For some background information about TPS, see 25.1.1.1 Total Stations - TPS.

Please note that specific details on connections to TPS instruments are outside the scope of this manual and are supplied separately.

See

16.1.1.1 Leica Instruments
16.1.1.2 Trimble Instruments
16.1.1.3 Topcon Instruments
16.1.1.6 TPS Simulator

16.1.1.1 Leica Instruments

Connection to a Leica TPS is completely controlled by ***12d Field***.

12d Field manages the communication and sends/receives commands via the Leica Geocom language.

16.1.1.2 Trimble Instruments

Connection to a Trimble instrument is done via the Trimble supplied Trimble Precision SDK (TPSDK).

12d Field sends requests to the SDK which manages all communication with the instrument, all aspects of controlling the instrument including reduction of measurement data back to basic angles and distances.

16.1.1.3 Topcon Instruments

There are now 2 types of Topcon instruments:

16.1.1.4 Topcon Instruments

16.1.1.5 Topcon Generic Instruments

16.1.1.4 Topcon Instruments

Connection to a Topcon TPS instrument is completely controlled by ***12d Field***.

12d Field manages the communication and sends/receives commands via the Topcon AP-L1A language.

16.1.1.5 Topcon Generic Instruments

From V15 a new method of connection is available for Topcon instrumenting negating the need to run the external link program, instruments since ~2016 such as the GT series can use this option.

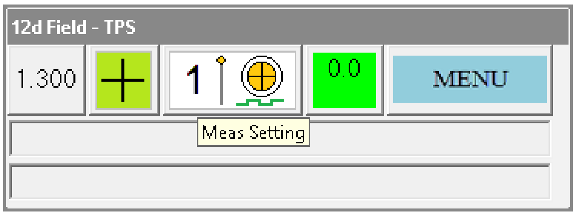
Connection to a Topcon Generic TPS instrument is completely controlled by ***12d Field***.

12d Field manages the communication and sends/receives commands via a proprietary Topcon command language.

16.1.1.6 TPS Simulator

For training and demonstration purposes, a TPS simulator is provided as one of the supported instruments.

Upon selecting the TPS simulator the user is presented with an identical TPS control bar as if they have selected a real instrument.



For details on how to control measurements taken by the TPS simulator please go to 16.3.2.3 12d Field - TPS Settings .

Continue to 16.1.2 GNSS Instruments or go back to 16.1.1 TPS Instruments .

16.1.2 GNSS Instruments

Unlike with TPS instrument, ***12d Field*** simply receives and processes industry standard NMEA strings from GNSS instruments.

Configuration of GNSS instruments is outside the scope of ***12d Field*** and is done via purpose-built software provided by the instrument manufacturers.

The received data is processed through various user defined transformations to map it into the local coordinate system.

For some background information about GNSS, see 25.1.1.2 GNSS (GPS, Glonass etc).

Please note specific details on connections to GNSS instruments are outside the scope of this manual and are supplied separately.

See

16.1.2.1 Generic GNSS Instrument
16.1.2.2 GNSS Simulator

16.1.2.1 Generic GNSS Instrument

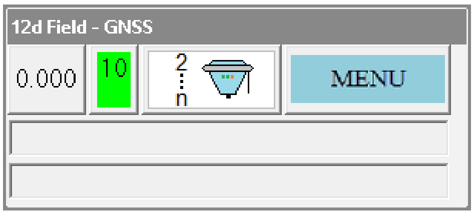
Most users will now use the **Generic GNSS Instrument** as few receivers now need script files to start broadcasting NMEA strings.

Continue to 16.1.2.2 GNSS Simulator or go back to 16.1.2 GNSS Instruments.

16.1.2.2 GNSS Simulator

For training and demonstration purposes, a GNSS simulator is provided as one of the supported instruments.

Upon selecting the Instrument as ***GNSS - Simulator***, the user is presented with an identical GNSS control bar as if they have selected a real GNSS instrument.



For details on how to control measurements taken by the GNSS simulator, see 16.5.14.4 Create NMEA String.

Continue to 16.1.3 General Information on 12d Field or go back to 16.1.2 GNSS Instruments.

16.1.3 General Information on 12d Field

See

16.1.3.1 12d Field Attributes

12d Field has approximately 1400 unique attribute names that describe everything from the instrument station setup details to the configuration of, and text used in, panels, and panel field values.

These values are written as vertex attributes on points stored in a model, or to a variety of text configuration files that ensure each ***12d Field*** session starts exactly where it left off in the previous session.

Continue to 16.1.3.2 Panel Field Behaviour or go back to 16.1.3 General Information on 12d Field.

16.1.3.2 Panel Field Behaviour

Unlike most ***12d Model*** panel fields, (Real boxes for example) ***12d Field*** boxes do not need a **Set** button and are updated as soon as the focus leaves the box. For example, when selecting another field or pressing a button.

When this happens the attribute for the appropriate field is updated and if this attribute is present in another panel then the field in the other panel will also be automatically updated

Continue to 16.1.3.3 Primary Setout Panel and Hot Keys or go back to 16.1.3 General Information on 12d Field.

16.1.3.3 Primary Setout Panel and Hot Keys

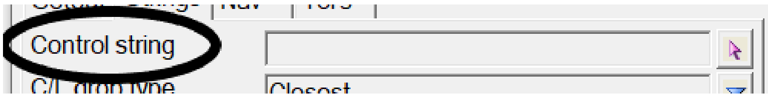
In general ***12d Field*** can have any number of ***Setout*** panels open which all can process measurements and display results but the first panel opened is the ***primary*** panel.

Only the ***primary*** panel will have the **Measurement** buttons active and be able to react to hot key presses. If this panel is closed then the next panel opened will become the primary panel and have its buttons activated.

Continue to 16.1.3.4 Customising Panel Field Descriptions or go back to 16.1.3 General Information on 12d Field.

16.1.3.4 Customising Panel Field Descriptions

All ***12d Field*** panels allow customising of the field descriptions on the panels to match regional naming conventions.



For more information please go to Customising panel field descriptions.

Continue to 16.1.3.5 Top most buttons or go back to 16.1.3 General Information on 12d Field .

16.1.3.5 Top most buttons

Many tablets have no hard keys available but keys such as <ESC>, LMB etc are essential for using ***12d Model***. So to replace these keys, ***Top Most Buttons*** are available.

For more details see 7.12.18 Toggle Topmost Buttons .

Continue to 16.1.3.6 On screen keyboard or go back to 16.1.3 General Information on 12d Field .

16.1.3.6 On screen keyboard

For use on a tablet ***12d Model***. provides an internal on-screen keyboard specifically designed to work with ***12d Model***.data fields.

For more details see <6.8.2.9 On-Screen Keyboard Settings>

Continue to 16.1.3.7 Hotkeys and Toolbars or go back to 16.1.3 General Information on 12d Field .

16.1.3.7 Hotkeys and Toolbars

Link to <43.3 User Defined Toolbars>

Continue to 16.1.3.8 General Font and Icon Scaling for 12d Model or go back to 16.1.3 General Information on 12d Field .

16.1.3.8 General Font and Icon Scaling for 12d Model

When using ***12d Model*** on a tablet it may be desirable to adjust menu, toolbar, view icon scaling and more. For more details refer to the GUI section of 7.12.2 Create/Edit env.4d .

General ***12d Field*** font size can be adjusted on the fly from ***12d Field*** itself. For more details please go to Gen.

Continue to 16.1.3.9 12d Field Panels or go back to 16.1.3 General Information on 12d Field .

16.1.3.9 12d Field Panels

12d Field panels do not use the standard panel layout files of slx or ddx.

For each panel opened inside the working directory, a file 12dF_XXXX_CONFIG.4D will be created when the panel is closed (XXXX being the internal name of the panel).

The ***12d Field*** attributes in the config file are identical for all panels with the values written varying on the needs of the parent panel.

For details of all ***12d Field*** panel configurations please go to Panel Configuration Files.

As per slx/ddx style panel layouts, ***12d Field*** can save and restore favourites for all Setout/Pickup panels.

Continue to 16.1.3.10 Logging or go back to 16.1.3 General Information on 12d Field .

16.1.3.10 Logging

12d Field creates two log files while running:

(a) a binary file for 12d internal use in analysing problems (see General logging)

(b) a text file for the user showing important details of the ***12d Model*** session (see User Logging).

Continue to 16.1.3.5 Top most buttons or go back to 16.1.3 General Information on 12d Field .

16.1.3.11 Measurement modes

12d Field has a large range of measurement options, especially with TPS instruments.

It is important that the user carefully reads what each mode does, and is clear with the terminology, and understands which of the modes best suits the task they are performing.

All the modes are there because they have been needed for users to undertake various jobs - they are not there because ***12d Solutions*** has a perverse sense of humour.

Continue to 16.1.3.12 TPS Measurements or go back to 16.1.3 General Information on 12d Field .

16.1.3.12 TPS Measurements

***12d Field* TPS Measurement Styles available with TPS instruments**

Important note - these modes are how the ***12d Field*** panel asks for and processes data from the instrument, not about settings/modes on the instrument itself hence identical for all instrument makes.

Single

The instrument takes a single measurement and the panel processes the measurement and updates results.

Single Remote

Leica only, the same as single except that the measurement is started from the TPS keyboard rather than the tablet.

Multiface

The instrument takes multiple measurements on different faces until a minimum number of readings and a defined accuracy is met, the panel then processes the combined measurement and updates results.

Continuous

The instrument takes a single measurement and the panel processes the measurement and updates results, the process is then repeated, hence, the panel data is continuously updated until the user presses stop. The instrument in this mode will typically be set to a fast measurement program and be in a prism tracking mode.

Hidden Pt

The user enters 2 offsets from a hidden point, the instrument takes a measurement at each of these points and the panel processes the measurement and updates results. This mode can handle either horizontally or vertically hidden points.

Continue to 16.1.3.13 Target and pole types or go back to 16.1.3 General Information on 12d Field .

16.1.3.13 Target and pole types

For modern TPS and GPS instruments the target and pole selection have become intertwined with the advent of tilt poles combined with the existing id target technology and its newer variations.

12d Field 'supports' 4 basic target types.

Any - no target, measure to any surface, previously referred to as RL, NP DR dependent on manufacturer.

Tape - or sheet, a measurement to generally a square reflective 'tape' surface.

Prism - This refers to the typical circular prism, a prism that must be specifically pointed at the TPS.

360 Prism - A prism that does not need orientating towards the TPS.

Then there are the extra capabilities available with the particular target or pole type.

Id - the target has an electronic Id which prevents the TPS from locking onto another/incorrect target. This Id can be native to the target or be part of a device on the pole.

Height - the pole has auto sensing of the height, when ***12d Field*** takes a reading the height is sourced from the pole and not manually entered.

Tilt - the pole has a tilt capability, can correct itself to give the correct tip position no matter the direction or inclination it is leaning. These need the pole height to be manually set.

Tilt with height - a tilt pole with auto sensors for the height.

Standard Target types

For each TPS instrument there are a number of inbuilt targets. For these targets the user selects the target type and the rest is handled internally by ***12d Field*** or natively on the TPS instrument itself. From V15C1g the user has the ability to customise the text displayed for these targets on the control bar. See < 12dF_TPS_INS_USER_TARGETS.4D>

User Defined Targets

12d Field supports up to twenty (20) user defined targets.

These can be **tape**, **prism** or **360 prism** targets, it is up to the user to understand, configure correctly and test these targets for the instrument being used. See < 12dF_TPS_INS_USER_TARGETS.4D>

Continue to 16.1.3.14 Target pointing and following modes. or go back to 16.1.3 General Information on 12d Field .

16.1.3.14 Target pointing and following modes.

The following 4 modes are available, (dependent on instrument hardware) for pointing and following the instrument, the 3 letter abbreviation is used throughout the manual to describe the pointing mode.

MNL - manual pointing, the user must manually fine point to the target prior to measuring, the TPS will not lock to and follow the target.

ATR - automatic target recognition, the user must approximately point to the target prior to measuring, the TPS will automatically do the fine pointing on measure, the TPS will not lock to and follow the target.

LCK - manual lock to target, the user must approximately point at the target and then initiate the lock to target, after that fine pointing is automatic and the TPS will follow the target.

ALK - automatic locking to target, the user needs only to approximately point at the target, the TPS will then automatically lock to the target, after that fine pointing is automatic and the TPS will follow the target.

Continue to 16.1.3.15 Measurement programs or go back to.16.1.3 General Information on 12d Field

16.1.3.15 Measurement programs

Across the instrument manufacturers there are a plethora of measurement modes to targets/any surfaces available, it is very difficult without rigorous testing in the user's specific environment to truly say what the accuracy of these modes are.

12d Field offers 4 styles of measurement, the 3 letter abbreviation is used throughout the manual to describe the program.

STD - single standard, a measurement to full accuracy, for each of the manufacturers there is a distinct measurement program that measures to the full capability of the instrument, this is the slowest of the measurement modes. The screen position of the target in ***12d Field*** is only updated after a measurement is completed.

FST - single fast, a measurement with possibly reduced accuracy, (this is often the same internal measurement as used for the STD mode but just done once rather than the average of several readings.) There can be little time difference between this and the **STD** mode. The screen position of the target in ***12d Field*** is only updated after a measurement is completed.

STK, standard tracking measurement, continuous distance measurement to a higher accuracy, (not recommended nor offered on all instruments), the screen position of the target in ***12d Field*** is continuously updated.

FTK - fast tracking measurement, for each of the manufacturers there is a distinct measurement program that measures as rapidly as possible with a nominal loss of accuracy, the screen position of the target in ***12d Field*** is continuously updated.

It should also be noted horizontal and vertical angle measurements are independent of distance measurements so it is up to the user to determine the right combination for the job at hand. For example, minor variations in distances in most cases will make no difference to calculated heights so a fast measurement program could be more suited to such jobs. If a user wants a precise distance but still wants the TPS to follow the target then **STD** would be an appropriate program as the target is steady when the measurement is called.

Continue to 16.1.3.16 GNSS Measurements. or go back to.16.1.3 General Information on 12d Field

16.1.3.16 GNSS Measurements.

12d Field **Measurement Styles available with GNSS instruments**

Single

The instrument takes a single measurement and the panel processes the measurement and updates results.

Averaging

The instrument takes multiple measurements until a minimum number of readings and a defined accuracy is met, the panel then processes the combined measurement and updates results.

Continuous

The instrument takes a single measurement and the panel processes the measurement and updates results, the process is then repeated, hence, the panel data is continuously updated until the user presses stop. The instrument in this mode will typically be set to a fast measurement program and be in a prism tracking mode.

Hidden Pt

The user enters 2 offsets from a hidden point, the instrument takes a measurement at each of these points and the panel processes the measurement and updates results. This mode can handle either horizontally or vertically hidden points.

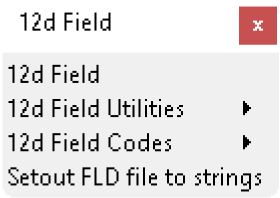
Continue to 16.2 12d Field Menu or return to 16.1 Overview of 12d Field or 16 12d Field .

16.2 12d Field Menu

Position of menu: **Survey =>12d Field**

For an overview of ***12d Field***, see 16.1 Overview of 12d Field .

The **12d Field** walk-right menu is:
.



See
16.3 Starting and Configuring 12d Field
16.6 12d Field Utilities
16.7 12d Field Codes
16.8 12dField Setout FLD File To Strings

16.3 Starting and Configuring 12d Field

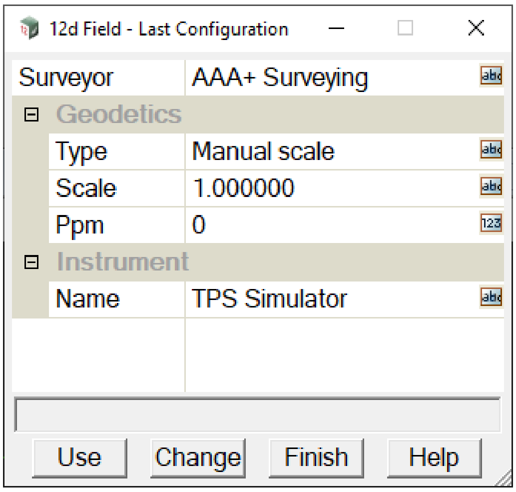
Position of menu: **Survey =>12d Field =>12d Field**

Important

12d Field uses many text files to store its configurations and allow easy customisation.

Generally, but not always these files start with the prefix **12dF_** and have the extension**.4D**, by default these files are stored in the **USER** area so that they are common to all projects. A user can then copy individual files in the **CUSTOMER_USER** or **working directory** to allow extra flexibility where needed. Please refer 16.4.1 Field File Paths for full details.

When **12d Field** is selected from the **12d Field** menu, the **12d File - Last Configuration** panel is brought up.



and

(a) if ***12d Field*** has been used before then the **12d File - Last Configuration** panel displays the settings for the last configuration used.

or

(b) if ***12d Field*** has **NOT** been used before then the **12d File - Last Configuration** panel displays default configuration settings.

The user can then either click on **Use** to start using ***12d Field*** with the displayed configuration, or click on **Change** to change the configuration settings, or click on **Finish** to stop using ***12d Field***.

So in all cases, the **12d File - Last Configuration** panel is the first panel the user sees when starting ***12d Field.*** See 16.3.1 12d Field - Last Configuration

Note

This manual only covers in detail the **TPS** and **GNSS simulators**. For connection details for actual instruments, please refer to the separate ***12d Field*** documents for each instrument type.

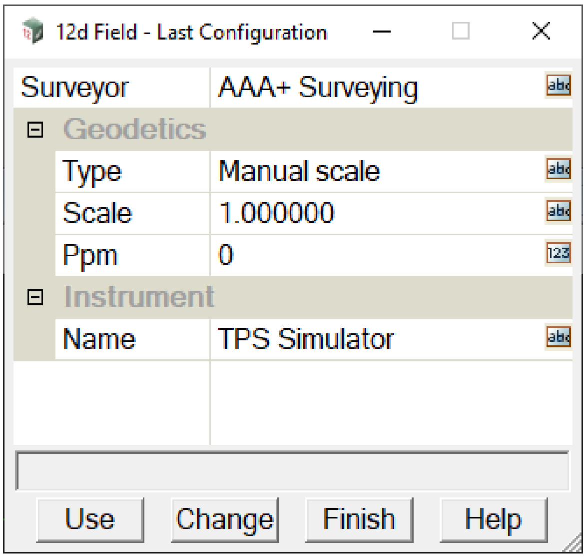
Continue to 16.3.1 12d Field - Last Configuration or return to 16 12d Field .

16.3.1 12d Field - Last Configuration

Position of option on menu: **Survey =>12d Field=>12d Field**

Clicking on the ***12d Field*** options displays the **12d File - Last Configuration** panel.

This panel is displayed if ***12d Field*** is being used for the first time, or had previously been used (see 16.3 Starting and Configuring 12d Field).



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

Field Description Type Defaults Pop-Up

The contents of this panel will vary depending on the instrument type and connection to the instrument.

Buttons at bottom

Use button

*Start **12d Field** using the displayed instrument and settings.*

Change button

*Clicking on Change closes this panel and opens the **12d Field Instrument Selection** panel (see 16.3.1.1 12d Field - Instrument Selection).*

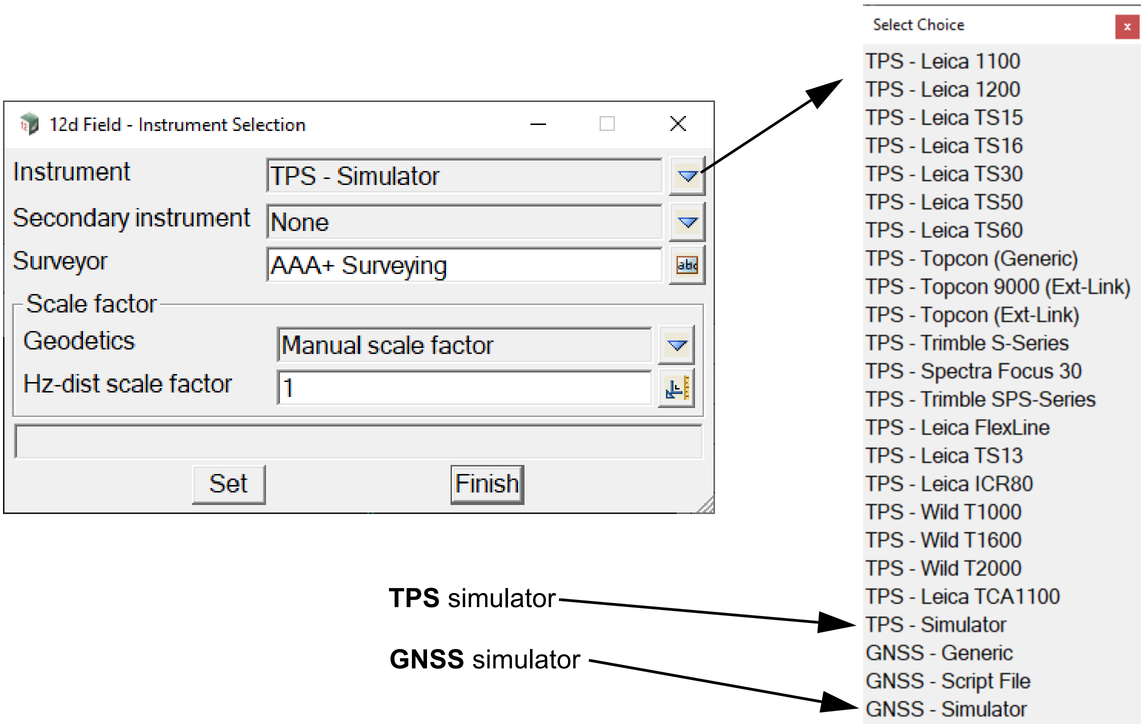
If there are no configuration changes to be made and there are no configuration or connections errors, either the 16.3.2 12d Field TPS Control Bar or the 16.3.3 12d Field GNSS Control Bar is brought up.

Continue to 16.3.1.1 12d Field - Instrument Selection or go back to 16 12d Field.

16.3.1.1 12d Field - Instrument Selection

The **12d Field - Instrument Selection** panel is used to select the type of instrument to connect to and then the connection method for the selected instrument.

This manual only covers in detail the **TPS** and **GNSS simulators**. For connection details for actual instruments, please refer to the separate ***12d Field*** documentation for each instrument type.



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

Field Description	Type	Defaults	Pop-Up
Instrument	choice box		defined instruments

The list of possible instruments to connect to.

The list is comprehensive and can be filtered to only the instruments actually used- for more details please go to Instrument Selection Configuration, 12dF_INSTRUMENT_SELECTION.4D

Field Description	Type	Defaults	Pop-Up
Secondary instrument	choice box		None, GNSS - Generic, GNSS - Script File GNSS - Simulator

When using a TPS in robotic mode with a GNSS equipped tablet, the position of the tablet can be used to guide the TPS to re-establish lost lock.

If None*, do not use a secondary instrument*

GNSS - Generic, *connect to the tablet GNSS as a generic GNSS instrument*

GNSS - Script File, *(This would not be used)*

GNSS - Simulator*, for demonstration purposes only*

Field Description	Type	Defaults	Pop-Up
Surveyor	input box		

Company/surveyor name to be written to all stored attributes.

Scale factor group

For TPS instruments, comprehensive geodetic adjustments to measured distances are available.

Geodetics	choice box	Manual scale factor, Point scale factor Height scale factor, Combined scale factor

The scale factor to be used.

*If **Manual scale factor**, a* **Manual h-dist sf** *field is displayed and the appropriate value entered.*

*If **Point scale factor**, a* **Projection** *field is displayed and the appropriate projection selected.*

*If **Height scale factor**, a* **Projection** *field is displayed and the appropriate projection selected.*

*If **Combined scale factor**, a* **Projection** *field and a **N Value** field is displayed and the appropriate projection and N value file are selected.*

For details see Geodetics.

Buttons at bottom

Set button

*If **Instrument** is **TPS - Simulator,** no further panels are necessary and the **12d Field** simulator begins.*

*If **Instrument** is the **GNSS - Simulator,** the **Configure GNSS Simulator** panel is brought up. See* 16.3.1.1.1 Configure GNSS Simulator .

*For all other **Instrument** types, further configuration panels appropriate to the selected instrument are brought up. These are outside the scope of this manual.*

Finish button

*Do not start recording shots and exit **12d Field**.*

Continue to 16.3.1.1.1 Configure GNSS Simulator or go back to 16.3.1 12d Field - Last Configuration .

16.3.1.1.1 Configure GNSS Simulator

When ***GNSS- Simulator*** has been selected as the ***instrument*** two extra panels are needed to configure the instrument:

1. The ***Configure GNSS Simulator (Step 1)*** panel

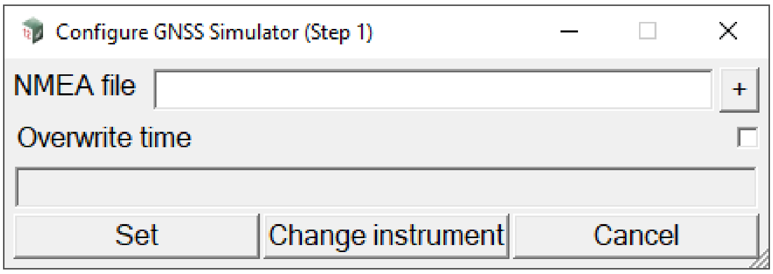
   This panel selects the NMEA file, See 16.3.1.1.1.1 Configure GNSS Simulator (Step 1)

2. The ***Configure GNSS Simulator (Step 2)***

   This panel is for providing information about the GNSS equipment, the projection used and a possible 2D Helmert. See 16.3.1.1.1.2 Configure GNSS Simulator (Step 2)

3. For an actual GNSS Device, there is a third configuration panel. See 16.3.1.1.1.3 Configure GNSS Device (Step 3) Panel .

16.3.1.1.1.1 Configure GNSS Simulator (Step 1)



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

Field Description	Type	Defaults	Pop-Up
NMEA file	folder		*.nmea

The GNSS simulator needs a NMEA file to run.
*The GNSS file can be a file recorded from an actual instrument or constructed from within **12d Field** itself by 'driving' along an existing string. For more details see* 16.5.14.4 Create NMEA String .
A default file "Default_LLQ.NMEA" is created automatically for first up usage.

Field Description	Type	Defaults	Pop-Up
Overwrite time	tick box		

*If **not ticked**, the time in the NMEA string is used.*
*If **ticked**, the time in the NMEA string is ignored and the current computer time is used instead.*

Buttons at bottom

Set button

After selecting **Set***, the panel* **Configure GNSS Device (Step 2)** *is displayed. See* 16.3.1.1.1.2 Configure GNSS Simulator (Step 2) .

Change instrument button

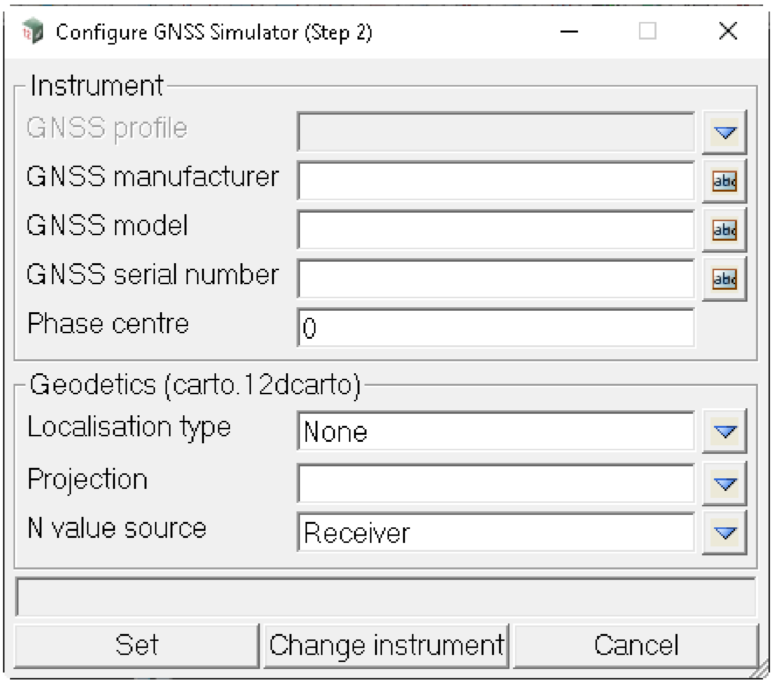
*Return to the **12d Field - Instrument Selection** panel. See* 16.3.1.1 12d Field - Instrument Selection .

Cancel button

*Exit **12d Field**.*

Continue to 16.3.1.1.1.2 Configure GNSS Simulator (Step 2) or go back to 16.1.3 General Information on 12d Field .

16.3.1.1.1.2 Configure GNSS Simulator (Step 2)



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

Field Description	Type	Defaults	Pop-Up

GNSS Profile choice box

For users transferring between multiple GNSS instruments, the individual details for populating the following fields can be stored in a configuration file, select the GNSS unit to be used.

For more details see GNSS Profiles Configuration, 12dF_GPS_PROFILES.4D

GNSS Manufacturer input box

The name of the manufacturer.

GNSS Model input box

The model of the instrument.

GNSS serial number input box

The alphanumeric serial number of the instrument.

Phase centre

A manufacturer supplied offset, typically from the bottom of the antenna mount to the true 'receiving centre' of the unit.

Localisation type choice box None, Full

*12d **Field** allows the user to simply select a projection and n-value source or to use a full localisation. Typically the 1st time on a site the user will select the **None** option and choose the appropriate projection and n-value source. They will then survey control points and then use the GNSS localisation panel to create the full localisation for the site. Subsequently on entering 12d **Field** the **Full** option will be selected and the full localisation used, here the projection and n-value are contained in the localisation and are displayed for informational purposes only.*

*If **None**, a* **Projection** *field and a **N Value source** field are displayed:*

Projection parameters projection box *.12dcarto files

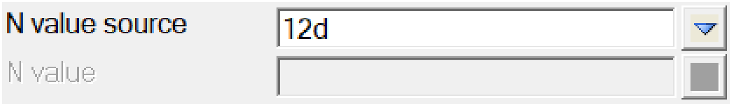
Select the projection defined in the 12dcarto file.

*Note the projection may or may not have a n-value defined, for example, in the event that the GPS base has been set up in such a way that incorrect orthometric heights are being broadcast the n value can be left undefined signalling to **12d Field** those values are invalid.*

N value source choice box Receiver, 12d

*If **Receiver**, the orthometric height and n value from the NMEA sentence are used for all calculations.*

*If **12d**, an **N Value** field is displayed:*



*If **non blank**, the n-value in the NMEA sentence is used to calculate the raw ellipsoid height and the orthometric height recalculated with the n value from the 12d projection.*

*If **blank**, then **12d Field** will not display orthometric or ellipsoid heights, typically this would be used in conjunction with the GNSS localization where the incoming NMEA sentences have incorrect heights.*

*If **Full,** a* **Localisation parameters** *field is displayed and the appropriate 2D Helmert parameters selected.*

Localisation parameters folder box *.TDF_HEL files

*Select the *.TDF_HEL file containing the transformation details to apply. This file is created with the* **GNSS Localisation** *panel in the **12d Field** Toolbar menu.*

Buttons at Bottom

Set button

*For the GNSS Simulator, **Set** start **12d Field** running and bring up the 1**2d Field GNSS Control bar** with the instrument type **GNSS - Simulator**. See* 16.3.3 12d Field GNSS Control Bar .

For an actual GNSS device, brings up the **Configure GNSS Device (Step 3)** *panel. See* Configure GNSS Device (Step 3) Panel .

Change instrument button

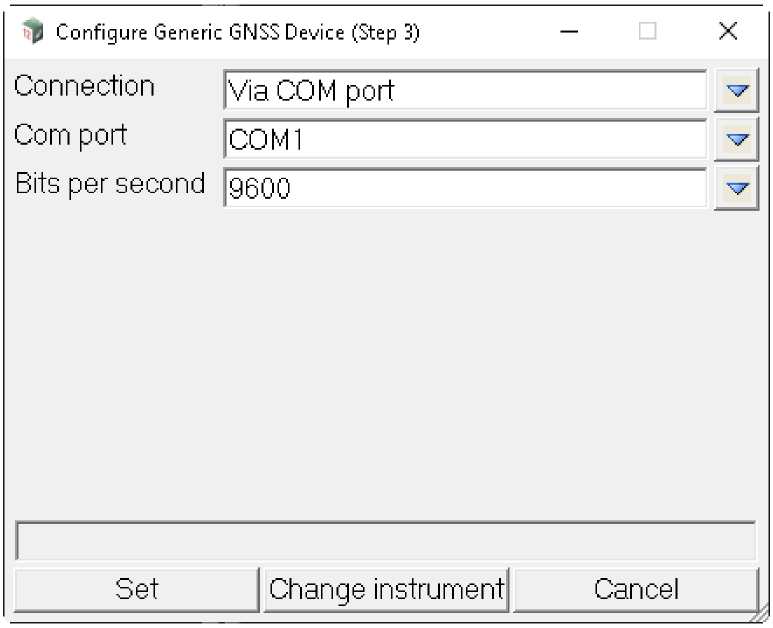
*Return to the **12d Field - Instrument Selection** panel. See* 16.3.1.1 12d Field - Instrument Selection

Cancel button

*Exit **12d Field**.*

Continue to 16.3.1.1.1.3 Configure GNSS Device (Step 3) Panel or return to 16.3.1 12d Field - Last Configuration .

16.3.1.1.1.3 Configure GNSS Device (Step 3) Panel



Field Description Type Defaults Pop-Up

Connection choice box Via COM port, Via Network, Via Bluetooth

*If **Via COM Port**, the* **Com port** *and* **Bits per second** *fields are displayed*

Com port choice box

Select the serial communication port to use.

Bits per second choice box

Select the data rate to match the settings on the GNSS unit.

*If **Via Bluetooth COM Port**, the* **Com port** *field is displayed - this is deprecated*

Com port choice box

Select the serial communication port to use.

***Important note:** this is deprecated and is only need for older versions of Windows and will not appear on the menu with newer Windows installations.*

*If **Via Network**, the* **Address** *and* **Port** *fields are displayed*

Address text box

??.

Port integer box

??.

*If **Via Bluetooth**, the* **Search for bluetooth devices** *button is displayed*

Clicking on the **Search for bluetooth devices** *button lists the available bluetooth devices to select from.*

Buttons at Bottom

Set button

Brings up the 12d Field GNSS toolbar. See 16.3.3 12d Field GNSS Control Bar.

Change instrument button

Return to the **12d Field - Instrument Selection panel**. *See* 16.3 Starting and Configuring 12d Field

Cancel button

Exit ***12d Field***.

Continue to 16.3.2 12d Field TPS Control Bar or return to 16.3.1 12d Field - Last Configuration .

16.3.2 12d Field TPS Control Bar

Once a TPS instrument has been selected and ***12d Field*** has successfully connected to the instrument, the **TPS control bar** will appear.

The **TPS control bar** is identical in functionality and layout for all TPS.

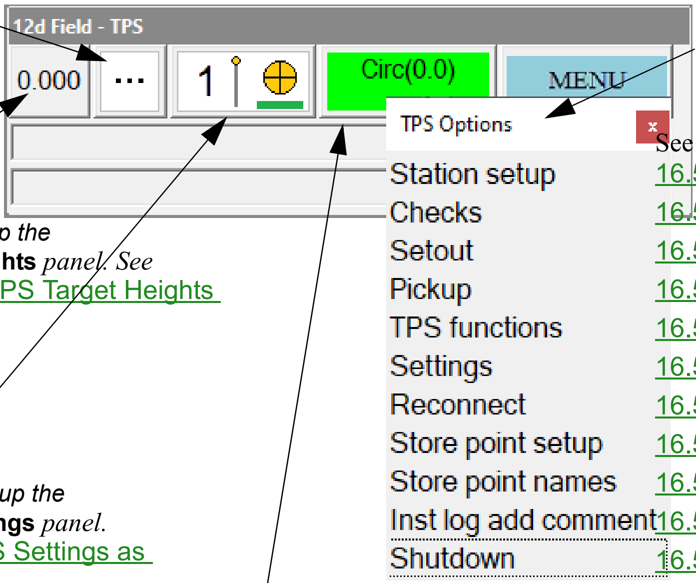
The **TPS control bar** has all the option for working with TPS for both ***Pickup*** and ***Setout***.

12d Field TPS Control Bar

Lock status

See 16.3.2.2.1.3 Lock status bar

See 16.5 12d Field Options



See
16.5.2 Station Setup - TPS
16.5.3 Checks - TPS
16.5.4 Setout
16.5.5 Pickup
16.5.6 TPS Control
16.5.7 General Settings - TPS
16.5.8 Reconnect
16.5.9 Store Point Setup
16.5.10 Store Point Names
16.5.11 Log Comment
16.5.12 12d Field Shutdown

Target height. *Brings up the* **12d Field - Target Heights** *panel. See* 16.3.2.1 12d Field - TPS Target Heights

Prism Constant

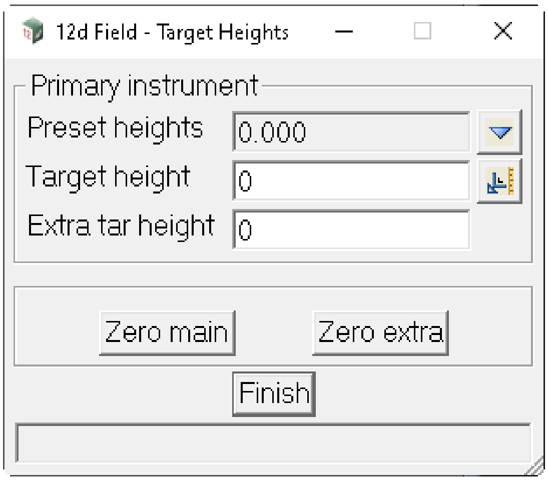
TPS Settings. *Brings up the* **12d Field - TPS Settings** *panel. See* 16.3.2.2.1.2 TPS Settings as

Target constant. *Displays information about the current TPS target. See*16.3.2.2 12dF_TPS_INS_USER_TARGETS.4D file format . *Also brings up the* **12d Field - TPS Settings** *panel. See* 16.3.2.3 12d Field - TPS Settings

Continue to next section 16.3.2.1 12d Field - TPS Target Heights or return to 16.3 Starting and Configuring 12d Field .

16.3.2.1 12d Field - TPS Target Heights

The **12d Field - TPS Target Heights** panel display, and sets, the state of the target heights for the **TPS** instrument.



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

Field Description	Type	Defaults	Pop-Up
Preset heights	choice box		pre-set target heights

List of preset target heights to select from.
When a value is selected it will be copied into the **Target height** *field.*

Target height	real box		

Target height.

Extra target height	real box		

*The **extra target height** allows the user to increase the **target height** with a measured value, e.g. the depth of a pit. When **non zero** the **extra target height** is added to the **target height** when reducing the TPS measurement. When the **extra target height** is **non zero** the user is presented the target heights panel every measurement.*

Zero main	button		

When pressed, the **Target height** *is set to zero (0).*

Zero extra	button		

When pressed, the **Extra tar height** *is set to zero (0).*

Continue to next section 16.3.2.2 12dF_TPS_INS_USER_TARGETS.4D file format or return to 16.3 Starting and Configuring 12d Field

16.3.2.2 12dF_TPS_INS_USER_TARGETS.4D file format

Before **V15C1g** ***12d Field*** allowed the definition of user targets for each of the major instrument manufacturers, these definitions were only for user defined targets and there was a separate file with a varying format for Leica, Trimble and Topcon.

From **V15C1g** all target definitions have been combined into a single file for all manufacturers and the format enhanced to allow more comprehensive user target definitions and overrides for the built-in target types.

12dF_TPS_INS_USER_TARGETS.4D is still a simple text file of similar format to the previous versions and loaded according to the standard ***12d Field*** file paths.

Each target definition line has 7 quoted and whitespace delimited fields, for example a user defining a Leica GPR1 circular prism for use with a Topcon instrument.

```
"TOPCON" "Leica GPR1 Circ" "-34.4" "50" "PRISM" "GPR1 -34.4" "Survey manager"
```

The format is as follows.

1st entry - manufacturer

"**LEICA**", "**TOPCON**" or "**TRIMBLE**"

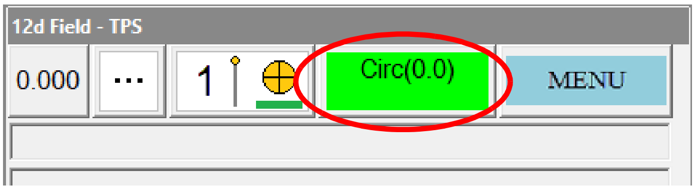
When the user starts 12dField only the target definitions related to the selected instrument will be loaded/shown.

2nd entry - target name

"**25mm sheet**"

This is the text shown in the drop down list when a user selects a target to use.

This entry can also be used to customize the text shown in the prism constant bitmap on the TPS Control Bar, prior to V15C1g only the target constant was displayed here.



The following fixed names indicate the user has custom text following for an inbuilt target to be displayed, these are not loaded as user targets.

Leica inbuilt prisms

"leica_circ_0" "leica_360_231" "leica_mini_360_300" "leica_mini_0" "leica_mini_175" "leica_tape_344" "leica_ma_mpr122" "leica_any"

Topcon inbuilt prisms

"topcon_generic_0" "topcon_generic_30" "topcon_360_ATP1_7_hc" "topcon_any"

Trimble inbuilt prisms

"trimble_360_id" "trimble_multitrack" " "trimble_activetrack_360" "trimble_mini_m17p5" "trimble_s_traverse_m35p0" "trimble_any"

3nd entry - target constant (mm.m)

"**23.1**"

The constant for the target to suit the manufacturer.

Inbuilt targets have fixed constants which cannot be overwritten, it is critical the user enters and tests for correct user constants.

The generic rule is a Topcon or Trimble constant is approximately equal to the Leica constant minus 34.4.

4th entry - target aperture/size (mm)

"38"

This field is highly recommended for Topcon instruments, it is the height of the glass part of the prism or the height of a tape/sheet target. If a user has multiple tape targets of different sizes it is recommended a user target with correct aperture to suit each one.

5th entry - target type

"ANY"

The instrument will be configured to measure to any surface, no defined target.

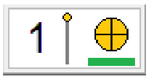
"TAPE"

The instrument will be configured to measure to a tape/sheet target, (Leica and Topcon only).

"PRISM", **"PRISM360"**

The instrument is configured to measure to a prism, the Topcon instruments distinguish between the circular and 360 types and use this settings internally, for all 3 manufacturers this setting is used to control the bitmap displayed in the control bar.

PRISM style bitmap:



PRISM360 style bitmap:

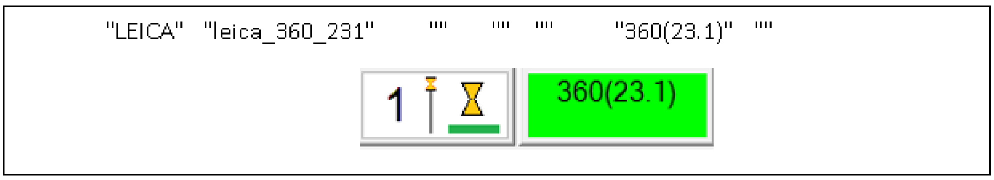
For information on TPS settings as Bitmaps see 16.3.2.2.1.1 TPS Settings as Bitmaps .

6th entry - control bar text for target

"360(23.1)"

The text displayed in the target constant part of the control bar, a user description, maximum of 16 characters. When ***12d Field*** is started the longest user text will be used to size the control bar bitmap.

For example, a user overwrite of a Leica GRZ4 360 prism.



7th target - author

Informational only

An example of a combined file used with a Leica MS60, Trimble S8 and Topcon GT1200

```
"LEICA"   "leica_circ_0"          ""      ""    ""          "Circ(0.0)"   ""
"LEICA"   "leica_mini_360_300"    ""      ""    ""          "M360(30.0)"  ""
"LEICA"   "leica_360_231"         ""      ""    ""          "360(23.1)"   ""
"LEICA"   "leica_mini_0"          ""      ""    ""          "Mini(0.0)"   ""
"LEICA"   "leica_mini_175"        ""      ""    ""          "Mini(17.5)"  ""
"LEICA"   "leica_tape_344"        ""      ""    ""          "Tape(34.4)"  ""
"LEICA"   "leica_any"             ""      ""    ""          "Any(34.4)"   ""
"LEICA"   "Ranch Mini 6.0"        "6.0"   "24"  "PRISM"     "RM 6.0"      "Survey manager"
"LEICA"   "Ranch mini mini"       "28.0"  "12"  "PRISM"     "RMM 28.0"    "Survey manager"

"TOPCON"  "Ranch mini"            "-28.4" "24"  "PRISM"     "RM -28.4"    "Survey manager"
"TOPCON"  "Leica GPR1 Circ"       "-34.4" "50"  "PRISM"     "GPR1 -34.4"  "Survey manager"
"TOPCON"  "Leica GRZ4 360"        "-11.3" "47"  "PRISM360"  "GRZ4 -11.3"  "Survey manager"
"TOPCON"  "25mm sheet"            "0.0"   "25"  "TAPE"      "25.0 TAPE"   "Survey manager"
"TOPCON"  "topcon_360_ATP1_7_hc"  ""      ""    ""          "APT1 -7mm"   "Survey manager"

"TRIMBLE" "Ranch mini"            "-28.4" "24"  "PRISM"     "RM -28.4"    "Survey manager"
"TRIMBLE" "trimble_any"           "0.0"   ""    "ANY"       "Any(0.0)"    "Survey manager"
"TRIMBLE" "trimble_mini_ml7p5"    ""      ""    ""          "Mini 17.5"   ""
```

Continue to next section 16.3.2.2.1 TPS Settings Options or return to 16.3 Starting and Configuring 12d Field .

16.3.2.2.1 TPS Settings Options

From **V15C1g** all of the TPS instruments use the same terminology rather than historical terminology associated with each of the individual manufacturers.

From **V15C1g** the bitmaps on the control bar are uniform for all of the instruments and they follow a strict naming standard to allow simple customisation if desired.

A **TPS Setting** comprises of 3 fundamental elements.

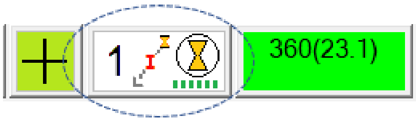
1. What sort of target and pole combination is being used.
2. How the TPS points at and optionally locks to the target.
3. What measurement program is used to measure a distance to the target.

In this section we will first describe each TPS Settings in conjunction with the control bar bitmap displayed for that setting.

Continue to 16.3.2.2.1.1 TPS Settings as Bitmaps or return to 16.3.2 12d Field TPS Control Bar or 16.3 Starting and Configuring 12d Field .

16.3.2.2.1.1 TPS Settings as Bitmaps

Take the following bitmap.



This represents a ***12d Field*** single measurement mode using a 360 prism with id and full tilt pole, the TPS is in a manual lock mode and using fast tracking measurement. The bitmap name for this bitmap is: **TDF_TPS_SNGL_PIHT_LCK_FTK.bmp**

The naming format is strict and can be interpreted as follows.

The first **3** characters are fixed:

TDF_TPS_SNGL_PIHT_LCK_FTK.bmp

Characters **5-7** are the instrument type, **TPS** or **GPS**

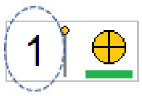
TDF_TPS_SNGL_PIHT_LCK_FTK.bmp

Characters **9-12** are the ***12d Field*** **measurement style**

TDF_TPS_SNGL_PIHT_LCK_FTK.bmp

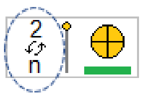
For TPS there are **SNGL**, **MULT**, **CONT**, **HPSP** or **RSNG** corresponding to single, multiface, continuous, hidden point and remote single respectively. GPS has **AVRG**, averaging.

SNGL - Single

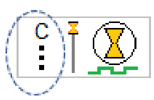


AVRG - Averaging

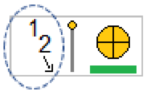
MULT - Multi-face



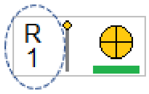
CONT - Continuous



HPSP - Hidden point



RSNG - Remote single



Character **14** indicates the target type.

TDF_TPS_SNGL_PIHT_LCK_FTK.bmp

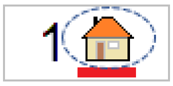
N - any surface for **TPS**, always **N** for **GPS**

C - a circular prism

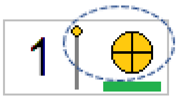
P - a 360 prism

S - a tape/sheet target

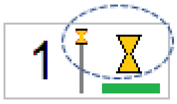
Any surface



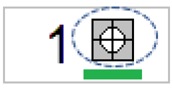
A circular prism



A 360 prism



A tape/sheet target



Characters **15-17** are about extra target and pole functionality.

TDF_TPS_SNGL_PIHT_LCK_FTK.bmp

___ - a standard target

I__ - the target is an Id/active target.

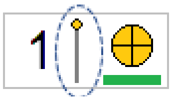
T__ - the pole has tilt capability but the height must be set manually.

H__ - the target has an auto-height pole.

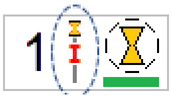
HT_ - the target has a tilt pole with auto-height.

IHT - the target is an Id/active target and has a tilt pole with auto-height.

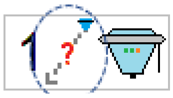
Standard target and pole



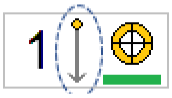
Id target



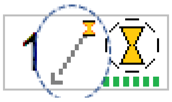
Tilt without automatic height



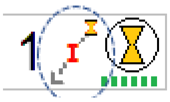
Auto height



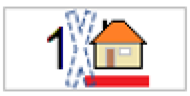
Tilt and auto height

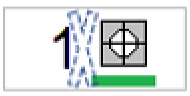


Id, tilt and auto height



Tape or **any surface** targets do not display any information.





Characters **19-21** are the target pointing and locking modes

TDF_TPS_SNGL_PIHT_LCK_FTK.bmp

XXX - GPS only, not applicable

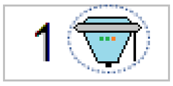
MNL - the user must manually fine point to the target prior to measuring, the TPS will not lock to and follow the target.

ATR - the user must approximately point to the target prior to measuring, the TPS will automatically do the fine pointing on measure, the TPS will not lock to and follow the target.

LCK - the user must approximately point to the target and then initiate the lock to target, after that fine pointing is automatic and the TPS will follow the target.

ALK - the user needs only to approximately point to the target, the TPS will then automatically lock to the target, after that fine pointing is automatic and the TPS will follow the target.

GPS is a simple icon of a GPS receiver.



MNL, a simple circular prism, 360 prism or house is shown.

ATR, a circular prism, 360 prism or tape target is shown with a clear circle in the middle.

LCK, a circular prism or 360 prism is shown with a solid circle on the outside.

ALK, a circular prism or 360 prism is shown with a broken circle on the outside.

Characters **23-25** are the TPS measurement program.

TDF_TPS_SNGL_PIHT_LCK_FTK.bmp

XXX - GPS only, not applicable

STD - single standard, a measurement to full accuracy, the screen position of the

target in ***12d Field*** is only updated after a measurement is completed.

FST - single fast, a measurement with possibly reduced accuracy, the screen position

of the target in ***12d Field*** is only updated after a measurement is completed.

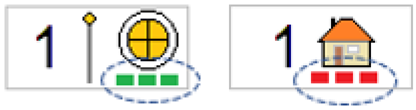
STK, standard tracking measurement, continuous distance measurement to a higher accuracy, (not recommended), the screen position of the target in ***12d Field*** is continuously updated.

FTK - fast tracking measurement, continuous fastest distance measurement nominally with reduced accuracy, the screen position of the target in ***12d Field*** is continuously updated.

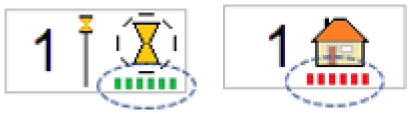
STD - a thick line, green for prism, red for any surface.

FST - a thin wavy line, green for prism, red for any surface.

STK - a dashed solid line, green for prism, red for any surface.

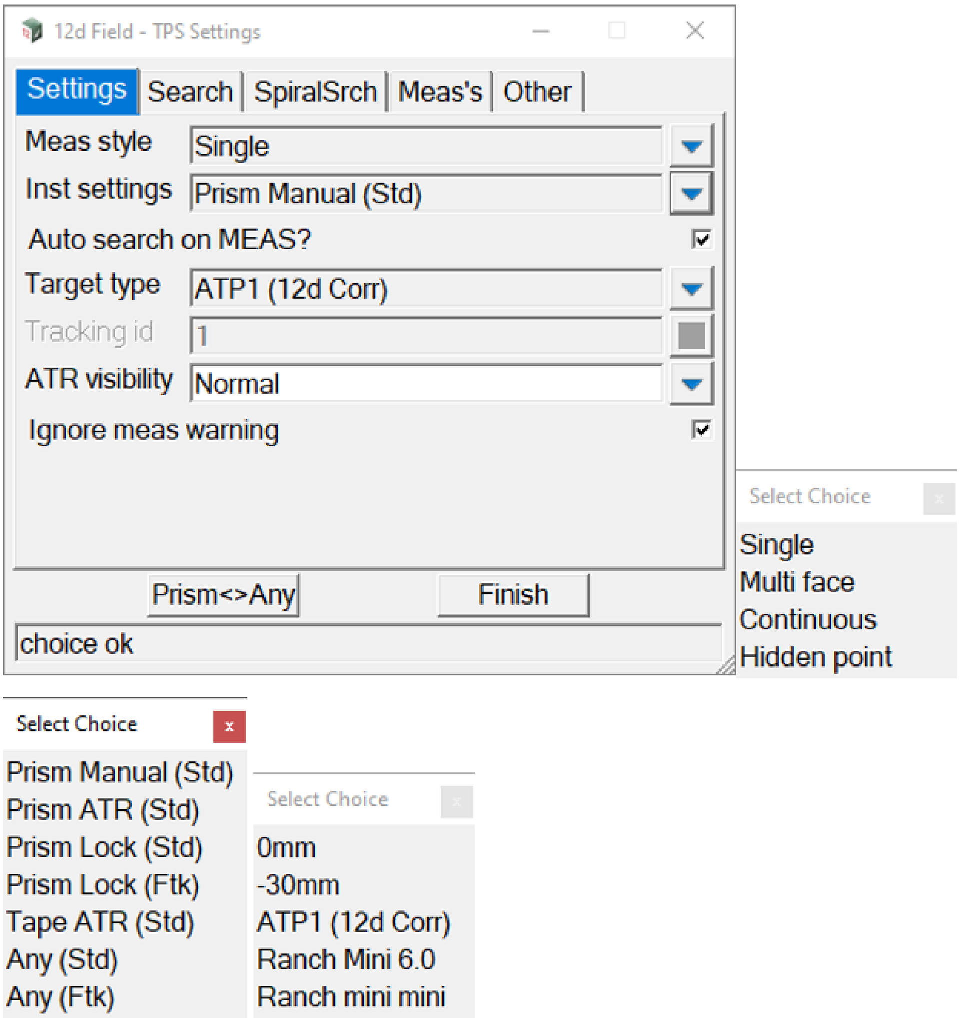


FTK - a dash-dot line, green for prism, red for any surface.



Continue to 16.3.2.2.1.2 TPS Settings as panel fields or return to 16.3.2 12d Field TPS Control Bar or 16.3 Starting and Configuring 12d Field .

16.3.2.2.1.2 TPS Settings as panel fields



Meas style choice box Single, Remote single, Multi face, Continuous, Hidden point

*Choose the **12d Field** measurement style, see* 16.1.3.12 TPS Measurements.

Inst settings choice box dependent on instrument

Full list of instrument setting choices.

*Dependent on the **Meas style** selected and the instrument manufacturer and series many instrument setting combinations are offered.*

E.g.

Any Manual (Ftk)

Tape ATR (Std)

Prism Manual (Std)

Prism(I) A-lock (Ftk)

The prompt is comprised of

1. the prism and pole type

Any - any surface

Tape - to a reflective sheet

Prism - to a standard circular or 360 prism

Prism(I) - to a prism with id support

Prism(?) - to a prism with a automatic height pole

Prism(?) - to a prism with a tilt-height pole

Prism(I?)- to a prism with id support on a tilt-height pole

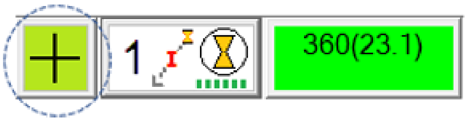
See 16.1.3.13 Target and pole types .

2. The point/follow mode, this can be Manual, ATR, Lock or A-lock, see 16.1.3.14 Target pointing and following modes.

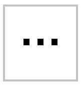
3. The measurement program, this can be STD, FST, STK or FTK, see 16.1.3.15 Measurement programs .

Continue to 16.3.2.2.1.3 Lock status bar or return to 16.3.2 12d Field TPS Control Bar or 16.3 Starting and Configuring 12d Field .

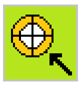
16.3.2.2.1.3 Lock status bar



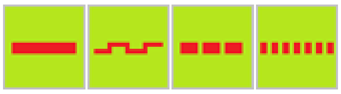
The instrument status button serves 2 purposes, it shows the current activity of the instrument and also serves to start searches or temporarily interrupt lock modes.



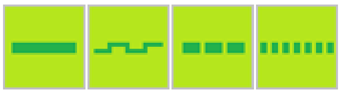
The instrument is idle, note this will be improved post V15C1g to indicate what search or other functionality will occur on pressing the button.



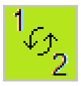
The instrument is in ATR mode and focusing.



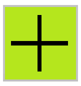
The instrument is taking an any surface measurement.



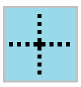
The instrument is taking a prism/tape measurement.



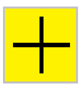
The instrument is changing face.



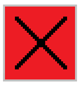
The instrument is locked onto and following the target, if the user presses the button the instrument will manually unlock from the target.



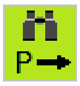
The instrument is manually unlocked by the user, press to search and lock on again.



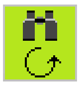
The instrument has lost lock and is in prediction mode.



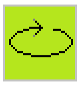
The instrument has lost lock.



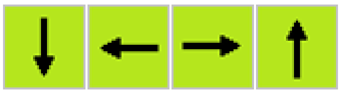
The instrument is power searching.



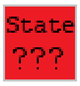
The instrument is spiral searching.



The instrument is rotating/moving to a new position.



The instrument is rotating in these directions.

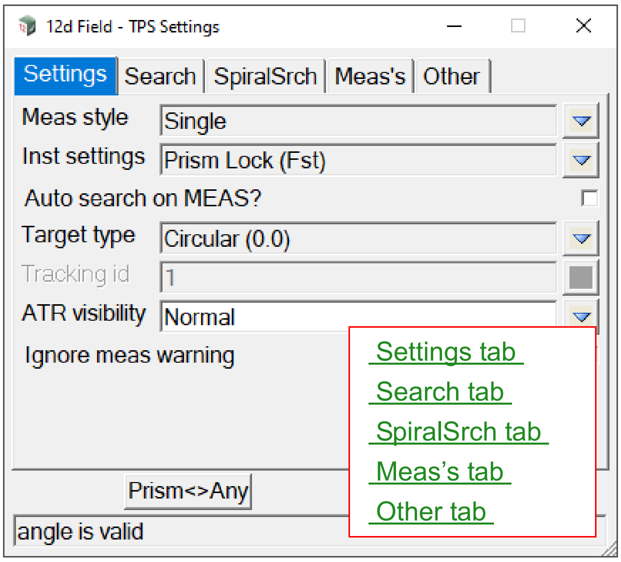


This should never happen, an unhandled state.

Continue to 16.3.2.3 12d Field - TPS Settings or return to 16.3.2 12d Field TPS Control Bar or 16.3 Starting and Configuring 12d Field .

16.3.2.3 12d Field - TPS Settings

The **12d Field - TPS** Settings panel defines the internal ***12d Field*** measurement style, the measurement and tracking setting on the TPS instrument itself, the search parameters when the prism is lost in robotic modes and accuracy tolerances to be achieved amongst other minor settings. The panel is different for all TPS instruments.



Settings tab
Search tab
SpiralSrch tab
Meas's tab
Other tab

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

Field Description	Type	Defaults	Pop-Up

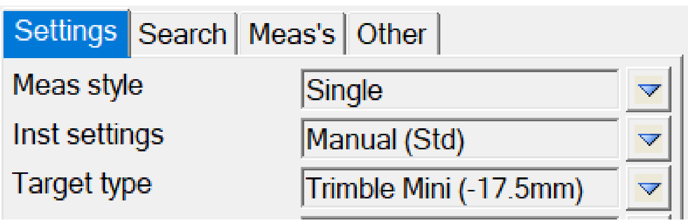
Buttons at Bottom

Prism<>Any button

Where an instrument can switch between measurement to a target and measurement to any surface this button will switch to the last combination of settings used for either type of measurement.

Settings tab

Setting tab common fields



Settings tab
Search tab
SpiralSrch tab
Meas's tab
Other tab

Field Description	Type	Defaults	Pop-Up
Meas style	choice box	Single	Single Meas, Averaging Continuous, Hidden Pt

For more information on Meas style see 16.1.3.12 TPS Measurements .

Field Description	Type	Defaults	Pop-Up
Inst settings	choice box		Prism fine, AC fine Tracking fine, Tracking coarse

Non prism normal

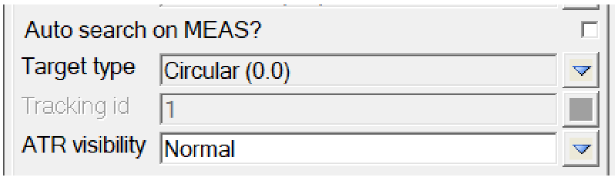
The Inst settings box presents the user with a list of EDM and motorisation modes available for each TPS, it is populated dependent on the choice in the Meas style box. For more information on insert setting options see 16.3.2.2.1 TPS Settings Options .

Target type choice box A6 (12d Corr), A7 (12d Corr)
0 mm, -30 mm
ATP1 (12d Corr)

The list of targets, (prism, tape or none) available for the current Inst setting, populated 1st from the inbuilt ***12d Field*** *targets list then the user targets. For a full description of* ***12d Field*** *targets see* 16.3.2.2 12dF_TPS_INS_USER_TARGETS.4D file format .

Note*: Choices depend on selected instrument.*

Leica settings extras



Auto search on MEAS? tick box ticked

If ***ticked****, when in a robotic mode and the prism target is not in the field of view a search will be started.*

If ***not ticked****, when in a robotic mode and the prism target is not in the field of view the measurement will fail.*

ATR visibility choice box

For pre Captivate instruments this controls ATR settings on the instrument, refer to the instrument manual for details.

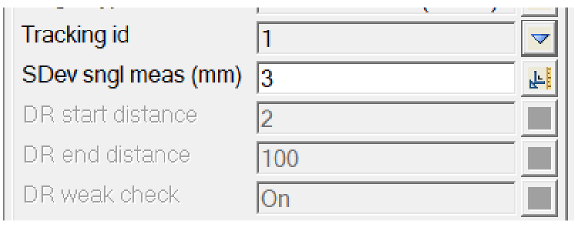
Ignore meas warning tick box not ticked

There are some warnings returned by the instrument, 1283 & 1284 that angular accuracy might be compromised.

If ***ticked****, the measurement will be accepted and processed.*

If ***not ticked****, the measurement is not accepted and fails.*

Trimble settings extras



Tracking id choice box 1 1 to 8

If an active tracking mode is selected select the tracking id of the active target.

SDev sngl meas (mm) real box 3

For standard measurement programs enter the desired standard deviation for the slope distance.

DR start distance

For direct reflex/any surface measurement programs enter the minimum distance that can be measured.

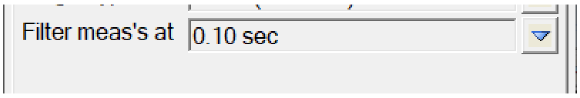
DR end distance

For direct reflex/any surface measurement programs enter the maximum distance that can be measured.

DR weak check	choice box		On, Off

To accept measurements at a lower accuracy (that is, below the normal instrument specification), disable Weak check.

Topcon generic settings extras



Filter mea's at	choice box	0.10 sec	0.01, 0.25, 0.33, 0.5 and 1.0 sec

The Topcon generic instrument transmits measurements at a very high rate, over 10Hz, set the filtering rate here to suit.

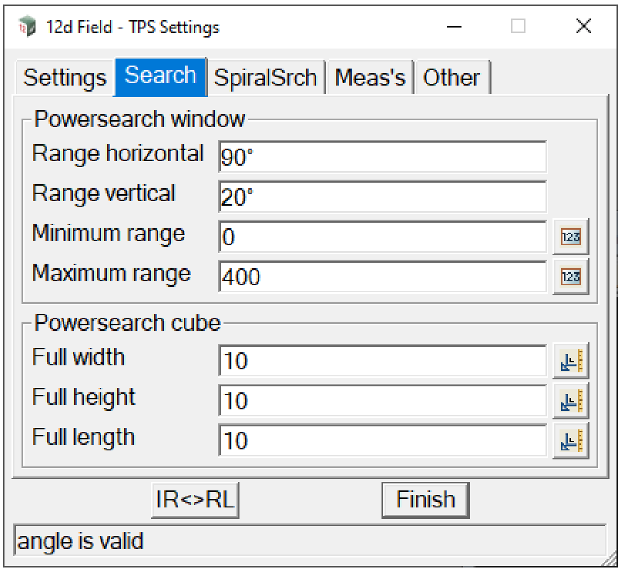
Search tab

For information on Leica search tab see Leica search tab .

For information on Trimble search tab see Trimble search tab .

For information on Topcon, Topcon 9000, Topcon generic search tab see The Topcon, Topcon 9000, Topcon generic search tab .

Leica search tab



Settings tab
Search tab
SpiralSrch tab
Meas's tab
Other tab

Powersearch window

The settings for a window powersearch relative to the current pointing of the instrument when the search is activated.

Range horizontal

The search window will be half of this value left and right of the current pointing.

Range vertical

The search window will be half of this value up and down of the current pointing.

Minimum range

Any target found less than this distance away will be ignored.

Maximum range

Any target found more than this distance away will be ignored.

Powersearch cube

The settings for a cube powersearch relative to the current pointing of the instrument when the search is activated and the last measured distance.

Full width

The search width will be half of this distance left and right of the current pointing.

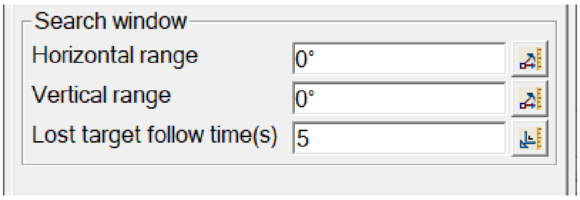
Full height

The search height will be half of this distance up and down of the current pointing.

Full length

The search depth will be half of this distance to and from the last measured distance.

Trimble search tab



Search window

The settings for a window powersearch relative to the current pointing of the instrument when the search is activated.

Horizontal range **angle box**

The search window will be half of this value left and right of the current pointing.

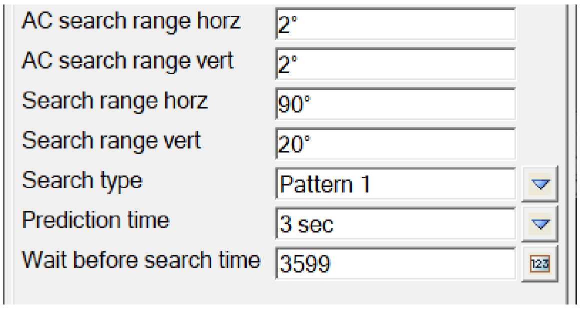
Vertical range **angle box**

The search window will be half of this value up and down of the current pointing.

Lost target follow time(s) **real box**

The time in seconds the instrument will follow the trajectory at the point of time the prism was lost.

The Topcon, Topcon 9000, Topcon generic search tab



AC search range horz

The auto-collimate search window will be half of this value left and right of the current pointing.

AC search range vert

The auto-collimate search window will be half of this value up and down of the current pointing.

Search range horz

The standard search window will be half of this value left and right of the current pointing.

Search range vert

The standard search window will be half of this value up and down of the current pointing.

Search type choice box Pattern 1 Pattern 1, Pattern 2

Select the predefined search pattern on the instrument.

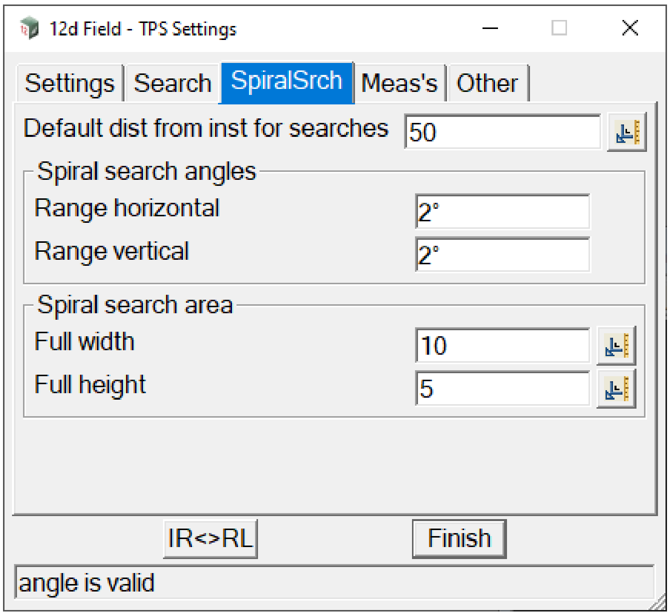
Prediction time choice box 3 sec 0.5, 1, 2, 3, 4, 5 seconds

The time in seconds the instrument will follow the trajectory at the point of time the prism was lost.

Wait before search time

The time in seconds after the prism is lost and the prediction time is finished before the instrument will perform an automatic search for the target. Leave at the maximum value of 3599 to disable this feature.

SpiralSrch tab



Settings tab
Search tab
SpiralSrch tab
Meas's tab
Other tab

Default dist from inst for searches real box 50

When there is no current distance measurement available this value will be used to calculate the angular range of cube searches.

Spiral search angles

Range horizontal

The search window will be half of this value left and right of the current pointing.

Range vertical

The search window will be half of this value up and down of the current pointing.

Spiral search area

Full width

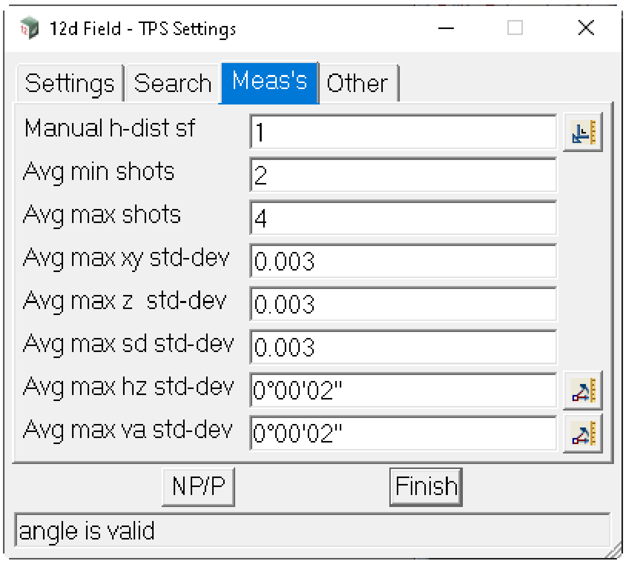
The search width will be half of this distance left and right of the current pointing.

Full height

The search height will be half of this distance up and down of the current pointing.

Meas’s tab

The Meas's tab is common for all instruments.



Settings tab
Search tab
SpiralSrch tab
Meas’s tab
Other tab

Manual h-dist sf real box

When geodetics are set to manually entered scale factor the value can be changed here.

Avg min shots integer box

For multiface type measurements the minimum number of faces to be measured.

Avg max shots integer box

For multiface type measurements the maximum number of faces to be measured, if tolerances have not been met at this point the measurement will fail.

Avg max xy std-dev real box

For multiface type measurements if the minimum faces have been completed and the standard deviation of the xy position is under this value then the measurement can proceed if all other tolerances have been met.

Avg max z std-dev real box

For multiface type measurements if the minimum faces have been completed and the standard deviation of the z/height is under this value then the measurement can proceed if all other tolerances have been met.

Avg max sd std-dev real box

For multiface type measurements if the minimum faces have been completed and the standard deviation of the slope distance is under this value then the measurement can proceed if all other tolerances have been met.

Avg max hz std-dev real box

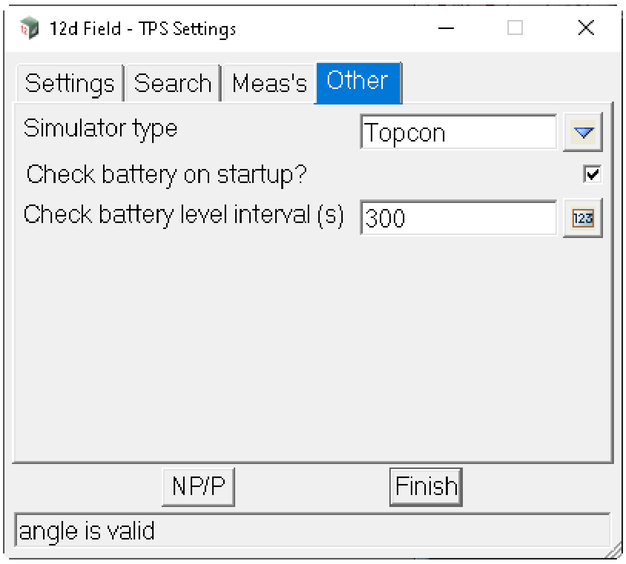
For multiface type measurements if the minimum faces have been completed and the standard deviation of the horizontal angle is under this value then the measurement can proceed if all other tolerances have *been met.*

Avg max va std-dev real box

For multiface type measurements if the minimum faces have been completed and the standard deviation of the vertical angle is under this value then the measurement can proceed if all other tolerances have been met.

Other tab

Common settings for other tab



Settings tab
Search tab
SpiralSrch tab
Meas's tab
Other tab

Simulator type choice box Leica, Trimble
Topcon 9000, Topcon
Topcon generic

Choose which instrument type the simulator will mimic. The simulator will never be fully identical to the real TPS due to subtle variations on what functionality is actually available so generally the simulator will mimic a fully featured instrument.

Check batter on startup? tick box

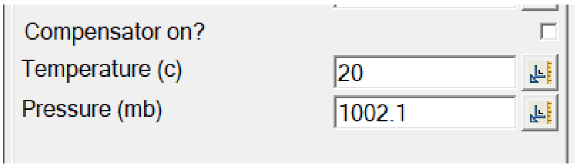
*If **ticked**, a message panel will show the battery level when 12dField is started.*

*If **not ticked**, the battery level is not checked when 12dField is started.*

Check batter level interval (s) integer box

The interval in seconds that 12dField polls the instrument for the battery level, if the level is different to the last level defined in 12dF_Battery_Levels.4D a message panel will show the new level.

Trimble other tab extras



Compensator on? tick box not ticked

*If **ticked**, the instruments compensator is enabled.*

*If **not ticked**, the instruments compensator is disabled, this should only ever be unticked when absolutely* *necessary.*

Temperature (c) real box

The temperature in Celsius to be used for measurement calculations.

Pressure (mb) real box

The pressure in millibars to be used for measurement calculations.

Continue to 16.3.3 12d Field GNSS Control Bar or return to 16.3.1 12d Field - Last Configuration or 16.3 Starting and Configuring 12d Field .

16.3.3 12d Field GNSS Control Bar

Once a GNSS instrument has been selected and ***12d Field*** has successfully connected to the instrument, the **GNSS control bar** will appear.

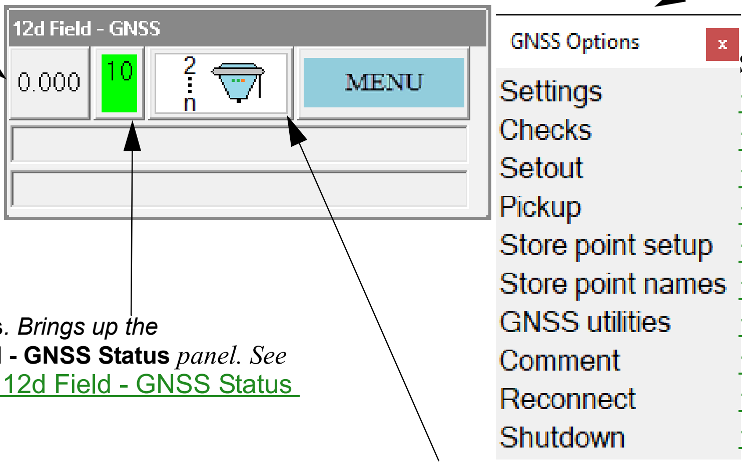
The **GNSS control bar** is identical in functionality and layout for all GNSS instruments but individual icons may vary from instrument type to instrument type.

The **GNSS control bar** has all the option for working with GNSS for both ***Pickup*** and ***Setout***.

12d Field GNSS Toolbar

Target height. *Brings up the* **12d Field - Target Heights** *panel. See* 16.3.3.1 12d Field - GNSS Target Heights

See 16.5 12d Field Options



See
16.5.15 General Settings - GNSS
16.5.13 Checks - GNSS
16.5.4 Setout
16.5.5 Pickup
16.5.9 Store Point Setup
16.5.10 Store Point Names
16.5.14 GNSS Utilities
16.5.11 Log Comment
16.5.8 Reconnect
16.5.12 12d Field Shutdown

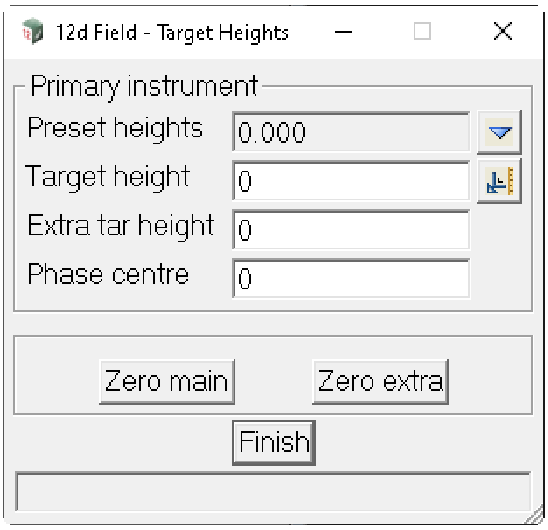
Satellites. *Brings up the* **12d Field - GNSS Status** *panel. See* 16.3.3.2 12d Field - GNSS Status

GNSS Settings. *Brings up the* **12d Field - GNSS Settings** *panel. See* 16.3.3.3 12d Field - GNSS Setting

Continue to 16.3.3.1 12d Field - GNSS Target Heights or return to 16.3 Starting and Configuring 12d Field .

16.3.3.1 12d Field - GNSS Target Heights

The **12d Field - GNSS Target Heights** panel display, and sets, the state of the target heights for the **GNSS** instrument.



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

Field Description	Type	Defaults	Pop-Up
Preset heights	choice box		preset heights

List of preset target heights to select from.
When a value is selected it will be copied into the **Target height f***ield.*

Target height real box

For GNSS instruments the target height and phase centre added to form the full target height. It is the users preference on how to use the combination of these 2.

Extra tar height real box

*The **extra target height** allows the user to increase the **target height** with a measured value, e.g. the depth of a pit. When **non zero** the **extra target height** is added to the **target height** and **phase centre** when reducing the GNSS measurement. When the **extra target height** is **non zero** the user is presented the target heights panel every measurement.*

Phase centre

A manufacturer supplied offset, typically from the bottom of the antenna mount to the true 'receiving centre' of the unit.

Zero main button

When pressed, the **Target height** *is set to zero (0).*

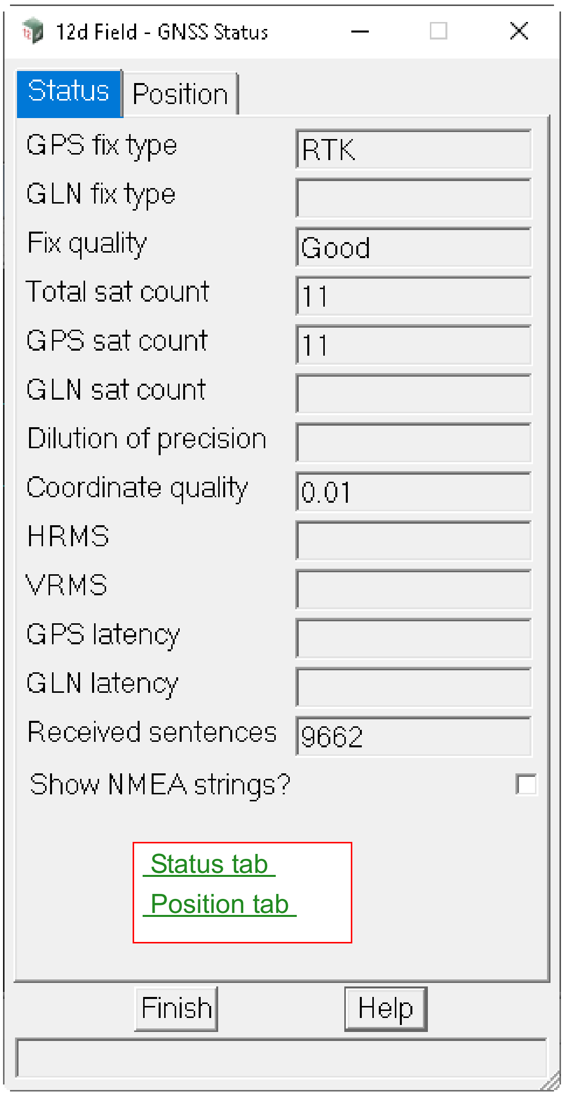
Zero extra button

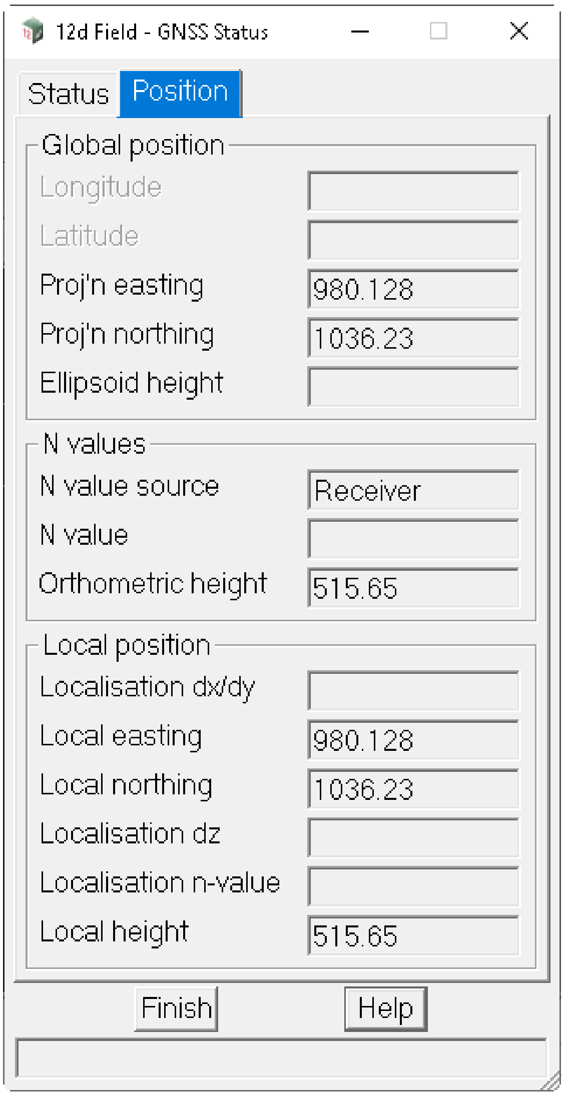
When pressed, the **Extra tar height** *is set to zero (0).*

Continue to 16.3.3.2 12d Field - GNSS Status or return to 16.3 Starting and Configuring 12d Field .

16.3.3.2 12d Field - GNSS Status

The **12d Field - GNSS Status** panel provides information about the current state of the **GNSS** instrument such as fix quality and number of satellites used.





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

Field Description Type Defaults Pop-Up

Status tab

GNSS fix type text box

The current fix type of the GNSS satellites, e.g RTK.

GLN fix type text box

The current fix type of the Glonass satellites, e.g RTK.

Fix quality text box

The quality of the GNSS, Good, Average, Poor no RTK.

Tot sat count integer box

The number of GNSS satellites (GPS and Glonass etc).

GPS sat count integer box

The number of GPS satellites.

GLN sat count integer box

the number of Glonass satellites.

Dilution of precision real box

The current dilution of precision.

Coordinate quality real box

Leica specific coordinate quality.

HRMS real box

Horizontal Root Mean Square value.

VRMS real box

Vertical Root Mean Square value.

GPS latency real box

The latency of the measurements from the GPS satellites.

GLN latency real box

The latency of the measurements from the Glonass satellites.

Received sentences integer box

The number of NMEA sentence bundles received in the current 12dField session.

Show NMEA strings tick box

*If **ticked**, the received NMEA sentence bundles are written to the output window.*
*If **not ticked,** the received NMEA sentence bundles are not shown.*

Position tab

Longitude angle box

The longitude of the running measurement.

Latitude angle box

The latitude of the running measurement.

Proj'n easting real box

The current easting of the GNSS.

Proj'n northing real box

The current northing of the GNSS.

Ellipsoid height real box

The current ellipsoid height of the GNSS.

N value source text box

The source of the N values - Receiver or 12d.

N value real box

The current N value.

Orthometric height real box

The current orthometric height of the GNSS

Localisation dx/dy real box

The adjustment applied to the raw GNSS coordinate to bring it into the local system.

Local easting real box

The local easting of the running measurement.

Local northing real box

The local northing of the running measurement.

Localisation dz real box

The height adjustment applied to the raw GNSS height to bring it into the local system.

Localisation n-value real box

The current n-value

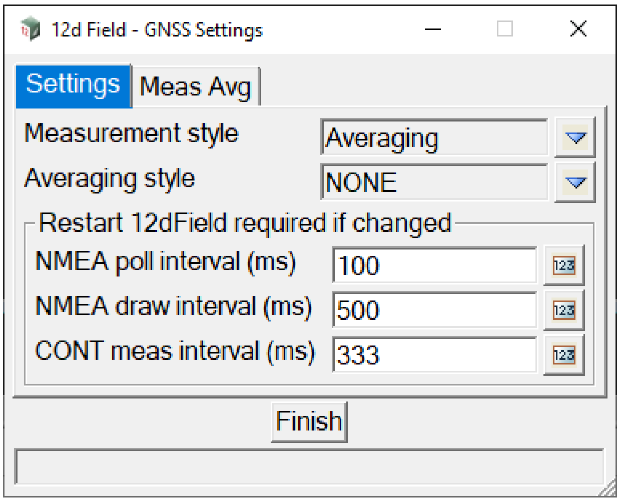
Local height real box

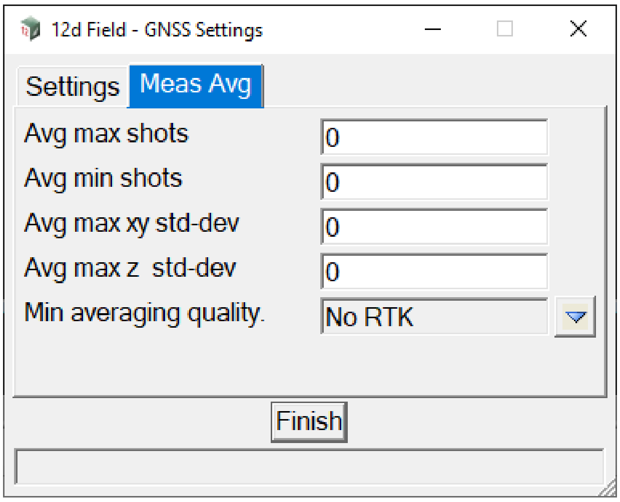
The local height of the running measurement.

Continue to 16.3.3.3 12d Field - GNSS Setting or return to 16.3 Starting and Configuring 12d Field .

16.3.3.3 12d Field - GNSS Setting

The **12d Field - GNSS Settings** panel defines the settings to control the collection of **GNSS** shots.





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

Field Description	Type	Defaults	Pop-Up

Settings tab

Measurement style	choice box		Single Meas, Averaging, Continuous, Hidden Pt

For information on GNSS Measurements see 16.1.3.16 GNSS Measurements.

Averaging style choice box

When the measurement style is set to averaging select the averaging style you wish to use here.

Averaging styles are defined in 12dF_GPS_MEAS_AVERAGE_SETTINGS.4D.

NMEA poll interval (ms) real box

The interval 12dField polls the communications port for NMEA sentence bundles, set this time faster than the equivalent time on the GNSS receiver.

NMEA draw interval (ms) real box

The interval the current GNSS position is drawn on the 12dField views.

CONT meas interval (ms) real box

The interval when in continuous measurement style 12dField looks to process downloaded NMEA sentence bundles, the NMEA poll interval should be set to faster than this.

Meas Avg tab

Avg max shots integer box

When averaging the maximum number of readings to be taken, if tolerances have not been met at this point the measurement will fail.

Avg min shots integer box

When averaging the minimum number of readings to be taken.

Avg max xy std-dev	real box	

For averaging type measurements if the minimum number of readings have been completed and the standard deviation of the xy position is under this value then the measurement can proceed if the z tolerance has been met as well.

Avg min xy std-dev	real box	

For averaging type measurements if the minimum number of readings have been completed and the standard deviation of the z/height is under this value then the measurement can proceed if the xy tolerance has been met as well.

Min averaging quality	choice box	Good Quality, Average Quality, Poor Quality, No RTK

The minimum quality level allowable for GPS averaging, levels less than this quality will be ignored.

Continue to 16.4 12d Field Concepts or return to 16.3 Starting and Configuring 12d Field .

16.4 12d Field Concepts

See 16.4.1 Field File Paths .

See 16.4.2 Attributes .

See 16.4.3 Overview of string and surface names .

16.4.1 Field File Paths

All of 12dField's configuration files are text files, all settings for instruments, panels and general settings are completely customised via these files.

How 12dField's configuration files are set up is very dependent on the user's needs. It would often be close to the sharing/Synergy configurations in use but allows its own tweaks to the overall environment.

See 16.4.1.1 Existing Files .

See 16.4.1.2 New Files .

See 16.4.1.3 12dF_Global_Config.4D .

16.4.1.1 Existing Files

When searching for an existing file ***12d Field*** will search via the standard paths with one exception. If the directory **12dF_Current_Settings** exists in the **working directory** ***12d Field*** will search here first before then using the standard search path. **12dF_Current_Settings** is new for V15.

16.4.1.2 New Files

If a 12dField configuration file is not found ***12d Field*** will create a new file and populate it with default values. By default all 12dField config files are created in the USER area however if the environment variable **TDF_CONFIGS_IN_USER_DIR_4D** is found and value set to 0 the new files will be created in the working directory.

16.4.1.3 12dF_Global_Config.4D

12dF_Global_Config.4d stores many of the settings that are in theory global across all of a user's 12dField projects. While this might be the case for a majority of the attributes the user has the ability to split where it's attributes are sourced from and saved to over the **USER**, **CUSTOMER_USER** and **working** directories.

Important, the user must set the path to **CUSTOMER_USER** via the **CUSTOMER_USER_4D** environment variable to be able to use that directory.

12d Field looks for 3 separate files when reading its global attributes, **12dF_GLOBAL_CONFIG.4D**, **12dF_CUSTOMER_CONFIG.4D** and **12dF_WORKING_CONFIG.4D**, these are searched for via the standard paths. Note by default these files are created in the standard areas so if a user wishes to make use of **12dF_CUSTOMER_CONFIG.4D** in the **CUSTOMER_USER** directory the file must be manually moved there.

Firstly, the attribute will be searched for in **12dF_GLOBAL_CONFIG.4D**, this means if the user does not want to source an attribute from this file they must comment out or remove the line from this file and add it to the file they wish it to be sourced from.

Secondly, the attribute will be searched for in **12dF_CUSTOMER_CONFIG.4D**, the attribute will have needed to have been removed from the global file and pasted here.

If still not found the attribute will then be searched for in **12dF_WORKING_CONFIG.4D**.

For example, each surveyor in an organization might have their own preference for hotkey bars layout and content, here it is desirable to store these in the **CUSTOMER_USER** area as this can be unique to each user.

In the **12dF_GLOBAL_CONFIG.4D** these lines will need to be commented out as such with the // characters or removed completely. If commented out they will not be written to file the next time the file is saved.

//st_hotkeys_bar_1 1 0

//st_hotkeys_bar_1_x 1 1842

//st_hotkeys_bar_1_y 1 258

//st_hotkeys_bar_1_tps_keys 1 XYZ STD TPS BAR

//st_hotkeys_bar_1_gps_keys 0

And added to 1**2dF_CUSTOMER_CONFIG.4D** without the comments.

st_hotkeys_bar_1 1 0

st_hotkeys_bar_1_x 1 1842

st_hotkeys_bar_1_y 1 258

st_hotkeys_bar_1_tps_keys 1 FREDS TPS BAR

st_hotkeys_bar_1_gps_keys 0

Continue to 16.4.2 Attributes or return to 16.4 12d Field Concepts .

16.4.2 Attributes

12d Field uses around 3000 attributes for its internal configuration and publishing surveyed results as vertex attributes.

For V15 attribute names underwent a major revision, since it's conception in 2007 the functionality available in ***12d Field*** has vastly expanded and newer setting out technologies such as the 4 chainage types meant a complete revision of attribute names was necessary.

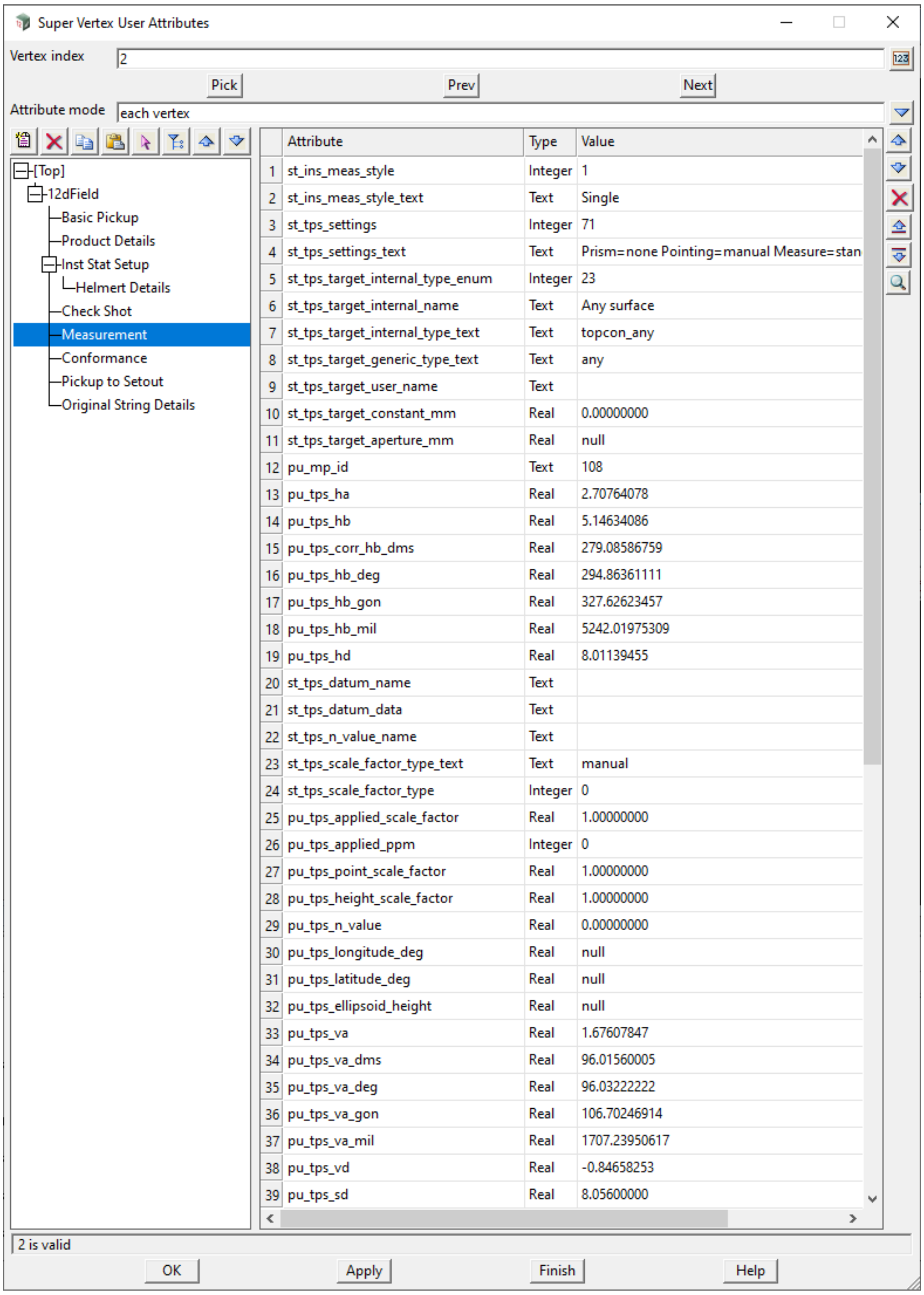
For example:

so_sp_ss_os "setout", the offset of the setout point from the setout string.

pu_mp_x "pickup", the easting of the surveyed TPS/GNSS point.

st_gps_localisation_file "setting", the name of the localization file containing the settings for GPS measurement reductions.

16.4.2.1 12d Field Attributes



See 16.4.2.1.1 Basic Pickup

See 16.4.2.1.2 Product Details

See 16.4.2.1.3 Inst Stat Setup

See 16.4.2.1.3.1 Helmert Details

See 16.4.2.1.3.2 Check Shot

See 16.4.2.1.3.3 Measurement

See 16.4.2.1.3.4 Conformance

See 16.4.2.1.3.5 Pickup to Setout

See 16.4.2.1.3.6 Original String Details

16.4.2.1.1 Basic Pickup

16.4.2.1.2 Product Details

16.4.2.1.3 Inst Stat Setup

16.4.2.1.3.1 Helmert Details

16.4.2.1.3.2 Check Shot

16.4.2.1.3.3 Measurement

Name	Type	Example	Description
st_tps_target_internal_type_enum	Integer	18	The number used internally by 12d to identify the target.
st_tps_target_internal_name	Text	ATP1 (12d Corr)	The text displayed in the target choice box.
st_tps_target_internal_type_text	Text	topcon_360_ATP1_7_hc	The internal 12d name for the target.
st_tps_target_generic_type_text	Text	prism_360	The generic type, **any**, **tape**, **prism** or **prism_360**
st_tps_target_user_name	Text	ATP1 -7mm	The user entered text for the target, (from 12dF_TPS_INS_USER_TARGETS.4D), this is displayed in the target constant area of the control bar if defined.
st_tps_target_constant_mm	Real	-7.00000000	The constant used for the current target.
st_tps_target_aperture_mm	Real	34.00000000	The aperture, size/height of the actual target area for tape and prism targets. Used by the Topcon and Sokkia Generic instruments.

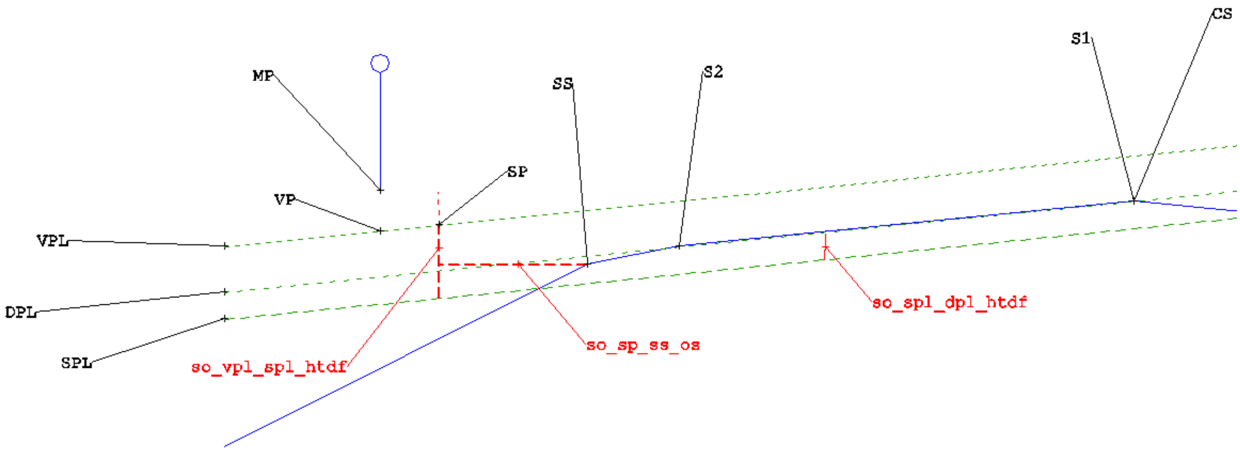
16.4.2.1.3.4 Conformance

16.4.2.1.3.5 Pickup to Setout

16.4.2.1.3.6 Original String Details

Continue to 16.4.3 Overview of string and surface names or return to 16.4 12d Field Concepts .

16.4.3 Overview of string and surface names



CS - **control string**, chainages are relative to this string, surveyed points are dropped to this string and all other cut perpendicular to this string for calculations.

SS - setout string, the string used for the horizontal location of the setout point.

S1, S2, CR - **string 1, string 2, crown**, strings used to define the plane of the setout surface dependent on the setout panel.

SC - secondary control, not shown, a completely independent string the measure point is dropped to for a reference chainage and offset.

SP - setout point, the nominal point calculated from the setout chainage, offset and height difference.

MP - measured point, the surveyed TPS or GNSS point.

VP - virtual point, a point calculated at the measured point on the **virtual plane**, this is the point that defines the delta values to the **setout point**.

DPL - design plane, a plane through the nominal design strings.

SPL - shifted plane, a plane when necessary defining a surface that is a set value from the design surface, e.g. top of a pavement sub layer.

VPL - virtual plane, a plane a nominal distance from the shifted plane, delta values are relative to this layer.

Continue to 16.5 12d Field Options or return to 16.4 12d Field Concepts .

16.5 12d Field Options

12d Field TPS Options

TPS Options	See
Station setup	16.5.2 Station Setup - TPS
Checks	16.5.3 Checks - TPS
Setout	16.5.4 Setout
Pickup	16.5.5 Pickup
TPS functions	16.5.6 TPS Control
Settings	16.5.7 General Settings - TPS
Reconnect	16.5.8 Reconnect
Store point setup	16.5.9 Store Point Setup
Store point names	16.5.10 Store Point Names
Inst log add comment	16.5.11 Log Comment
Shutdown	16.5.12 12d Field Shutdown

12d Field GNSS Options

GNSS Options	See
Settings	16.5.15 General Settings - GNSS
Checks	16.5.13 Checks - GNSS
Setout	16.5.4 Setout
Pickup	16.5.5 Pickup
Store point setup	16.5.9 Store Point Setup
Store point names	16.5.10 Store Point Names
GNSS utilities	16.5.14 GNSS Utilities
Comment	16.5.11 Log Comment
Reconnect	16.5.8 Reconnect
Shutdown	16.5.12 12d Field Shutdown

Continue to 16.5.1 Common Buttons, Panel Tabs and Fields .

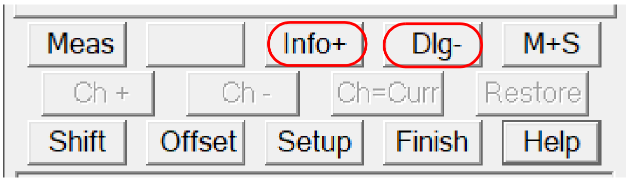
16.5.1 Common Buttons, Panel Tabs and Fields

See

- 16.5.1.1 Info and Dlg Buttons
- 16.5.1.2 Meas, Store and MS+ST Buttons
- 16.5.1.3 Ch+, Ch-, Ch=Curr and Restore Buttons
- 16.5.1.4 Shift, Offset and Setup Buttons
- Continue to 16.5.1.5 Navigation Tab or return to 16.5.1 Common Buttons, Panel Tabs and Fields
- 16.5.1.5 Navigation Tab
- 16.5.1.6 Tolerances Tab
- 16.5.1.7 Common Panel Fields

16.5.1.1 Info and Dlg Buttons

These buttons do not change in behaviour between all of the different measure modes.



Info+

Displays the information panel.

This panel contains extra information about the current setout that is not displayed in the standard panel. The contents of this information panel is user configurable via the text file ***12dF_INFO_PAGE_CONFIG.4D****.*

When the information panel is active, the button changes to ***Info-****.*

Info-

Closes the extra the information panel.

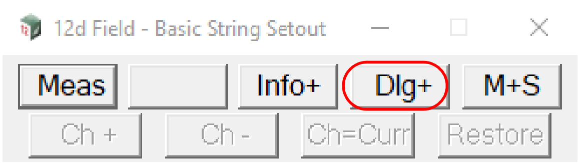
When the information panel closed, the button changes to ***Info****+.*

Dlg-

When pressed the panel changes so that only the button area is displayed and the button changes to ***Dlg+.***

Dlg+

When pressed the panel changes from just showing the button to full size and the button changes to ***Dlg-.***



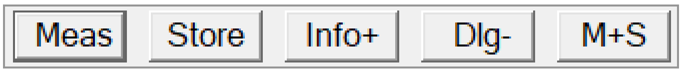
16.5.1.2 Meas, Store and MS+ST Buttons

See

16.5.1.2.0.1 Single (GNSS/TPS) and Multiface (TPS only) Measurement Modes
16.5.1.2.0.2 Continuous (GNSS/TPS) Measurement Mode
16.5.1.2.0.3 Averaging measurement mode (GNSS only)

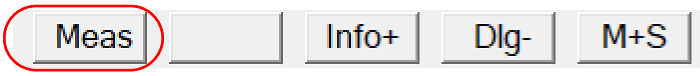
16.5.1.2.0.1 Single (GNSS/TPS) and Multiface (TPS only) Measurement Modes

In **Single** and **Multiface** modes, the **Meas, Store and MS_ST** buttons can be used.



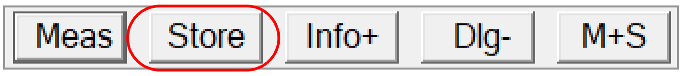
However, the **Store** button is disable until a measurement is made.

Meas



*Starts the measurement and on completion of the measurement, the **Store** button appears:*

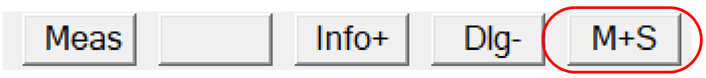
Store



Stores the point as per the settings in the 16.5.9 Store Point Setup *panel.*
*Once stored, the **Store** button is blanked out until a new measurement is taken.*

***Note**: storing the first point automatically brings up the* **Store Point Setup** *panel to define the settings.*

MS+ST - Measure and Store

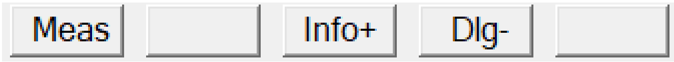


Starts a measurement and stores the point as per the settings in the 16.5.9 Store Point Setup *panel.*
*The **Store** button remains disabled.*

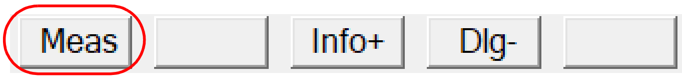
Continue to 16.5.1.2.0.2 Continuous (GNSS/TPS) Measurement Mode or return to 16.5.1 Common Buttons, Panel Tabs and Fields .

16.5.1.2.0.2 Continuous (GNSS/TPS) Measurement Mode

In **Continuous** mode, the **MS+ST** button is disabled.



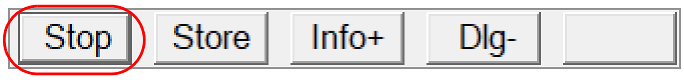
Meas - Continuous



Start continuous measurement.

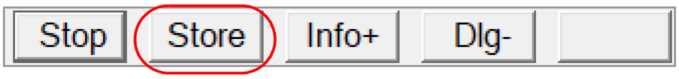
*The **Stop** button then replaces the **Meas** button and the **Store** button is enabled.*

Stop



Stop the continuous measurement.

Store



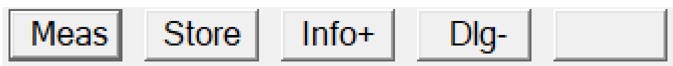
Store the point as per the settings in the 16.5.9 Store Point Setup *panel.*

*The button state does not change meaning the user can continue to store points at a single press of the **Store** button.*

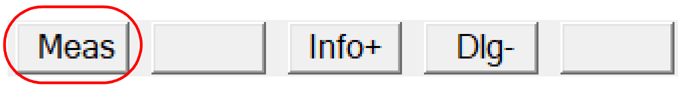
Continue to 16.5.1.2.0.3 Averaging measurement mode (GNSS only) or return to 16.5.1 Common Buttons, Panel Tabs and Fields .

16.5.1.2.0.3 Averaging measurement mode (GNSS only)

In Averaging mode the **MS+ST** button is disabled.



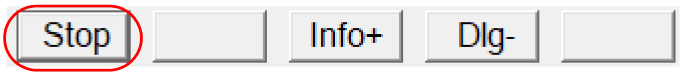
Meas



Start an averaging measurement.

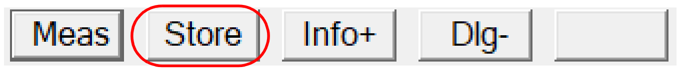
*The details of the averaging, standard deviations in x, y, and z are displayed in the third message line of the panel. The **Stop** button then replaces the **Meas** button.*

Stop



Stop the averaging measurement.

Store

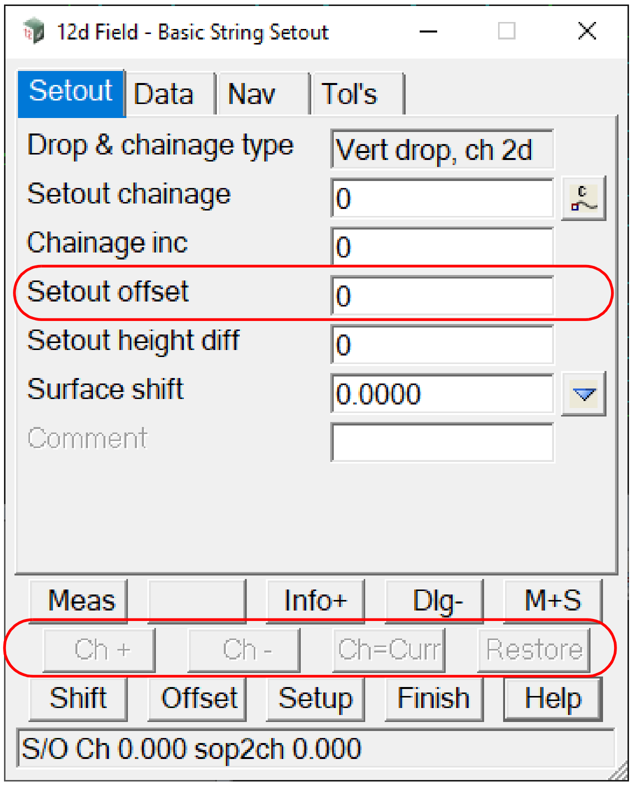


Store the point as per the settings in the 16.5.9 Store Point Setup *panel.*

Continue to 16.5.1.3 Ch+, Ch-, Ch=Curr and Restore Buttons or return to 16.5.1 Common Buttons, Panel Tabs and Fields .

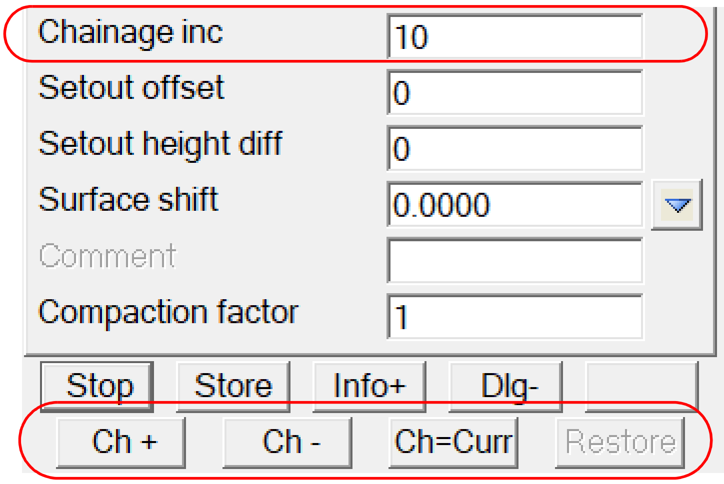
16.5.1.3 Ch+, Ch-, Ch=Curr and Restore Buttons

The chainage buttons commonly appear as the middle row of buttons in a **12d Field Setout** panel.



The **Ch+** and **Ch-** buttons are used to quickly increment to the next chainage to be setout.

The buttons are activated when the **Chainage Increment** field in the panel has a value other than zero (0).



Ch+

*When pressed the value in the **Chainage Increment** field is added to the current setout chainage.*

*The value in **Chainage Increment** field can be positive or negative.*

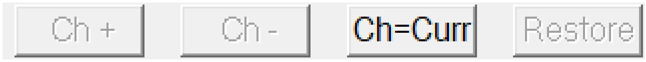
Ch-

*When pressed the value in the **Chainage Increment** field is subtracted from the current setout chainage.*

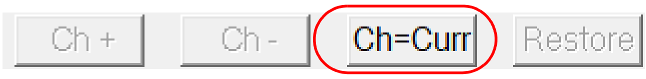
*The value in **Chainage Increment** field can be positive or negative.*

***Note** - the chainages generated by Ch+/Ch- are not restricted to the simple interval from the current setout chainage, other significant points on the control string such as horizontal tangent points can be included as well. Link to Settings->Survey->Spec Ch's.*

The **Ch=Curr** and **Restore** buttons are used when the user has a need to temporarily use the current chainage for setout purposes.



Ch=Curr



The button is activated when a measurement has been taken.

When pressed, the setout chainage is set to the current chainage.

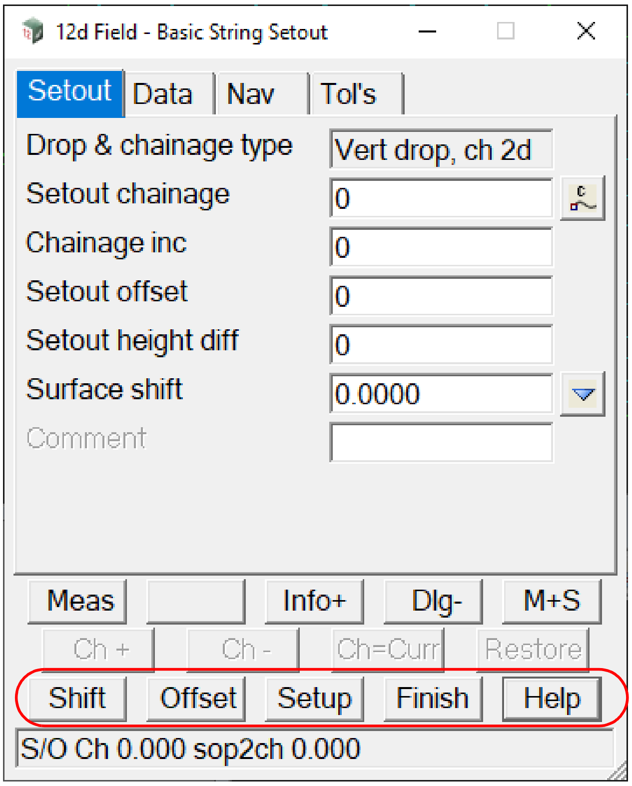
The **Restore** *button is then activated and the* **Ch+** and **Ch-** *buttons disabled.*

Restore

*When pressed, the setout chainage is set back to the chainage when **Ch=Curr** was pressed and the **Ch+ Ch-** buttons enabled.*

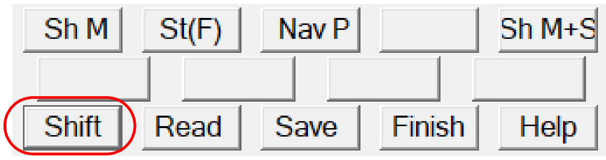
Continue to 16.5.1.4 Shift, Offset and Setup Buttons or return to 16.5.1 Common Buttons, Panel Tabs and Fields .

16.5.1.4 Shift, Offset and Setup Buttons



Shift

Display extra functionality available for each panel button.



Offset

Open the Offset Measurement panel. LINK

Setup

Open the Store Point Setup panel. See 16.5.9 Store Point Setup .

Setup >

Sh M

Prepares the tablet to take a measurement by a touch anywhere on the screen.

Sh M+S

Prepares the tablet to take a measurement and store the point by a touch anywhere on the screen.

Nav P

*Brings up the **Read Nav Config** panel.*

The standard navigation page configuration is store in the file "12dF_NAV_PAGE_CONFIG.4D", alternative configurations can be dynamically loaded using this panel, these files are identical format to the standard file but with the extension "NAV_PAGE_CONFIG_4D".

Finish	button

Read the selected file, the next measurement will populate the navigation screen using the new configuration.

Cancel	button

Exit without changing the configuration.

St(F)

*Force store, this button allows a measurement to be stored a second time, for example the **Store Point Setup** panel could be opened, settings changed and the point stored again.*

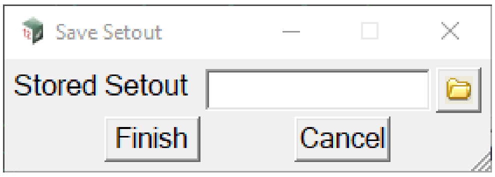
Save and Read

*Like all of **12d Model** it can be advantageous to store frequently used settings and load them on demand.*

***12d Field** predates the SLX & DDX formats and as such uses custom files to save and populate its panels. The standard config files are named dependent on the setout panel. For example the **Crossfall Setout** panel configuration is stored in **12dF_CROSSFALL_CONFIG.4D.** Any number of configurations for each panel can be stored in a favourites file with an extension based on the panel, e.g. **.12dF_PANEL_FAV_CROSSFALL_SETOUT_4D**.*

Save

*Brings up the **Save Setout** panel.*



Stored Setout	file box

Enter or select the favourites file to store the panel contents, the extension is dependent on the setout panel.

Finish	button

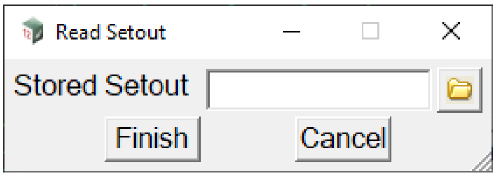
Save the contents of the current panel for future use.

Cancel	button

Exit without saving.

Read

*Brings up the **Read Setout** panel.*



Stored Setout file box

The favourites file to use to populate the panel.

Read a stored favourite and populate the panel from it.

Finish button

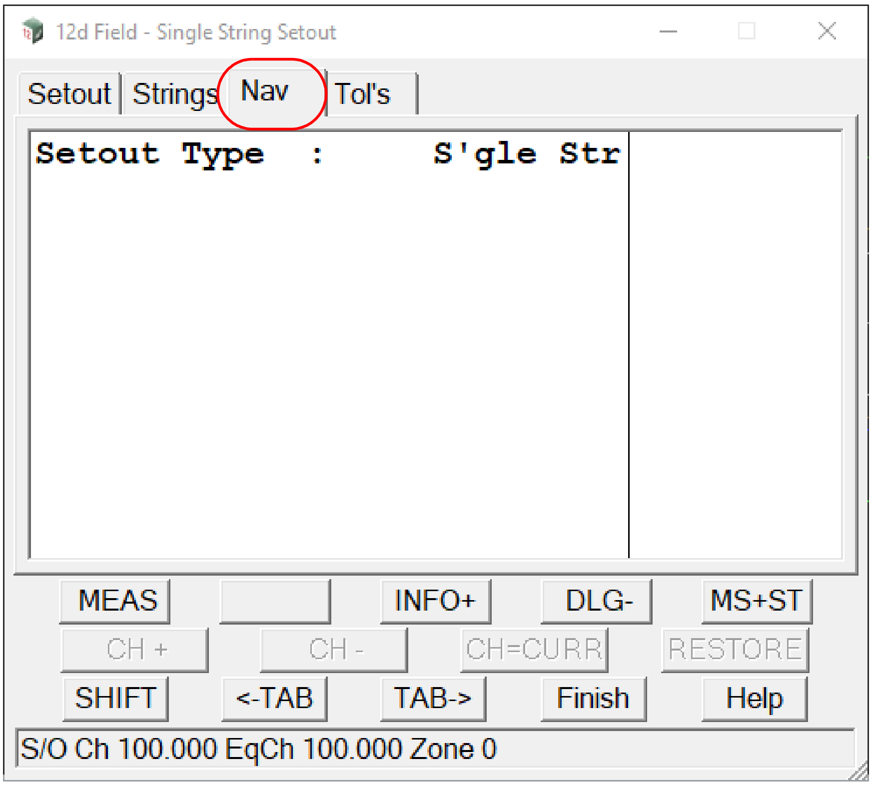
Save the contents of the current panel for future use.

Cancel button

Exit without saving.

Continue to 16.5.1.5 Navigation Tab or return to 16.5.1 Common Buttons, Panel Tabs and Fields

16.5.1.5 Navigation Tab



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

Field Description	Type	Defaults	Pop-Up
Navigation box	draw box		

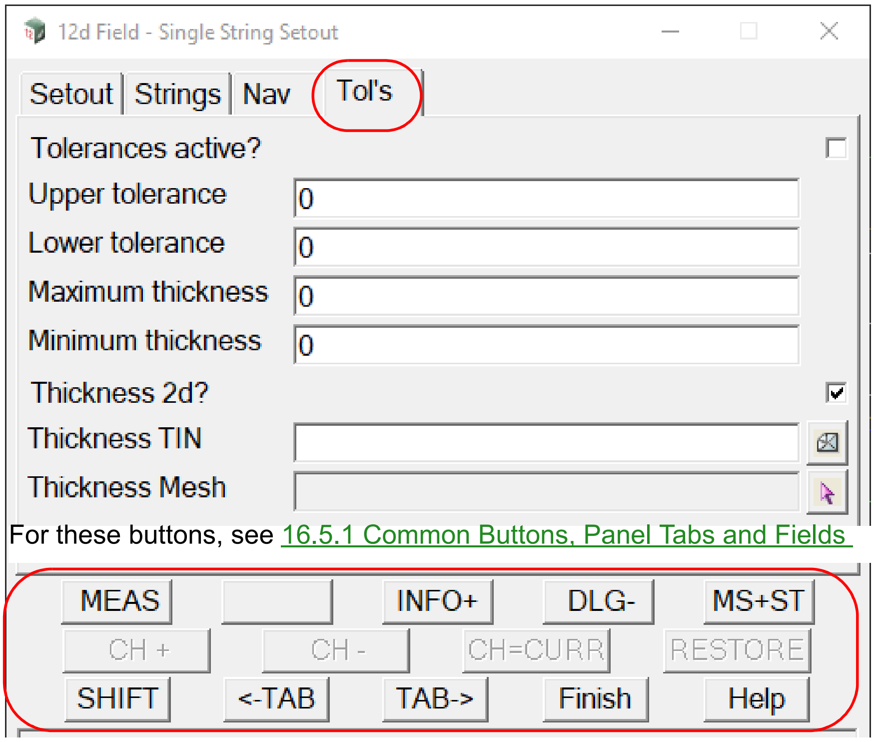
The 12d Field navigation box augments setout by displaying user definable information rows plus a bulls-eye as a visual aid.

Buttons at Bottom

For more information on these buttons, see 16.5.1 Common Buttons, Panel Tabs and Fields.

Continue to 16.5.1.6 Tolerances Tab or return to 16.5.1 Common Buttons, Panel Tabs and Fields

16.5.1.6 Tolerances Tab



For these buttons, see 16.5.1 Common Buttons, Panel Tabs and Fields

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

Field Description	Type	Defaults	Pop-Up
Tolerances active?	tick box	not ticked	

*If **ticked**, then differences to design will be checked against these tolerances and warnings displayed, the tolerances and differences to them will also be written to the 12dField vertex attributes.*

Upper tolerance 12dF real box

The upper tolerance from design for a thickness check, +ve = above design level.

Lower tolerance 12dF real box

The lower tolerance from design for a thickness check, +ve = above design level.

Maximum thickness 12dF real box

The maximum thickness for a thickness check.

Minimum thickness 12dF real box

The minimum thickness for a thickness check.

Thickness 2d? tick box ticked

*If **not ticked**, tolerances are applied 3d to the tin or trimesh.*

Thickness TIN 12dF tin box

The tin to be used for thickness checks.

Thickness Mesh string select box

The trimesh to be used for thickness checks.

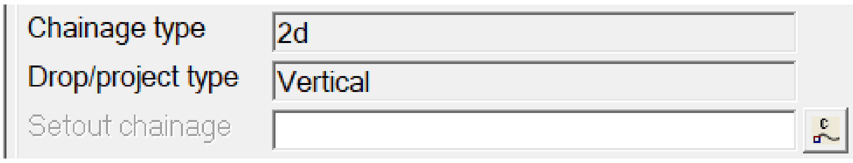
Continue to 16.5.1.7 Common Panel Fields or return to 16.5.1 Common Buttons, Panel Tabs and Fields .

16.5.1.7 Common Panel Fields

See

16.5.1.7.1 Setout Chainage (so_cs_ch)

Fundamental to many 12dField setout panels is the setout chainage.

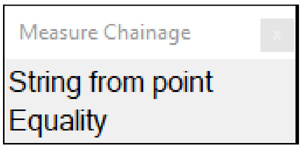


The setout chainage can be one of the 4 available chainage types, <19.4 Different types of chainage drop>, the type of chainage is always shown, read only when fixed, changeable when the setout panel supports use of multiple chainage types.

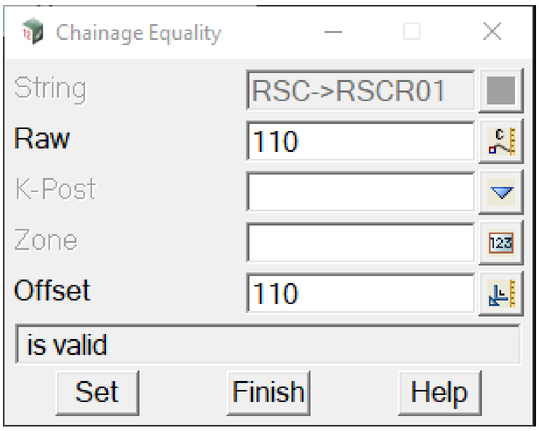
Chainage equalities are only supported for the typical Vertical/2d chainage type.

The chainage shown is always the 'raw chainage', the distance along the control string plus the start chainage.

If the control string is a super-alignment ***with equalities*** then clicking the **chainage** icon brings up the **Measure Chainage** menu with **Equality** on it.



Clicking **Equality** brings up the **Chainage Equality** panel.



Continue to 16.5.1.7.2 Chainage inc (so_cs_ch_inc) or return to 16.5.1 Common Buttons, Panel Tabs and Fields .

16.5.1.7.2 Chainage inc (so_cs_ch_inc)

The value the setout chainage will be changed by when chainage increment/decrement is called.

If special chainages are specified in the Settings Panel such as horizontal TP's then these will affect the increment, for more details please go to Spec Ch's.

Continue to 16.5.1.7.3 Setout offset (so_sp_ss_os) or return to 16.5.1 Common Buttons, Panel Tabs and Fields .

16.5.1.7.3 Setout offset (so_sp_ss_os)

The offset from the setout string to setout, +ve is to the right of the string, -ve left. Note the offset is from the setout string, not the control string, the setout string is cut perpendicular to the control string at the setout chainage and the offset applied from there.

Continue to 16.5.1.7.4 Surface shift (so_sp1_dp1_htdf) or return to 16.5.1 Common Buttons, Panel Tabs and Fields .

16.5.1.7.4 Surface shift (so_sp1_dp1_htdf)

A road design might only be delivered as the final surface, the surface shift can be used to define the various sub layers, the entered values can be stored in the file 12dF_SURFACE_SHIFTS.4D for reuse.

The shift is added to the design plane to give the shifted plane.

Continue to 16.5.1.7.5 Setout height diff (so_vpl_spl_htdf) or return to 16.5.1 Common Buttons, Panel Tabs and Fields .

16.5.1.7.5 Setout height diff (so_vpl_spl_htdf)

There is often the need to mark a set height above the shifted surface.

The height diff is added to the shifted plane to give the virtual plane.

Note the **surface shift** and **height diff** are provided for clarity but not necessary, for example, to mark out a point 0.500 above a surface-0.362 below the design plane.

A **surface shift -0.362** & **height diff 0.5** is the same as a **surface shift 0.000** & **height diff 0.138**.

Continue to 16.5.1.7.6 Comment (st_gui_display_pu_comment_line) or return to 16.5.1 Common Buttons, Panel Tabs and Fields .

16.5.1.7.6 Comment (st_gui_display_pu_comment_line)

A comment that is stored.

Continue to 16.5.1.7.7 Compaction factor (so_compaction_factor) or return to 16.5.1 Common Buttons, Panel Tabs and Fields .

16.5.1.7.7 Compaction factor (so_compaction_factor)

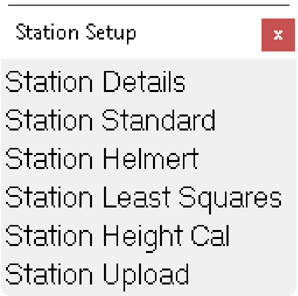
A compaction factor applied to the delta heights, for example if a material is going to compact by 23% enter this value as 1.23, this means the delta height displayed on the screen will be inflated by 23% to account for subsequent compaction. (Note this widget is optional and only appears if activated in the Settings panel). For more details please go to Settings->Panels->General->Use compaction factors.

Continue to 16.5.2 Station Setup - TPS or return to 16.5.1 Common Buttons, Panel Tabs and Fields
.

16.5.2 Station Setup - TPS

Clicking on the **Station Setup** menu option brings up the **Station Setup** menu.

.



See

16.5.2.1 Station Details - TPS
16.5.2.2 Station Standard - TPS
16.5.2.3 Station Helmert - TPS
16.5.2.4 Station Least Squares Resection - TPS
16.5.2.5 Instrument Station Height Calculation - TPS
16.5.2.6 Station Upload - TPS

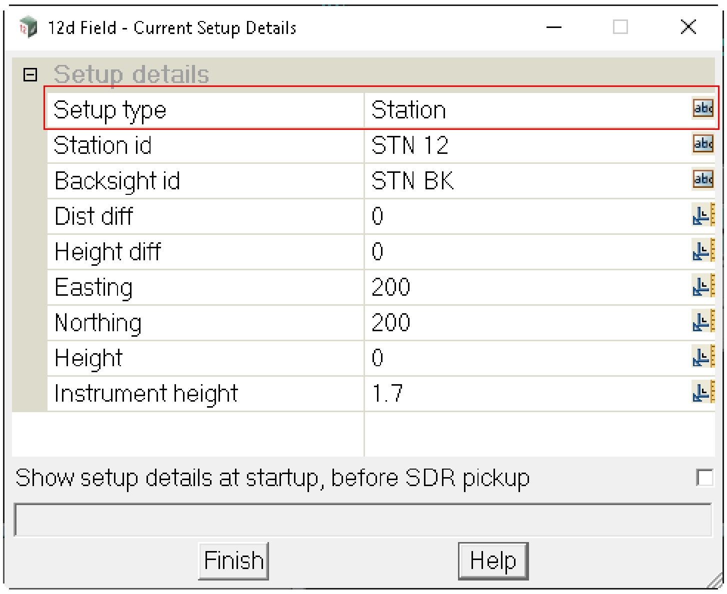
16.5.2.1 Station Details - TPS

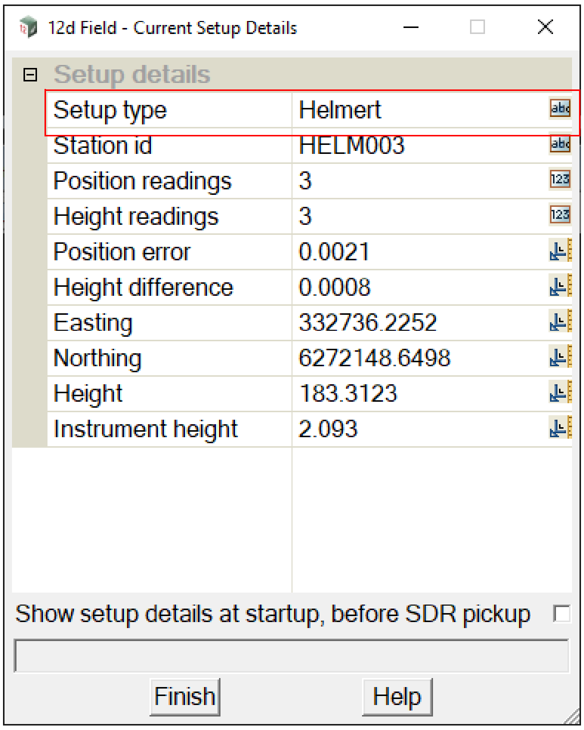
There are 3 basic TPS setup types available in ***12d Field,*** **standard**, **helmert** and **least squares**.

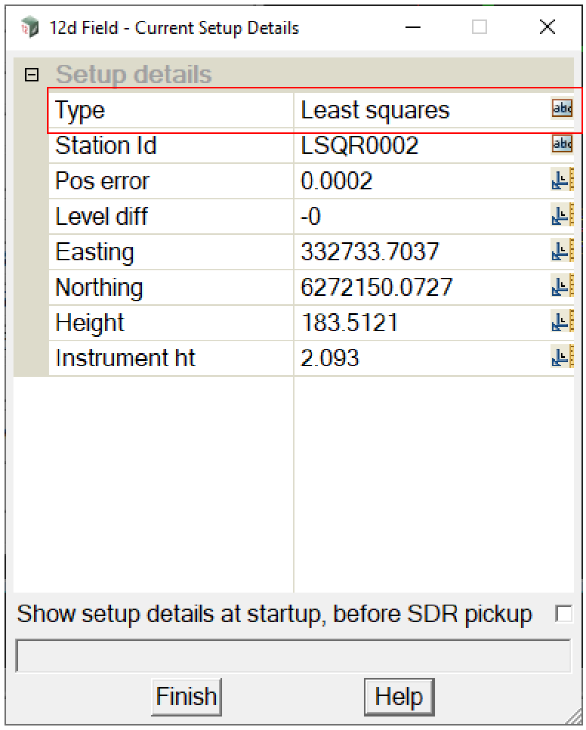
It is possible to also do a height calibration to alter the height of the current setup

Clicking on **Station Details** brings up the **12d Field - Current Setup Details** panel.

.







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

Field Description Type Defaults Pop-Up

Type output

Station

Setup over a known point and sight to a backsight.

Station (Hgt Cal)

Same as station but height has been recalibrated to one or more points.

Helmert

A linearised resection with distance measurements to all points

Helmert (Hgt Cal)

*Same as **helmert** but height has been recalibrated to one or more points.*

Least squares

A resection allowing a combination of distance and angle only measurements.

Least squares (Hgt Cal)

*Same as **least squares** but height has been recalibrated to one or more points.*

Station id output

Name of the point that the TPS is set up on or the name of the newly resected point.

Backsight id output

***Station only**, the name of the point that the backsight was made to.*

Position readings output

***Resections only**, number of readings used to determine the xy position of the calculated point.*

Height readings output

***Resections only**, number of readings used to determine the position of the calculated point.*

Dist diff output

***Station only**, difference in distance measured to the backsight and the distance calculated from the coordinates of the instrument and the backsight.*

Position error output

***Resections only**, estimated positional error of the calculated point.*

Level diff output

***Station**: Difference in z-value measured to the backsight.*

***Resections**: maximum difference between all calculated z values.*

Easting, Northing, Height output

X/Y/Z coordinate of the instrument set up point.

Instrument height output

Height of the TPS at the instrument set up point.

Show setup details at start up, before SDR pickup tick box

*If **ticked**, the set up details are show at start up and when starting up SDR Pickup.*
*If **not ticked**, the set up details are NOT show at start up and when starting up SDR Pickup.*

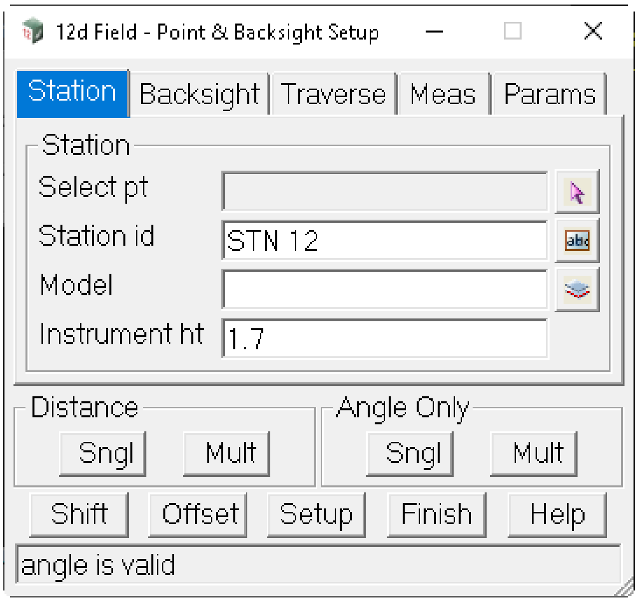
Continue to 16.5.2.2 Station Standard - TPS or return to 16.5.2 Station Setup - TPS .

16.5.2.2 Station Standard - TPS

The **Station Standard** option is for setting up the instrument over a known point and for then doing a backsight measurement.

Clicking on **Station Standard** brings up the **12d Field - Point & Backsight Setup** panel.

.



Station tab
Backsight tab
Traverse tab
Meas tab
Params tab

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

Field Description	Type	Defaults	Pop-Up

Station tab

Select pt string select box

Select a point to setup the TPS over.

After the point is selected, the Station id, Model for the selected point will be displayed in the **Station id** *and* **Model** *fields.*

Station id text box

Point id of the point to setup the TPS over.

Model model box available models

The model of the point to setup the TPS over.

Instrument height real box

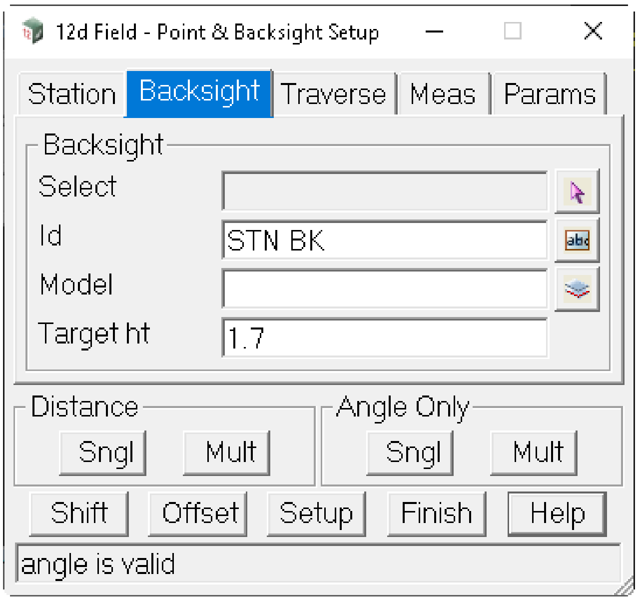
The height of the instrument. See 25.1.1.1 Total Stations - TPS .

Buttons at Bottom

For more information on these buttons, see 16.5.1 Common Buttons, Panel Tabs and Fields .

Backsight tab

.



Station tab
Backsight tab
Traverse tab
Meas tab
Params tab

Backsight

Select pt string select box

*Select a point to measure to and uses as a **Backsight**. See* Backsight - Bearing Datum Difference .
After the point is selected, the Station id and Model for the selected backsight point will be displayed in the **Station id** *and* **Model** *fields.*

Station id text box

Point id of the backsight point.

Model model box available models

The model of the backsight point.

Instrument height real box

The height of the target. See 25.1.1.1 Total Stations - TPS .

Buttons at Bottom

For more information on these buttons, see 16.5.1 Common Buttons, Panel Tabs and Fields .

Traverse tab

This tab is used in conjunction with **SDR pickup** if the user is traversing while conducting the survey. The backsight is flagged as the next traverse point.

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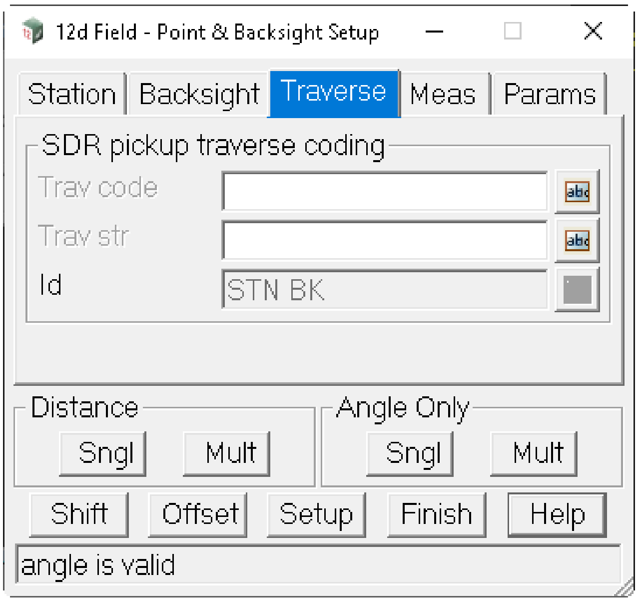


Station tab
Backsight tab
Traverse tab
Meas tab
Params tab

SDR pickup traverse coding

Trav code text box

This should match the code nominated in the SDR function as the traversing code.

Trav str text box

The string name matching the current traverse leg.

Id text box

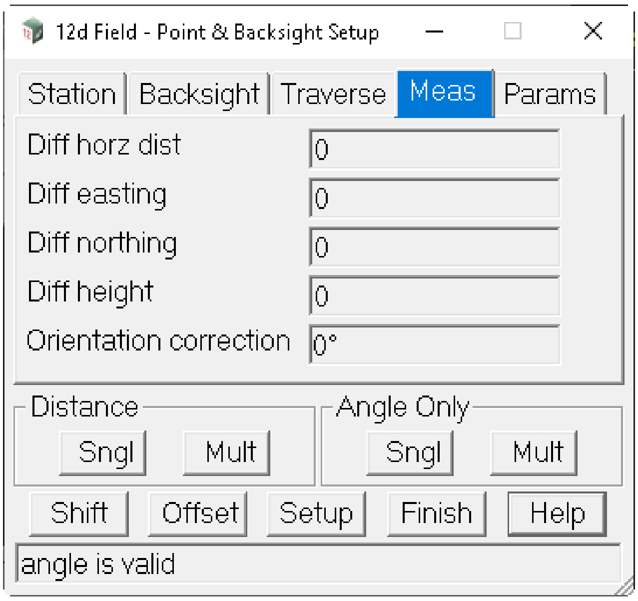
Informational only, this is the selected backsight id.

Buttons at Bottom

For more information on these buttons, see 16.5.1 Common Buttons, Panel Tabs and Fields .

Meas tab

.



Station tab
Backsight tab
Traverse tab
Meas tab
Params tab

Diff horz dist real box

The measured - calculated horizontal distance.

Diff easting real box

The measured - backsight easting.

Diff northing real box

The measured - backsight northing.

Diff height real box

The measured - backsight height.

Orientation correction real box

Information, no horizontal angle is uploaded to the instrument so a correction is necessary to correct the random pointing of the TPS into the true system. Note internally 12d ***Field*** *works in angles, anticlockwise from east, not survey bearings.*

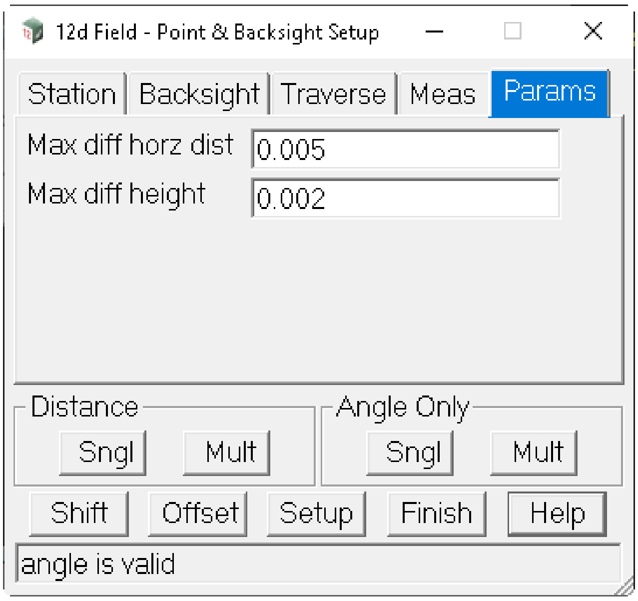
The measured - calculated horizontal angle.

Buttons at Bottom

For more information on these buttons, see 16.5.1 Common Buttons, Panel Tabs and Fields .

Params tab

.



Station tab
Backsight tab
Traverse tab
Meas tab
Params tab

Max diff horz dist output

*If the **Diff horz dist** exceeds this value on exiting the setup a warning message will be displayed the setup is out of tolerance.*

Max diff height output

*If the **Diff height** exceeds this value on exiting the setup a warning message will be displayed the setup is out of tolerance.*

Buttons at Bottom

For more information on these buttons, see 16.5.1 Common Buttons, Panel Tabs and Fields .

Continue to 16.5.2.3 Station Helmert - TPS or return to 16.5.2 Station Setup - TPS .

16.5.2.3 Station Helmert - TPS

The **12d Field - Helmert Resection** panel can be used to establish a station setup by taking readings to up to 6 known points.

The horizontal position is obtained by a Helmert transformation; translation, rotation and uniform scaling of the readings.

The vertical position is obtained by meaning the z values of the readings, the z value is not weighted on distance measured.

Readings can be used for either horizontal position, vertical position or both.

Clicking **Station Helmert** brings up the **12d Field - Helmert Resection** panel.

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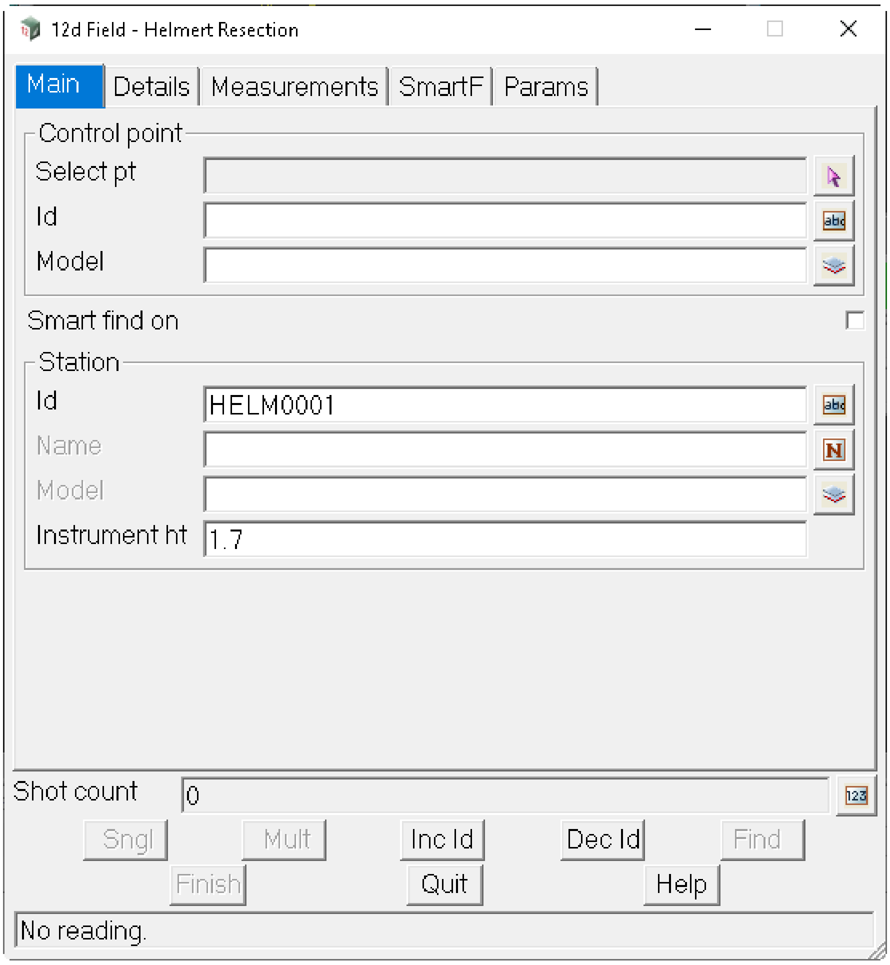

Main tab
Details tab
Measurements tab
SmartF tab
Params tab

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

Field Description	Type	Defaults	Pop-Up

Buttons at Bottom

For more information on these buttons, see 16.5.1 Common Buttons, Panel Tabs and Fields .

Main tab

A point for use in the resection can either be picked from the screen or manually entered.

If picked from the screen the Id and Model boxes will be filled automatically.

If entered manually the Id must be unique in the point model.

*Note in 12d **Field** the Id always refers to the Vertex Id.*

Control point

Select pt string select box

Select a Control point for the resection.

After the point is selected, the Id and Model for the selected control point is displayed in the **Id** *and* **Model** *fields.*

Id text box

Point id of the control point.

Model model box available models

Model of the control point.

Smart find on text box

***Smart find** can automatically work out which control point is associated with each measurement without the user selecting a point or manually entering the id. This is particularly useful in difficult environments where the target is visible but difficult or physically impossible to identify. When smart find is activated only the **Model** field is active, all smart points must be in this one model. The helmert resection needs no initial reading before using smart find.*

Station

*For typical engineering use the resected station is never stored as a physical point nor does it really need an **id** but this is enforced so when the resection is used inside SDR pickup it follows normal convention.*

Id text box

*The id to be used for the new resected helmert point. This **id** is automatically incremented for the next station helmert setup.*

Name, Model & Instrument ht

If the user wishes to store the resected point, e.g., they have created a physical mark on the ground then if these fields are filled in a point will created. If any of these are blank a point will not be created.

Name input box

The name of the string the point is to be stored in.

Model model box available models

The model to store the resected point string in.

instrument ht real box

The height difference of the TPS from the ground point.

Shot count integer box

Number of shots so far taken in the resection.

Details tab

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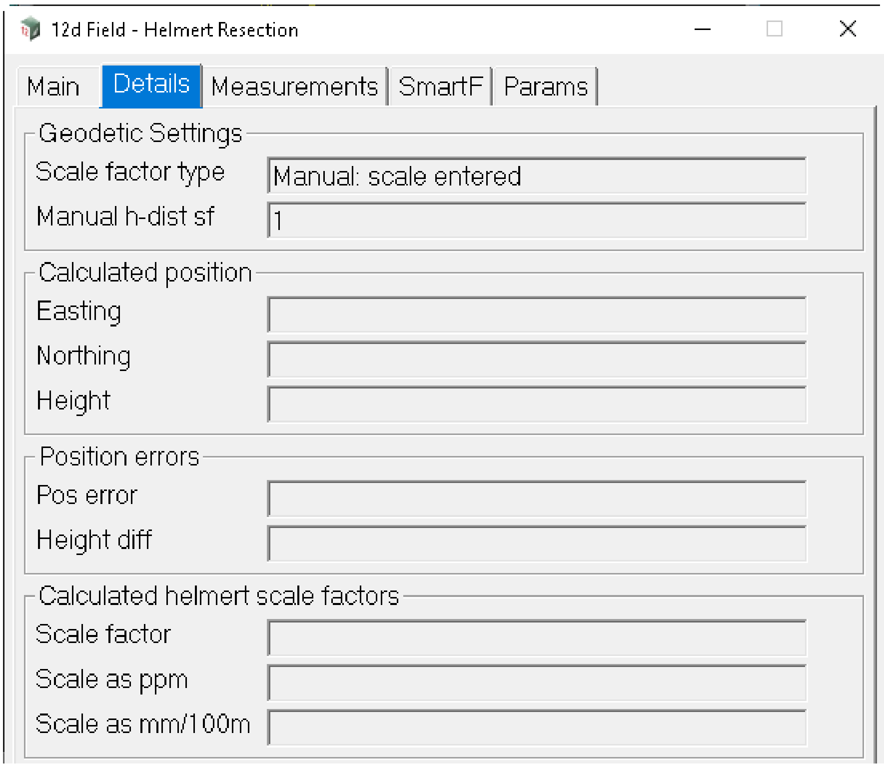


Main tab
Details tab
Measurements tab
SmartF tab
Params tab

Geodetic Settings

*Informational only, the geodetics in use for the current **12d Field** sessions.*
<link to an explanation of the geodetics>??

Calculated position

Easting real box

The calculated easting of the resected point

Northing real box

The calculated northing of the resected point

Height real box

The calculated height of the resected point

Position errors

Pos error

The position error is only available when 3+ measurements have been completed.
The estimated positional error of the resected point, the point should lie inside a circle of this diameter.

RL diff

The RL diff is only available when 2+ measurements have been completed.
The maximum difference between calculated heights of all measurements.

Calculated helmert scale factors

A helmert resection applies a uniform scaling to all measurement to get a best fit, the following field give the user an idea of the accuracy of the reading.

*The geodetics scale factor has already been applied and is not reflected in this scale factor, this should be as close to **1.0** as possible.*

Scale factor real box

The calculated scale factor applied to all reduced horizontal distances to get the best fit, e.g., 1.00011.

Scale as ppm integer box

The calculated scale factor expressed as ppm, e.g., 110.

Scale as mm/100m integer box

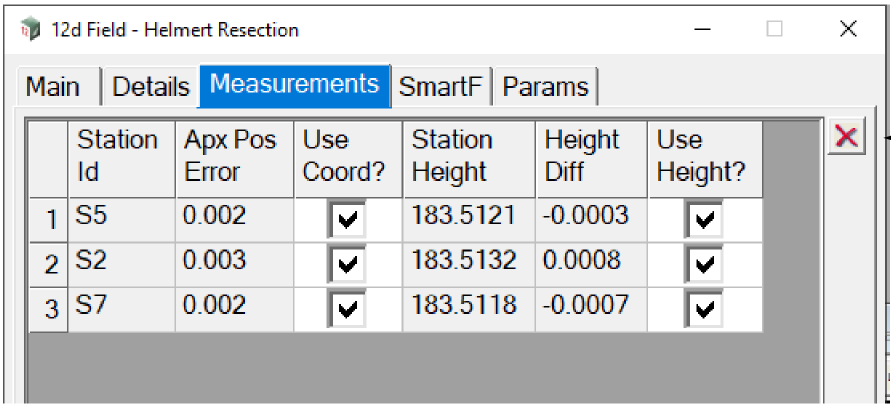
The calculated scale factor expressed as mm per 100m, e.g., 11.

Measurements tab

The measurements grid allows the user to view and manipulate the measurements so far taken for the resection.

A measurement can be completely removed from the resection by placing the focus in the row to be removed and clicking the delete icon, on the RHS.

.



Delete icon

Main tab
Details tab
Measurements tab
SmartF tab
Params tab

Grid

Station Id text column

The control point id of this measurement.

Apx Pos Error real column

The estimated error circle for this measurement, a larger error here generally, but not necessarily means this measurement has some sort of error.

Use Coord? tick column

The user can tick on or off the usage of this xy measurement in the resection, the resection will be recalculated and xy residuals updated on changing the tick status of this box.

Station Height real column

The calculated height from this control point.

Height Diff real column

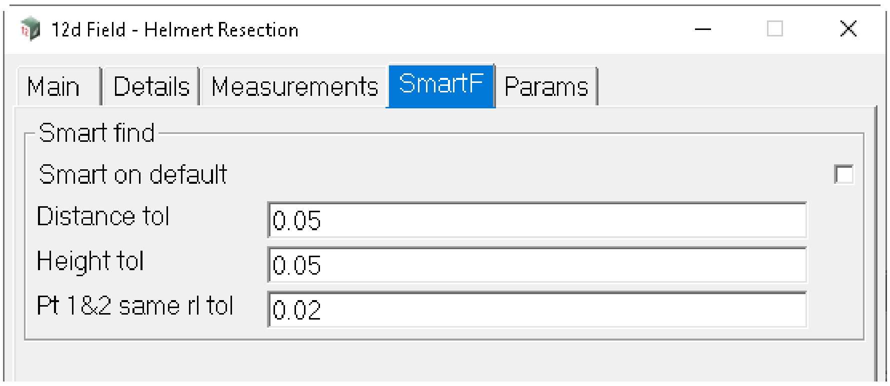
The height difference from the mean of all heights for this measurement, a larger difference here generally, but not necessarily means this measurement has some sort of height error.

Use Height? tick column

The user can tick on or off the usage of this height measurement in the resection, the resection will be recalculated and height residuals updated on changing the tick status of this box.

SmartF tab

.



Main tab
Details tab
Measurements tab
SmartF tab
Params tab

Smart find

*For **smart find** to work it needs tolerances as it tries to find matching points in the control model for the measurements taken. These tolerances should be as small as possible, especially for large control models as multiple pairs of points could match the current readings.*

If possible if the 1st reading in the resection is to a known control point then the chances of following smart find reading finding an incorrect match is greatly reduced.

Smart on default tick column

*If **ticked**, on opening the helmert panel **smart find** is active.*
*If **not ticked**, on opening the helmert panel **smart find** is inactive.*

Distance tol real box

For a control point to be accepted as a smart find candidate the distance and height difference to it from the estimated resection point must fall within both of these tolerances.

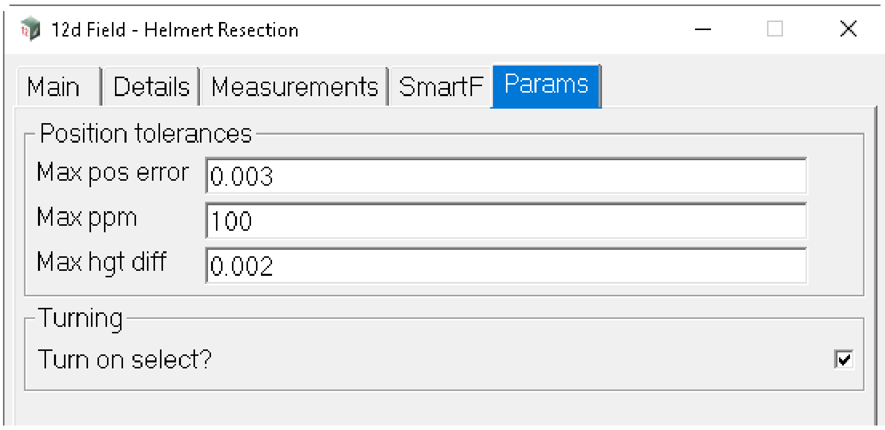
Height tol real box

The height difference tolerance for a smart find candidate.

Pt 1&2 same rl tol real box

When smart find is used to locate the 1st 2 control points in a resection there are always 2 solutions which can only be determined by the best height differences, if the height differences are less than this value a warning message will be displayed that the current solution might be 'flipped'.

Params tab



Main tab
Details tab
Measurements tab
SmartF tab
Params tab

Position tolerances

Max pos error real box

If the position error exceeds this value on exiting the setup a warning message will be displayed the setup is out of tolerance.

Max ppm real box

If the calculated helmert ppm exceeds this value on exiting the setup a warning message will be displayed the setup is out of tolerance.

Max hgt diff real box

If the maximum height difference exceeds this value on exiting the setup a warning message will be displayed the setup is out of tolerance.

Turning

Turn on select? tick box

*If **ticked**, and a helmert position has been established, (2 or more measurements) then the TPS will automatically turn to the next selected control point.*

*If **not ticked**, the TPS will not automatically turn to the next selected control point.*

Buttons at Bottom

SNGL button

Take a single distance measurement dependent on the current TPS measurement settings.

MULT button

Take a multiface distance measurement dependent on the current TPS measurement settings.

INC ID button

Increment the point ID E.g. BOLT30 -> BOLT31

DEC ID button

Decrement the point ID E.g. BOLT31 -> BOLT30

Find button

This button can be used to locate a control point by displaying a bearing and distance from the current target location to the newly selected control point. It will take a measurement using the last type used, SNGL or MULT and display the direction and distance in the panel message box.

Continue to 16.5.2.4 Station Least Squares Resection - TPS or return to 16.5.2 Station Setup - TPS .

16.5.2.4 Station Least Squares Resection - TPS

The **12d Field - Least Squares Resection** panel can be used to establish a station setup by taking distance and angle only readings to up to 6 known points.

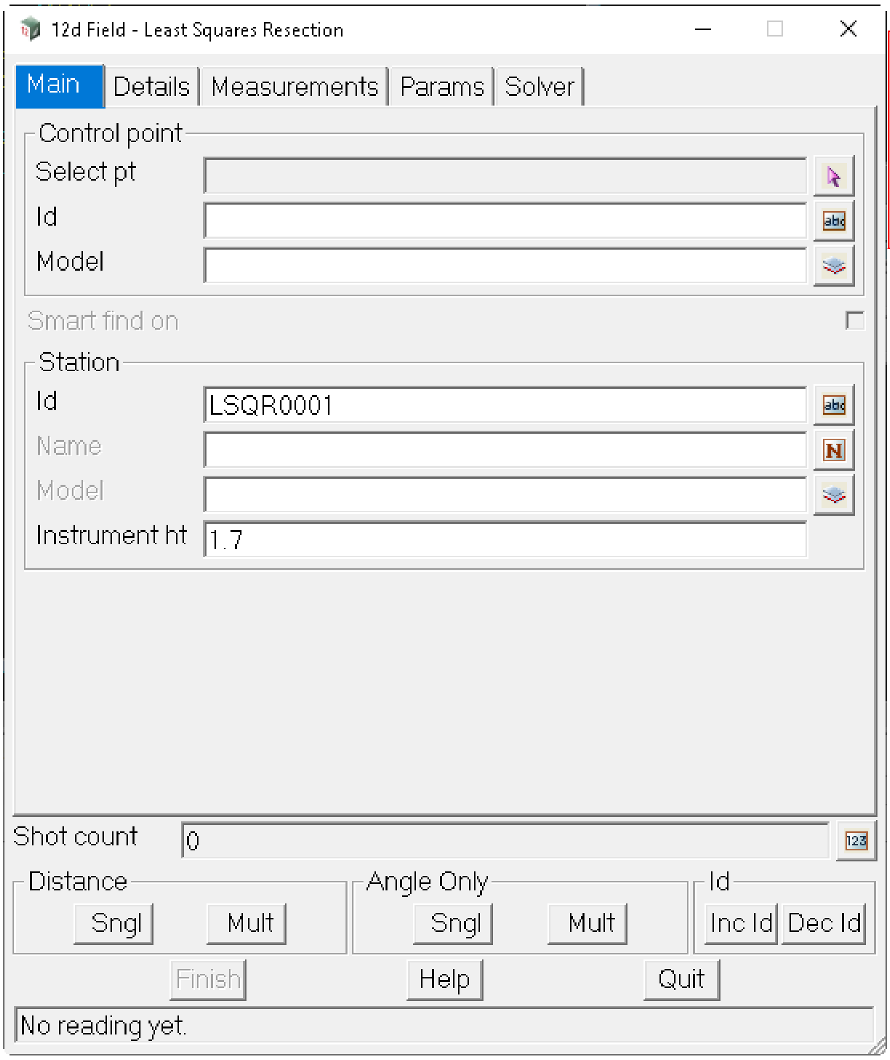
The horizontal position is obtained by a least squares calculation; the iterative calculation finds the best coordinate of the resection point to match the measurements. Least squares does not support the calculation of the orientation correction needed to swing unadjusted bearing from the TPS into the local system, this is a separate calculation.

The vertical position is obtained by meaning the z values of the readings, the z value is not weighted on distance measured.

Readings can be used for either horizontal position, vertical position or both.

Clicking **Station Least Squares** brings up the **12d Field - Least Squares Resection** panel.

.



Main tab
Details tab
Measurements tab
Params tab
Solver tab

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

Field Description Type Defaults Pop-Up

Buttons at Bottom

For more information on these buttons, see 16.5.1 Common Buttons, Panel Tabs and Fields .

Main tab

Control point

Select pt string select box

Select a Control point for the resection.

After the point is selected, the Id and Model for the selected control point is displayed in the **Id** *and* **Model** *fields.*

Id text box

Point id of the control point.

Model model box available models

Model of the control point.

Smart find on text box

Smart find *can automatically work out which control point is associated with each measurement without the user selecting a point or manually entering the id. This is particularly useful in difficult environments where the target is visible but difficult or physically impossible to identify. When smart find is activated only the* ***Model*** *field is active, all smart points must be in this one model. With* ***least squares*** *at least one measurement must be taken before smart find can be activated.*

Station

For typical engineering use the resected station is never stored as a physical point nor does it really need an ***id*** *but this is enforced so when the resection is used inside SDR pickup it follows normal convention.*

Id text box

The id to be used for the new resected least squares point. This ***id*** *is automatically incremented for the next station least squares setup.*

Name, Model & Instrument ht

If the user wishes to store the resected point, e.g., they have created a physical mark on the ground then if these fields are filled in a point will created. If any of these are blank a point will not be created.

Name input box

The name of the string the point is to be stored in.

Model model box available models

The model to store the resected point string in.

instrument ht real box

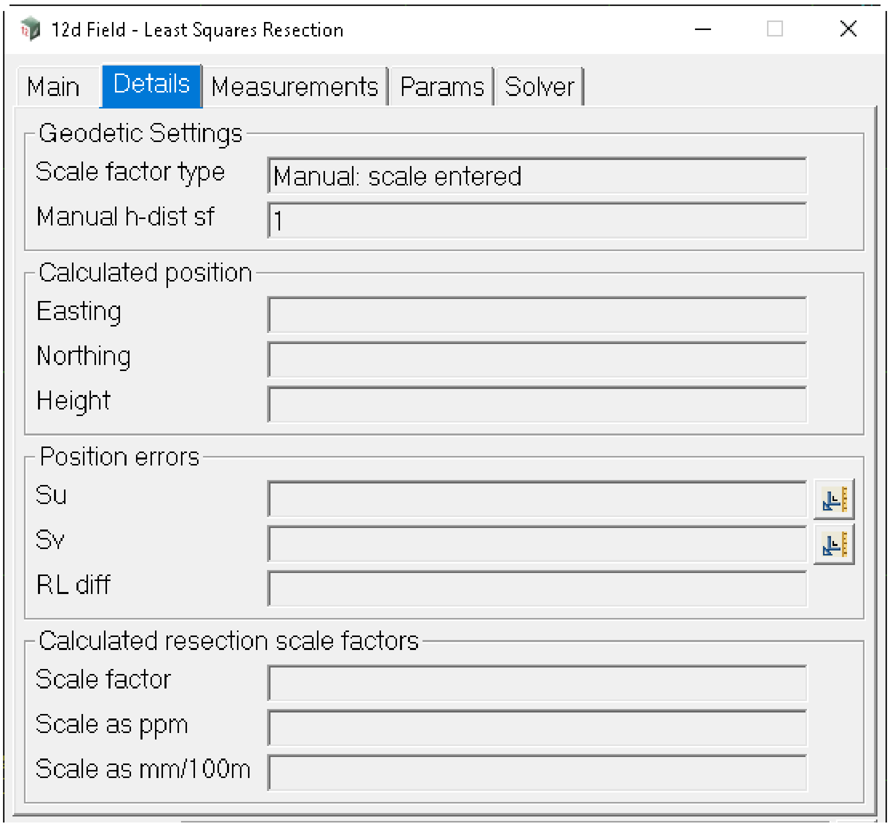
The height difference of the TPS from the ground point.

Shot count integer box

Number of shots so far taken in the resection.

Details tab

.



Main tab
Details tab
Measurements tab
Params tab
Solver tab

Geodetic Settings

Informational only, the geodetics in use for the current 12dField sessions.
<link to an explanation of the geodetics>??

Calculated position

Easting real box

The calculated easting of the resected point

Northing real box

The calculated northing of the resected point

Height real box

The calculated height of the resected point

Position errors

The least squares resection will give an error ellipse as opposed to the circle of the helmert resection, the closer the ellipse is to a circle the better conditioned the least squares result.

Su

The major axis of the positional error of the resected point.

Sv

The major axis of the positional error of the resected point.

RL diff

The maximum difference between calculated heights of all measurements.

Calculated helmert scale factors

A least squares resection applies non uniform scaling to all measurements to get a best fit, the following *fields try give the user an idea of the accuracy of the readings.*

The geodetics scale factor has already been applied and is not reflected in this scale factor, this should be as close to ***1.0*** *as possible.*

Scale factor real box

The calculated meaned scale factor from all reduced horizontal distances to get the best fit, e.g., 1.00011.

Scale as ppm integer box

The calculated meaned scale factor expressed as ppm, e.g., 110.

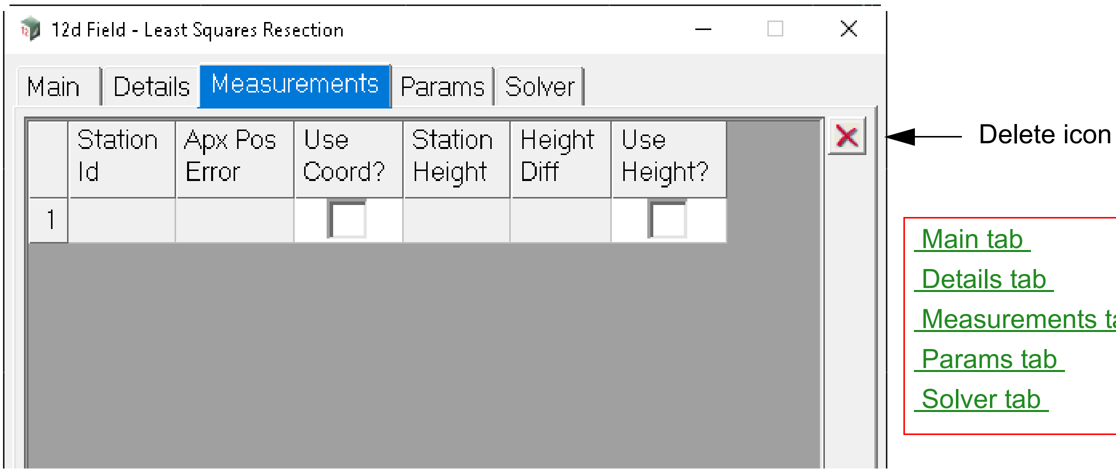
Scale as mm/100m integer box

The calculated meaned scale factor expressed as mm per 100m, e.g., 11.

Measurements tab

The measurements grid allows the user to view and manipulate the measurements so far taken for the resection.

A measurement can be completely removed from the resection by placing the focus in the row to be removed and clicking the delete icon, on the RHS.



Main tab
Details tab
Measurements tab
Params tab
Solver tab

Grid

Station Id text column

The control point id of this measurement.

Apx Pos Error real column

The estimated error circle for this measurement, a larger error here generally, but not necessarily means this measurement has some sort of error.

Use Coord? tick column

The user can tick on or off the usage of this xy measurement in the resection, the resection will be recalculated and xy residuals updated on changing the tick status of this box.

Station Height real column

The calculated height from this control point.

Height Diff real column

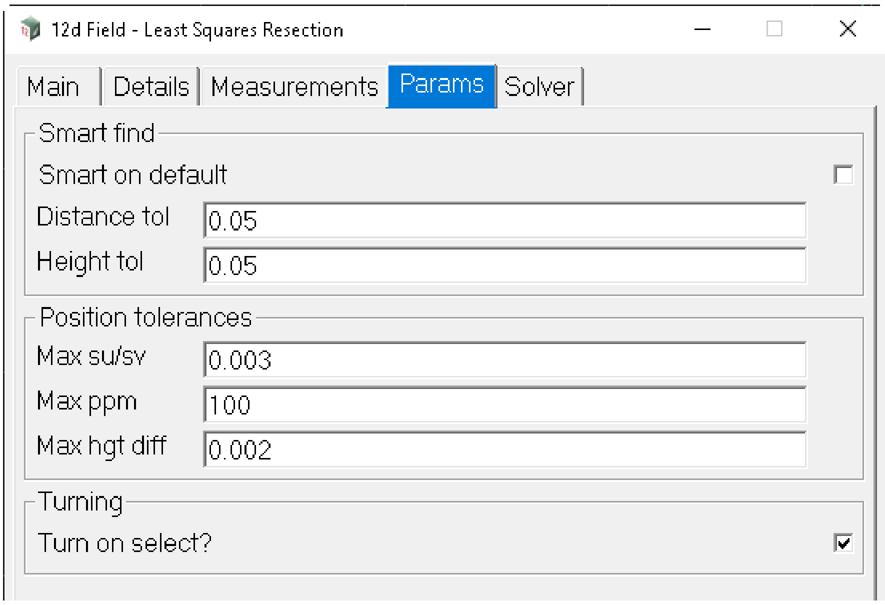
The height difference from the mean of all heights for this measurement, a larger difference here generally, but not necessarily means this measurement has some sort of height error.

Use Height? tick column

The user can tick on or off the usage of this height measurement in the resection, the resection will be recalculated and height residuals updated on changing the tick status of this box.

Params tab

.



[Main tab](#)
[Details tab](#)
[Measurements tab](#)
[Params tab](#)
[Solver tab](#)

Smart find tolerances

*For **smart find** to work it needs tolerances as it tries to find matching points in the control model for the measurements taken. These tolerances should be as small as possible, especially for large control models as multiple pairs of points could match the current readings.*

If possible if the 1st reading in the resection is to a known control point then the chances of following smart find reading finding an incorrect match is greatly reduced.

Smart on default? tick box

*If **ticked**, on opening the helmert panel **smart find** is active.*
*If **not ticked**, on opening the helmert panel **smart find** is inactive.*

Distance and Height tols

For a control point to be accepted as a smart find candidate the distance and height difference to it from the estimated resection point must fall within both of these tolerances.

Distance tol real box

The horizontal distance tolerance for a smart find candidate.

Height tol real box

The height difference tolerance for a smart find candidate.

Position tolerances

Max sj/sv real box

If the RMS of the su&sv errors exceeds this value on exiting the setup a warning message will be displayed the setup is out of tolerance.

Max ppm real box

If the calculated resection ppm exceeds this value on exiting the setup a warning message will be displayed the setup is out of tolerance.

Max hgt diff real box

If the maximum height difference exceeds this value on exiting the setup a warning message will be displayed the setup is out of tolerance.

Turning

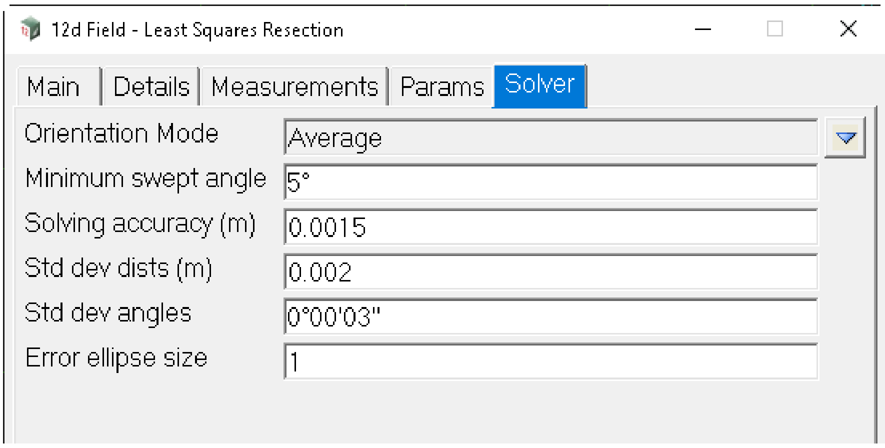
Turn on select? tick box

*If **ticked**, and a helmert position has been established, (2 or more measurements) then the TPS will automatically turn to the next selected control point.*

*If **not ticked**, the TPS will not automatically turn to the next selected control point.*

Solver tab

.



Main tab
Details tab
Measurements tab
Params tab
Solver tab

Orientation mode choice box Average, Longest

A least squares resection calculates the best position, unlike a helmert resection it has no concept of a general orientation correction to be applied to every TPS reading.

*If **Average**, Use the means of measurements to all control points for the orientation correction.*

*If **Longest**, Use the measurement to the furthest control point to calculate the orientation correction.*

Minimum swept angle real box

Least squares resections should not contain swept angles near to 0 or 180°, enter a value here to automatically values less than this from the calculations.

Solving accuracy (m) real box

Enter the accuracy desired for the calculations, once better than this value the calculations will stop, if this cannot be achieved an error is shown.

Std dev dists (m) real box

Enter the nominal standard deviation of the TPS distance in metres, e.g., 0.002.

Std dev angles real box

Enter the nominal standard deviation of the TPS angle measurements, e.g., 3".

Error ellipse size real box

Enter the size of the error ellipse to be display on screen.

Buttons at Bottom

SNGL button

Take a single distance measurement dependent on the current TPS measurement settings.

MULT button

Take a multiface distance measurement dependent on the current TPS measurement settings.

INC ID button

Increment the point ID E.g. BOLT30 -> BOLT31

DEC ID button

Decrement the point ID E.g. BOLT31 -> BOLT30

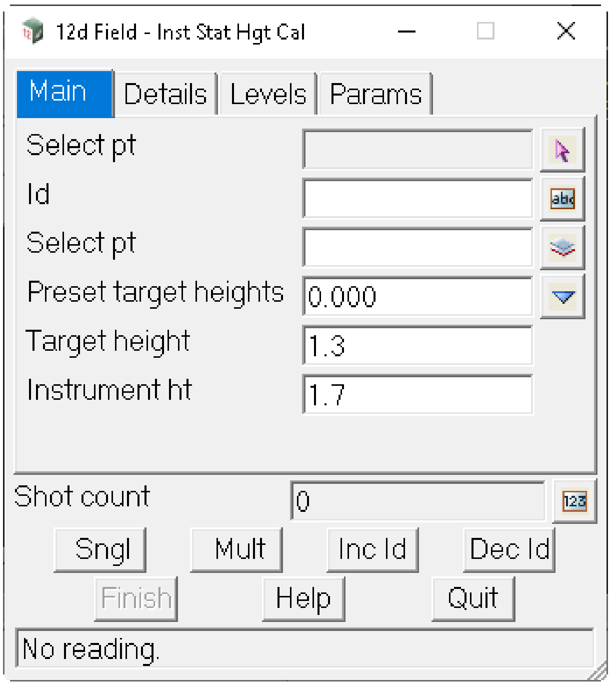
Continue to 16.5.2.5 Instrument Station Height Calculation - TPS or return to 16.5.2 Station Setup - TPS .

16.5.2.5 Instrument Station Height Calculation - TPS

The **Station Height Cal** option measures to one or more known points to refine the height of the current setup.

Clicking **Station Height Cal** brings up the **12d Field - Inst Stat Hgt Cal** panel.

.



Main tab
Details tab
Levels tab
Params tab

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

Field Description	Type	Defaults	Pop-Up

Buttons at Bottom

For more information on these buttons, see 16.5.1 Common Buttons, Panel Tabs and Fields .

Main tab

Select pt	string select box		

??.

Id	text box		

??.

Preset target heights	choice box		list of preset target

Select a target height from the pop-up list. The selected target height is piped into the **Target height** *field.*

Target height	real box		

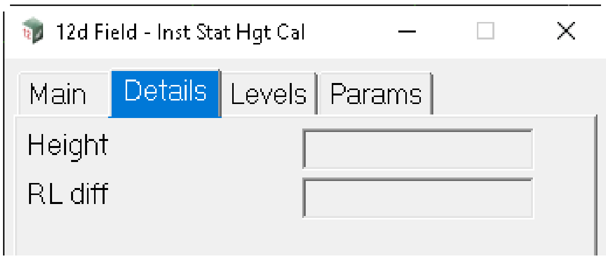
Height of the target.

Instrument height	real box		

Height of the TPS at the setup point.

Details tab

.



Main tab
Details tab
Levels tab
Params tab

Height real box

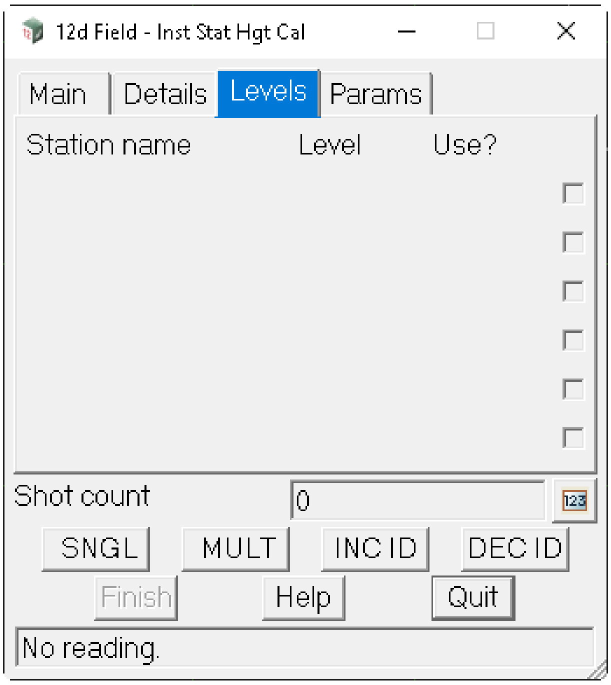
??.

RL diff real box

??.

Levels tab

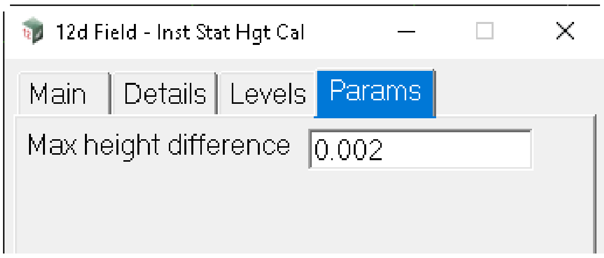
.



Main tab
Details tab
Levels tab
Params tab

Params tab

.



Main tab
Details tab
Levels tab
Params tab

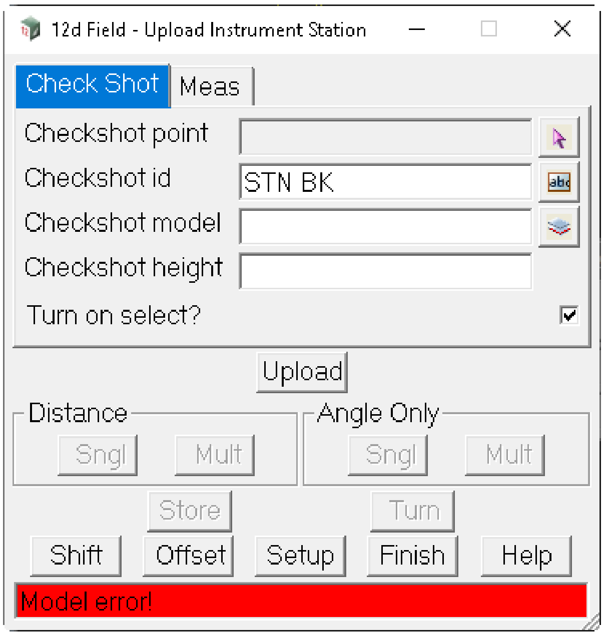
Max height difference real box

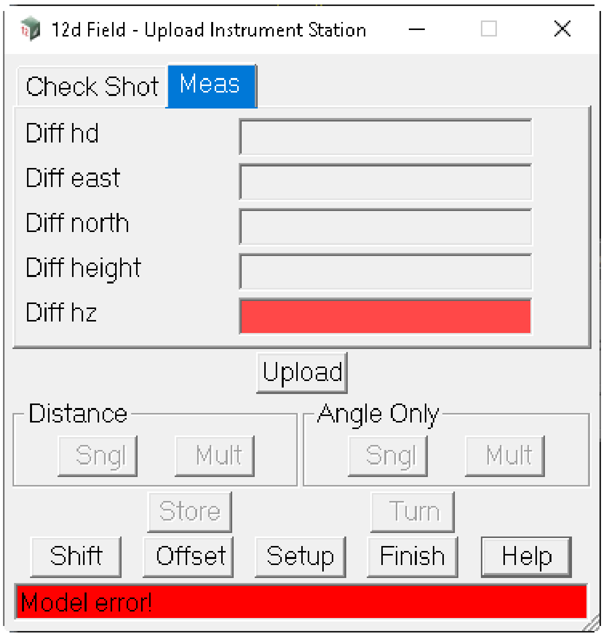
??.

16.5.2.6 Station Upload - TPS

Clicking **Station Upload** brings up the **12d Field** -panel.

.





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

Field Description	Type	Defaults	Pop-Up

Buttons at Bottom

For more information on these buttons, see 16.5.1 Common Buttons, Panel Tabs and Fields .

Check shot tab

Checkshot pt string select box

Select the point to take a checkshot to.

Checkshot name text box

Name of the checkshot point.

Checkshot Model model box available models

Model of the checkshot point.

Checkshot height real box

Height of the checkshot point.

Turn on select? tick box

??.

Meas tab

Diff hd real box

Difference in horizontal distance between the measurement to the checkshot point, and the horizontal distance calculated from the coordinates of the instrument set up point and the checkshot point.

Diff east/north/height real box

Difference between the easting/northing/height calculated from the measurement to the checkshot point, and the actual easting of the checkshot point.

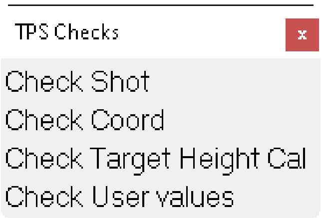
Diff hz real box

??

16.5.3 Checks - TPS

Clicking on the **Checks** menu option brings up the **TPS Checks** menu.

.



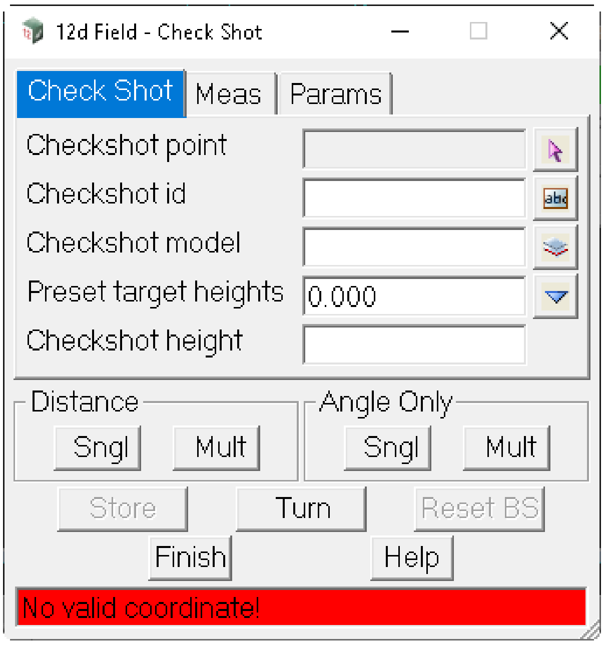
See
16.5.3.1 Check Shot - TPS
16.5.3.2 Check Coord - TPS
16.5.3.3 Check Target Height Calibrate - TPS
16.5.3.4 Check User Values - TPS

16.5.3.1 Check Shot - TPS

The **Check Shot** option performs a check measurement for delta angles and distances to a known point.

Clicking **Check Shot** brings up the **12d Field -**panel.

.



Check Shot tab
Meas tab
Params tab

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

Field Description Type Defaults Pop-Up

Buttons at Bottom

For more information on these buttons, see 16.5.1 Common Buttons, Panel Tabs and Fields.

Check Shot tab

Checkshot point string select box

Select the point to take a checkshot to.

Checkshot id text box

The id of the selected checkshot point.

Checkshot model model box available models

The model of the selected checkshot point.

Preset target heights choice box list of preset target heights

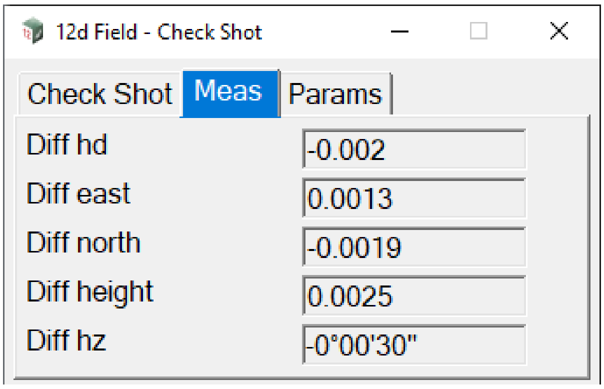
Select a target height from the pop-up list. The selected target height is piped into the **Checkshot height** *field.*

Checkshot height real box

Height of the target at the checkshot point.

Meas tab

.



Check Shot tab
Meas tab
Params tab

Diff hd real box

Difference in horizontal distance between the measurement to the checkshot point, and the horizontal distance calculated from the coordinates of the instrument set up point and the checkshot point.

Diff east/north/height real box

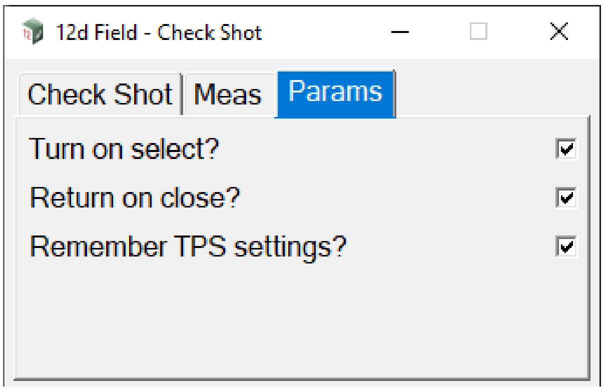
Difference between the easting/northing/height calculated from the measurement to the checkshot point, and the actual easting/northing/height of the checkshot point.

Diff hz real box

Difference in horizontal angle between the measurement to the checkshot point, and the horizontal angle calculated from the coordinates of the instrument set up point and the checkshot point.

Params tab

.



Check Shot tab
Meas tab
Params tab

Turn on select? tick box

*If **ticked**, and a valid Checkshot height is entered on selecting the checkshot point the instrument will turn both horizontally and vertically to the point.*

Return on close? tick box

*If **ticked**, when the Check Shot panel is closed the instrument will return turn both horizontally and vertically to where it was pointed before the panel opened.*

Remember TPS settings? tick box

*If **ticked**, when the Check Shot panel is opened and the TPS measurement settings/style are subsequently changed from what they were before these new settings are remembered and used the next time the panel is opened. On closing the settings will also be changed back to be the settings before the panel was opened.*

This means if the survey is being conducted in a robotic mode but the checkshot is to a fixed target the user does not have to manually change settings again once the correct settings for the checkshot have been entered.

Buttons

STORE button

*If **SDR Pickup** is **running** all of the appropriate check shot opcodes are written to the SDR function.*

*If **SDR Pickup** is **not running** the overall checkshot are written the 12dField backup.FLD file.*

12dField setout stores up to 6 sets of vertex checkshot attributes, i.e., each instance of a setout panel, (or Basic Pickup and any other non SDR panel) can open and use the checkshot panel 6 times, this is an automatic process.

TURN button

Turn the instrument both horizontally and vertically to the checkshot point.

RESET BS button

*The internal angle swing attribute (su_is_ori_corr) is reset to match the reading to the backsight. If **SDR pickup** is running then all of the appropriate op-codes for backsight coords, id and height are written to the SDR function.*

Note this button can be used with all setup types, Standard, Helmert and Least Squares resections.

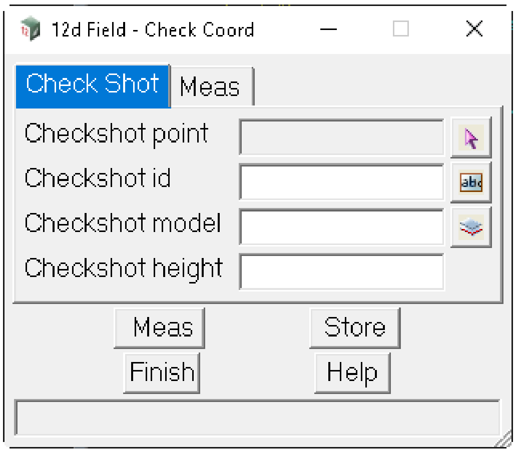
Continue to 16.5.3.2 Check Coord - TPS or go back to 16.5.3 Checks - TPS .

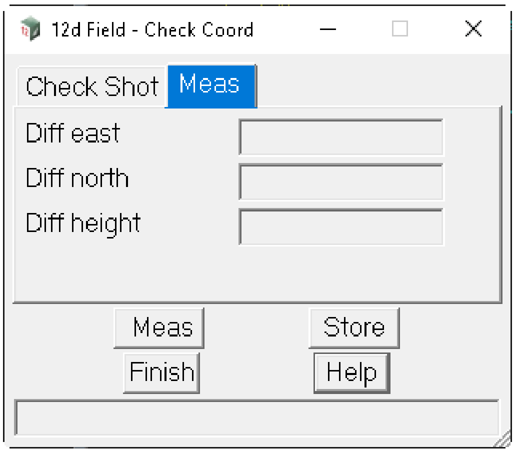
16.5.3.2 Check Coord - TPS

The **Check Coord** option performs a check measurement for delta coordinates to a known point, this is primarily intended as a GNSS option.

Clicking **Check Coord** brings up the **12d Field** -panel.

.





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

Field Description | Type | Defaults | Pop-Up

Check Shot tab

Checkshot point string select box

Select the point to take a checkshot to.

Checkshot id text box

Name of the checkshot point.

Checkshot model model box available models

Model of the checkshot point.

Checkshot height real box

Height of the target at the checkshot point.

Meas tab

Diff east/north/height real box

Difference between the easting/northing/height calculated from the measurement to the checkshot point, and the actual easting/northing/height of the checkshot point.

Buttons at Bottom

For more information on these buttons, see 16.5.1 Common Buttons, Panel Tabs and Fields.

STORE **button**

*If **SDR Pickup** is **running** all of the appropriate check coord opcodes are written to the SDR function.*

*If **SDR Pickup** is **not running** the similar check coord codes are written the 12dField backup.FLD file.*

12dField setout stores up to 6 sets of vertex check coord attributes, i.e., each instance of a setout panel, (or Basic Pickup and any other non SDR panel) can open and use the check coord panel 6 times, this is an automatic process.

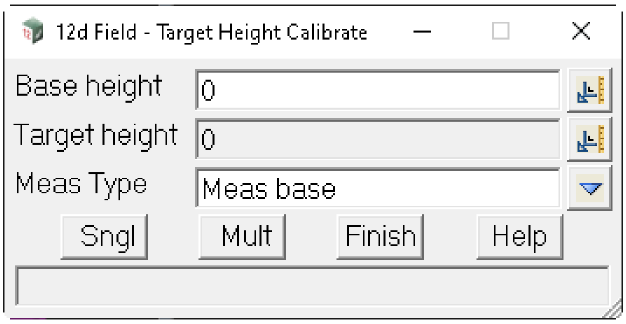
Continue to 16.5.3.3 Check Target Height Calibrate - TPS or go back to 16.5.3 Checks - TPS .

16.5.3.3 Check Target Height Calibrate - TPS

The **Check Target Height Cal** option is a routine to calibrate heights of target poles.

Clicking **Check Target Height Cal** brings up the **12d Field - Target Height Calibrate** panel.

.



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

Field Description	Type	Defaults	Pop-Up
Base height	measures box		
??.			
Target height	measures box		
??.			
Meas type	choice box		Meas base. Meas target
??.			

Buttons at Bottom

For more information on these buttons, see 16.5.1 Common Buttons, Panel Tabs and Fields .

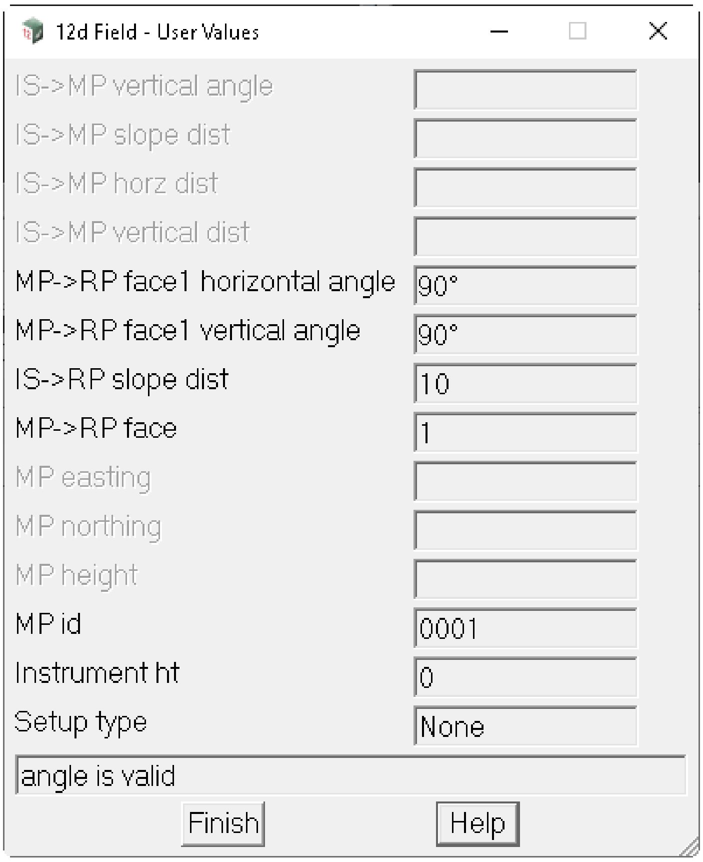
Continue to 16.5.3.4 Check User Values - TPS or go back to 16.5.3 Checks - TPS .

16.5.3.4 Check User Values - TPS

The **Check User Values** option is a user defined panel for displaying values of various attributes.

Clicking **Check User values** brings up the **12d Field - User Values** panel.

.



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

Field Description Type Defaults Pop-Up

IS->MP vertical angle output

The instrument to measured point vertical angle.

IS->MP slope distance output

The instrument to measured point slope distance.

IS->MP horiz dist output

The instrument to measured point horizontal distance.

IS->MP vert dist output

The instrument to measured point vertical distance.

MP->RP face 1 horizontal angle output

??.

MP->RP face 1 vertical angle output

??.

IS->RP slope dist output

??.

MP->RP face output

??.

MP easting/northing/height output

The easting/northing/height of the measured point.

MP id output

The point id of the measured point.

Instrument ht output

Height of the instrument.

Setup type output

Setup type.

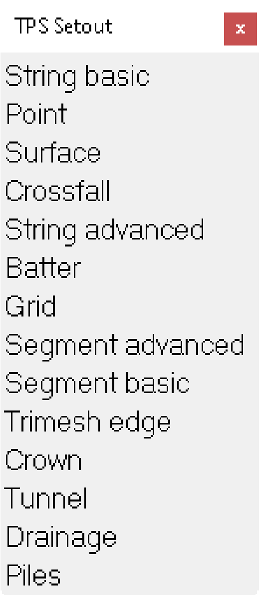
Continue to 16.5.4 Setout or go back to 16.5.3 Checks - TPS .

16.5.4 Setout

Clicking on the **Setout** menu option brings up the **Setout** menu.

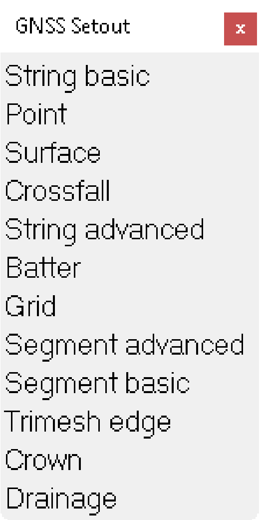
.

TPS Setout



See
16.5.4.1 Setout String Basic
16.5.4.2 Setout Point
16.5.4.3 Setout Surface
16.5.4.4 Setout Crossfall
16.5.4.5 Setout String Advanced
16.5.4.6 Setout Batter
16.5.4.7 Setout Grid
16.5.4.8 Setout Advanced Segment
16.5.4.9 Setout Basic Segment
16.5.4.10 Setout Trimesh Edge
16.5.4.11 Setout Crown
16.5.4.12 Setout Tunnel
16.5.4.13 Setout Drainage
16.5.4.14 Setout Piles

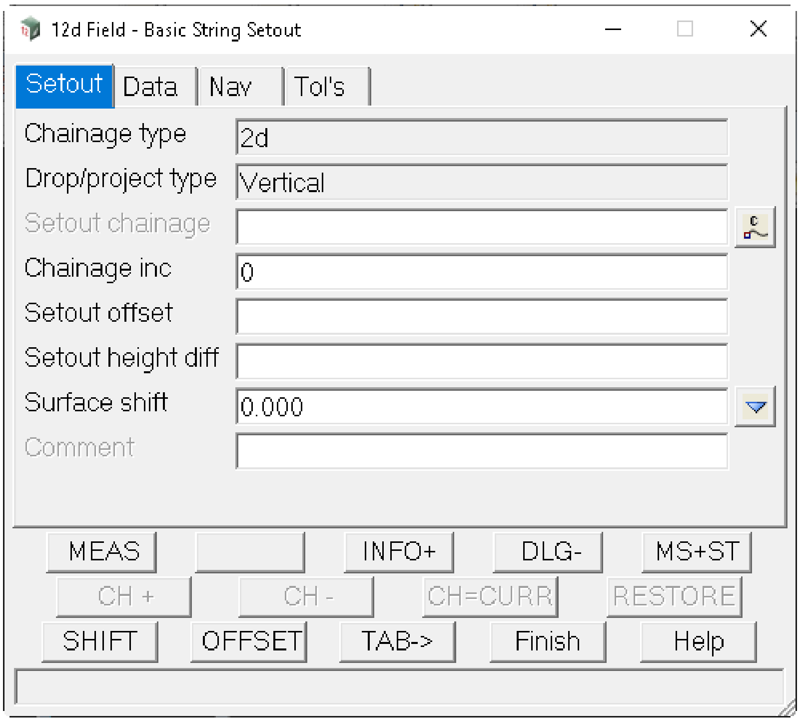
GNSS Setout



See
16.5.4.1 Setout String Basic
16.5.4.2 Setout Point
16.5.4.3 Setout Surface
16.5.4.4 Setout Crossfall
16.5.4.5 Setout String Advanced
16.5.4.6 Setout Batter
16.5.4.7 Setout Grid
16.5.4.8 Setout Advanced Segment
16.5.4.9 Setout Basic Segment
16.5.4.10 Setout Trimesh Edge
16.5.4.11 Setout Crown
16.5.4.13 Setout Drainage

16.5.4.1 Setout String Basic

Clicking **String Basic** brings up the **12d Field - Basic String Setout** panel.



Setout tab
Data tab
Nav tab
Tol's tab

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

Field Description Type Defaults Pop-Up

Buttons at Bottom

For more information on these buttons, see 16.5.1 Common Buttons, Panel Tabs and Fields.

Setout tab

Chainage type 2d

??.

Drop/project type Vertical

??.

Setout chainage

??.

Chainage inc 0

??.

Setout offset

??.

Setout offset

??.

Setout height diff

??.

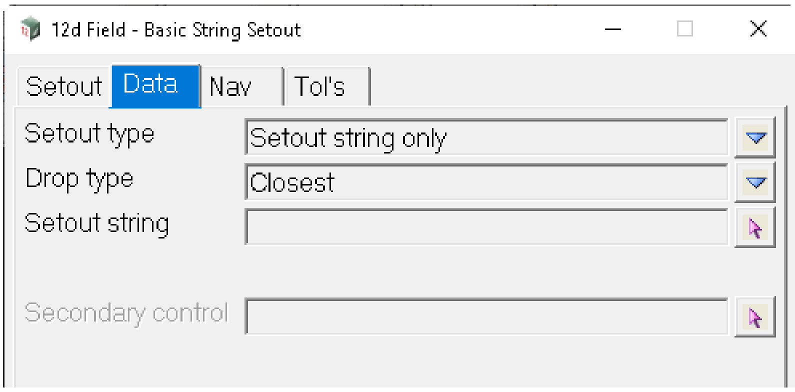
Surface shift

??.

Comment

??.

Data tab



Setout tab
Data tab
Nav tab
Tol's tab

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

Field Description	Type	Defaults	Pop-Up

Data tab

Setout type	choice box	Setout string only	Setout string only String & control string

??.

Drop type	choice box	Closest	Closest to control string Closest to setout ch

??.

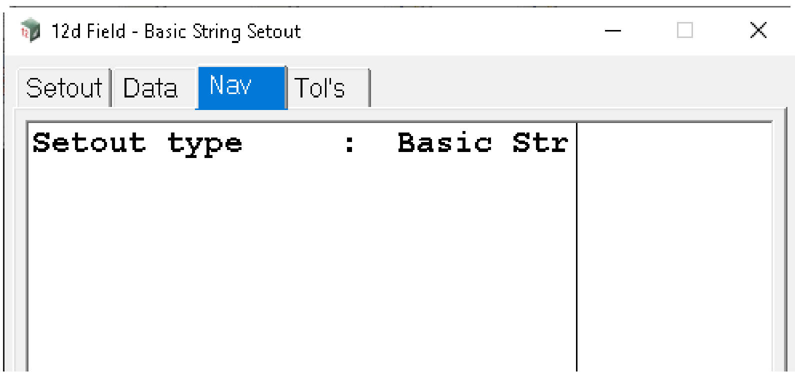
Setout string	string select		

??.

Secondary control	string select		

??.

Nav tab



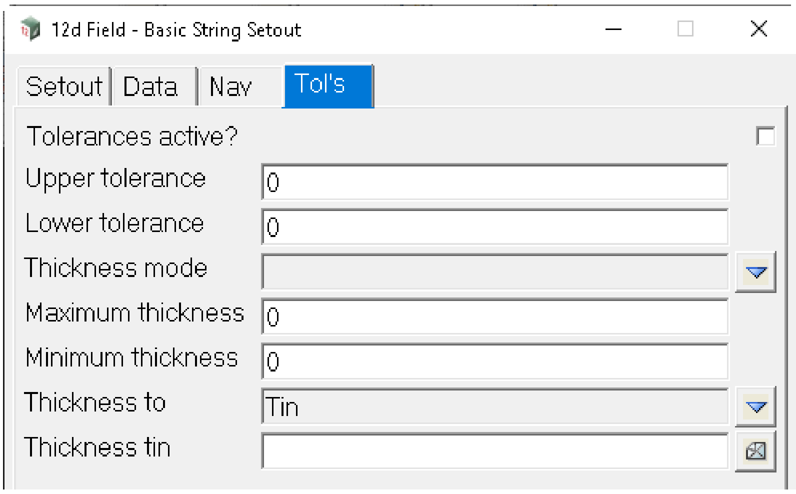
Setout tab
Data tab
Nav tab
Tol's tab

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

Field Description Type Defaults Pop-Up

Nav tab

Tol's tab



Setout tab
Data tab
Nav tab
Tol's tab

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

Field Description Type Defaults Pop-Up

Tol's tab

Tolerance active? tick box not ticked

??.

Upper tolerance 0

??.

Lower tolerance 0

??.

Thickness mode

??.

Maximum thickness 0

??.

Minimum thickness 0

??.

Thickness to choice box tin tin, trimesh

??.

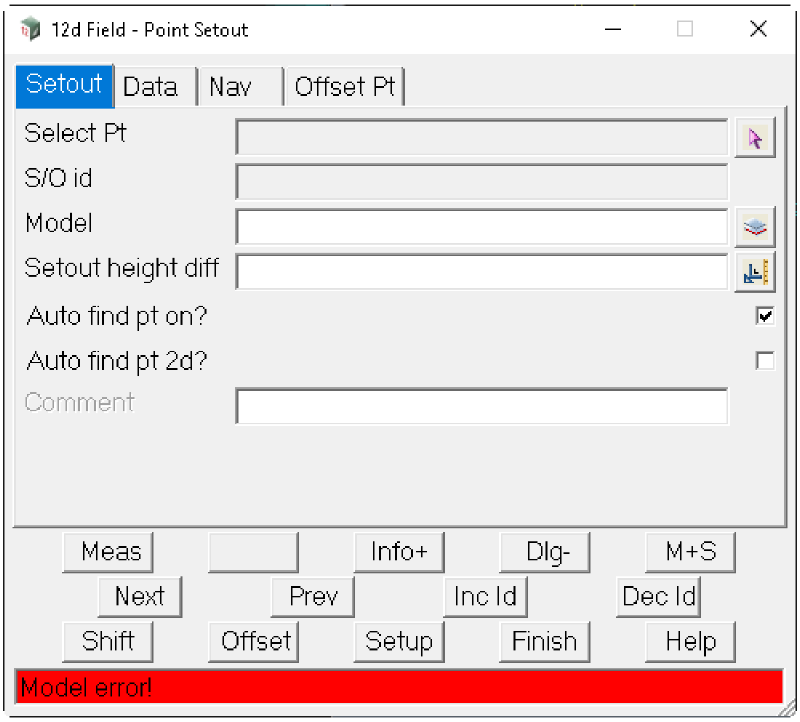
Thickness tin tin box

??.

Continue to 16.5.4.2 Setout Point or go back to 16.5.4 Setout .

16.5.4.2 Setout Point

Clicking **Point** brings up the **12d Field - Point Setout** panel.



Data Tab
Nav tab
Tol's tab
Offset Pt Tab

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

Field Description	Type	Defaults	Pop-Up

Buttons at Bottom

For more information on these buttons, see 16.5.1 Common Buttons, Panel Tabs and Fields .

Setout tab

Select Pt	string select		

??.

S/O id			

??.

Model	model box		

??.

Setout height diff	real box		

??.

Auto find pt on?	tick box	not ticked	

??.

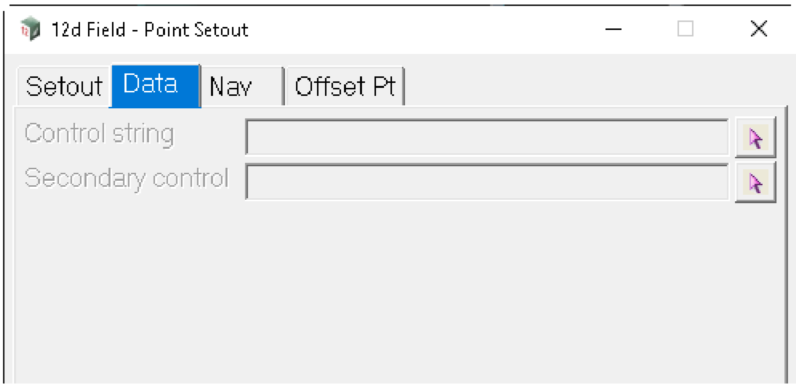
Auto find pt 2d?	tick box	not ticked	

??.

Comment

??.

Data Tab



Data Tab
Nav tab
Tol's tab
Offset Pt Tab

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

Field Description	Type	Defaults	Pop-Up

Data tab

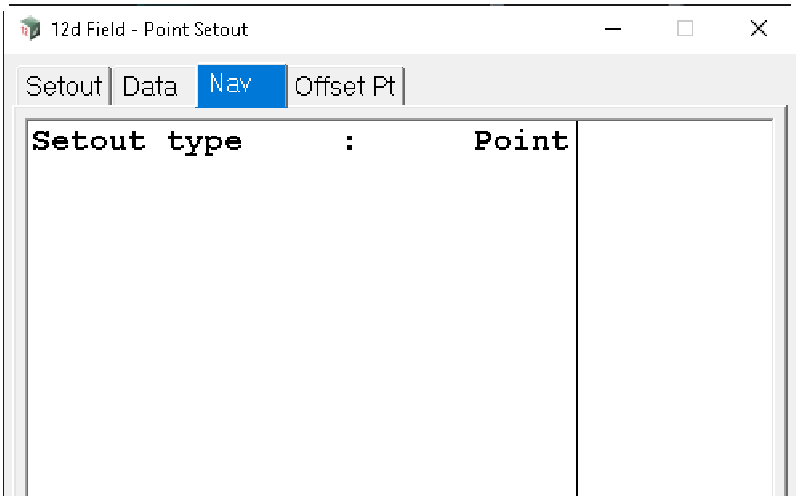
Control string string select

??.

Secondary string string select

??.

Nav Tab



Data Tab
Nav tab
Tol's tab
Offset Pt Tab

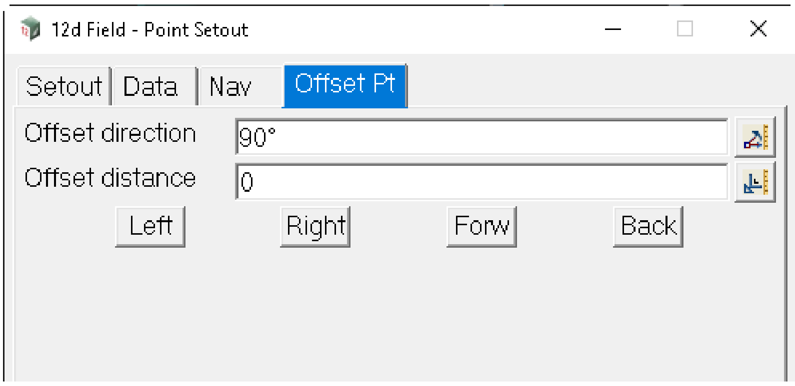
The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up

Nav tab

??.

Offset Pt Tab



Data Tab
Nav tab
Tol's tab
Offset Pt Tab

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

Field Description   Type   Defaults   Pop-Up

Offset Pt tab

Offset direction   real box   90 degrees

??.

Offset distance   real box   0

??.

Left   button   0

??.

Right   button   0

??.

Forw   button   0

??.

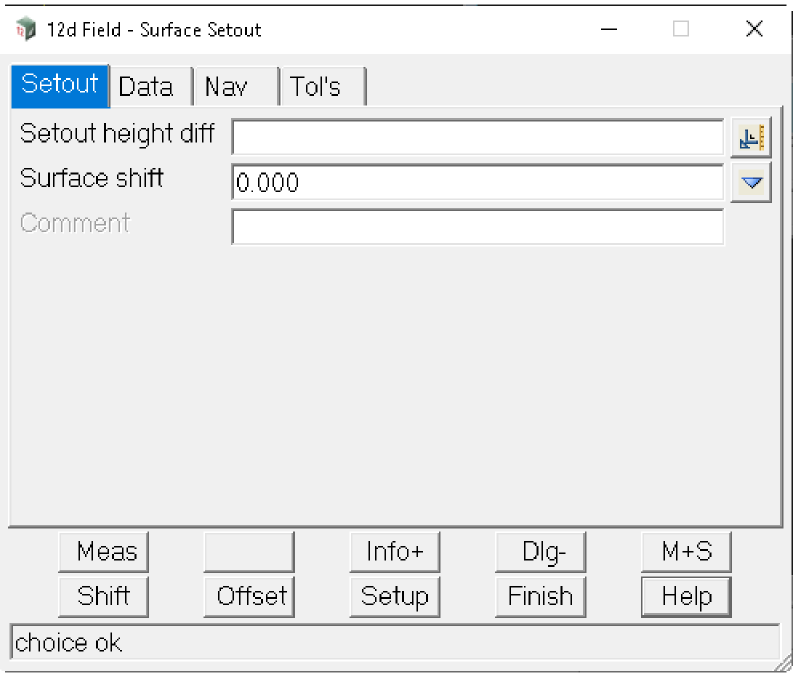
Back   button   0

??.

Continue to 16.5.4.3 Setout Surface or go back to 16.5.4 Setout.

16.5.4.3 Setout Surface

Clicking **Surface** brings up the **12d Field -Surface Setout** panel.



Setout tab
Data Tab
Nav Tab
Tol's Tab

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

Field Description Type Defaults Pop-Up

Buttons at Bottom

For more information on these buttons, see 16.5.1 Common Buttons, Panel Tabs and Fields .

Setout tab

Setout height diff real box

??.

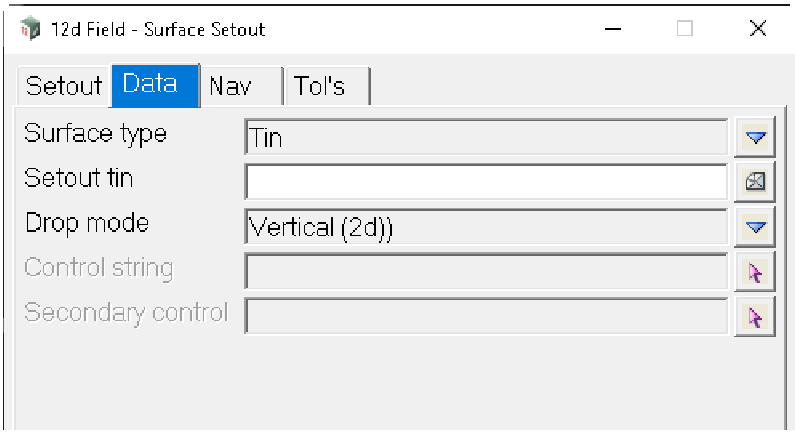
Surface shift choice box 0.000

??.

Comment

??.

Data Tab



[Setout tab](#)
[Data Tab](#)
[Nav Tab](#)
[Tol's Tab](#)

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

Field Description	Type	Defaults	Pop-Up

Data tab

Surface type	choice box	Tin	Tin, Trimesh

??.

Setout tin	tin box		

??.

Drop mode	choice box	Vertical (2d)	Vertical (2d), Perpendicular (3d)

??.

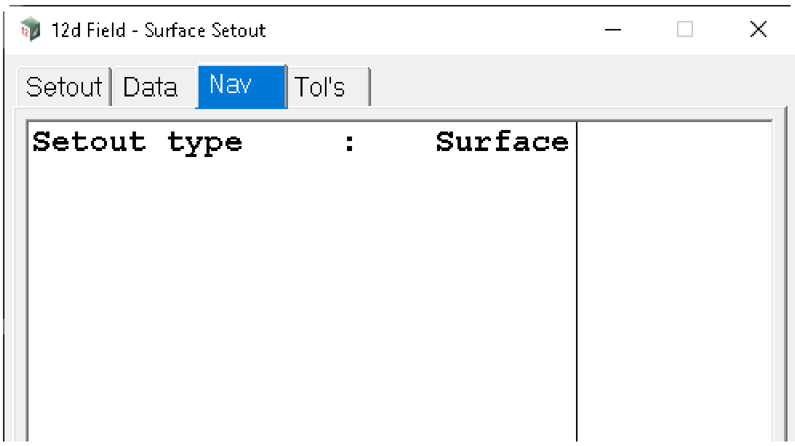
Control string	string select		

??.

Secondary control	String select		

??.

Nav Tab



[Setout tab](#)
[Data Tab](#)
[Nav Tab](#)
[Tol's Tab](#)

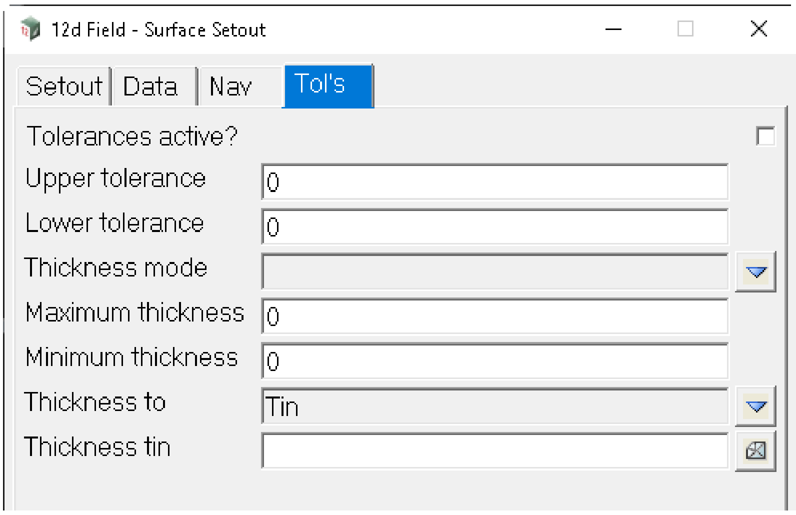
The fields and buttons used in this panel have the following functions.

Field Description Type Defaults Pop-Up

Nav tab

??.

Tol's Tab



Setout tab
Data Tab
Nav Tab
Tol's Tab

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

Field Description	Type	Defaults	Pop-Up

Tol's tab

Tolerance active?	tick box	not ticked	

??.

Upper tolerance		0	

??.

Lower tolerance		0	

??.

Thickness mode

??.

Maximum thickness		0	

??.

Minimum thickness		0	

??.

Thickness to	choice box	tin	tin, trimesh

??.

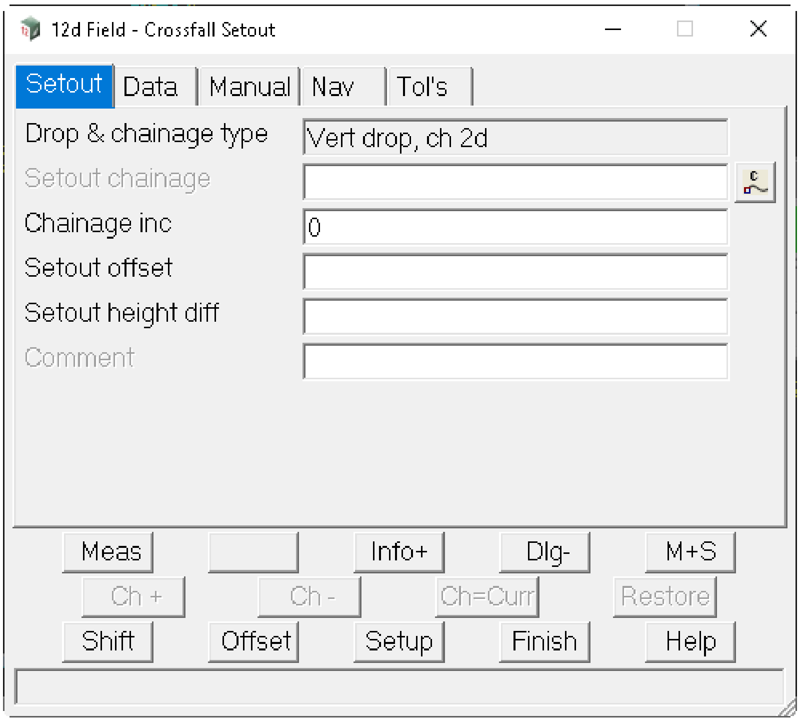
Thickness tin	tin box		

??.

Continue to 16.5.4.4 Setout Crossfall or go back to 16.5.4 Setout .

16.5.4.4 Setout Crossfall

Clicking **Crossfall** brings up the **12d Field - Crossfall Setout** panel.



Setout tab
Data Tab
Manual Tab
Nav Tab
Tol's Tab

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

Field Description	Type	Defaults	Pop-Up

Buttons at Bottom

For more information on these buttons, see 16.5.1 Common Buttons, Panel Tabs and Fields .

Setout tab

Chainage type 2d

??.

Drop/project type Vertical

??.

Setout chainage

??.

Chainage inc 0

??.

Setout offset

??.

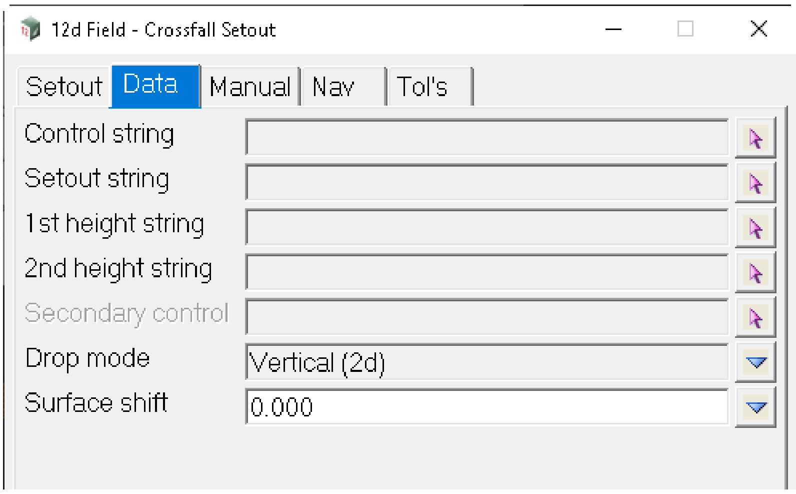
Setout height diff

??.

Comment

??.

Data Tab

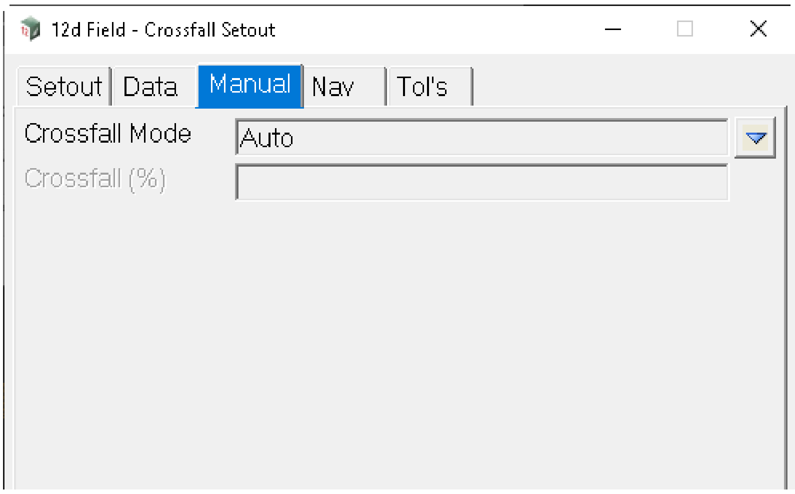


Setout tab
Data Tab
Manual Tab
Nav Tab
Tol's Tab

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

Field Description	Type	Defaults	Pop-Up
Control string	string select		
??.			
Setout string	string select		
??.			
1st height string	string select		
??.			
2nd height string	string select		
??.			
Secondary control	string select		
??.			
Drop mode	choice box	Vertical (2d)	Vertical (2d), Perpendicular (3d)
??.			
Surface shift	choice box	0.000	0.000
??.			

Manual Tab



[Setout tab](#)
[Data Tab](#)
[Manual Tab](#)
[Nav Tab](#)
[Tol's Tab](#)

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

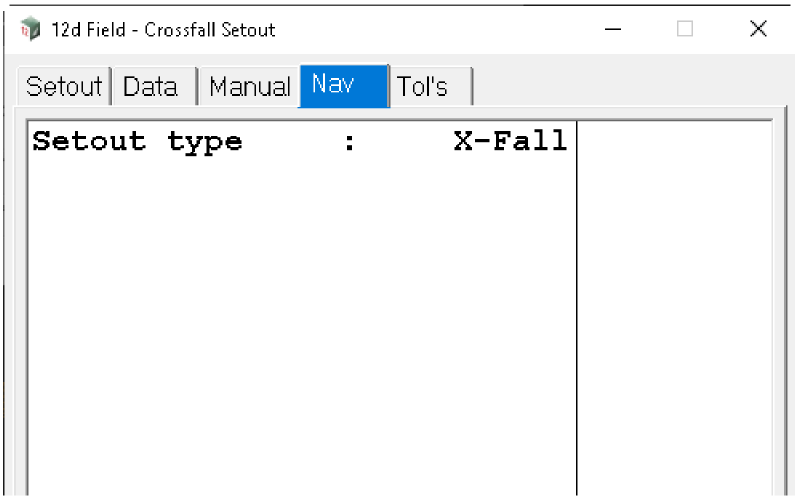
Field Description	Type	Defaults	Pop-Up
Crossfall Mode	choice box		Auto Centreline, string & x-fall Manual, use current x-fall

??.

Crossfall (%)

??.

Nav Tab



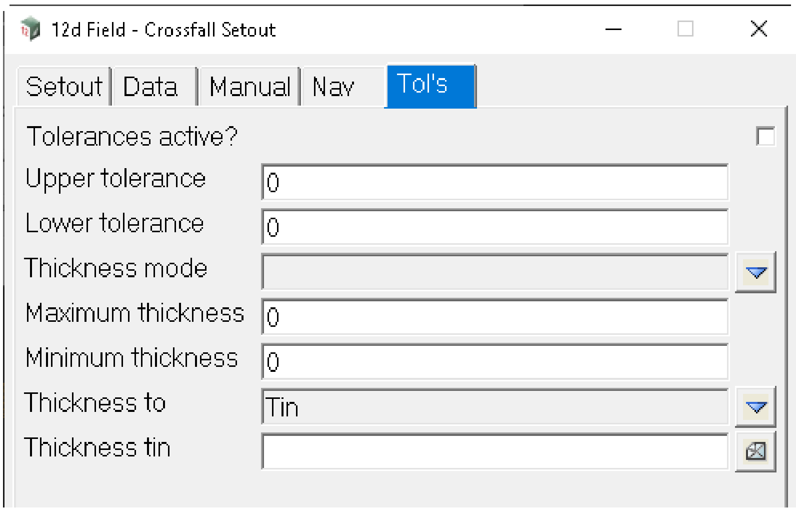
[Setout tab](#)
[Data Tab](#)
[Manual Tab](#)
[Nav Tab](#)
[Tol's Tab](#)

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

Field Description	Type	Defaults	Pop-Up

Nav tab

Tol’s Tab



[Setout tab](#)
[Data Tab](#)
[Manual Tab](#)
[Nav Tab](#)
[Tol’s Tab](#)

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

Field Description	Type	Defaults	Pop-Up
Tolerance active?	tick box	not ticked	

??.

Upper tolerance		0	

??.

Lower tolerance		0	

??.

Thickness mode	choice box		None, Vertical (2d), Perpendicular (3d)

??.

Maximum thickness		0	

??.

Minimum thickness		0	

??.

Thickness to	choice box	tin	tin, trimesh

??.

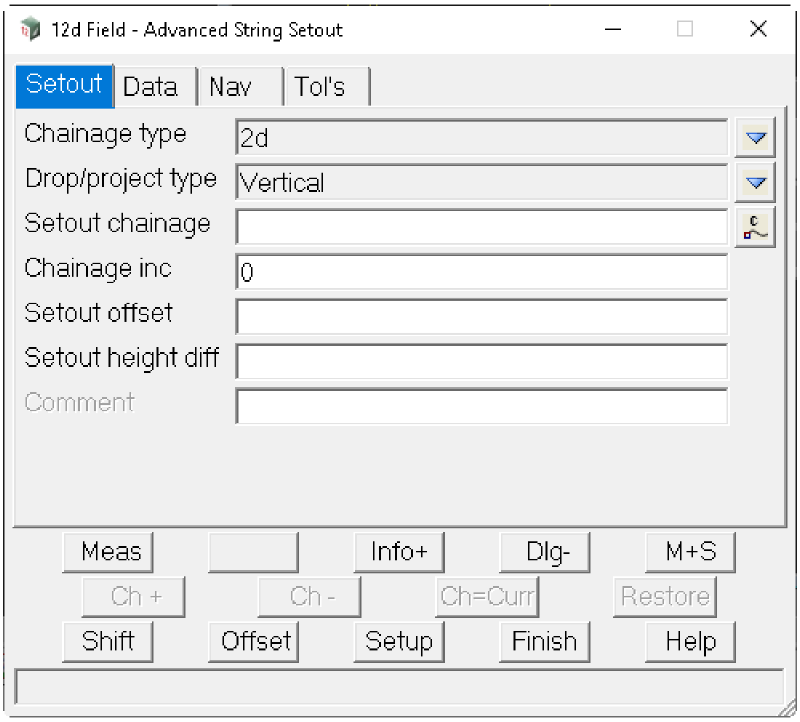
Thickness tin	tin box		

??.

Continue to 16.5.4.5 Setout String Advanced or go back to 16.5.4 Setout .

16.5.4.5 Setout String Advanced

Clicking **String Advanced** brings up the **12d Field - Advanced String Setout** panel.



Setout Tab
Data Tab
Nav Tab
Tol's Tab

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

Field Description Type Defaults Pop-Up

Buttons at Bottom

For more information on these buttons, see 16.5.1 Common Buttons, Panel Tabs and Fields .

Setout Tab

Field	Type	Defaults	Pop-Up
Chainage type	choice box	2d	2d, 3d

??.

Field	Type	Defaults	Pop-Up
Drop/project type	choice box	Vertical	Vertical, Perpendicular

??.

Setout chainage

??.

Chainage inc 0

??.

Setout offset

??.

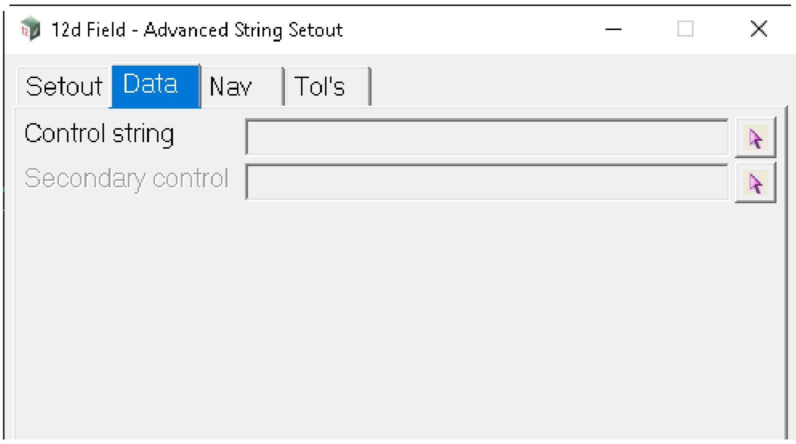
Setout height diff

??.

Comment

??.

Data Tab



Setout Tab
Data Tab
Nav Tab
Tol's Tab

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

Field Description Type Defaults Pop-Up

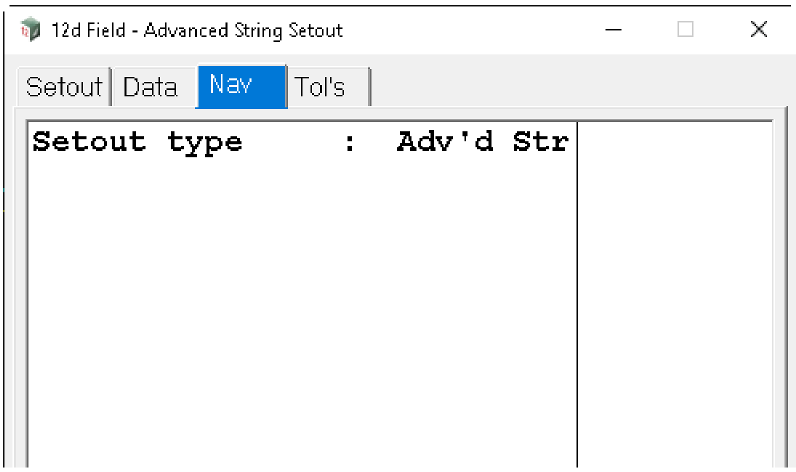
Control string

??.

Secondary control

??.

Nav Tab

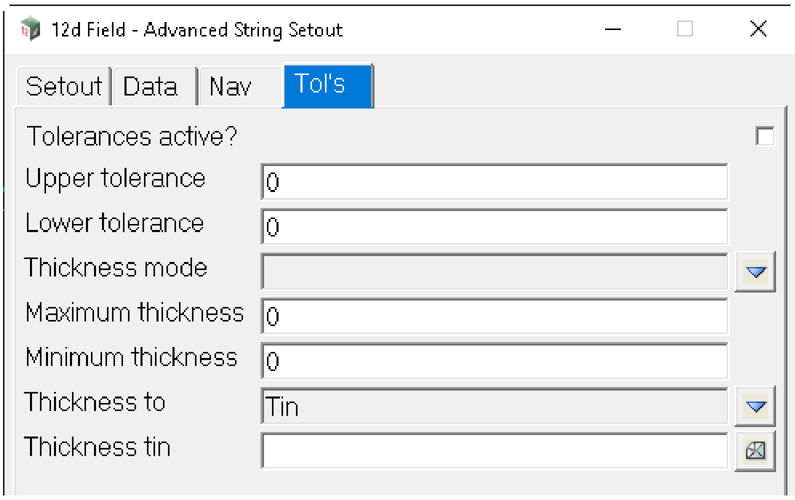


Setout Tab
Data Tab
Nav Tab
Tol's Tab

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

Field Description Type Defaults Pop-Up

Tol's Tab



Setout Tab
Data Tab
Nav Tab
Tol's Tab

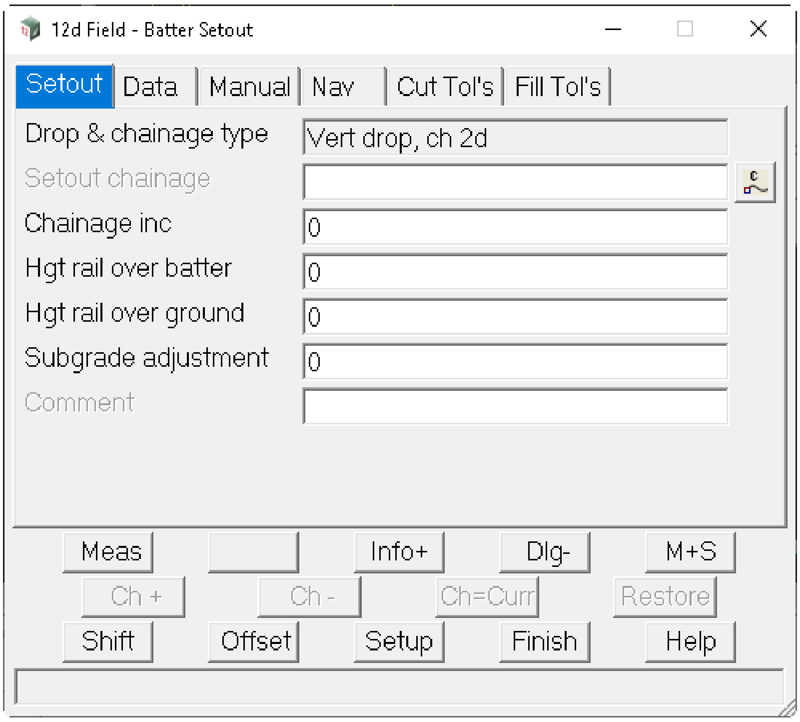
The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Tolerance active?	tick box	not ticked	
??.			
Upper tolerance		0	
??.			
Lower tolerance		0	
??.			
Thickness mode	choice box		None, Vertical (2d), Perpendicular (3d)
??.			
Maximum thickness		0	
??.			
Minimum thickness		0	
??.			
Thickness to	choice box	tin	tin, trimesh
??.			
Thickness tin	tin box		
??.			

Continue to 16.5.4.6 Setout Batter or go back to 16.5.4 Setout .

16.5.4.6 Setout Batter

Clicking **Batter** brings up the **12d Field - Batter Setout** panel.



Setout Tab
Data Tab
Manual Tab
Nav Tab
Cut Tol's Tab
Fill Tol's Tab

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

Field Description	Type	Defaults	Pop-Up

Buttons at Bottom

For more information on these buttons, see 16.5.1 Common Buttons, Panel Tabs and Fields .

Setout Tab

Chainage type	choice box	2d	2d, 3d

??.

Drop/project type	choice box	Vertical	Vertical, Perpendicular

??.

Setout chainage

??.

Chainage inc		0	

??.

Hgt rail over batter		0	

??.

Hgt rail over ground		0	

??.

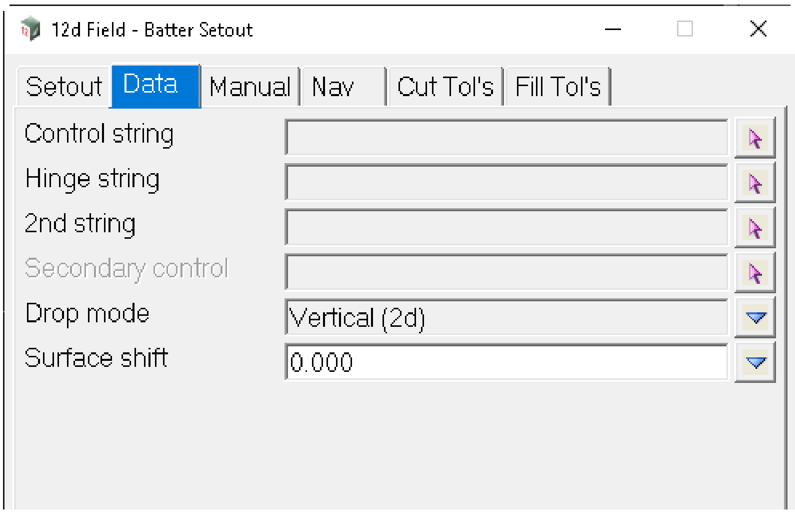
Subgrade adjustment 0

??.

Comment

??.

Data Tab

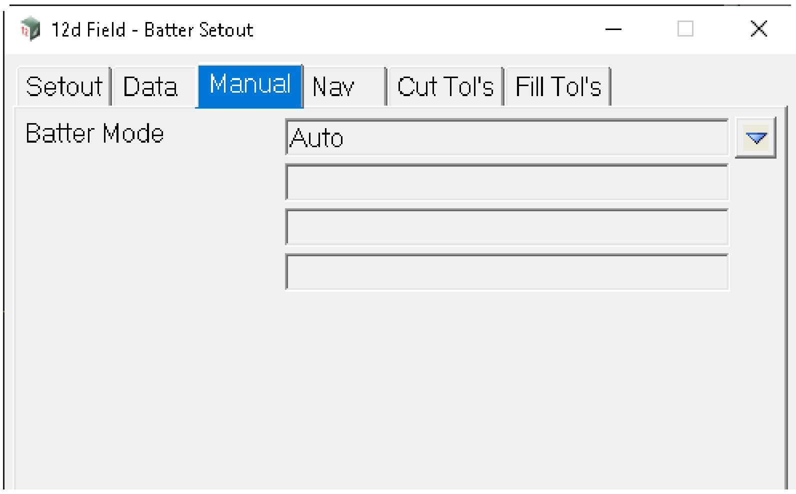


Setout Tab
Data Tab
Manual Tab
Nav Tab
Cut Tol's Tab
Fill Tol's Tab

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

Field Description	Type	Defaults	Pop-Up
Control string	string select		
??.			
Hinge string	string select		
??.			
2nd string	string select		
??.			
Secondary control	string select		
??.			
Drop mode	choice box	Vertical (2d)	Vertical (2d), Perpendicular (3d)
??.			
Surface shift	choice box		0.000
??.			

Manual Tab



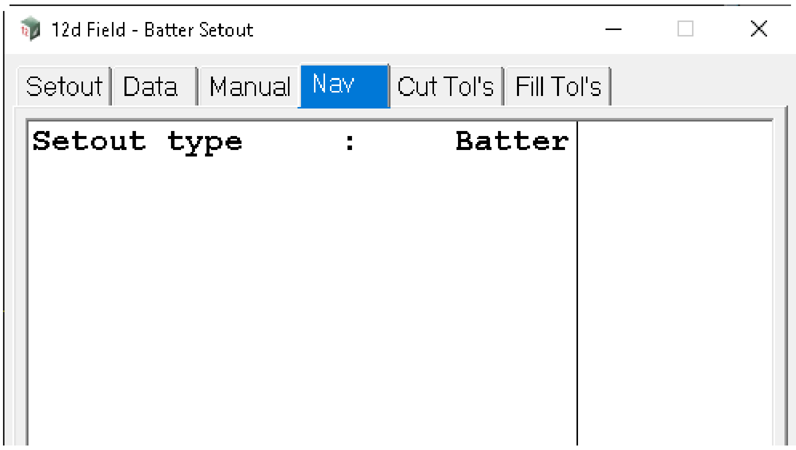
Setout Tab
Data Tab
Manual Tab
Nav Tab
Cut Tol's Tab
Fill Tol's Tab

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

Field Description	Type	Defaults	Pop-Up
Batter Mode	choice box	Auto	Auto Centerline, hinge & slope Manual relative(dOS&dHgt) Manual absolute (dOS&RL) Manual, use current slope

??.

Nav Tab

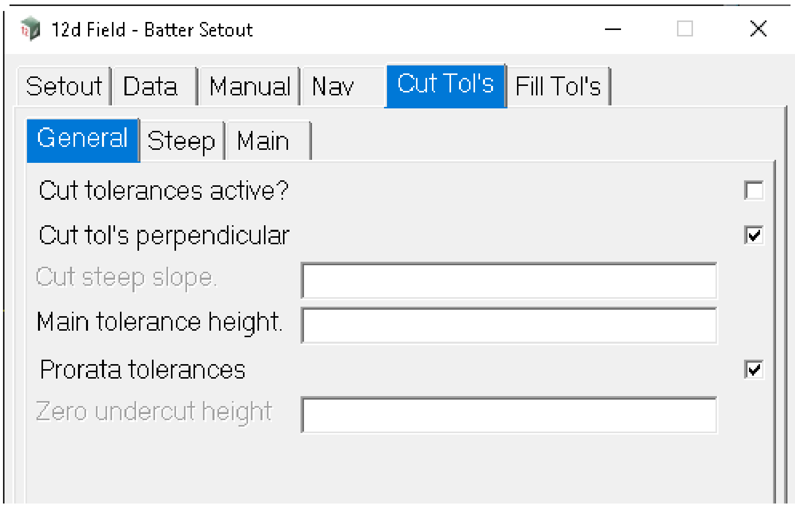


Setout Tab
Data Tab
Manual Tab
Nav Tab
Cut Tol's Tab
Fill Tol's Tab

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

Field Description Type Defaults Pop-Up

Cut Tol's Tab



Setout Tab
Data Tab
Manual Tab
Nav Tab
Cut Tol's Tab
Fill Tol's Tab

General tab
Steep tab
Main tab

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

Field Description	Type	Defaults	Pop-Up

General tab

Cut tolerances active?	tick box	not ticked	

??.

Cut tol's perpendicular	tick box	ticked	

??.

Cut steep slope

??.

Main tolerance height

??.

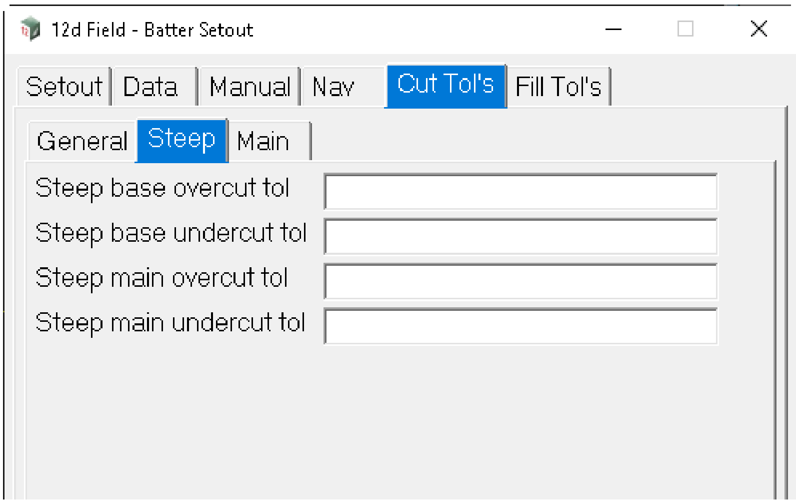
Prorata tolerance	tick box	not ticked	

??.

Zero undercut height

??.

Steep tab



Setout Tab
Data Tab
Manual Tab
Nav Tab
Cut Tol's Tab
Fill Tol's Tab

General tab
Steep tab
Main tab

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

Field Description Type Defaults Pop-Up

Steep base overcut tol

??.

Steep base undercut tol

??.

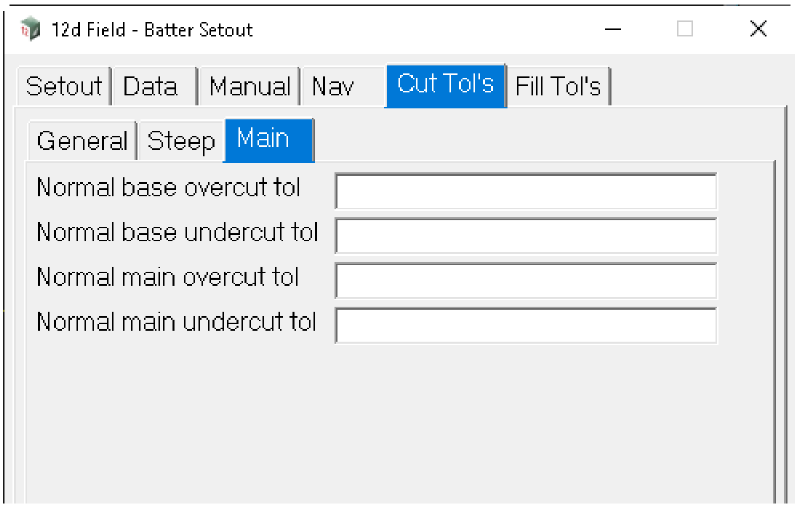
Steep main overcut tol

??.

Steep main undercut tol

??.

Main tab



Setout Tab
Data Tab
Manual Tab
Nav Tab
Cut Tol’s Tab
Fill Tol’s Tab

General tab
Steep tab
Main tab

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

Field Description Type Defaults Pop-Up

Normal base overcut tol

??.

Normal base undercut tol

??.

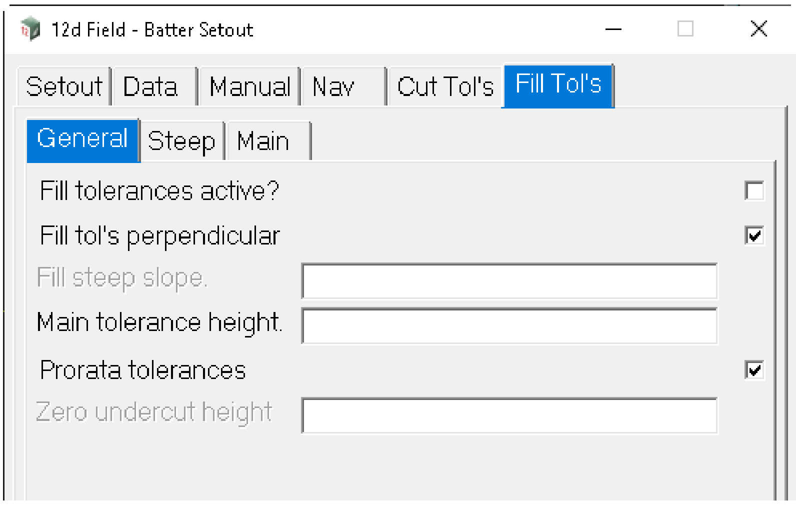
Normal main overcut tol

??.

Normal main undercut tol

??.

Fill Tol’s Tab



Setout Tab
Data Tab
Manual Tab
Nav Tab
Cut Tol’s Tab
Fill Tol’s Tab

General tab
Steep tab
Main tab

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

Field Description	Type	Defaults	Pop-Up

General tab

Fill tolerances active?	tick box	not ticked	

??.

Fill tol’s perpendicular	tick box	ticked	

??.

Fill steep slope

??.

Main tolerance height

??.

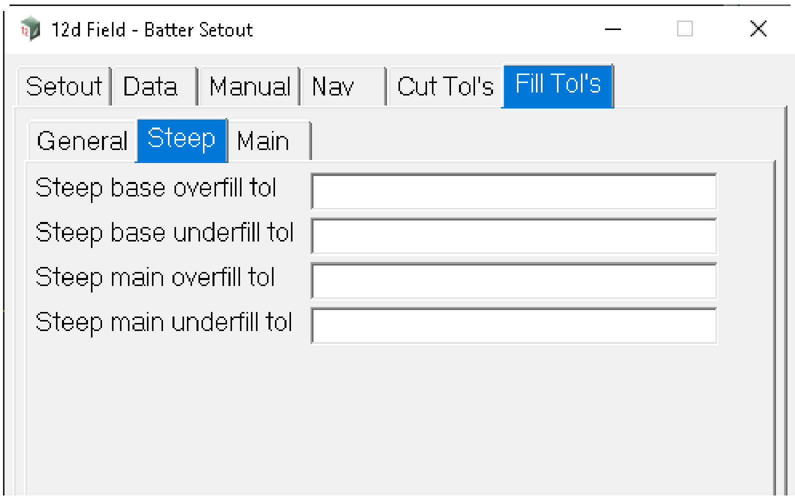
Prorata tolerance	tick box	not ticked	

??.

Zero undercut height

??.

Steep tab



Setout Tab
Data Tab
Manual Tab
Nav Tab
Cut Tol's Tab
Fill Tol's Tab

General tab
Steep tab
Main tab

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

Field Description Type Defaults Pop-Up

Steep base overcut tol

??.

Steep base undercut tol

??.

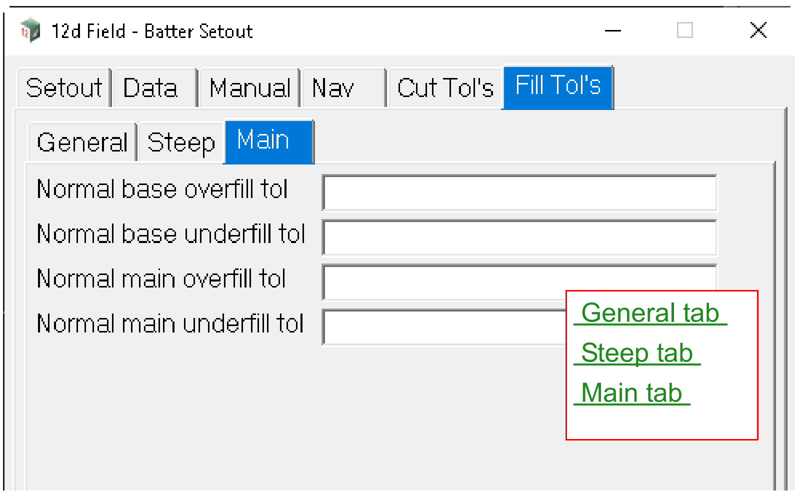
Steep main overcut tol

??.

Steep main undercut tol

??.

Main tab



General tab
Steep tab
Main tab

Setout Tab
Data Tab
Manual Tab
Nav Tab
Cut Tol's Tab
Fill Tol's Tab

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

Field Description Type Defaults Pop-Up

Normal base overcut tol

??.

Normal base undercut tol

??.

Normal main overcut tol

??.

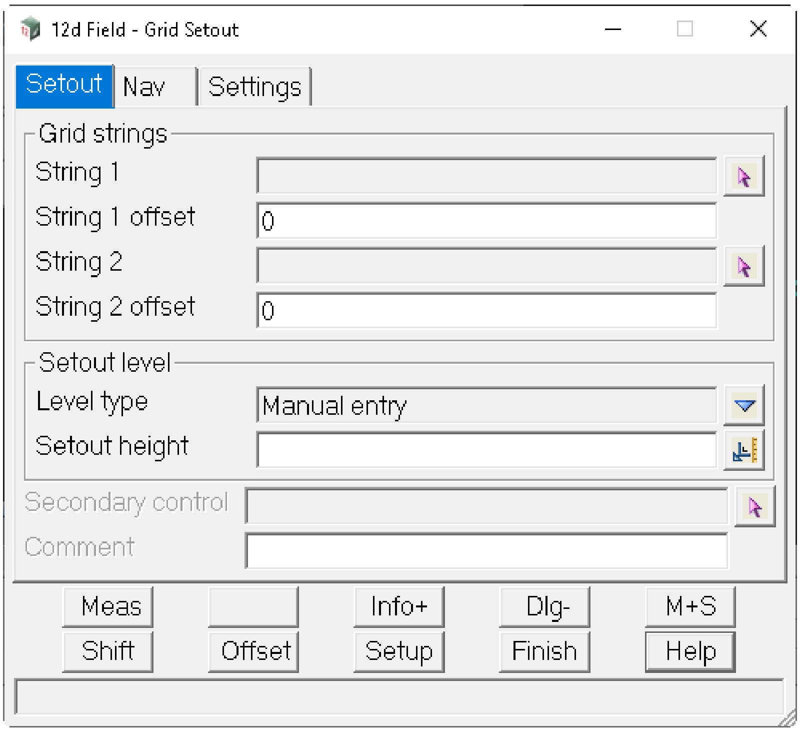
Normal main undercut tol

??.

Continue to 16.5.4.7 Setout Grid or go back to 16.5.4 Setout .

16.5.4.7 Setout Grid

Clicking **Setout Grid** brings up the **12d Field - Grid Setout** panel.



Setout Tab
Nav Tab
Settings Tab

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

Field Description	Type	Defaults	Pop-Up

Buttons at Bottom

For more information on these buttons, see 16.5.1 Common Buttons, Panel Tabs and Fields .

Setout Tab

Grid strings

String 1	string select		
??.			
String 1 offset		0	
??.			
String 2	string select		
??.			
String 2 offset		0	
??.			

Setout level

Level type	choice box	Manual entry	Manual entry Drop to string 1 Drop to string 2

??.

Setout height real box

??.

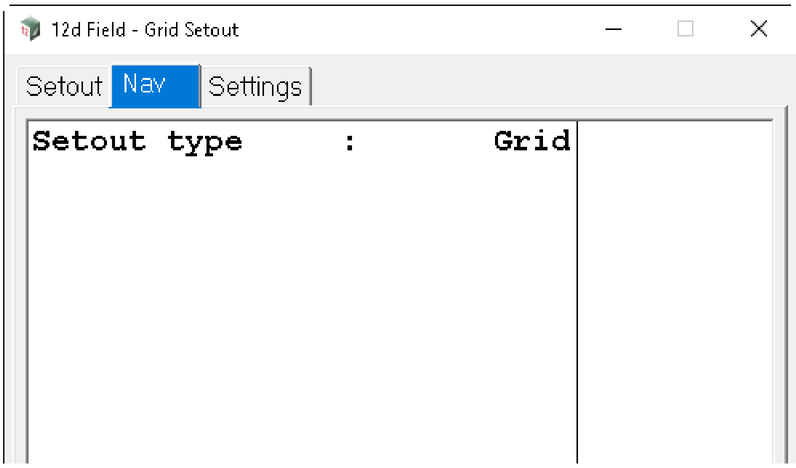
Secondary control string select

??.

Comment

??.

Nav Tab

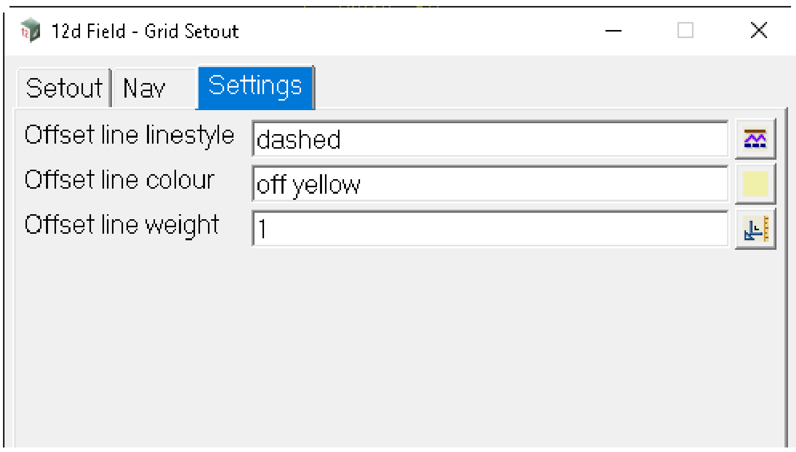


Setout Tab
Nav Tab
Settings Tab

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

Field Description Type Defaults Pop-Up

Settings Tab



Setout Tab
Nav Tab
Settings Tab

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

Field Description Type Defaults Pop-Up

Offset line linestyle

??.

Offset line colour colour box yellow

??.

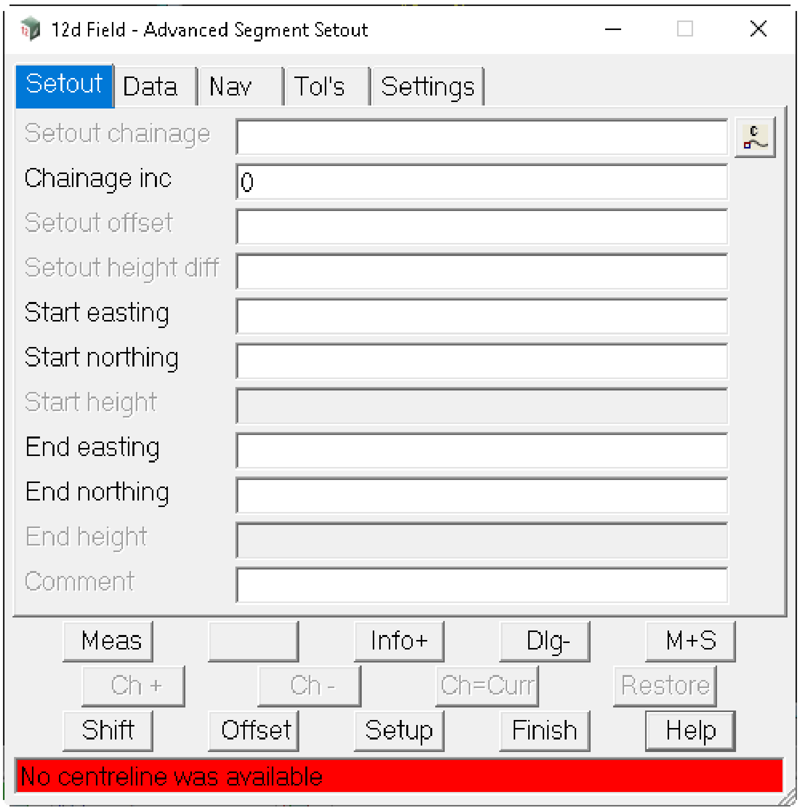
Offset line weight real box

??.

Continue to 16.5.4.8 Setout Advanced Segment or go back to 16.5.4 Setout .

16.5.4.8 Setout Advanced Segment

Clicking **Segment Advanced** brings up the **12d Field - Advanced Segment Setout** panel.



Setout Tab
Data Tab
Nav Tab
Tol's Tab
Settings Tab

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

Field Description Type Defaults Pop-Up

Buttons at Bottom

For more information on these buttons, see 16.5.1 Common Buttons, Panel Tabs and Fields.

Setout Tab

Setout chainage

??.

Setout offset 0

??.

Chainage inc

??.

Setout height diff 0

??.

Start easting

??.

Start northing

??.

Start height

??.

End easting

??.

End northing

??.

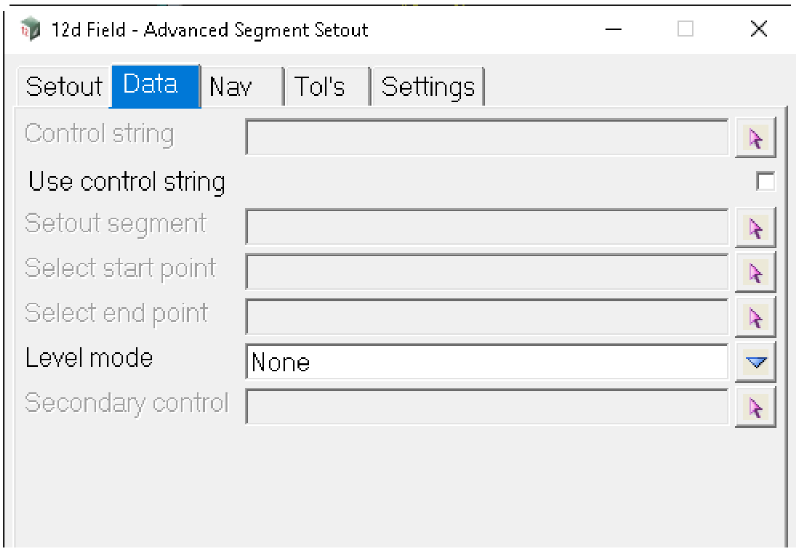
End height

??.

Comment

??.

Data Tab



Setout Tab
Data Tab
Nav Tab
Tol's Tab
Settings Tab

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

Field Description	Type	Defaults	Pop-Up
Control string	string select		

??.

Use control string	tick box	not ticked	

??.

S/O segment	string select		

??.

Select start point	string select		

??.

Select end point

??.

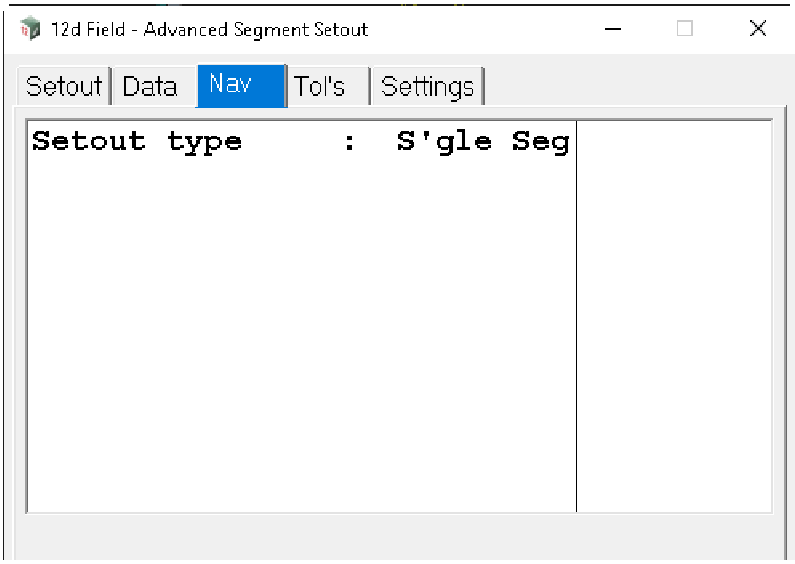
Level mode	choice box		

??.

Seconday control	string select		

??.

Nav Tab

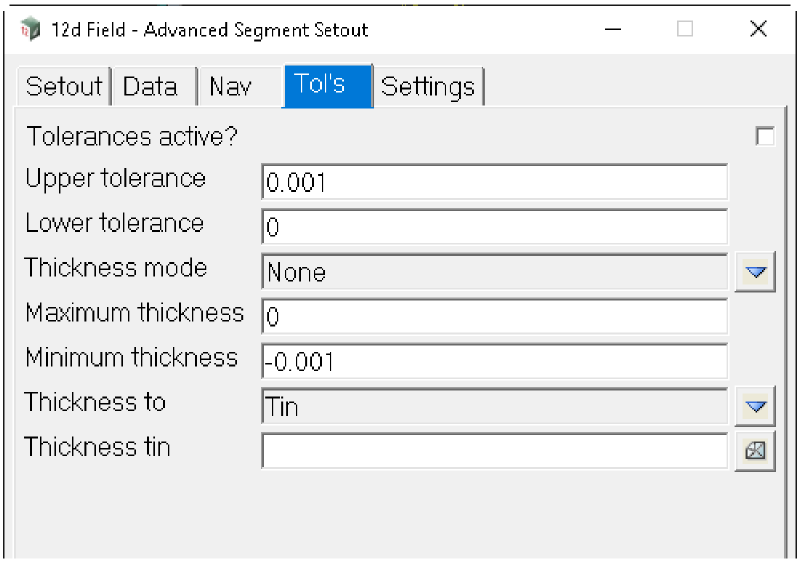


Setout Tab
Data Tab
Nav Tab
Tol's Tab
Settings Tab

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

Field Description Type Defaults Pop-Up

Tol's Tab

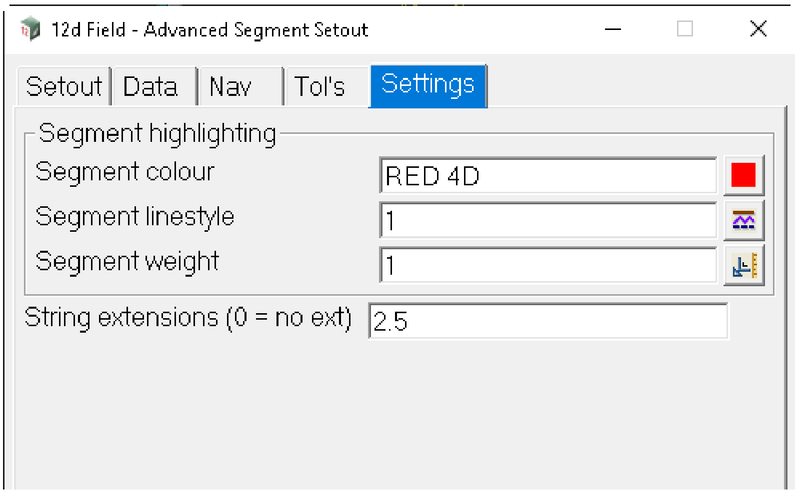


Setout Tab
Data Tab
Nav Tab
Tol's Tab
Settings Tab

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

Field Description	Type	Defaults	Pop-Up
Tolerance active?	tick box	not ticked	
??.			
Upper tolerance		0.001	
??.			
Lower tolerance		0	
??.			
Thickness mode	choice box		None, Vertical (2d), Perpendicular (3d)
??.			
Maximum thickness		0	
??.			
Minimum thickness		-0.001	
??.			
Thickness to	choice box	tin	tin, trimesh
??.			
Thickness tin	tin box		
??.			

Settings Tab



[Setout Tab](#)
[Data Tab](#)
[Nav Tab](#)
[Tol's Tab](#)
[Settings Tab](#)

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

Field Description	Type	Defaults	Pop-Up
Segment highlighting			
Segment colout	colour box	red	available colours

??.

Segment linestyle

??.

Segment weight	real box

??.

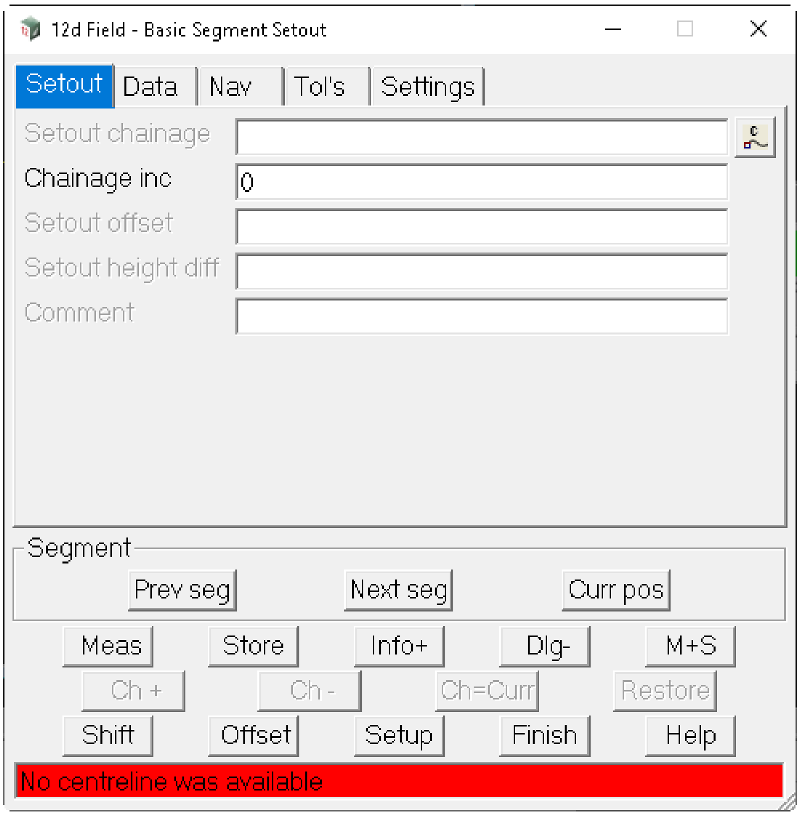
String extensions (o = no ext)

??.

Continue to 16.5.4.9 Setout Basic Segment or go back to 16.5.4 Setout .

16.5.4.9 Setout Basic Segment

Clicking **Segment Basic** brings up the **12d Field - Basic Segment Setout** panel.



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

Field Description Type Defaults Pop-Up

Buttons at Bottom

For more information on these buttons, see 16.5.1 Common Buttons, Panel Tabs and Fields.

Setout Tab

Setout chainage

??.

Chainage inc

??.

Setout offset

??.

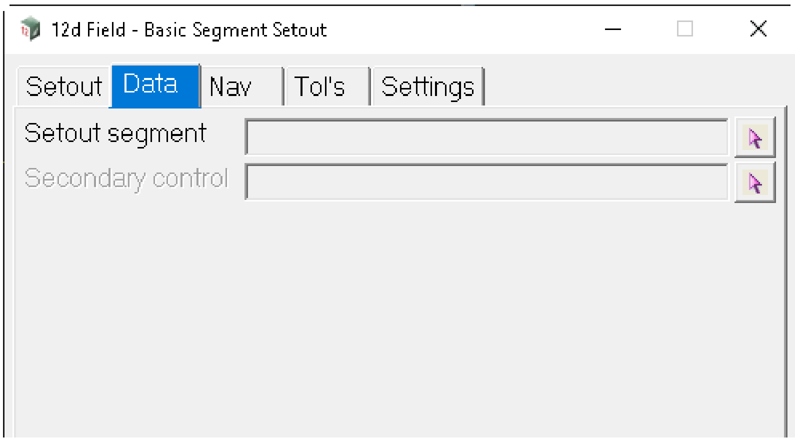
Setout height diff

??.

Comment

??.

Data Tab



Setout Tab
Data Tab
Nav Tab
Tol's Tab
Settings Tab

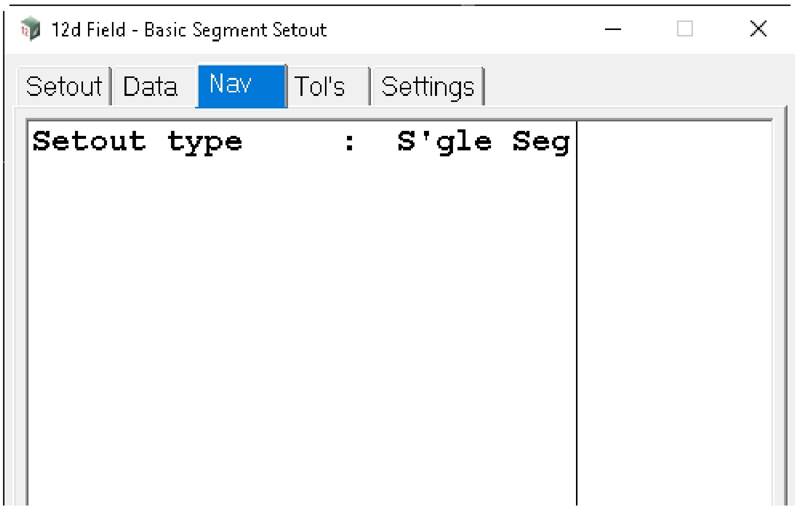
Setout segment

??.

Secondary control

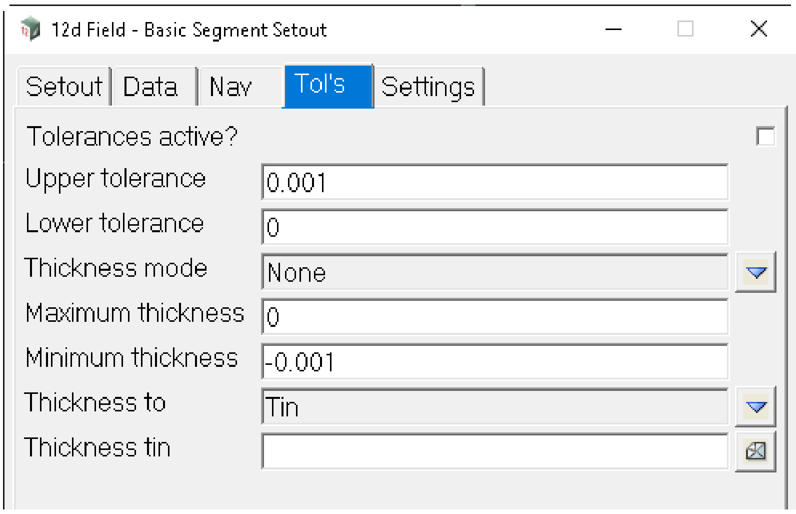
??.

Nav Tab



Setout Tab
Data Tab
Nav Tab
Tol's Tab
Settings Tab

Tol's Tab



Setout Tab
Data Tab
Nav Tab
Tol's Tab
Settings Tab

Tolerance active? tick box not ticked

??.

Upper tolerance 0.001

??.

Lower tolerance 0

??.

Thickness mode choice box None None, Vertical (2d), Perpendicular (3d)

??.

Maximum thickness 0

??.

Minimum thickness -0.001

??.

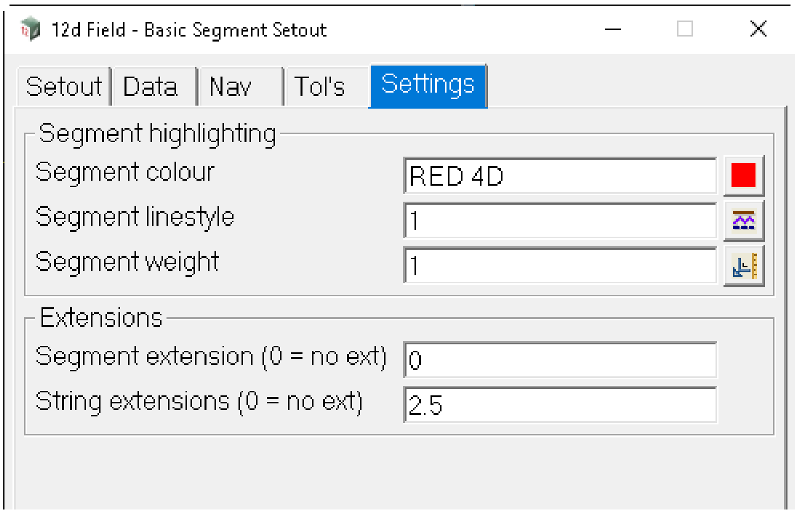
Thickness to choice box tin tin, trimesh

??.

Thickness tin tin box

??.

Settings Tab



Setout Tab
Data Tab
Nav Tab
Tol's Tab
Settings Tab

Segment highlighting

Segment colout colour box red available colours

??.

Segment linestyle

??.

Segment weight real box

??.

Extensions

Segment extensions (o = no ext)

??.

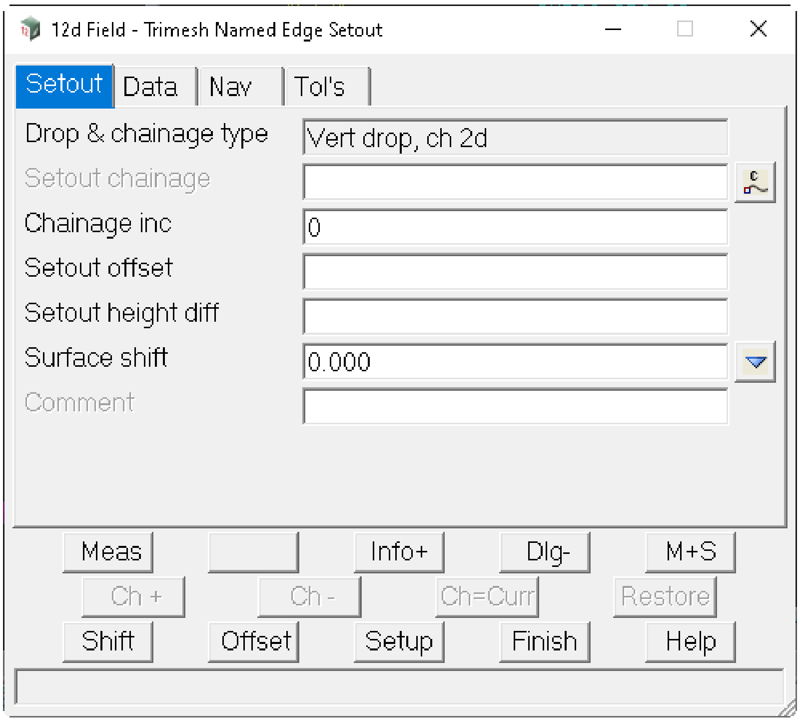
String extensions (o = no ext)

??.

Continue to 16.5.4.10 Setout Trimesh Edge or go back to 16.5.4 Setout .

16.5.4.10 Setout Trimesh Edge

Clicking **Trimesh Edge** brings up the **12d Field - Trimesh Named Edge Setout** panel.



Setout Tab
Data Tab
Nav Tab
Tol's Tab

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

Field Description Type Defaults Pop-Up

Buttons at Bottom

For more information on these buttons, see 16.5.1 Common Buttons, Panel Tabs and Fields .

Setout Tab

Chainage type 2d

??.

Drop/project type Vertical

??.

Setout chainage

??.

Chainage inc 0

??.

Setout offset

??.

Setout height difference

??.

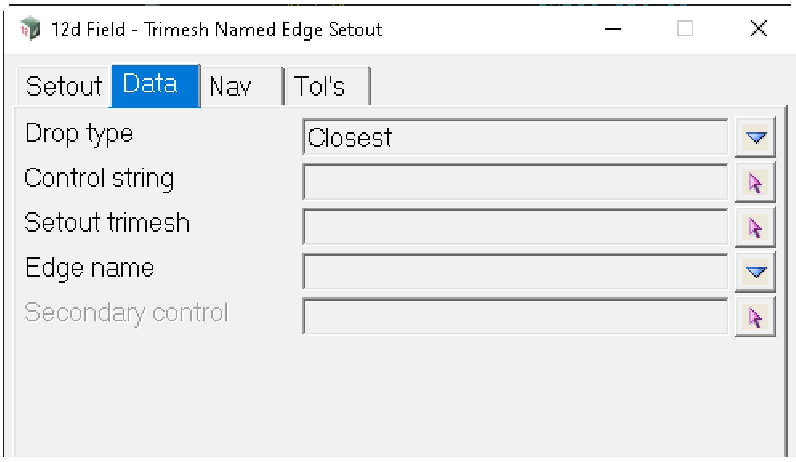
Surface shift 0.000

??.

Comment

??.

Data Tab



[Setout Tab](#)
[Data Tab](#)
[Nav Tab](#)
[Tol's Tab](#)

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

Field Description	Type	Defaults	Pop-Up
Drop type	choice box	Closest	Closest to control string Closest to setout ch

??.

Control string string select

??.

Setout trimesh string select

??.

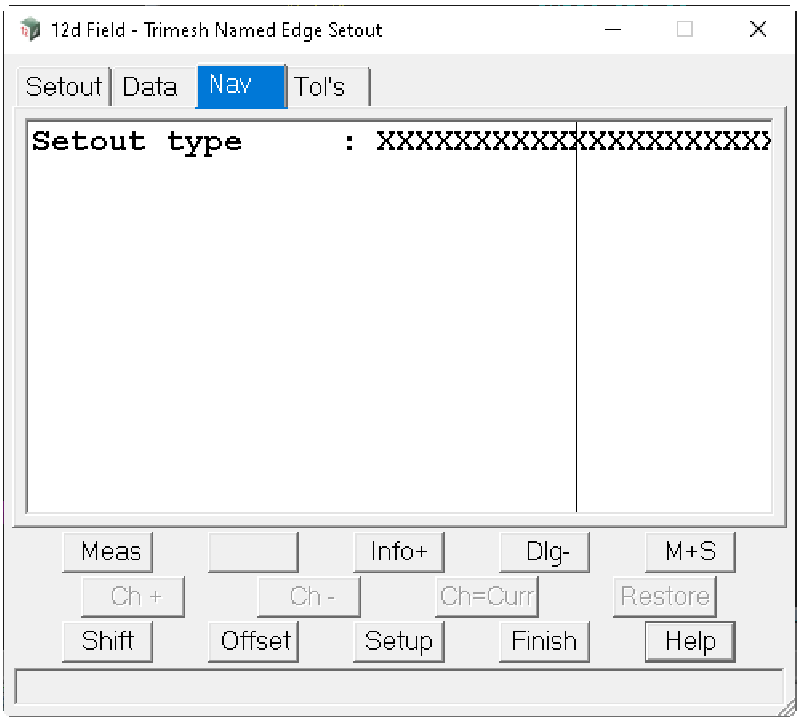
Edge name choice box

??.

Secondary control string select

??.

Nav Tab

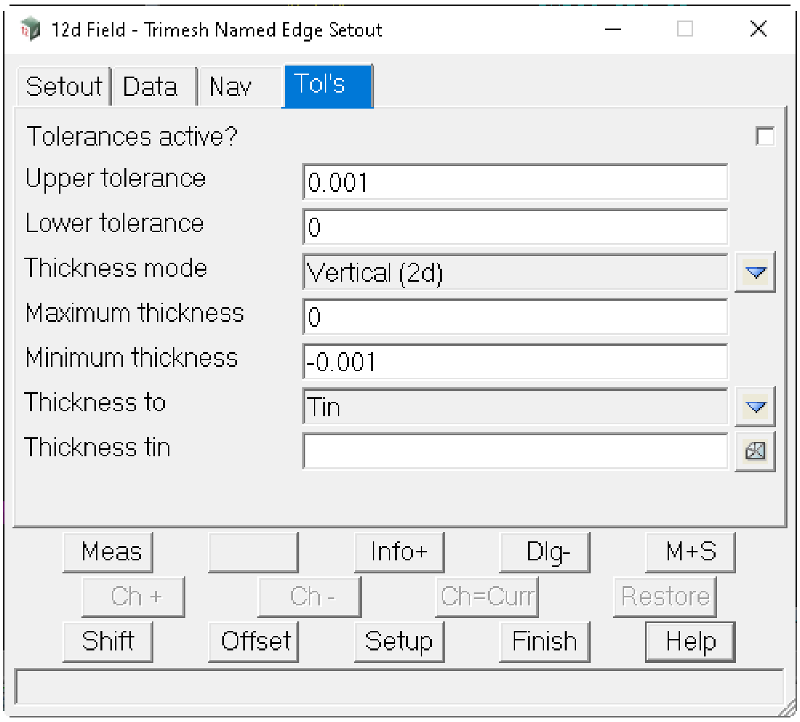


[Setout Tab](#)
[Data Tab](#)
[Nav Tab](#)
[Tol's Tab](#)

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

Field Description	Type	Defaults	Pop-Up

Tol's Tab



Setout Tab
Data Tab
Nav Tab
Tol's Tab

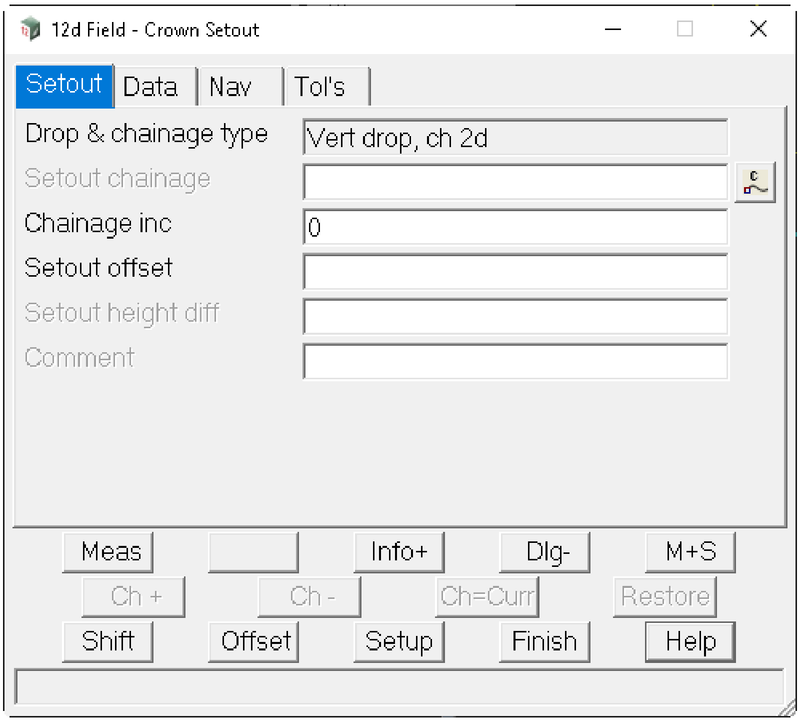
The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Tolerance active?	tick box	not ticked	
??.			
Upper tolerance		0	
??.			
Lower tolerance		0	
??.			
Thickness mode	choice box		None, Vertical (2d), Perpendicular (3d)
??.			
Maximum thickness		0	
??.			
Minimum thickness		0	
??.			
Thickness to	choice box	tin	tin, trimesh
??.			
Thickness tin	tin box		
??.			

Continue to 16.5.4.11 Setout Crown or go back to 16.5.4 Setout .

16.5.4.11 Setout Crown

Clicking **Crown** brings up the **12d Field - Crown Setout** panel.



Setout Tab
Data Tab
Nav Tab
Tol's Tab

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

Field Description Type Defaults Pop-Up

Buttons at Bottom

For more information on these buttons, see 16.5.1 Common Buttons, Panel Tabs and Fields.

Setout Tab

Chainage type 2d

??.

Drop/project type Vertical

??.

Setout chainage

??.

Chainage inc 0

??.

Setout offset

??.

Setout height difference

??.

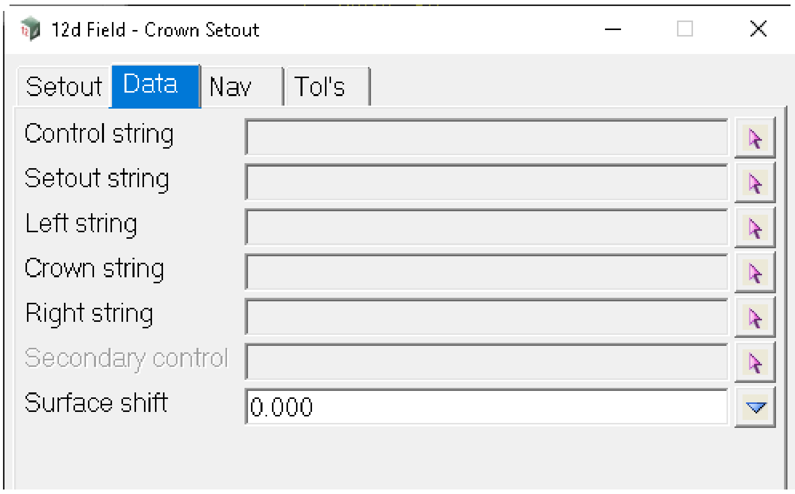
Surface shift 0.000

??.

Comment

??.

Data Tab

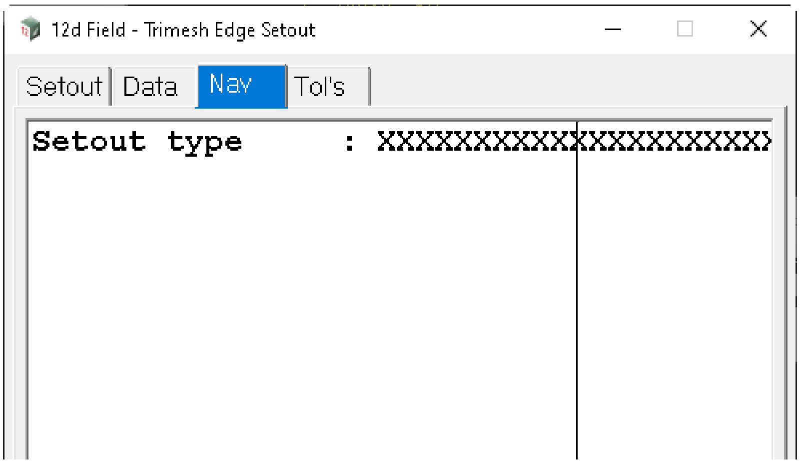


[Setout Tab]
[Data Tab]
[Nav Tab]
[Tol's Tab]

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

Field Description	Type	Defaults	Pop-Up
Control string	string select		
??.			
Setout string	string select		
??.			
Left string	string select		
??.			
Crown string	string select		
??.			
Right string	string select		
??.			
Secondary control	string select		
??.			
Surface shift	choice box		0.000
??.			

Nav Tab

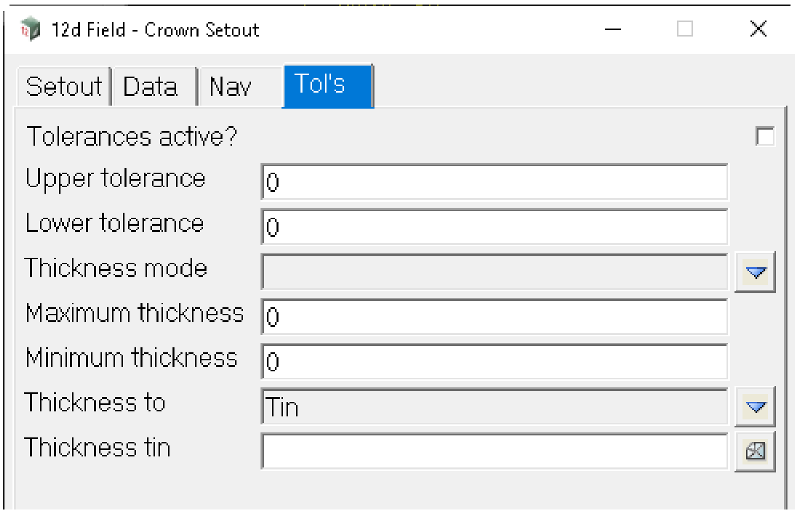


Setout Tab
Data Tab
Nav Tab
Tol's Tab

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

Field Description	Type	Defaults	Pop-Up

Tol's Tab



[Setout Tab](#)
[Data Tab](#)
[Nav Tab](#)
[Tol's Tab](#)

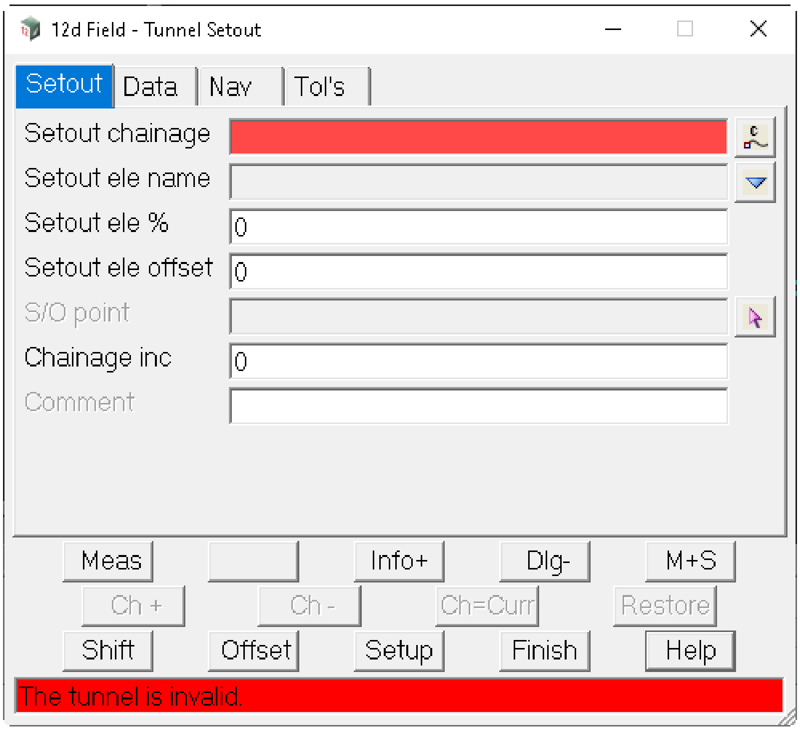
The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Tolerance active?	tick box	not ticked	
??.			
Upper tolerance		0	
??.			
Lower tolerance		0	
??.			
Thickness mode	choice box		None, Vertical (2d), Perpendicular (3d)
??.			
Maximum thickness		0	
??.			
Minimum thickness		0	
??.			
Thickness to	choice box	tin	tin, trimesh
??.			
Thickness tin	tin box		
??.			

Continue to 16.5.4.12 Setout Tunnel or go back to 16.5.4 Setout .

16.5.4.12 Setout Tunnel

Clicking **Tunnel** brings up the **12d Field - Tunnel Setout** panel.



Setout Tab
Data Tab
Nav Tab
Tol's Tab

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

Field Description	Type	Defaults	Pop-Up

Buttons at Bottom

For more information on these buttons, see 16.5.1 Common Buttons, Panel Tabs and Fields .

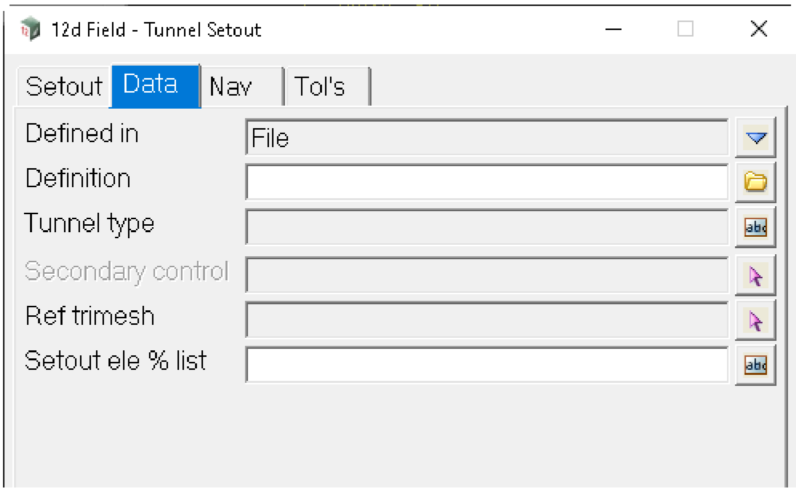
Setout Tab

Field Description	Type	Defaults	Pop-Up
Setout chainage			
??.			
Setout ele name	choice box		
??.			
Setout ele %		0	
??.			
Setout ele offset		0	
??.			
S/O point	string select		
??.			
Chainage inc		0	
??.			

Comment

??.

Data Tab

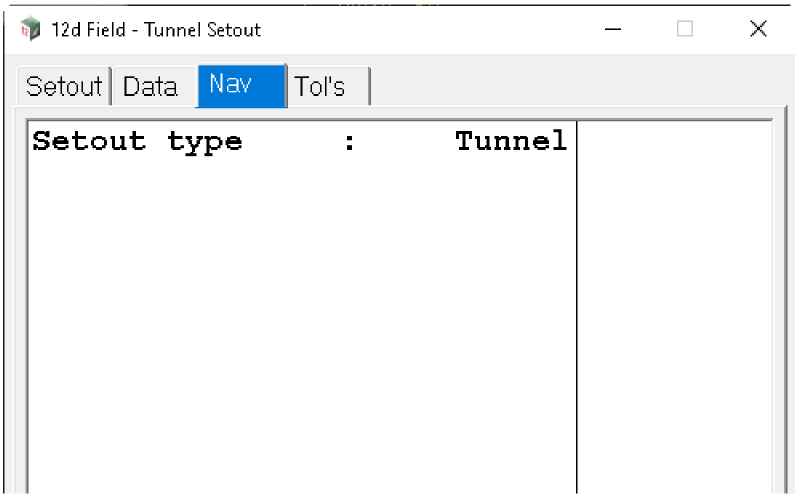


[Setout Tab](#)
[Data Tab](#)
[Nav Tab](#)
[Tol's Tab](#)

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

Field Description	Type	Defaults	Pop-Up
Defined in	choice box	file	File, Centreline
??.			
Definition	file box		*.12d_tunnel
??.			
Tunnel type	text box		
??.			
Secondary control	string select		
??.			
Ref trimesh	string select		
??.			
Setout ele % list	text box		
??.			

Nav Tab

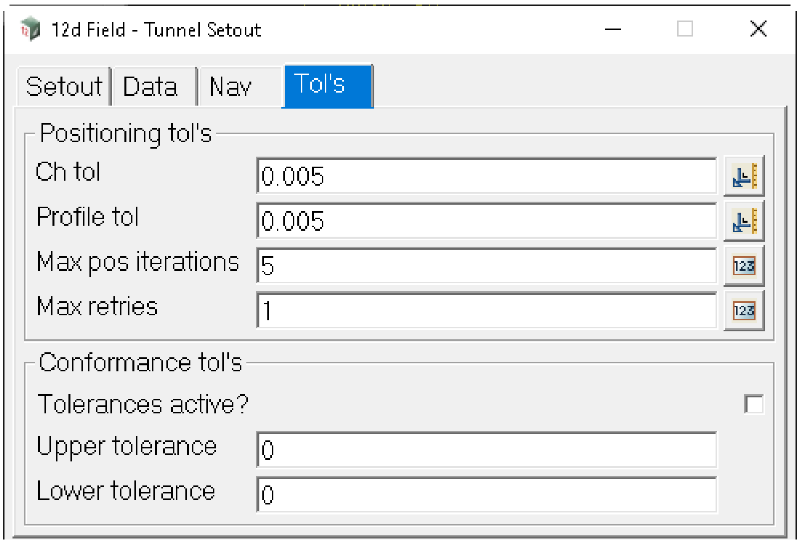


Setout Tab
Data Tab
Nav Tab
Tol's Tab

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

Field Description	Type	Defaults	Pop-Up

Tol's Tab



Setout Tab
Data Tab
Nav Tab
Tol's Tab

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

Field Description	Type	Defaults	Pop-Up

Positioning tol's

Ch tol	real box	0.005	

??.

Profile tol	real box	0.005	

??.

Max pos iterations	integer box	5	

??.

Max retries	integer box	1	

??.

Conformance tol's

Tolerances active?	tick box	not ticked	

??.

Upper tolerance		0	

??.

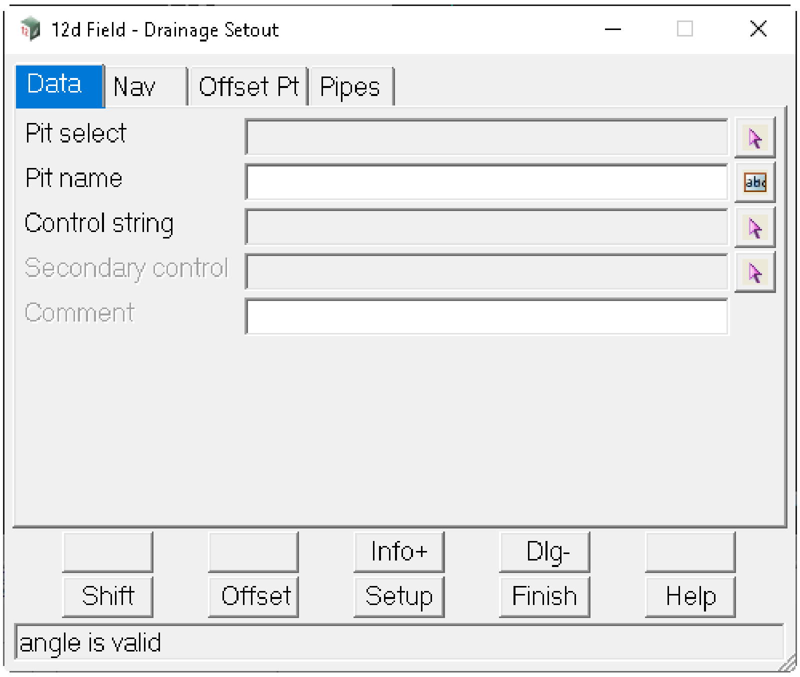
Lower tolerance		0	

??.

Continue to 16.5.4.13 Setout Drainage or go back to 16.5.4 Setout .

16.5.4.13 Setout Drainage

Clicking **Drainage** brings up the **12d Field - Drainage Setout** panel.



Setout Tab
Nav Tab
Offset Pt Tab
Pipes Tab

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

Field Description | Type | Defaults | Pop-Up

Buttons at Bottom

For more information on these buttons, see 16.5.1 Common Buttons, Panel Tabs and Fields .

Setout Tab

Pit select string select

??.

Pit name text box

??.

Control string string select

??.

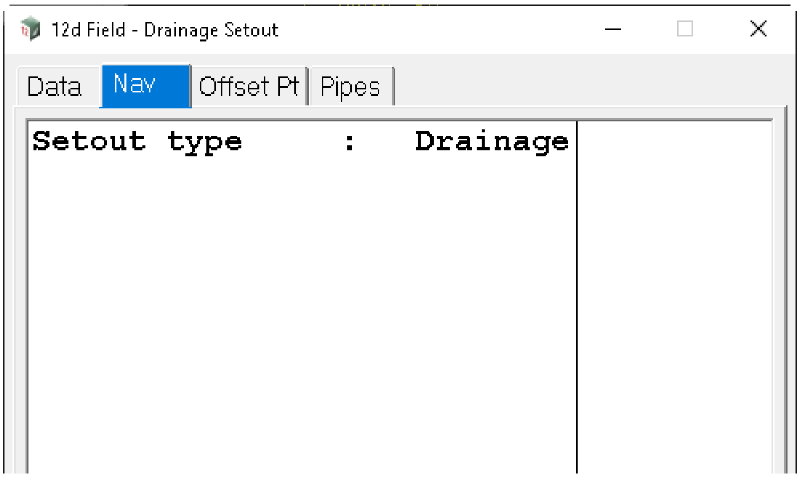
Secondary control string select

??.

Comment

??.

Nav Tab

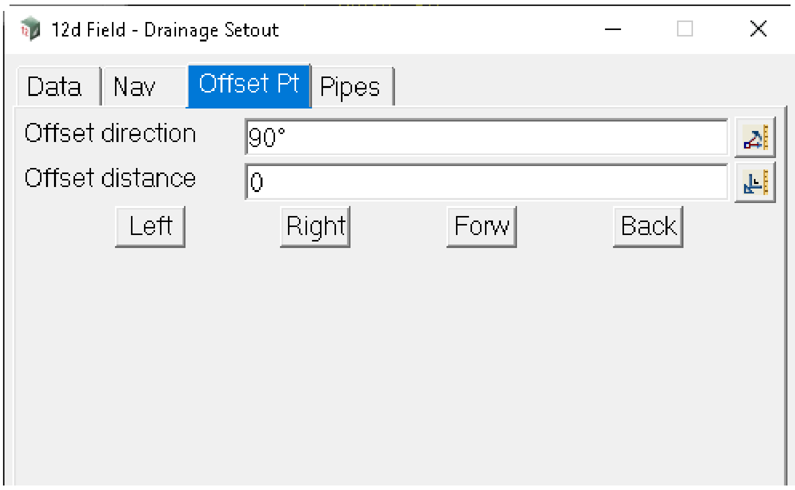


Setout Tab
Data Tab
Nav Tab
Tol's Tab

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

Field Description	Type	Defaults	Pop-Up

Offset Pt Tab

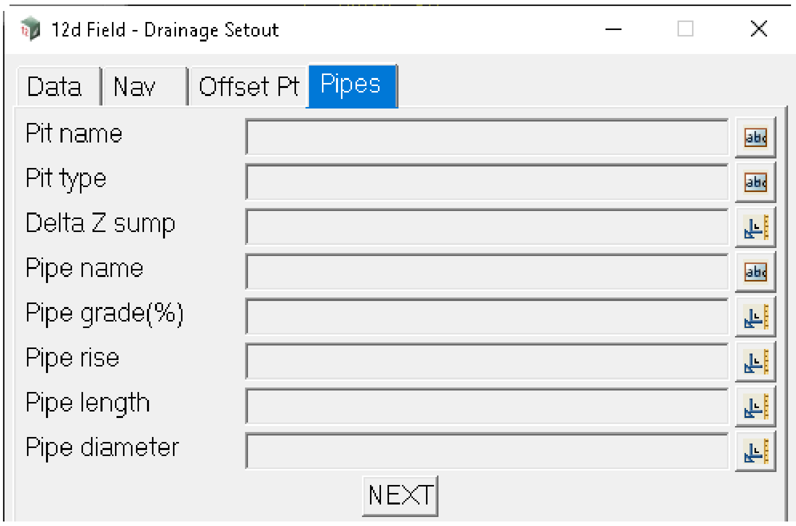


Setout Tab
Data Tab
Nav Tab
Tol’s Tab

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

Field Description	Type	Defaults	Pop-Up
Offset direction	angle box	90 degrees	
??.			
Offset distance	real box	0	
??.			
Left	button		
??.			
Right	button		
??.			
Forw	button		
??.			
Back	button		
??.			

Pipes Tab



Setout Tab
Data Tab
Nav Tab
Tol's Tab

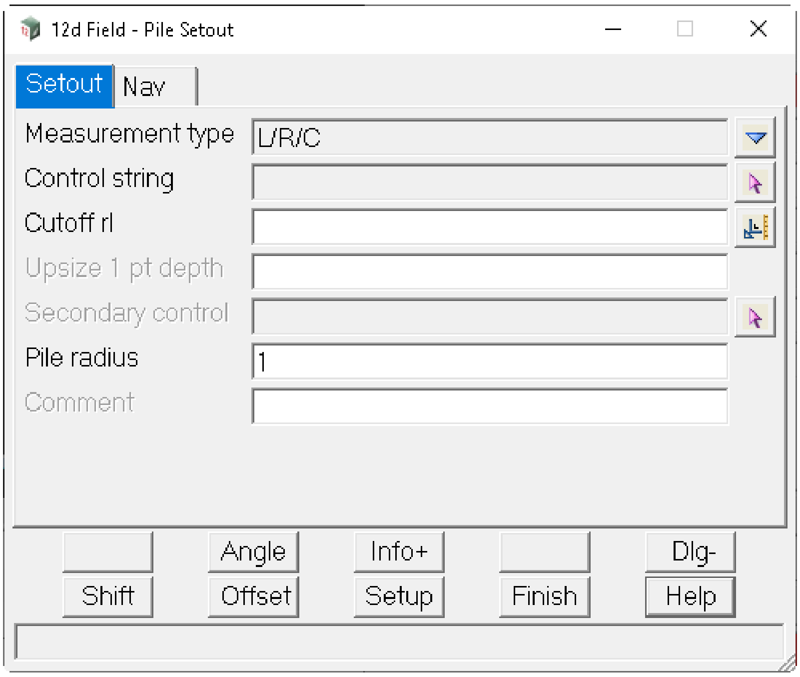
The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Pit name	text box		
??.			
Pit type	text box		
??.			
Delta Z sump	real box		
??.			
Pipe name	text box		
??.			
Pipe grade (%)	real box		
??.			
Pipe rise	real box		
??.			
Pipe length	real box		
??.			
Pipe diameter	real box		
??.			
Next	button		
??.			

Continue to 16.5.4.14 Setout Piles or go back to 16.5.4 Setout .

16.5.4.14 Setout Piles

Clicking **Piles** brings up the **12d Field - Pile Setout** panel.



Setout Tab
Nav Tab

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

Field Description	Type	Defaults	Pop-Up

Buttons at Bottom

For more information on these buttons, see 16.5.1 Common Buttons, Panel Tabs and Fields .

Setout Tab

Measurement type	choice box	L/R/C	Left/Right/Centre Centre, (manual aim) Fit 2 bands, known radius Fit 3 bands, known radius Fit 3 bands, find radius

??.

Control string string select

??.

Cutoff rl real box

??.

Upsize 1 pt depth

??.

Secondary control string select

??.

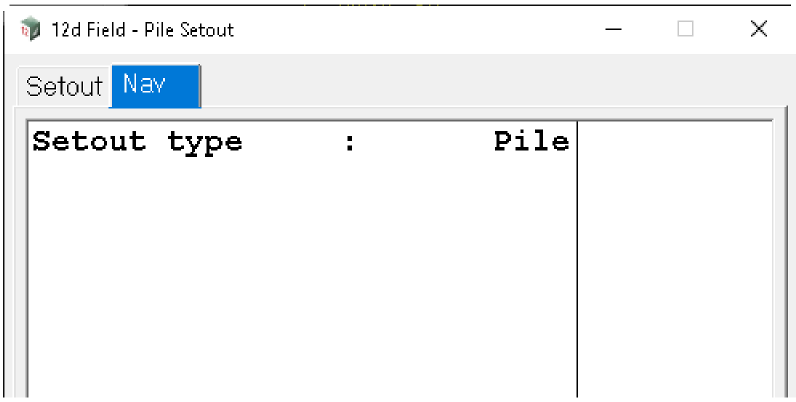
Pile radius

??.

Comment

??.

Nav Tab



Setout Tab
Nav Tab

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

Field Description	Type	Defaults	Pop-Up

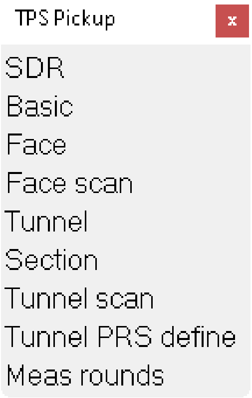
Continue to 16.5.5 Pickup or go back to 16.5.4 Setout .

16.5.5 Pickup

Clicking on the **Pickup** menu option brings up the **Pickup** menu.

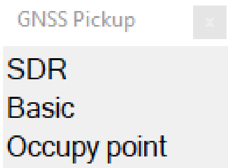
.

TPS Pickup



See
16.5.5.1 Pickup SDR
16.5.5.2 Pickup Basic
16.5.5.3 Pickup Face
16.5.5.4 Pickup Face Scan
16.5.5.5 Pickup Tunnel
16.5.5.6 Pickup Section
16.5.5.7 Pickup Tunnel Scan
16.5.5.8 Pickup Tunnel PRS Define
16.5.5.9 Pickup Measurement Rounds

GNSS Pickup



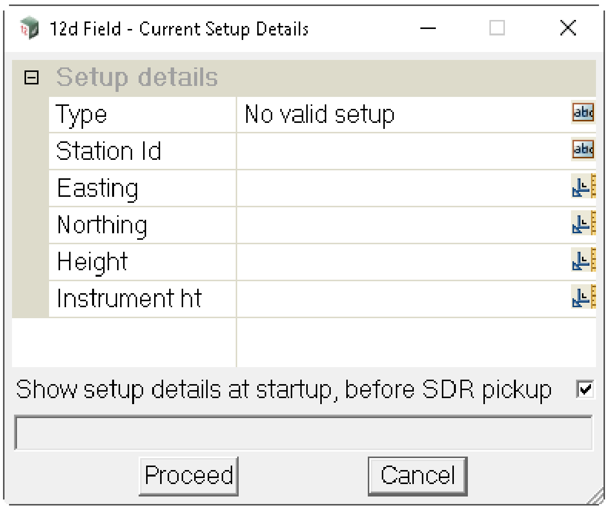
See
16.5.5.1 Pickup SDR
16.5.5.2 Pickup Basic
16.5.5.10 Pickup Occupy Point

16.5.5.1 Pickup SDR

Pickup SDR uses a **12d Field - Pickup Function** which is similar to a **SDR Function** with the addition of an optional **12d Field Codes File**.

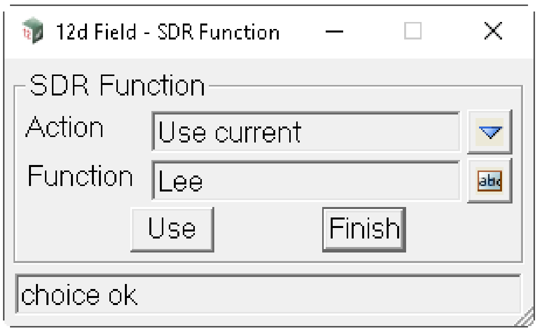
Clicking **SDR** first brings up the **12d Field -**panel.

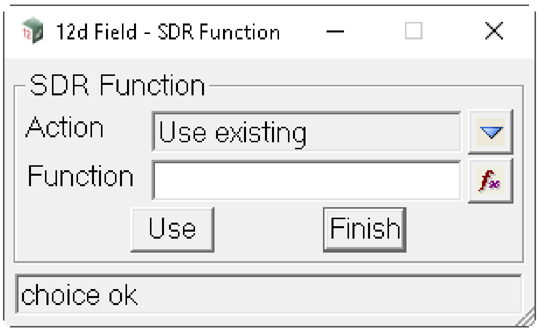
.



The fields is this panel have been documented in except there is now an addition **Proceed** button.

After clicking on **Proceed**, the **12d Field - SDR Function** panel appears:





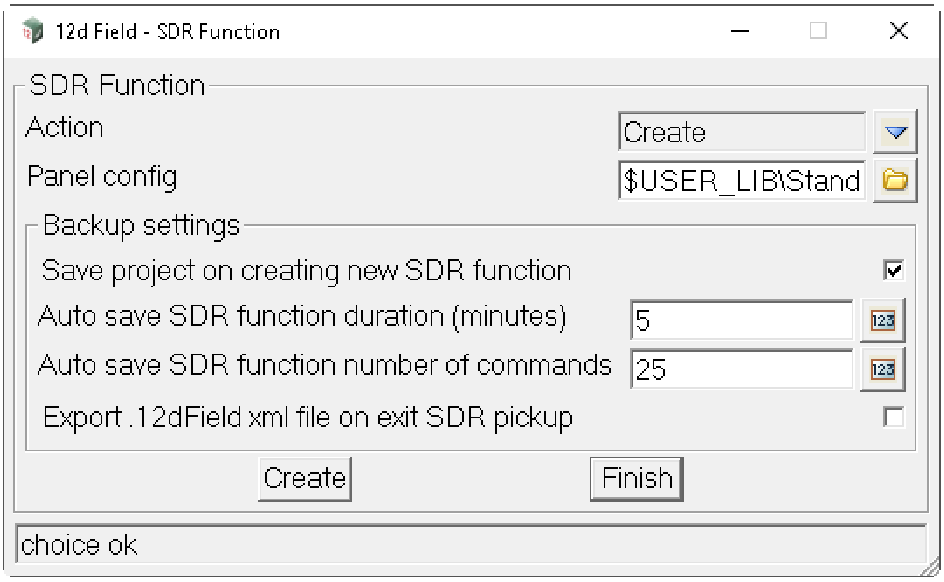
The fields and buttons used in this panel have the following functions.

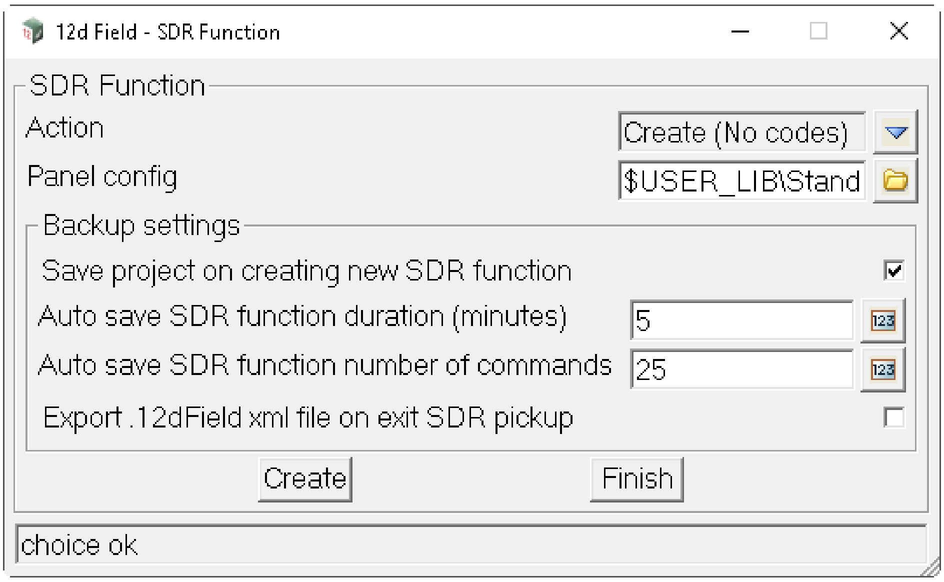
Field Description	Type	Defaults	Pop-Up
Action	choice box		Use current, Use existing Create, Create (no codes)

*if **Use current**, the SDR Function currently being used and is used when the* **Use** *button is pressed.*

*If **Use existing**, a different, but existing, SDR Function is selected in the* **Function** *field, and then used when the* **Use** *button is pressed.*

*If **Create** or **Create (No Cods)**, a new SDR Function is created and extra fields are added to the* **12d Field - SDR Function** *panel:*





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

Panel config folder box *.12dfield_sdr_config files

*If **not blank**, the given **12dfield_sdr_config file** is used to tailor what tabs are visible on the created **12d Field - SDR Function.***

*If **blank**, the **12d Field - SDR Function** is created with all fields and tabs.*

Backup settings

Save project on creating new SDR function tick box

*If **ticked**,??.*

*If **not ticked**,??.*

Auto save SDR function duration (minutes) integer box

*If **not blank**, the **SDR Function** is saved after every given number of minutes.*

*If **blank**, the **SDR Function** is not automatically saved at any time interval.*

Auto save SDR function number of commands integer box

*If **not blank**, the **SDR Function** is saved after every given number of SDR commands.*

*If **blank**, the **SDR Function** is not automatically saved after any number of SDR commands.*

Export.12dField xml file on exit SDR pickup tick box

*If **ticked**, a 12d Field XML file is created when the SDR Function is exited.*

*If **not ticked**, no 12d Field XML file is created when the SDR Function is exited.*

Buttons at Bottom

Create button

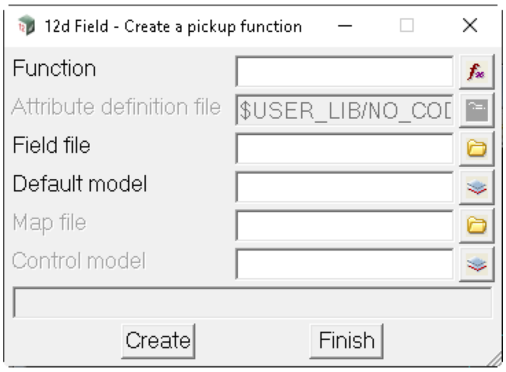
When pressed, bring up the **12d Field - Create a Pickup Function** *panel is displayed.*

What tabs are on the panel will depend on the ***Panel config*** *file.*

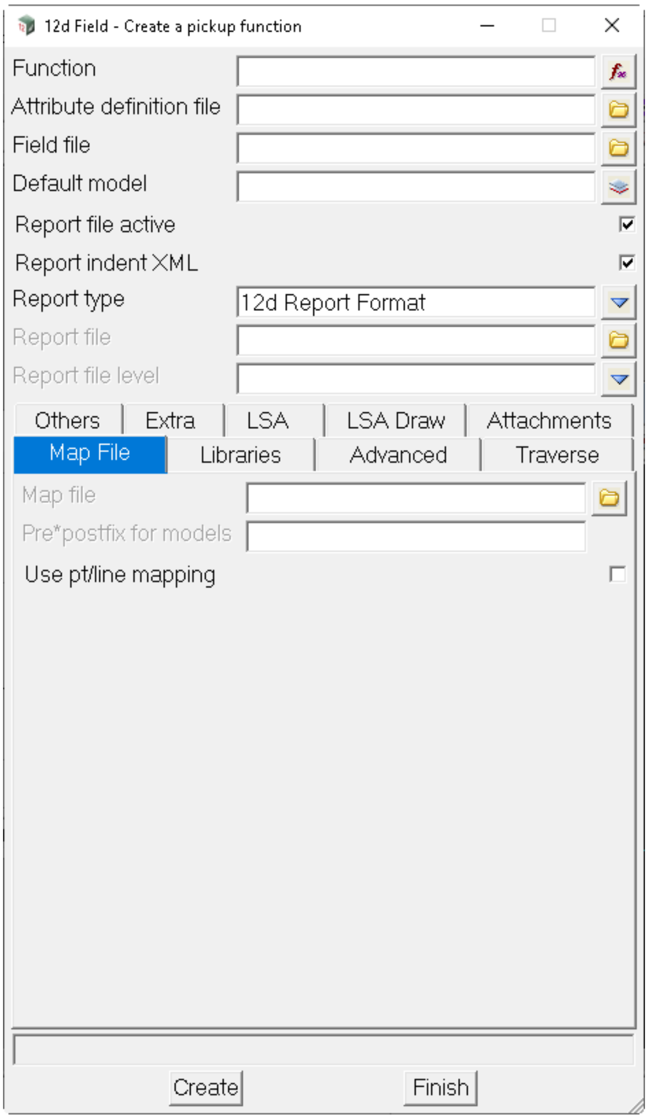
When **Create (NO CODES)** is used (and the **Panel config** NO_CODES.12dfield_sdr_coding), the **12d Field - Create a Pickup Function** panel is a simplified pane with fewer fields and tabs:

When **Create** is used (and the **Panel config** Standard.12dfield_sdr_coding), the **12d Field - Create a Pickup Function** panel is the full panel with all field and tabs:

Create (NO CODES) Used



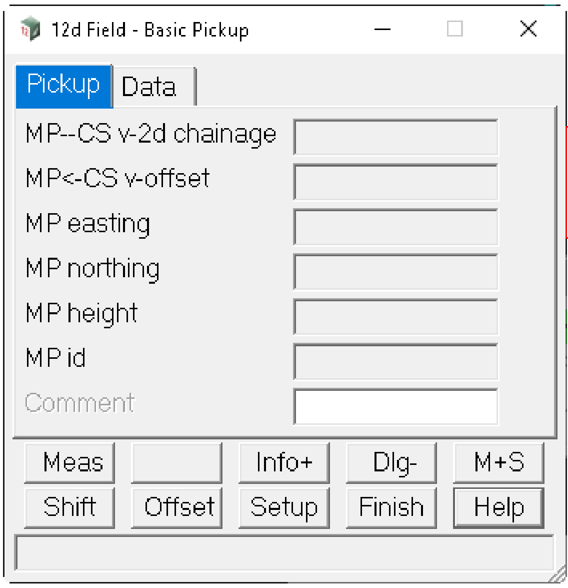
Create Used



Continue to 16.5.5.2 Pickup Basic or go back to 16.5.5 Pickup .

16.5.5.2 Pickup Basic

Clicking **Basic** brings up the **12d Field - Basic Pickup** panel.



Pickup Tab
Data Tab

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

Field Description	Type	Defaults	Pop-Up

Buttons at Bottom

For more information on these buttons, see 16.5.1 Common Buttons, Panel Tabs and Fields .

Pickup Tab

MP--CS c-2d chainage
??.

MP<-CS v-offset

??.

MP easting

??.

MP northing

??.

MP height

??.

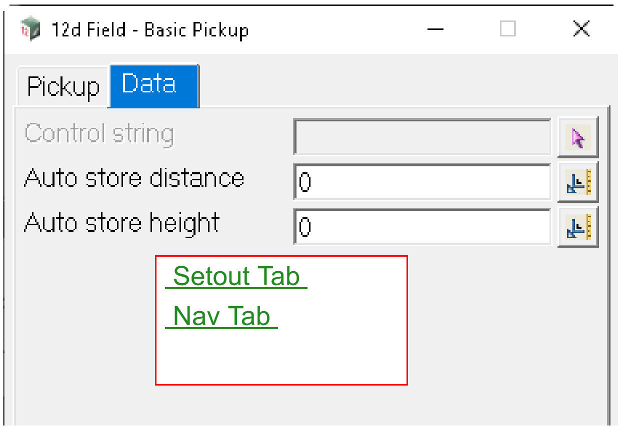
MP id 0001

??.

Comment

??.

Data Tab



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

Field Description	Type	Defaults	Pop-Up
Control string	string select		

??.

Auto store distance	real box	0	

??.

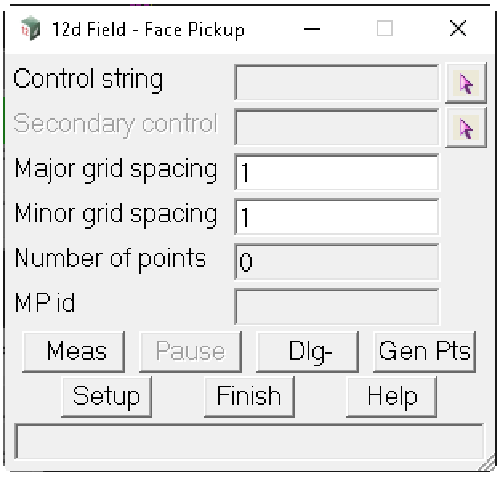
Auto store height	real box	0	

??.

Continue to 16.5.5.3 Pickup Face or go back to 16.5.5 Pickup .

16.5.5.3 Pickup Face

Clicking **Face** brings up the **12d Field - Face Pickup** panel.



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

Field Description	Type	Defaults	Pop-Up
Control string	string select		

??.

Secondary control	string select		

??.

Major grid spacing		1	

??.

Minor grid spacing		1	

??.

Number of points		0	

??.

MP id		0001	

??.

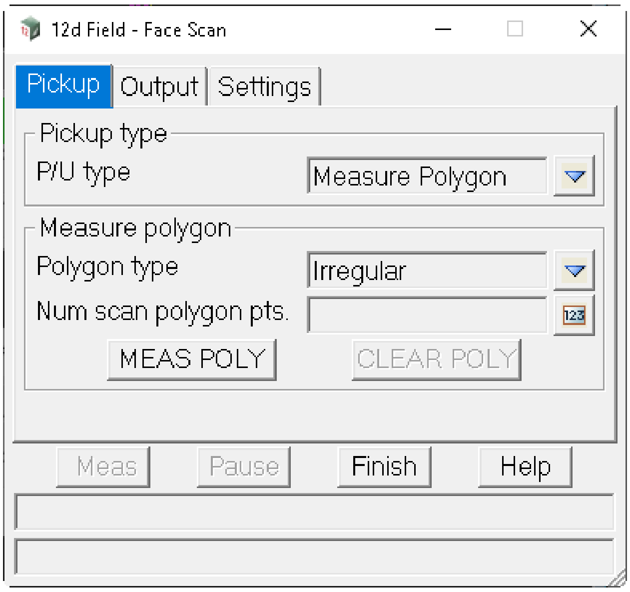
Buttons at Bottom

For more information on these buttons, see 16.5.1 Common Buttons, Panel Tabs and Fields .

Continue to 16.5.5.4 Pickup Face Scan or go back to 16.5.5 Pickup .

16.5.5.4 Pickup Face Scan

Clicking **Pickup Face Scan** brings up the **12d Field - Face Scan** panel.



[Pickup Tab](#)
[Output Tab](#)
[Settings Tab](#)

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

Field Description	Type	Defaults	Pop-Up

Buttons at Bottom

For more information on these buttons, see 16.5.1 Common Buttons, Panel Tabs and Fields.

Pickup Tab

Pickup type

P/U type	choice box	Measure Polygon	Select Polygon Measure Polygon

??.

Measure polygon

Polygon type	**choice box**	Irregular	Irregular, Loop, Down down, Up up, Down up, Up down

??.

Num scan polygon pts integer box

??.

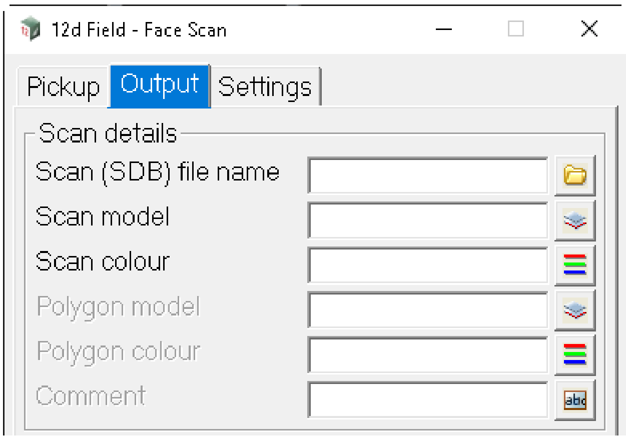
MEAS POLY button

??.

CLEAR POLY button

??.

Output Tab

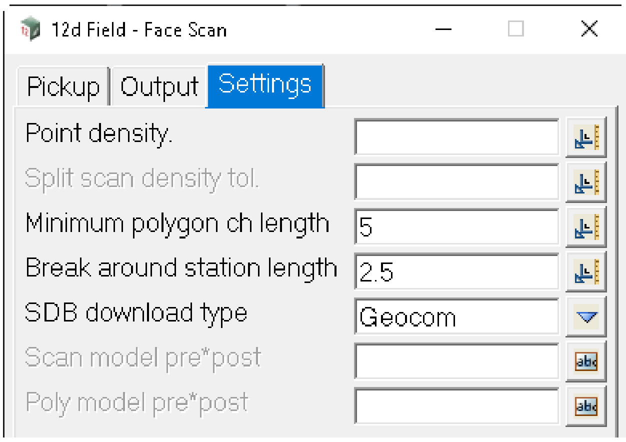


[Pickup Tab](#)
[Output Tab](#)
[Settings Tab](#)

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

Field Description	Type	Defaults	Pop-Up
Scan details			
Scan (SDB) file name	file box		*.SDB files
??.			
Scan model	model box		available models
??.			
Scan colour	colour box		available colours
??.			
Polygon model	model box		available models
??.			
Polygon colour	colour box		available colours
??.			
Comment	text box		
??.			

Settings Tab



Pickup Tab
Output Tab
Settings Tab

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

Field Description	Type	Defaults	Pop-Up
Point density	real box		

??.

Spit scan density tol	real box		

??.

Minimum polygon ch length	real box	5	

??.

Break around station length	real box	2.5	

??.

SDB download type	choice box	Geocom	Geocom, USB

??.

Scan model pre*post	text box		

??.

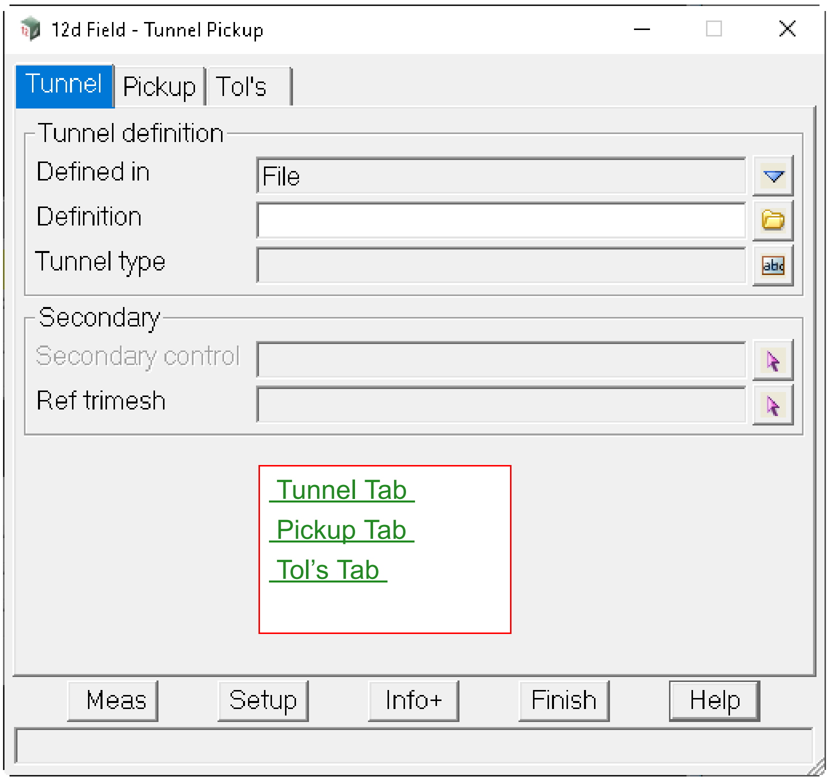
Poly model pre*post	text box		

??.

Continue to 16.5.5.5 Pickup Tunnel or go back to 16.5.5 Pickup .

16.5.5.5 Pickup Tunnel

Clicking **Tunnel** brings up the **12d Field - Tunnel Pickup** panel.



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

Field Description	Type	Defaults	Pop-Up

Buttons at Bottom

For more information on these buttons, see 16.5.1 Common Buttons, Panel Tabs and Fields .

Tunnel Tab

Tunnel definition

Defined in	choice box	File	File, Centreline

??.

Definition	file box		*.12d_tunnel files

??.

Tunnel type	text box		

??.

Secondary

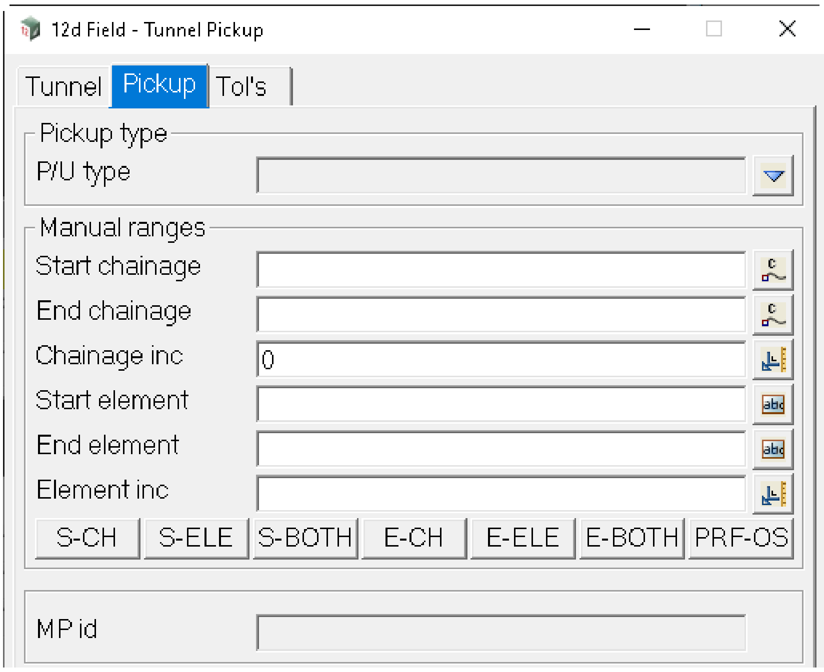
Secondary control	string select		

??.

Ref trimesh	string select		

??.

Pickup Tab



Tunnel Tab
Pickup Tab
Tol's Tab

Pickup type

P/U type	choice box	Manual range, PRS file, Previous Model

??.

Manual ranges

Start chainage

??.

End chainage

??.

Chainage inc

??.

Start element

??.

End element

??.

Element inc

??.

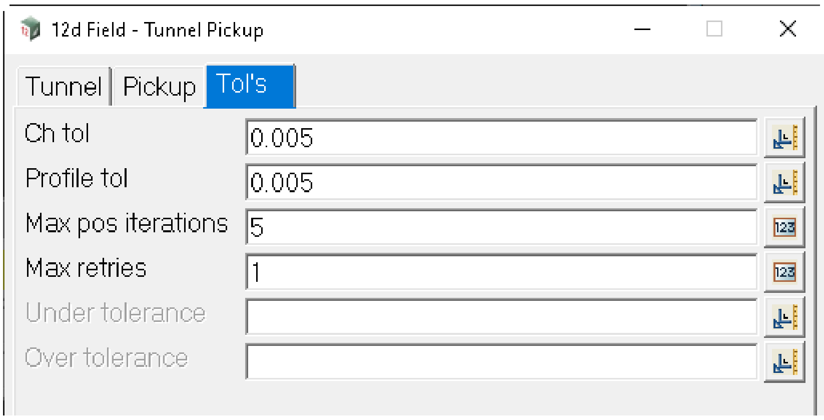
Buttons

??.

MP id

??.

Tol’s Tab



Tunnel Tab
Pickup Tab
Tol’s Tab

Ch tol 0.005

??.

Profile tol 0.005

??.

Max pos iterations 5

??.

Max retries 1

??.

Under tolerance

??.

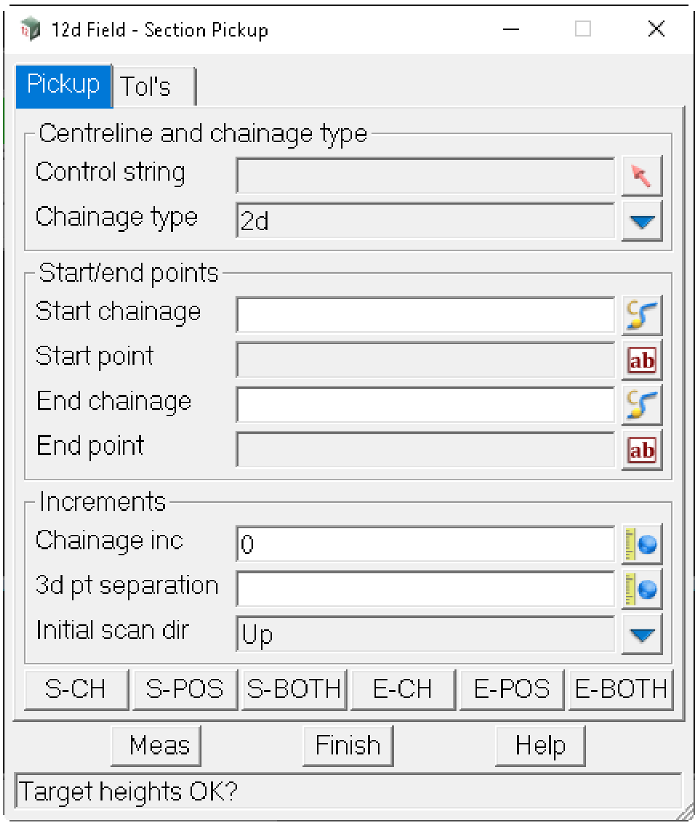
Over tolerance

??.

Continue to 16.5.5.6 Pickup Section or go back to 16.5.5 Pickup .

16.5.5.6 Pickup Section

Clicking **Section** brings up the **12d Field - Section Pickup** panel.



Pickup Tab
Tol's Tab

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

Field Description Type Defaults Pop-Up

Buttons at Bottom

For more information on these buttons, see 16.5.1 Common Buttons, Panel Tabs and Fields .

Pickup Tab

Centreline and chainage type

Control string string select

??.

Chainage type choice box 2d

??.

Start/end points

Start chainage

??.

Start point

??.

End chainage

??.

End point

??.

Increments

Chainage inc real box 0

??.

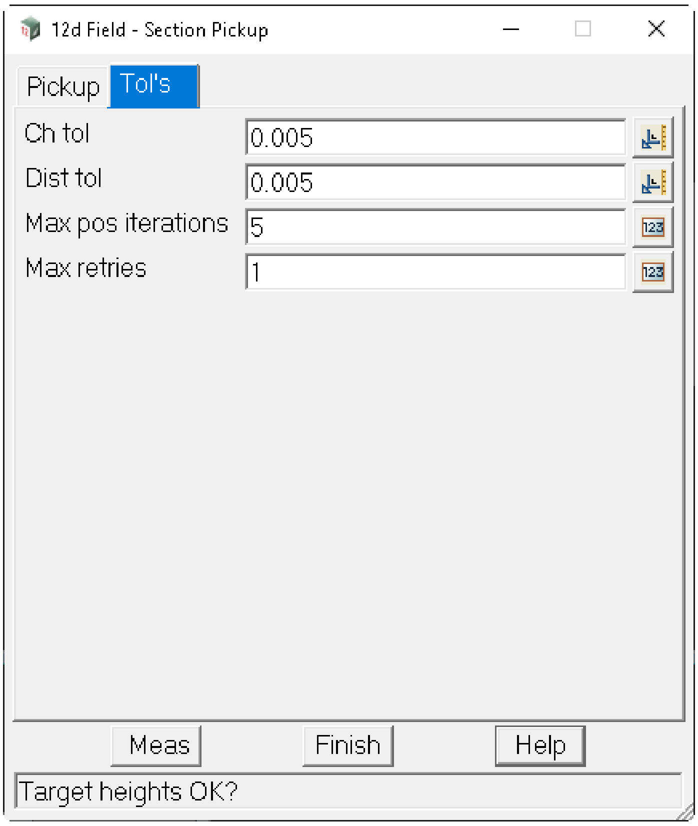
3d pt seperation real box

??.

Initial scan dir choice box Up

??.

Tol's Tab



Pickup Tab
Tol's Tab

Ch tol real box

??.

Dist tol real box

??.

Max pos iterations real box

??.

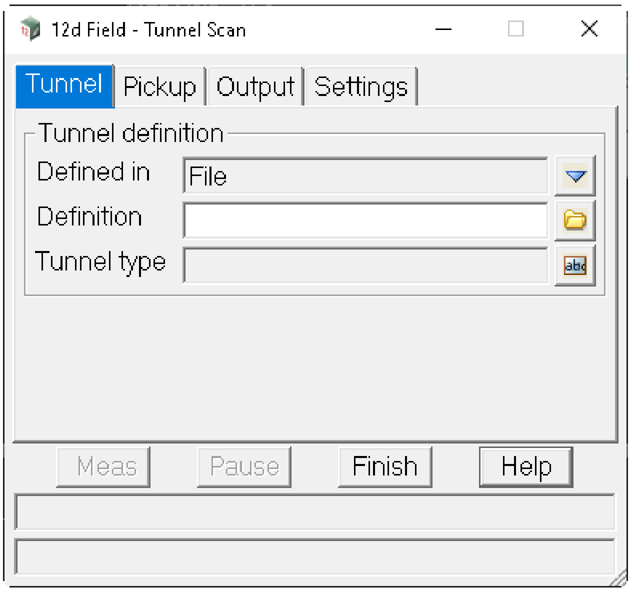
Max retries real box

??.

Continue to 16.5.5.7 Pickup Tunnel Scan or go back to 16.5.5 Pickup .

16.5.5.7 Pickup Tunnel Scan

Clicking **Section** brings up the **12d Field - Tunnel Scan** panel.



Tunnel Tab
Pickup Tab
Output Tab
Settings Tab

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

Field Description	Type	Defaults	Pop-Up

Buttons at Bottom

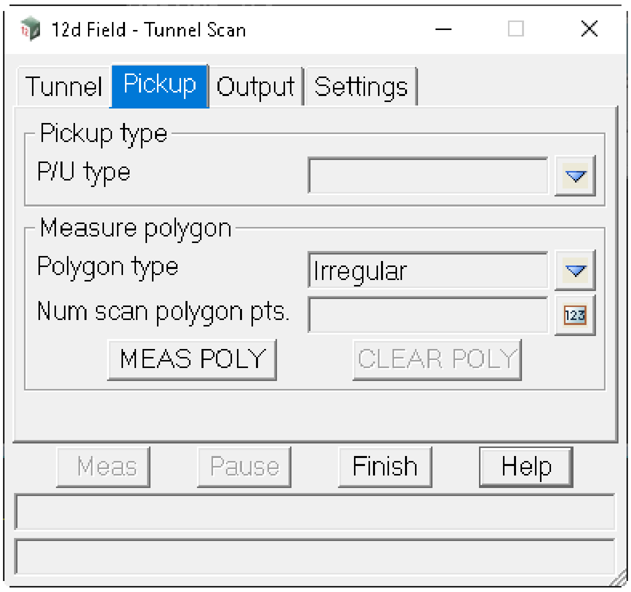
For more information on these buttons, see 16.5.1 Common Buttons, Panel Tabs and Fields .

Tunnel Tab

Tunnel definition

Field Description	Type	Defaults	Pop-Up
Defined in	choice box	File	File, Centreline
??.			
Definition	file box		*.12d_tunnel files
??.			
Tunnel type	text box		
??.			

Pickup Tab



Tunnel Tab
Pickup Tab
Output Tab
Settings Tab

Pickup type

P/U type	choice box		Manual range, PRS File

??.

Measure polygon

Poygon type	choice box	Irregular

??.

Num scan polygon pts

??.

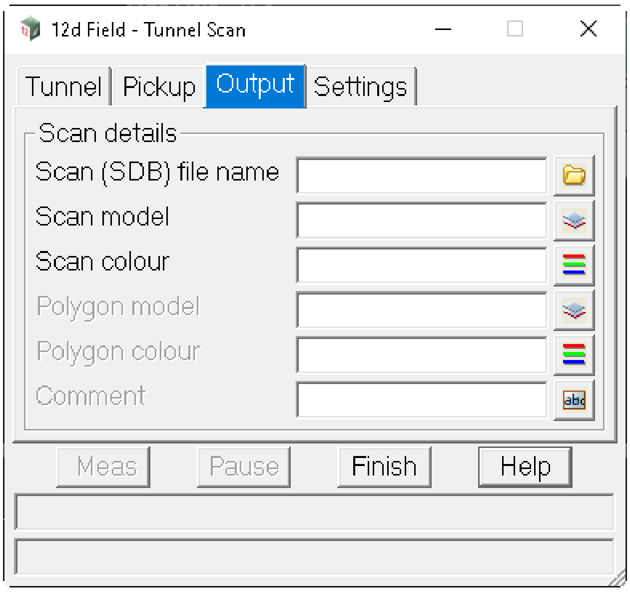
MEAS POLY button

??.

CLEAR POLY button

??.

Output Tab



Tunnel Tab
Pickup Tab
Output Tab
Settings Tab

Scan details

Scan (SDB) file name	file box	*.SDB files

??.

Scan model	model box	available models

??.

Scan colour	colour box	available colours

??.

Polygon model	model box	available models

??.

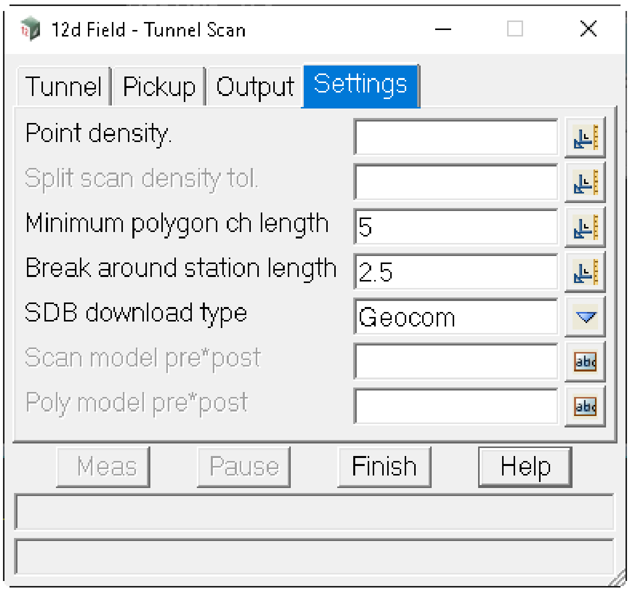
Polygon colour	colour box	available colours

??.

Comment	text box	

??.

Settings Tab



Tunnel Tab
Pickup Tab
Output Tab
Settings Tab

Point density real box

??.

Split scan density tol real box

??.

Minimum polygon ch length real box 5

??.

Break around station length real box 2.5

??.

SDB download type choice box Geocom Geocom, USB

??.

Scan model pre*post text box

??.

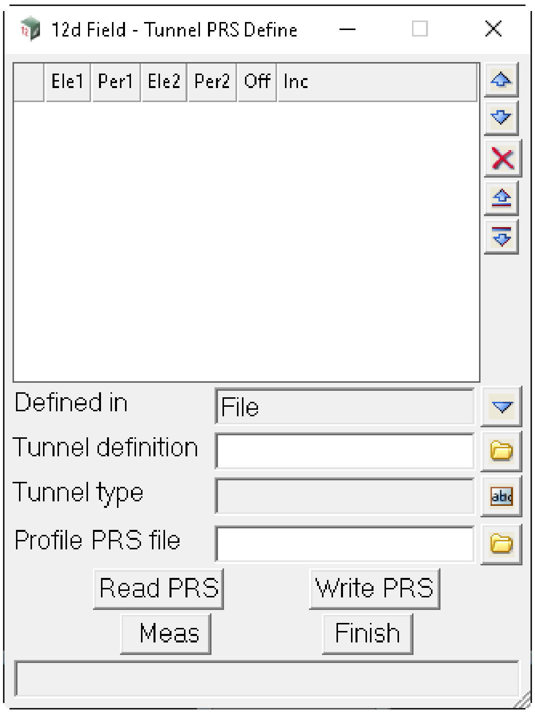
Poly model pre*post text box

??.

Continue to 16.5.5.8 Pickup Tunnel PRS Define or go back to 16.5.5 Pickup .

16.5.5.8 Pickup Tunnel PRS Define

Clicking **Section** brings up the **12d Field - Tunnel PRS Define** panel.



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

Field Description	Type	Defaults	Pop-Up
Defined in	choice box	File	File, Centreline
??.			
Tunnel definition	file box		*.12d_tunnel files
??.			
Tunnel type	text box		
??.			
Profile PRS file	file box		*.PRS files
??.			

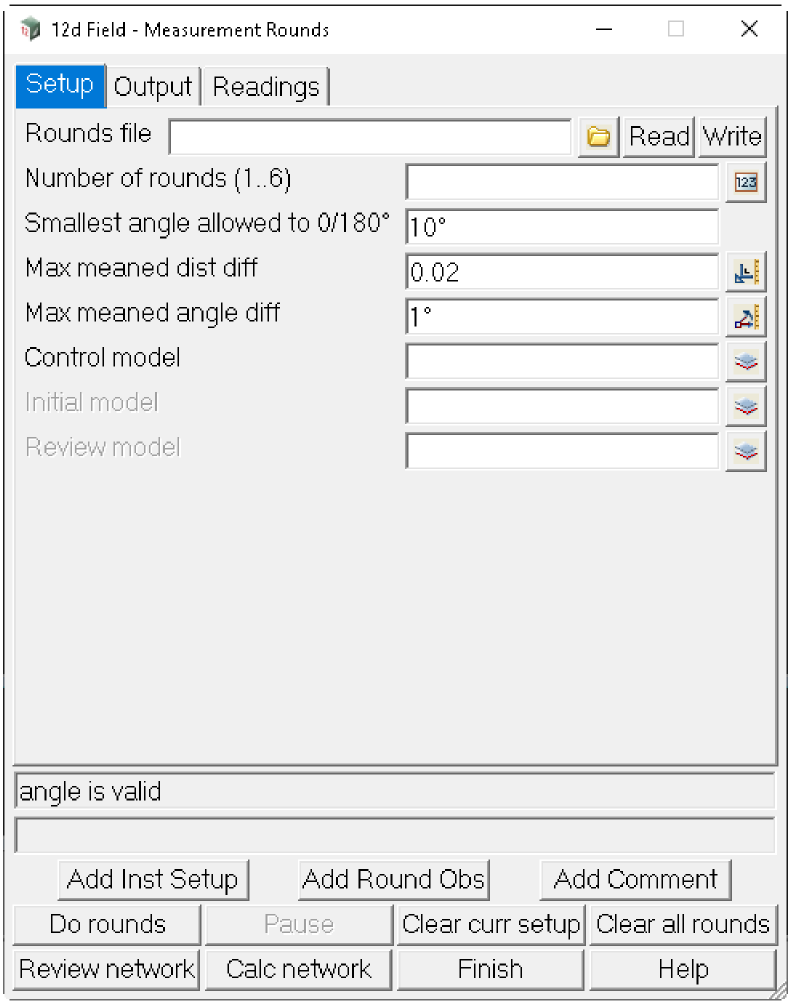
Buttons at Bottom

For more information on these buttons, see 16.5.1 Common Buttons, Panel Tabs and Fields.

Continue to 16.5.5.9 Pickup Measurement Rounds or go back to 16.5.5 Pickup .

16.5.5.9 Pickup Measurement Rounds

Clicking **Section** brings up the **12d Field - Measurement Rounds** panel.



Setup Tab
Output Tab
Readings Tab

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

Field Description	Type	Defaults	Pop-Up

Setup Tab

Rounds file	file box		*.12dF_Meas_Rounds files

??.

Read	button		

??.

Write	button		

??.

Number of rounds (1..6)	integer box		

??.

Smallest angle allowed to 0/180		10 degrees	

??.

Max meaned dist diff	real box	0.02	

??.

Max meaned angle diff angle box 1 degree

??.

Control model model box available models

??.

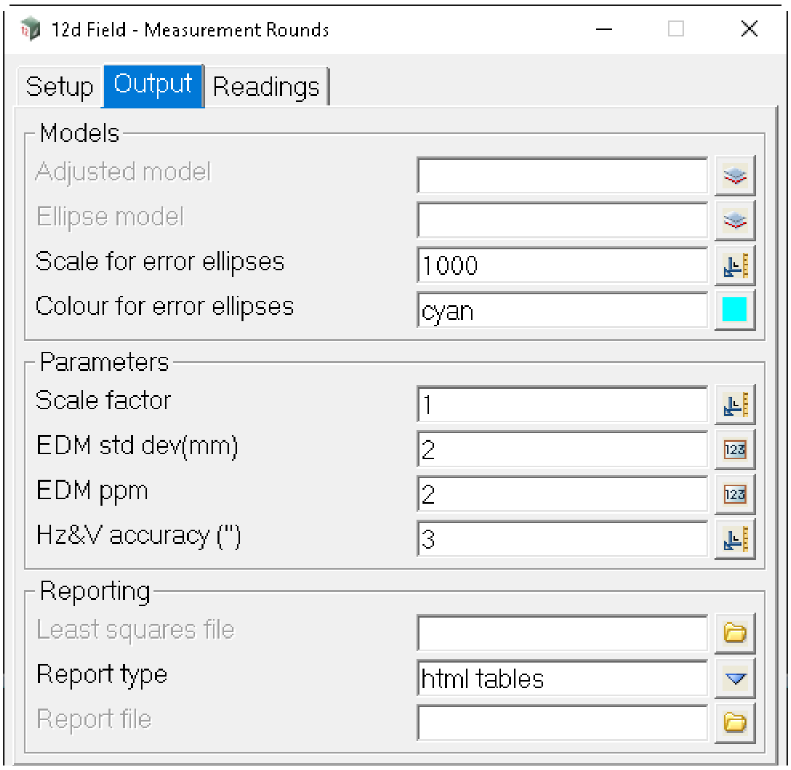
Initial model box available models

??.

Review model box available models

??.

Output Tab



Setup Tab
Output Tab
Readings Tab

Models

Adjusted model model box available models

??.

Ellipse model model box available models

??.

Scale for errors ellipses real box 1000

??.

Colour for error ellipses colour box cyan available colours

??.

Parameters

Scale factor **real** box 1

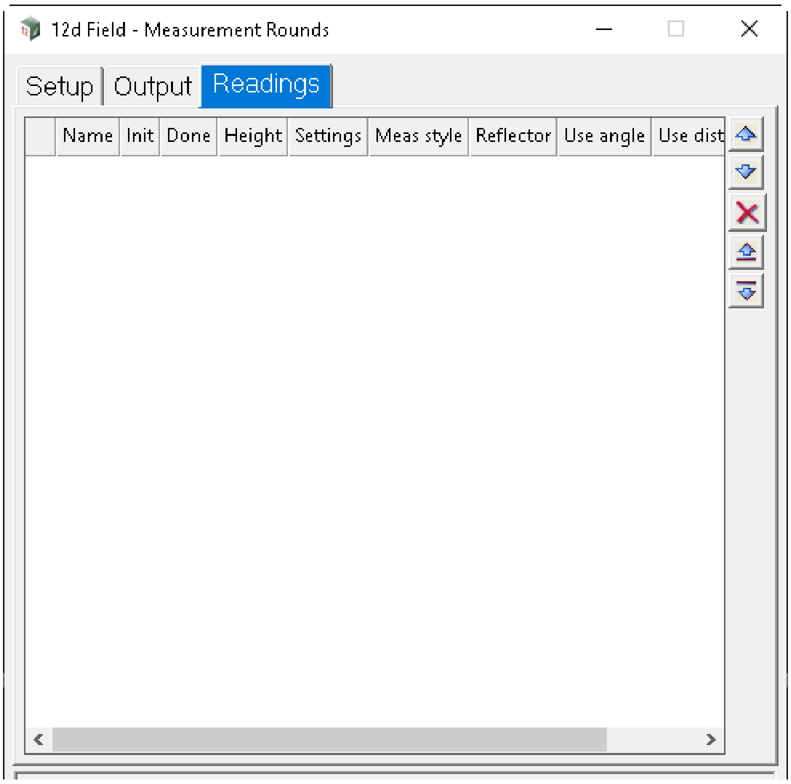
??.

EDM stf dev(mm)	integer box	2	
??.			
EDM ppm	integer box	2	
??.			
Hz&V accuracy (")	real box	3	
??.			

Reporting

Least squares file	file box		*.XML files
??.			
Report type	choice box	html tables	html tables, pdf tabes original xml, plain text <Customize>
??.			

Readings Tab



Setup Tab
Output Tab
Readings Tab

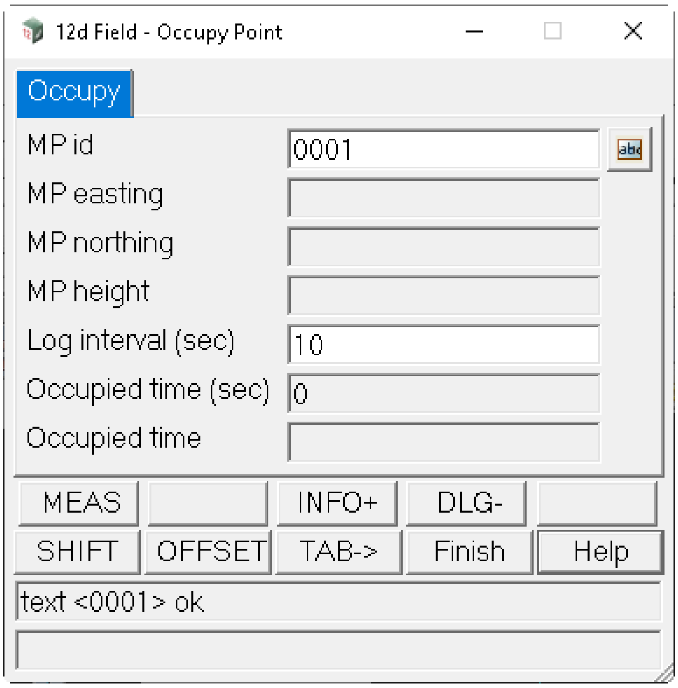
Continue to 16.5.6 TPS Control or go back to 16.5.5 Pickup .

16.5.5.10 Pickup Occupy Point

Position of option on menu: **Survey =>Field 12d=>Pickup =>Occupy point**

The **Occupy Point** option measure a point by taking reading over an extended time period.

Selecting **Occupy Point** brings up the **12d Field - Occupy Point** panel:



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

Field Description	Type	Defaults	Pop-Up

MP id text box

The Point Id for the occupied point.

MP easting/northing/height output

The easting/northing/height for the occupied point.

Log interval (sec) real box

The interval between writing points to a log.

Occupied time (sec) output

??.

Occupied time output

??.

Continue to 16.5.6 TPS Control or return to 16.5.5 Pickup .

16.5.6 TPS Control

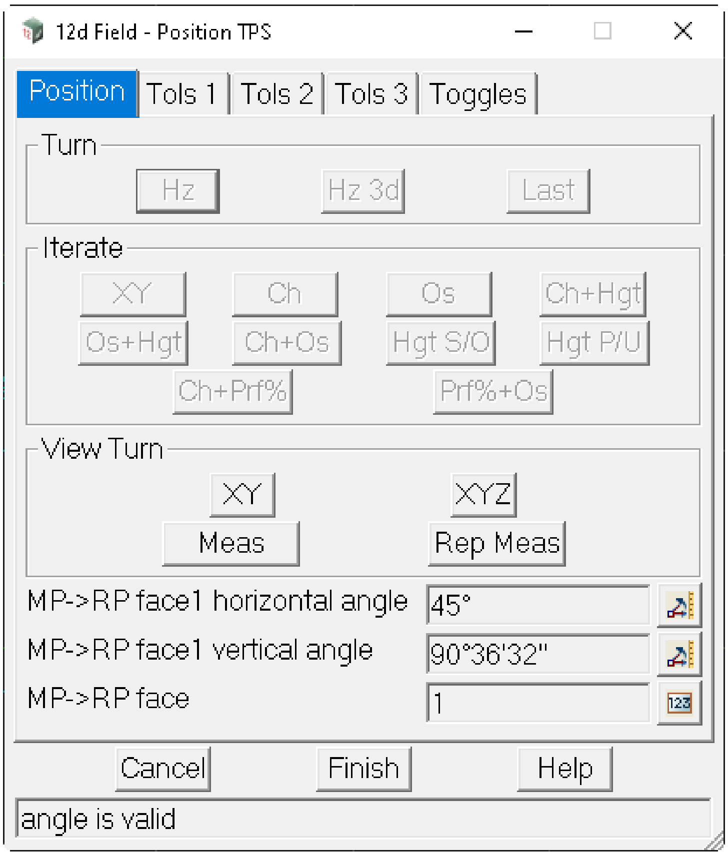
Clicking on the **TPS** menu option brings up the **TPS Functions** menu.

.

See
16.5.6.1 TPS Position
16.5.6.2 TPS Joystick
16.5.6.3 TPS Status
16.5.6.4 TPS Bubble
16.5.6.5 TPS Locate Prism
16.5.6.6 TPS Offset Measurement
16.5.6.7 TPS Simulator Settings

16.5.6.1 TPS Position

Clicking on **TPS Position** brings up the **12d Field - Position TPS** panel.



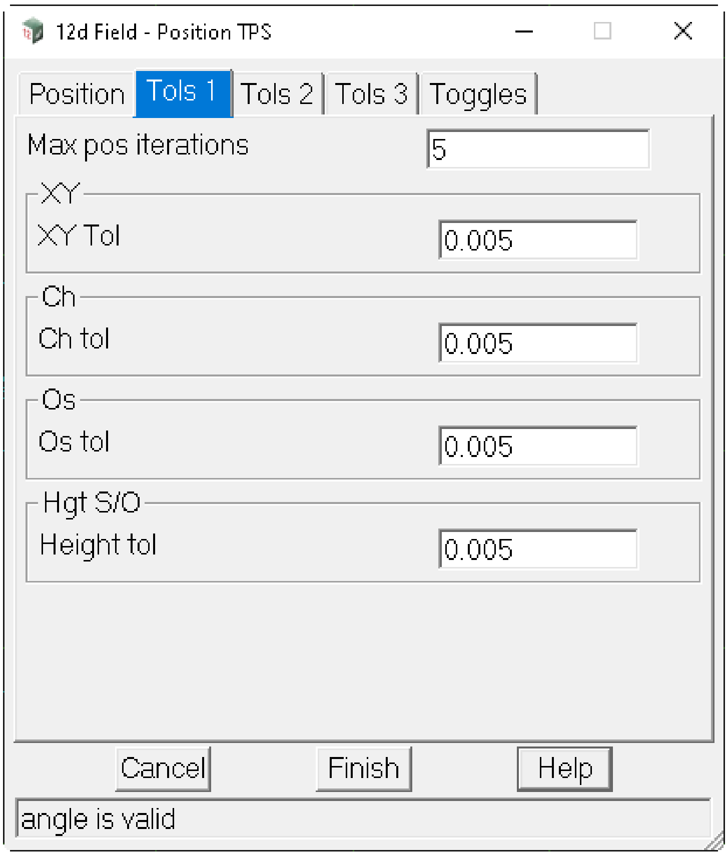
Position Tab
Tols 1 Tab
Tols 2 Tab
Tols 3 Tab
Toggles Tab

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

Field Description	Type	Defaults	Pop-Up

Position Tab

Tols 1 Tab

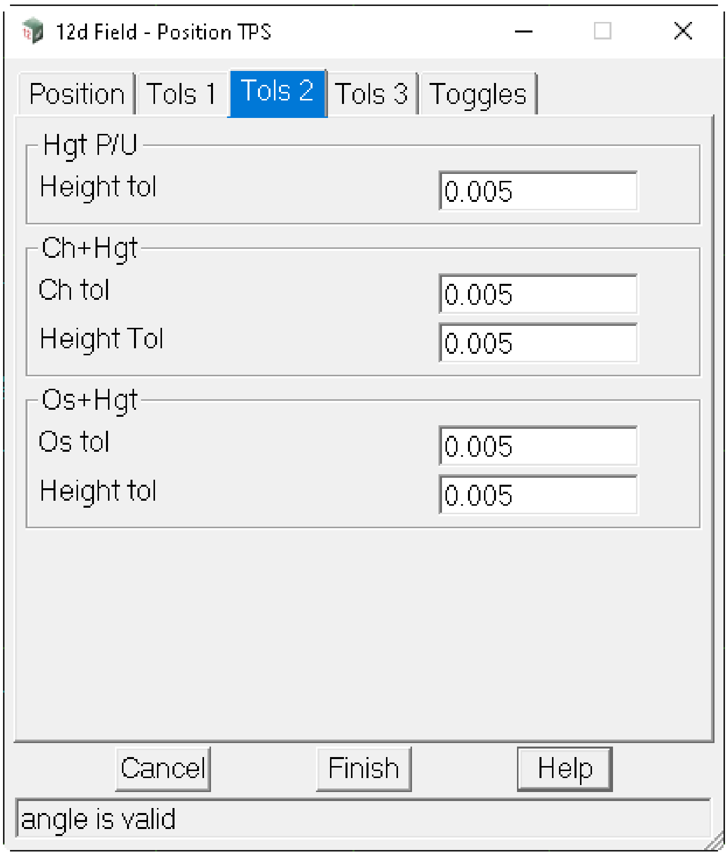


Position Tab
Tols 1 Tab
Tols 2 Tab
Tols 3 Tab
Toggles Tab

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

Field Description	Type	Defaults	Pop-Up

Tols 2 Tab

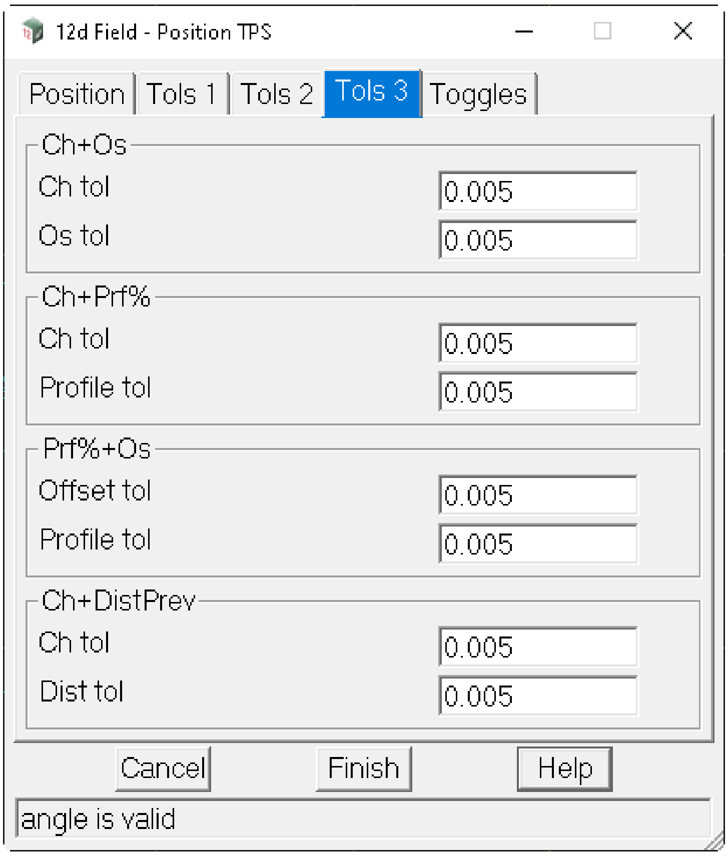


Position Tab
Tols 1 Tab
Tols 2 Tab
Tols 3 Tab
Toggles Tab

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

Field Description Type Defaults Pop-Up

Tols 3 Tab

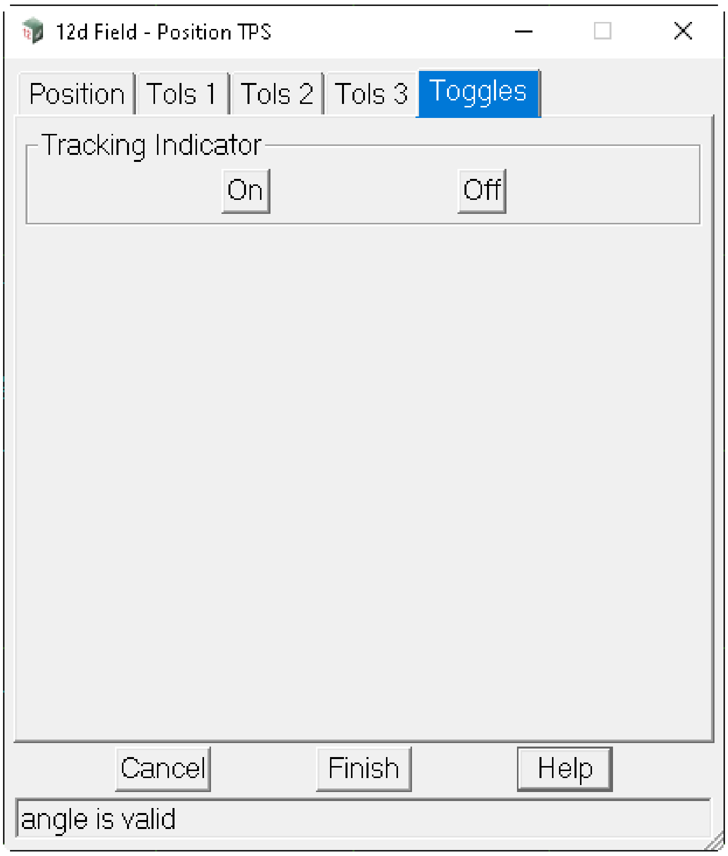


Position Tab
Tols 1 Tab
Tols 2 Tab
Tols 3 Tab
Toggles Tab

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

Field Description	Type	Defaults	Pop-Up

Toggles Tab



Position Tab
Tols 1 Tab
Tols 2 Tab
Tols 3 Tab
Toggles Tab

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

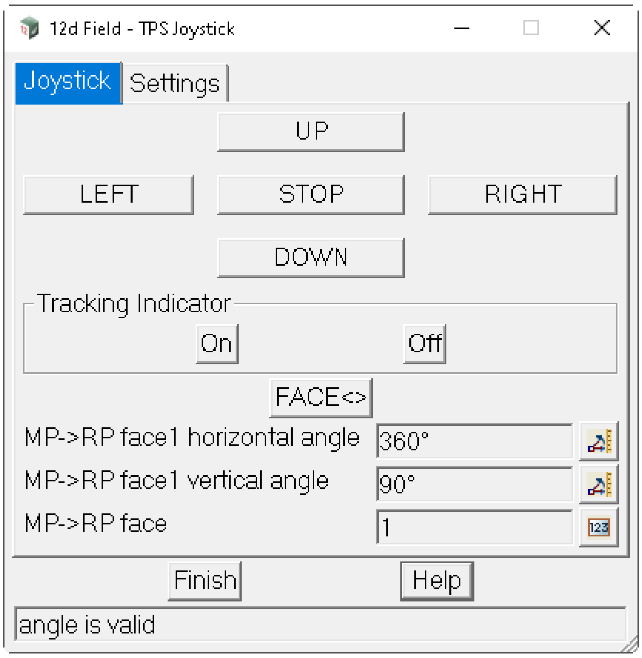
Field Description	Type	Defaults	Pop-Up

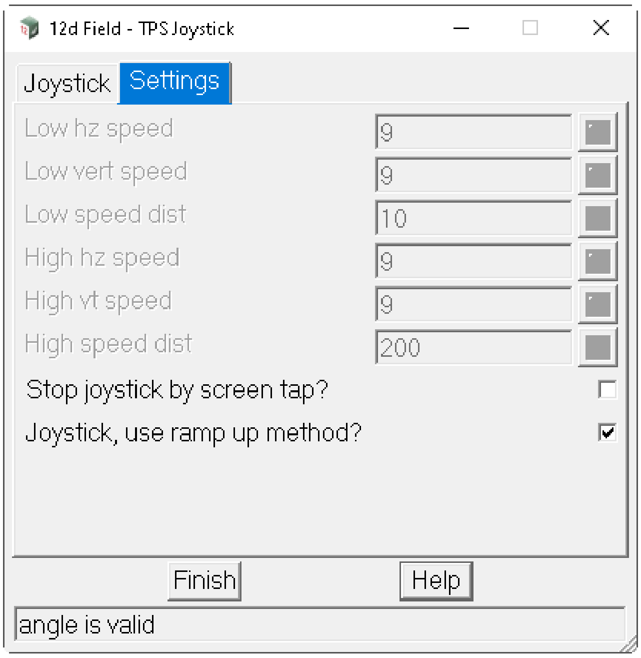
Continue to 16.5.6.2 TPS Joystick or go back to 16.5.6 TPS Control.

16.5.6.2 TPS Joystick

Clicking **TPS Joystick** brings up the **12d Field - TPS Joystick** panel.

.





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

Field Description	Type	Defaults	Pop-Up

Joystick tab

UP button

*Rotate the TPS up. **UP** can be pressed twice more to increase the speed of rotation.*
The TPS will continue to rotate until STOP is pressed.

LEFT button

Rotate the instrument to the left as viewed from the prism back to the instrument.
***LEFT** can be pressed twice more to increase the speed of rotation.*
The TPS will continue to rotate until STOP is pressed.

STOP button

Stop the instrument rotating.

RIGHT button

Rotate the instrument to the right as viewed from the prism back to the instrument.
***RIGHT** can be pressed twice more to increase the speed of rotation.*
The TPS will continue to rotate until STOP is pressed.

DOWN button

Rotate the instrument down.
***DOWN** can be pressed twice more to increase the speed of rotation.*
The TPS will continue to rotate until STOP is pressed.

Tracking Indicator

On button

Turn the tracking indicator on.

Off button

Turn the tracking indicator off.

FACE<> button

??.

MP->RP face 1 horizontal angle angle box

??.

MP->RP face 1 vertical angle angle box

??.

MP->RP face integer box

??.

Settings tab

Low/High hz speed

??.

Low/High vert speed

??.

Low/High speed dist

??.

Stop joystick by screen tap? tick box

*If **ticked**, the rotation of the instrument is stopped by tapping on the screen.*

*If **not ticked**, the rotation of the instrument is NOT stopped by tapping on the screen. The STOP button needs to be pressed the STOP the instrument from rotating.*

Joystick, use ramp up method? tick box

*If **ticked**,??.*

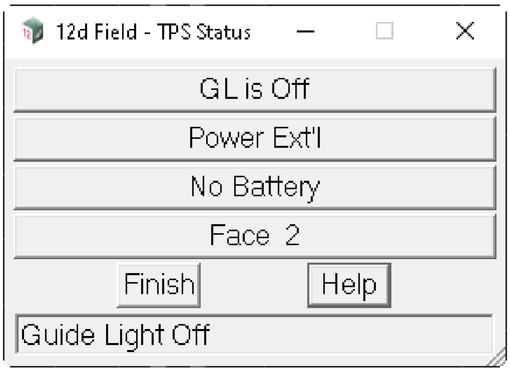
*If **not ticked**,??.*

Continue to 16.5.6.3 TPS Status or go back to 16.5.6 TPS Control .

16.5.6.3 TPS Status

Clicking **TPS Status** brings up the **12d Field - TPS Status** panel.

.



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

Field Description	Type	Defaults	Pop-Up
GL is Off	button		

??.

Power Ext'l	button		

??.

No Battery	button		

??.

Face 1/Face 2	button		

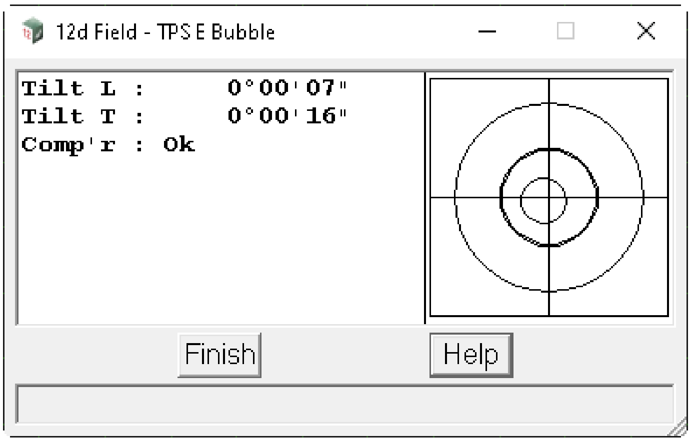
??.

Continue to 16.5.6.4 TPS Bubble or go back to 16.5.6 TPS Control .

16.5.6.4 TPS Bubble

Clicking **TPS Bubble** brings up the **12d Field - TPS Bubble** panel.

.



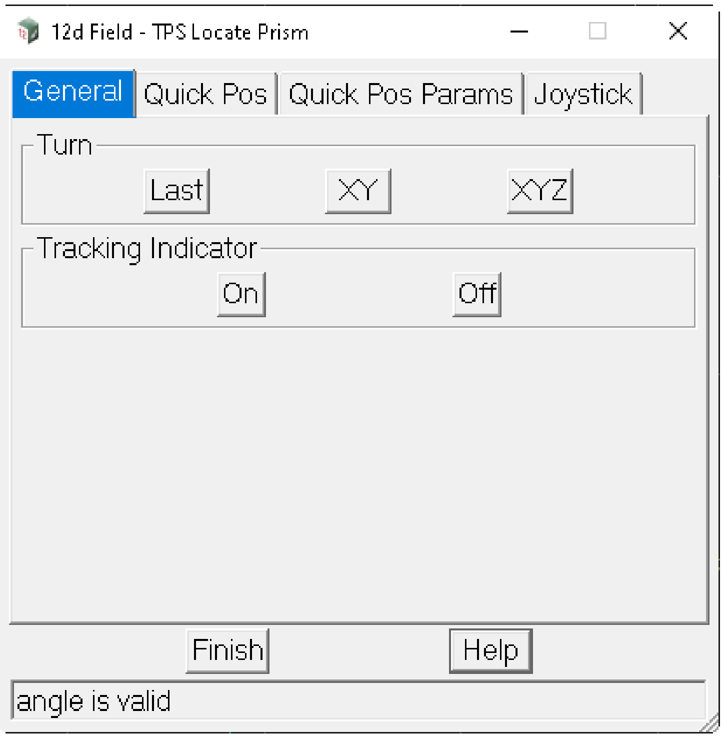
The diagram and information show the status of the bubble on the TPS.

When using ***12d Field*** you are usually not near the TPS Instrument itself so this option allows to monitor the bubble on the TPS in case it moves out of being set up on the vertical.

Continue to 16.5.6.5 TPS Locate Prism or go back to 16.5.6 TPS Control.

16.5.6.5 TPS Locate Prism

Clicking **TPS Locate Prism** brings up the **12d Field - TPS Locate Prism** panel.
.



General tab
Quick Pos tab
Quick Pos Params tab
Joystick tab

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

Field Description | Type | Defaults | Pop-Up

General tab

Turn

Last button

??.

XY button

??.

XYZ button

??.

Tracking Indicator

On button

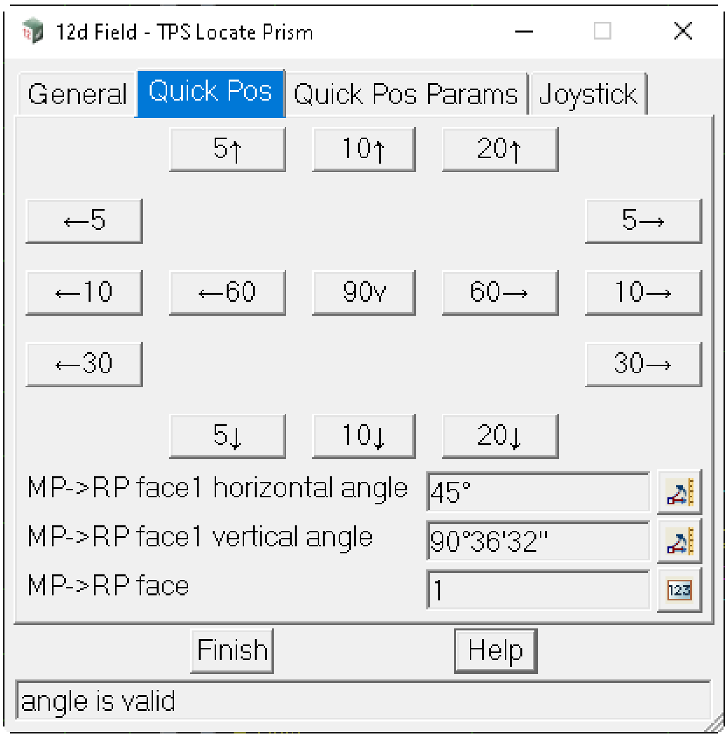
??.

Off button

??.

Quick Pos tab

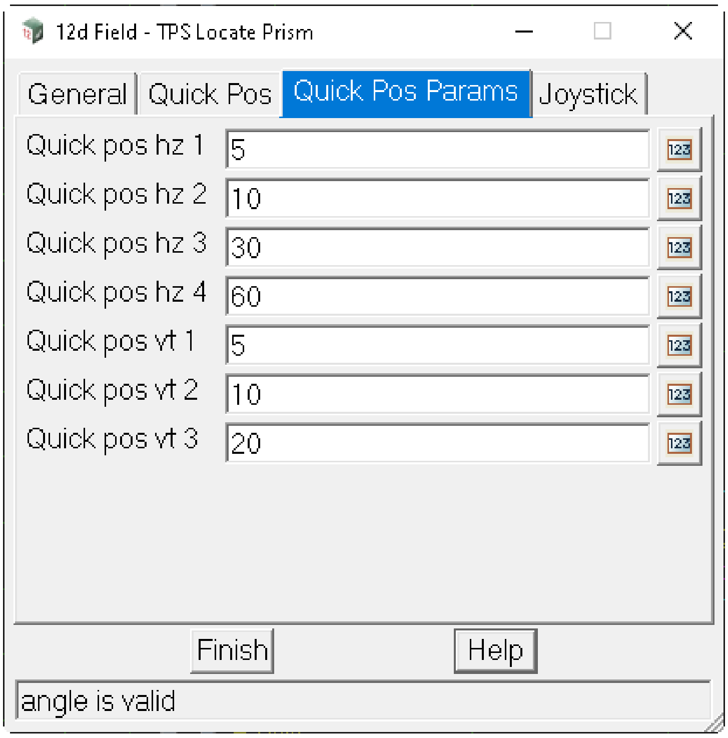
.



General tab
Quick Pos tab
Quick Pos Params tab
Joystick tab

Quick Pos Params tab

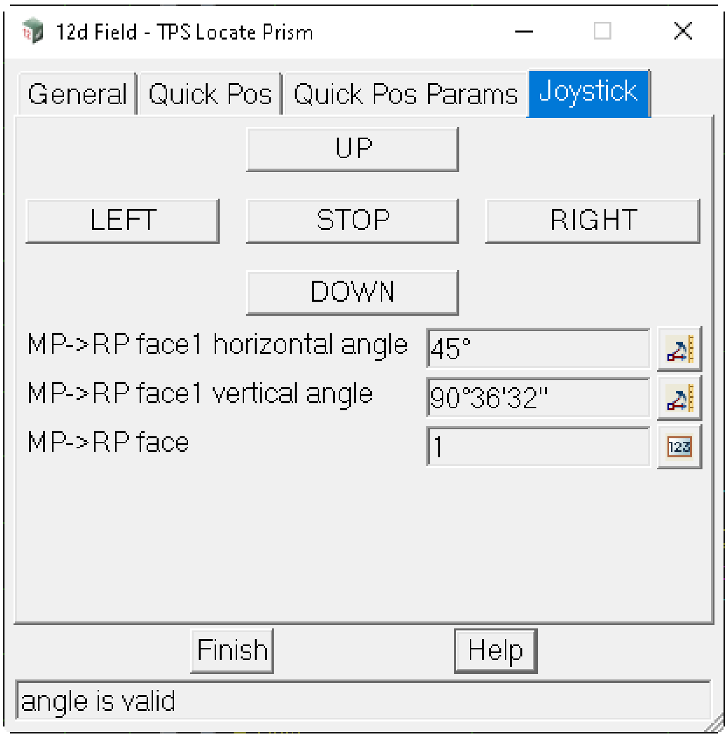
.



General tab
Quick Pos tab
Quick Pos Params tab
Joystick tab

Joystick tab

.

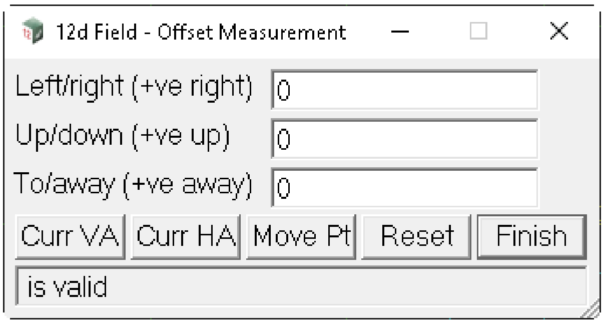


General tab
Quick Pos tab
Quick Pos Params tab
Joystick tab

Continue to 16.5.6.6 TPS Offset Measurement or go back to 16.5.6 TPS Control .

16.5.6.6 TPS Offset Measurement

Clicking **TPS Offset Meas Prism** brings up the **12d Field - Offset Measurement** panel.
.



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

Field Description Type Defaults Pop-Up

General tab

Left/right (+ve right real box

??.

Up/down (+ve up real box

??.

To/away (+ve away real box

??.

Curr VA button

??.

Curr HA button

??.

Move Pt button

??.

Reset button

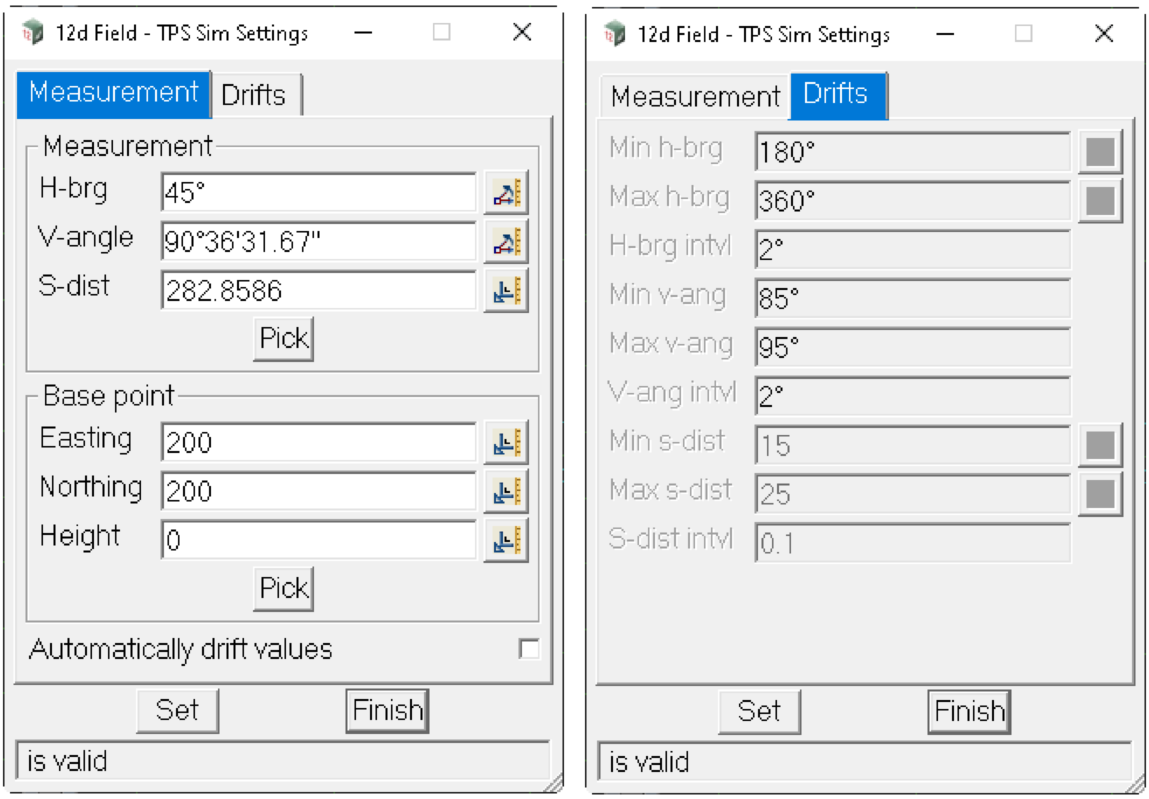
??.

Continue to 16.5.6.7 TPS Simulator Settings or go back to 16.5.6 TPS Control .

16.5.6.7 TPS Simulator Settings

Clicking **TPS Sim Settings** brings up the **12d Field - Sim Settings** panel.

.



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

Field Description	Type	Defaults	Pop-Up

Measurement tab

Measurement

H-brg real box

??.

V-angle real box

??.

S-dist real box

??.

Pick button

??.

Base point

Easting/Northing/Height real box

??.

Drifts tab

Min h-brg real box

??.

Max h-brg real box

??.

H-brg intvl real box

The horizontal bearing interval??.

Min v-ang real box

??.

Max v-ang real box

??.

V-ang intvl real box

The vertical angle interval??.

Min s-dist real box

??.

Max s-dist real box

??.

S-dist intvl real box

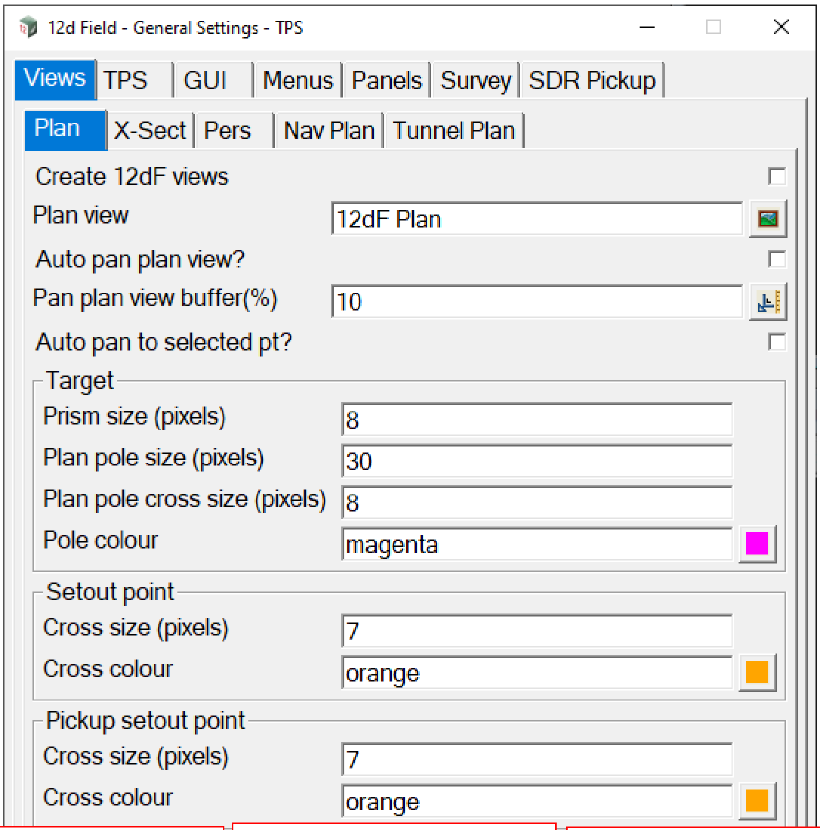
The slope distance interval??.

Continue to 16.5.7 General Settings - TPS or go back to 16.5.6 TPS Control .

16.5.7 General Settings - TPS

Clicking **Settings** brings up the **12d Field - Settings** panel for a TPS.

.



Menus tab

Menus >General tab
Menus >Setup tab
Menus >Setout tab
Menus >Pickup
Menus >TPS

Panels tab

Panels >General tab
Panels >Nav Page
Panels >E Bubble
Panels >Tol'r tabs
Panels >HotKeys
Panels >Strings

Survey tab

Survey >General tab
Survey >Keys tab
Survey >Storage
Survey >Spec Ch's
Survey >Setup

Views tab

Views >Plan tab
Views >X-Sect tab
Views >Pers tab
Views >Nav Plan tab
Views >Tunnel Plan tab

TPS tab

TPS >Search tab
TPS >General tab
TPS >Target Heights tab

GUI tab

GUI >Gen tab
GUI >Sounds tab
GUI >Colours tab
GUI >Logging tab

Pickup tab

SDR Pickup >General tab
SDR Pickup >GUI

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

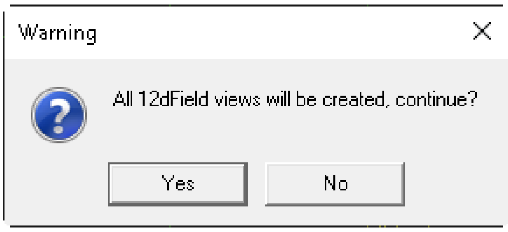
Field Description Type Defaults Pop-Up

Views tab

Views >Plan tab

Create 12dF views tick box

*When **ticked**, a Warning message comes up and if **Yes** is selected and the standard **12d Field** views don't exist, the standard **12d Field** plan, section and perspective views are created and their names added to the appropriate fields in the view tabs. The tick is then turned off.*



Plan view view box available views

Plan view to display survey data.

Auto pan Plan view? tick box

*If **ticked**, this Plan view automatically pans to a point highlighted by the **12d Field** options.*

*If **not ticked**, this Plan view does not automatically pan to a point highlighted by the **12d Field** options.*

Pan plan view buffer (%) real box measures

*When the point highlighted by **12d Field** comes within this % of the view border and auto pan is on the highlighted point will be panned to be centre of the view.*

Auto pan to selected pt? tick box

*If **ticked**, this Plan view automatically pans to selected points in the **12d Field** options.*

*If **not ticked**, this Plan view does not automatically pan to selected points in the **12d Field** options.*

Prism size (pixels) real box

Size in pixels to draw the symbol for the prism at its position in the plan view.

Plan pole size (pixels) real box

Size in pixels to draw the symbol for the pole at its position in the plan view.

Plan pole cross size (pixels) real box

Size in pixels to draw a cross at the pole at its position in the plan view.

Pole colour colour box

Colout to draw the pole in the plan view.

Setout point

Cross size (pixels) real box

Size in pixels to draw a cross at the design setout point in the plan view.

Cross colour colour box orange available colours

Colour to draw a cross at the design setout point in the plan view.

Pickup setout point

Cross size (pixels) real box

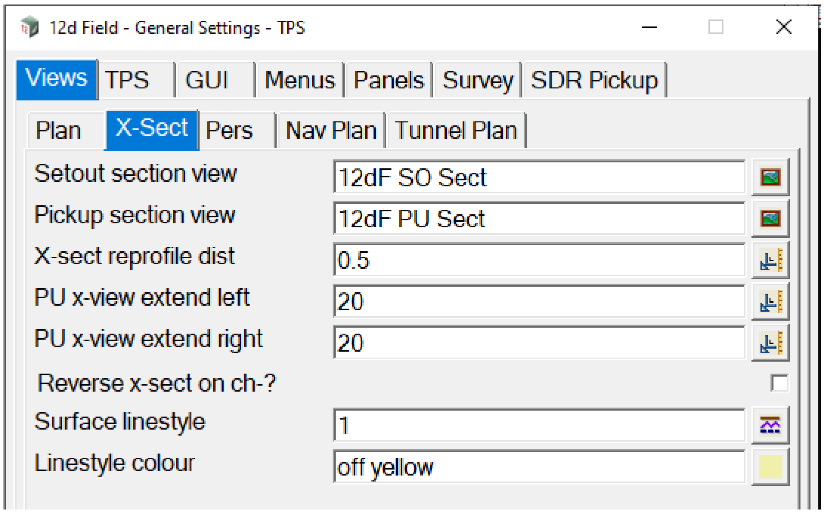
Size in pixels to draw a cross at the calculated setout point relative to the actual pole position in the plan view.

Cross colour colour box orange available colours

Colour to draw a cross at the calculated setout point relative to the actual pole position in the plan view.

Views >X-Sect tab

.



Setout section view view box available views

Section view to display a section at the current setout chainage.

Pickup section view view box available views

Section view to display a section at the current target position.

X-sect reprofile dist real box measures

The section is only redrawn when the chainage difference from previously drawn section is greater than this.

PU x-view extend left/right real box measures

The distance to extend the section view to the left/right (relative to the alignment).

The distance is in metres.

Reverse x-sect on ch- tick box

*If **ticked**, the section view is reversed when setting out in the opposite direction to the alignment.*

*If **not ticked**, the section view is NOT reversed when setting out in the opposite direction to the alignment.*

***Note**: Chainage increment must be set to negative to reverse the section view display.*

Surface linestyle linestyle box

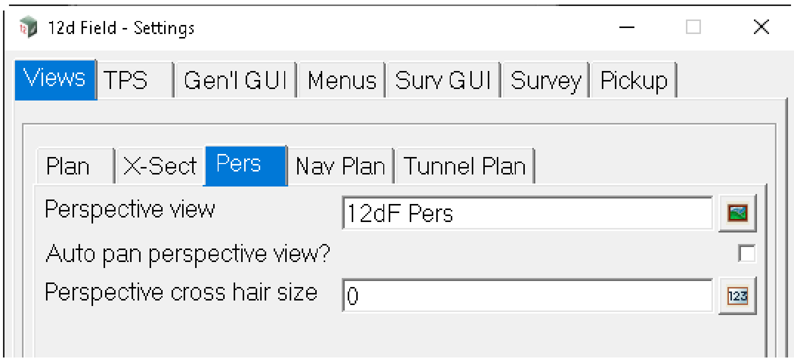
LInestyle to use to display the profile through the surface.

Linestyle colour) colour box

Colour of the linestyle.

Views >Pers tab

.



Perspective view view box available views

Perspective view to display measurements etc.

Auto pan Plan view? tick box

*If **ticked**, this Perspective view automatically pans to a point highlighted by the **12d Field** options.*

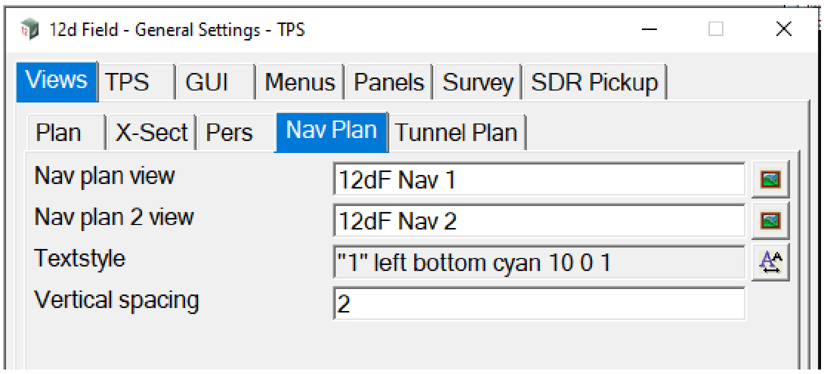
*If **not ticked**, this Perspective does not automatically pan to a point highlighted by the **12d Field** options.*

Perspective cross hair size real box measures

Size in metres of the cross hair in this perspective view.

Views >Nav Plan tab

.



Nav plan view view box available views

Plan view to use to display the Nav plan information.

Nav plan 2 view view box available views

Plan view to use to display the second setout panel information.

Textstyle textstyle data box

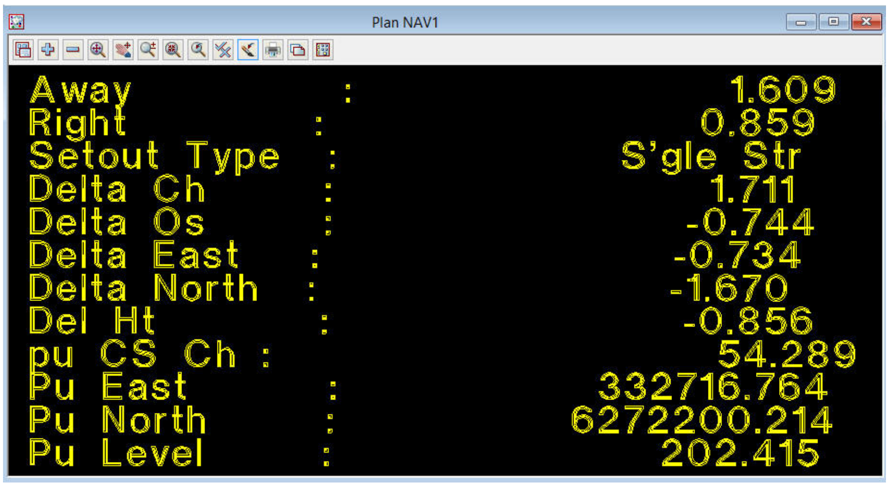
The textstyle data used to display the information in the Nav plan view and Nav plan 2 view.

***Note** - it is recommended to use a monospaced font such as Courier to prevent the misalignment of text as shown in following image.*

Vertical spacing real box measures

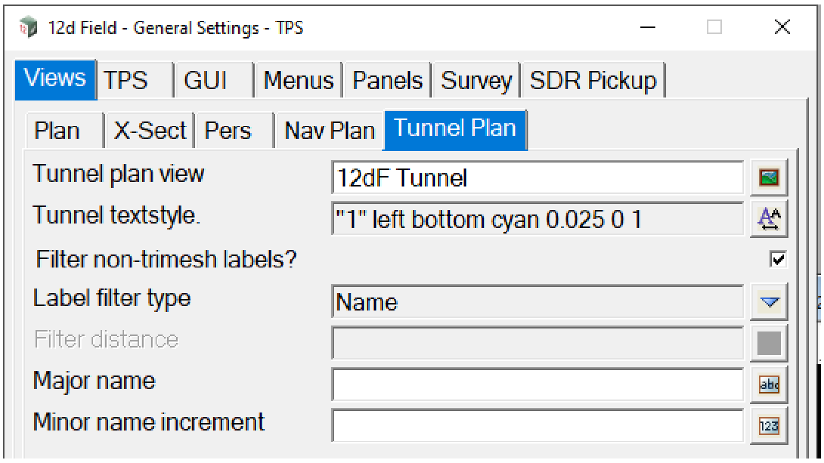
Spacing to use between the line of text when displaying the information.

.



Views >Tunnel Plan tab

.



Tunnel plan view view box available views

Plan view to use to display the Tunnel plan information.

Tunnel Text textstyle data box

The textstyle data used to display the tunnel information in the Tunnel plan view.

Filter pro/pra labels? tick box

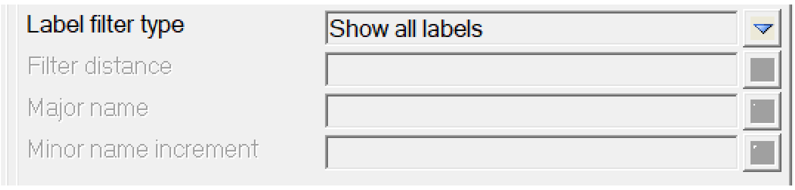
*If **ticked**, filtering is applied to traditional profiles defined by lines and arcs. These would normally not need filtering as points are not generated around arcs unlike trimesh definitions which always have label filtering.*

*If **not ticked**, traditional profiles labels are not filtered.*

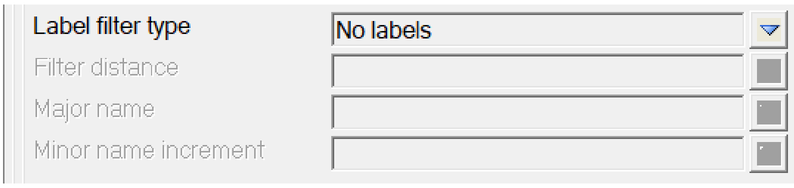
Label filter type choice box

Show all labels
Show no labels
Show labels filtered by distance

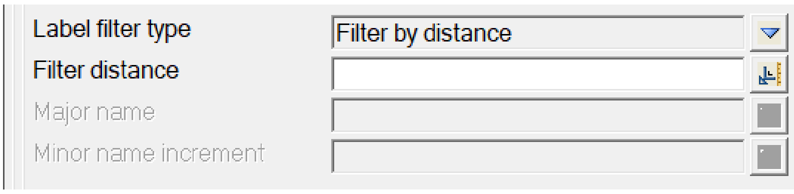
Show labels filtered by name



No filtering takes place and all labels are shown.



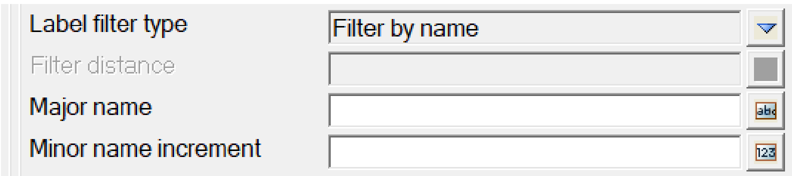
No labels are shown.



Labels are shown only when a certain distance around the profile from the previously displayed label.

Filter distance real box measures

The distance from the previous label before displaying the next.



For trimesh tunnels generated with a major text part, e.g. WALL, ROOF and minor numeric parts, WALL01, WALL02... ROOF20, ROOF21... the labelling can be filtered with this choice.

Major name text box

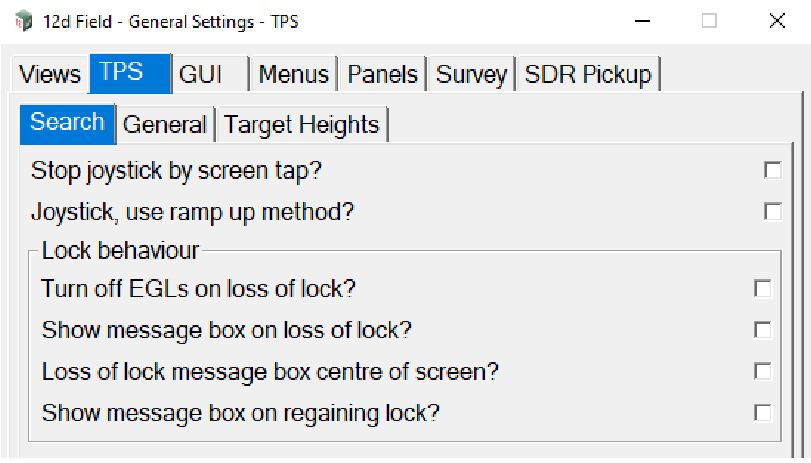
*A wildcarded match the major labelling, e.g. * to label all tunnel profile segments.*

Major name increment long box

Display every n'th label, e.g. For RR0..RR8 a value of 3 will display RR0, RR3, RR6

TPS tab

.



TPS >Search tab

Stop joystick by screen tap? tick box not ticked

*If **ticked**, the joystick rotating is stopped by tapping on the screen.*

*If **not ticked**, the joystick rotating is NOT stopped by tapping on the screen.*

Joystick, use ramp up method? tick box not ticked

*If **ticked**, the joystick starts at the minimum speed and ramps up to maximum speed after 3 presses.*

*If **not ticked**, the joystick starts and stays at the minimum speed.*

Lock behaviour

Turn off EGLs on loss of lock? tick box not ticked

Guide lights are not permitted in many workplaces, if the TPS turns them on automatically on loss of lock use this setting.

*If **ticked**, then the EGL is turned off when lock is lost.*

*If **not ticked**, then the EGL status is not checked or changed when lock is lost.*

Show message box on loss of lock? tick box not ticked

*If **ticked** then a message box appears when lock is lost.*

*If **not ticked** then a message box does not appears when lock is lost.*

Loss of lock message box centre of screen? tick box not ticked

*If **ticked**, then the lost lock message box is always displayed centre of screen.*

*If **not ticked**, then the lost lock message box is displayed at the previous message box position*

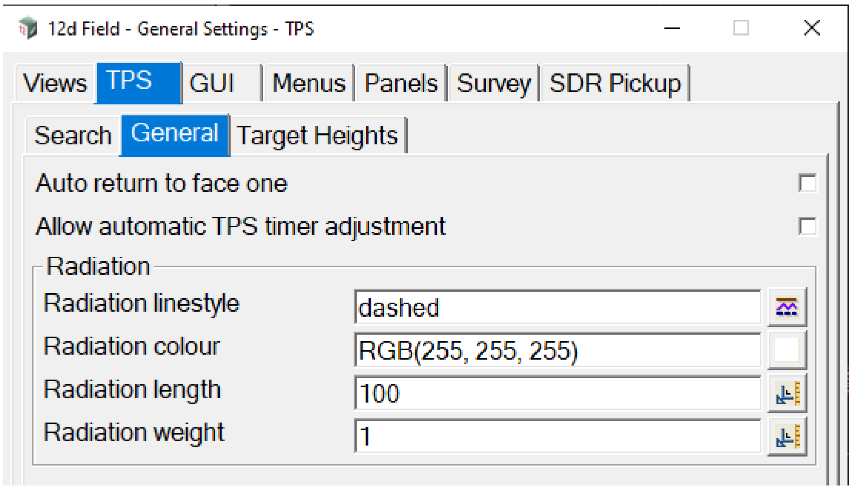
Show message box centre on regaining lock? tick box not ticked

*If **ticked**, then a message box is displayed when lock is regained.*

*If **not ticked**, then a message box is not displayed when lock is regained*

TPS >General tab

.



Auto return to face one tick box not ticked

For options, measurement styles that change the face of the instrument this setting attempts to return the instrument to face one on completion. This does not work in all situations.

*If **ticked**, the instrument returns to face one is possible.*

*If **not ticked**, the instrument does not return to face 1.*

Allow automatic TPS timer adjustment tick box not ticked

*The rate at which 12dField polls a TPS for angles and continuous measurements is controlled in the file **12dF_INSTRUMENT_SETTING_4D**. For each instrument in this 12da style file there is a line*

integer "tps_angle_poll_time" 500

*which sets the time in milliseconds the user wishes to poll the TPS. This is only editable via the file and with valid values of **250** to **1000ms**, i.e., a **¼ to 1s**.*

Dependent on hardware, the number of panels open and the complexity of computations a shorter poll time could lead the system to become less responsive.

*If **ticked**, 12dField will monitor the total processing time and on starting the next session of 12dField adjust the polling time to a more suitable value.*

*If **not ticked**, the polling time will remain constant at the setting in the file.*

Radiation

Radiation defines the drawing of the current TPS direction, e.g. from the setup point to the last known target position.

Radiation linestyle linestyle box

The linestyle used for drawing the radiation line.

Radiation colour colour box orange available colours

The colour used for drawing the radiation line.

Radiation length real box

The length of the radiation line to be drawn if the TPS is not in a mode actively tracking/measuring distances to the target.

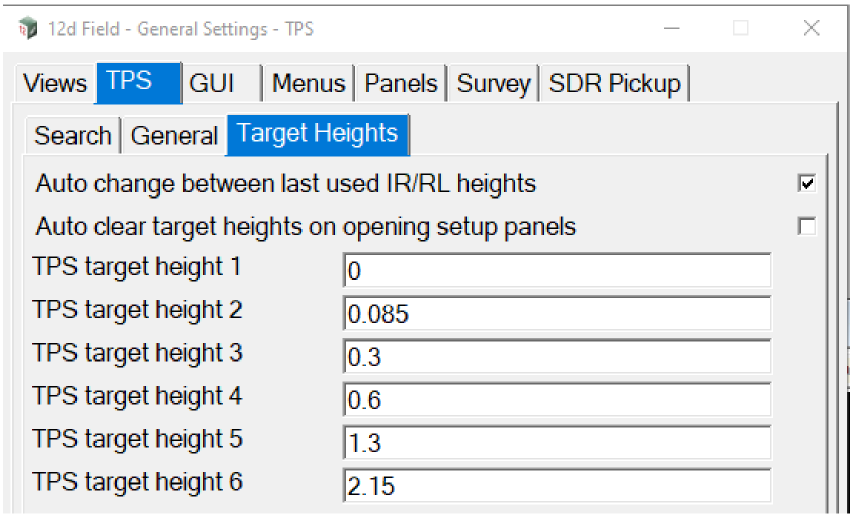
Radiation weight real box

The weight used for drawing the radiation line.

TPS >Target Heights tab

Up to six target heights can be stored. They are displayed in the pop-up list for **Preset heights** fields.

.



Auto change between last used IR/RL heights tick box ticked

*The is a button/hotkey available to toggle between measurement to a target and measurement to any surface, 12d **Field** remembers the last target height used in either of these modes.*

*If **ticked**, change the target height to the last used in that mode.*

*If **not ticked**, do not change the target height to the last used in that mode, use the current height.*

Auto clear target heights on opening setup panels tick box not ticked

*If **ticked**, the target height field will be blanked on starting the panel forcing the user to enter a new height.*

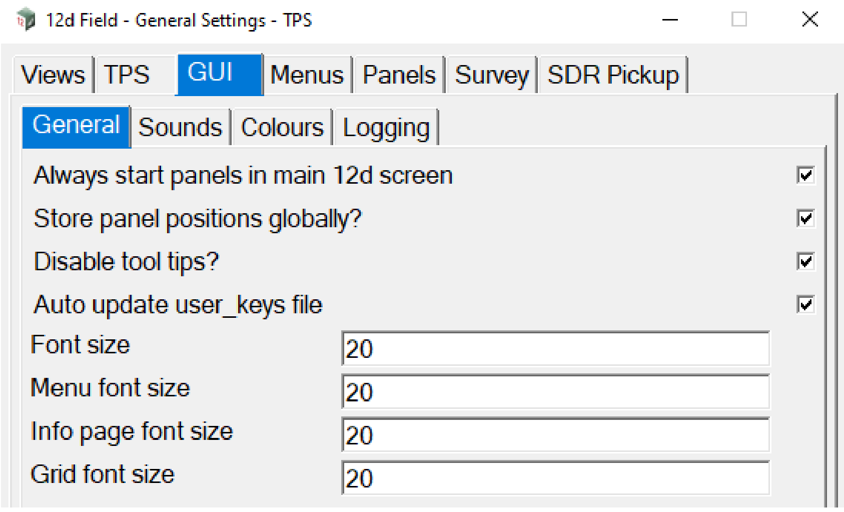
*If **not ticked**, the target height value is untouched when starting the panel.*

TPS target height 1-6 real box measures

Up to six target heights can be stored. They are displayed in the pop-up list for Preset heights fields.

GUI >Gen tab

.



Always start panels in main 12d screen tick box ticked

A panel is always checked on startup it falls inside the main 12d window, if it does not it is moved to the centre of the screen.

Store panel positions globally? tick box ticked

*If **ticked**, the position of the **12d Field** panels are stored in the global config file rather than the project config file.*

*If **not ticked**, the position of the **12d Field** panels are stored in the project config file.*

Disable tool tips? tick box ticked

*If **ticked**, the tool tip pop-up are disabled.*
*If **not ticked**, the tool tip pop-up are NOT disabled.*

Auto updateuser_keys file tick box ticked

*If **ticked**, the current contents of the user keys will be checked against the latest set available and missing keys appended to 12dF_USER_KEYS.4D after the comment line // auto appended hotkey.*
*If **not ticked**, then newer user keys are not checked for.*

Font size

*Size of the font for **12d Field** setout text.*

Menu font size

*Size of the font for menus for **12d Field** panels.*

Info page font size

Size of the font for the Info page.

Grid font size

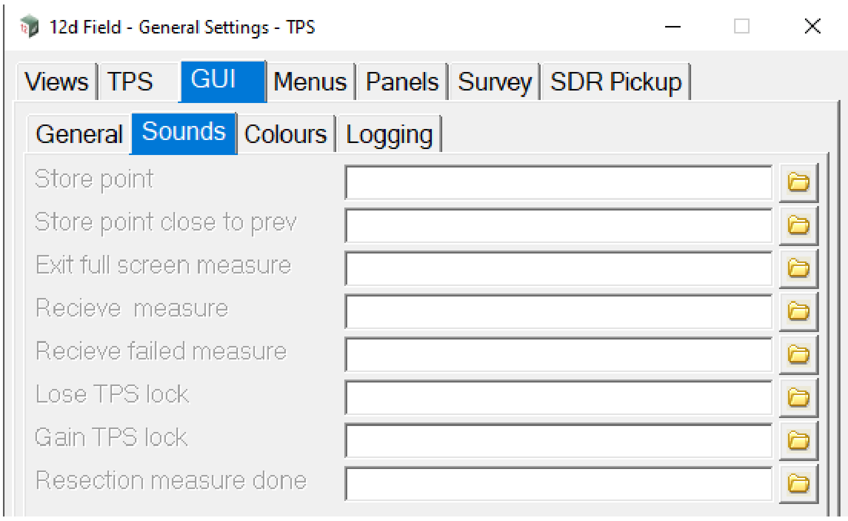
Size of the font for the grid.

GUI >Sounds tab

This tab contains a number of events that the user can associate the playing of a sound with when they occur.

Note - when in continuous measurement modes the playing of some sounds is disabled as they take longer to play than the repeated measurements occur.

The user can add their own sound files or browse to the ones in the standard Windows installation.



Store point file box

Play a sound on the storing of a point.

Store point close to prev file box

Play a sound if the point to be stored is too close to the previously stored point.

Exit full screen measure file box

Play a sound when a full screen measure is completed. (Tapping the screen to start the measure.)

Receive measure file box

Play a sound on receiving a successful measurement.

Receive failed measure file box

Play a sound on receiving an unsuccessful measurement.

Lose TPS lock file box

Play a sound on the TPS losing lock.

Gain TPS lock file box

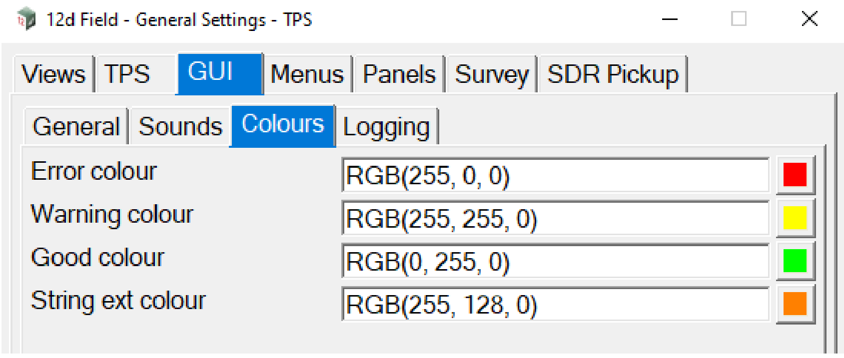
Play a sound on gaining TPS lock.

Resection measure done file box

??.

GUI >Colours tab

12d Field messages are generally a white background when informational but can have special colours set for various purposes.



Error colour colour box red

*The background colour to display in **12d Field** message boxes for errors.*

Warning colour colour box yellow

*The background colour to display in **12d Field** message boxes for warnings.*

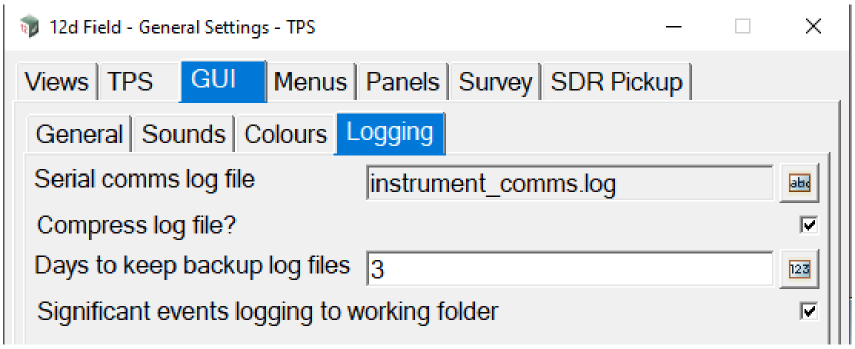
Good colour colour box green

*The background colour to display in **12d Field** message boxes for to let the user know things have returned to a good state.*

String ext colour colour box orange

*The background colour to display in **12d Field** message boxes to show strings have been extended for calculations.*

GUI >Logging tab



Serial comms log file input box readonly

Informational only - logging from the TPS/GNSS instrument is written to the binary file instrument_comm.log. This file is necessary for support of complex communication and behavioural issues.

Compress log file tick box ticked

*Normally the logging will attempt to filter repetitive information to greatly reduce the size of the log file, in some support situations it might be requested to untick this box so every communication between **12d Field** and the attached instrument is recorded.*

*If **ticked**, logging is filtered to only included critical information.*

*If **not ticked**, all communications with the instrument are logged.*

Days to keep backlog files integer box

*The logs for **12d Field** sessions are stored in the backups.4d folder in the working directory.*

*Enter the number of days before **12d Field** deletes these files automatically.*

Significant events logging to working folder tick box ticked

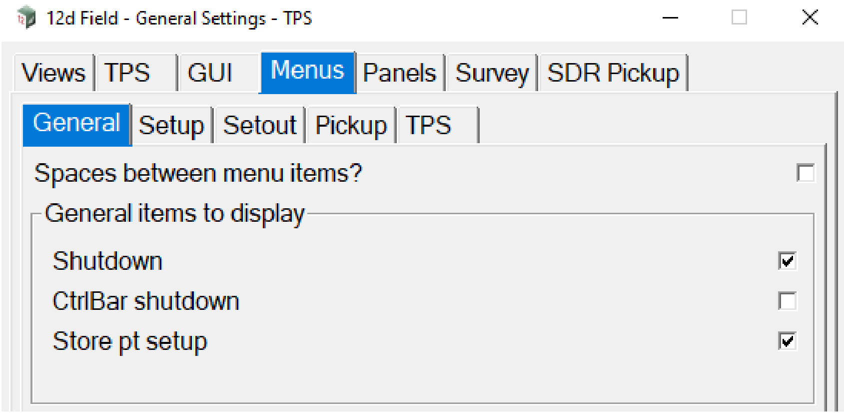
12DF_SIGNIFICANT_EVENTS_LOGGING.TXT is a plain text log file available to the user listing various aspects of the operation of 12dField.

*If **ticked**, 12DF_SIGNIFICANT_EVENTS_LOGGING.TXT is always created in the working directory.*

*If **not ticked**, 12DF_SIGNIFICANT_EVENTS_LOGGING.TXT is always created in accordance with the standard search paths.*

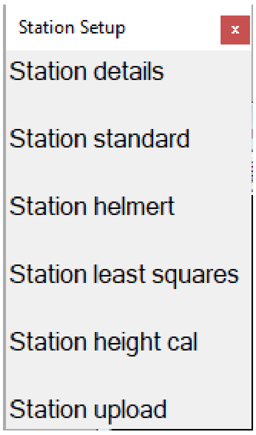
Menus >General tab

.



Spaces between menu items? tick box not ticked

*If **ticked**, add a space between all menu items.*

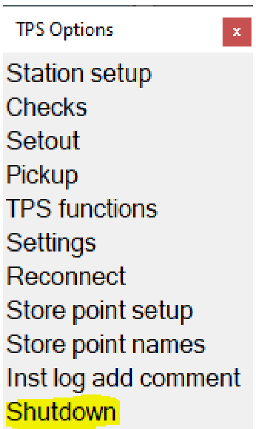


*If **not ticked**, menus do not add an extra space between menu items.*

General items to display

Shutdown tick box ticked

*If **ticked**, Shutdown is added to the end of the options menu.*



*If **not ticked**, Shutdown is added to the end of the options menu only if CtrlBar shutdown is also unticked.*

CtrlBar shutdown tick box not ticked

*If **ticked**, the shutdown button is added to the end of the control bar.*

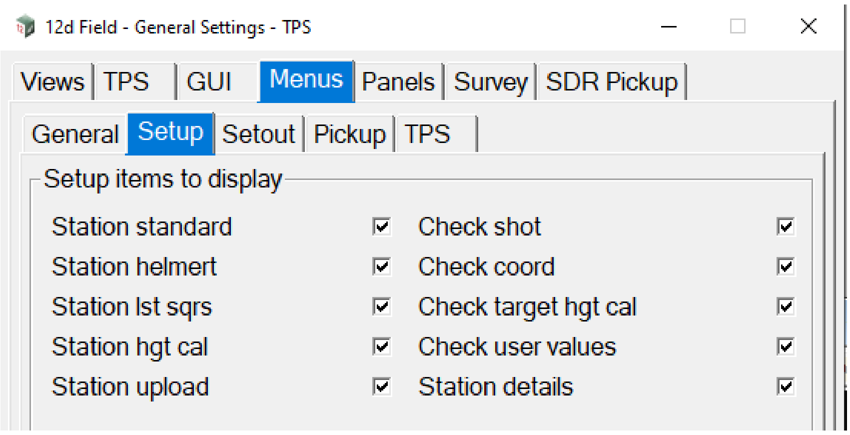
*If **not ticked**, the shutdown button is not added to the end of the control bar and will be added to the options menu.*

Store pt setup tick box ticked

*If **ticked**, Store point setup is added to the options menu.*

*If **not ticked**, Store point setup is not added to the options menu.*

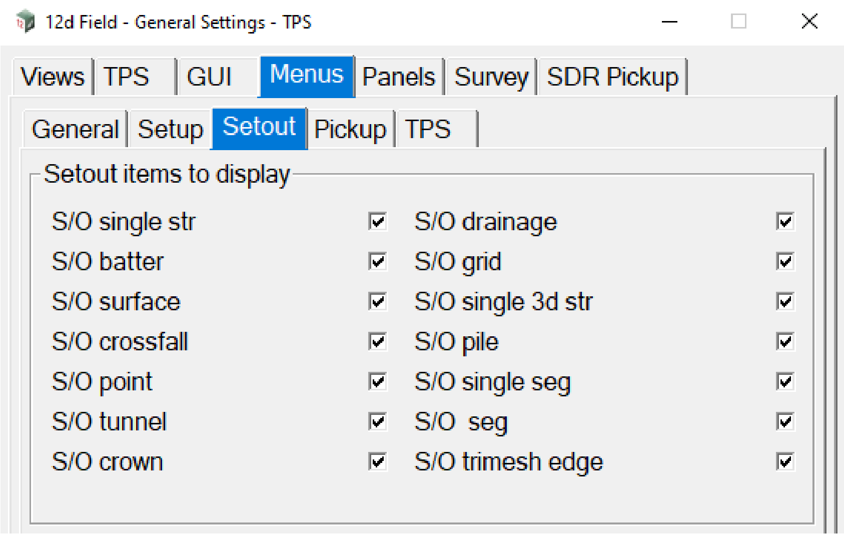
Menus >Setup tab



Setup items to display

*Select the items to display on the **Station setup** and **Checks** menus.*

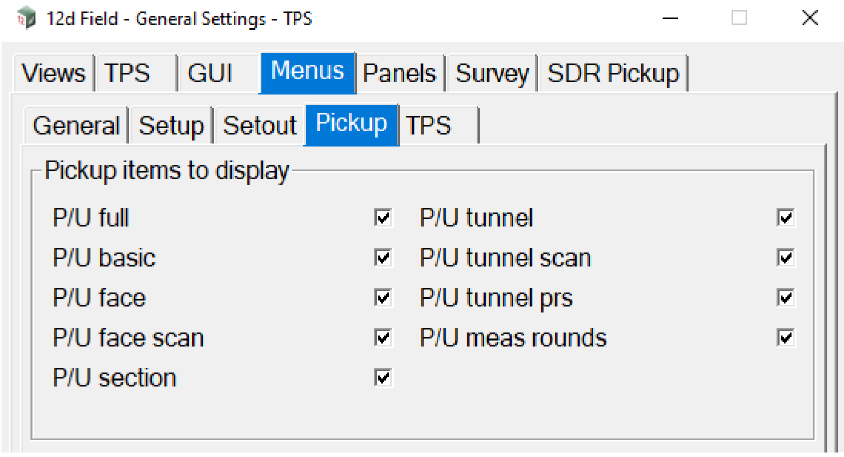
Menus >Setout tab



Setout items to display

*Select the items to display on the **Setout** menu.*

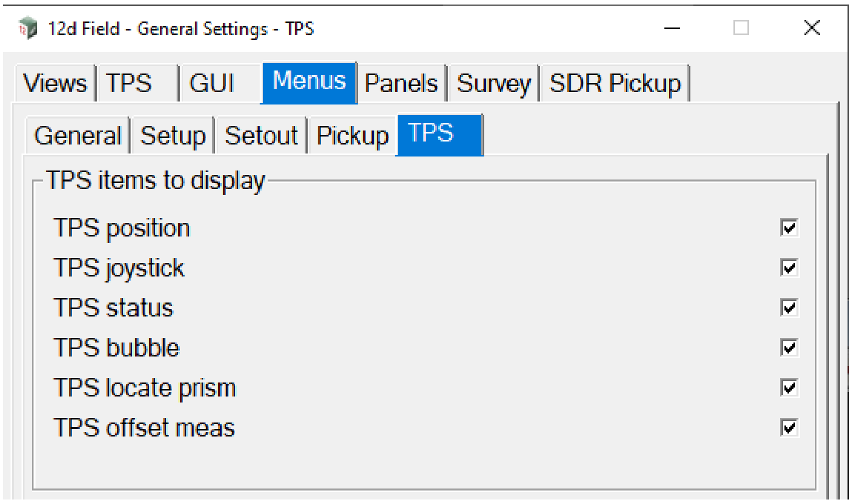
Menus >Pickup



Pickup items to display

*Select the items to display on the **Pickup** menu.*

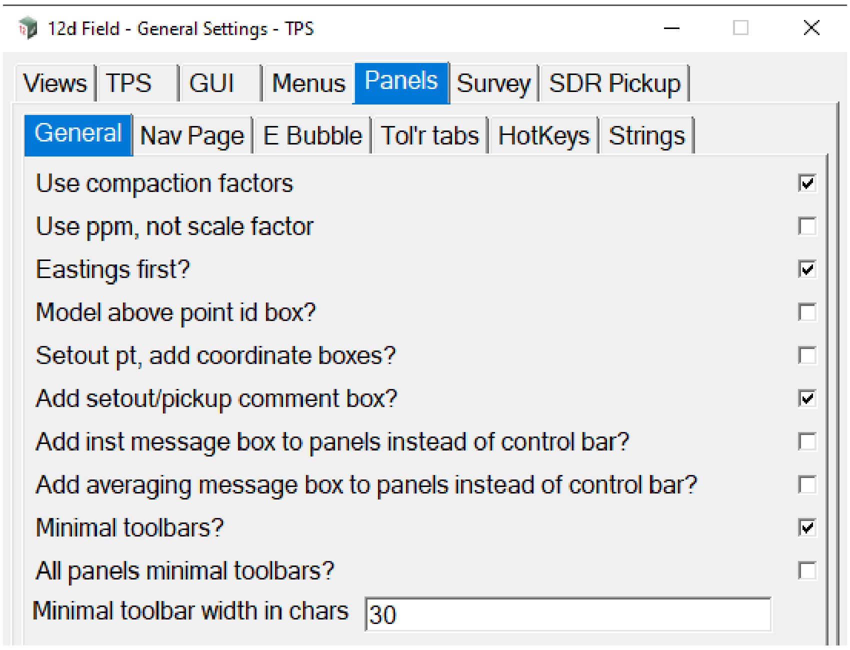
Menus >TPS



TPS items to display

*Select the items to display on the **TPS functions** menu.*

Panels >General tab



Use compaction factors tick box ticked

*If **ticked**, the compaction factor widget will be added to the appropriate setout panels.*

*If **not ticked**, the compaction factor widget will not be added to the setout panels and the compaction factor will be set to 1.0. LINK to comp factor explanation.*

Use ppm, not scale factor tick box not ticked

*If **ticked**, for geodetics the scale factor will be displayed as **ppm**, e.g **-40** rather than a scale factor **0.9996**.*

*If **not ticked**, for geodetics the scale factor will be displayed as **scale factor**, e.g **0.9996** rather than a ppm of **-40**.*

Easting first? tick box not ticked

*If **ticked**, an easting box will be added to a panel above a northing box.*

*If **not ticked**, a northing box will be added to a panel above an east ing box.*

Model above point id box? tick box not ticked

*If **ticked**, in **point setout** the **model** box will be added before the **point id** box.*

*If **not ticked**, in **point setout** the **point id** box will be added before the **model** box.*

Setout pt, add coordinate boxes? tick box not ticked

*If **ticked**, in **point setout** boxes will be added for **easting**, **northing** and **height**.*

*If **not ticked**, in **point setout** no coordinate boxes will be added.*

Add setout/pickup comment box? tick box ticked

*If **ticked**, a user comment box is added to setout and pickup, not (SDR) panels.*

*If **not ticked**, a user comment box is not added to setout and pickup panels.*

Add inst message box to panels instead of control bar? tick box not ticked

*If **ticked**, the message box with information about the instrument and measurements is added to each panel rather than the control bar.*

*If **not ticked**, the message box with information about the instrument and measurements is added only to the control bar.*

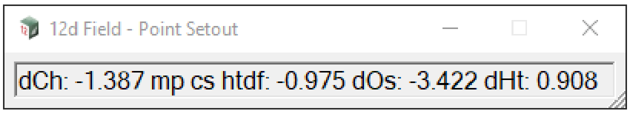
Add average message box to panels instead of control bar? tick box not ticked

*If **ticked**, the message box with progress information about multiface and averaging measurements is added to each panel rather than the control bar.*

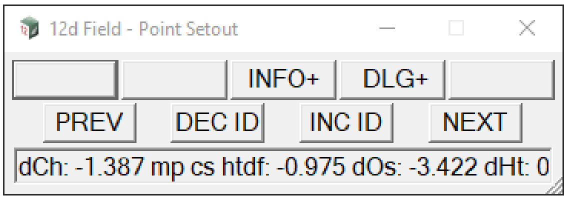
*If **not ticked**, the message box with information about multiface and averaging measurements is added only to the control bar.*

Minimal toolbars? tick box ticked

*If **ticked**, if the panel is not the primary setout panel when minimised only the message box with delta values is shown.*



*If **not ticked**, the minimised panel will show its buttons and the message box with delta values.*



All panels minimal toolbars? tick box not ticked

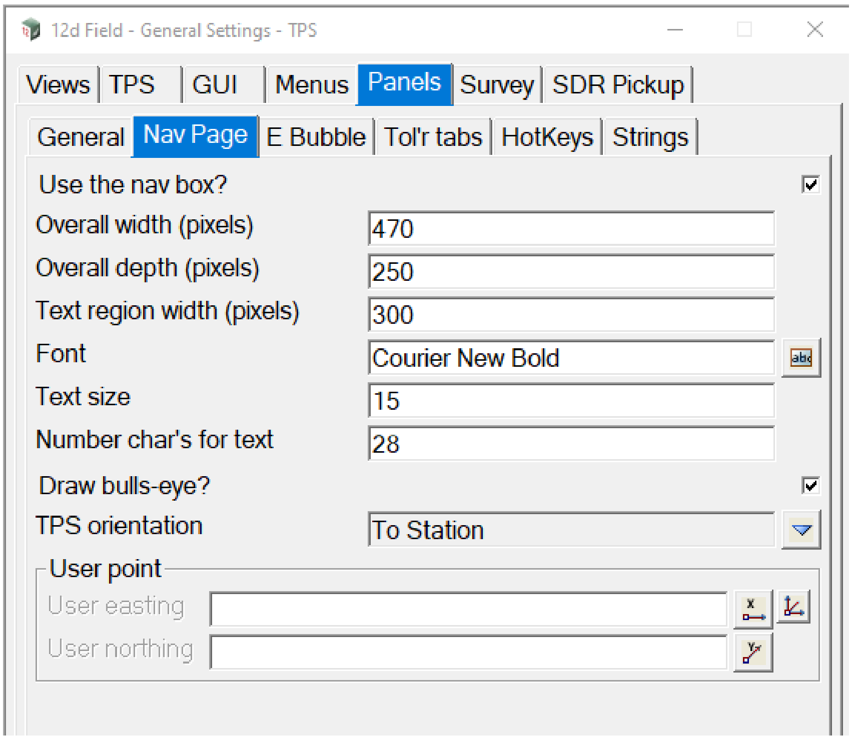
*If **ticked**, all panels, including the primary panel when minimised will only display the message box with delta values.*

*If **not ticked**, the primary panel when minimised will display its button and the message box with delta values.*

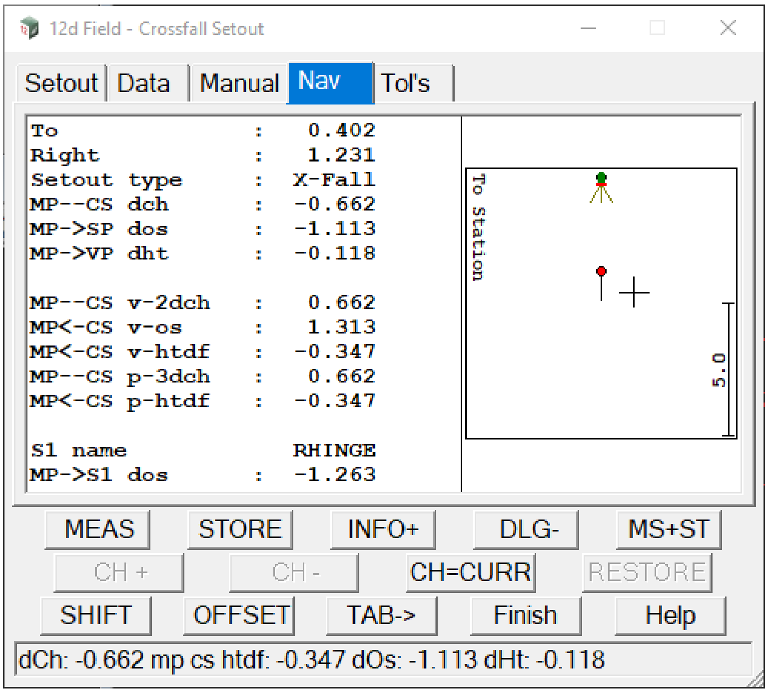
Minimal toolbar width in chars

The width of the minimised toolbar in characters, this setting is deprecated and set for removal at a latter stage.

Panels >Nav Page



The *12d Field* navigation page is a 2 part page with a user definable information table and a bulls-eye as a visual aid.



Use the nav box? tick box ticked

*If **ticked**, the navigation page is added to supported setout panels.*

*If **not ticked**, the navigation page is not used.*

Overall width (pixels) integer box

The width in pixels of the entire draw box containing the information table and bulls-eye.

Overall depth (pixels) integer box

The depth in pixels of the entire draw box containing the information table and bulls-eye. Note the depth needs to be set to match the size necessary to display all of the information as no scrolling is available.

Text region width (pixels) integer box

The number of pixels on the left hand side of the draw box reserved for the information table.

Font font box

The font to use in the navigation page, it is recommended to use a monospaced font such as Courier so test aligns neatly vertically.

Text size integer box

The text size.

Number char's for text integer box

This is a legacy setting that will be improved in the future, this number needs to be made large enough that it is greater than the combined prompt and value in the information tables. If it is not the value will be drawn as XX.XXXX.

Draw bulls-eye? tick box ticked

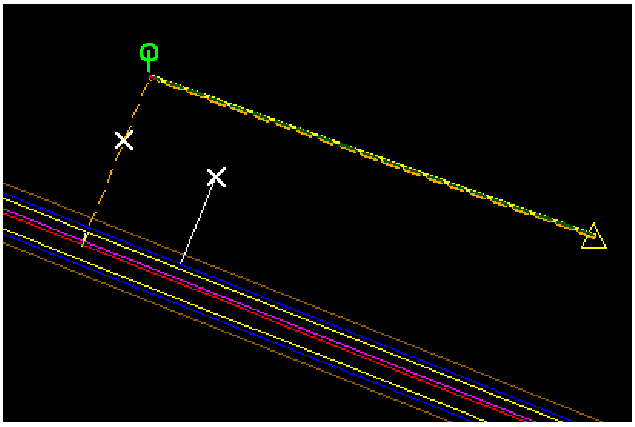
*If **ticked**, the bulls-eye is drawn.*

*If **not ticked**, the bulls-eye is not drawn but the space reserved for it remains untouched.*

TPS orientation choice box None, Centreline, From Station, To Station, To North, To User Point

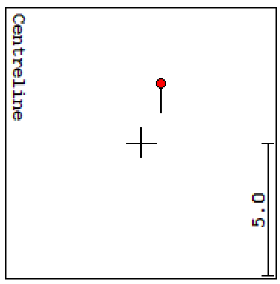
The bull-eye box shows the position of the target and setout point orientated in a certain direction to make it easier to move towards the setout point.

Take the following example, the centreline runs from the station to the measured point.

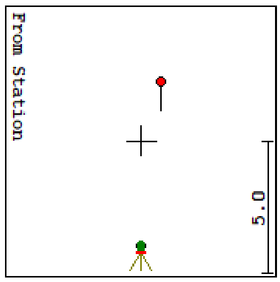


***None** - nothing is drawn in the bull-eye box.*

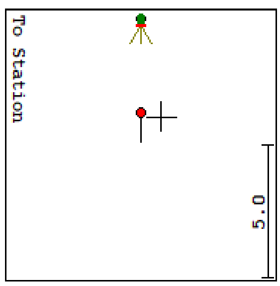
***Centreline** - the box is orientated with the centreline direction as 'north'.*



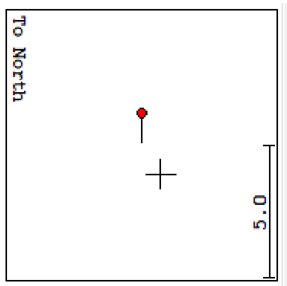
From Station



To Station

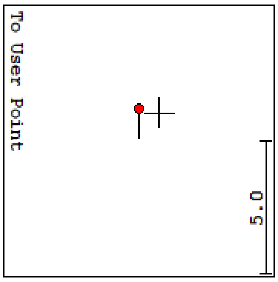


To North



To user point

In this case the user point has been set to the setup point.



User point

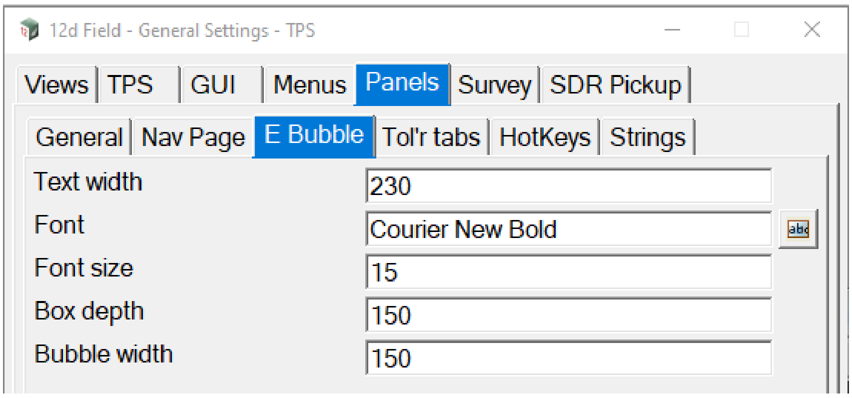
User easting

Easting of the user orientation point.

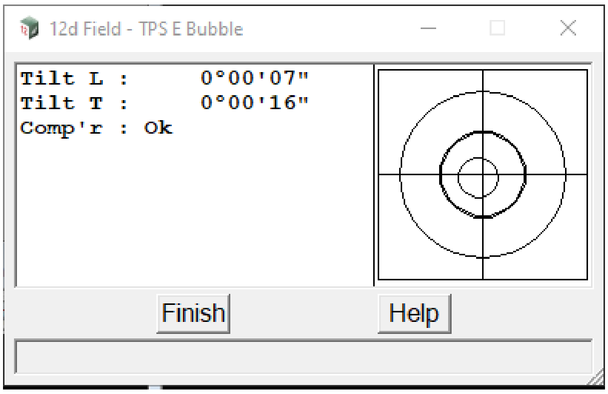
User northing

Northing of the user orientation point.

Panels >E Bubble



Control the settings for display of the TPS electronic bubble.



Text width integer box

The width in pixels of the text area.

Font font box

The font to use, it is recommended to use a monospaced font such as Courier so text aligns neatly *vertically.*

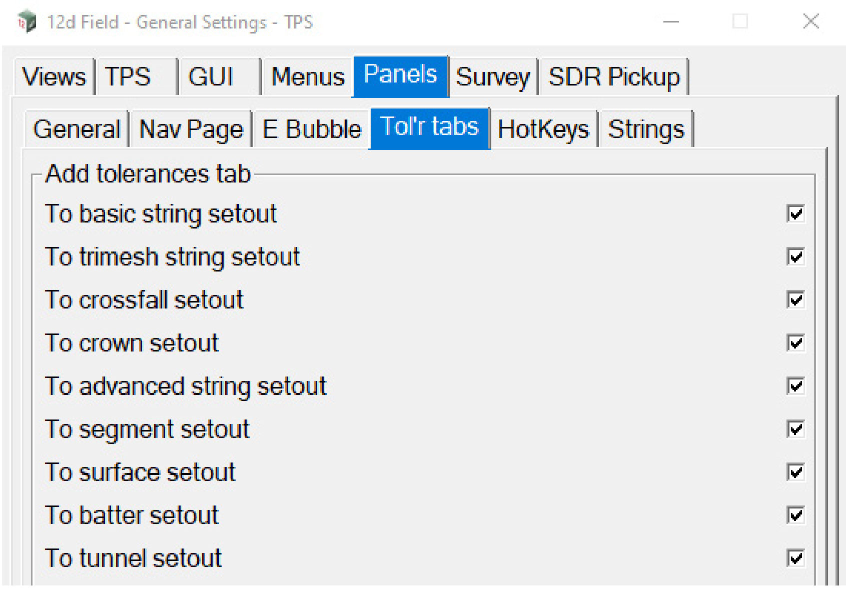
Box depth integer box

Depth of the bubble box.

Bubble width integer box

Width of the bubble box.

Panels >Tol'r tabs

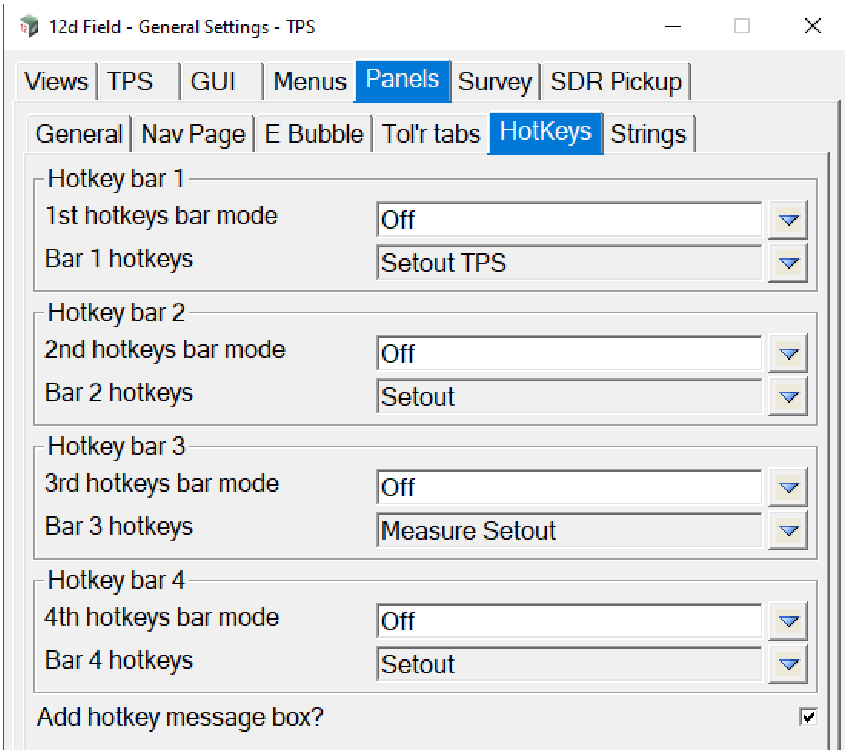


Add tolerances tab

If ***ticked****, the tolerances tab is added to the setout panel and tolerance checks are able to be performed.*

If ***not ticked****, the tolerances tab is not added to the setout panel and no tolerance checks are performed.*

Panels >HotKeys



Hotkey bar 1 - 4

The behaviour of all 4 bars is identical.

1st, 2nd, 3rd, 4th hotkeys bar mode choice box Off Off, On -Vertical
On - Horizontal

Off *- the hotkey bar is not displayed.*

On - Vertical *- the hotkey bar is on and its item are arranged vertically.*

On - Horizontal *- the hotkey bar is on and its item are arranged horizontally.*

Bar 1,2,3,4 hotkeys choice box

*Select the contents of the hotkey bar, these are defined in the text file **12dF_HOTKEY_BARS.4D**.*

Add hotket message box? tick box ticked

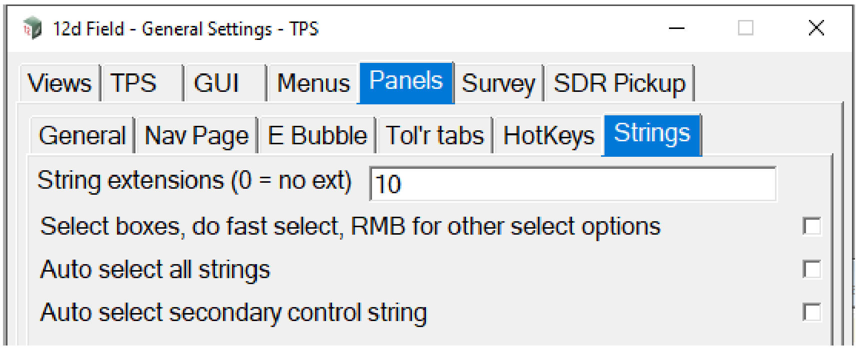
If using a keyboard for hotkeys it is essential that 12d has Windows focus, e.g. in a view or a widget.

*If **ticked**, an extra message box is added to each panel add the focus shifted aggressively to this to ensure keyboard activated hotkeys will work.*

*If **not ticked**, the user must ensure the focus is on a view or widget to ensure keyboard activated hotkeys will work.*

Do not tick this box if you do not use keyboard hotkeys.

Panels >Strings

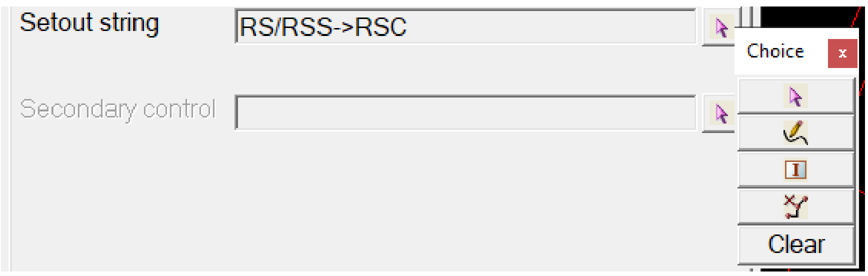


String extensions (0 = no ext) tick box not ticked

*If **non zero** then all strings used by **12d Field** will be extended tangentially, horizontally and vertically by this amount when dropping a point to or cutting them. If the drop or cut falls in this area then the results message box changes to a special warning colour, link to <GUI->Colours->String ext colour>*

Select boxes, do fast select, RMB for other select options tick box not ticked

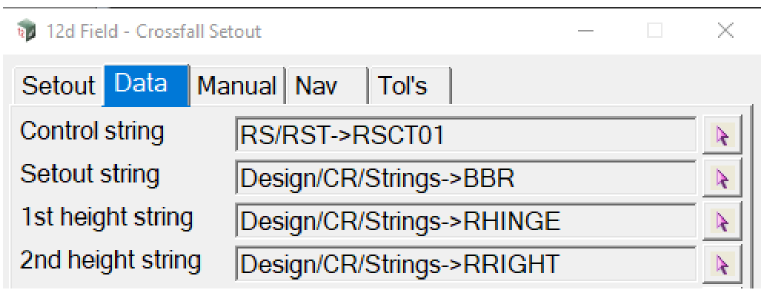
*If **ticked**, when clicking on the select widget the panel will minimise and restore when the element is selected. To access the options the user must right click on the select.*



*If **not ticked**, the options will be shown automatically, hence it will take 2 clicks to select a string but it also means on a tablet the RMB is not needed so access to other necessary options such as **Clear** can be simpler.*

Auto select all strings tick box not ticked

*If **ticked**, dependent on the setout panel a single select will auto prompt for the select of all following strings, using the crossfall setout panel as an example:*



*If the user chooses to select the **Setout string** then they will automatically be asked to select the **1st height string** and the **2nd height string**. The automatic selects can be cancelled with ESC.*

*If **not ticked**, all strings must be selected individually.*

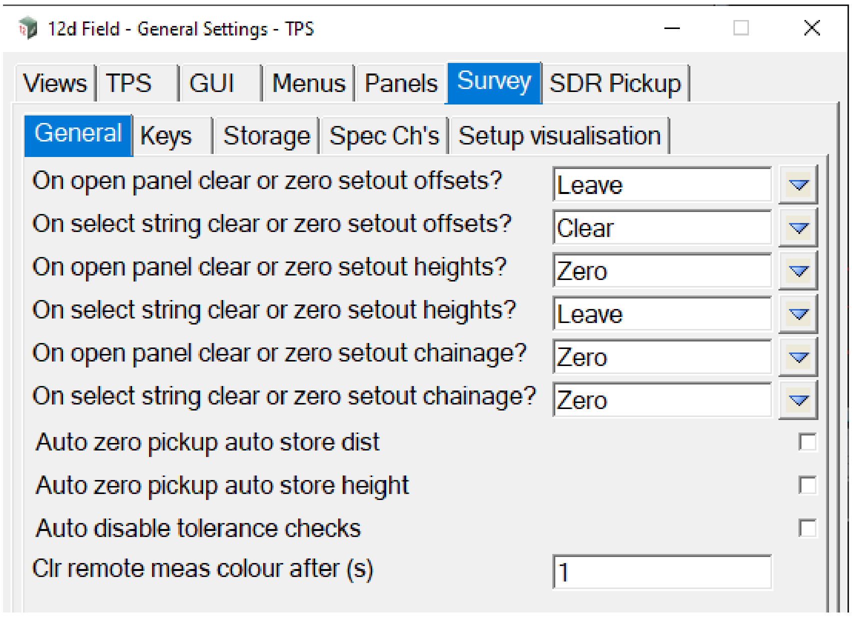
Auto select secondary control string tick box not ticked

*If **ticked** and **Auto select all strings** is **ticked**, the secondary control string will be last in the automatic selection process.*

*If **not ticked**, the secondary control must be selected individually.*

Survey >General tab

.



On open panel clear or zero setout offsets> choice box Leave, Clear, Zero

*If **Leave**, the setout offset is left unchanged on starting a panel.*

*If **Clear**, the setout offset is cleared on starting a panel, the user will need to re-enter the value.*

*If **Zero**, the setout offset is set to 0.0 on starting a panel.*

On select string clear or zero setout offsets? choice box Leave, Clear, Zero

*If **Leave**, the setout offset is left unchanged on selecting a string.*

*If **Clear**, the setout offset is cleared on selecting a string, the user will need to re-enter the value.*

*If **Zero**, the setout offset is set to 0.0 on selecting a string.*

On open panel clear or zero setout heights? choice box Leave, Clear, Zero

*If **Leave**, the setout heights are left unchanged on starting a panel.*

*If **Clear**, the setout height difference, surface shift and batter rail heights are cleared on starting a panel, the user will need to re-enter these values.*

*If **Zero**, the setout height difference, surface shift and batter rail heights are set to 0.0 on starting a panel.*

On select string clear or zero setout heights? choice box Leave, Clear, Zero

*If **Leave**, the setout heights are left unchanged on selecting a string.*

*If **Clear**, the setout height difference, surface shift and batter rail heights are cleared on selecting a string, the user will need to re-enter these values.*

*If **Zero**, the setout height difference, surface shift and batter rail heights are set to 0.0 on selecting a String.*

On open panel clear or zero setout chainage? choice box Leave, Clear, Zero

*If **Leave**, the setout chainage is left unchanged on starting a panel.*

*If **Clear**, the setout chainage is cleared on starting a panel.*

*If **Zero**, the setout chainage is set to 0.0 on starting a panel.*

On select string clear or zero setout chainage? choice box Leave, Clear, Zero

*If **Leave**, the setout chainage is left unchanged on selecting a string.*

*If **Clear**, the setout chainage is cleared on selecting a string.*

*If **Zero**, the setout chainage is set to 0.0 on selecting a string.*

Auto zero pickup auto store dist tick box not ticked

*If **ticked**, on starting **Basic Pickup** the **Auto store distanc**e is set to 0.0.*

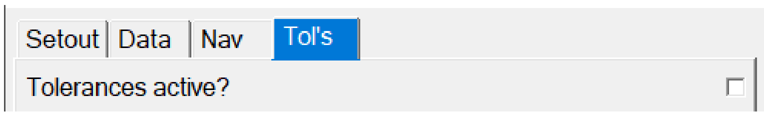
*If **not ticked**, on starting **Basic Pickup** the **Auto store distance** is left unchanged.*

Auto zero pickup auto store height tick box not ticked

*If **ticked**, on starting Basic Pickup the Auto store height is set to 0.0.*

*If **not ticked**, on starting Basic Pickup the Auto store height is left unchanged.*

Auto disabletolerance checks tick box not ticked



*If **ticked**, tolerance checks will be disabled when starting a panel.*

*If **not ticked**, the tolerance checks status will be left unchanged when starting a panel.*

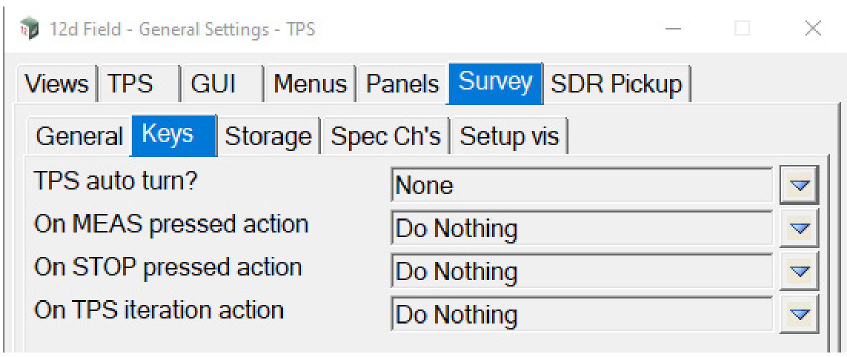
Clr remote meas colour after (s) integer box

Deprecated, Leica TPS 1200 instrument only, if using remote measure, activating measurement for instrument keyboard via GSI.

After this amount of time has passed a warning this was a remote measure will be cleared.

Survey >Keys tab

.



TPS auto turn? choice box None, 2d and 3d

This is the action taken when a new setout coordinate is calculated, does the user want the instrument to automatically point there.

*If **None -** do nothing.*

*If **2d** - point horizontally to the setout point using current vertical angle.*

*If **3d -** point horizontally and vertically to the setout point.*

On MEAS pressed action choice box Do Nothing, Focus to Nav Page, DLG

*If **Do Nothing** - do nothing.*

*If **Focus To Nav Page** - change to the navigation page.*

*If **DLG** - minimise the panel.*

On STOP pressed action choice box Do Nothing, Startup Info Page, DLG+

*If **Do Nothing** - do nothing.*

*If **Startup Info Page** - startup the information page, (INFO+).*

*If **DLG+** - maximise the panel.*

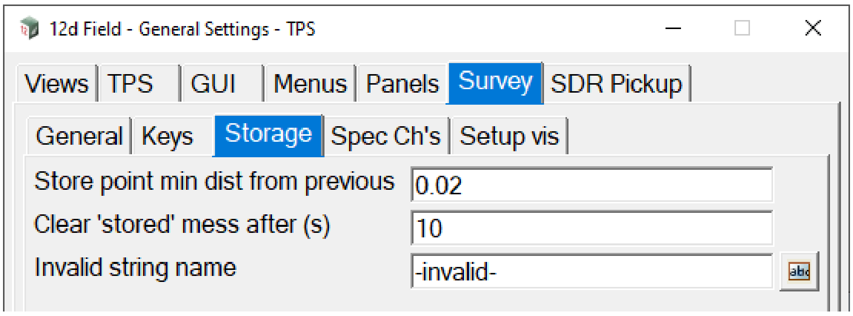
On TPS iteration action choice box Do Nothing, Focus to Nav Page

*If **Do Nothing** - do nothing.*

*If **Focus To Nav Page** - change to the navigation page.*

Survey >Storage

.



Store point minimum dist from previous real box

If when attempting to store a point the new point is within this distance of the previously stored point a message box will be shown asking whether it is OK to continue.

Clear 'stored' mess after (s) integer box

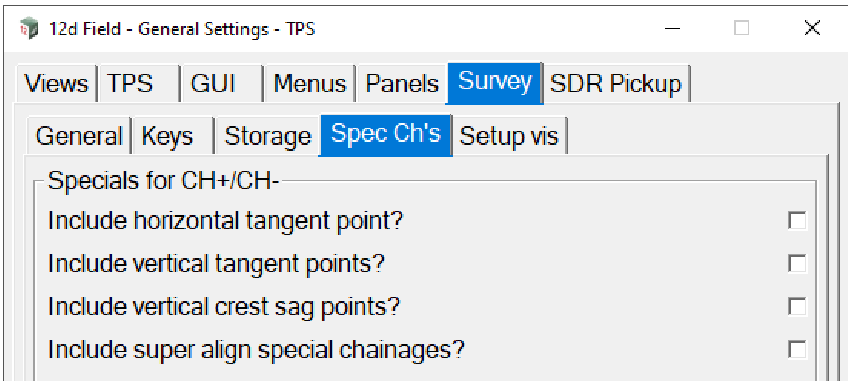
The time duration in seconds after which the 'Point stored' message will be cleared from the panel message box.

Invalid string name input box

*For the setout panels and basic pickup this name will not validate and forces the user to enter a new string name. This was added primarily for administrators for various purposes when manipulating the **12d Field** configuration files.*

Survey >Spec Ch's

.



Specials for CH+/CH-

When the control string is a super alignment apart for the even chainage increments extra points can also be included.

Include horizontal tangent points? tick box not ticked

Includes all horizontal tangent chainages.

Include vertical tangent points? tick box not ticked

Includes all vertical tangent chainages.

Include vertical crest sag points? tick box not ticked

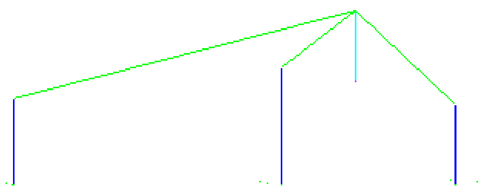
Includes all crest/high and sag/low vertical chainages.

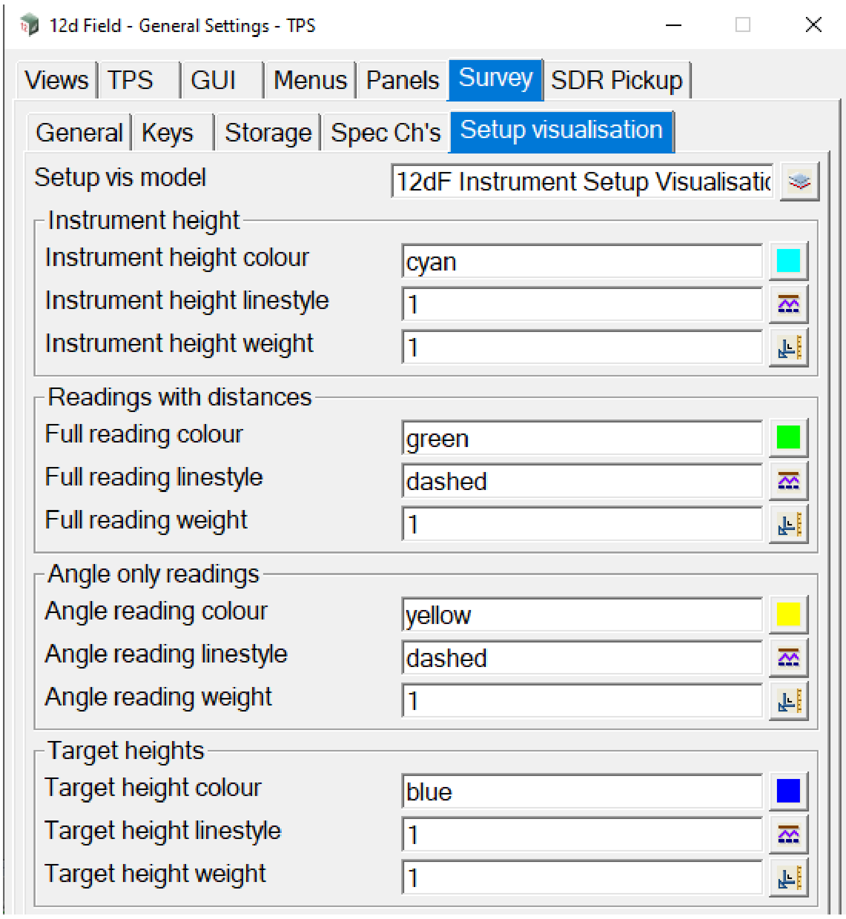
Include super alignment special chainages? tick box not ticked

Includes the list of super alignment special chainages.

Survey >Setup visualisation

The settings on this tab allow the user to create a simple model for visualising the TPS setup, the following a helmert setup.





Setup vis model model box Available models

The model to store the visualisation in.

*Each of the following 4 groups prompt for the **colour**, **linestyle** and **weight** of the straight lines they draw, these are self explanatory,*

Instrument height

The colour, linestyle and weight of the line drawn from the centre of the TPS down to the entered instrument height. If the instrument height was zero no line will be drawn.

Reading with distances

The colour, linestyle and weight of measurements with distances, all measurements in a helmert resection will be drawn with these settings.

Angle only readings

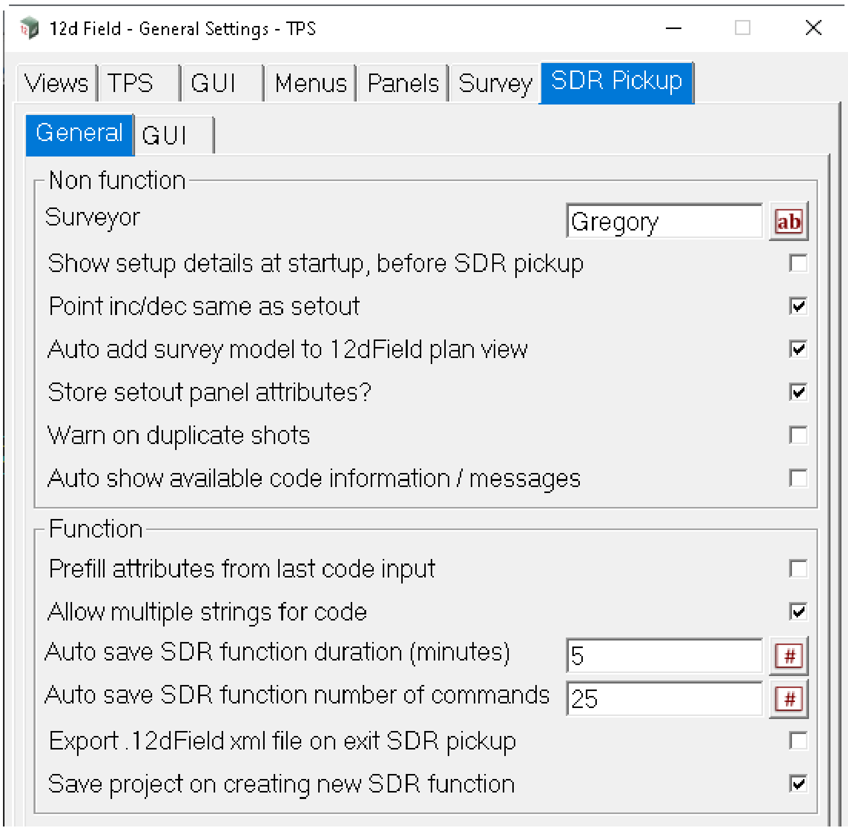
The colour, linestyle and weight of measurements with angle measurements only, measurements in a least squares resection or standard setup could be drawn with these settings.

Target heights

The colour, linestyle and weight of the line drawn from the control point up to the entered target height. If the target height was zero no line will be drawn.

SDR Pickup >General tab

.



Non function

Setting not related to the SDR function

Surveyor model box

Company/surveyor name to be written to all stored attributes.

Show setup.

Show setup details at startup, before SDR pickup tick box not ticked

*If **ticked**, the set up details are show when starting up SDR Pickup.*

*If **not ticked**, the set up details are NOT show when starting up SDR Pickup*

Point inc/dec same sa setout tick box not ticked

*If **ticked**, the point increment/decrement operates as per **12d Field** setout. link to ??*

*If **not ticked**, the point increment/decrement operates as per the origianl**12d Field** pickup, link to <??>*

Auto add survey model to 12dField plan view tick box ticked

*If **ticked**, the SDR survey is automatically added to the **12d Field** plan view.*

*If **not ticked**, the SDR survey is not added to the **12d Field** plan view.*

Store setout panel attributes? tick box ticked

*If **ticked**, any setout panel that is open in conjunction with SDR pickup will have its calculation attributes stored on the SDR point vertex as well.*

*If **not ticked**, any setout panel that is open in conjunction with SDR pickup is ignored.*

Warn on duplicate shots tick box ticked

This setting is obsolete and will be removed.

Auto show available code information/messages tick box not ticked

*If **ticked**, information available with an SDR code will be automatically shown when the code is selected for use.*

*If **not ticked**, information available with an SDR code will not be automatically shown when the code is selected for use.*

Function

setting associated directly with the SDR function

Prefill attributes from last code input tick box not ticked

*If **ticked**, a code panel will be automatically populated from the last instance of that panel.*

*If **not ticked**, a code panel will be empty when created requiring all fields to be filled in.*

Allow multiple string for code tick box ticked

*If **ticked**, a code will be searched for by code and string name.*

*If **not ticked**, a code will be searched for by matching the code only.*

Auto save SDR function number of commands integer box

Auto save the SDR function after this number of minutes, all of the SDR data is in the function so even if 12d terminates unexpectedly no data is lost before the last save of the function to disk.

Export .12dField XML file on exit SDR pickup tick box not ticked

*If **ticked**, not recommended, a **12d Field** XML will be written on closing SDR pickup. This is not recommended as all of the data is in the SDR function and the file serves no real purpose, informational only, it will also be very large and can take minutes to write dependent on hardware.*

*If **not ticked**, recommended, no file will be written on exiting SDR pickup.*

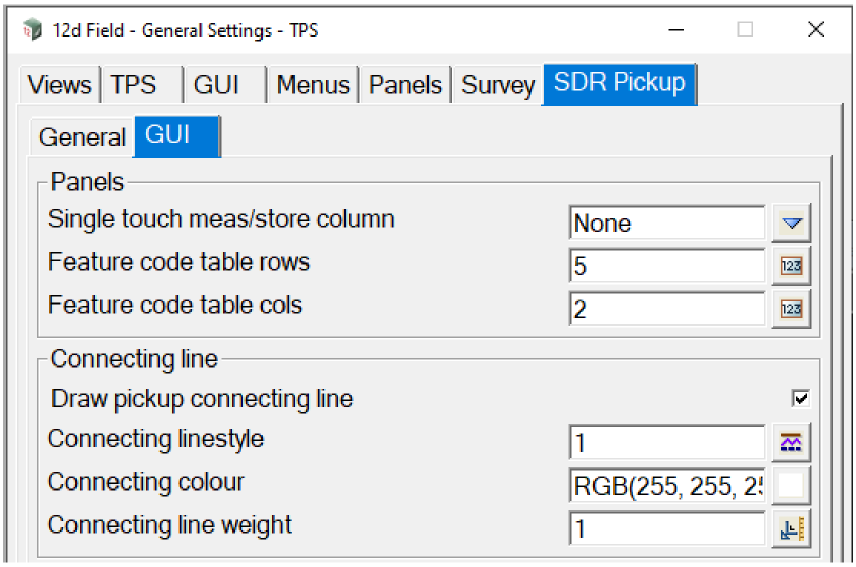
Save project on creating new SDR function tick box ticked

*If **ticked**, recommended, the project will be saved on creating the SDR function meaning the function is added to the project so if 12d terminates unexpectedly the function will still be visible in the project.*

*If **not ticked**, the project will have to be saved manually. If 12d terminates unexpectedly before a subsequent save of the project the function will still be there and valid but will have to be manually added to the project.*

SDR Pickup >GUI

.



Panels

Single touch meas/store column choice box None None, Measure store, Measure record

*If **None**, no extra column is added to the SDR pickup panel grid.*

*If **Measure store**, an extra column is added to the SDR pickup panel grid, a touch in this column will change to the code and string name in that row and activate measure & store.*

*If **Measure record**, an extra column is added to the SDR pickup panel grid, a touch in this column will change to the code and string name in that row and activate measure & record.*

Feature code table rows integer box

The number of rows of buttons in the feature code table.

Feature code table cols integer box

The number of columns of buttons in the feature code table.

Connecting line

The details of a line drawn for the last stored point to the current location.

Draw pickup connecting line tick box ticked

*If **ticked**, the connecting line is drawn.*

*If **not ticked**, the connecting line is not drawn.*

Connecting linestyle linestyle box

The linestyle of the connecting line.

Connecting colour colour box available colours

The colour of the connecting line.

Connecting line weight real box

The line weight of the connecting line.

Continue to 16.5.8 Reconnect or return to 16.5 12d Field Options

16.5.8 Reconnect

Selecting **Reconnect** will attempt to disconnect from the current instrument and then reconnect.

This may be required when the instrument has been restarted.

Important Note: this option will not appear in the menu for some instruments.

Continue to 16.5.9 Store Point Setup or return to 16.5 12d Field Options .

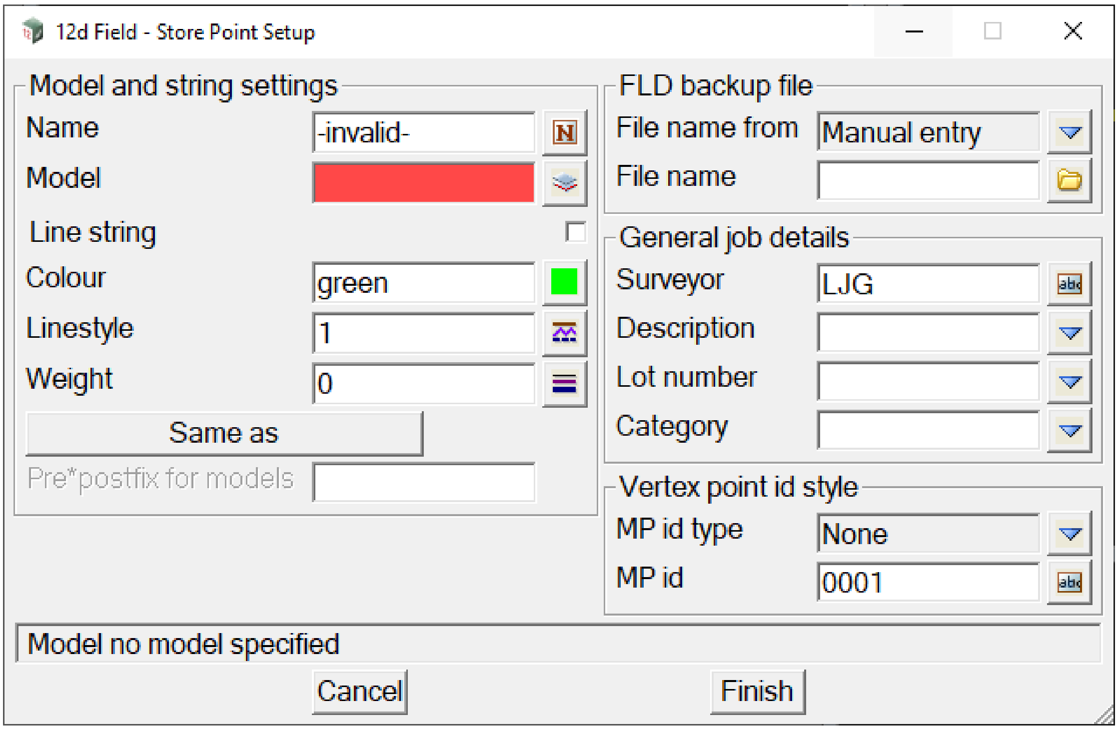
16.5.9 Store Point Setup

Clicking **Store Pt Setup** brings up the **12d Field - Store Point Setup** panel.

For setout and pickup panels other than SDR Pickup the **12d Field - Store Point Setup** panel is called up the first time a user attempts to store a point to a model or if the user presses the **Setup** button on the ***12d Field*** control bar.

This panel must be validly completed before a point can be stored.

The panel is grouped into four separate areas which will now be described.



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

Field Description Type Defaults Pop-Up

Model and string settings

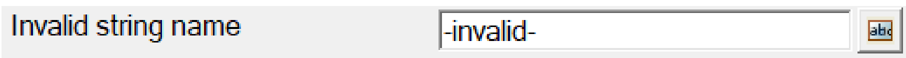
These settings work the same as your typical 12d settings work, they control the look of the stored string in the model.

Name name box

Enter the name of the string to be stored manually or from the pop up select a predefined name (from names.4d) which will also populate the other settings.

On initial use the name is set to that specified in the Settings panel.

General Settings - TPS/GNSS->Survey->Storage->Invalid string name



The name field will not validate until the user changes it from the above value.

Model model box available models

*The model to store the string in. (This model will automatically be added to your defined **12d Field** plan view)*

Line string tick not ticked

*If **ticked**, the string is a line string.*
*If **not ticked**, the string is a point string.*

Colour colour box green

The colour of the string.

Linestyle

Linestyle of the string.

Weight

The thickness of the string.

Same as button

Select an existing point/line and the fields will set to it's properties.

Pre*postfix for models

*If **non blank,** the pre-postfix will be applied to the nominal model when storing the point.*

FLD backup file

All 12dField points are stored to a FLD file as well as a model. This is done for backup reasons as every shot is stored to the FLD file on disk when a shot is taken ensuring no data should be lost in the event of an unexpected shutdown of 12d. The older .FLD format is used as it is a 'flat' format and each shot can be simply appended to the end of the file.

The 12dField .FLD files have sufficient attributes in them that they can be read directly back into 12d via a specialised panel, they cannot be reduced through the survey data reduction functions. 16.8 12dField Setout FLD File To Strings

File names from Manual Entry
Populate from model name
Populate from <pre> part of pre post
Populate from <post> part of pre-post

***Manual Entry** - enter the name of the file in the **File name** box.*
***Populate from model name** - the name of the model in the **model box** is used as the file name.*
***Populate from <pre> part of pre-post** - the name of the file is the pre part.*
***Populate from <post> part of pre-post** - the name of the file is the post part.*

*For example a surveyor might enter a model name of "Asphalt Conformance" in the **model box**.*
*They then for a pre fix enter the year month and day and their initials "20113006MG " and they select "**Populate from model name**" for the FLD file name.*
The model and field file written will be "20113006MG Asphalt Conformance"

General job details

Surveyor

The name of the surveyor.

Description

*A description of the survey (Populated from **12dF_JOB_DESCRIPTIONS.4D**).*

Lot number

*A lot number of the survey (Populated from **12dF_JOB_LOT_NUMBERS.4D**).*

Category

*The category of the survey (Populated from **12dF_JOB_CATEGORIES.4D**).*

Vertex point id style

This choice box controls the way the id of each vertex in the string is written.

MP id type

None
Same each shot,
Inc on Rec, Dec on Rec
Chainage, Chainage &Offset.
Same as Setout Id

None *- no vertex id is written.*
Same each shot *- the value in the* ***Pickup Id*** *box will be used for all points stored.*
Inc on Rec *- the value in the* ***Pickup Id*** *box will be used for the next point stored then incremented.*
Dec on Rec *- the value in the* ***Pickup Id*** *box will be used for the next point stored then decremented.*
Chainage *- the chainage of the point being stored will be used as it's vertex id.*
Chainage&Offset *- the chainage and offset of the point being stored will be used as it's vertex id.*
Same as Setout Id *- the vertex id of the point being setout will be used.*

Notes on the incrementing of the Id.
The id is alphanumeric and the number of characters does not change.The increment/decrement applies to the either the numeric or alpha ending of the id, not to a combination of both.

```
Increment examples 1->2, 9->0, A1>A2, A9->A0, AA->AB, AZ->BA,
S099->S100, S999->S000
Decrement examples 6->5, 0->9, A2>A1, A0->A9, AB->AA, AA->ZZ,
S100->S099, S000->S999
```

MP id

This is the id of the next vertex to be stored.

Button at Bottom

Cancel button

If cancel is pressed the panel will close but the next time a point is stored it will open again.

Finish button

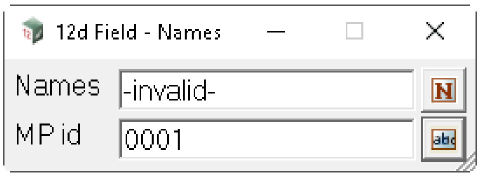
If the panel validates correctly it will close and the point will be stored. The panel will only open again if called manually from the control bar or a new setout is started.

Continue to 16.5.10 Store Point Names or return to 16.5 12d Field Options .

16.5.10 Store Point Names

The **Store Point Names** panel contains 2 of the common fields from the much larger 16.5.9 Store Point Setup panel. This panel is designed to stay up permanently for simple quick changes to points stored by the setout routines.

Clicking **Store Pt Names** brings up the **12d Field - Names** panel.



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

Field Description	Type	Defaults	Pop-Up
Names	names box		

*See **Name** in the* Model and string settings *section of the* 16.5.9 Store Point Setup *panel.*

Field Description	Type	Defaults	Pop-Up
MP id	text box		

*See **MP id** in the* Vertex point id style *section of the* 16.5.9 Store Point Setup *panel.*

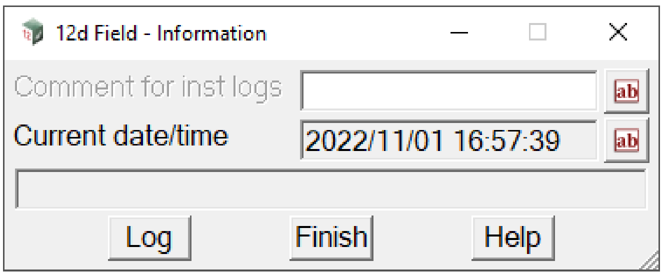
Continue to 16.5.11 Log Comment or return to 16.5 12d Field Options .

16.5.11 Log Comment

The Instrument **Log Comment** panel is for support purposes.

When an issue occurs the user can enter comments in this panel and the comments are written as part of the ***12d Field*** session time line to the logging files for later analysis.

Clicking **Inst log comment** brings up the **12d Field - Information** panel.



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

Field Description	Type	Defaults	Pop-Up
Comment for inst logs	text box		

*If **not blank,** the text is written to the instrument log file.*

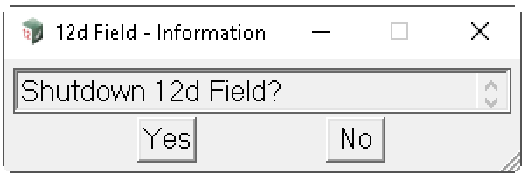
Current date/time text box

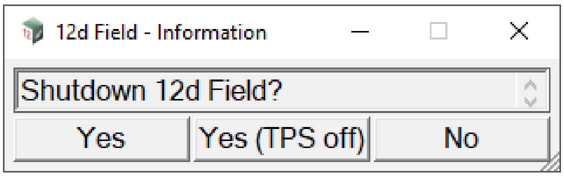
Displays the continuously updated date and time, for support purposes if doing a screen captures having this panel present with the time/date in view helps to tie the events in with the log files.

Continue to 16.5.12 12d Field Shutdown or return to 16.5 12d Field Options .

16.5.12 12d Field Shutdown

Clicking **Shutdown** brings up the **12d Field - Shutdown** panel.





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

Field Description	Type	Defaults	Pop-Up
Yes	button		

*If **pressed, 12d Field** is shutdown.*

Yes (TPS off)	button		

*If pressed, **12d Field** is shutdown and the TPS is powered off.*

***Note** this is only available on instruments that support this feature.*

No	button		

*If **pressed, 12d Field** is not shutdown.*

Continue to 16.5.13 Checks - GNSS or return to 16.5 12d Field Options .

16.5.13 Checks - GNSS

Clicking on the **Checks** menu option brings up the **GNSS Checks** menu.

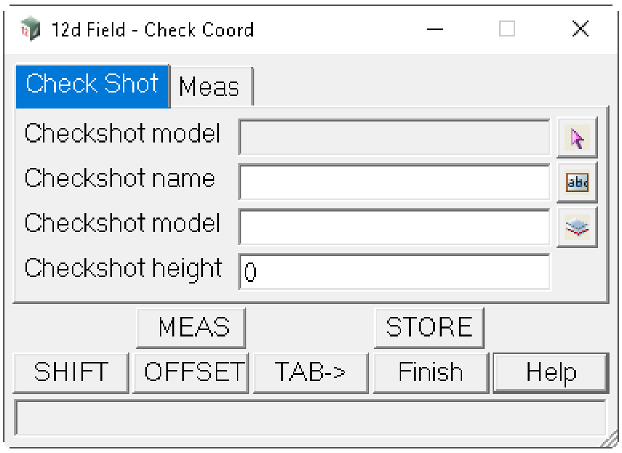
.

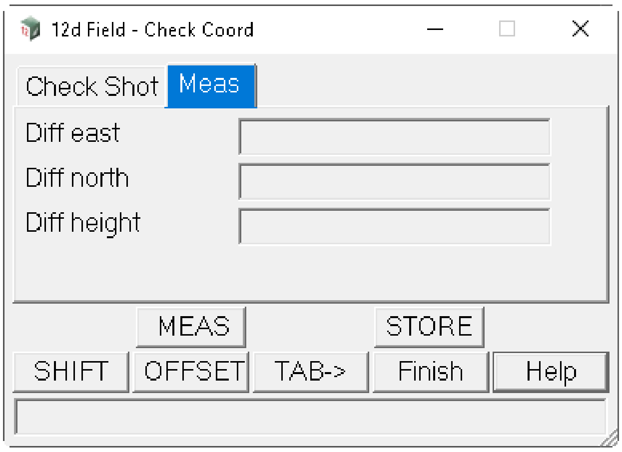
See
16.5.13.1 Check Coord - GNSS

16.5.13.1 Check Coord - GNSS

Clicking **Check Coord** brings up the **12d Field** -panel.

.





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

Field Description Type Defaults Pop-Up

Check Shot tab

Checkshot model model box

.

Meas tab

Diff east real box

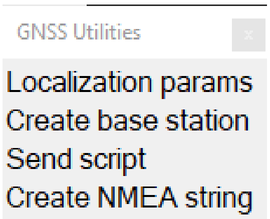
.

Continue to 16.5.14 GNSS Utilities or go back to 16.5.13 Checks - GNSS .

16.5.14 GNSS Utilities

Clicking on the **GNSS Utilities** menu option brings up the **GNSS Utilities** menu:

.



See
16.5.14.1 GNSS Localization Calculations
16.5.14.2 Create a Base Station
16.5.14.3 Send a Script
16.5.14.4 Create NMEA String

16.5.14.1 GNSS Localization Calculations

Position of option on menu: **Survey =>Field 12d =>GNSS utilities =>Localization params**

The panel is used to create the localization parameters used inside ***12d Field*** for reducing GNSS observations to a local system.

Note - prior to V15 this panel was separate to ***12d Field*** with the advent of V15 the panel is now only available while ***12d Field*** is running. From V15 with the new 12dcarto format the surveyor configures the projection and n-value settings prior to entering ***12d Field***, these are informational only in this panel which is solely used to do the local horizontal and vertical transformations.

Points collected with ***12d Field*** as raw WGS84 cartesian coordinates can be matched with local control points to calculate the parameters to convert GNSS readings directly into the local system. **Important - the points must be surveyed using V15, using observed points prior to V15 will give an incorrect localization.**

The ***12d Field*** localization treats horizontal and vertical components separately.

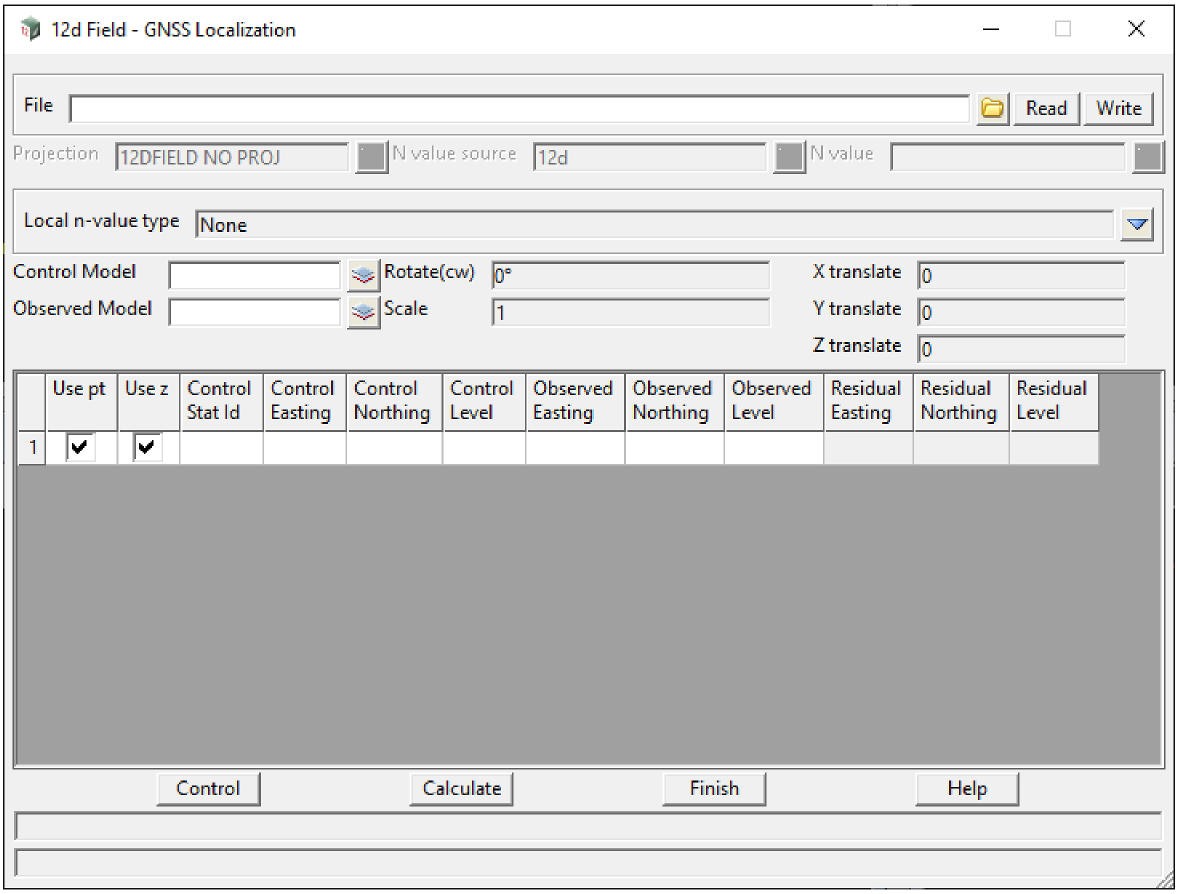
The horizontal transformation is a 2D Helmert with 2D translation, 2D rotation and uniform scaling of the x and y axes, the observed points are the raw WGS84 cartesian coordinates, reduced from long/lat via the current projection. The helmert transformation is used to fine tune the raw coordinates into the local variations always present with site control or to transform into a completely local system with no relation to the raw cartesian coordinates.

The vertical translation is then applied using the localized x,y coordinates, at this point the z value is the orthometric or geoid height, the ellipsoid less the n-value. Like the horizontal position the z value will often need fine tuning to match the local control, whether this be historical variations or substantial local variations in the n-values.

Note, prior to V15 the use of a local tin was available in this panel, this has been removed from V15 on as a local tin was not easily portable between projects.

The vertical translation can be a plane of best fit, a string, (ideal for long thin road corridors) or a trimesh. Note the plane, string and trimesh definitions are now written to the localization file so the localization is completely portable between projects. When you read an existing TDF_HEL file which has a string or trimesh it is added to a temporary model which can be copied, added to a view for visualisation and can also be edited if adjustments are needed. The model will have a GUID style name, "7825CF0A 2621 4943 A258 0057D3AD1867". When exiting the GNSS Localization panel the string/trimesh is saved to the TDF_HEL file and the temporary model deleted from the project.

Selecting **Localization params** brings up the **GNSS Localization** panel:



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

Field Description Type Defaults Pop-Up

File *.tdf_hel

The TDF_HEL file to be read in or written to. This is the file used by **12d Field** *to store the localization parameters.*

Read button

Read in the TDF_HEL file.

Write button

Write out the TDF_HEL file.

Projection input box

Informational only, the projection used by **12d Field** *to calculate the WGS84 cartesian coordinates.*

N value source input box Receiver, 12d

Informational only.

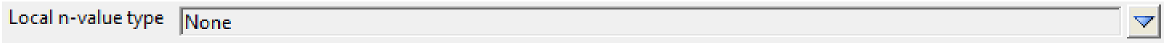
If ***None****, the ellipsoid and/or orthometric heights have probably been recognised as incorrect and need the GNSS Localization to calculate correctly.*

If ***Receiver****, the orthometric height has been calculated using the n-value in the NMEA sentence.*

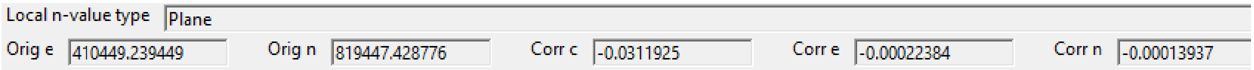
If ***12d****, the orthometric height has been calculated using the n-value from the 12dcarto file.*

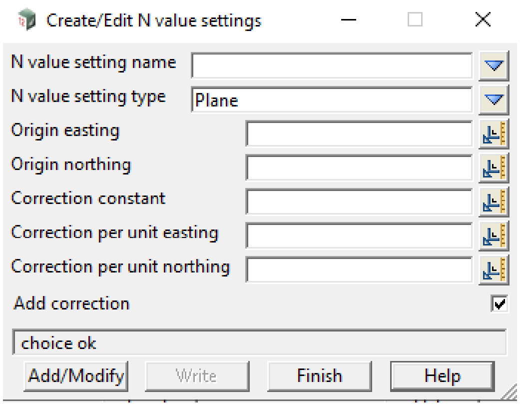
Local n-value type choice box None, Plane, String, Trimesh

*If **None**, the orthometric height of the observed point is used unadjusted.*



*If **Plane**, a plane of best fit is calculated from the observed points with valid z values, the plane coefficients are currently displayed and can be copied and pasted into the Create/Edit N value settings panel if necessary.*

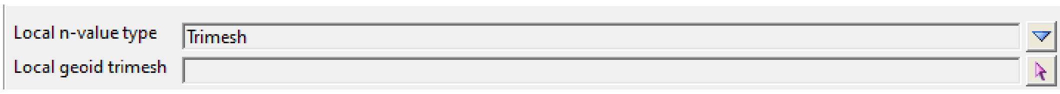




*If **String**, often, for long road corridors even with the most up to date n-value files there can be distinct variations between theoretical and actual values. Here, the user can create a string, typically a 3d like string with the vertex height the local n-value correction to apply, subsequently each point is dropped to this string and the interpolated z value used as the local n-value.*

***Note**, when using this option the string is written in a 12da format to the TDF_HEL file. It is therefore not necessary to copy the string between projects as an in memory copy of the string is created on reading the TDF_HEL file.*

*If **Trimesh**, the local xy are dropped vertically to a trimesh and the interpolated z added to the current height. For portability reasons a trimesh is used instead of a tin and like the **String** option the trimesh definition is written to the TDF_HEL and the trimesh does not need to be copied to all projects.*



*Note, for **String** and **Trimesh** types create the string or trimesh with the appropriate vertices set at 0.0 heights, when **Calculate** is pressed the Residual Level column will display the height differences to set to the string/trimesh.*

If local n value is a string or trimesh then it can be added to a model for editing or visualization if needed.

Control model model box available models

The model containing the control points, it is an error if the control point selected is not part of this model.

Observed model model box available models

The model containing the observed points, it is an error if the observed point selected is not part of this model.

***Note** - the **Control model** and **Observed model** boxes can be disabled by setting the environment variable **TDF_GPS_FORCE_CTRL_OBS_CHECK_4D** to **0**.*

Rotate (cw) angle box

The clockwise rotation parameter of the helmert transformation.

Scale real box

The scaling parameter of the helmert transformation.

X translate real box

The x translation of the helmert transformation.

Y translate real box

The y translation of the helmert transformation.

Z translate measure box

*The z translation of the helmert transformation, (note this is 0.0 if any local n-value method is used other than **None**.*

***Important note**, internally, due to historical reasons the helmert transformation is stored as a 0.0, 0.0 based transformation rather than the origin being at the centroid of the control points. While this makes no difference at all to the end result the x, y translation values can look disconcertingly wrong to the user. As such the x&y translation values displayed are that as if the transformation was a centroid based origin.*

*The only time this is evident is when an existing TDF_HEL localization is read in, the displayed x,y values are the 0 based values, pressing **Calculate** will show the 'true' centroid translations.*

The grid

Use pt tick box ticked

*If **ticked**, this point is used in the transformation xy calculations.*

Use z tick box ticked

*If **unticked**, this point is not used to calculate the transformation height parameter.*

Control Stat Id

The Id of the control station, will normally match the observed Id.

Control Easting/Northing/Level

The coordinate of the control station.

Observed Easting/Northing/Level

The coordinate of the observed point.

Residual Easting/Northing/Level

The delta of the observed point with the control point after the transformation has been applied.

Buttons

Control button

Start the selection of the control/observed point pairs.

Note that he environment variable PICK_ORDER_OBSERVED_FIRST_4D can be set to make the selection order 'observed' then 'control'. For ease of use 2 plan views should be used, one with the observed points and one with the control points.

Calculate button

Calculate the transformation and update the residuals in the grid control.

Although never recommended a one point transformation is allowed, the scale factor will be set to 1.0, rotation to 0° and simple x, y& z translations set.

For more than 1 point the scale and rotation will be calculated.

Finish button

Exit the panel, a warning message will appear if the transformation parameters have not yet been written to file.

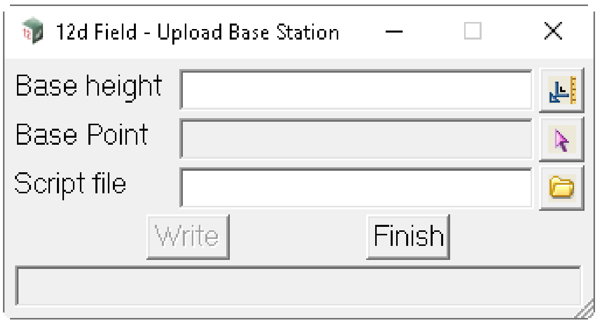
Continue to 16.5.14.2 Create a Base Station or return to 16.5.14 GNSS Utilities .

16.5.14.2 Create a Base Station

Position of option on menu: **Survey =>Field 12d=>GNSS Utilities =>Create Base Station**

This option select a local point to use as a base station.

Selecting **Create Base Station** brings up the **12d Field - Upload Base Station** panel:



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

Field Description	Type	Defaults	Pop-Up
Base height	measure box		

The height of the base station.

Base point	string select box		

The vertex to be the base station.

Script file	file box		

The interval between writing points to a log.

Buttons at Bottom

Write	button		

Write out the script file.

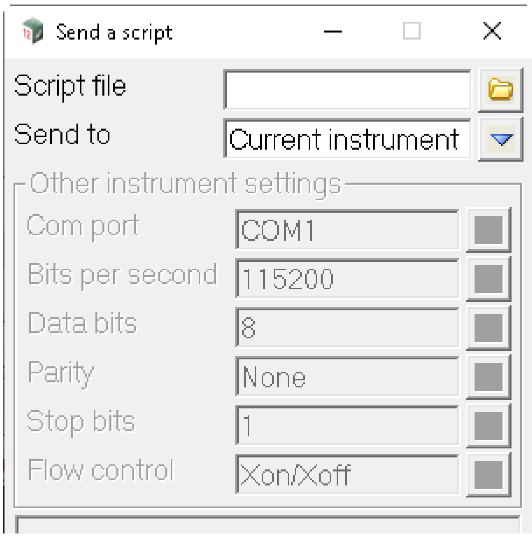
Continue to 16.5.14.3 Send a Script or go back to 16.5.14 GNSS Utilities .

16.5.14.3 Send a Script

Position of option on menu: **Survey =>Field 12d=>GNSS Utilities =>Send script**

This option uploads a script to a GNSS instrument.

Selecting **Send script** brings up the **Send a Script** panel:



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

Field Description	Type	Defaults	Pop-Up
Script file	file box		

The height of the base station.

Send to	choice box		Current instrument Other instrument

*If **Current instrument** then the script file is uploaded to the current GNSS instrument.*

*If **Other instrument** then the script file is uploaded to the current GNSS instrument using the settings in the "Other Instrument settings" section of the panel.*

COM port	choice box		

The com port to write the data out to.

Bits per second	choice box		

The number of bits per second when sending the data.

Data bits	choice box		5, 6, 7, 8, Mark

the number of bits that make up a data word.

Parity	choice box		None, Odd, Even, Mark, Space

The parity for the data word.

Stop bits	choice box		1, 1.5, 2

The number of stop bits in the data word.

Flow control	choice box		Xon/Xoff, Hardware, None

The protocol to use to control the flow of data.

Send	button		

Transmit the script file.

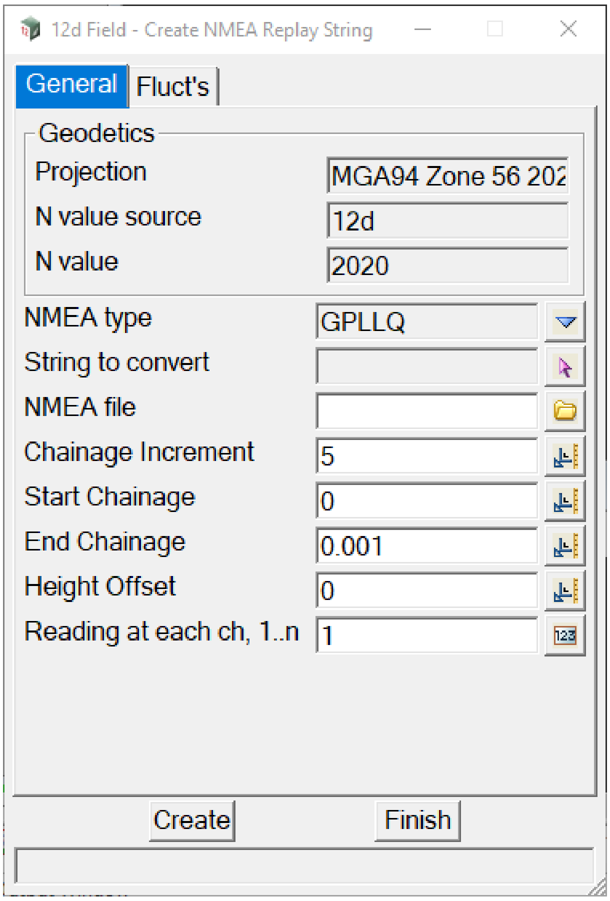
Continue to 16.5.14.4 Create NMEA String or go back to 16.5.14 GNSS Utilities .

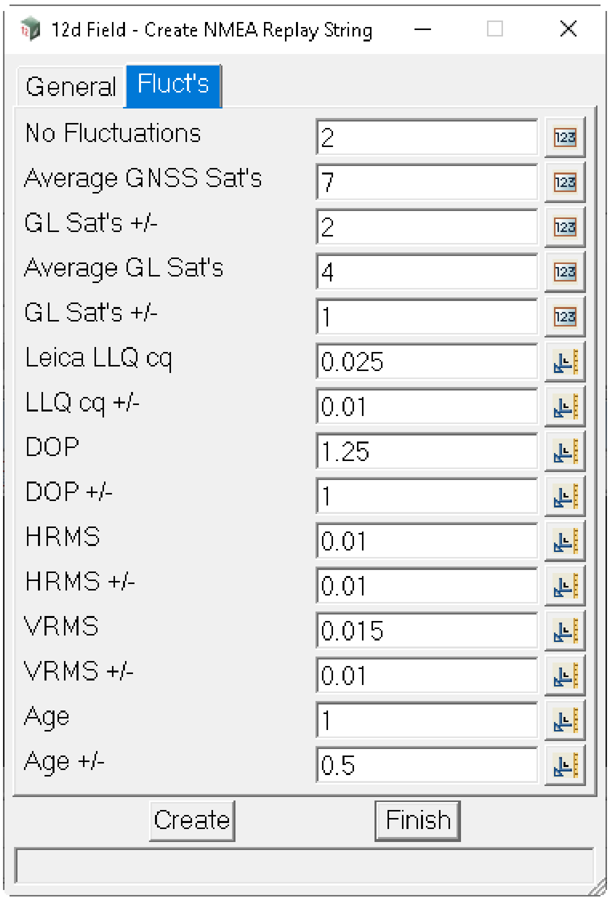
16.5.14.4 Create NMEA String

Position of option on menu: **Survey =>Field 12d=>GNSS Utilities =>Create Base Station**

This option creates a NMEA string from a super string to simulate a GNSS 'walking' around.

Selecting **Create NMEA string** brings up the **12d Field - Create NMEA Replay String** panel:





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

Field Description Type Defaults Pop-Up

Geodetics group

*Informational only, displays the current **Projection** and **N-value** details configured on starting **12d Field**.*

General tab

NMEA type choice box GPLLQ, GNLLQ, GPGGA GNGNS, GNGNS & GNGST

The standard for the NMEA string.

String to convert string select

The string to create a NMEA file for.

NMEA file file box

The name for the created NMEA file.

Chainage increment measure box

??.

Start chainage measure box

??.

End chainage measure box

??.

Height offset measure box

??.

Reading at each ch, 1... n integer box

??.

Fluct's tab

Num fluctuations integer box

??.

Average GNSS Sat's integer box

The average number of GNSS satellites.

Button at Bottom

Create button

Create the NMEA file for the selected string.

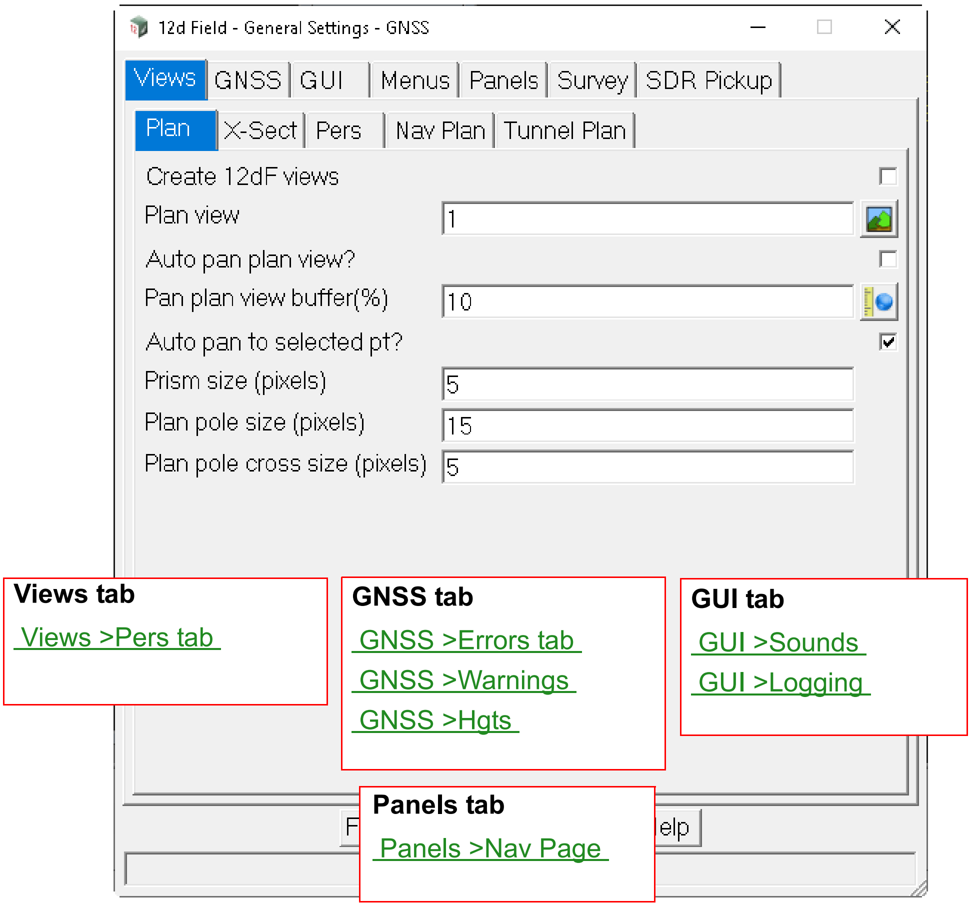
Continue to 16.5.15 General Settings - GNSS or go back to 16.5.14 GNSS Utilities .

16.5.15 General Settings - GNSS

The GNSS version of this panel is largely identical to the TPS version, differences only are shown. For common fields see 16.5.7 General Settings - TPS .

Clicking **Settings** brings up the **12d Field - Settings** panel for a GNSS.

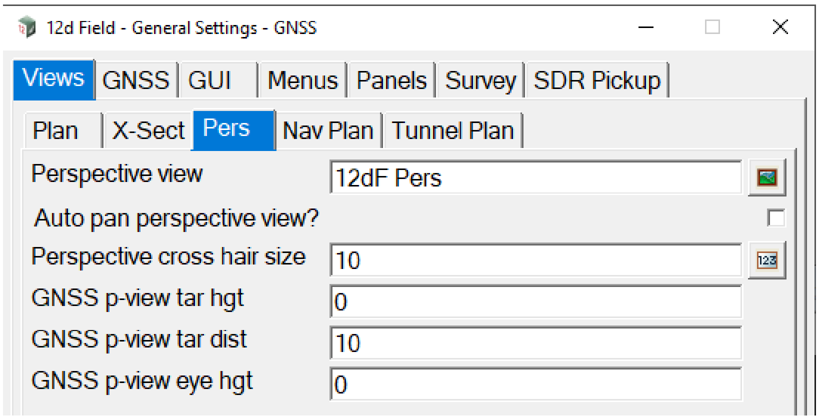
.



Views >Pers tab

For common fields see the TPS panel, Views >Pers tab.

.



GNSS only items

When auto-panning the GNSS perspective view there are 3 fields to control the orientation of the view.

GNSS p-view tar dist real box

The target point is this distance from the current GNSS position in the direction from the previous GNSS position.

GNSS p-view tar hgt real box

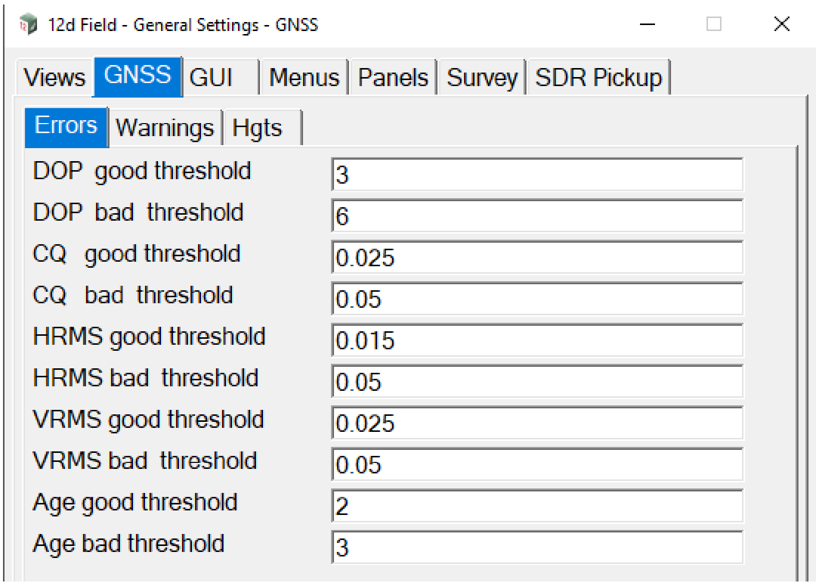
This height is added to the target point to give the final target position.

GNSS p-view eye hgt real box

The eye point of the view is the current GNSS position plus this height.

GNSS >Errors tab

.



The GPS errors define **good** and **bad** thresholds.

Any value less than the **good** threshold is considered **good**.

Any value greater than the **bad** threshold is considered **bad**.

Any value falling in between these 2 is considered **average**.

DOP, dilution of precision

CQ coordinate quality

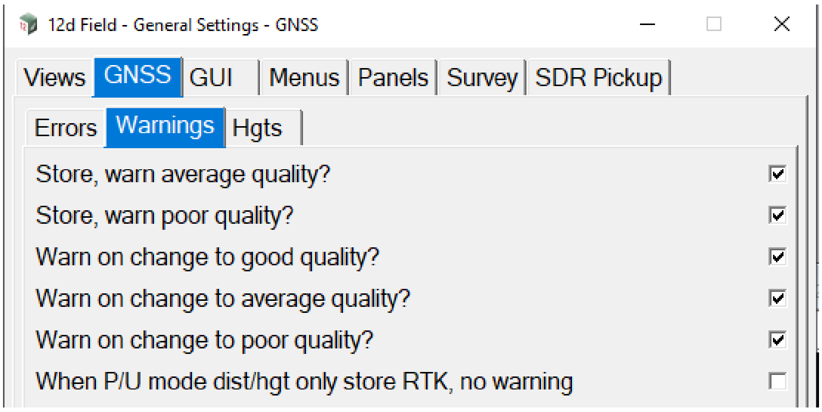
HRMS, horizontal root mean square

VRMS, vertical root mean square

Age, latency of measurements from GNSS satellites.

GNSS >Warnings

.



Store, warn average quality? tick box ticked

*If **ticked**, on storing a point and it is below **good** quality a message box will be shown prompting to continue.*

*If **not ticked**, on storing a point and it is **average** quality or better it will be stored without prompting.*

Store, warn poor quality? tick box ticked

*If **ticked**, on storing a point and it is below **average** quality a message box will be shown prompting to continue.*

*If **not ticked**, on storing a point and it is **poor** quality or better it will be stored without prompting.*

Store, warn on change to good quality? tick box ticked

*If **ticked**, and the GPS changes from poor or **average** to **good** quality a message box will be shown informing of this.*

*If **not ticked**, and the GPS changes from **poor** or **average** to good quality nothing will happen.*

Store, warn on change to average quality? tick box ticked

*If **ticked**, and the GPS changes from **poor** or **good** to average quality a message box will be shown informing of this.*

*If **not ticked**, and the GPS changes from **poor** or **good** to average quality nothing will happen.*

Store, warn on change to poor quality? tick box ticked

*If **ticked**, and the GPS changes from **good** or **average** to poor quality a message box will be shown informing of this.*

*If **not ticked**, and the GPS changes **good** or **average** to poor quality nothing will happen.*

When P/U mode dist/hgt only store RTK, no warning tick box not ticked

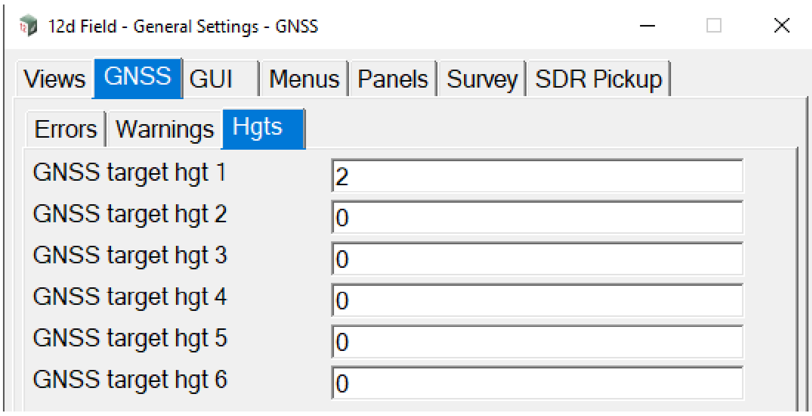
*This tick box applies when the user is in **Basic Pickup** automatically storing points when a certain distance or height difference from the previously stored point.*

*If **ticked**, a change from **good** quality to **poor** or **average** will not show a message box and points will be* *silently stored again once quality returns to **good**.*

*If **not ticked**, a change from **good** quality to **poor** or **average** will show a message box and storing of points will resume manually once quality has return to **good**.*

GNSS >Hgts

.



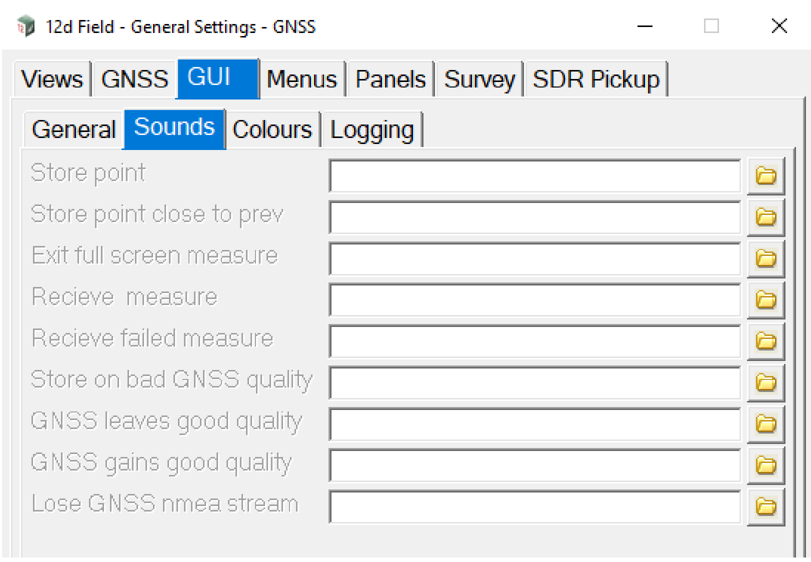
GNSS target hgt 1- 6 real box

Up to six target heights can be stored. They are displayed in the pop-up list for Preset heights fields.

GUI >Sounds

For common fields see the TPS panel, GUI >Sounds tab .

.



GNSS only options

Store on bad GNSS quality file box *.WAV files

*If **ticked**, play a sound on storing a point of **bad** quality.*

*If **not ticked**, do not play a sound on storing a point of **bad** quality.*

GNSS leaves good quality file box *.WAV files

*If **ticked**, play a sound when the quality changes from **good** to **bad** or **average**.*

*If **not ticked**, do not play a sound when the quality changes away from **good**.*

GNSS gains good quality file box *.WAV files

*If **ticked**, play a sound when the quality changes from **average** to **bad** or **good**.*

*If **not ticked**, do not play a sound when the quality changes back to **good**.*

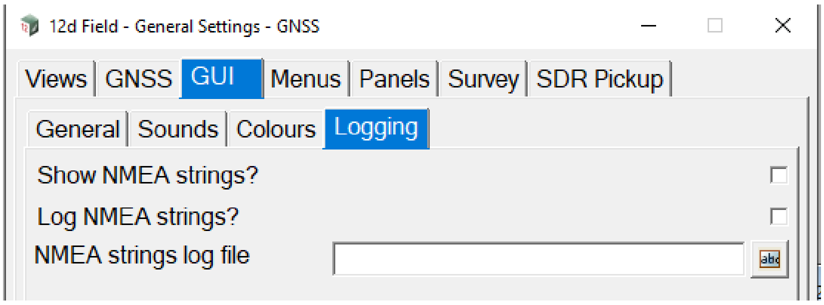
Lose GNSS nmea stream file box *.WAV files

*If **ticked**, play a sound when **12d Field** detects the NMEA string has been lost.*

*If **not ticked**, do not play a sound when the NMEA string has been lost.*

GUI >Logging

.



Show NMEA strings? tick box not ticked

*If **ticked**, the received NMEA sentence bundles are written to the output window.*

*If **not ticked**, the received NMEA sentence bundles are not shown.*

Log NMEA strings tick box not ticked

*If **ticked**, the received NMEA sentence bundles are written to a text log file.*

*If **not ticked**, the received NMEA sentence bundles are not written to file.*

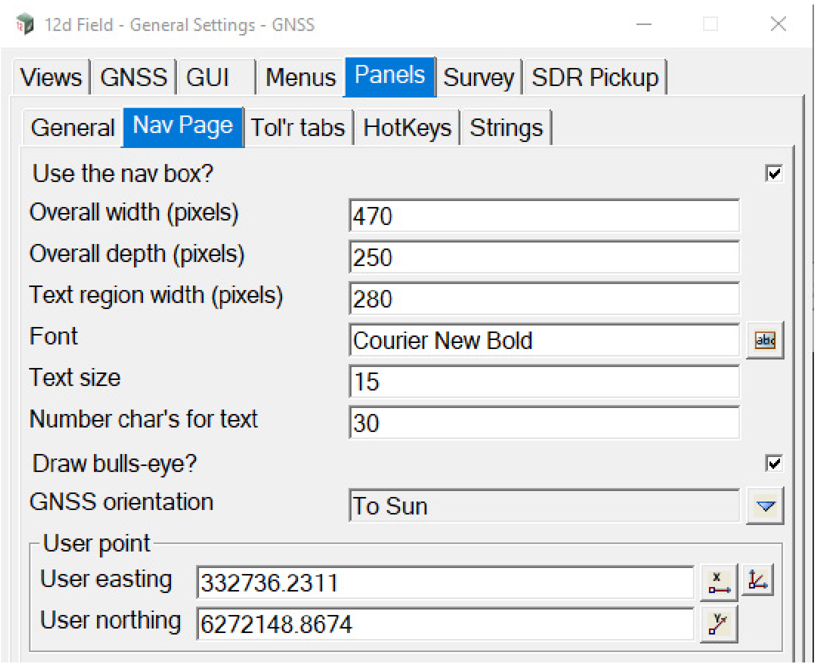
NMEA strings log file text box NMEA

The text file the NMEA sentence bundles will be written to.

Panels >Nav Page

For common fields see the TPS panel, Panels >Nav Page .

.

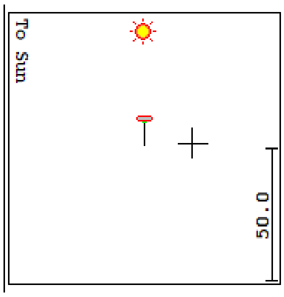


GNSS only options

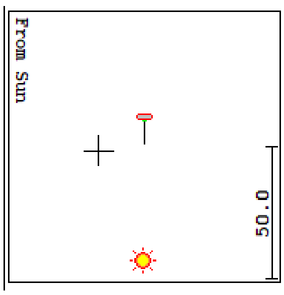
The GNS orientation is identical to TPS orientation except the options To Sun and From Sun are present.

GNS orientation	choice box	None, Centreline, From Station, To Station, To North, To Sun, From Sun, To User Point

To Sun



To From

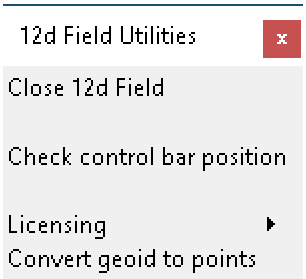


Continue to 16.6 12d Field Utilities or go back to 16.5.15 General Settings - GNSS .

16.6 12d Field Utilities

Position of menu: **Survey =>12d Field =>12d Field Utilities**

The **12d Field Utilities** walk right menu is:



See
16.6.1 Close 12d Field

16.6.2 Check Control Bar Position

16.6.3 Licensing

16.6.4 Convert Geoid to Points

16.6.1 Close 12d Field

Position of option on menu: **Survey =>12d Field =>12d Field Utilities => Close 12d field**

If pressed and ***12d Field*** is not running then an error is displayed.

If pressed and ***12d Field*** is running then the standard ***12d Field*** shutdown panel is displayed.

Continue to next section 16.6.2 Check Control Bar Position or return to 16.3 Starting and Configuring 12d Field .

16.6.2 Check Control Bar Position

Position of option on menu: **Survey =>12d Field =>12d Field Utilities =>Check control bar position**

If pressed and ***12d Field*** is not running an error is displayed.

If pressed and ***12d Field*** is running then two things happen:

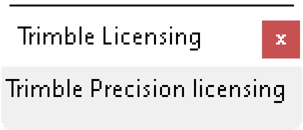
1. The position of the control bar is checked and if fully or partially outside the ***12d Model*** screen the control bar will be moved to the centre of the ***12d Model*** screen.
2. Then, moved or unmoved, the ***12d Field*** control bar will be refreshed and brought to the front of the ***12d Model*** screen.

Continue to next section 16.7 12d Field Codes or return to 16.3 Starting and Configuring 12d Field .

16.6.3 Licensing

Position of menu: **Survey =>12d Field =>12d Field Utilities =>Licensing**

The **Licensing** walk right menu is:



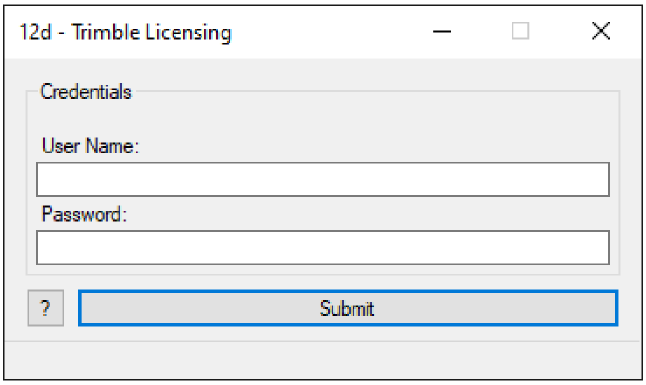
See
16.6.3.1 Trimble Precision Licensing

16.6.3.1 Trimble Precision Licensing

Position of menu: **Survey =>12d Field =>Utilities =>Trimble Precision licensing**

To connect to a Trimble or Spectra instrument the user must first licence their computer/tablet for use with the Trimble libraries. To use this option the user must have a valid Trimble login and administrative rights for the computer.

Clicking on **Trimble Precision licensing** runs the Trimble program ***TrimbleLicense.exe***.



On successful submission the computer/tablet will be able to connect to the Trimble/Spectra instrument with 12dField straight away.

Continue to next section 16.6.4 Convert Geoid to Points or return to 16.3 Starting and Configuring 12d Field .

16.6.4 Convert Geoid to Points

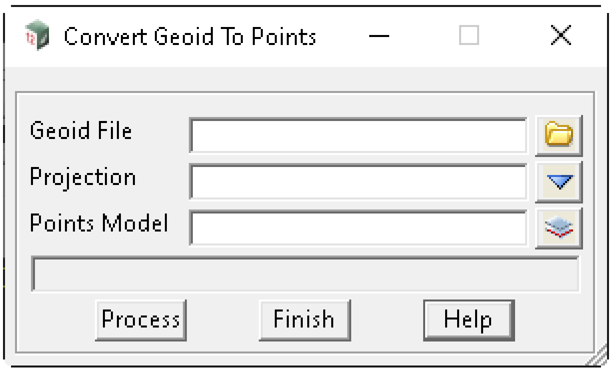
Position of option on menu: **Survey =>Field 12d=>12d Field Utilities =>GNSS Localisation =>Convert geoid to points**

Purpose

1.Convert *.dat files from (fttps://ftp.ga.gov.au/geodesy-outgoing/gravity/ausgeoid) to a 12d Model of points as preparation for creating a Geoid tin

2.Applies a defined projection

3.Allows the user to combine multiple *.dat files into one Model



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

Field Description	Type	Defaults	Pop-Up
Geoid File	file box		*.dat

Select downloaded files from ftp site ftp://ftp.ga.gov.au/geodesy-outgoing/gravity/ausgeoid.

Projection	projection box	current projection	available projections

*If **not blank**, 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 6.6.7 Cartographic Projections.

Points Model	input box		available models

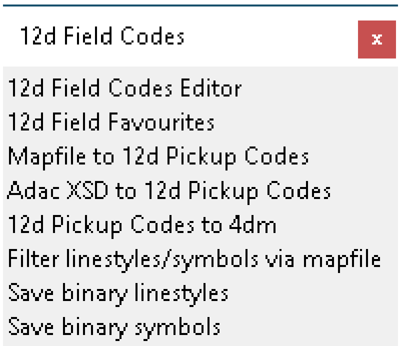
Name of the model that data is placed in. The model will be created if it does not already exist. This field must be filled in.

Continue to next section 16.7 12d Field Codes or return to 16.3 Starting and Configuring 12d Field .

16.7 12d Field Codes

Position on menu: **Survey =>12d Field => 12d Field codes**

The **12d codes** walk right menu is



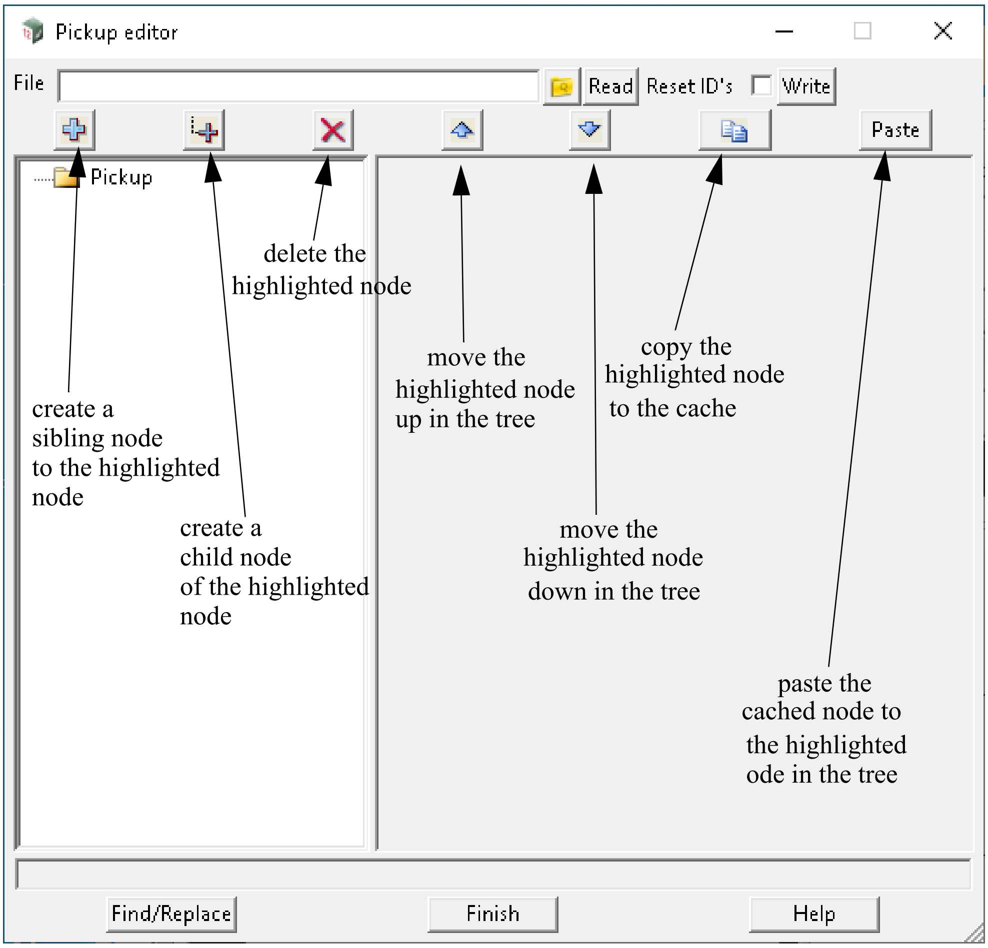
See
16.7.1 12d Field Codes Editor
16.7.2 12d Field Favourites
16.7.3 Mapfile to 12d Pickup Codes
16.7.4 ADAC XSD to 12d Pickup Codes
16.7.5 12d Pickup Codes to Macro
16.7.6 Filter Linestyles/Symbols via Mapfile
16.7.7 Save Binary Linestyles
16.7.8 Save Binary Symbols

16.7.1 12d Field Codes Editor

Position on menu: Survey =>12d Field =>12d Field Codes =>12d Field Codes Editor

The **Pickup Editor** panel allows you to define and edit feature codes to be used in **12d Field Pickup**.

Selecting **12d Pickup Codes Editor** brings up the **Pickup Editor** panel.



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

Field Description Type Defaults Pop-Up

File

The 12d Field pickup codes file to edit or create.

Read

Reads the pickup codes file.

Write

Writes the pickup codes file.

Icons

*Add a new node at the current level of the highlighted node in the tree - a sibling node. You can't add a sibling node to the top level **Pickup** node.*

Add a child to the current highlighted node in the tree.

Delete the current highlighted node in the tree.

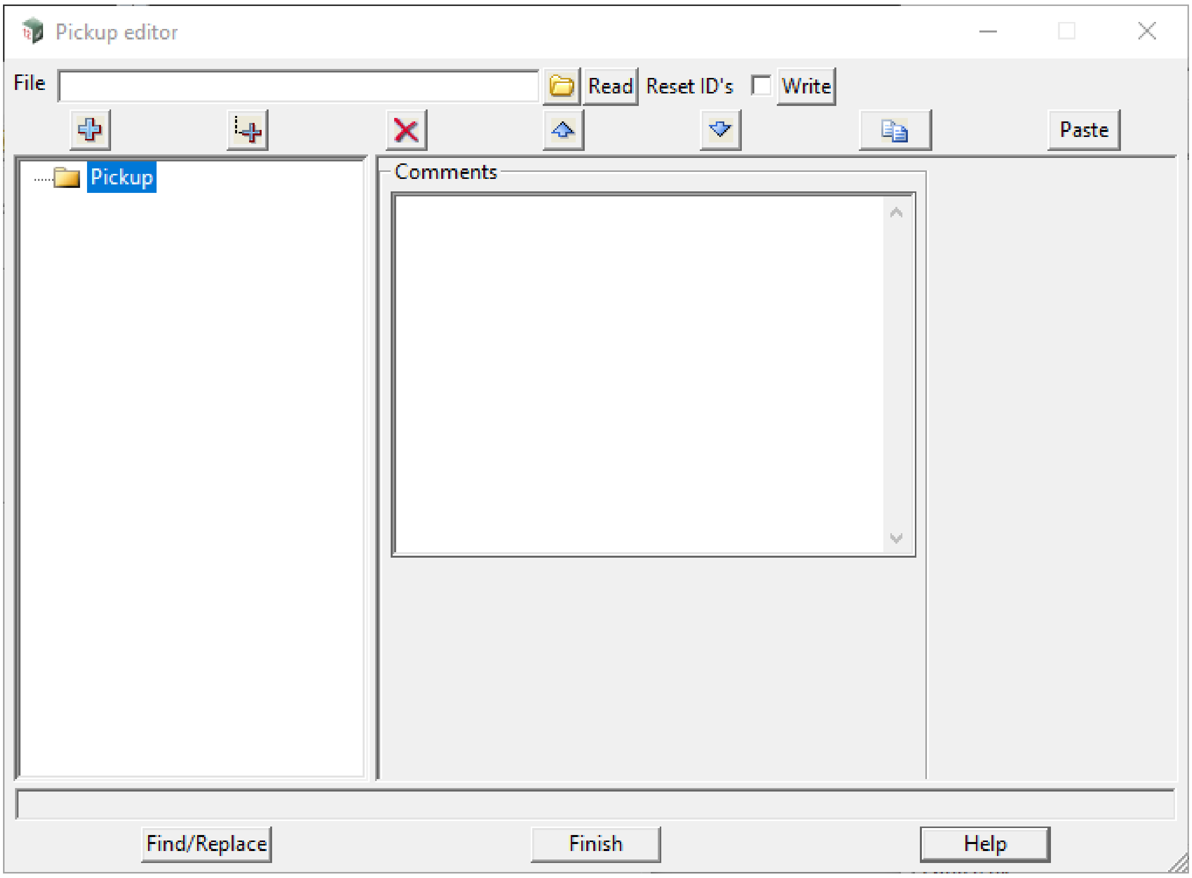
Moves the current highlighted node in the tree up.

Moves the current highlighted node down in the tree.

Copies to the cache the current highlighted node in the tree.

Paste *Pastes the cached node to the current node in the tree (if it is allowed).*

When you click on and highlight the **Pickup** node, a ***Comments*** text area is displayed on the right hand side of the panel.

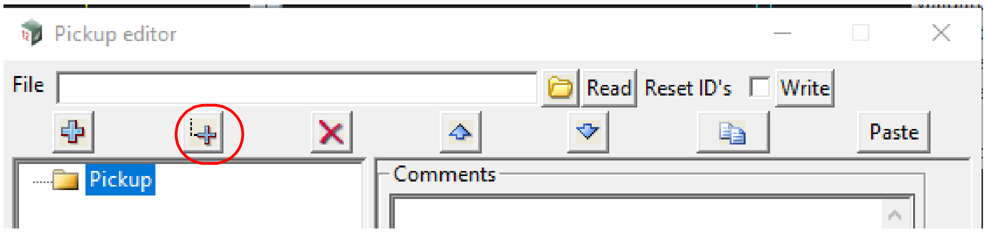


Text can be entered into the ***Comments*** area and it will be saved with the **Pickup Codes File.**

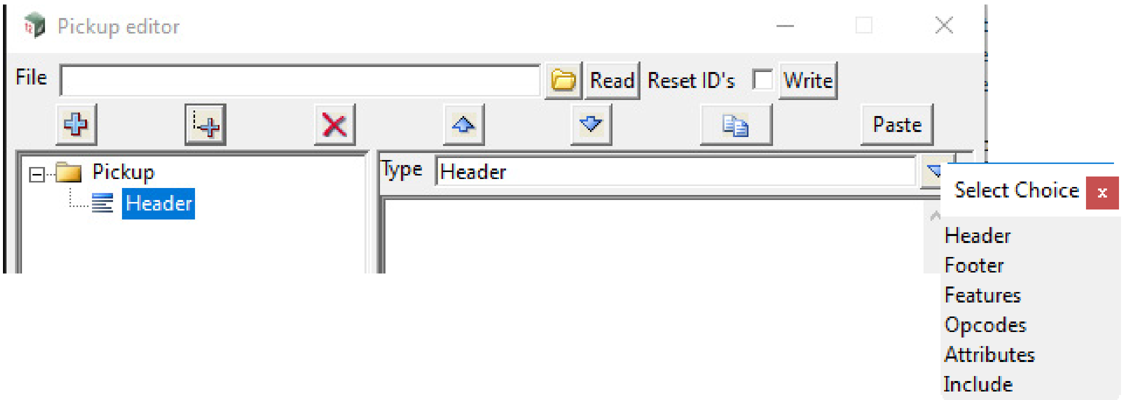
For information on using the panel, continue to next section 16.7.1.1 Defining Pickup Codes or return to 16.3 Starting and Configuring 12d Field .

16.7.1.1 Defining Pickup Codes

At the first level under **Pickup**, there are a number of different **Types of nodes** that can be added to the ***Pickup Codes File*** by first clicking on and highlighting the **Pickup** node, and then clicking on the **Add a Child** icon .

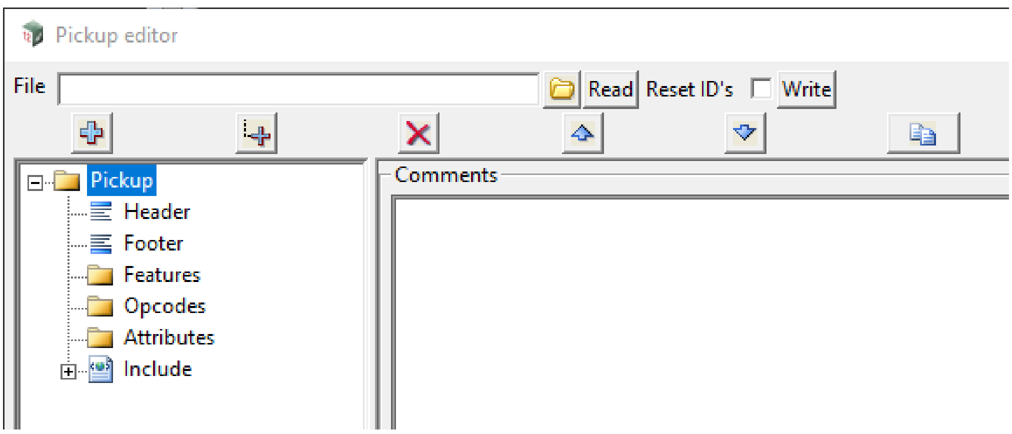


By default a **Header Type** is created but this can then be changed by clicking on the choice icon for the **Type** field and selecting from the pop-up list.



For example, selecting **Features** adds a **Prompt** field which is displayed as the **Features** name in ***12d Field Pickup***.and also replaces the node name **Header**.

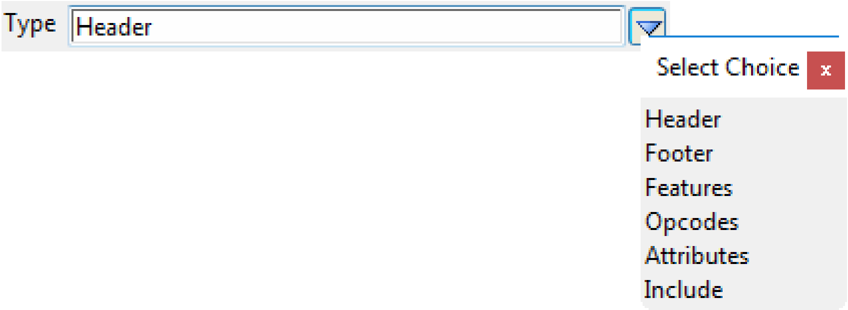
Or an example with one of each Type with the type of Type as the Prompt:



Important Note

To see the change of node name (e.g. **Header** to **Road**) in the **Pickup Editor**, you may have to click onto another node in the tree and then click back onto the current node.

For information on each of the **Types,** see:

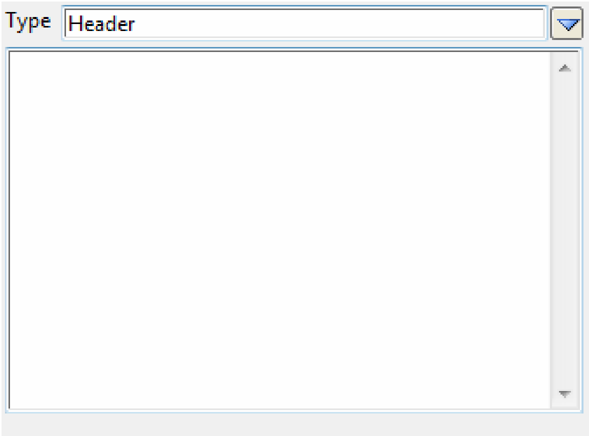


See

16.7.1.1.1 Header
16.7.1.2 Footer
16.7.1.2.2 Features
16.7.1.2.3 Opcodes
16.7.1.2.4 Attributes
16.7.1.2.1 Include

16.7.1.1.1 Header

A **Header Type** is for typing in data that will be included at the top of any generated macro code.



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

Field Description	Type	Defaults	Pop-Up

Text field

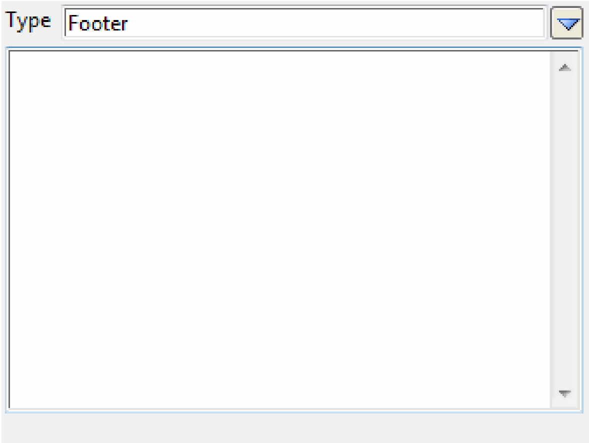
The macro code to include in the header of the macro.

There are **no** Children for **Header**.

Continue to next section 16.7.1.2 Footer or return to 16.3 Starting and Configuring 12d Field .

16.7.1.2 Footer

A **Footer Type** is for typing in data that will be included at the bottom of any generated macro code.



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

Field Description Type Defaults Pop-Up

Text field

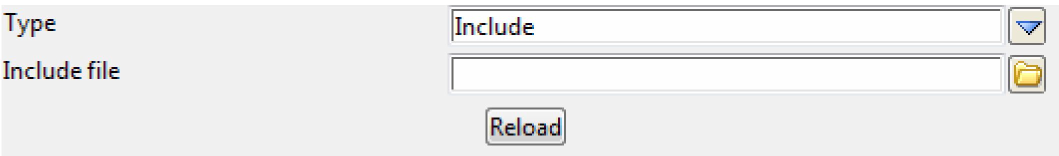
The macro code to include in the footer of the macro.

There are **no** Children for **Footer**.

Continue to next section 16.7.1.2.1 Include or return to 16.3 Starting and Configuring 12d Field .

16.7.1.2.1 Include

An **Include Type** is used for including another **Field Code File** at the place where the **Insert** occurs in the current **Field Code File**.



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

Field Description Type Defaults Pop-Up

Include file file

The field code file to be included.

Reload button

Reloads the include file.

Note that **Include files** can be edited inline, within one editor.

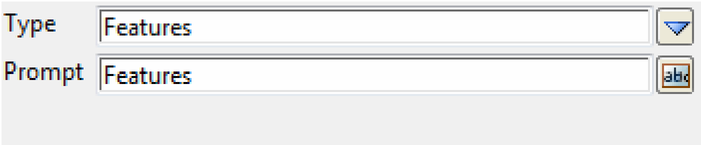
There are **no** Children for **Include**.

Continue to next section 16.7.1.2.2 Features or return to 16.3 Starting and Configuring 12d Field .

16.7.1.2.2 Features

The **Features Type** can contain one or more Children of type **Feature**, **Features Group** or **Include** items.

Given that a **Features** can contain a ***Features Group*** which can contain a ***Features Group*** then a tree structure can be defined under any **Features**.



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

Field Description	Type	Defaults	Pop-Up
Prompt	input		

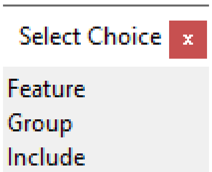
The prompt name of the Features that becomes the node name and will appear in 12d Field Pickup.

For example, for a **Features** called **Road**:

Important Note

The see the change of node name (e.g. **Road**) in the **Pickup Editor**, you may have to click onto another node in the tree and then click back onto the current node.

Allowed Children of a Features

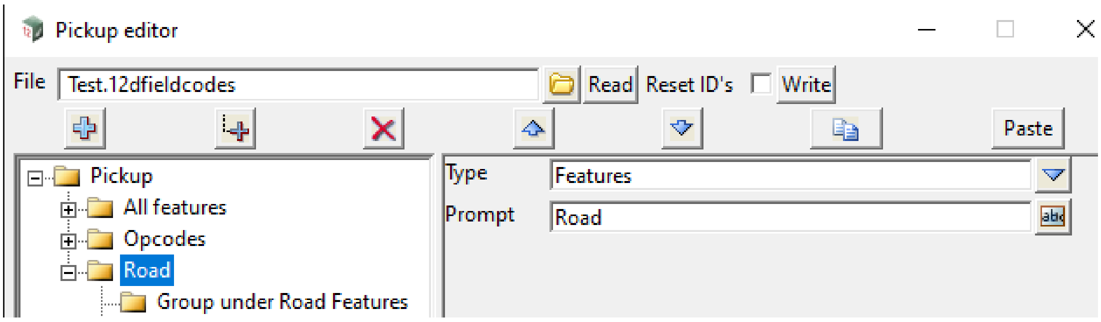


See
16.7.1.2.2.1.1 Feature
16.7.1.2.2.1 Features Group
16.7.1.2.1 Include

16.7.1.2.2.1 Features Group

Defines a **Features Group** that can contain one or more of children of type ***Features Group, Feature*** or ***Include***.

Given that a **Features Group** can contain a ***Features Group*** which can contain a ***Features Group*** then a tree structure can be defined under any **Features**.



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

Field Description	Type	Defaults	Pop-Up
Prompt	input		

The cosmetic name for the Features Group.

Allowed Children of a Features Group

Select Choice	See
Feature	16.7.1.2.2.1.1 Feature
Group	16.7.1.2.2.1 Features Group
Include	16.7.1.2.1 Include

Continue to next section 16.7.1.2.2.1.1 Feature or return to 16.3 Starting and Configuring 12d Field
.

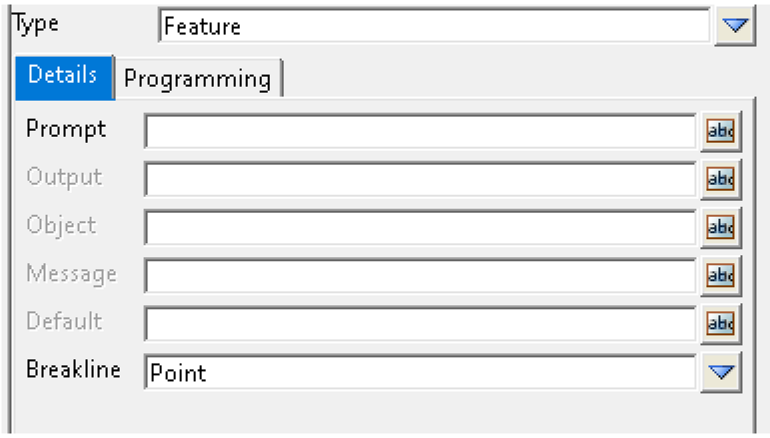
16.7.1.2.2.1.1 Feature

The **Feature** type defines the feature string that is now being picked up in the field. For example **EB** for Edge of Bitumen. The following measurement will then define the vertices that make up the feature string.

A **Feature** can contain one or more of children of type ***Feature Group***, ***Choice group***, ***Opcode***, ***Feature***, ***Real*** attribute, ***Text*** attribute, ***Integer*** attribute, ***Measure***, ***Choice*** or ***Include***.

Given that a **Feature** can contain a ***Feature Group*** which can contain a ***Feature Group*** then a tree structure can be defined under any **Feature**.

Important Note: Unlike **Feature**, a **Feature Group** can **not** contain an **Opcode** as a Child and so there is ***only one*** **Opcode** in the tree structure under a **Feature**.



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

Field Description	Type	Defaults	Pop-Up

Details tab

Prompt	text box		

The name to be displayed when this Feature is used during 12d Field Pickup. For example, Edge of Bitumen or EB.

Output	text box		

*If **not blank**, the value to output to the 12d Field Pickup file. e.g. EB.*
*If **blank** it uses the value in **Prompt**.*

Object	text box		

*If **not blank**, the value to be used to define a set of attributes.*
*If **blank** it uses the value in **Output**.*

Message	text box		

A message to display when picking up the feature.

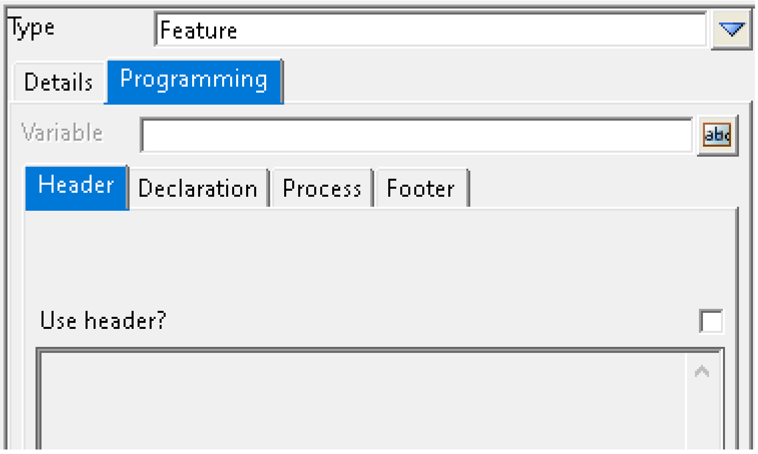
Default	text box		

The default value.

Breakline	choice box		Both, Point, Line

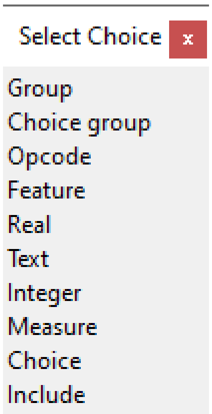
The breakline type for the created feature string.

Programming tab



See 16.7.1.2.5 Programming .

Allowed Children of a Feature



See
16.7.1.2.2.1.2 Feature Group
16.7.1.2.2.1.3 Choice Group Attribute
16.7.1.2.2.1.6 Opcode
16.7.1.2.2.1.7 Feature Attribute
16.7.1.2.2.1.8 Real Attribute
16.7.1.2.2.1.9 Text Attribute
16.7.1.2.2.1.10 Integer Attribute
16.7.1.2.2.1.11 Measure Attribute

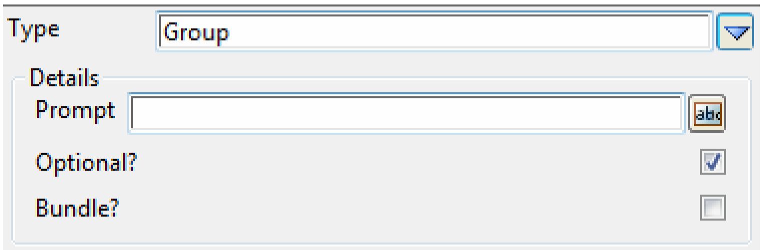
16.7.1.2.1 Include

16.7.1.2.2.1.2 Feature Group

Defines a **Feature Group** that can contain one or more of children of type ***Feature Group***, ***Choice group***, ***Feature***, ***Real*** attribute, ***Text*** attribute, ***Integer*** attribute, ***Measure***, ***Choice*** or ***Include****.*

Given that a **Feature Group** can contain a ***Feature Group*** which can contain a ***Feature Group*** then a tree structure can be defined under any ***Feature Group***.

Note: unlike **Feature**, a **Feature Group** can not contain an **Opcode** as a Child and so there is only one **Opcode** in the tree under a **Feature**.



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

Field Description	Type	Defaults	Pop-Up
Prompt	input		

The cosmetic name for the group.

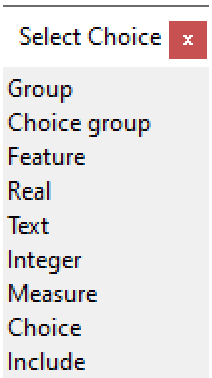
Optional?	tick box		

*If **ticked**, filling out the group is optional.*
*If **not ticked,** at least one field in the group must be filled out.*

Bundle?	tick box		

*If **ticked**, this feature group is treated as a bundle.*
*If **not ticked**, this group is treated as a normal group.*

Allowed Children under a Feature Group



See
16.7.1.2.2.1.2 Feature Group
16.7.1.2.2.1.3 Choice Group Attribute
16.7.1.2.2.1.7 Feature Attribute
16.7.1.2.2.1.8 Real Attribute
16.7.1.2.2.1.9 Text Attribute
16.7.1.2.2.1.10 Integer Attribute
16.7.1.2.2.1.11 Measure Attribute

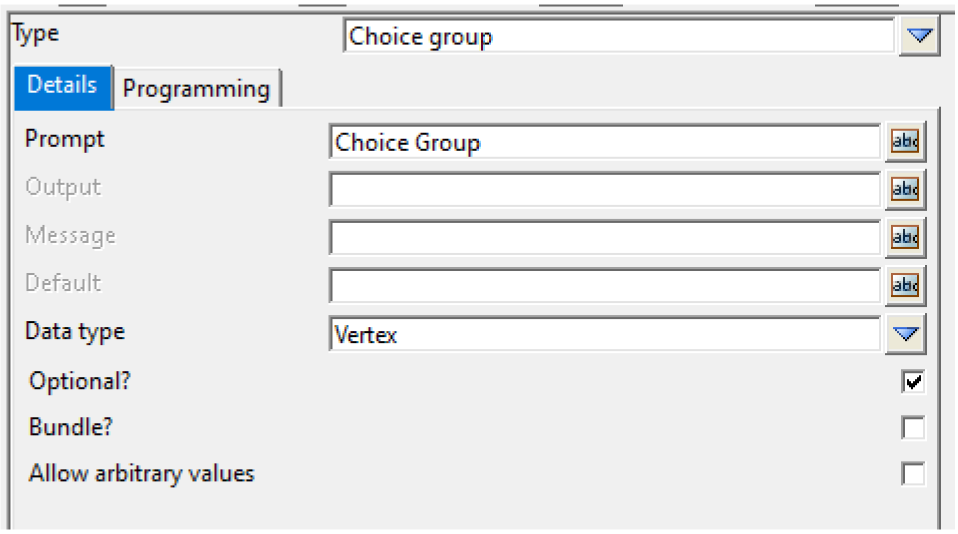
16.7.1.2.1 Include

16.7.1.2.2.1.3 Choice Group Attribute

This allows the definition of an attribute defined by a set of choices, defined into groups, to attach to a feature.

A **Choice Group Attribute** can contain one or more of children of type ***Choice group***, ***Choice data*** or ***Include***.

Given that a **Choice Group Attribute** can contain a ***Choice group*** which can contain a ***Choice group*** then a tree structure can be defined under any ***Choice Group Attribute***.



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

Field Description	Type	Defaults	Pop-Up

Details tab

Prompt	input		
The cosmetic name to be displayed during 12d field pickup			
Output	input		
The optional value to output to the pickup file - uses prompt if undefined			
Message	input		
A message to display when displaying the choice group			
Default	input		
The default value			
Data type	choice box		Vertex, Next Segment, Prev Segment, String, Prompt, Prompt Segment
How the attribute should be attached			
Optional?	tick box		
*If **ticked**, this attribute is treated as optional.* *If **not ticked**, this attribute must be filled out.*			
Bundle?	tick box		
*If **ticked**, this attribute is treated as a bundle.* *If **not ticked**, this attribute is treated as a normal attribute.*			

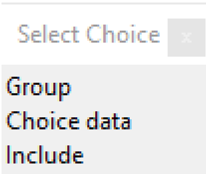
Allow arbitrary values tick box

If ***ticked****,??.*
If ***not ticked****,??.*

Programming tab

See 16.7.1.2.5 Programming .

Allowed Children Under a Choice Group Attribute



See
16.7.1.2.2.1.4 Choice Group
16.7.1.2.2.1.5 Choice Data
16.7.1.2.1 Include

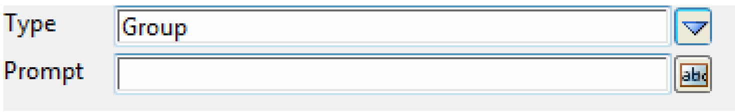
Continue to next section 16.7.1.2.2.1.4 Choice Group or return to 16.3 Starting and Configuring 12d Field .

16.7.1.2.2.1.4 Choice Group

Allows a group of choice group attribute related data to be defined

A **Choice Group** can contain one or more of children of type ***Choice group***, ***Choice data*** or ***Include***.

Given that a **Choice group** can contain a ***Choice group*** which can contain a ***Choice group*** then a tree structure can be defined under any ***Choice Group***.

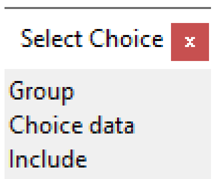


The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Prompt	input		

The cosmetic name of the group to display.

Allowed Children under a Choice Group

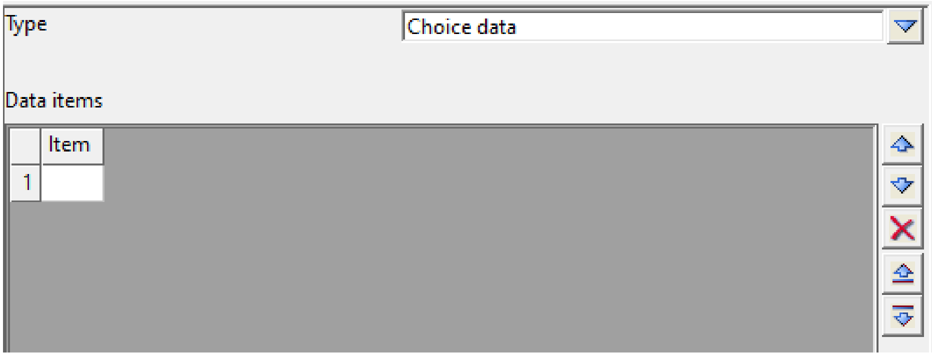


See
16.7.1.2.2.1.4 Choice Group
16.7.1.2.2.1.5 Choice Data
16.7.1.2.1 Include

Continue to next section 16.7.1.2.2.1.5 Choice Data or return to 16.3 Starting and Configuring 12d Field .

16.7.1.2.2.1.5 Choice Data

The choices to display for a Choice attribute.



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

Field Description Type Defaults Pop-Up

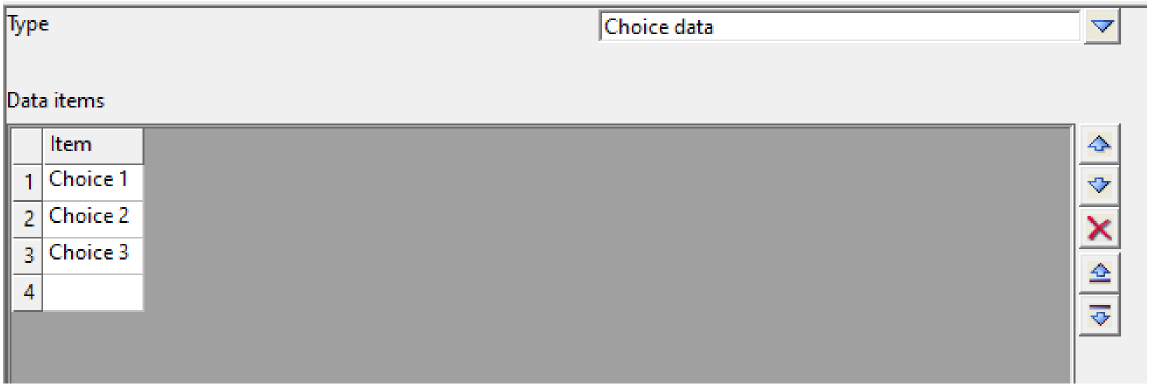
Data Items

Grid.

Item column of texts

The values for a Choice.

For example:

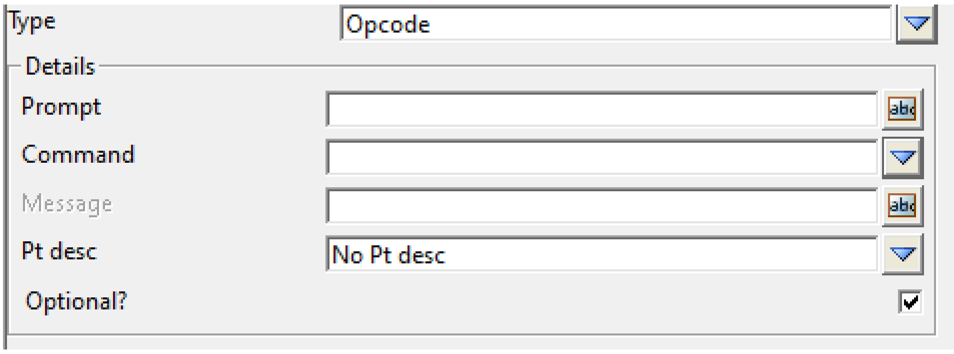


There are no Children under a Choice Data

Continue to next section 16.7.1.2.2.1.6 Opcode or return to 16.3 Starting and Configuring 12d Field

16.7.1.2.2.1.6 Opcode

This defines an attribute attached to a **Feature** that requires the entry of an ***12d Field*** **Opcode**.



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

Field Description	Type	Defaults	Pop-Up
Prompt	text box		

The cosmetic name for the opcode.

Command	opcode box		

The Opcode to be recorded in the attribute. For the choice of Opcodes, see 26.8 12d Survey Opcode Summary .

Message	input		

An optional message to display when entering the opcode.

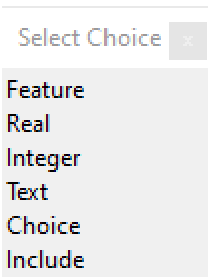
Pt desc	choice box		No pt desc, Pt desc, Null pt desc

Specifies if there is a point description or not.

Optional	tick box		

*If **ticked**, this opcode attribute is optional.*
*If **not ticked,** this opcode attribute must be entered in the field.*

Allowed Children under an Opcode

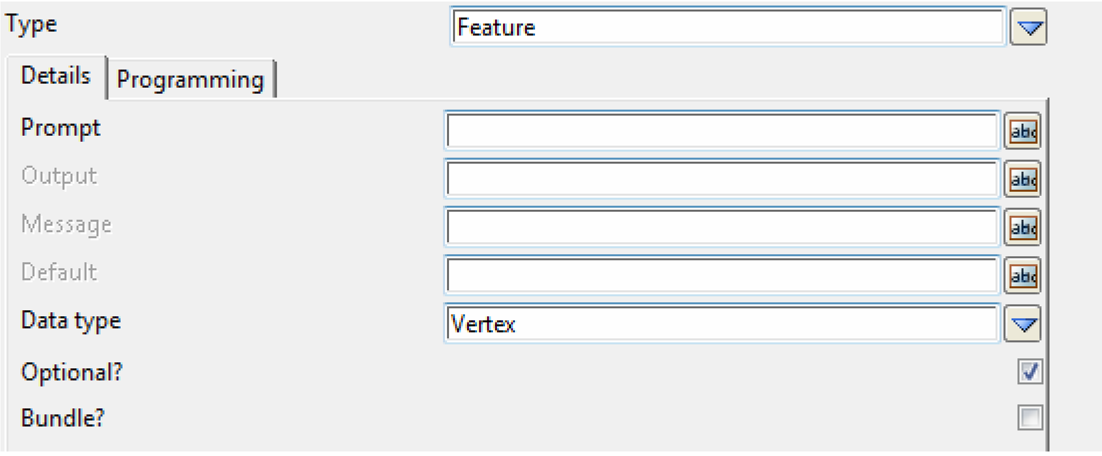


See
16.7.1.2.2.1.7 Feature Attribute
16.7.1.2.2.1.8 Real Attribute
16.7.1.2.2.1.10 Integer Attribute
16.7.1.2.2.1.9 Text Attribute
16.7.1.2.2.1.12 Choice Attribute
16.7.1.2.1 Include

Continue to next section 16.7.1.2.2.1.7 Feature Attribute or return to 16.3 Starting and Configuring 12d Field .

16.7.1.2.2.1.7 Feature Attribute

This defines an attribute attached to a feature, which requires the entry of another feature.



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

Field Description	Type	Defaults	Pop-Up

Details tab

Prompt input

The cosmetic name to be displayed during 12d field pickup.

Output input

The optional value to output to the pickup file - uses prompt if undefined.

Message input

A message to display when picking up the code.

Default input

The default value.

Data type choice box — Pop-Up: Vertex, Next Segment, Prev Segment, String, Prompt, Prompt Segment

How the attribute should be attached.

Optional? tick box

*If **ticked**, this attribute is treated as optional.*
*If **not ticked**, this attribute must be filled out*

Bundle? tick box

*If **ticked**, this attribute is treated as a bundle.*
*If **not ticked**, this attribute is treated as a normal attribute.*

Programming tab

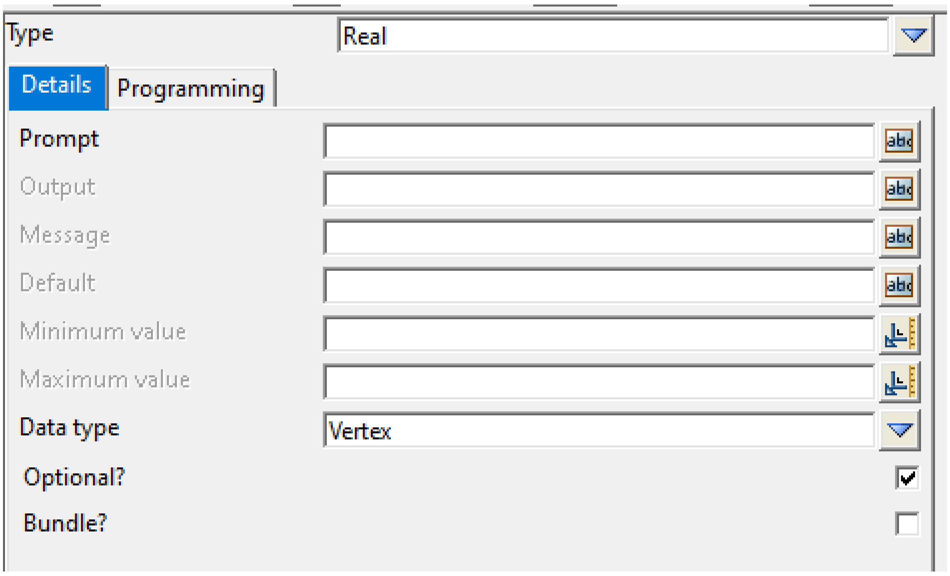
See 16.7.1.2.5 Programming .

There are no Children under a Feature Attribute

Continue to next section 16.7.1.2.2.1.8 Real Attribute or return to 16.3 Starting and Configuring 12d Field .

16.7.1.2.2.1.8 Real Attribute

This defines an attribute attached to a Feature, which requires the entry of a real value.



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

Field Description	Type	Defaults	Pop-Up

Details tab

Prompt text box

The cosmetic name to be displayed during 12d field pickup.

Output text box

The optional value to output to the pickup file - uses prompt if undefined.

Message text box

A message to display when picking up the code.

Default text box

The default value.

Minimum value real box

*If **not blank,** the entered value must be greater than or equal to this value.*
*If **blank** then there is no minimum value restriction.*

Maximum value real box

*If **not blank**, the entered value must be less than or equal to this value.*
*If **blank** then there is no maximum value restriction.*

Data type choice box — Pop-Up: Vertex, Next Segment, Prev Segment, String, Prompt, Prompt Segment

How the attribute should be attached.

Optional? tick box

*If **ticked**, this attribute is treated as optional.*

*If **not ticked**, this attribute must be filled out.*

Bundle? tick box

*If **ticked**, this attribute is treated as a bundle.*
*If **not ticked**, this attribute is treated as a normal attribute.*

Programming tab

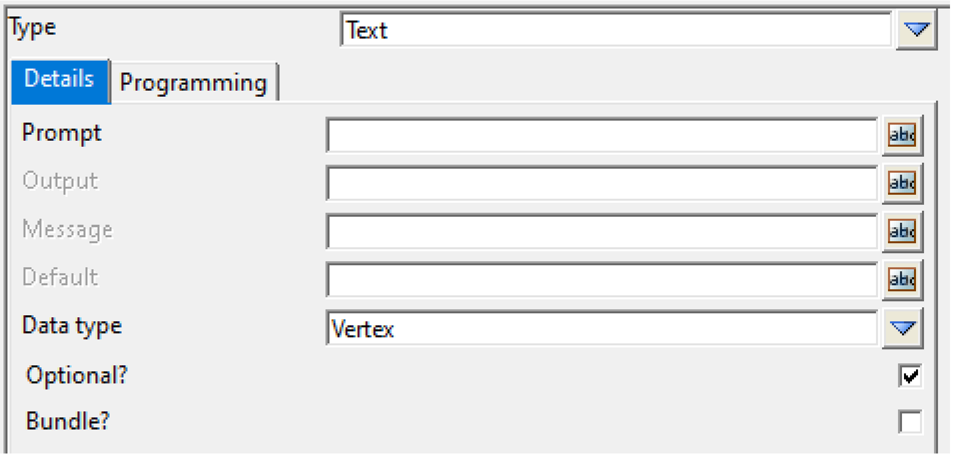
See 16.7.1.2.5 Programming .

There are no Children under a Real Attribute.

Continue to next section 16.7.1.2.2.1.9 Text Attribute or return to 16.3 Starting and Configuring 12d Field .

16.7.1.2.2.1.9 Text Attribute

This defines an attribute attached to a feature, which requires the entry of a text value.



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

Field Description	Type	Defaults	Pop-Up

Details tab

Prompt text box

The cosmetic name to be displayed during 12d field pickup.

Output text box

The optional value to output to the pickup file - uses prompt if undefined.

Message text box

A message to display when picking up the code.

Default text box

The default value.

Data type choice box — Vertex, Next Segment, Prev Segment, String, Prompt, Prompt Segment

How the attribute should be attached.

Optional? tick box

*If **ticked**, this attribute is treated as optional.*
*If **not ticked**, this attribute must be filled out.*

Bundle? tick box

*If **ticked**, this attribute is treated as a bundle.*
*If **not ticked**, this attribute is treated as a normal attribute*

Programming tab

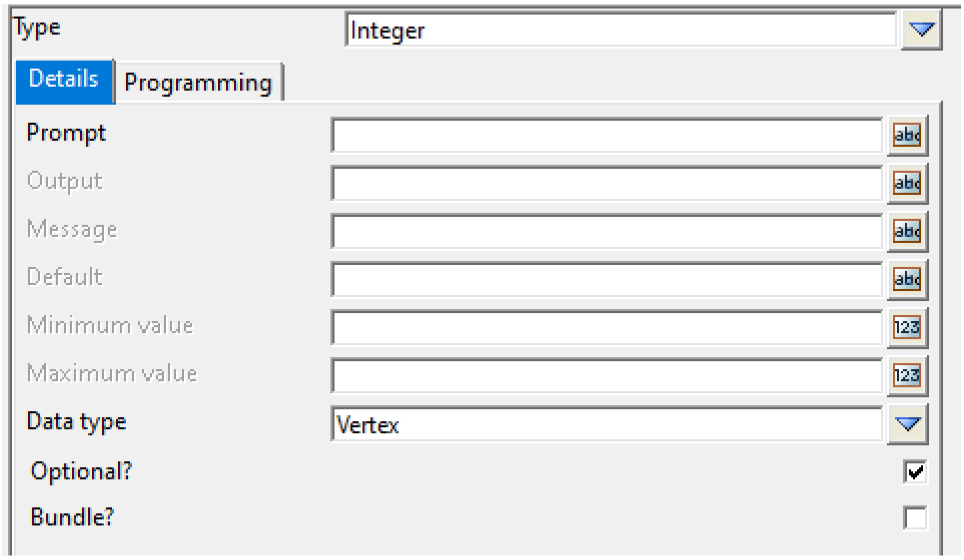
See 16.7.1.2.5 Programming .

There are no Children under a Text Attribute.

Continue to next section 16.7.1.2.2.1.10 Integer Attribute or return to 16.3 Starting and Configuring 12d Field .

16.7.1.2.2.1.10 Integer Attribute

This defines an attribute attached to a feature, which requires the entry of an integer value.



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

Field Description	Type	Defaults	Pop-Up

Details tab

Prompt text box

The cosmetic name to be displayed during 12d field pickup.

Output text box

The optional value to output to the pickup file - uses prompt if undefined.

Message text box

A message to display when picking up the code.

Minimum value integer box

*If **not blank,** the entered value must be greater than or equal to this value.*
*If **blank** then there is no minimum value restriction.*

Maximum value integer box

*If **not blank**, the entered value must be less than or equal to this value.*
*If **blank** then there is no maximum value restriction.*

Default text box

The default value.

Data type choice box — Pop-Up: Vertex, Next Segment, Prev Segment, String, Prompt, Prompt Segment

How the attribute should be attached.

Optional? tick box

*If **ticked**, this attribute is treated as optional.*
*If **not ticked**, this attribute must be filled out.*

Bundle? tick box

*If **ticked**, this attribute is treated as a bundle.*
*If **not ticked**, this attribute is treated as a normal attribute.*

Programming tab

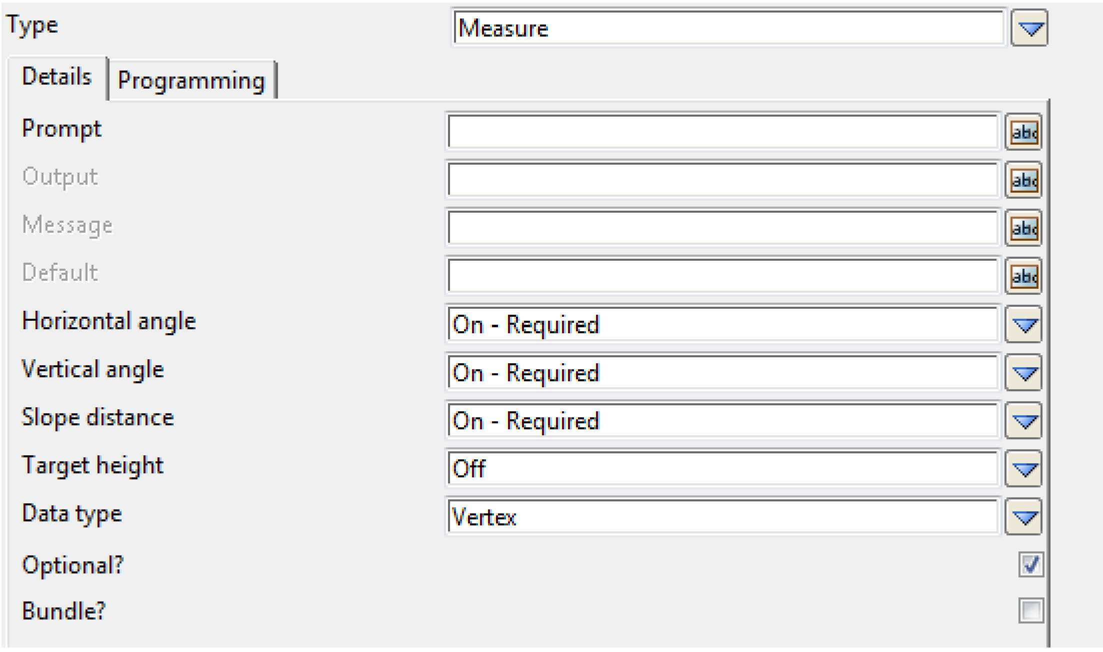
See 16.7.1.2.5 Programming .

There are no Children under an Integer Attribute.

Continue to next section 16.7.1.2.2.1.11 Measure Attribute or return to 16.3 Starting and Configuring 12d Field .

16.7.1.2.2.1.11 Measure Attribute

This defines an attribute attached to a feature, which requires a physical measurement.



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

Field Description	Type	Defaults	Pop-Up

Details tab

Prompt input

The cosmetic name to be displayed during 12d field pickup.

Output input

The optional value to output to the pickup file - uses prompt if undefined.

Message input

A message to display when picking up the code.

Default input

The default value.

Horizontal angle choice box — Off, On - Required, On - Optional

If the horizontal angle is to be captured.

Vertical angle choice box — Off, On - Required, On -Optional

If the vertical angle is to be captured.

Slope distance choice box — Off, On - Required, On -Optional

If the slope distance is to be captured.

Target height choice box — Off, On - Required, On - Optional

If the target height is required.

Data type	choice box	Vertex, Next Segment, Prev Segment, String, Prompt, Prompt Segment

How the attribute should be attached.

Optional?	tick box

*If **ticked**, this attribute is treated as optional.*
*If **not ticked**, this attribute must be filled out.*

Bundle?	tick box

*If **ticked**, this attribute is treated as a bundle.*
*If **not ticked**, this attribute is treated as a normal attribute.*

Programming tab

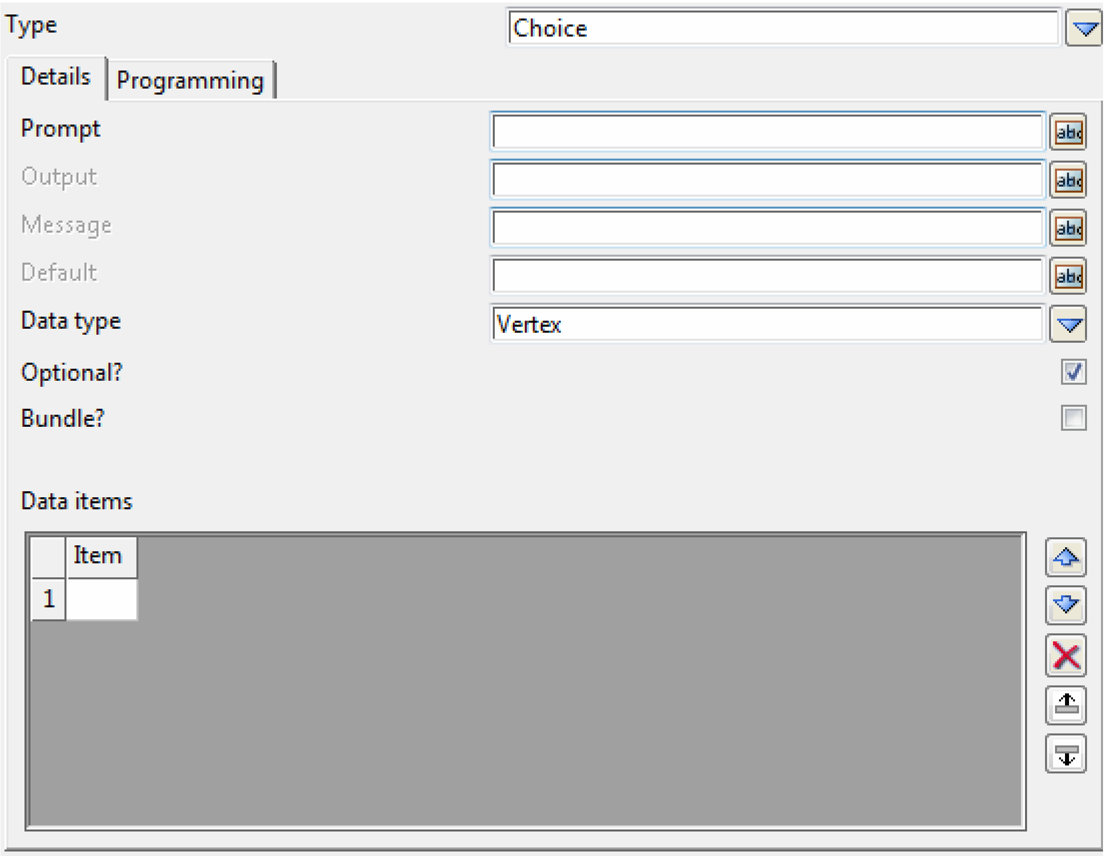
See 16.7.1.2.5 Programming .

There are no Children under a Measure Attribute.

Continue to next section 16.7.1.2.2.1.12 Choice Attribute or return to 16.3 Starting and Configuring 12d Field .

16.7.1.2.2.1.12 Choice Attribute

This defines an attribute attached to a feature, which requires a value to be selected from a list of choices.



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

Field Description	Type	Defaults	Pop-Up

Details tab

Prompt input

The cosmetic name to be displayed during 12d field pickup.

Output input

The optional value to output to the pickup file - uses prompt if undefined.

Message input

A message to display when picking up the code.

Default input

The default value.

Data type choice box — Pop-Up: Vertex, Next Segment, Prev Segment, String, Prompt, Prompt Segment

How the attribute should be attached.

Optional? tick box

*If **ticked**, this attribute is treated as optional.*
*If **not ticked**, this attribute must be filled out.*

Bundle? tick box

*If **ticked**, this attribute is treated as a bundle.*
*if **not ticked**, this attribute is treated as a normal attribute.*

Data Items grid

Grid.

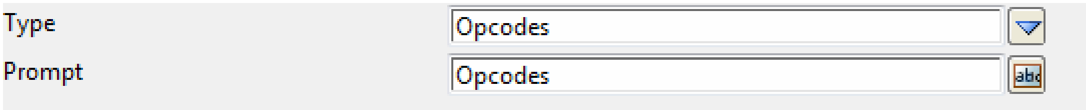
Item grid

A choice item to display.

Continue to next section 16.7.1.2.3 Opcodes or return to 16.3 Starting and Configuring 12d Field .

16.7.1.2.3 Opcodes

This **Type** defines a group of opcodes.

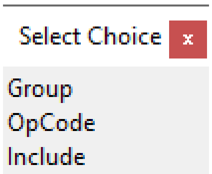


The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Prompt	input		

The cosmetic name of the opcodes group.

Allowed Children under an Opcodes

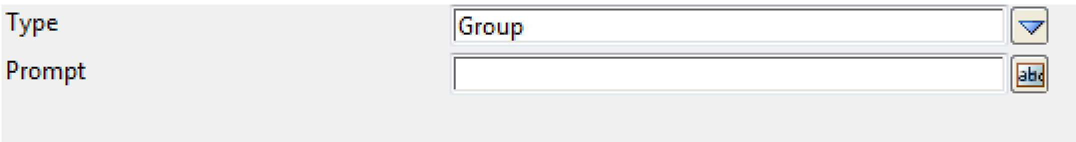


See
16.7.1.2.3.1 Opcodes Group
16.7.1.2.3.2 OpCode
16.7.1.2.1 Include

Continue to next section 16.7.1.2.3.1 Opcodes Group or return to 16.3 Starting and Configuring 12d Field .

16.7.1.2.3.1 Opcodes Group

This code defines a group of opcodes

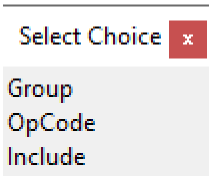


The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Prompt	input		

The cosmetic name of the group of opcodes.

Available children types

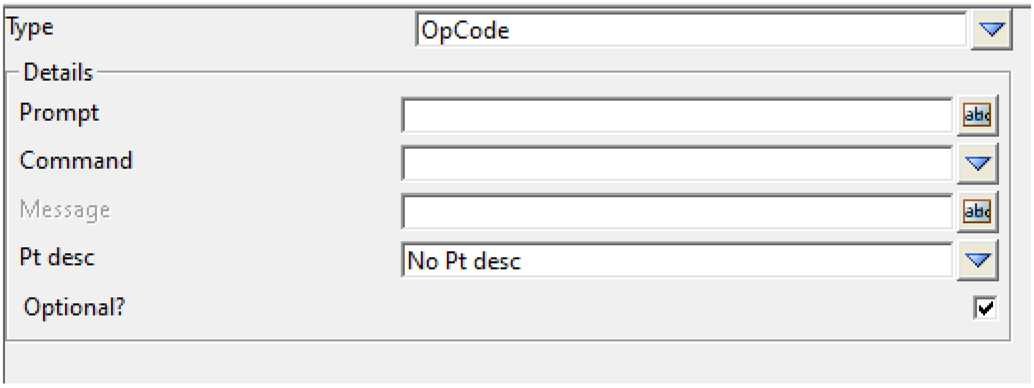


See
16.7.1.2.3.1 Opcodes Group
16.7.1.2.3.2 OpCode
16.7.1.2.1 Include

Continue to next section 16.7.1.2.3.2 OpCode or return to 16.3 Starting and Configuring 12d Field .

16.7.1.2.3.2 OpCode

This defines a custom opcode that can be attached to the running pickup function or a picked up Feature.



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

Field Description Type Defaults Pop-Up

Prompt input

The cosmetic name to be displayed during 12d field pickup.

Output input

The optional value to output to the pickup file - uses prompt if undefined.

Message input

A message to display when entering the opcode.

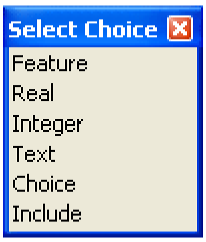
Pt desc choice box No pt desc, Pt desc, Null pt desc

The point description.

Optional? tick box

If ***ticked****, this opcode is treated as optional.*
if ***not ticked****, it is required.*

Available children types

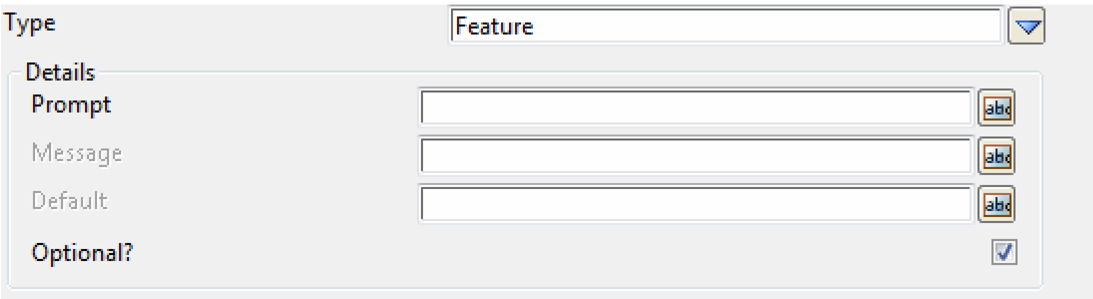


See
16.7.1.2.3.3 Feature Attribute (OpCode)
16.7.1.2.3.4 Real Attribute (OpCode)
16.7.1.2.3.5 Integer Attribute (OpCode)
16.7.1.2.3.6 Text Attribute (OpCode)
16.7.1.2.3.7 Choice Attribute (OpCode)
16.7.1.2.1 Include

Continue to next section 16.7.1.2.3.3 Feature Attribute (OpCode) or return to 16.3 Starting and Configuring 12d Field .

16.7.1.2.3.3 Feature Attribute (OpCode)

This defines an attribute attached to an opcode, which requires the entry of a feature.



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

Field Description	Type	Defaults	Pop-Up
Prompt	input		

The cosmetic name to be displayed during 12d field pickup.

Message	input		

A message to display when entering the opcode attribute.

Default	input		

The default value for the attribute.

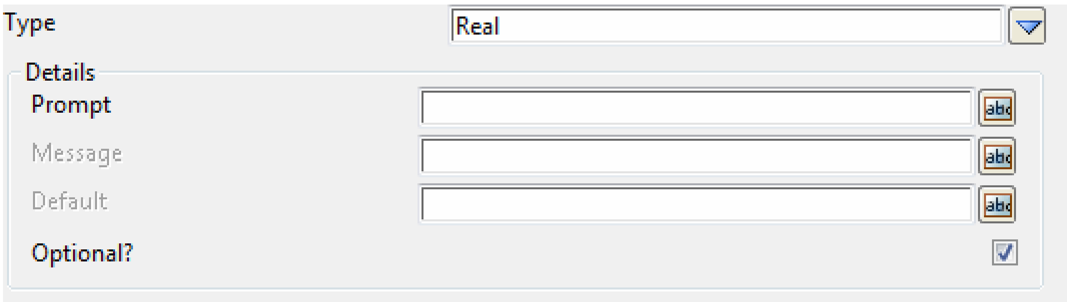
Optional?	tick box		

*If **ticked**, this attribute is treated as optional.*
*If **not ticked**, it is required.*

Continue to next section 16.7.1.2.3.4 Real Attribute (OpCode) or return to 16.3 Starting and Configuring 12d Field .

16.7.1.2.3.4 Real Attribute (OpCode)

This defines an attribute attached to an opcode, which requires the entry of a real value.



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

Field Description	Type	Defaults	Pop-Up
Prompt	input		

The cosmetic name to be displayed during 12d field pickup.

Message input

A message to display when entering the opcode attribute.

Default input

The default value for the attribute.

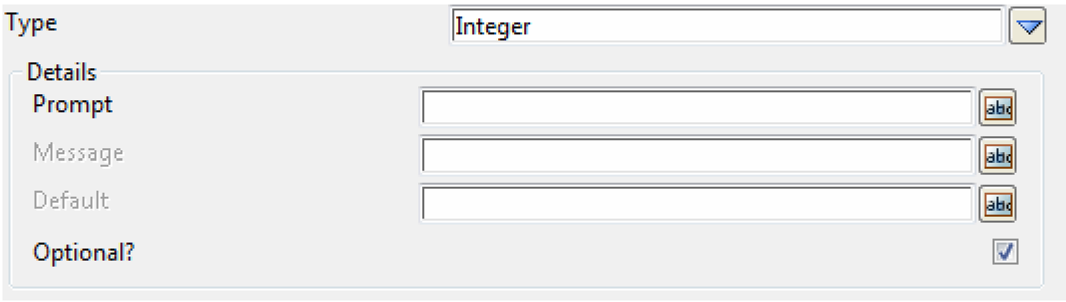
Optional? tick box

*If **ticked**, this attribute is treated as optional.*
*If **not ticked**, it is required.*

Continue to next section 16.7.1.2.3.5 Integer Attribute (OpCode) or return to 16.3 Starting and Configuring 12d Field .

16.7.1.2.3.5 Integer Attribute (OpCode)

This defines an attribute attached to an opcode, which requires the entry of an integer value.



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

Field Description	Type	Defaults	Pop-Up
Prompt	input		

The cosmetic name to be displayed during 12d field pickup.

Message	input		

A message to display when entering the opcode attribute.

Default	input		

The default value for the attribute.

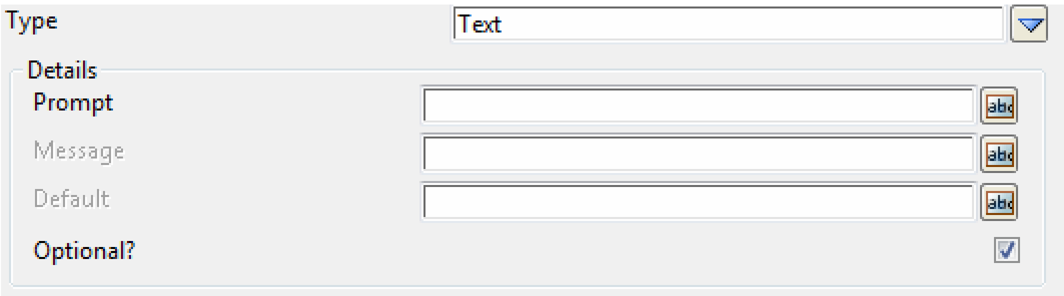
Optional?	tick box		

*If **ticked**, this attribute is treated as optional.*
*If **not ticked**, it is required.*

Continue to next section 16.7.1.2.3.6 Text Attribute (OpCode) or return to 16.3 Starting and Configuring 12d Field .

16.7.1.2.3.6 Text Attribute (OpCode)

This defines an attribute attached to an opcode, which requires the entry of a text value.



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

Field Description	Type	Defaults	Pop-Up
Prompt	input		

The cosmetic name to be displayed during 12d field pickup.

Message	input		

A message to display when entering the opcode attribute.

Default	input		

The default value for the attribute.

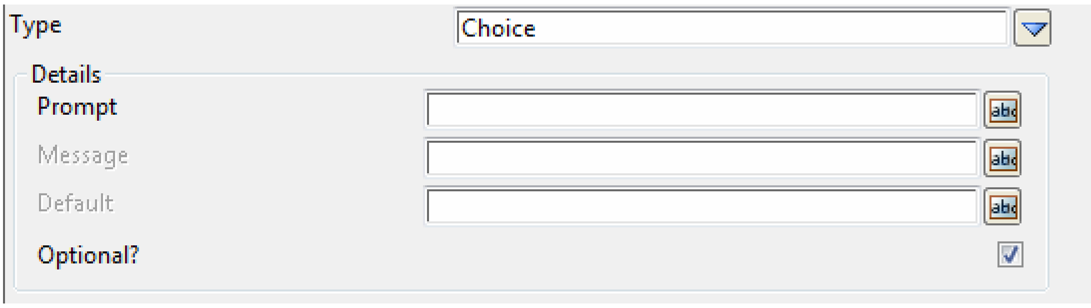
Optional?	tick box		

*If **ticked**, this attribute is treated as optional.*
*If **not ticked**, it is required.*

Continue to next section 16.7.1.2.3.7 Choice Attribute (OpCode) or return to 16.3 Starting and Configuring 12d Field .

16.7.1.2.3.7 Choice Attribute (OpCode)

This defines an attribute attached to an opcode, which requires the entry of a value selected from a choice.



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

Field Description Type Defaults Pop-Up

Prompt input

The cosmetic name to be displayed during 12d field pickup.

Message input

A message to display when entering the opcode attribute.

Default input

The default value for the attribute.

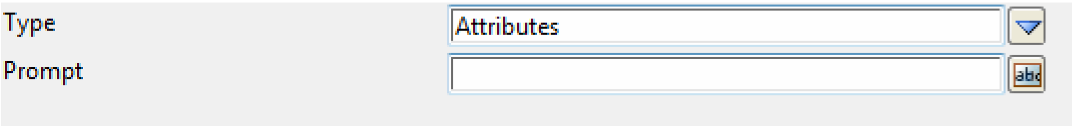
Optional? tick box

*If **ticked**, this attribute is treated as optional.*
*If **not ticked**, it is required.*

Continue to next section 16.7.1.2.4 Attributes or return to 16.3 Starting and Configuring 12d Field .

16.7.1.2.4 Attributes

This defines a top level group of attributes.

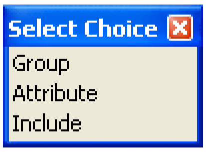


The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Prompt	input		

The cosmetic name for the group of attributes.

Available children types

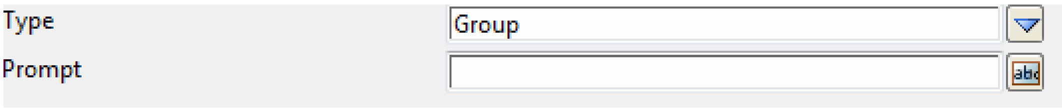


See
16.7.1.2.4.1 Group (Attributes)
16.7.1.2.4.2 Attribute
16.7.1.2.1 Include

Continue to next section 16.7.1.2.4.1 Group (Attributes) or return to 16.3 Starting and Configuring 12d Field .

16.7.1.2.4.1 Group (Attributes)

This defines a group of attributes or other groups.

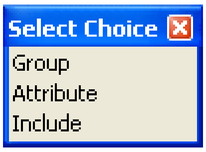


The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Prompt	input		

The cosmetic name for the group that will be displayed.

Available children types

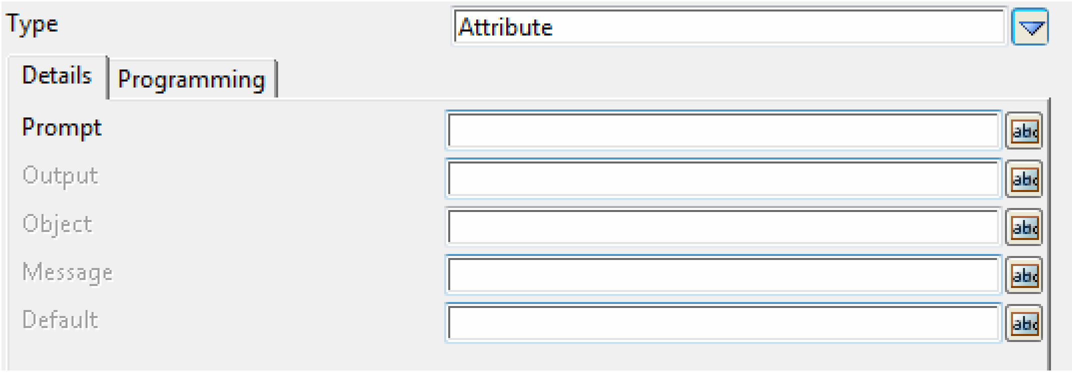


See
16.7.1.2.4.1 Group (Attributes)
16.7.1.2.4.2 Attribute
16.7.1.2.1 Include

Continue to next section 16.7.1.2.4.2 Attribute or return to 16.3 Starting and Configuring 12d Field .

16.7.1.2.4.2 Attribute

This defines an attribute that may be attached to a picked up point or string during pickup.



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

Field Description　Type　Defaults　Pop-Up

Details tab

Prompt　input

The cosmetic name to be displayed during 12d field pickup.

Output　input

The optional value to output to the pickup file - uses prompt if undefined.

Object　input

The optional value to be used to define a set of attributes - uses output if undefined.

Message　input

A message to display when picking up the code.

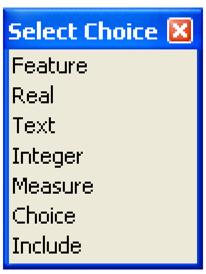
Default　input

The default value.

Programming tab

See 16.7.1.2.5 Programming

Available children types



See
16.7.1.2.2.1.7 Feature Attribute
16.7.1.2.2.1.8 Real Attribute
16.7.1.2.2.1.9 Text Attribute
16.7.1.2.2.1.10 Integer Attribute
16.7.1.2.2.1.11 Measure Attribute
16.7.1.2.2.1.12 Choice Attribute
16.7.1.2.1 Include

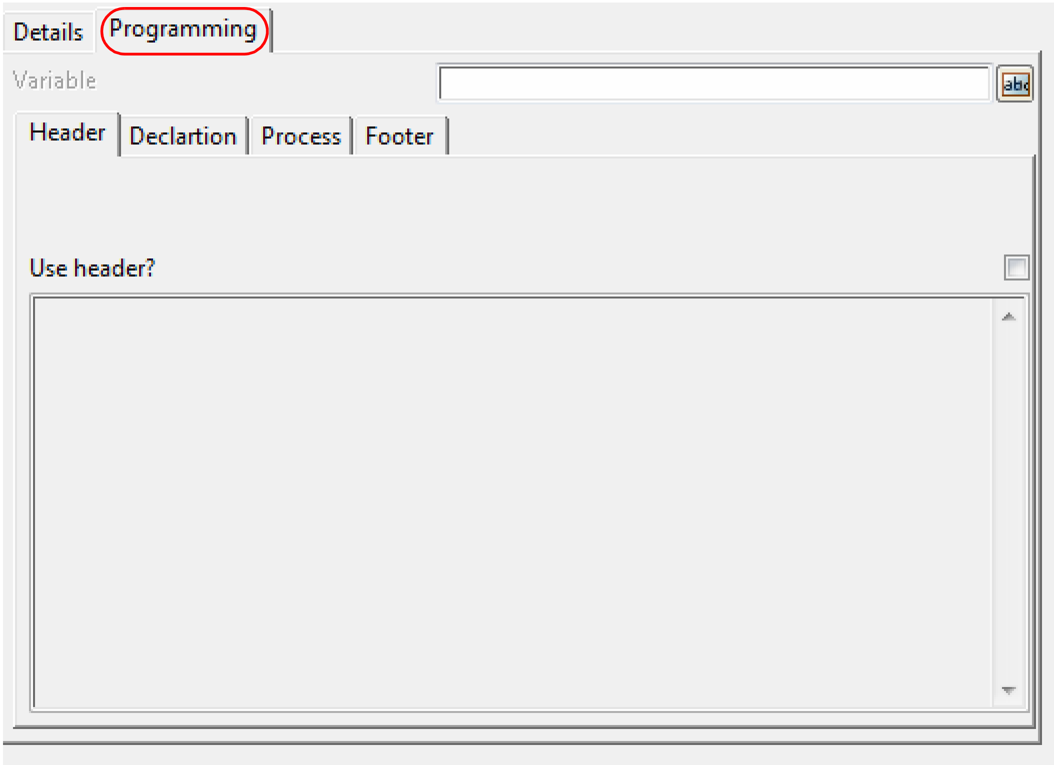
Continue to next section 16.7.1.2.5 Programming or return to 16.3 Starting and Configuring 12d Field .

16.7.1.2.5 Programming

It is possible to generate macro code for GIS post processing, for any feature or attribute. The **Programming tab** is used to assist you in doing so.

See 16.7.5 12d Pickup Codes to Macro for more information on how to generate a GIS post processing 4dm file.

To assist you, this is broken into sections: Header tab , Declaration tab , Process tab , Footer tab .



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

Field Description	Type	Defaults	Pop-Up
Variable	input		

For use with attributes or opcodes, defines the variable that the data should be stored in for use later.

See Header tab , Declaration tab , Process tab , Footer tab .

Header tab

The **Header tab** defines any header that should be output into the macro file for the current item.

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

Field Description	Type	Defaults	Pop-Up
Use header?	tick box		

*If **ticked**, the header will output to the generated file.*
*If **not ticked**, no header will be used.*

Text field

The macro code to output into the GIS post processing file.

Declaration tab

The **Declaration tab** defines the 'declaration' to be output into the macro, which can be used for defining variables.

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

Field Description	Type	Defaults	Pop-Up
Use declaration?	tick box		

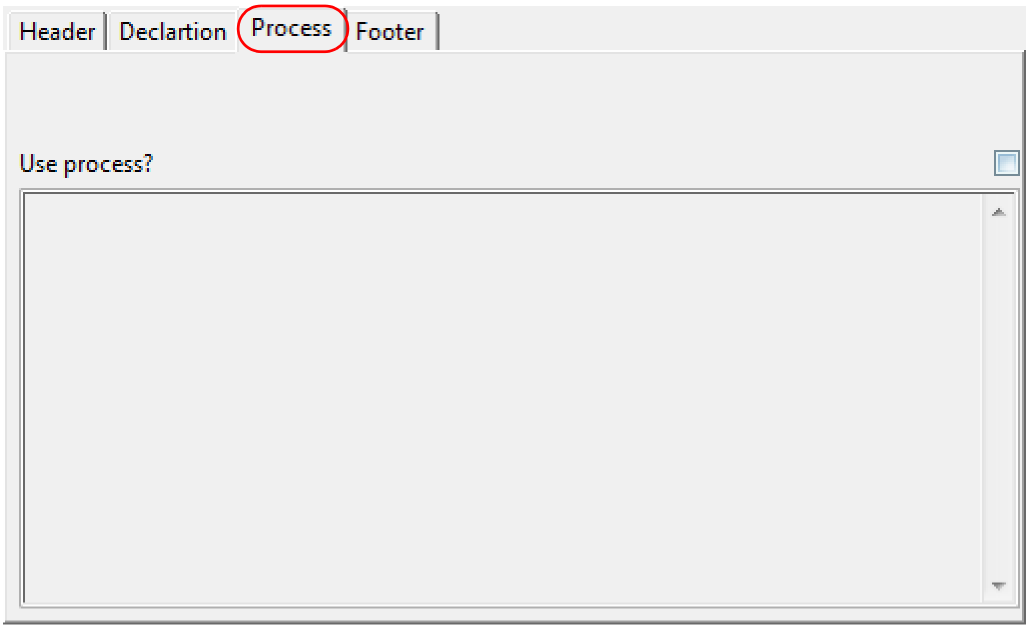
*If **ticked**, a declaration will be output to the generated file.*
*If **not ticked**, no declaration will be output.*

Text field

The macro code to output into the GIS post processing file.

Process tab

The **Process tab** defines the main processing part of the macro code, which could be used to process a selected feature code and associated attributes, or other items such as opcodes.



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

Field Description	Type	Defaults	Pop-Up
Use process?	tick box		

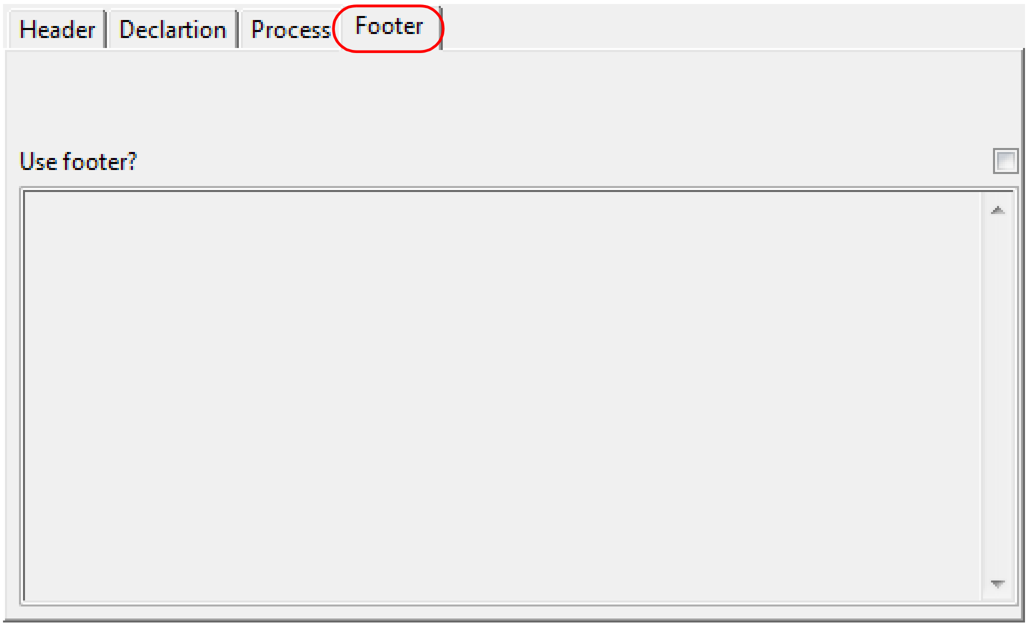
*If **ticked**, the process data will be output into the generated file.*
*If **not ticked**, no process data will be output.*

Text field

The macro code to output into the GIS post processing file.

Footer tab

The **Footer tab** defines any footer that should be output into the macro file for the current item.



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

Field Description	Type	Defaults	Pop-Up
Use footer?	tick box		

*If **ticked**, the footer will output to the generated file.*
*If **not ticked,** no footer will be output.*

Text field

The macro code to output into the GIS post processing file.

Continue to next section 16.7.2 12d Field Favourites or return to 16.3 Starting and Configuring 12d Field .

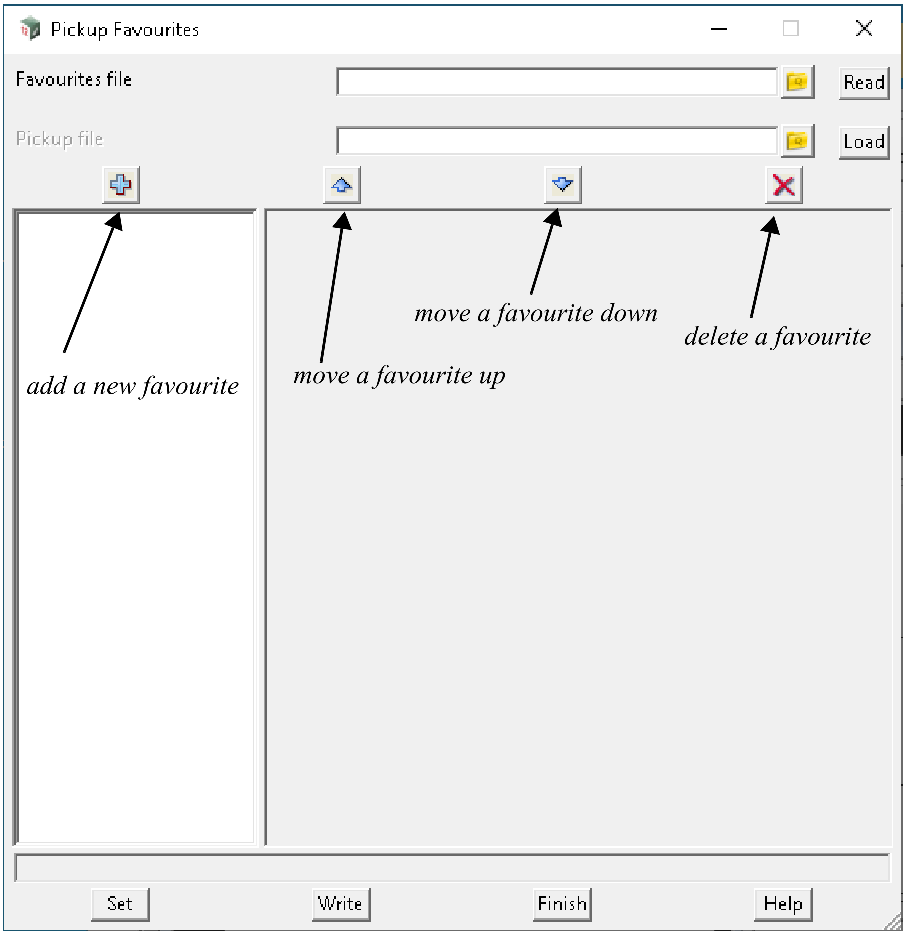
16.7.2 12d Field Favourites

Position of option on menu: **Survey =>12d Field =>12d Field Codes => 12d Field Favourites**

This panel is used to create and edit ***12d Field Pickup Favourites*** files.

The files contain a list of feature codes and associated information for use with picking up within ***12d Field***.

Selecting **12d Field Favourites** brings up the **Pickup Favourites** panel.



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

Field Description	Type	Defaults	Pop-Up
Favourites file	file		*.12dfieldfavourites

The favourites file to create or edit.

Read	button		

Reads the favourites file, if it exists.

Pickup file	file		*.12dfieldcodes

The optional 12d field pickup codes file to use as the source of feature codes available as favourites.

Load	button		

Loads the optional 12d field pickup codes file for use.

Buttons at Bottom

Set button

??.

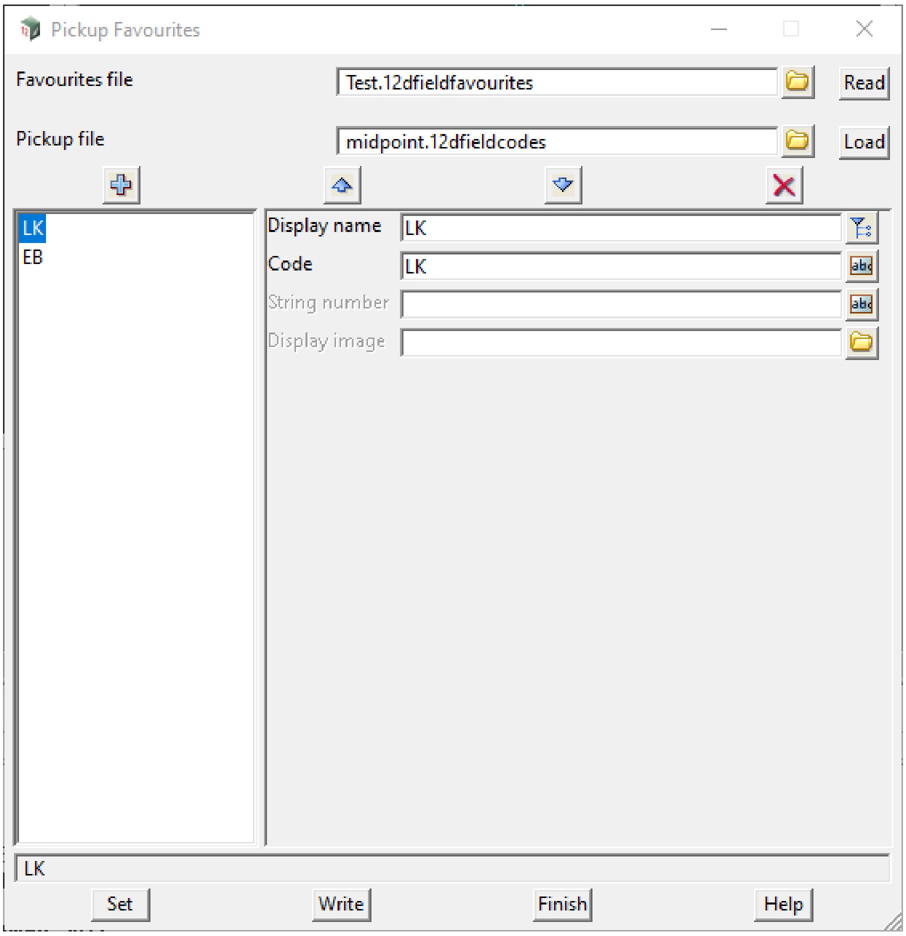
Write button

Writes the Pickup favourites to the specified file.

Icons

add a new favourite *move a favourite up* *move a favourite down* *delete a favourite*

*Clicking on **Add a New Favourite** adds a new Favourite to the tree and fields to the right hand side.*



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

Field Description	Type	Defaults	Pop-Up
Display name	input		Loaded Field Codes

The cosmetic name of the favourite to display
If not specified, the favourite will display using the code name.

If a Pickup Codes File has been loaded, the list of codes in the Pickup Codes File will be available as a choice in the browse box.
If no Pickup Codes File has been loaded, nothing will appear in the browse box.

Code

The name of the favourite.
String number *input*

The optional string number for the favourite.

Display image file

The optional cosmetic image of the favourite to display.
If not specified, no image will be displayed.

Continue to next section 16.7.3 Mapfile to 12d Pickup Codes or return to 16.3 Starting and Configuring 12d Field .

16.7.3 Mapfile to 12d Pickup Codes

Position of option on menu: Survey =>12d Field =>12d Field Codes => Mapfile to 12d Pickup Codes

This option is used to create a ***12d Field Pickup Coding*** file from an existing map file.

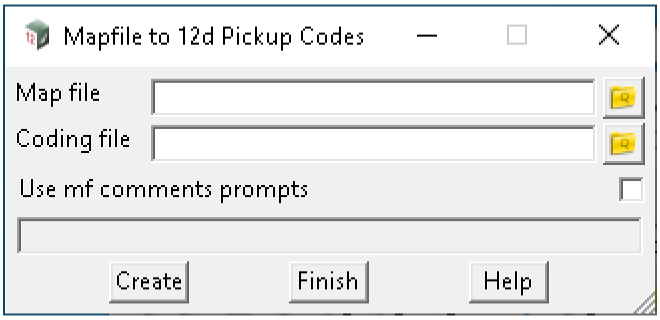
Only the following information from the **Basic** section of the mapfile is used

Key

Model

Comment

Selecting **Mapfile to 12d Pickup Codes** brings up the **Mapfile to 12d Pickup Codes** panel



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

Field Description	Type	Defaults	Pop-Up
Mapfile	file		*.mapfile *.mf

Name of the 12d mapfile to convert from.

Field Description	Type	Defaults	Pop-Up
Coding file	file		*.12dfieldcodes

Name of the coding file to convert to.

Use mf comments prompts tick box

*If **ticked**, the **Comment** field is used as the display prompt that the user sees when selecting the current feature code.*
*If **not ticked**, the **Key** field is used as the display prompt.*

Buttons at Bottom

Create button

Convert the file.

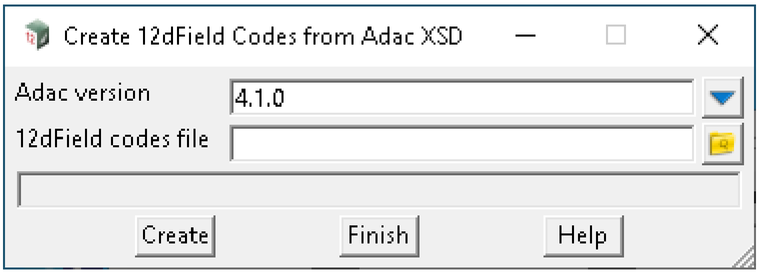
Continue to next section 16.7.4 ADAC XSD to 12d Pickup Codes or return to 16.3 Starting and Configuring 12d Field .

16.7.4 ADAC XSD to 12d Pickup Codes

Position of option on menu: Survey =>12d Field =>12d Field Codes => ADAC XSD to 12d Pickup Codes

This section of documentation is a work in progress and will be updated in subsequent releases.

Selecting **ADAC XSD to 12d Pickup Codes** brings up the **Create 12d Field Codes from ADAC XSD** panel



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

Field Description	Type	Defaults	Pop-Up
ADAC Version	choice box		

The version of ADAC being used.

12dField codes file	file box		*.12dfieldcodes

??.

Buttons at Bottom

Create	button

Convert the file.

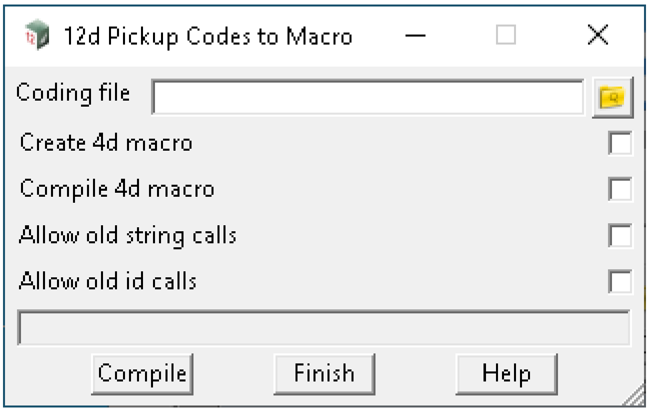
Continue to next section 16.7.5 12d Pickup Codes to Macro or return to 16.3 Starting and Configuring 12d Field .

16.7.5 12d Pickup Codes to Macro

Position of option on menu: **Survey =>12d Field =>12d Field Codes => 12d Pickup Codes to 4dm**

This panel generates a macro based on any programming defined in a ***12d Field Pickup Codes*** file. It will create a new file of the same name as the 12d Field pickup codes file, with the extension 4dm

Selecting **12d Pickup Codes to 4dm** brings up the **12d Pickup Codes to Macro** panel



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

Field Description	Type	Defaults	Pop-Up
Coding file	file		*.12dfieldcodes

The 12d Field Pickup codes file to read.

Create 4d macro	tick box		

*If **ticked**, it creates the 4dm file from the 12d Field Pickup codes file programming.*

Compile 4d macro	tick box		

*If **ticked**, the created 4dm file will be compiled into a 4do file.*
*if **not ticked**, no compilation will take place.*

Allow old string calls	tick box		

*if **ticked**, old string calls will be allowed by the compiler.*
*if **not ticked**, old string calls will not be allowed by the compiler.*

Allow old id calls	tick box		

*If **ticked**, old id calls will be allowed by the compiler.*
*If **not ticked**, old id calls will not be allowed by the compiler.*

Buttons at Bottom

Compile	button		

Creates and/or compiles the 12d Field Pickup codes file into a macro.

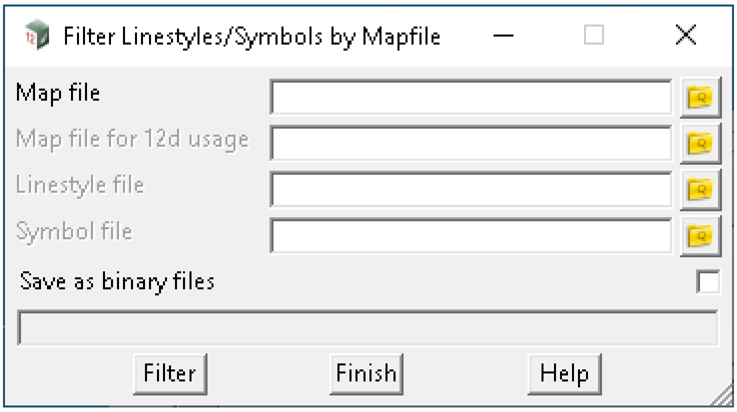
Continue to 16.7.6 Filter Linestyles/Symbols via Mapfile or return to 16.3 Starting and Configuring 12d Field .

16.7.6 Filter Linestyles/Symbols via Mapfile

Position of option on menu: **Survey =>12d Field =>12d Field Codes => Filter linestyles/symbols via mapfile**

This section of documentation is a work in progress and will be updated in subsequent releases.

Selecting **Filter linestyles/symbols via mapfile** brings up the **Filter Linestyles/Symbols by Mapfile** panel



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

Field Description	Type	Defaults	Pop-Up
Map file	file box		available map files
??.			
Map file for 12d usage	file box		available map files
??.			
Linestyle file	file box		
??.			
Symbol file	file box		
??.			
Save as binary files	tick box	not ticked	
??.			

Buttons at Bottom

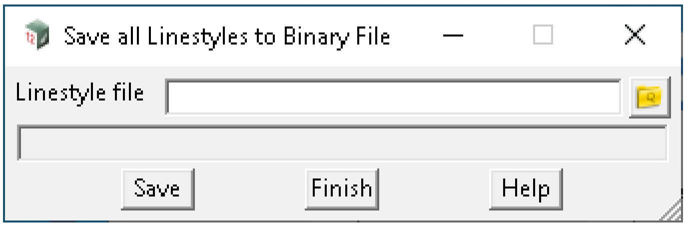
Filter	button
??.	

Continue to next section 16.7.7 Save Binary Linestyles or return to 16.3 Starting and Configuring 12d Field .

16.7.7 Save Binary Linestyles

Position of option on menu: **Survey =>12d Field =>12d Field Codes => Save binary linestyles**

Selecting **Save binary linestyles** brings up the **Save all Linestyles to Binary File** panel



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

Field Description	Type	Defaults	Pop-Up
Linestyle file	file box		available *.4d files

The name of the binary form of the linestyle file.

Save	button		

Buttons at Bottom

Saves the linestyle data as a binary file.

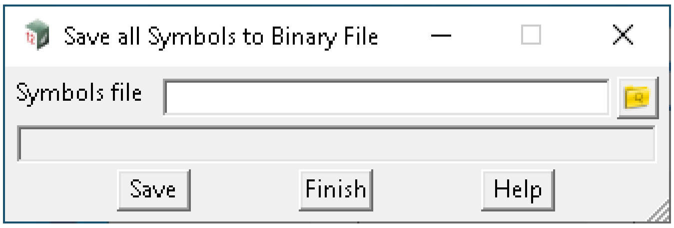
Continue to next section 16.7.8 Save Binary Symbols or return to 16.3 Starting and Configuring 12d Field .

16.7.8 Save Binary Symbols

Position of option on menu: **Survey =>12d Field =>12d Field Pickup Codes => Save binary symbols**

This section of documentation is a work in progress and will be updated in subsequent releases.

Selecting **Save binary symbols** brings up the **Save all Symbols to Binary File** panel



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

Field Description	Type	Defaults	Pop-Up
Symbols file	file box		available *.4d files

??.

Buttons at Bottom

Save	button		

Saves file.

Continue to next section 16.8 12dField Setout FLD File To Strings or return to 16 12d Field .

16.8 12dField Setout FLD File To Strings

Position of option on menu: **Survey =>12d Field =>Setout FLD file to strings**

12d Field Setout is used to setout data directly from a ***12d Model*** project but during that process ***12d Field Setout*** also can produce points that are stored in the ***12d Model*** project.

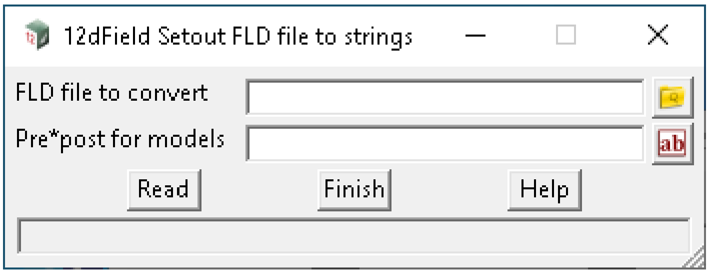
As a backup to the storing of points, ***12d Field Setout*** also creates a modified ***fld*** file.

Although this modified ***fld*** file created by ***12d Field Setout*** can't be used with ***SDR Function Reduction***, the ***fld*** file is attributed in such a way it can be read directly into ***12d Model*** **without** going through a ***SDR Function*** by using the ***Setout FLD file to string*** option.

The string data will be read in with the original name, model, colour, linestyle and weight.

fld files created by ***12d Field Setout*** from version **V9C1e** can be read in with the ***Setout FLD file to string*** option.

Selecting **Setout FLD file to strings** displays the**12dField Setout FLD File To Strings** panel.



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

Field Description	Type	Defaults	Pop-Up
FLD file to convert	file		

*The **fld** file produced by 12d Field Setout that is to be read in.*

Pre*post for models

For more information please go to the section 4.24.2 Pre*Postfix in Panel Fields

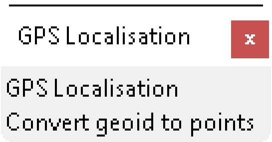
Buttons at Bottom

Read	button		

*The **fld** file will be read in.*
*If a point in the **.fld** file is not correctly attributed, a message will be displayed in the output window and no point will be created.*

Return to 16 12d Field .

16.8.1 GNSS Localisation - Deprecated



See
16.8.1.1 GNSS Localisation
16.6.4 Convert Geoid to Points

16.8.1.1 GNSS Localisation

Position of option on menu: **Survey =>Field 12d=>GNSS Localisation =>GNSS Localisation**

The panel is used to create the localisation parameters used inside ***12d Field*** for reducing GNSS observations into a local system.

Points collected with ***12d Field*** as raw WGS84 cartesian coordinates can be matched with local control points to calculate the parameters to convert GNSS readings directly into the local system.

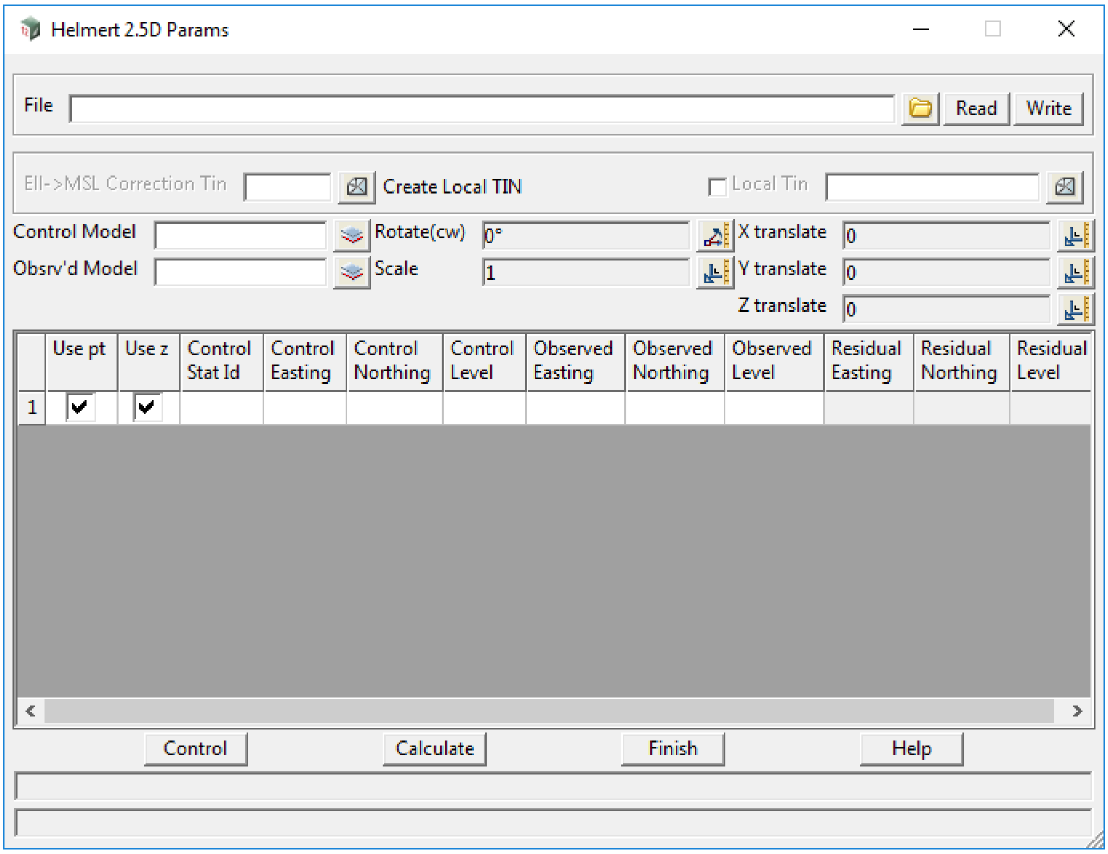
The ***12d Field*** localisation treats horizontal and vertical components separately. The horizontal transformation is a 2D Helmert translation, translation, rotation and uniform scaling of the x and y axes.

The vertical translation can either be a simple z translation or be taken from a tin, the tin can be manually created outside of the panel, *e.g.* from AusGeoid98 or created by the panel via a plane of best fit.

The basic workflow for this panel is to observe known control points in the field with ***12d Field*** with just the ellipsoid set, *e.g.* MGA56.

Then use this panel to match the observed points with the control points to create the localisation.

Selecting **GNSS Localisation** brings up the **Helmert 2.5D Params** panel



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

Field Description Type Defaults Pop-Up

File *.tdf_hel

The TDF_HEL file to be read in or written to. This is the file used by 12d Field to localise GNSS reading.

Read button

Read in the TDF_HEL file.

Write button

Write out the TDF_HEL file.

Geoid Tin

If selected the value of the tin at the local coordinate is added to the height of the raw GNSS coordinate.

Create Local TIN tick box

*If **unticked**, and the **Local Tin** box is blank the points are adjusted by the straight mean z difference of the observations.*
*If **unticked**, and the **Local Tin** box is not empty the points are adjusted by the value of the TIN at the xy location.*

*If **ticked**, and the **Local Tin** box is not empty a plane of best fit is used to create the local TIN and the points are adjusted by the value of the TIN at the current xy location. The extent of the local TIN is 1000m outside the control used.*

Local Tin

*The **Local Tin** as described above.*

Control model model box

The model containing the control points.

Obsrv'd model model box

The model containing the observed points.

Rotate (cw) measure box At Point, Point to Point, String from Point, String to Point

The clockwise rotation parameter of the helmert transformation.

Scale measure box At Point, Point to Point, String from Point, String to Point

The scaling parameter of the helmert transformation.

X translate measure box At Point, Point to Point, String from Point, String to Point

The x translation of the helmert transformation.

Y translate measure box At Point, Point to Point, String from Point, String to Point

The y translation of the helmert transformation.

Z translate measure box At Point, Point to Point, String from Point, String to Point

The z translation of the helmert transformation, (note this is 0.0 if a local TIN is being used).

The grid

Please note changing the level of a control station to "null" means the station and corresponding observed point will not be used in the height calculations.

Use pt tick box

*If **ticked**, this point is used in the transformation calculations.*

Use z tick box

*If **unticked**, this point is not used to calculate the transformation height parameter.*

Control Stat Id

The Id of the control station, will normally match the observed Id.

Control Easting/Northing/Level

The coordinate of the control station.

Observed Easting/Northing/Level

The coordinate of the observed point.

Residual Easting/Northing/Level

The delta of the observed point with the control point after the transformation has been applied.

Buttons

Control button

Start the selection of the control/observed point pairs. Note the environment variable

PICK_ORDER_OBSERVED_FIRST_4D can be set to make the selection order 'observed' then 'control'. For ease of use 2 plan views should be used, one with the observed points and one with the control points.

Calculate button

Calculate the transformation and update the residuals in the grid control.

Finish button

Exit the panel, a warning message will appear if the transformation parameters have not yet been written to file.

16.9 Old Documentation

16.9.0.0.1 Single String Setout

The **12d Field Single String Setout** panel is used when the setout point is relative both horizontally and vertically to one string, for example a traffic island or kerb and gutter.

Single string setout works by dropping a point to a nominated control string, then the setout string is cut normal to the dropped point on the control string.

When setting out the setout string is cut normal from a point at the setout chainage on the control string, then the setout offset is then applied from here to create the setout point.

Note the control string and the setout string could be the same string or all different, this dependant on the task being performed.

Selecting the **Single String Setout** option brings up the **12d Field - Single String Setout** panel.

Setout tab

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

Field Description	Type	Defaults	Pop-Up
Setout CS Raw Ch	12dF chainage box		

The raw, no equalities setout chainage on the control string, start chainage plus distance along string.

Setout Offset 12dF double box

The offset from the setout string to setout, +ve is to the right of the string, -ve left.

Chainage Increment 12dF double box

The value the setout chainage will be changed by when chainage increment/decrement is called.

Stakeout Hgt Diff 12dF double box

The height diff from the setout surface/string. +ve is above.

Compaction Factor 12dF double box

A compaction factor applied to the delta heights, e.g. if you know say asphalt will compact by 23% and you need to cover this enter the value as 1.23. (Note this widget is optional and only appears if activated in the Settings panel).

Buttons

MEAS button

Start a measurement, the behaviour is determined by the TPS/GNSS measurement setting set from the control bar.

INFO+ button

Display the user configurable information panel to view extra information not available on the standard dialogue.

DLG- button

Minimises the dialogue so only the first 2 rows of buttons are shown.

MS+ST button

Start a measurement and store it on completion.

CH + button

Increment the setout chainage by the value in the chainage increment field.

CH - button

Decrement the setout chainage by the value in the chainage increment field.

CH=CURR button

Set the setout chainage to the chainage of the last measured point.

RESTORE button

*Restore the setout chainage to the chainage prior to the "**CH=CURR**" button being pressed.*

<-TAB button

Go to the previous tab in the dialogue.

TAB-> button

Go to the next tab in the dialogue.

DLG+ button

Restore a minimised panel to it's full size.

INFO- button

Close the user configurable information panel.

Nav P button

Load a saved navigation page configuration.

Sh M button

Start a measurement with a touch on the screen.

Sh M+S button

Start a measurement with a touch on the screen, store it on completion.

READ button

Load previously saved setout settings for reuse.

SAVE button

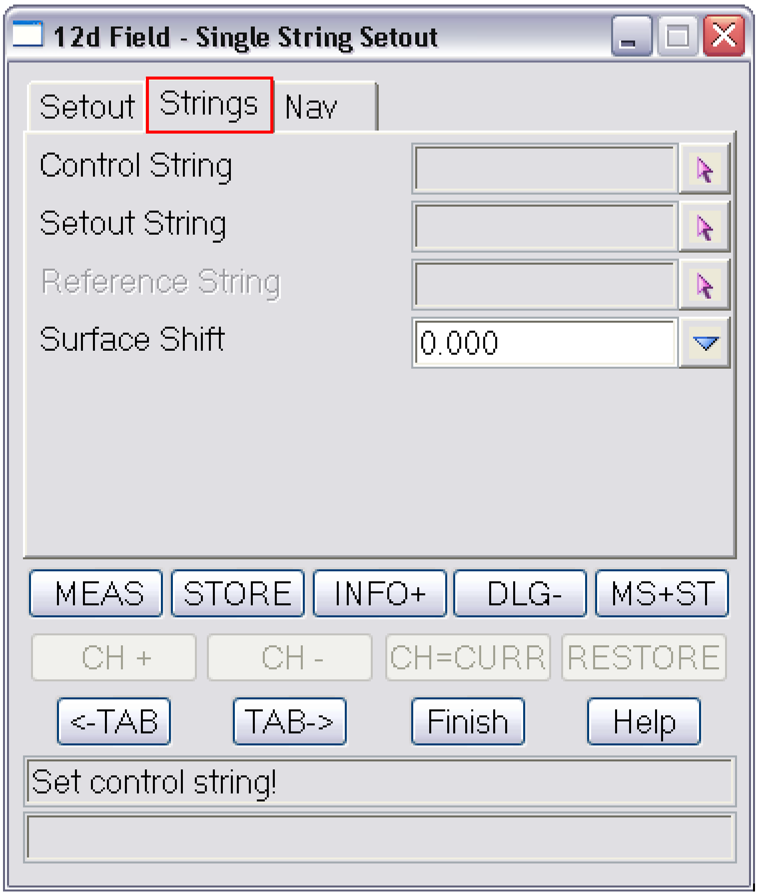
Save the current setout settings for reuse at a later date.

STOP button

Stop the measurement in process.

STORE button

Store the last measured point.



Strings tab

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

Field Description	Type	Defaults	Pop-Up
Control String	12dF string select box		

Control string, the string to which the other strings are cut normal to for calculations.

Setout String	12dF string select box		

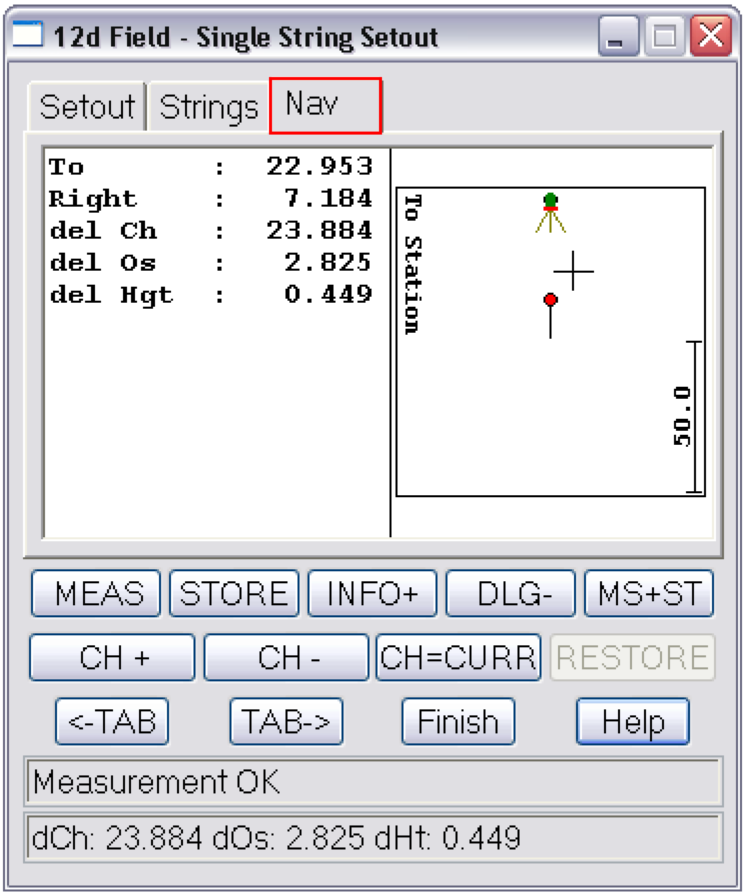
Setout String, setout offset & heights are relative to this string at a point cut normal from the setout chainage on the control string/centreline

Reference String	12dF string select box		

Reference string, a string to which the current point is dropped normally to for information only.

Surface Shift	choice box		-0.0000

*A vertical shift to be applied to the design level, +ve raises the level, can be manually entered or selected from the choice list, (defined in "**TDF_SURFACE_SHIFTS.4D**")*



Nav tab

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

Field Description	Type	Defaults	Pop-Up
Navigation Box		draw box	

The 12d Field navigation box augments setout by displaying user definable information rows plus a bulls-eye as a visual aid.

Continue to next section 16.9.0.0.2 Batter Setout or return to 16.3 Starting and Configuring 12d Field .

16.9.0.0.2 Batter Setout

The **12d - Field Batter Setout** panel is used to dynamically locate the intersection point of a slope defined by the cut of 2 strings and the natural surface at the users current position.

It is designed around the user wishing to place batter rails in place for guiding the cut/fill.

Note, unlike other string setout routines the batter setout does not have a setout string, just the control string and the 2 design strings.

The user is able to set a shift to move the design surface up or down once the strings are cut.

There are manual modes available for setting the design slope when 2 strings are not able to be cut.

Batter setout works by dropping a point to a nominated control string, the 2 strings used to determine the slope are cut normal to the dropped point on the control string, the delta offset for the pole is dependant on the users height rather than a setout string.

Selecting the **Batter Setout** option brings up the **12d - Field Batter Setout** panel.

Setout tab

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

Field Description	Type	Defaults	Pop-Up
Setout CS Raw Ch	12dF chainage box		

The raw, no equalities setout chainage on the control string, start chainage plus distance along string.

Chainage Increment	12dF double box		

The value the setout chainage will be changed by when chainage increment/decrement is called.

Hgt Rail over Batter 12dF double box

The height of the batter rail above the design batter, say 0.1 for cut and 1.0 for fill.

Hgt Rail over Ground 12dF double box

The height of the batter rail above the natural ground, typically as large as number as possible to get the rail away from the top/toe of the batter.

Compaction Factor 12dF double box

A compaction factor applied to the delta heights, e.g. if you know say asphalt will compact by 23% and you need to cover this enter the value as 1.23. (Note this widget is optional and only appears if activated the **Settings** *panel.)*

Buttons

MEAS button

Start a measurement, the behaviour is determined by the ***TPS/GNSS*** *measurement setting set from the control bar.*

INFO+ button

Display the user configurable information panel to view extra information not available on the standard dialogue.

DLG- button

Minimises the dialogue so only the first 2 rows of buttons are shown.

MS+ST button

Start a measurement and store it on completion.

CH + button

Increment the setout chainage by the value in the chainage increment field.

CH - button

Decrement the setout chainage by the value in the chainage increment field.

CH=CURR button

Set the setout chainage to the chainage of the last measured point.

RESTORE button

*Restore the setout chainage to the chainage prior to the "**CH=CURR**" button being pressed.*

<-TAB button

Go to the previous tab in the dialogue.

TAB-> button

Go to the next tab in the dialogue.

STOP button

Stop the measurement in process.

STORE button

Store the last measured point.

Nav P button

Load a saved navigation page configuration.

Sh M button

Start a measurement with a touch on the screen.

Sh M+S button

Start a measurement with a touch on the screen, store it on completion.

READ button

Load previously saved setout settings for reuse.

SAVE button

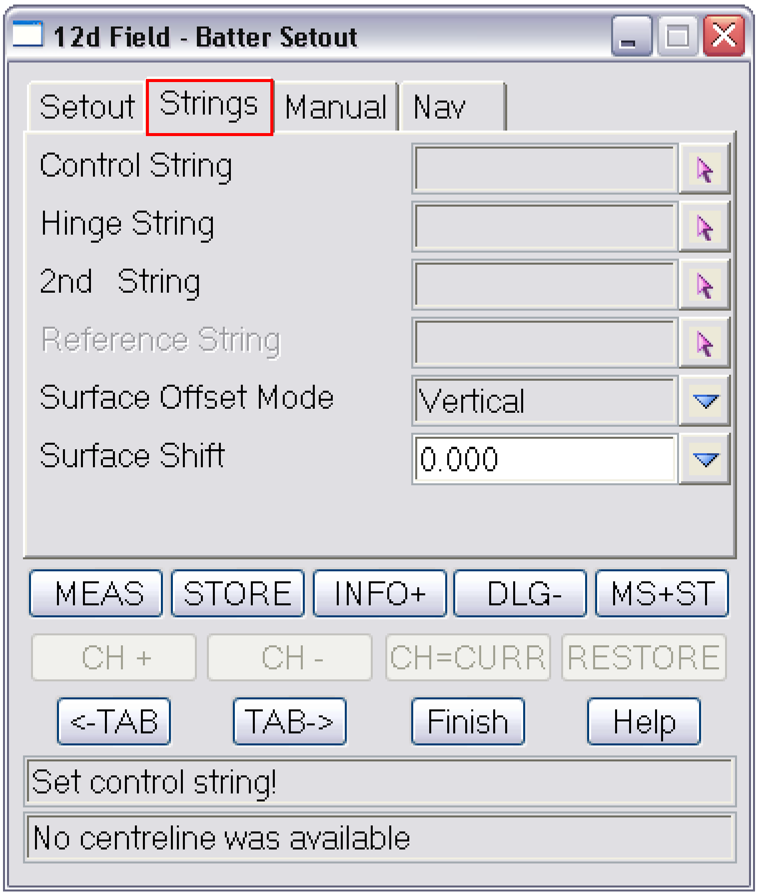
Save the current setout settings for reuse at a later date.

DLG+ button

Restore a minimised panel to it's full size.

INFO- button

Close the user configurable information panel.



Strings tab

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

Field Description Type Defaults Pop-Up

Control String 12dF string select box

Control string, the string to which the other strings are cut normal to for calculations.

Hinge String 12dF string select box

The hinge string is the string the batter is being cut or filled to. Slope distances etc. are given to this string.

2nd String 12dF string select box

The other string along with the hinge string defining the batter slope.

Reference String 12dF string select box

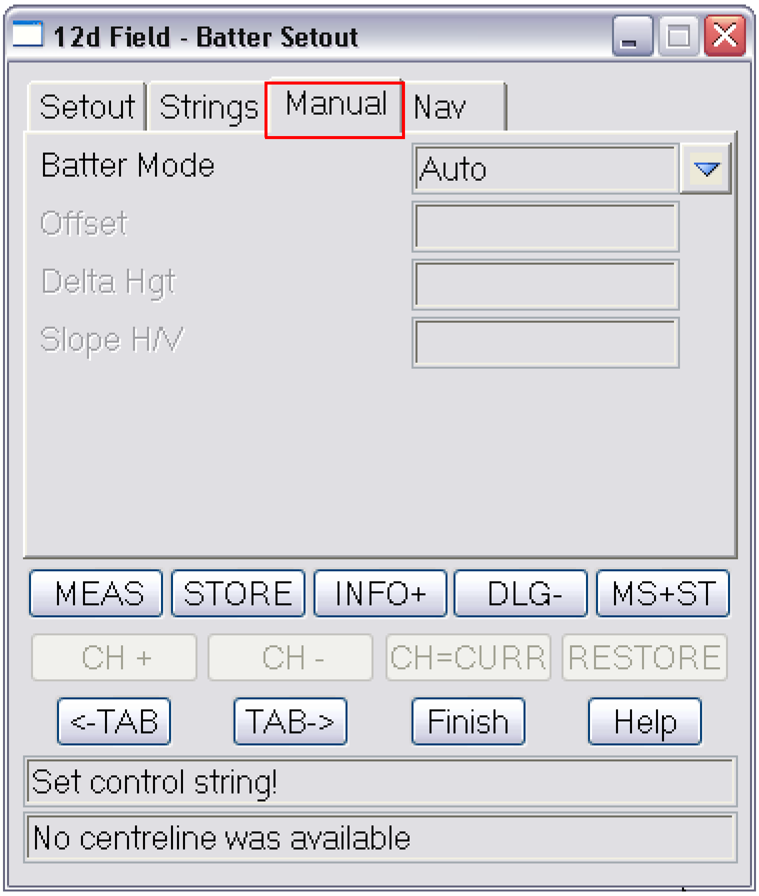
Reference string, a string to which the current point is dropped normally to for information only.

Surface Offset Mode choice box vertical, normal

Whether the offset to the surface is normal or vertical.
Vertical: *The height offset is applied vertically to the design slope.*
Normal: *The height offset is applied normal/perpendicular to the design slope.*

Surface Shift choice box 0.000

*A vertical shift to be applied to the design level, +ve raises the level, can be manually entered or selected from the choice list, (defined in "**TDF_SURFACE_SHIFTS.4D**")*



Manual tab

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

Field Description	Type	Defaults	Pop-Up
Batter Mode	choice box		Auto Centreline, hinge & slope Manual relative (dOS&dHgt), Manual absolute (dOS&RL) Manual, use current slope

Choose the method to generate the batter slope.

Auto: *The batter slope is determined by cutting the hinge and secondary string.*

Centreline, hinge & slope: *The batter setout is done by cutting the hinge and applying a manually entered slope from this.*

Manual relative (dOS&dHgt): *The user manually enters the hinge offset from the control line, the hinge height relative to the control line and the batter slope.*

Manual absolute (dOS&RL)*: The user manually enters the hinge offset from the control line, the absolute hinge height and the batter slope.*

Manual, use current slope*: The batter setout is done by cutting the hinge and applying the last measured slope.*

Offset 12dF double box

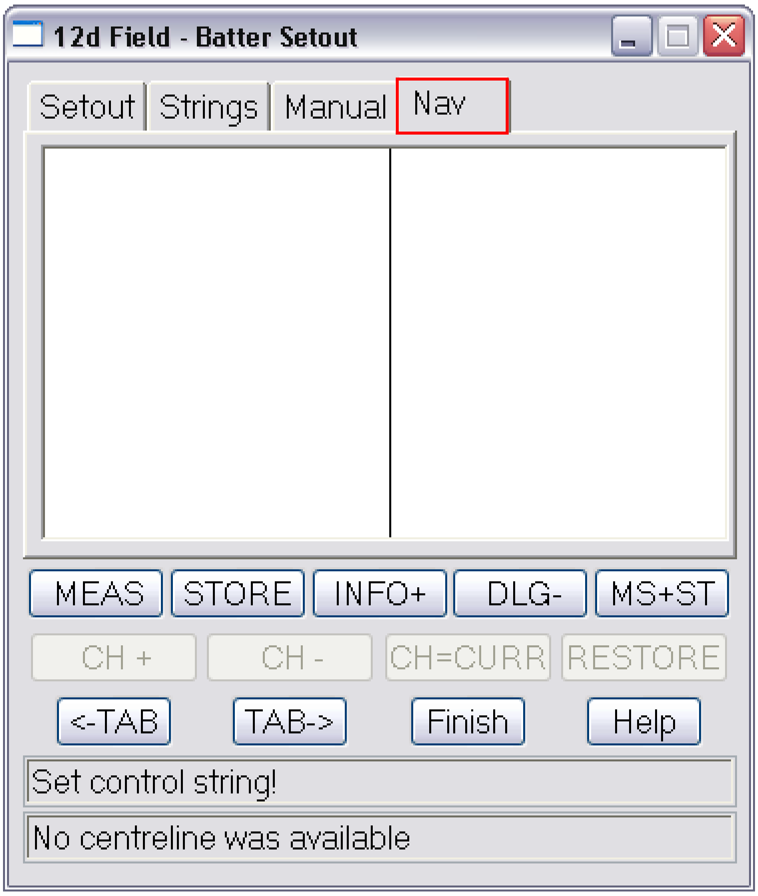
*Dependant on the '**Batter Mode**' setting in use, see description of the options in '**Batter Mode**'.*

Delta Hgt/Absolute Height 12dF double box

*Dependant on the '**Batter Mode**' setting in use, see description of the options in '**Batter Mode**'.*

Slope H/V 12dF double box

The slope of the batter in horizontal/vertical from, e.g. 2:1



Nav tab

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

Field Description Type Defaults Pop-Up

Navigation Box draw box

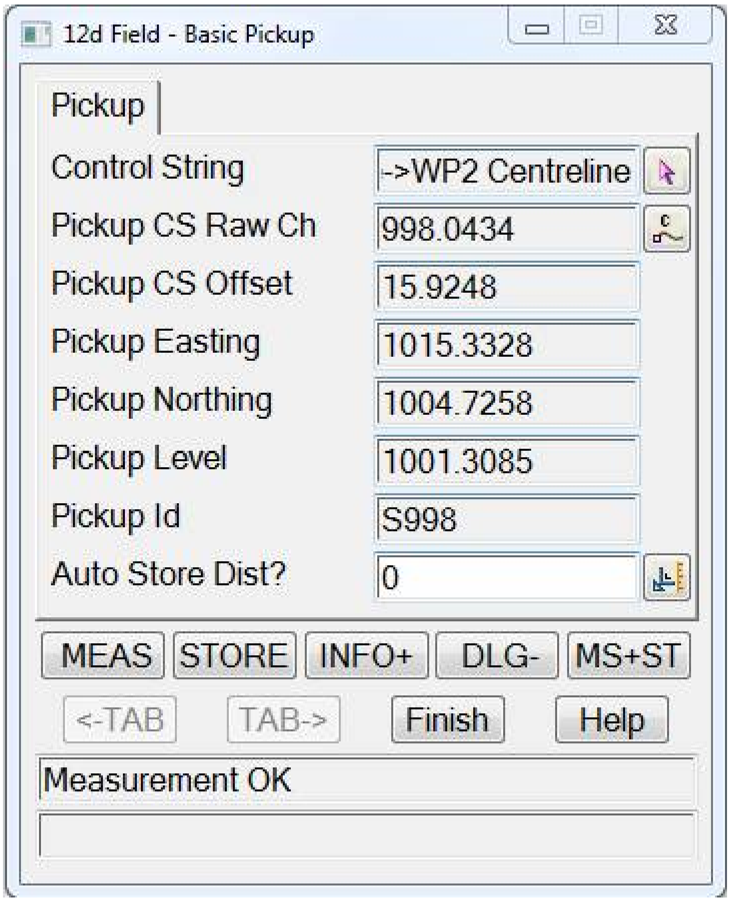
The 12d Field navigation box augments setout by displaying user definable information rows plus a bulls-

eye as a visual aid.

Continue to next section 16.9.0.0.3 12d Field -Basic Pickup or return to 16.3 Starting and Configuring 12d Field .

16.9.0.0.3 12d Field -Basic Pickup

The **12d Field - Basic Pickup** panel enables the user to pickup and store points. Basic Pickup is only for points and simple lines, it has no edit facilities, recalculations for target height corrections *etc*.



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

Field Description Type Defaults Pop-Up

Control String 12dF string select box

If selected the chainage and offset of the current point on this string will be displayed.

Pickup CS Raw Ch 12dF chainage box

The raw/non equality chainage of the current point on the control string.

Pickup CS Offset 12dF double box

The offset of the current point from the control string, +ve is right

Pickup Easting 12dF double box

The measured easting.

Pickup Northing 12dF double box

The measured northing.

Pickup Level 12dF double box

The measured level.

Pickup Id 12dF input box

The Id of the measured point, the behaviour of the Id is controlled from the 16.5.9 Store Point Setup *panel.*

Auto Store Dist? 12dF double box

If non zero the distance between shots to automatically store points, the measurement mode must be continuous.

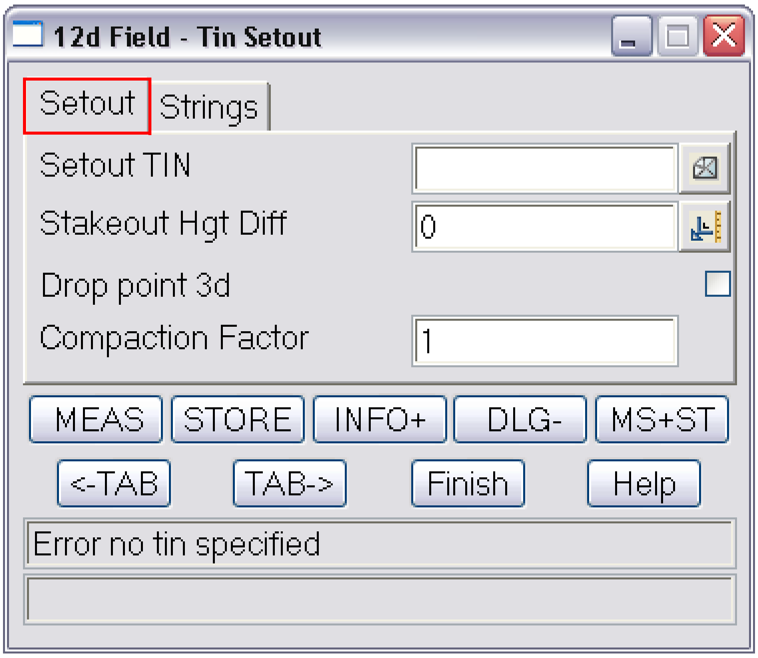
Continue to next section 16.9.0.0.4 Tin Setout or return to 16.3 Starting and Configuring 12d Field .

16.9.0.0.4 Tin Setout

The **12d Field - Tin Setout** panel is used when the user needs to get design levels from a tin.

The point can be dropped either vertically to the tin or 3d/normal to the tin.

Selecting the **Tin Setout** option brings up the **12d Field - Tin Setout** panel.



Setout tab

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

Field Description	Type	Defaults	Pop-Up
Setout TIN	12dF tin box		

The TIN to use for setting out.

Stakeout Hgt Diff 12dF double box

The height diff from the setout surface/string. +ve is above.

Drop point 3d named tick box

When this is toggled on the point is dropped normal to the tin.

In the event the point cannot be dropped to triangle face it will try drop to the edge of a triangle that lies inside the 2d boundary of the tin.

Compaction Factor 12dF double box

A compaction factor applied to the delta heights, e.g. if you know say asphalt will compact by 23% and you need to cover this enter the value as 1.23. (Note this widget is optional and only appears if activated in the Settings panel).

Buttons

MEAS button

Start a measurement, the behaviour is determined by the TPS/GNSS measurement setting set from the control bar.

INFO+ button

Display the user configurable information panel to view extra information not available on the standard dialog.

DLG- button

Minimises the dialogue so only the first 2 rows of buttons are shown.

MS+ST button

Start a measurement and store it on completion.

<-TAB button

Go to the previous tab in the dialogue.

TAB-> button

Go to the next tab in the dialogue.

STOP button

Stop the measurement in process.

STORE button

Store the last measured point.

Nav P button

Load a saved navigation page configuration.

Sh M button

Start a measurement with a touch on the screen.

Sh M+S button

Start a measurement with a touch on the screen, store it on completion.

READ button

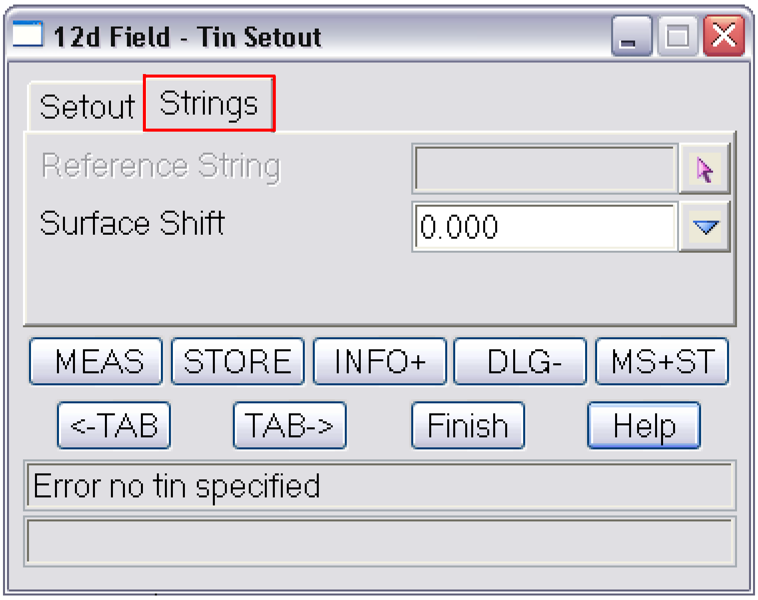
Load previously saved setout settings for reuse.

SAVE button

Save the current setout settings for reuse at a later date.

INFO- button

Close the user configurable information panel.



Strings tab

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

Field Description	Type	Defaults	Pop-Up
Reference String	12dF string select box		

Reference string, a string to which the current point is dropped normally to for information only.

Field Description	Type	Defaults	Pop-Up
Surface Shift	choice box		0.000

*A vertical shift to be applied to the design level, +ve raises the level, can be manually entered or selected from the choice list, (defined in "**TDF_SURFACE_SHIFTS.4D**")*

Continue to next section 16.9.0.0.5 Crossfall Setout or return to 16.3 Starting and Configuring 12d Field .

16.9.0.0.5 Crossfall Setout

The **12d Field** - **Crossfall Setout** panel is used when the user wants to generate their design height by cutting 2 strings and projecting the plane of the cuts to their position.

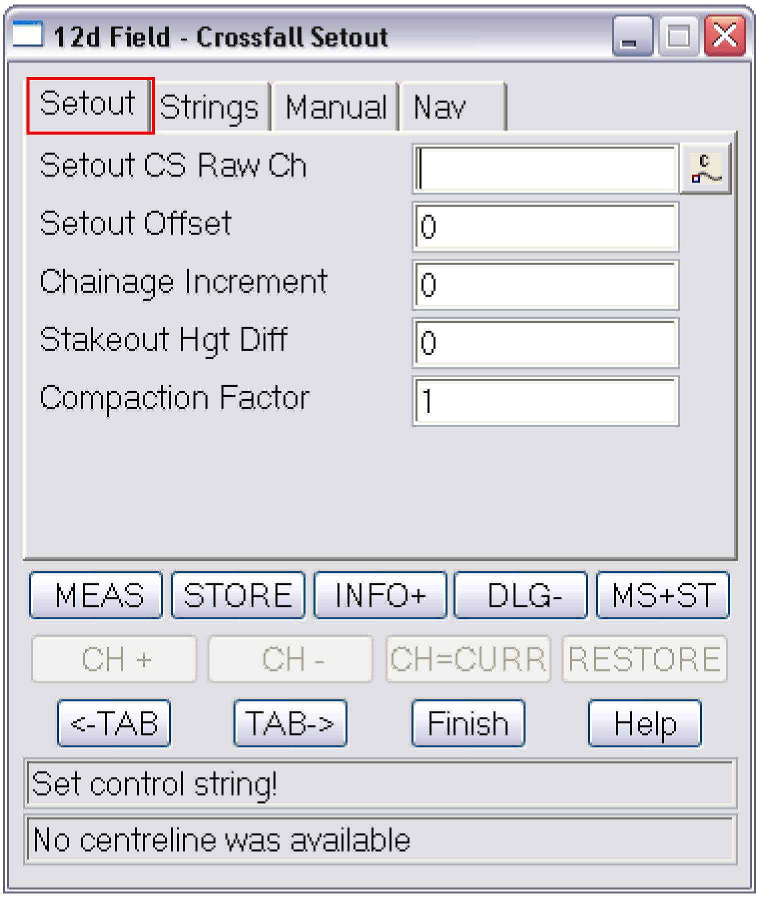
The user is able to set a shift to move the design surface up or down once the strings are cut.

There are manual modes available of setting the design crossfall when 2 strings are not able to be cut.

Crossfall Setout works by dropping a point to a nominated control string, then a setout string and the 2 strings used to determine the crossfall are cut normal to the dropped point on the control string.

Note the control string, the setout string and 1 of the level strings could be the same string or all different, this dependant on the task being performed.

Selecting the **Crossfall Setout** option brings up the **12d Field** - **Crossfall Setout** panel.



Setout tab

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

Field Description	Type	Defaults	Pop-Up
Setout CS Raw Ch	12dF chainage box		

The raw, no equalities setout chainage on the control string, start chainage plus distance along string

Setout Offset	12dF double box		

The offset from the setout string to setout, +ve is to the right of the string, -ve left

Chainage Increment	12dF double box		

Chainage Increment

Stakeout Hgt Diff 12dF double box

The height diff from the setout surface/string. +ve is above.

Compaction Factor 12dF double box

*A **Compaction Factor** applied to the delta heights, e.g. if you know say asphalt will compact by 23% and you need to cover this enter the value as 1.23. (Note this widget is optional and only appears if activated in the Settings panel).*

Buttons

MEAS button

Start a measurement, the behaviour is determined by the TPS/GNSS measurement setting set from the control bar.

INFO+ button

Display the user configurable information panel to view extra information not available on the standard dialogue

DLG- button

Minimises the dialogue so only the first 2 rows of buttons are shown.

MS+ST button

Start a measurement and store it on completion.

CH + button

Increment the setout chainage by the value in the chainage increment field.

CH - button

Decrement the setout chainage by the value in the chainage increment field.

CH=CURR button

Set the setout chainage to the chainage of the last measured point.

RESTORE button

*Restore the setout chainage to the chainage prior to the "**CH=CURR**" button being pressed.*

<-TAB button

Go to the previous tab in the dialogue.

TAB-> button

Go to the next tab in the dialogue.

STORE button

Store the last measured point.

Nav P button

Load a saved navigation page configuration.

Sh M button

Start a measurement with a touch on the screen.

Sh M+S button

Start a measurement with a touch on the screen, store it on completion.

READ button

Load previously saved setout settings for reuse.

SAVE button

Save the current setout settings for reuse at a later date.

DLG+ button

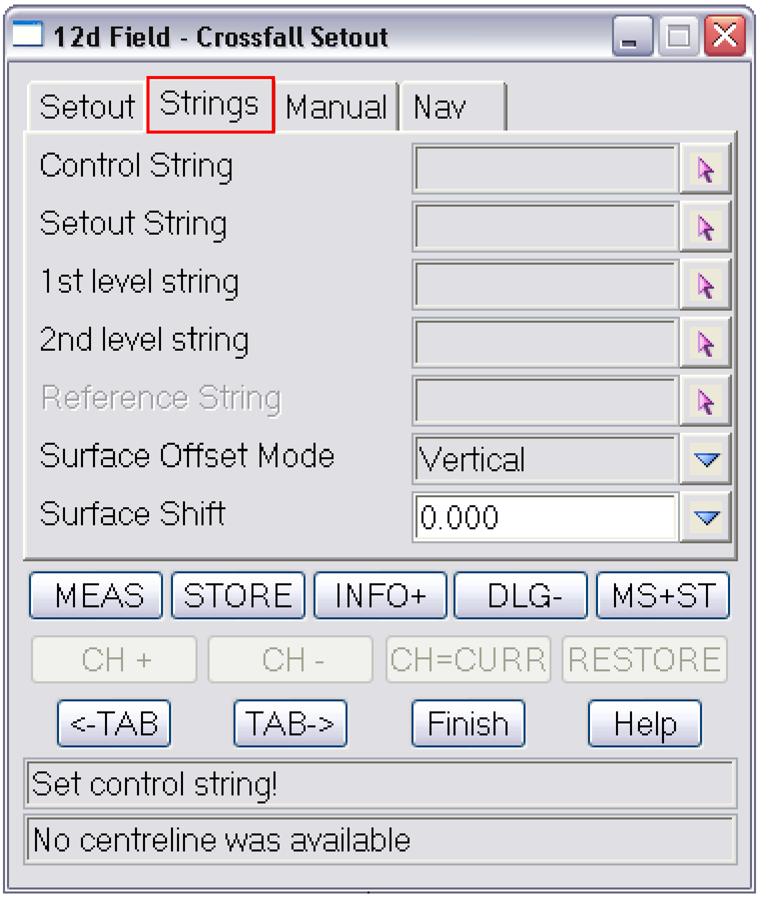
Restore a minimised panel to it's full size.

INFO- button

Close the user configurable information panel.

STOP button

Stop the measurement in process.



Strings tab

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

Field Description Type Defaults Pop-Up

Control String 12dF string select box

Control string, the string to which the other strings are cut normal to for calculations.

Setout String 12dF string select box

Setout String, setout offset & heights are relative to this string at a point cut normal from the setout chainage on the control string/centreline

1st level string 12dF string select box

Level string 1, the string cut for one of the design heights.

2nd level string 12dF string select box

Level string 2, the string cut for a 2nd design height.

Reference String 12dF string select box

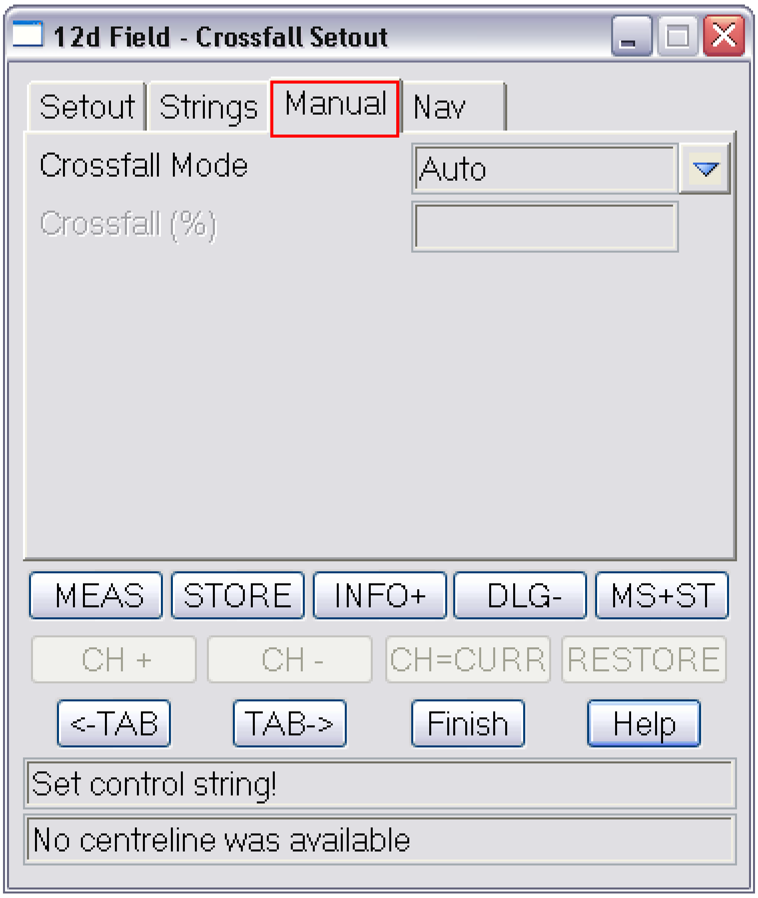
Reference string, a string to which the current point is dropped normally to for information only.

Surface Offset Mode choice box Vertical, Normal

Whether the offset to the surface is normal or vertical
***Vertical**: The height offset is applied vertically to the design surface.*
***Normal**: The height offset is applied normal/perpendicular to the design surface.*

Surface Shift choice box

*A vertical shift to be applied to the design level, +ve raises the level, can be manually entered or selected from the choice list, (defined in "**TDF_SURFACE_SHIFTS.4D**").*



Manual tab

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

Field Description	Type	Defaults	Pop-Up
Crossfall Mode	choice box		Auto, Centreline, string & x-fall, Manual, use current x-fall

The method used to generate the design crossfall

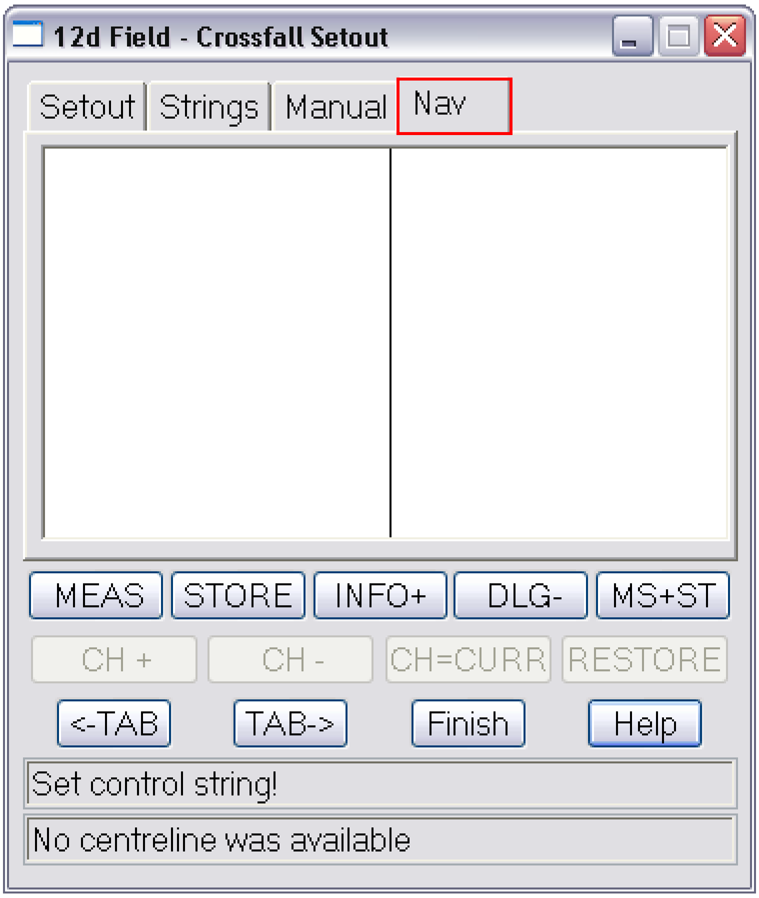
***Auto:** The crossfall is calculated by cutting the 1st and 2nd strings.*

Centreline, string & x-fall: *The crossfall is entered manually, only the 1st string is cut and the crossfall projected from this.*

Manual, use current x-fall: *The crossfall is entered manually defaulting to last calculated crossfall, only the 1st string is cut and the crossfall projected from this.*

Crossfall (%) 12dF double box

The manual crossfall entered by the user in the crossfall setout routine



Nav tab

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

Field Description	Type	Defaults	Pop-Up
Navigation Box	draw box		

The 12d Field navigation box augments setout by displaying user definable information rows plus a bulls-eye as a visual aid.

Continue to next section 16.9.0.0.6 Point Setout or return to 16.3 Starting and Configuring 12d Field .

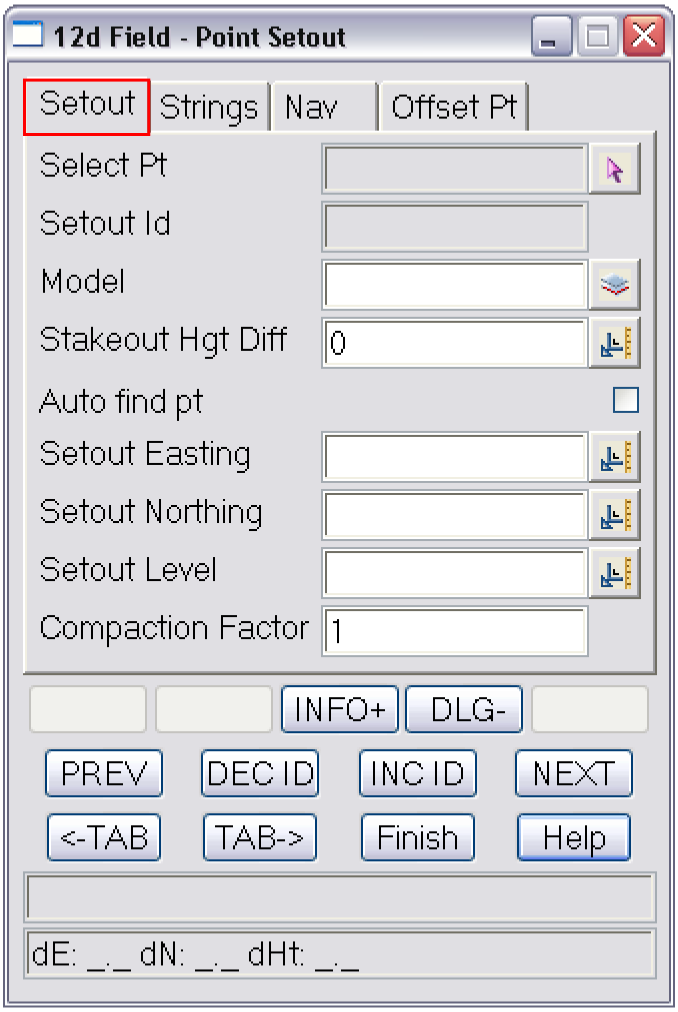
16.9.0.0.6 Point Setout

The **12d Field - Point Setout** panel enables the user to setout individual points, optionally referenced to a control string.

The point can be either selected from a view, be found automatically or be manually entered.

The panel also allows the offsetting of the point by a defined bearing and distance.

Selecting the **Point Setout** option brings up the **12d Field - Point Setout** panel.



Setout tab

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

Field Description Type Defaults Pop-Up

Point Selection

The point can be picked from a view, in this case the Id and Model boxes will be automatically filled out.

The point id can be manually changed but in this case must be unique in the model.

If auto find is on the point will be set to the closest point in the setout model to the current position in the field

Select Pt 12dF new select box

Select the point to setout, will update the Point Id and Model boxes.

Setout Id 12dF input box

The id/name of the setout point.

Model model box

The model containing the setout point.

Stakeout Hgt Diff 12dF double box

The height diff from the setout surface/string. +ve is above.

Auto find pt named tick box

Auto find pt

Setout Easting, Setout Northing, Setout Level

The coordinate boxes are only added to the panel if ticked on under survey in the settings panel.

Setout Easting 12dF double box

The easting to setout.

Setout Northing 12dF double box

The northing to setout.

Setout Level 12dF double box

The height to setout.

Compaction Factor 12dF double box

A compaction factor applied to the delta heights, e.g. if you know say asphalt will compact by 23% and you need to cover this enter the value as 1.23. (Note this widget is optional and only appears if activated in the Settings panel.)

Buttons

MEAS button

Start a measurement, the behaviour is determined by the TPS/GNSS measurement setting set from the control bar.

INFO+ button

Display the user configurable information panel to view extra information not available on the standard dialogue

DLG- button

Minimises the dialogue so only the first 2 rows of buttons are shown.

MS+ST button

Start a measurement and store it on completion.

NEXT button

Make the setout point the next point in the current string.

PREV button

Make the setout point the previous point in the current string.

INC ID button

Increment the point ID and make this the setout point. E.g. BOLT30 -> BOLT31

DEC ID button

Decrement the point ID and make this the setout point. E.g. BOLT31 -> BOLT30

<-TAB button

Go to the previous tab in the dialogue.

TAB-> button

Go to the next tab in the dialogue.

STOP button

Stop the measurement in process.

STORE button

Store the last measured point.

Nav P button

Load a saved navigation page configuration.

Sh M button

Start a measurement with a touch on the screen.

Sh M+S button

Start a measurement with a touch on the screen, store it on completion.

READ button

Load previously saved setout settings for reuse.

SAVE button

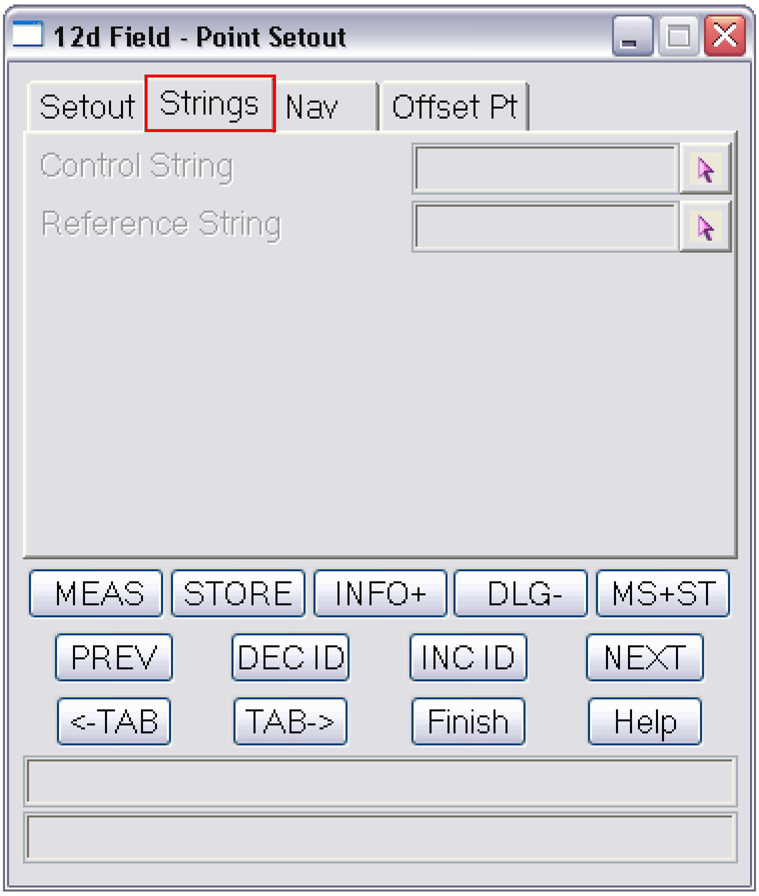
Save the current setout settings for reuse at a later date.

DLG+ button

Restore a minimised panel to it's full size.

INFO- button

Close the user configurable information panel.



Strings tab

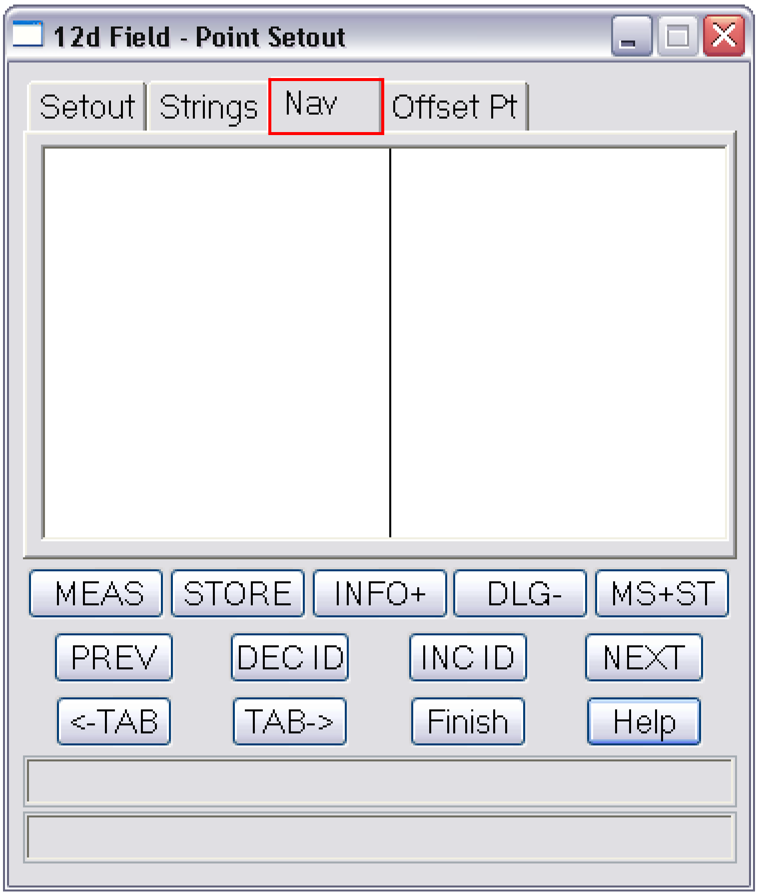
The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Control String	12dF new select box		

Control string, the string to which the other strings are cut normal to for calculations.

Field Description	Type	Defaults	Pop-Up
Reference String	12dF new select box		

Reference string, a string to which the current point is dropped normally to for information only.

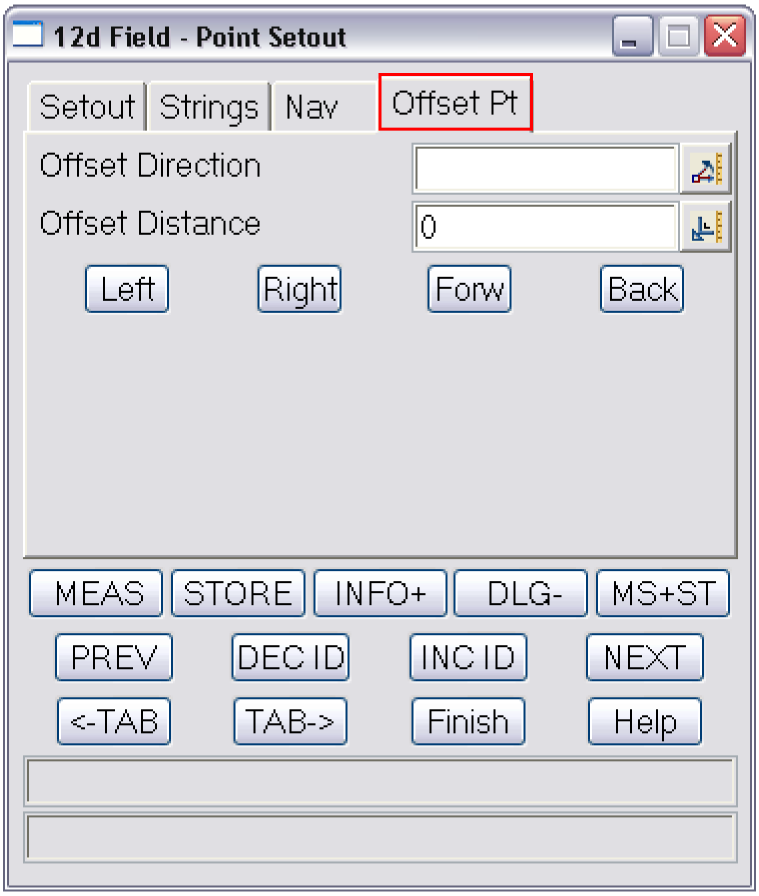


Nav tab

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

Field Description	Type	Defaults	Pop-Up
Navigation Box	draw box		

The 12d Field navigation box augments setout by displaying user definable information rows plus a bulls-eye as a visual aid.



Offset Pt tab

The **Offset Point** tab allows the current setout point to be offset in a defined direction and distance.

For example if the offset direction was 45° and the offset distance 5m pressing Left would move the point 5m at 315°.

If a control string is nominated then when the point is originally selected it is dropped to the control string and the bearing at this point is the default for the offset direction.

For example, to place offset pegs to a drainage pit select the road centreline and then select the pit. The bearing is that of the road, enter the offset distance and press Right or Left and the point is updated.

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

Field Description	Type	Defaults	Pop-Up
Offset Direction	12dF angle box		

Direction to offset base point in.

Offset Distance	12dF double box		

Distance to offset base point by.

Left	button		

Offset the point by the offset distance to the left of the offset direction.

Right	button		

Offset the point by the offset distance to the right of the offset direction.

Forw button

Offset the point by the offset distance in the offset direction.

Back button

Offset the point by the offset distance against the offset direction.

Continue to next section 16.9.0.0.7 Grid Setout or return to 16.3 Starting and Configuring 12d Field
.

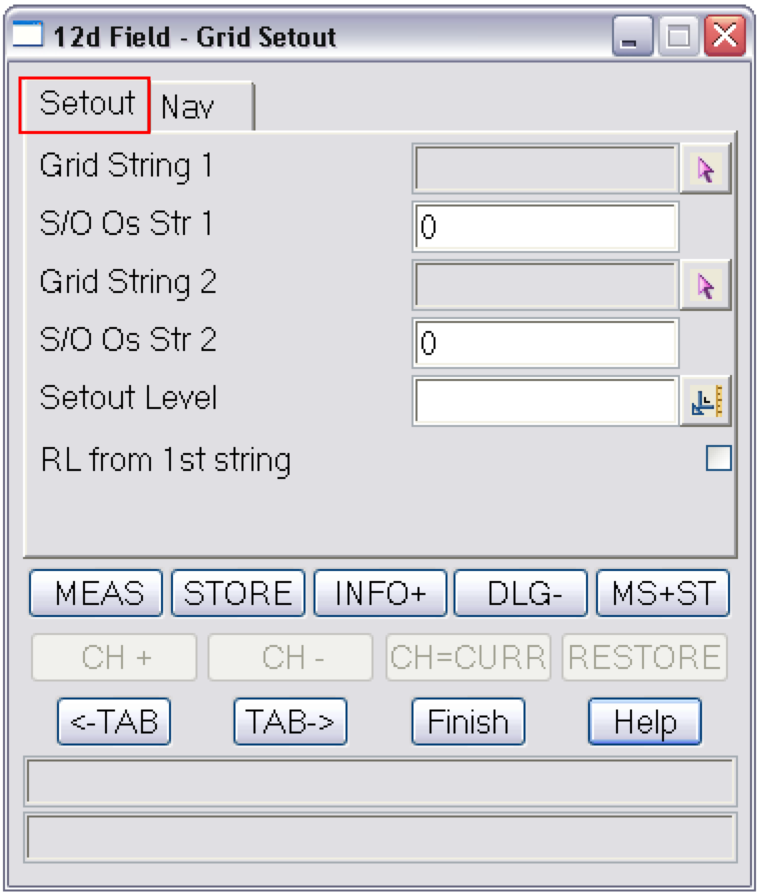
16.9.0.0.7 Grid Setout

This section of documentation is a work in progress and will be updated in subsequent releases.

The **12d Field - Grid Setout** panel creates a setout point at offsets from 2 strings.

Most typically used in buildings where points are dimensioned off setout grids

Selecting the **Grid Setout** option brings up the **12d Field - Grid Setout** panel.



Setout tab

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

Field Description	Type	Defaults	Pop-Up
Grid String 1	12dF new select box		

The first string for grid setout.

S/O Os Str 1	12dF double box		

The setout offset from the first string.

Grid String 2	12dF new select box		

The second string for grid setout.

S/O Os Str 2	12dF double box		

The setout offset from the second string.

Setout Level	12dF double box		

The height to setout.

RL from 1st string tick box

If ticked then the level of the 1st string selected will be the setout level.

Buttons

MEAS button

Start a measurement, the behaviour is determined by the TPS/GNSS measurement setting set from the control bar.

INFO+ button

Display the user configurable information panel to view extra information not available on the standard dialogue

DLG- button

Minimises the dialogue so only the first 2 rows of buttons are shown.

MS+ST button

Start a measurement and store it on completion.

CH + button

increment the setout chainage by the value in the chainage increment field.

CH - button

Decrement the setout chainage by the value in the chainage increment field.

CH=CURR button

Set the setout chainage to the chainage of the last measured point.

RESTORE button

*Restore the setout chainage to the chainage prior to the "**CH=CURR**" button being pressed.*

<-TAB button

Go to the previous tab in the dialogue.

TAB-> button

Go to the next tab in the dialogue.

STOP button

Stop the measurement in process.

STORE button

Store the last measured point.

Nav P button

Load a saved navigation page configuration.

Sh M button

Start a measurement with a touch on the screen.

Sh M+S button

Start a measurement with a touch on the screen, store it on completion.

READ button

Load previously saved setout settings for reuse.

SAVE button

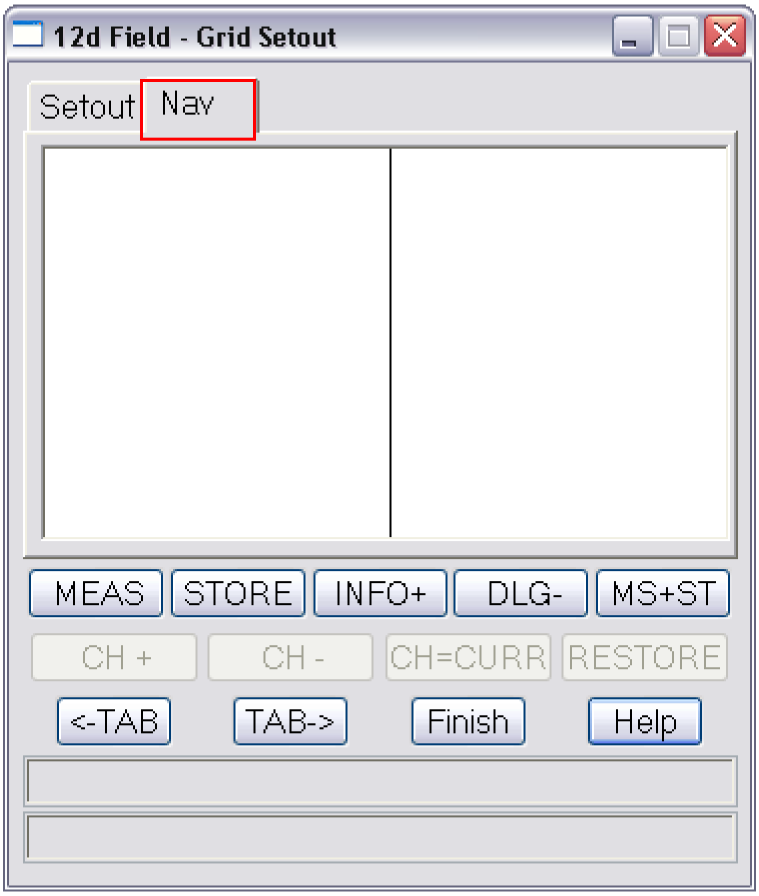
Save the current setout settings for reuse at a later date.

DLG+ button

Restore a minimised panel to it's full size.

INFO- button

Close the user configurable information panel.



Nav tab

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

Field Description Type Defaults Pop-Up

Navigation Box draw box

The 12d Field navigation box augments setout by displaying user definable information rows plus a bulls-eye as a visual aid.

Continue to next section 16.9.0.0.8 Crown Setout or return to 16.3 Starting and Configuring 12d Field .

16.9.0.0.8 Crown Setout

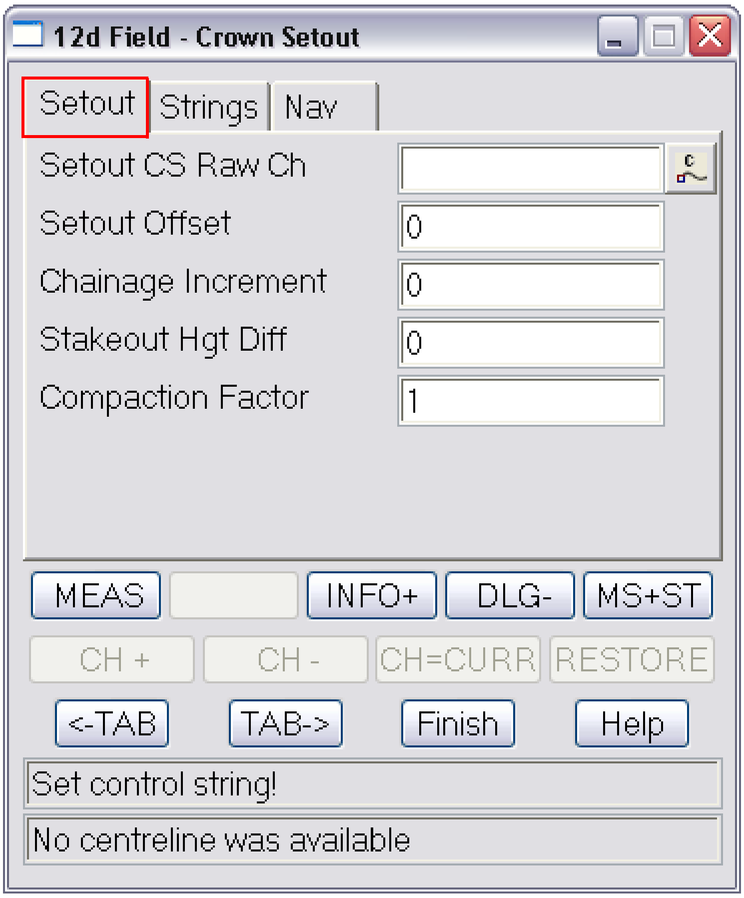
The **12d Field - Crown Setout** panel is effectively 2 **12d Field - Crossfall Setout** panels. It is typically used on rural roads when the user wants to generate design heights to both sides of the crowned road.

Crown setout works by dropping a point to a nominated control string, then the setout string and the 3 strings used to determine the crown are cut normal to the dropped point on the control string.

The user is able to set a shift to move the design surface up or down once the strings are cut.

Note the setout string and 1 of the level strings could be the same string or different, this dependant on the task being performed.

Selecting the **Crown Setout** option brings up the **12d Field - Crown Setout** panel.



Setout tab

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

Field Description Type Defaults Pop-Up

Setout CS Raw Ch 12dF chainage box

The raw, no equalities setout chainage on the control string, start chainage plus distance along string

Setout Offset 12dF double box

The offset from the setout string to setout, +ve is to the right of the string, -ve left

Chainage Increment 12dF double box

The value the setout chainage will be changed by when chainage increment/decrement is called.

Stakeout Hgt Diff 12dF double box

The height diff from the setout surface/string. +ve is above.

Compaction Factor 12dF double box

A compaction factor applied to the delta heights, e.g. if you know say asphalt will compact by 23% and you need to cover this enter the value as 1.23. (Note this widget is optional and only appears if activated in the Settings panel.)

Buttons

MEAS button

Start a measurement, the behaviour is determined by the ***TPS/GNSS*** *measurement setting set from the control bar.*

INFO+ button

Display the user configurable information panel to view extra information not available on the standard dialogue

DLG- button

Minimises the dialogue so only the first 2 rows of buttons are shown.

MS+ST button

Start a measurement and store it on completion.

CH + button

Increment the setout chainage by the value in the chainage increment field.

CH - button

Decrement the setout chainage by the value in the chainage increment field.

CH=CURR button

Set the setout chainage to the chainage of the last measured point.

RESTORE button

Restore the setout chainage to the chainage prior to the ***"CH=CURR"*** *button being pressed.*

<-TAB button

Go to the previous tab in the dialogue.

TAB-> button

Go to the next tab in the dialogue.

STOP button

Stop the measurement in process.

STORE button

Store the last measured point.

Nav P button

Load a saved navigation page configuration.

Sh M button

Start a measurement with a touch on the screen.

Sh M+S button

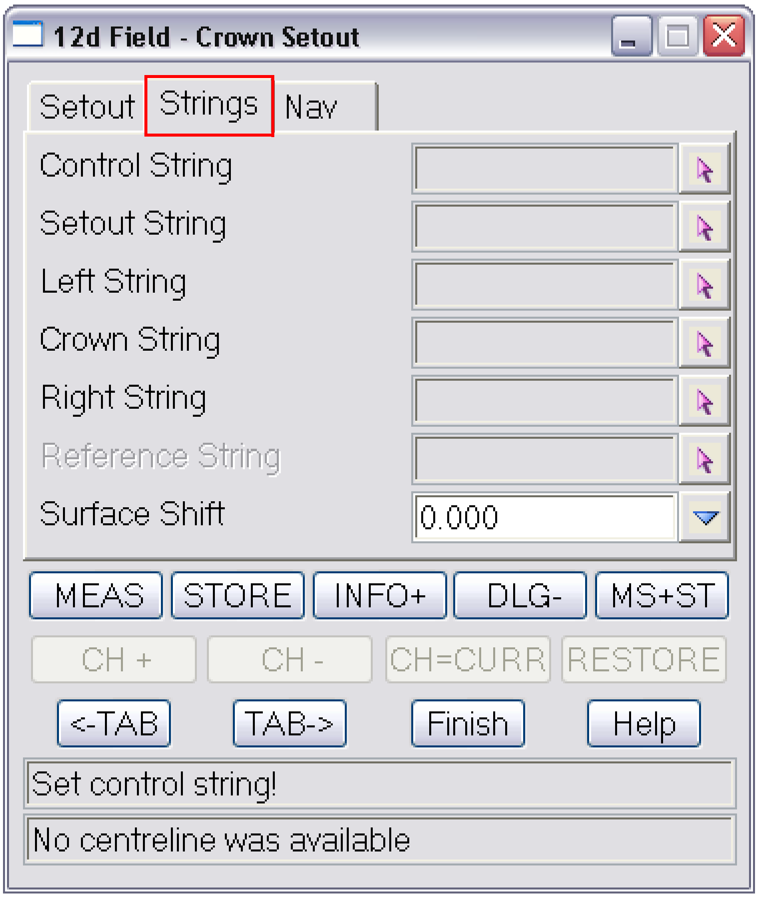
Start a measurement with a touch on the screen, store it on completion.

READ button

Load previously saved setout settings for reuse.

SAVE button

Save the current setout settings for reuse at a later date.



Strings tab

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

Field Description Type Defaults Pop-Up

Control String 12dF new select box

Control string, the string to which the other strings are cut normal to for calculations.

Setout String 12dF new select box

Setout String, setout offset & heights are relative to this string at a point cut normal from the setout chainage on the control string/centreline

1st Level String 12dF new select box

Level string 1, a string cut for one of the design heights.

Crown String 12dF new select box

Crown string, the middle string for design heights in crown setout

2nd Level String 12dF new select box

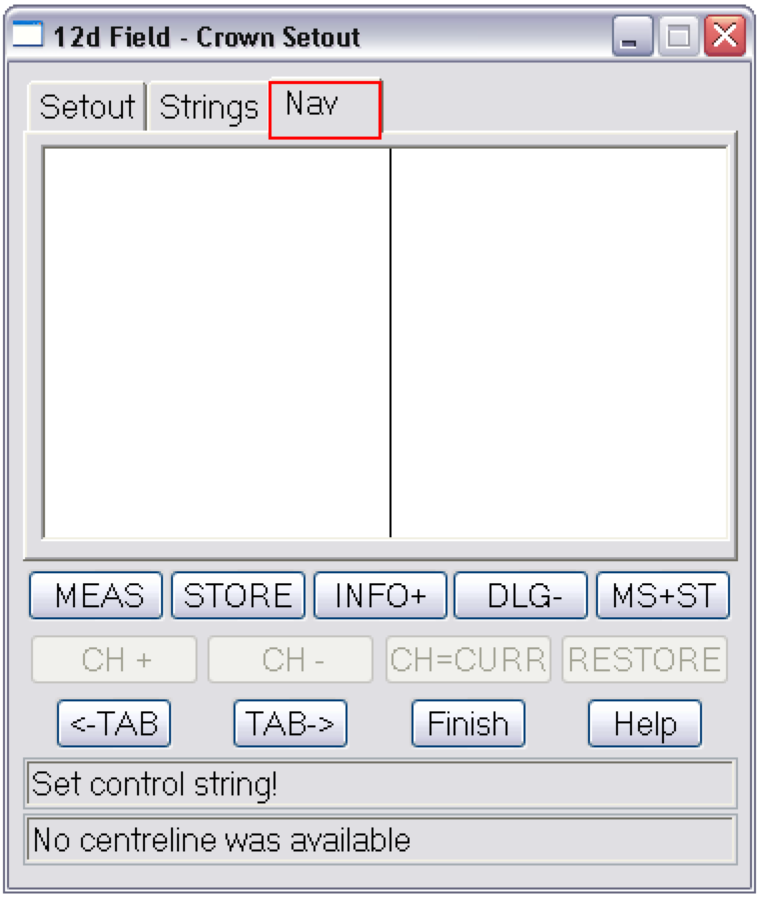
Level string 2, the string cut for a 2nd design height.

Reference String 12dF new select box

Reference string, a string to which the current point is dropped normally to for information only.

Surface Shift choice box 0.0000

*A vertical shift to be applied to the design level, +ve raises the level, can be manually entered or selected from the choice list, (defined in "**TDF_SURFACE_SHIFTS.4D**")*



Nav tab

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

Field Description Type Defaults Pop-Up

Navigation Box draw box

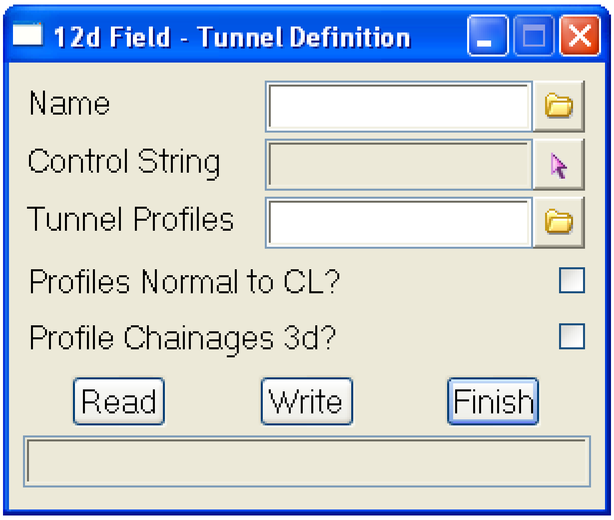
The 12d Field navigation box augments setout by displaying user definable information rows plus a bulls-eye as a visual aid.

Continue to next section 16.9.0.0.9 Tunnel Definition or return to 16.3 Starting and Configuring 12d Field .

16.9.0.0.9 Tunnel Definition

The **Tunnel Definition** panel combines a centreline, the **PRO/PRA** tunnel definition files and information on how the profiles are applied to the centreline into a single file for use by the **Tunnel Setout** panel.

For more information on **PRO/PRA** tunnel definition files please see 19.15.14 Definition of the PRO and PRA definition files



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

Field Description Type Defaults Pop-Up

Name

*The name of the tunnel, this a file with the extension **12dF_TUN_DEF.***

Control string

*The centreline the tunnel definitions are applied to, the centreline must have valid vertical geometry for the chainage ranges in the **PRA** file.*

Tunnel Profiles

*The **PRO/PRA** files containing the tunnel definition. For more information on **PRO/PRA** tunnel definition files please see* 19.15.14 Definition of the PRO and PRA definition files

Profiles Normal to CL? tick box

if ticked the tunnel is calculated perpendicular/normal to the vertical alignment of the centreline resulting in a true 3d model.

if not ticked the tunnel is calculated vertical to the vertical alignment of the centreline, this means an effective loss of clearance on steeper grades.

Profile Chainages 3d? tick box

*if not ticked the chainages in the **PRA** file are taken as plan chainages.*

if ticked the chainages are interpreted as 3d, this is the plan/2d chainage of the 1st point where the horizontal and vertical geometry coincide plus the 3d length along the centreline from there.

Buttons at Bottom

Read button

Read in a 12dField tunnel definition file.

Write button

Write to a 12dField tunnel definition file.

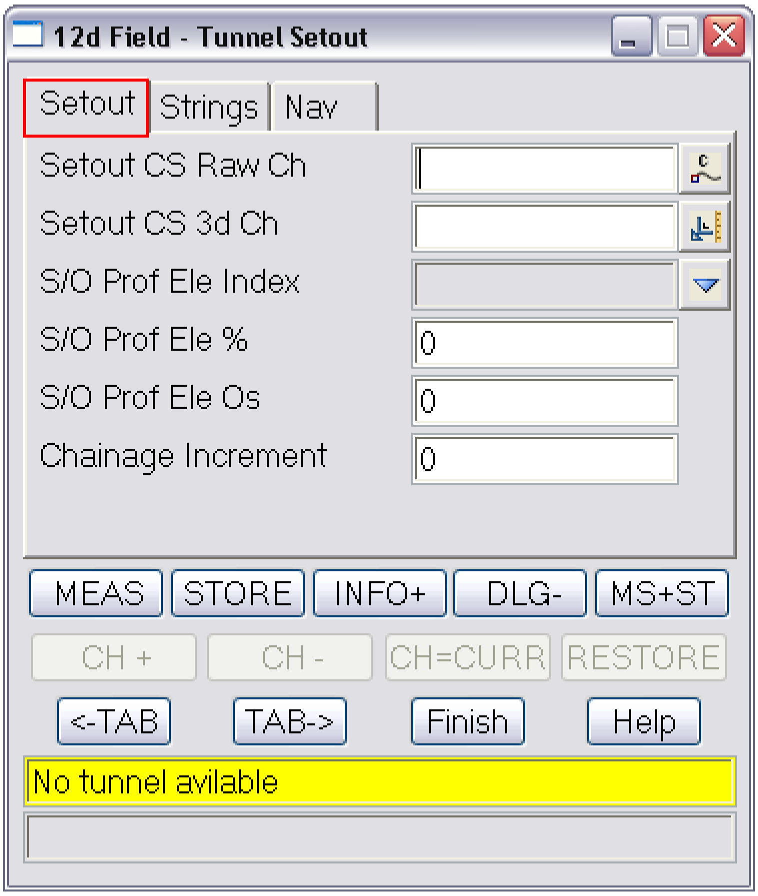
Finish

Exit the panel.

Continue to next section 16.9.0.0.10 Tunnel Setout or return to 16.3 Starting and Configuring 12d Field .

16.9.0.0.10 Tunnel Setout

The **Tunnel Setout** option, (available in TPS only) allows the user to locate and setout points on a tunnel previously defined in the 16.9.0.0.9 Tunnel Definition panel.



Setout tab

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

Field Description Type Defaults Pop-Up

Setout CS Raw Ch

The plan chainage of the point you wish to setout. If the tunnel chainages are defined as 3d this will be read only and be updated when a 3d chainage is entered.

Setout CS 3d Ch

The 3d chainage of the point you wish to setout. If the tunnel chainages are defined as 2d this will be read only and be updated when a 2d chainage is entered.

S/O Prof Ele Name

The name of the element in the profile to setout.

S/O Prof Ele %

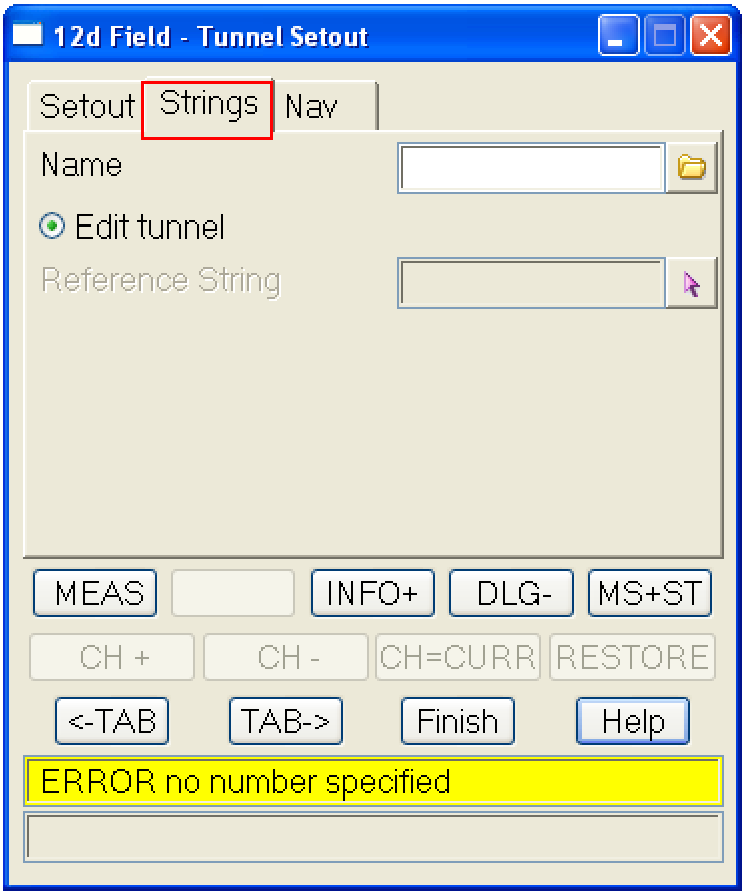
The percentage around the element to setout, 0% means the start of the element, 100% the end of the element.

S/O Prof Ele Os

The offset from the element to setout, +ve is to the right of the element.

Chainage Increment 12dF double box

The value the setout chainage will be changed by when chainage increment/decrement is called.



Strings tab

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

Field Description Type Defaults Pop-Up

Name

Select the tunnel to setout.

Edit tunnel

If pressed will open up the 16.9.0.0.9 Tunnel Definition *panel with the currently defined tunnel, on closure of the* ***Tunnel Definition*** *panel the definition will be read in again.*

Reference String 12dF new select box

Reference string, a string to which the current point is dropped normally to for information only.

Attributes specific to tunnel setout for display on the information and navigation pages.

pu_tun_ele_name

Name of the tunnel element at the shot taken

pu_tun_ele_idx

Index, (zero based) of the tunnel element in the profile at the shot taken, 0 is the first element

pu_tun_ele_per

Percentage around the tunnel element at the shot taken.

pu_tun_ele_os

Offset from the tunnel element at the shot taken, +ve is to the right hand side.

so_tun_ele_name

Name of the tunnel element at the point setout

so_tun_ele_idx

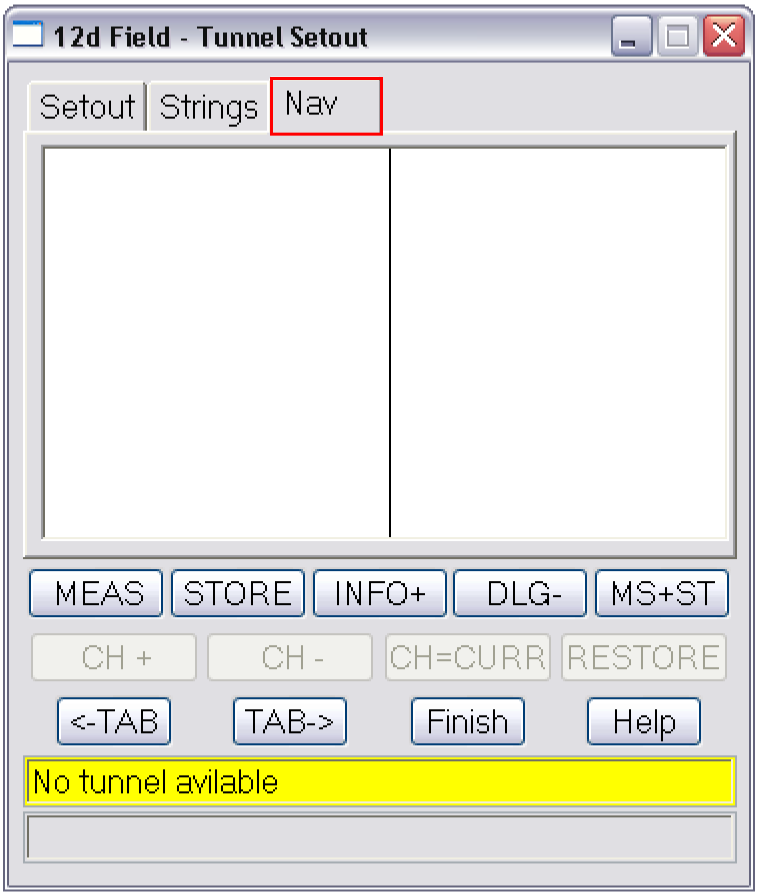
Index, (zero based) of the tunnel element in the profile at the point setout, 0 is the first element

so_tun_ele_per

Percentage around the tunnel element at the point setout.

so_tun_ele_os

Offset from the tunnel element at the point setout, +ve is to the right hand side.



Nav tab

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

Field Description	Type	Defaults	Pop-Up
Navigation Box	draw box		

The 12d Field navigation box augments setout by displaying user definable information rows plus a bulls-eye as a visual aid.

Continue to next section 16.9.0.0.11 Station Helmert or return to 16.3 Starting and Configuring 12d Field .

16.9.0.0.11 Station Helmert

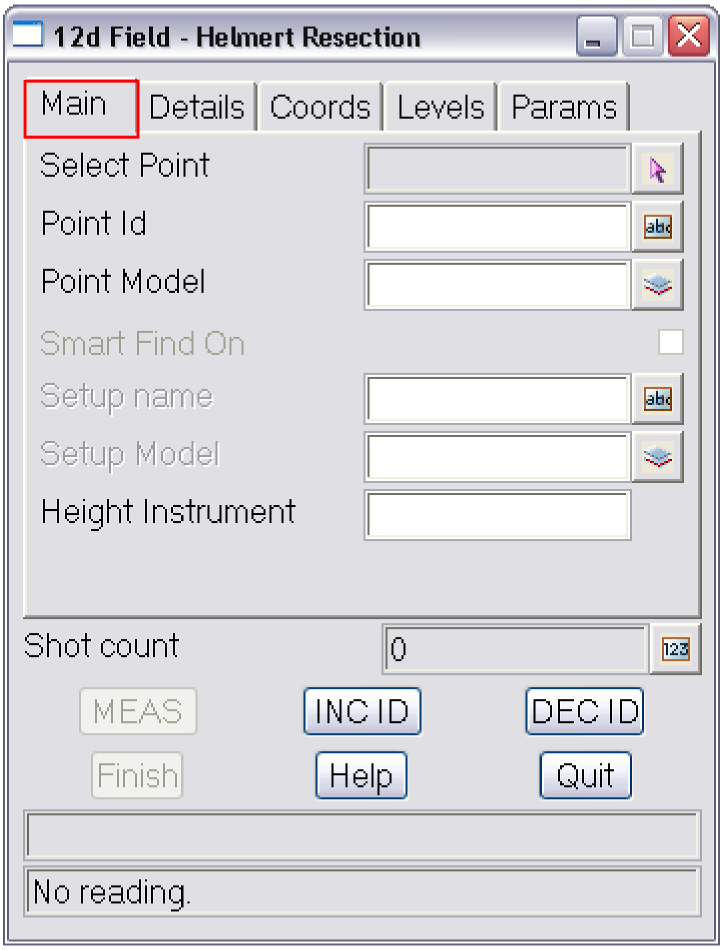
The **12d Field - Helmert Resection** panel can be used to establish a station setup by taking readings to up to 6 known points.

The horizontal position is obtained by a Helmert transformation; translation, rotation and uniform scaling of the readings.

The vertical position is obtained by meaning the z values of the readings, the z value is not weighted on distance measured.

Readings can be used for either horizontal position, vertical position or both.

Selecting **Station Helmert** displays the **12d Field - Helmert Resection** panel on the screen.



Main tab

A point for use in the resection can either be picked from the screen or manually entered.

If picked from the screen the Id and Model boxes will be filled automatically.

If entered manually the Id must be unique in the point model.

Note in 12dField the Id always refers to the Vertex Id.

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

Field Description	Type	Defaults	Pop-Up
Select Point	string select box		

Select the point for the next shot to be used in the resection

Point Id 12dF input box

The Id/name of the target point.

Point Model model box

The model containing the point for use in the resection.

Smart Find On tick box

Smart find can be used when you can clearly identify one point in a resection, e.g. in a tunnel you can see multiple targets but only identify the one closest to you.
Smart find can be used after you have measured to the identified point.

If ticked on then after a reading to a station smart find will look through the points model to find one that the reading matches, both horizontally and vertically.

The horizontal and vertical tolerances can be set on the parameters tab.

Use smart find to identify all stations measured to automatically.

The surveyor can optionally store the resection point to a model if need be.

Setup name input box

The Id of the setup to be stored.

Setup Model model box

The model to store the setup to.

Height Instrument 12dF double box

The height of the instrument above the setup point.

Buttons

MEAS button

Take a measurement to a station.

INC ID button

Increment the point ID and make this the setout point. E.g. BOLT30 -> BOLT31

DEC ID button

Decrement the point ID and make this the setout point. E.g. BOLT31 -> BOLT30

Shot Count

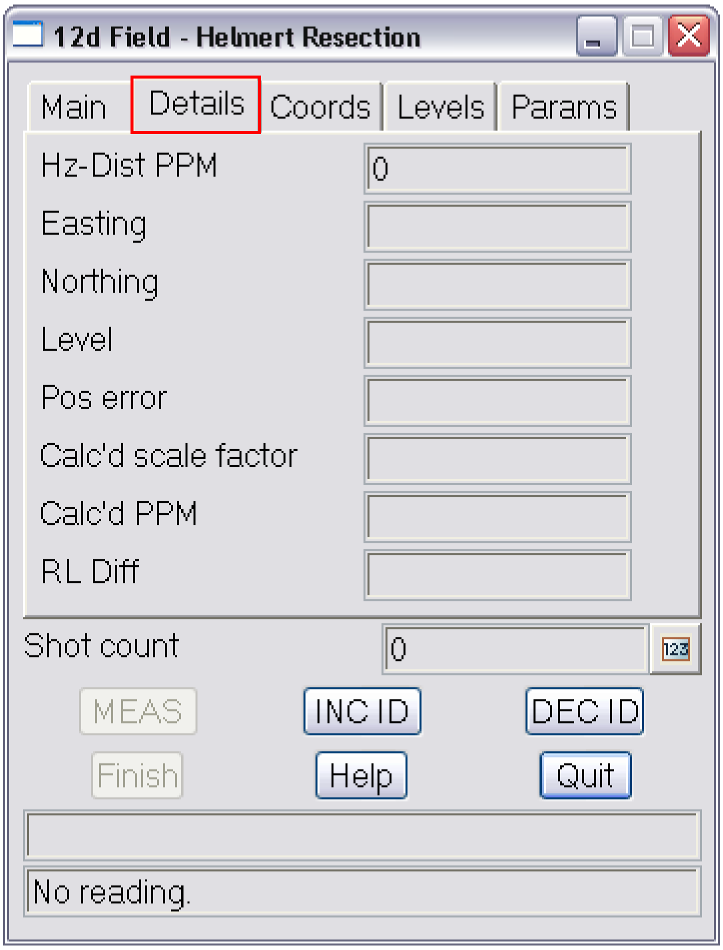
Number of shot used so far in the resection.

Finish button

Leave the panel and make this the new station setup, if any of the position tolerances nominated on the parameters tab are exceeded you will get a warning box allowing you to re-enter or continue.

Quit button

Quit the resection and restore the previous station setup.



Details tab

The details tab displays the overall details of the current setup.

The level of detail is different for 2 and 3+ shots where redundancies in the helmert calcs are available. For 3+ shot the estimation error can be displayed.

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

Field Description	Type	Defaults	Pop-Up
Hz-Dist PPM	12dF long box		

The scale factor to be applied to measured horizontal distances.

Easting	double box		

The calculated easting of the station setup.

Northing	double box		

The calculated northing of the station setup.

Level	double box		

The calculated level of the station setup.

Pos error	double box		

The estimated horizontal error in the station setup.

Calc'd scale factor	double box		

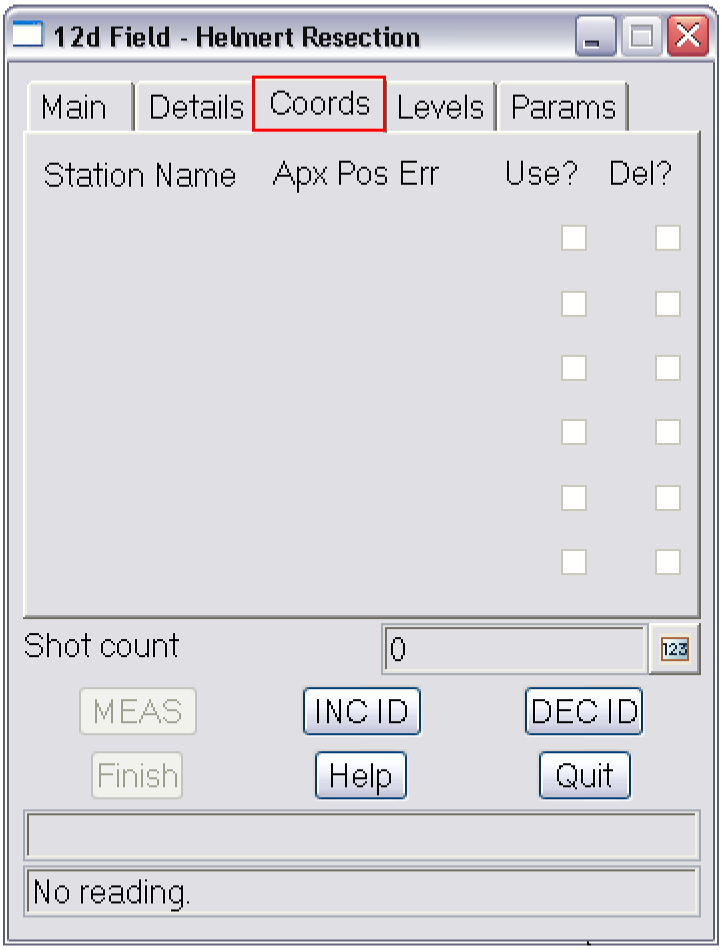
The scale factor applied to the measurements to get the best fit.

Calc'd PPM double box

The scale factor in ppm applied to the measurements to get the best fit.

RL Diff double box

The height difference range between the readings.



Coords tab

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

Field Description Type Defaults Pop-Up

Station Name

The name of the station this reading refers to.

Apx Pos Err

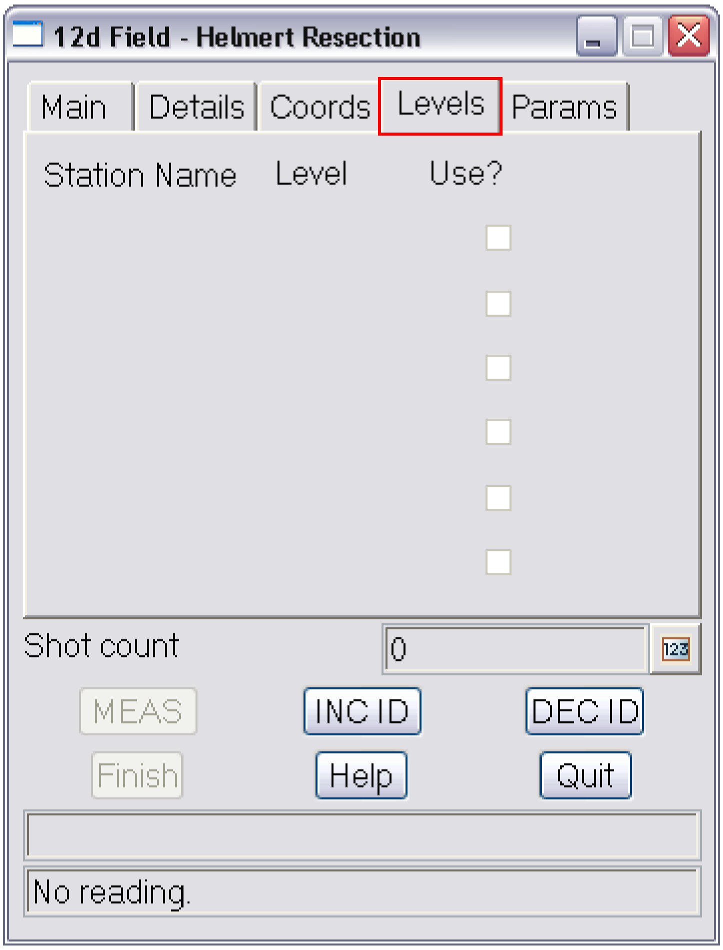
The approximate horizontal position error of this reading calculated in conjunction with all other readings in use. A high error for this reading in comparison to others might indicate a problem with this reading.

Use? tick box

If ticked this reading will be used in the horizontal calculation. Ticking or unticking the box will trigger the recalculation of the horizontal position.

Del? tick box

If ticked a confirmation box will be displayed and the reading removed from the resection. Removal will trigger the recalculation of the horizontal position.



Levels tab

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

Field Description Type Defaults Pop-Up

Station Name

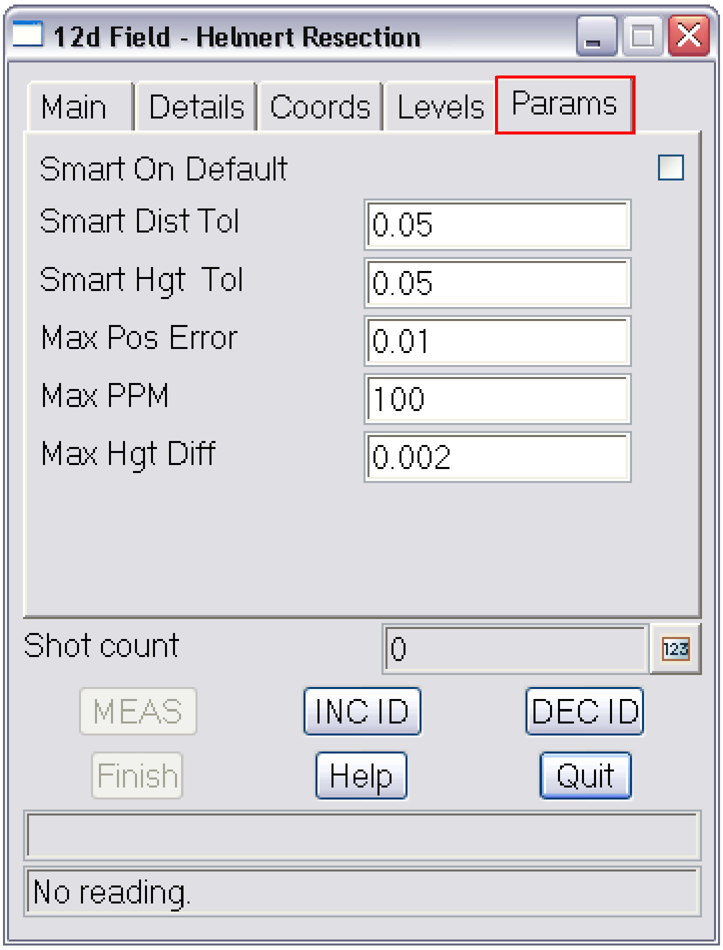
The name of the station this reading refers to.

Level

The level of the station calculated by this reading. A large difference for this reading in comparison to others might indicate a problem with this reading.

Use? tick box

If ticked this reading will be used in the vertical calculation. Ticking or unticking the box will trigger the recalculation of the vertical position.



Params tab

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

Field Description Type Defaults Pop-Up

Smart On Default tick box

The smart find feature is ticked on by default

Smart Dist Tol 12dF double box

The distance tolerance for a point to be used in the smart find

Smart Hgt Tol 12dF double box

The level tolerance for a point to be used in the smart find

Max Pos Error 12dF double box

The maximum position error allowed, a warning will be shown if exceeded.

Max PPM 12dF double box

The maximum ppm's allowed, a warning will be shown if exceeded.

Max Hgt Diff 12dF double box

The maximum height variation allowed, a warning will be shown if exceeded.

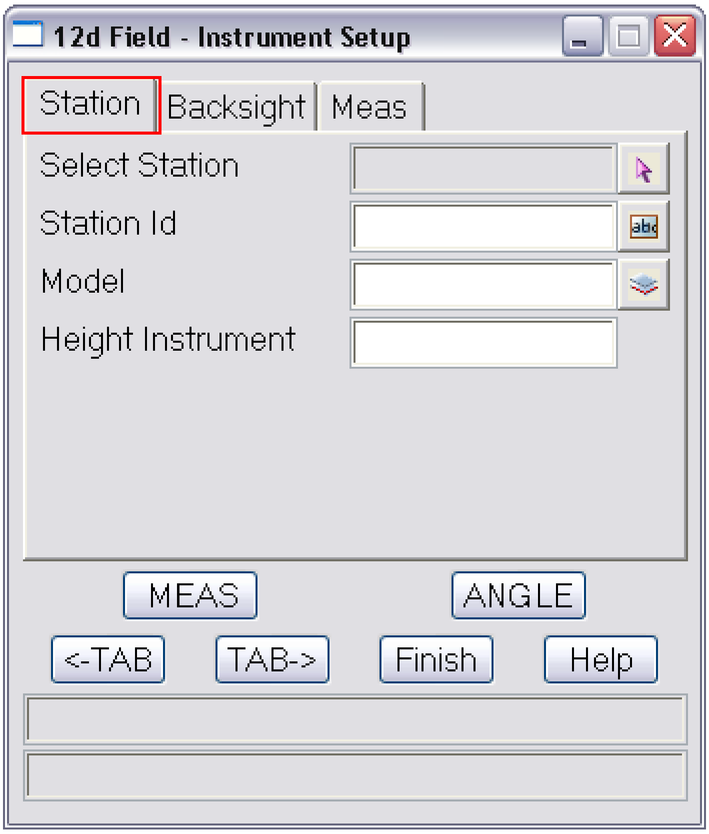
Continue to next section 16.9.0.0.12 Station Standard or return to 16.3 Starting and Configuring 12d Field .

16.9.0.0.12 Station Standard

The **12d Field - Instrument Setup** panel is used to establish a station setup over a known point.

Orientation is established by measuring/sighting a backsight station. It is not necessary to set an orientation on the instrument, 12dField handles the angle difference internally.

Selecting the **Station Standard** option brings up the **12d Field - Instrument Setup** panel.



Station tab

The point for use in the setup can either be picked from the screen or manually entered.

If picked from the screen the Id and Model boxes will be filled automatically.

If entered manually the Id must be unique in the point model.

Note in 12dField the Id always refers to the Vertex Id.

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

Field Description	Type	Defaults	Pop-Up
Select Station	string select box		

Select the control station you are setting up over.

Station Id	12dF input box		

The Id/name of the instrument setup.

Model	model box		

The model containing the instrument station.

Height Instrument	12dF double box		

The height of the instrument above the setup point.

Buttons

MEAS button

Start a full measurement, distance and angles.

ANGLE button

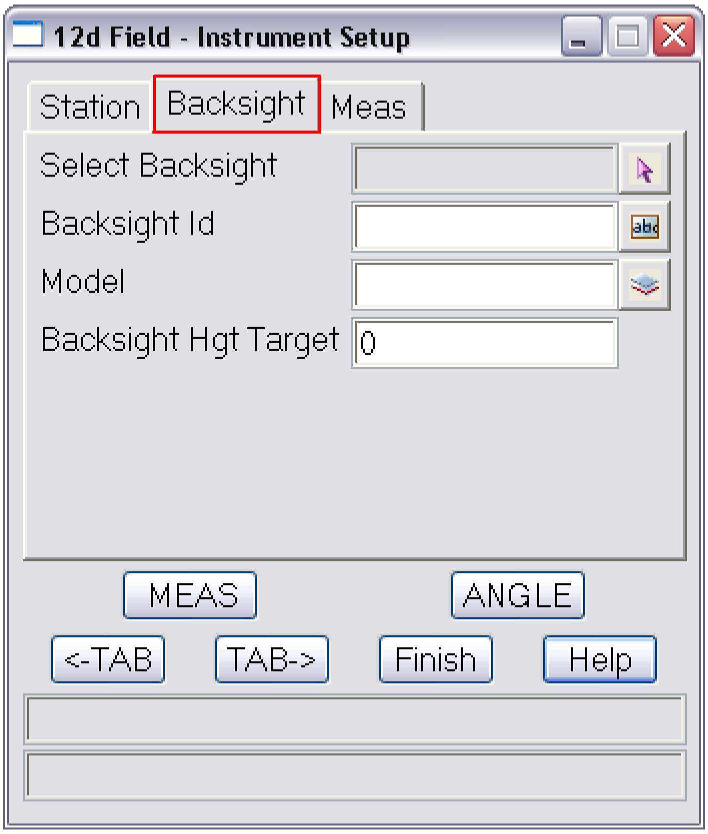
Start a horizontal/vertical angular measurement, no distance.

<-TAB button

Go to the previous tab in the dialogue.

TAB-> button

Go to the next tab in the dialogue.



Backsight tab

The backsight for use in the setup can either be picked from the screen or manually entered.

If picked from the screen the Id and Model boxes will be filled automatically.

If entered manually the Id must be unique in the point model.

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

Field Description Type Defaults Pop-Up

Select Backsight string select box

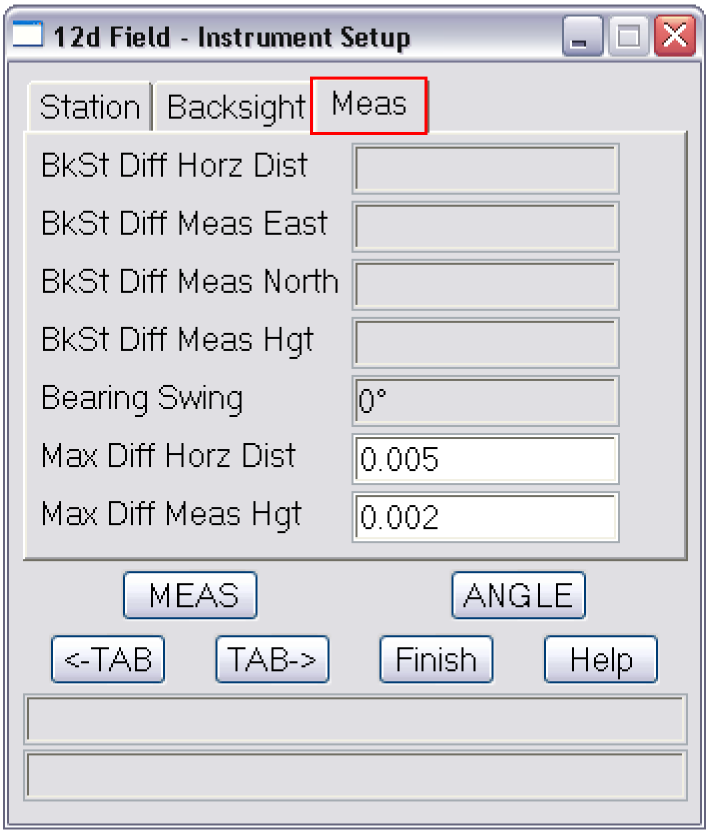
Select the point to be used for the backsight.

Backsight Id 12dF input box

The Id/name of the backsight point.

Backsight Hgt Target 12dF double box

The height of the backsight target above the backsight point.



Meas tab

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

Field Description	Type	Defaults	Pop-Up

BkSt Diff Horz Dist 12dF double box

Measured difference in horizontal distance to the backsight point.

BkSt Diff Meas East 12dF double box

Measured difference in easting to the backsight point.

BkSt Diff Meas North 12dF double box

Measured difference in northing to the backsight point.

BkSt Diff Meas Hgt 12dF double box

Measured difference in height to the backsight point.

Bearing Swing 12dF angle box

A bearing swing applied to the instrument reading to get the correct grid bearing.

Max Diff Horz Dist 12dF double box

Difference in horizontal distance that brings up a warning message.

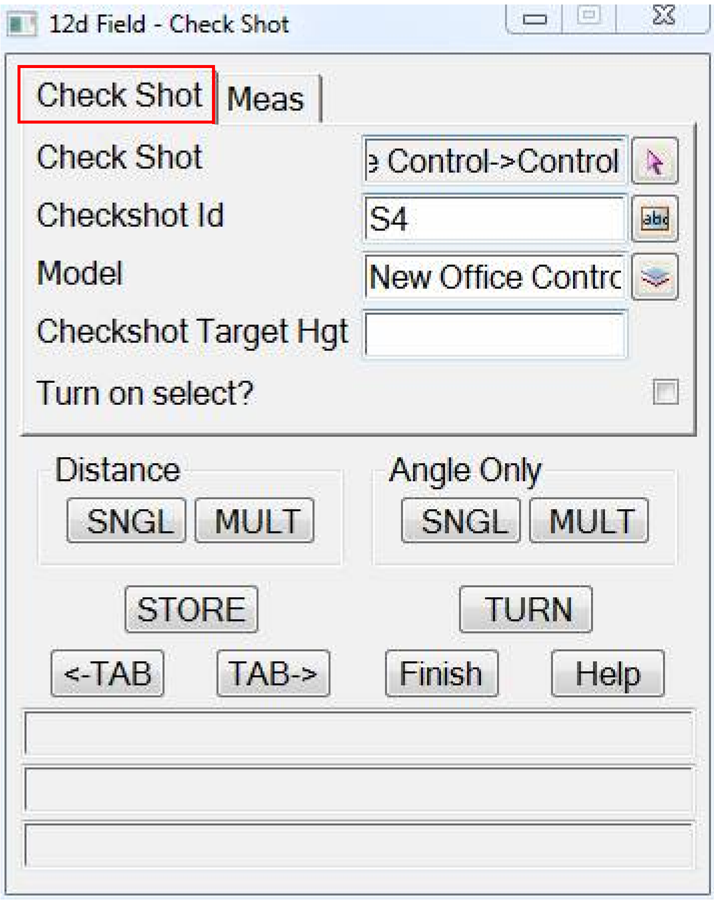
Max Diff Meas Hgt 12dF double box

Difference in height that brings up a warning message.

Continue to next section 16.9.0.0.13 Check Shot or return to 16.3 Starting and Configuring 12d Field .

16.9.0.0.13 Check Shot

The **12d Field - Check Shot** panel allows a measurement to a known point to check the validity of the current setup. The measurement can be a full measurement or angle only.



Check Shot tab

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

Field Description | Type | Defaults | Pop-Up

Check Shot string select box

Select a point for the check shot measurement.

Checkshot Id

The vertex id of the selected point, this can be populated from the select or manually entered.

Model model box

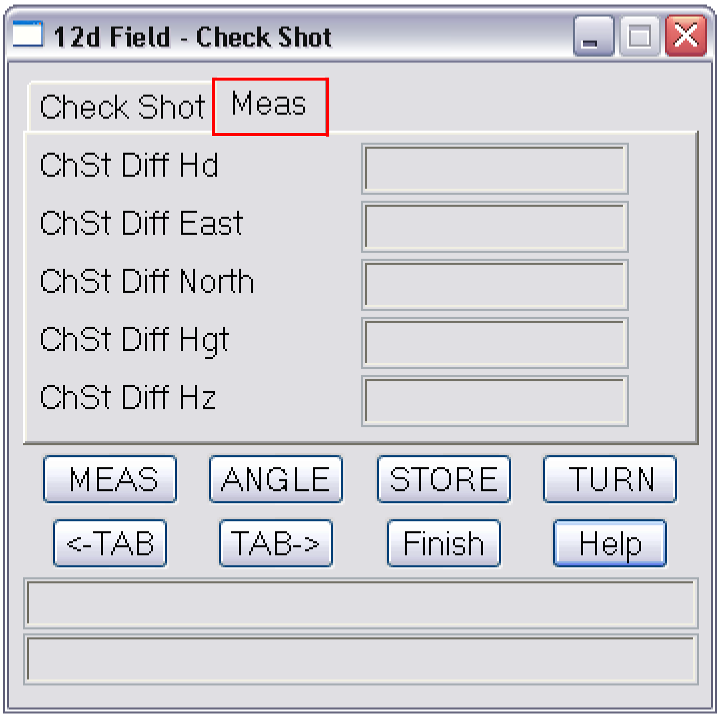
The model containing the checkshot point.

Checkshot Target Hgt

The height of target for the checkshot.

Turn on select? tick box

*If **ticked**, on selecting a checkshot point the instrument will rotate automatically to that point.*



Meas tab

Once a measurement is completed the focus will change to the **Meas** tab.

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

Field Description Type Defaults Pop-Up

ChSt Diff Hd

The difference in horizontal distance to the checkshot point, actual - observed.

ChSt Diff East

The difference in eastings to the checkshot point, actual - observed.

ChSt Diff North

The difference in northings to the checkshot point, actual - observed.

ChSt Diff Hgt

the difference in level to the checkshot point, actual - observed.

ChSt Diff Hz

The difference in horizontal angle to the checkshot point, actual - observed.

Buttons

Distance

SNGL button

Take a single distance measurement to the checkshot dependent on the current TPS measurement settings.

MULT button

Take a multiface distance measurement to the checkshot dependent on the current TPS measurement settings.

Angle Only

SNGL button

Take a single angular measurement to the checkshot dependent on the current TPS measurement settings.

MULT button

Take a multiface angular measurement to the checkshot dependent on the current TPS measurement settings.

STORE button

Write the measurement to the checkshot to the current field file (.FLD), this does not store the reading to a model.

TURN button

Rotate the instrument to the selected checkshot point.

<-TAB button

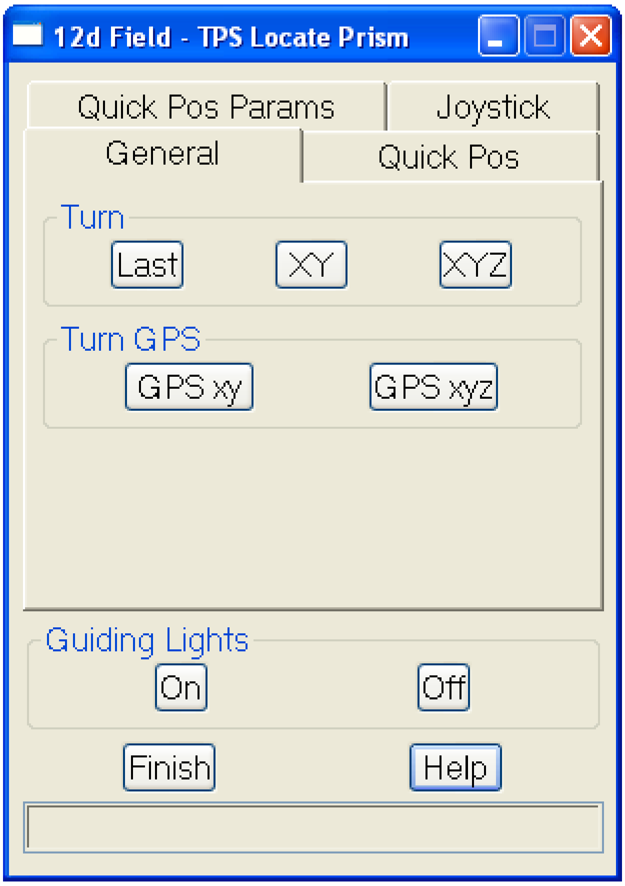
Go to the previous tab in the dialogue.

TAB-> button

Go to the next tab in the dialogue.

16.9.0.0.14 Locate Prism TPS

The **12d Field - TPS Locate Prism** panel is an aid to remotely position the TPS to the current prism location.



Common fields and buttons

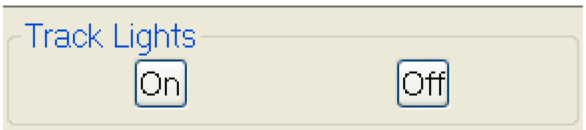
The fields and buttons used in this panel have the following functions.

Field Description Type Defaults Pop-Up

Guiding lights

The guiding lights button group is available if the TPS in use has guide lights. The naming of the guiding lights group depends on the primary instrument.

Trimble SPSx30



Topcon 9000

Leica 1200

On

Activate the instruments guiding lights.

On

Deactivate the instruments guiding lights.

General tab

Turn

Last

The instrument will turn to the last position a measurement was taken at.

XY

A screen select will be activated and the instrument will turn horizontally only to the selected position.

XYZ

A screen select will be activated and the instrument will turn horizontally and vertically to the selected position.

Turn GNSS

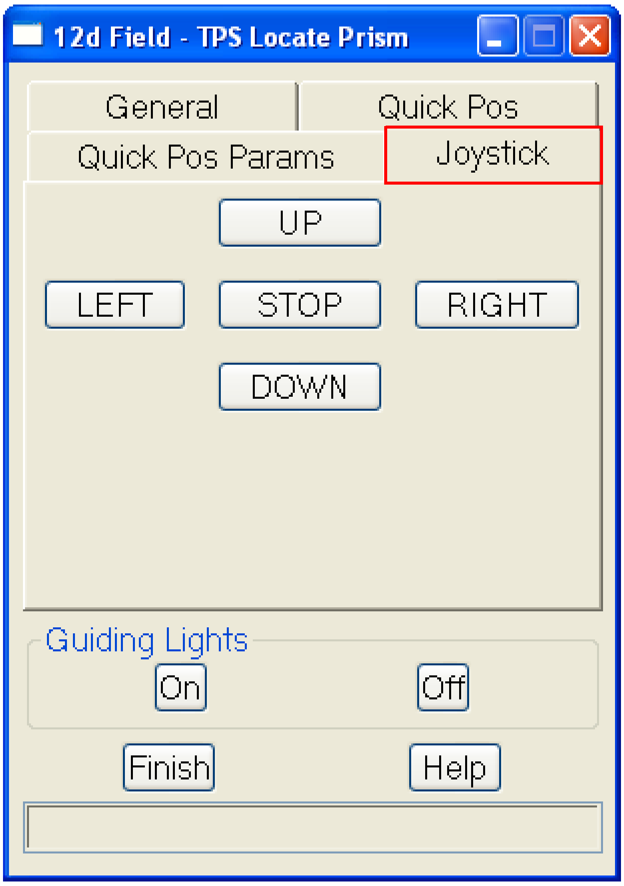
Note these buttons are only available if a GNSS instrument is selected as the secondary instrument.

GNSS xy

The instrument will turn horizontally only to the current GNSS position.

GNSS xyz

The instrument will turn horizontally and vertically to the current GNSS position.



Joystick tab

LEFT

Rotate the instrument to the left as viewed from the prism back to the instrument, ***LEFT*** *can be pressed twice more to increase the speed of rotation.*

RIGHT

Rotate the instrument to the right as viewed from the prism back to the instrument, ***RIGHT*** *can be pressed twice more to increase the speed of rotation.*

UP

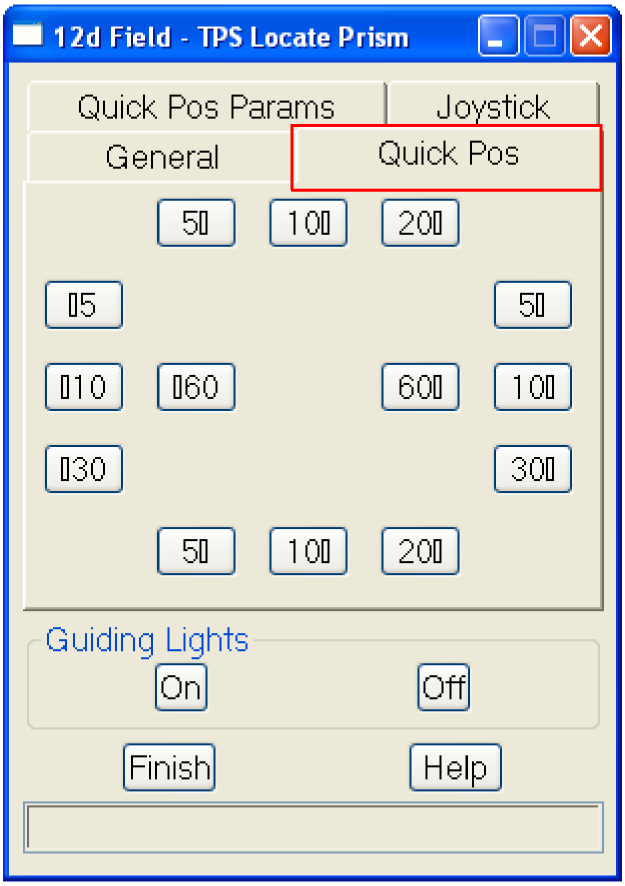
Rotate the Up, ***UP*** *can be pressed twice more to increase the speed of rotation.*

DOWN

Rotate the Down, ***DOWN*** *can be pressed twice more to increase the speed of rotation.*

STOP

Stop the instrument rotating.

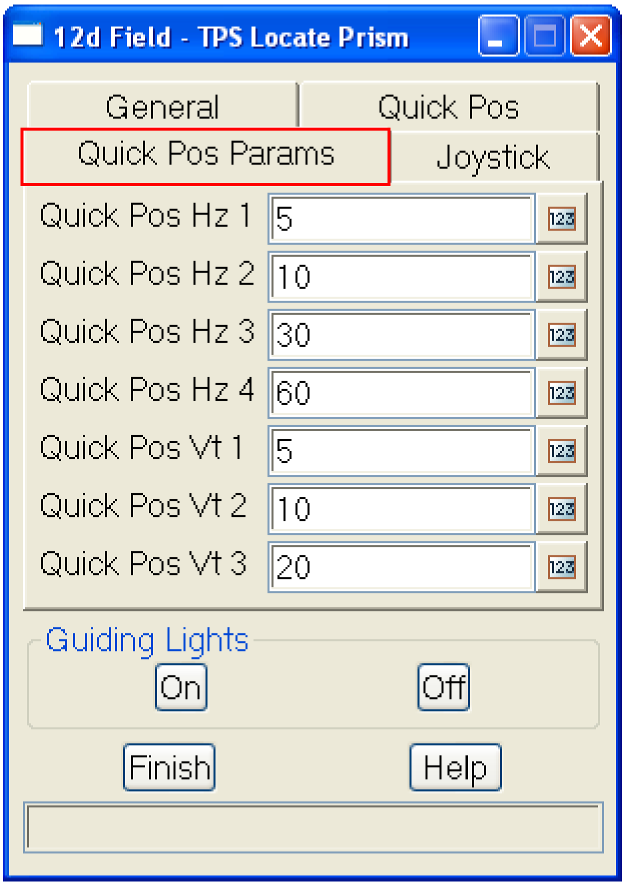


Quick Pos tab

The **Quick Pos** tab allows the user to manually rotate the instrument in the horizontal and vertical directions by preset amounts.This is sometimes easier to use to orientate the instrument correctly than the joystick controls. There are 4 user definable rotations in the horizontal directions and 3 in the vertical.

The buttons show the direction of rotation and the amount of rotation in degrees, the amount of the rotation is defined on the Quick Pos Params tab .

When a rotation button is pressed the instrument will rotate by a specified amount and direction, all buttons are disabled until the rotation has completed



Quick Pos Params tab

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

Field Description Type Defaults Pop-Up

The **Quick Pos Params** define the rotation available in the Quick Pos tab.

Quick Pos Hz 1

the amount of rotation in degrees for the top button in the horizontal groups for ***Quick Pos***

Quick Pos Hz 2

the amount of rotation in degrees for the outer middle button in the horizontal groups for ***Quick Pos***

Quick Pos Hz 3

the amount of rotation in degrees for the lower button in the horizontal groups for ***Quick Pos***

Quick Pos Hz 4

the amount of rotation in degrees for the inner middle button in the horizontal groups for ***Quick Pos***

Quick Pos Vt 1

the amount of rotation in degrees for the left button in the vertical groups for ***Quick Pos***

Quick Pos Vt 2

the amount of rotation in degrees for the middle button in the vertical groups for ***Quick Pos***

Quick Pos Vt 3

the amount of rotation in degrees for the right button in the vertical groups for ***Quick Pos***

16.9.0.1 12d Pickup

Position of option on menu: **Survey =>12d Field =>12d Pickup**

WARNING

This section of documentation is for the deprecated *12d Field* Pickup that was in *12d Model 12* but no longer exists in *12d Model 15*.

In *12d Model 15, 12d Field* Pickup *and 12d Field* Setout have been integrated.

The documentation in the *12d Model 15*. Reference Manual for the combined *12d Field* Pickup and *12d Field* Setout is still being worked on.

However because of the extra information required for setting up and using *12d Field,* a separate document that goes through the combined *12d Field* Pickup and *12d Field* Setout in *12d Model 15* has also been produced.

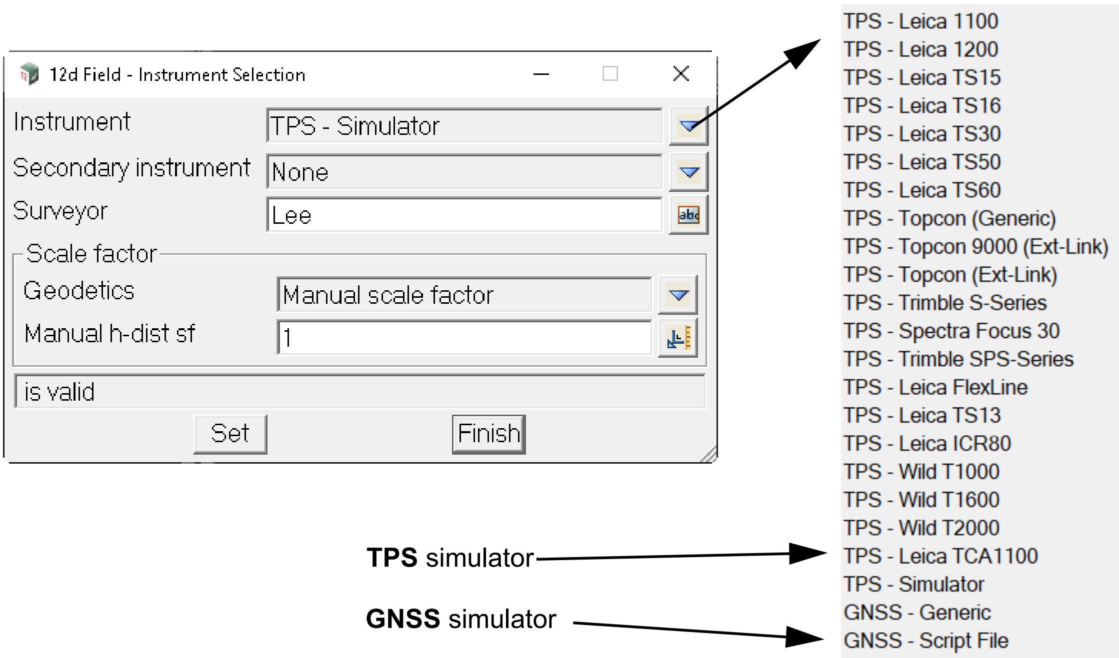
16.10 Lees Replaced Documentation

16.10.1 From 12d Field Configuration

When ***12d Field*** is selected then either:

(a) ***12d Field*** has **NOT** been run before.

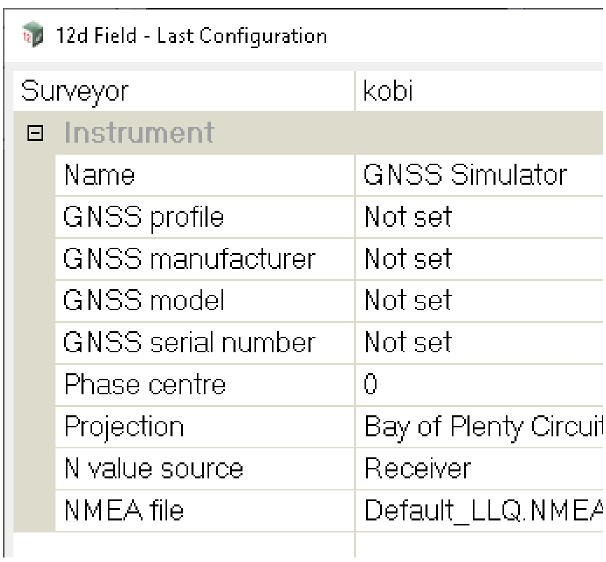
The **12d Field - Instrument Selection Field** panel is displayed and used to define the configuration to be used.



In the **Instrument** field, the choices in the pop-up are either a ***TPS*** (see 16.10.2 TPS Configuration) or a ***GNSS*** instrument (see 16.10.3 GNSS Configuration).

(b) ***12d Field*** has been run before

The **12d Field - Last Configuration** panel is then displayed with information on the last ***12d Field*** configuration used and is ready to be use again.



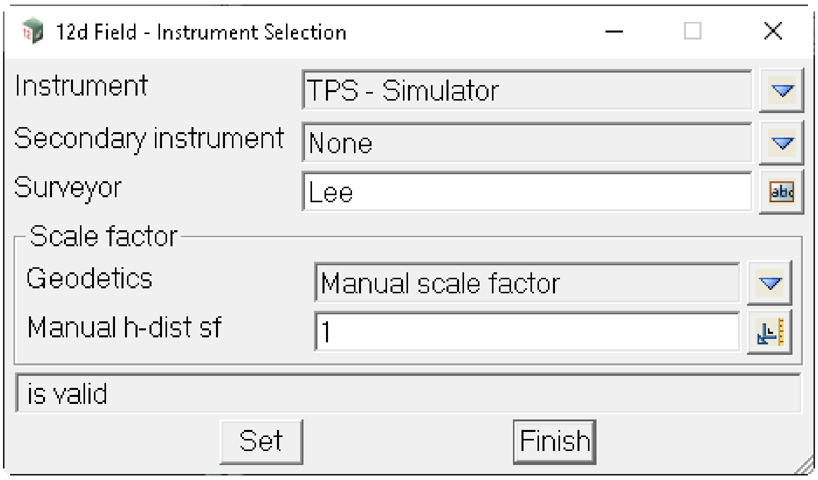
Click on the button **Use** to continue using the last configuration or click on **Change** to define and use a different configuration.

If **Change** is selected then the **12d Field - Instrument Selection Field** panel is displayed and in the pop-up for the **Instrument** field, either a ***TPS*** instrument (see 16.10.2 TPS Configuration) or a ***GNSS*** instrument (see 16.10.3 GNSS Configuration) can be selected.

For more information, see 16.10.2 TPS Configuration or 16.10.3 GNSS Configuration.

16.10.2 TPS Configuration

After selecting a **TPS** instrument, the **12d Field - Instrument Selection** panel is displayed.



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

Field Description	Type	Defaults	Pop-Up
Instrument	choice box		

the selected TPS instrument.

Secondary Instrument	choice box		None, GNSS - Generic, GNSS - Script File, GNSS - Simulator

*a GNSS instrument can also be selected and used to display position on the screen. This is often a GNSS built into the tablet being used for **12d Field**.*

Surveyor

*enter the name for the surveyor using **12d Field***

Geodetics	choice box		Manual scale factor, Point scale factor Height scale factor, Combined scale factor

the scale factor to be used.

*If **Manual scale factor**, a* **Manual h-dist sf** *field is displayed and the appropriate value entered.*
*If **Point scale factor**, a* **Projection** *field is displayed and the appropriate projection selected.*
*If **Height scale factor**, a* **Projection** *field is displayed and the appropriate projection selected.*
*If **Combined scale factor**, a* **Projection** *field and a **N Value** field is displayed and the appropriate projection and N value file are selected.*

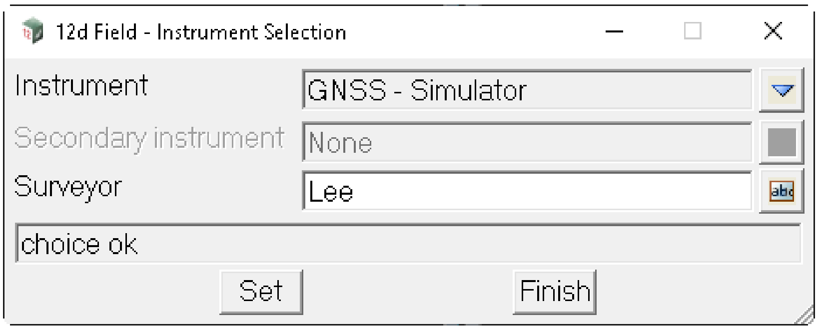
Set	button		

selecting **Set** *displays the* **12d Field TPS toolbar**. *See* 16.3.2 12d Field TPS Control Bar.

Continue to 16.10.3 GNSS Configuration or return to 16.3 Starting and Configuring 12d Field .

16.10.3 GNSS Configuration

After selecting a **GNSS** instrument, the **12d Field - Instrument Selection** panel is displayed.



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

Field Description	Type	Defaults	Pop-Up
Instrument	choice box		

the selected GNSS instrument.

Secondary Instrument	choice box		None, GNSS - Generic, GNSS - Script File, GNSS - Simulator

a GNSS instrument can also be selected and used to display position on the screen. This is often a GNSS built into the tablet being used for ***12d Field****.*

Surveyor

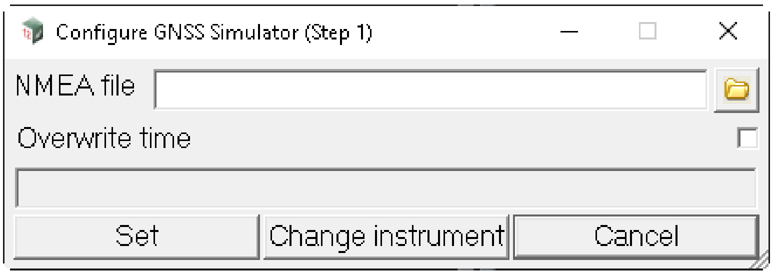
enter the name for the surveyor using ***12d Field.***

Set	button		

After selecting **Set***, the panel* **Configure GNSS Device (Step 1)** *is displayed which is the first of two or three panels of required information. See* Configure GNSS Device (Step 1) Panel .

Continue to Configure GNSS Device (Step 1) Panel or return to 16.10.3 GNSS Configuration .

Configure GNSS Device (Step 1) Panel



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

Field Description	Type	Defaults	Pop-Up
NMEA file	folder box		*.nmea

the GNSS simulator needs a NMEA file to run.
This can be a file recorded from an actual instrument or constructed from within 12dField itself by 'driving' along an existing string.
A default file "Default_LLQ.NMEA" is created automatically for first up usage.

Overwrite time tick box

*if **ticked**, the time in the NMEA string is ignored and the current computer time used instead.*
*If **not ticked**, the time in the NMEA string is used.*

Set button

brings up the **Configure GNSS Device (Step 2)** *panel. See* Configure GNSS Device (Step 2) Panel .

Change instrument button

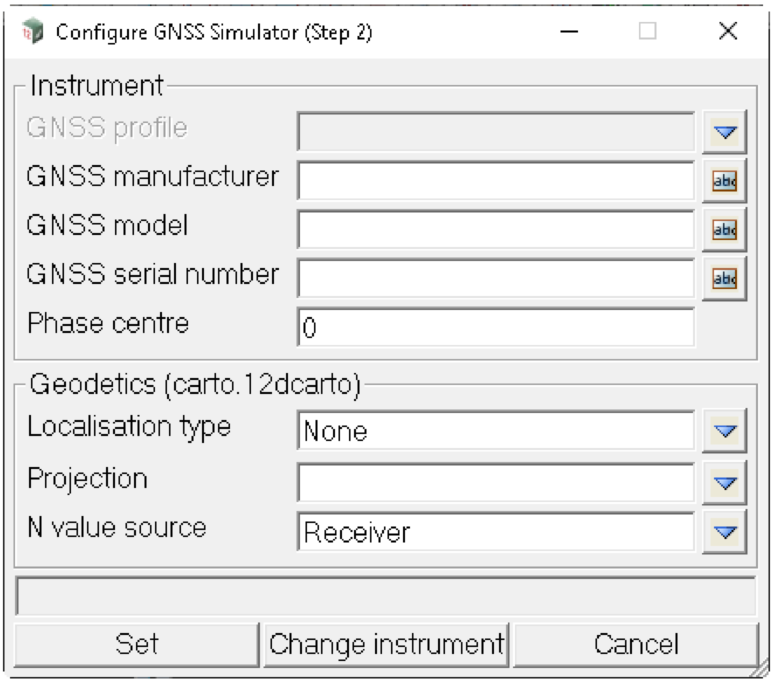
return to the **12d Field - Instrument Selection panel**. *See* 16.3 Starting and Configuring 12d Field .

Cancel button

*exit **12d Field.***

Continue to Configure GNSS Device (Step 2) Panel or return to 16.10.3 GNSS Configuration .

Configure GNSS Device (Step 2) Panel



Field Description	Type	Defaults	Pop-Up
GNSS profile	choice box		

.

GNSS manufacturer	text box		

.

GNSS model	text box		

.

GNSS serial number	text box		

.

Phase centre

.

Localisation type	choice box		None, Full

*if **None**, a* **Projection** *field and a **N Value source** field are displayed:*

Projection parameters		projection box	*.12dcarto files

select the projection.

N value source		choice box	Receiver, 12d

*if **Receiver**,*

*if **12d**, an **N Value** field is displayed:*

N value		N -value box	

.

*If **Full**, a* **Localisation parameters** *field is displayed and the appropriate 2D Helmert parameters selected.*

Localisation parameters folder box *.TDF_HEL files

*select the *.TDF_HEL file containing the transformation details to apply. This file is created with the* **GNSS Localisation** *panel in the* ***12d Field*** *Toolbar menu.*

Buttons at Bottom

Set button

for the GNSS Simulator, Set starts 12d Field running and brings up the 12d Field GNSS Control Bar. See 16.3.3 12d Field GNSS Control Bar

For an actual GNSS device, brings up the **Configure GNSS Device (Step 3)** *panel. See* Configure GNSS Device (Step 3) Panel.

Change instrument button

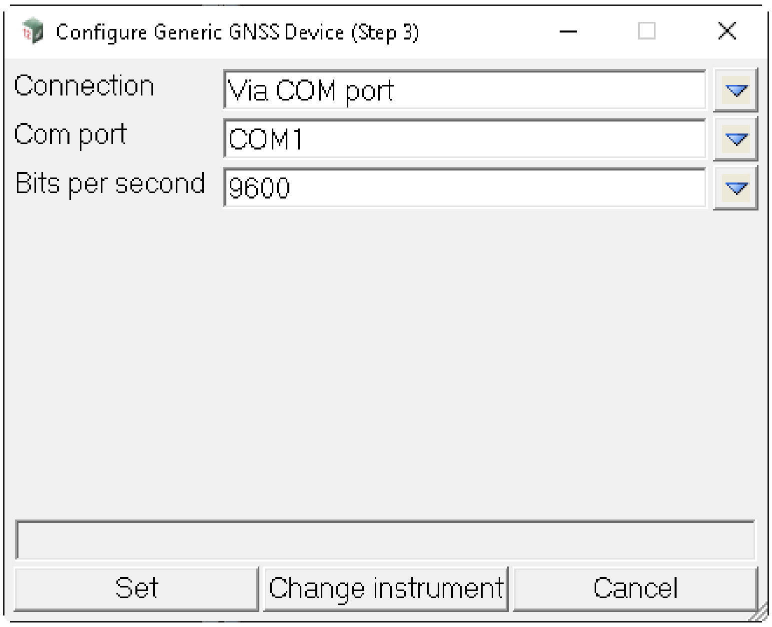
return to the **12d Field - Instrument Selection panel**. *See* 16.3 Starting and Configuring 12d Field.

Cancel button

exit ***12d Field.***

Continue to Configure GNSS Device (Step 3) Panel or return to 16.10.3 GNSS Configuration.

Configure GNSS Device (Step 3) Panel



Field Description Type Defaults Pop-Up

Connection choice box Via COM port, Via Bluetooth COM port Via Network, Via Bluetooth

.

*If **Via COM Port**, the* **Om port** *and* **Bits per second** *fields are displayed*

Com port choice box

.

Bits per second choice box

.

*If **Via Bluetooth COM Port**, the* **Com port** *field is displayed*

Com port choice box

.

*If **Via Network**, the* **Address** *and* **Port** *fields are displayed*

Address text box

.

Port integer box

.

*If **Via Bluetooth**, the* **Search for bluetooth devices** *button is displayed*

Clicking on the **Search for bluetooth devices** *button lists the available bluetooth devices to select from.*

Buttons at Bottom

Set button

brings up the 12d Field GNSS toolbar. See 16.3.3 12d Field GNSS Control Bar .

Change instrument button

return to the **12d Field - Instrument Selection panel***. See* 16.3 Starting and Configuring 12d Field
.

Cancel button

exit ***12d Field.***

17 Design

There has been changes to the **Design** chapter in the ***12d Model Reference manual***.

See 17.1 Quick Start
See 17.2 Quick Tools
See 17.3 Boxing - Named Grade
See 17.4 MTF Links and Layers File Format
See 17.5 Apply MTF Manager - Create/Update
See 17.6 MTF Snippets
See 17.7 Snippet Placed to Model of Strings
See 17.8 Create Shapes
See 17.9 Pavement Manager
See 17.10 TRI_PAVEMENT_NEW_FROM_ATTRS.mtfsnippet
See 17.11 TRI_PAVEMENT_NEW_KERB_FROM_ATTRS.mtfsnippet
See 17.12 TRI_PAVEMENT_NEW_TO_TIN_FROM_ATTRS.mtfsnippet
See 17.13 INSERT_PAVEMENT_TYPE_LOCATION.MTFSNIPPET.mtfsnippet
See 17.14 Copy MTF to seed
See 17.15 Apply MTF - Recreate String Sort
See 17.16 Debugging Snippets
See 17.17 Road Widening - with Snippet
See 17.18 Create Ramps and Driveways
See 17.19 Track
See 17.20 Fixed Link - To String

See 17.21 Create Polygon

17.1 Quick Start

Position of menu: **Design =>Quick start**

Now documented In the v15 reference manual

The **Quick start** walk- right menu is

17.1.1 Urban Road

For information on toolbar commands see 17.2.5 Toolbar Commands.

17.1.1 Urban Road

Position of menu: **Design =>Quick start =>Urban road**

This option uses an MTF Seed File from the 12d install

DQ_Road_Urban.mtf_seed

It comprises **start up snippet**s for the placement of the design road surface.

It also contains various **regions** defining example modifiers. Some are example modifiers and are **inactive**.

Last of all there is a region for applying the **Pavement Manager** attribute snippets.

Note: In order to automatically create an Apply Many, using the above seed file, certain key lines need to be in the LHS and or RHS modifiers. These entries are made up of Comments, Chainage Aliases and Region titles. Their position in the seed file is essential, in order to use the **Design Quick Tools**.

Rural Road Kerb Return Islands Channel

The above Seed options are also available, and operate in the same manner.

Seed File extract…LHS

The first two lines **must** be as per below:

Comment: Created by Quick Design

Chainage Alias: **LHS EXTENTS** …set to Start & End (ref)

	Type	Alias	Start ch	End ch	Details	Value	Active	Cor
1	Created by Quick Design							
2	Chainage Alias	LHS EXTENTS	Start (ref)	End (ref)			☑	opt
3	⊟ DESIGN SURFACE							
4	Create Design by Snippets							
5	MTF Snippet C:/Program Files/12d/12dmodel/15.00/library/INS_R_ROADKG		Relative Al LHS EXTEN 0	Relative A LHS EXTE 0	Lane 1 width Lane 2 width Shoulder width Road xfall	3.5 -3.0	☑	Lan
6	MTF Snippet C:\Program Files/12d/12dmodel/15.00/library/INS_V_PATH		Relative Al LHS EXTEN 0	Relative A LHS EXTE 0	Grass width Footpath width Landscape width Footpath xfall	1 1.5 2.5 2	☑	Wic
7	Cut and Fill Interface to Tin (TICK ACTIVE TO USE)							
8	MTF Snippet C:\Program Files/12d/12dmodel/15.00/library/INS_E_FINAL		Relative Al LHS EXTEN 0	Relative A LHS EXTE 0	Tin Final cut slope (1v in Final fill slope (1v in) Strip	SURVEY 2 4	☐	Fina
9	⊟ LHS PAVEMENTS							
10	MTF Snippet C:/Program Files/12d/12dmodel/15.00/library/TRI_PAVEMENT_NEW_KERB_FROM_ATTRS		Start (ref)	End (ref)	Reference_Style Kerb_Style	PT01 SA	☐	opt
11	MTF Snippet C:/Program Files/12d/12dmodel/15.00/library/TRI_PAVEMENT_NEW_FROM_ATTRS		Start (ref)	End (ref)	Reference_Style Link copy mode Trimesh/Layer Suffix	GR01 Start -> End (All links) GR2	☐	opt
12	MTF Snippet C:/Program Files/12d/12dmodel/15.00/library/TRI_PAVEMENT_NEW_FROM_ATTRS		Start (ref)	End (ref)	Reference_Style Link copy mode Trimesh/Layer Suffix	GR01 Start -> End (All links) GR1	☐	opt
13	MTF Snippet C:/Program Files/12d/12dmodel/15.00/library/TRI_PAVEMENT_NEW_FROM_ATTRS		Start (ref)	End (ref)	Reference_Style Link copy mode Trimesh/Layer Suffix	FPC Start -> End (All links) FP	☐	opt

Design Region:

The design is made up of a few snippets to define the road surface.

The pavement modifiers, are snippets, and have been set to inactive.

They are positioned after a region called:

LHS PAVEMENTS

Again, this region is **mandatory**.

Seed File extract…RHS

The first two lines **must** be as per below:

Comment: Created by Quick Design

Chainage Alias: **RHS EXTENTS** …set to Start & End (ref)

	Type	Alias	Start ch	End ch	Details	Value	Active
1	Created by Quick Design						
2	Chainage Alias	RHS EXTENTS	Start (ref)	End (ref)			☑
3	⊟ DESIGN SURFACE						
4	Create Design by Snippets (Recommended)						
5	MTF Snippet C:/Program Files/12d/12dmodel/15.00/library/INS_R_ROADKG		Relative Alias Start RHS EXTENTS 0	Relative Alias End RHS EXTENTS 0	Lane 1 width Lane 2 width Shoulder width Road xfall	3.5 -3.0	☑
6	MTF Snippet C:/Program Files/12d/12dmodel/15.00/library/INS_V_PATH		Relative Alias Start RHS EXTENTS 0	Relative Alias End RHS EXTENTS 0	Grass width Footpath width Landscape width Footpath xfall	1 1.5 2.5 2	☑
7	MTF Snippet C:/Program Files/12d/12dmodel/15.00/library/INS_E_FINAL		Relative Alias Start RHS EXTENTS 0	Relative Alias End RHS EXTENTS 0	Tin Final cut slope (1v in) Final fill slope (1v in) Strip	SURVEY 2 4	☐
8	⊟ RHS PAVEMENTS						
9	MTF Snippet C:/Program Files/12d/12dmodel/15.00/library/TRI_PAVEMENT_NEW_KERB_FROM_/		Start (ref)	End (ref)	Reference_Style Kerb_Style	PT01 SA	☐
10	MTF Snippet C:/Program Files/12d/12dmodel/15.00/library/TRI_PAVEMENT_NEW_FROM_ATTRS		Start (ref)	End (ref)	Reference_Style Link copy mode Trimesh/Layer Suffix	GR01 Start -> End (All links) GR2	☐
11	MTF Snippet C:/Program Files/12d/12dmodel/15.00/library/TRI_PAVEMENT_NEW_FROM_ATTRS		Start (ref)	End (ref)	Reference_Style Link copy mode Trimesh/Layer Suffix	GR01 Start -> End (All links) GR1	☐
12	MTF Snippet C:/Program Files/12d/12dmodel/15.00/library/TRI_PAVEMENT_NEW_FROM_ATTRS		Start (ref)	End (ref)	Reference_Style Link copy mode Trimesh/Layer Suffix	FPC Start -> End (All links) FP	☐

Design Region:

The design is made up of a few snippets to define the road surface.

The pavement modifiers, are snippets, and have been set to inactive.

They are positioned after a region called:

RHS PAVEMENTS

Again, this region is **mandatory**.

Why the above restrictions?

The Design Quick Tools require the user to select strings created from the Apply Many, in order to activate the edit options. The MTF is read and modifiers edited or inserted to reflect the Design Quick Tool used. The first comment is read, searching for the words "Quick Design".

THE MTF IS UPDATED AND SAVED.

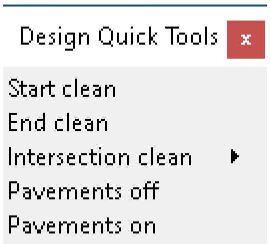
Continue to 17.2 Quick Tools or go back to 17.1 Quick Start.

17.2 Quick Tools

Position of menu: **Design =>Quick tools**

Now documented In the v15 reference manual

The **Quick tools** walk- right menu is



See
17.2.1 Start Clean
17.2.2 End Clean
17.2.3 Intersection Clean
17.2.4 Pavement On/Off
17.2.4 Pavement On/Off

For information on toolbar commands see 17.2.5 Toolbar Commands.

17.2.1 Start Clean

Position of menu: **Design =>Quick tools =>Start clean**

This option is used to redefine the LHS and or RHS of the design road, by selecting any **AM strings**, followed by a string end point.

Typically, the end point of an intersection kerb return

Depending on which side is selected…

If the kerb return is a **Super Alignment**, a smart chainage is used that references the end of the kerb return.

A test is done to check whether or not that kerb return is unique. If not, an **evaluated chainage** is calculated and a **typed** chainage entry is used.

If the external string selected is **not** a super alignment, **or** the end of the kerb return is **not** selected (rather a point along the string e.g.) …

An **evaluated chainage** is calculated and a **typed** chainage entry is use.

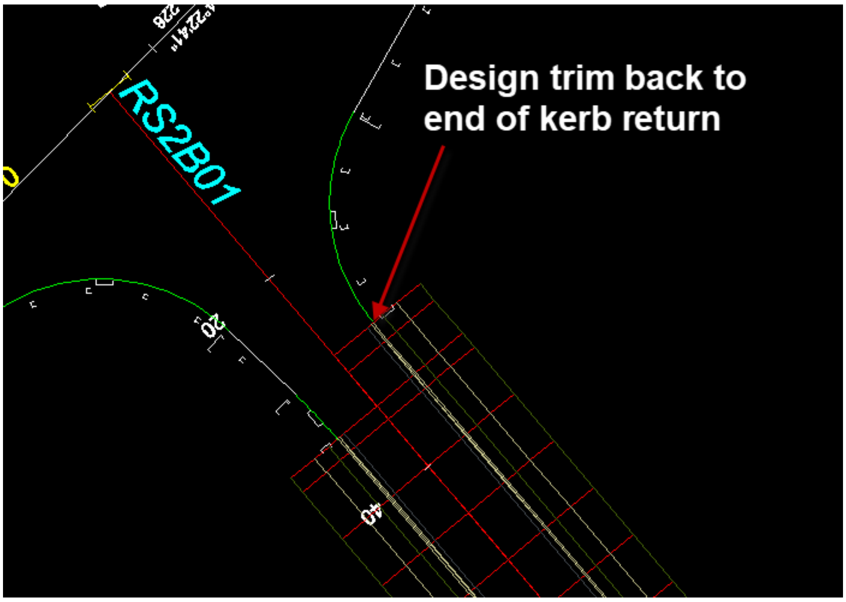
Continue to 17.2.2 End Clean or go back to 17.2 Quick Tools.

17.2.2 End Clean

Position of menu: **Design =>Quick tools =>End clean**

This option is similar to the start tool above but the end of the road design is selected

The LHS EXTENTS alias, and RHS EXTENTS alias is again updated.



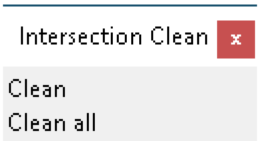
The AM is recalced.

Continue to 17.2.3 Intersection Clean or go back to 17.2 Quick Tools.

17.2.3 Intersection Clean

Position of menu: **Design =>Quick tools =>Intersection clean**

The **Intersection clean** walk- right menu is



See
17.2.3.1 Clean
17.2.3.2 Clean All

17.2.3.1 Clean

Position of menu: **Design =>Quick tools =>Intersection clean =>Clean**

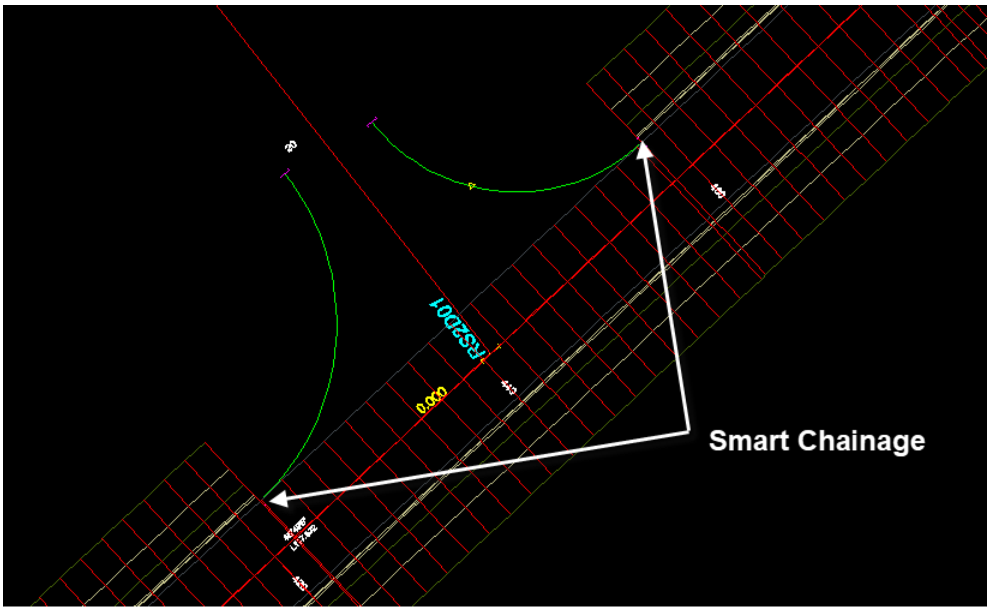
This option is used to remove parts of your design from the first link outwards (Lip of Kerb e.g.).

Once one of the design **AM strings** is selected, you will be prompted for the selection of **two** end point strings. Typically, the end points of intersection kerb returns.

Depending on which side is selected.

As per the start and end clean up checks are done on the strings selected, to determine if the end of a **unique** kerb return has been selected or not.

A smart chainage is used or a typed evaluated chainage.

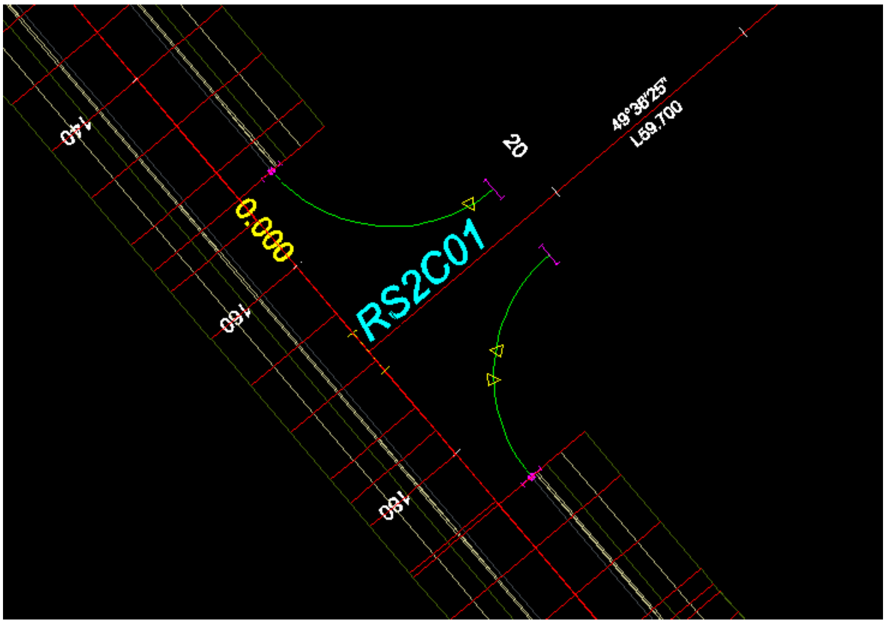


Continue to 17.2.3.2 Clean All or go back to 17.2.3 Intersection Clean.

17.2.3.2 Clean All

Position of menu: **Design =>Quick tools =>Intersection clean =>Clean all**

This option is similar to the previous, except that it removes **ALL** the design strings through the intersection.



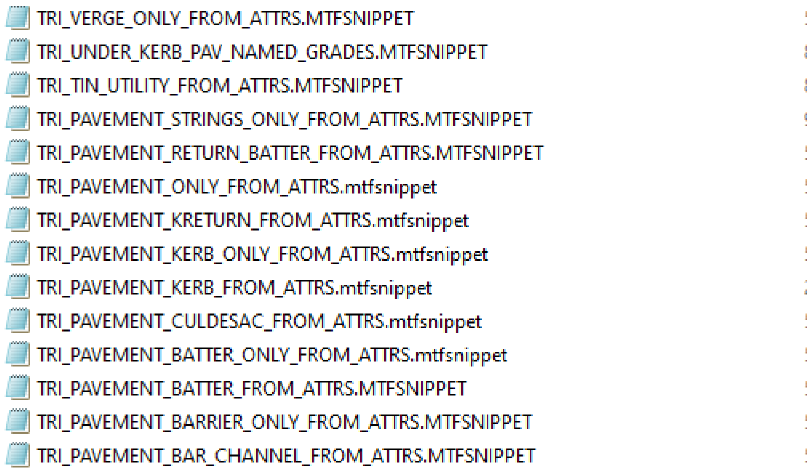
Continue to 17.2.4 Pavement On/Off or go back to 17.2.3 Intersection Clean.

17.2.4 Pavement On/Off

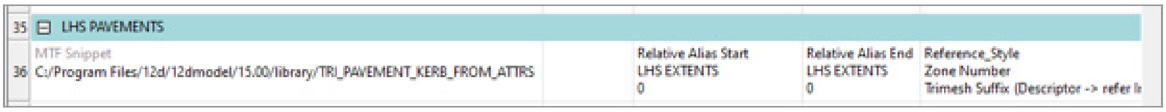
Position of menu: **Design =>Quick tools =>Pavement on**

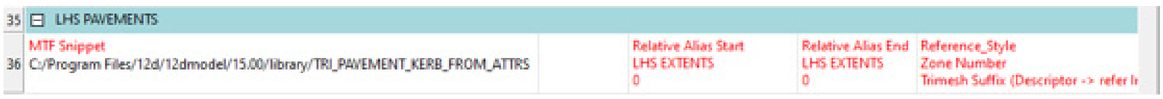
Position of menu: **Design =>Quick tools =>Pavement off**

These options will search through the MTF on both sides, for any standard 12d **Pavement Manage**r snippets using **Attributes** e.g.



Once found, the modifier is either made **active** or **inactive**.





Note: These options can be used on any MTF, even if it was not initially created, using the Design Quick seed files.

THE MTF IS UPDATED AND SAVED.

Continue to 17.2.5 Toolbar Commands or go back to 17.2 Quick Tools.

17.2.5 Toolbar Commands

Even though the "Design Quick" toolbar uses seed files shipped with 12d, there is no reason that any user defined seeds could be added to a User defined Toolbar

user_toolbars.4d.

Extract from **12d toolbars.4d**

Toolbar "Design Quick Start" {

Button "Urban Road" {

Command "macro -no_console -close_on_exit $LIB_4D/AM_Seed_Drop.4do $LIB_4D/DQ_Road_Urban.mtf_seed

"**Icon** "Urban.bmp"

}

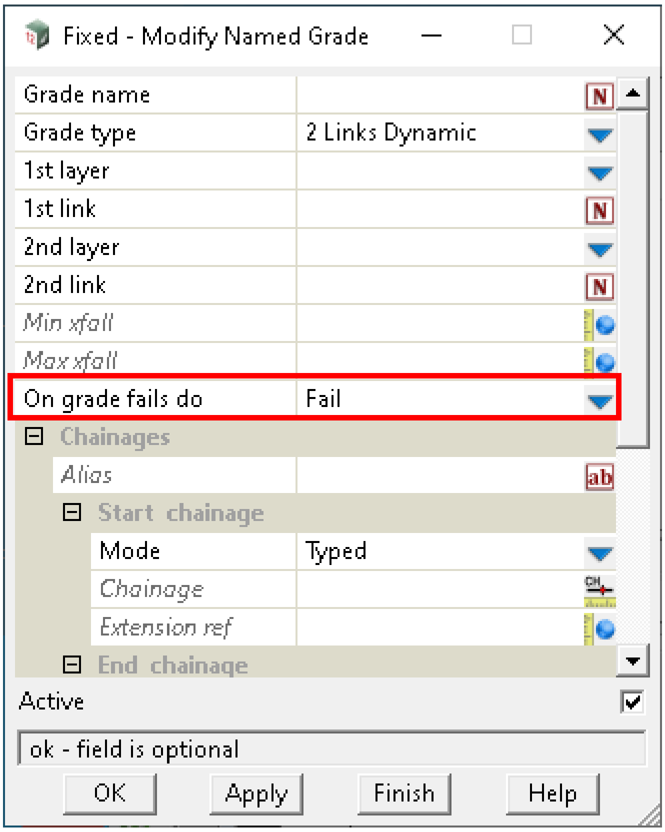
}

17.3 Boxing - Named Grade

Selecting **Named grade** brings up the panel **Fixed - Modify Named Grade**

Now documented In the v15 reference manual

The option **On grade fails do** has been added to the Fixed-Modify Named Grade panel.



On grade fails do	choice box	Fail, Horizontal, Vertical X-Fall(%), Slope(h/v)

If the name grade fails, for example a link is missing at a chainage then one of the fixed named grades, those that do not require links or tins can be called instead.

*If **On Grade Fails do** is **Horizontal**, see* if Grade type is Horizontal.

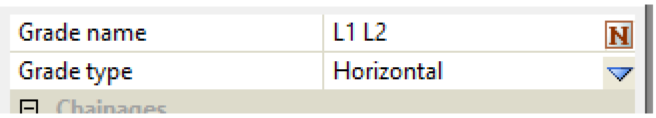
*If **On Grade Fails do** is **Vertical**, see* if Grade type is Vertical.

*If **On Grade Fails do** is **X-Fall(%)**, see* if Grade type is Xfall (%).

*If **On Grade Fails do** is **Slope(h/v)**, see* if Grade type is Slope (h/v).

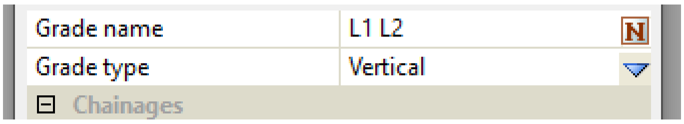
if **Grade type** is **Horizontal**

The grade returned is 0%.



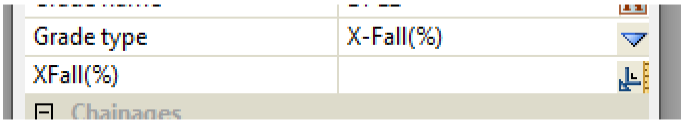
if **Grade** type is **Vertical**

A grade of 1000000 is returned on the RHS and -1000000 on the LHS.



if **Grade** type is **Xfall (%)**

The grade is defined as a fixed xfall.

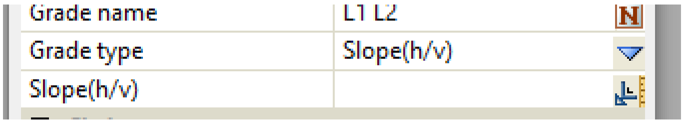


Xfall (%) real box

The grade (in percent crossfall) to use.

if **Grade** type is **Slope (h/v)**

The grade is defined as a fixed slope.



Slope (h/v) real box

The slope in (horizontal over vertical) to use.

17.4 MTF Links and Layers File Format

Now documented In the v15 reference manual

In a MTF file the first keyword on a line indicates the type of modifier and is generally followed by the link(s) description, we will use this format here to describe the various forms the link(s) description can take in an MTF or MTFSNIPPET file.

The link description(s) is always quoted, e.g., "**EPRL**".

See 17.4.1 Link names prior to the introduction of multiple layers.

See 17.4.2 Link names with the introduction of multiple layers and snippets.

See 17.4.3 Syntax for compacting multiple link names.

See 17.4.4 Syntax for auto generating incrementing/decrementing link names.

See 17.4.5 Final notes.

17.4.1 Link names prior to the introduction of multiple layers

Links and their associated Layers can be represented in many ways in the MTF and MTFSNIPPET files, prior to the introduction of multiple layers in the MTF just the link name was necessary.

A single link being insert in the design layer

insert "**EPRL**" "green" …….

Multiple links being removed from the design layer

remove "**EPRL**" "**L1RL**" "**L2CL**" 1000.0 …

This format is still valid, any link without a layer name will be inserted in the "**Design**" layer.

Continue to 17.4.2 Link names with the introduction of multiple layers and snippets.

17.4.2 Link names with the introduction of multiple layers and snippets

With the introduction of multiple layers and snippets the traditional layer was given the default name "**Design**" with the following layers user defined.

So, in the MTF file the new syntax had to contain both the layer and link names, then, especially with use in snippets it was necessary to introduce notation to indicate the side, left, right or unresolved the link was being placed on.

A single link being inserted on the left hand side of the design layer, this is signified by the << separating the layer and link.

insert "**Design<<EPRL**" "green" …

A single link being inserted on the right hand side of the design layer, this is signified by the >> separating the layer and link.

insert "**Design**>>**EPRR**" "green" …

A single link defined in a snippet, in this case when the snippet is used it could be inserted on either the left or right hand side of a layer, in this case we use => to denote the side is unresolved until the MTF is run.

insert "**Design**=>**EPRR**" "green"

Multiple links being removed from the LHS of layer "FSL"

remove "**FSL**<<**EPRL**" "**FSL**<<**L1RL**" "**FSL**<<**L2CL**" 1000.0 …

Note, for more advanced use a left hand modifier can contain a reference to a right hand side link by using the >> notation and vice-versa.

A link entered into the left or right hand sides of the MTF can also use the => notation, the 1st time the apply is run this will be converted to either << or >> to suit.

Continue to 17.4.3 Syntax for compacting multiple link names.

17.4.3 Syntax for compacting multiple link names

With the introduction of snippets which require the manual editing of the raw modifier commands and modifiers than contained many link names it was desirable to introduce syntax to compact multiple link names into something more manageable.

Concatenating multiple link names with a semicolon ";".

Multiple links in the same layer can be compacted via the following syntax "**Layer**=>**Link1;Link2;Link3**", the layer name and side syntax is unchanged followed by unlimited multiple link names separated with a ;

Take the example

remove "**FSL**<<**EPRL**" "**FSL**<<**L1RL**" "**FSL**<<**L2CL**" 1000.0 …

This can be compacted to

remove "**FSL**<<**EPRL**;**L1RL**;**L2CL**" 1000.0 …

This syntax can freely be used in the traditional multi link name format

remove "**FSL**<<**EPRL**;**L1RL**;**L2CL**" "**SGL**<<**EFLL**" 1000.0 …

Important, any white space will be honoured.

Continue to 17.4.4 Syntax for auto generating incrementing/decrementing link names.

17.4.4 Syntax for auto generating incrementing/decrementing link names

Some modifiers, such as **Fixed - Insert Arc** Links generate many links which would typically have an "incrementing" name

insert_arc_links "**FINAL**<<**W01**;**W02**;**W03**;**W04**;**W05**" "red"…

For these cases to avoid the labourious entry of all of the individual link names the user can use the colon : operator to generate consecutive link names.

insert_arc_links "**FINAL**<<**W01**:**W05**" "red"…

The 2 links must be the same number of characters, the incrementable/decrementable characters are auto detected and can be letters or numbers, an error will be displayed if the pattern cannot be determined.

Multiple uses are permitted separated by a semicolon:

insert_arc_links "**FINAL**<<**W01**:**W05**;**WLE**:**WLA**" "red"…

Continue to 17.4.5 Final notes.

17.4.5 Final notes

The semicolon operator is used in both the normal MTF editor panels and snippets. The user will see the semicolon compacted link name list in the main MTF Modifiers panel, when the individual modifier panel is opened the links will appear individually, quoted and separated by spaces. When the modifier panel is closed they will automatically be compacted again.

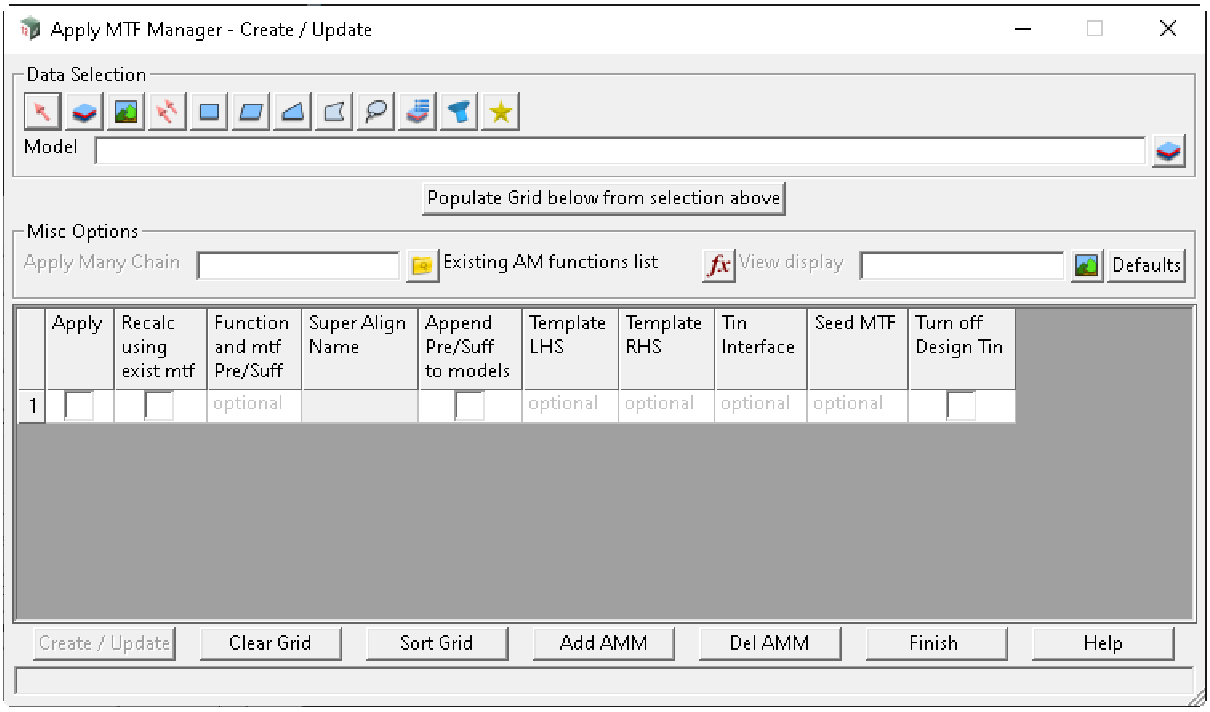
The colon operator is intended for use in snippets only, it can be manually entered into the MTF file but when the individual modifier panel is opened the link names will be expanded and upon closing written in the semicolon format.

17.5 Apply MTF Manager - Create/Update

Position of option on menu: **Design =>Apply =>Apply MTF manager**

Now documented In the v15 reference manual

Selecting the **Apply MTF manager** option displays the **Apply MTF Manager - Create / Update** panel.



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

Field Description Type Defaults Pop-Up

Data Super Alignment Selection data source

Data selection type - for a full description go to 4.24.3 Data Source.

Selected data source input Model

Source of data to be processed.

Populate Grid below from selection above button

Needs to be selected, to validate the data source and hence populate the grid with Super Alignments.

Misc Options

Apply MTF Chain file box available *.chain files

*If **not blank**, entry used as chain file of all the Apply MTF Functions that are created at the time of process...optional.*

Existing AM Functions function box available functions

This option will give you a list of all the existing AM Functions in the project, as a quick reference when creating new ones.

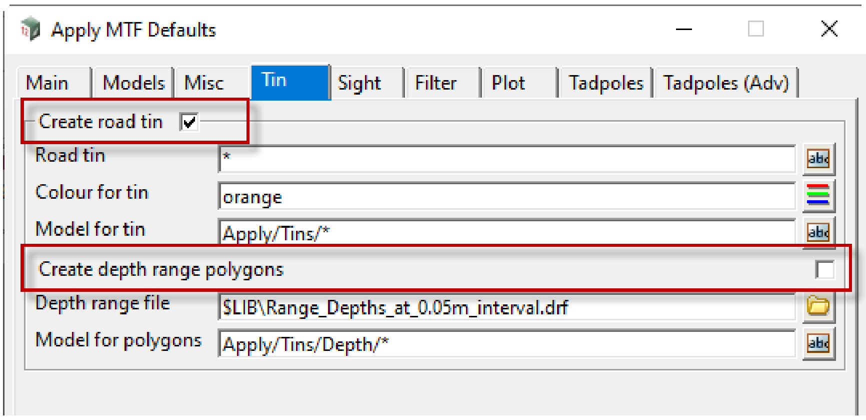
View Display view box available views

*If **not blank**, entry used as view onto which design strings and sections models will be automatically added, for ease of viewing...optional.*

Defaults button

If selected, the Apply MTF defaults panel will be activated. This allows you change the defaults before continuing with creating or editing any Apply MTF functions.

It is a good idea to complete the defaults for all tabs, which allows you to control their use by the tick box (refer Tin tab below).



Grid

Apply tick box not ticked

Set to ticked once a SA selection string is accepted.

*If ticked and the **<Create/Update>** is selected, then the Apply MTF will be created or an existing one recalced.*

*If **ticked** and the **<Del AMM>** button is also selected, then the Apply MTF Manager reference to that alignment will be deleted.*

*If **not ticked** and the **<Create/Update>** is selected, then the Apply MTF will NOT be created or an existing one recalced.*

Note: It is up to the user to delete the actual Apply MTF Function and all associated data including the mtf.

Recalc using exist mtf tick box

This tick box is an automatic indication of whether or not a Reference Super Alignment has an Apply MTF Function already linked to it.

There is no need for the user to use this box when creating or updating an Apply MTF Function.

It will be unticked if the reference has no Apply MTF Function attached.

In this case templates are required for Left, Right or both.

It will be ticked if the reference does have one or more Apply MTF Functions attached.

In this case the existing AM will be updated using the existing MTF and reflect any changes in regards to models required.

Function & mtf Pre/Suff input DES*

*If **not blank**, entry used as a prefix or suffix in conjunction with the Apply MTF Reference Super Alignment Name.*

Example:

Reference SA name:	MC00
Pre/Suff:	DES*
Apply MTF Function Name:	DES MC00
Reference SA name:	MC00
Pre/Suff:	* DES
Apply MTF Function Name:	MC00 DES

If blank, the Apply MTF Reference Super Alignment Name is used only

Apply MTF Function Name: MC00

Super Align Name input

Automatically populated, after the SA reference is selected.

The Super Alignment Name entry cannot be changed as it comprises part of the Apply MTF Function name....refer above.

Append Pre/Suff to models tick box not ticked

*If **ticked**, then the prefix or suffix will be combined with the SA name (refer above) and passed down to any default extensions from the Apply MTF Defaults.*

*refer **Design=>Apply=>Apply MTF Defaults***

Model Format for Apply MTF Defaults:

Road Surface Strings *e.g.*

"DESIGN *" used in conjunction with a Pre/Suff of DES * and a SA name MC00, would result in a strings model called "DES DESIGN MC00"

"* DESIGN" used in conjunction with a Pre/Suff of DES * and a SA name MC00, would result in a strings model called "DES MC00 DESIGN"

Template LHS input

Name of the template to be applied to the left side of the reference SA.

Template RHS input

Name of the template to be applied to the right side of the reference SA.

Tin interface input

*If **not 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 is used unless a tin is specified in the decisions section of the templates.*

Seed MTF file box *.mtf_seed files

*If **not blank**, entry will be used to create the MTF for that row in the grid. In this case the Template LHS and RHS are not required.*

Turn off Design Tin file box

*If **ticked**, then the design tin will not be created, even if it has been set in the AM defaults.*

This is the only override available.

Buttons at Bottom

Create/Update button

A validation on the panel is carried out along with a check if an Apply MTF Function being created, exists or not.

Appropriate warning messages in the output window will be displayed.

The Apply MTF Function is created or an existing one is updated.

If a new Apply MTF is being created, then the grid on the AMM panel is refreshed and the tick box <Recalc using exist mtf> is set to ticked.

***Note**:*

If <Recalc using exist mtf> is displayed, then a normal recalc is done on the existing AM.

All settings will be set from the current AM defaults.

If the existing function is recalced outside of the AMM panel, then the AM defaults are not used.

Clear Grid button

Clears the selection lines in the grid.

Sort Grid button

Sorts the grid lines by placing lines where the <Recalc using exist mtf> box is ticked on, at the top of the grid.

Add AMM button

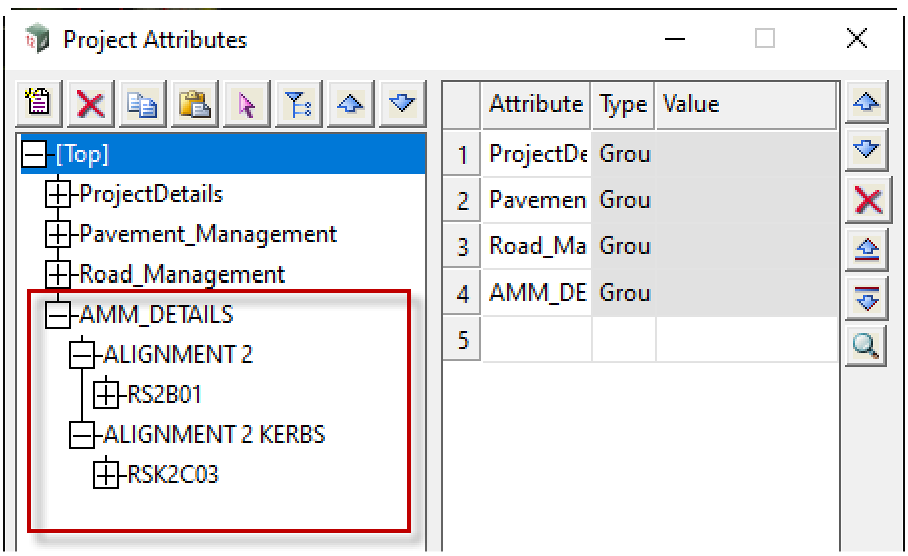
For clarity...clear the grid first and then select the Super Alignment you wish to add another Apply MTF Function to.

Del AMM button

In order to delete (or remove) from the Apply MTF Manager any connection to a Super Alignment, then first clear the grid, select the Super alignment and UNTICK the <Apply> box.

*The information on the **AMM**, and any association of a Function with a Super alignment, is available under menu:*

Project->Utilities->Attributes



17.6 MTF Snippets

There have been numerous additions to Snippets.

Now documented In the v15 reference manual

See

17.6.1 Common Definitions for Snippet Parameters

17.6.2 Snippet Parameters and Commands

17.6.3 Automatic Parameters in Snippets

17.6.4 Snippet Directives

17.6.1 Common Definitions for Snippet Parameters

param_desc   param_default

param_desc

From V15C1g, the **description** can contain a **tooltip**.

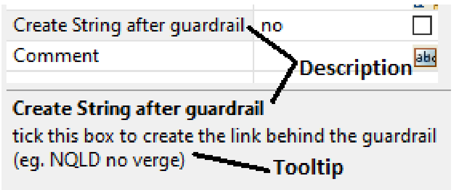
The general syntax for **param_desc** is:

"**description**<~~> **tooltip**"

The delimiter "<~~>" and **tooltip** are **optional**.

Where the double quotes (") are only required if there is a space within **param_desc**.

A **description** of "Create String after guardrail" and a **tooltip** of "tick this box to create the link behind the guardrail (eg. NQLD no verge)" for **param_desc** will produce the following parts of the **MTF Snippet** panel:



17.6.2 Snippet Parameters and Commands

17.6.2.1 Snippet Command NO_REPEAT_DIRECTIVES

If the snippet does not use repeat directives, then including this snippet command will have a small performance gain the 1st time the snippet is run dependent on the size of the snippet.

It must be in a comment line and be the only text on the line.

```
// NO_REPEAT_DIRECTIVES
```

If this is not present the 1st time the snippet is run it will look for repeat directives, after that it will not search for them if not present in the initial search.

This snippet command will only have a noticeable effect on very large snippets, 1000's of lines.

17.6.3 Automatic Parameters in Snippets

17.6.3.1 _APPLY_FUNC_NAME

This will insert the name of the Apply MTF function.

17.6.3.2 _MODIFY_EXTRAS

This will insert **absolute extra_start extra_end**.

17.6.3.3 _ABS_ES_EE

This will insert **absolute extra_start extra_end**.

17.6.3.4 _ASE

This will insert **absolute extra_start extra_end**.

17.6.3.5 _ABS

This will insert **absolute.**

17.6.3.6 _ABS_ES

This will insert **absolute extra_start.**

17.6.3.7 _ABS_EE

This will insert **absolute extra_end.**

17.6.3.8 _ES

This will insert **extra_start.**

17.6.3.9 _ES_EE

This will insert **extra_start extra_end.**

17.6.3.10 _EE

This will insert **extra_end.**

17.6.3.11 _MODEL_ATTRIBUTE

This will insert a **model attribute** from the current ***12d Model*** project.

The particular attribute to be inserted is specified between square brackets [ ] and follows the standard convention of attribute paths in ***12d Model***.

Model attributes are similar to **project attributes** just needing an extra field for the model to use.

The basic format is

_MODEL_ATTRIBUTE[the model name,the attribute]

The model name and attribute are separated by a comma should not be quoted.

```
$(_MODEL_ATTRIBUTE[MTF attrs source,MTF/General/Colours/ESL/value])
```

Model attributes can contain parameters:

```
$(_MODEL_ATTRIBUTE[$(SOURCE_MODEL),MTF/General/Colours/ESL/value])
$(_MODEL_ATTRIBUTE[$(SOURCE_MODEL),$(VALUE)])
```

Note that the standard convention of attribute paths in ***12d Model*** supports duplicate attribute paths accessible via the [instance] syntax. In the sample above to use the 2nd instance of **Value** it would look as such:

$(_MODEL_ATTRIBUTE[$(SOURCE_MODEL),MTF/General/Colours/ESL/value[2]])

This can also use a parameter.

$(_MODEL_ATTRIBUTE[$(SOURCE_MODEL),MTF/General/Colours/ESL/
value[$(VAL_INST)]])

17.6.4 Snippet Directives

See

17.6.4.1 Tokens Arithmetic
17.6.4.2 Miscellaneous

17.6.4.1 Tokens Arithmetic

See

17.6.4.1.1 tok_divide_dbl_tok
17.6.4.1.2 tok_eval_as_int

17.6.4.1.1 tok_divide_dbl_tok

The **tok_divide_dbl_tok** directive divides and sets the value of a token by the value of another token.

The syntax is:

```
@ tok_divide_dbl_tok <token1> <token2>
```

<token1> - the name of the token to apply the arithmetic to.

<token2> - the name of the token to divide the 1st token by.

It is an error if either token cannot be evaluated as a valid real number.

It is an error if the value of the second token is zero.

```
@ def_tok TOK_VAL_1 10.0
@ def_tok TOK_VAL_2 5.0
@ tok_divide_dbl_tok TOK_VAL_1 TOK_VAL_2

@ if_tok_neq_dbl TOK_VAL_1 2.0
  @ echo "Eek, that should have equalled 2.0"
@ end_if
```

17.6.4.1.2 tok_eval_as_int

The **tok_eval_as_int** directive evaluates and truncates the real value of a token to an integer.

The syntax is:

```
@ tok_eval_as_int <token1>
```

<token1> - the name of the token to convert to an integer.

It is an error if the token cannot be evaluated as a valid real number.

3.14 will be truncated to 3

0.71 will be truncated to 0

-0.71 will be truncated to 0

-3.14 will be truncated to -3

```
@ def_tok NUM "(-2 - 0.5)"
@ tok_eval_as_int NUM

@ if_tok_eq_int NUM -2
@ else
  @ echo "Eek, that should have equalled -2"
@ end_if
```

17.6.4.2 Miscellaneous

See

17.6.4.2.1 X remove_project_attribute
17.6.4.2.2 set_model_attribute
17.6.4.2.3 remove_model_attribute

17.6.4.2.1 X remove_project_attribute

The **remove_project_attribute** directive allows the removal of a project attribute, typically used to remove an attribute that has been used to transfer information between snippets once the apply has run.

```
@ remove_project_attribute <attribute path>
```

<**attribute path**> the path of the project attribute to remove.

17.6.4.2.2 set_model_attribute

The call **set_model_attribute** is identical in functionality to **set_project_attribute** just requiring an extra parameter for the model name.

The **set_model_attribute** directive allows the setting of a model text attribute.

```
@ set_model_attribute <model name> <attribute path> <value>
```

<model name> the name of the model to set the attribute to.

<attribute path> the path of the model attribute.

<value> the text attribute.

```
// simple define of a model attribute
@ set_model_attribute "ATTRS_MODEL" "APPLY/STR NUM" 9
// define of a model attribute using another token
@ def_tok INIT_VAL 9
@ set_model_attribute attribute "ATTRS_MODEL" "APPLY/STR NUM2" $(INIT_VAL)
```

17.6.4.2.3 remove_model_attribute

The **remove_model_attribute** directive allows the removal of a model attribute.

```
@ remove_model_attribute <model name> <attribute path>
```

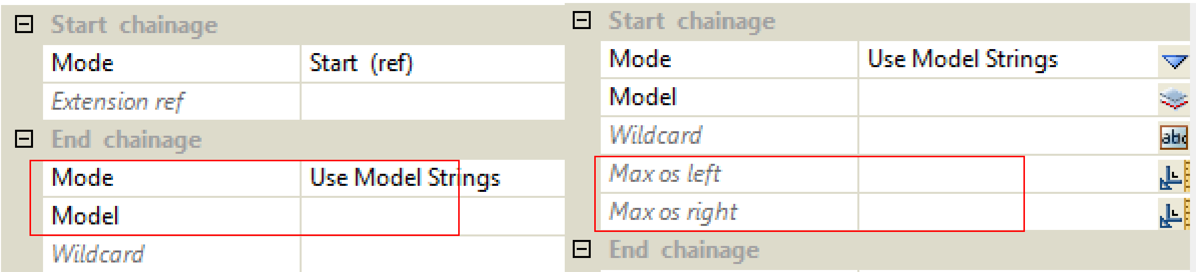
<model name> the name of the model to set the attribute to.

<attribute path> the path of the model attribute.

17.7 Snippet Placed to Model of Strings

The options **Max os left** and **Max os right** has been added to the panel.

Selecting **Snippet cut ref with model of string** adds the **Model**, **Wildcard** and **Extension other** fields.



Max os left real box

*If **not blank**, the maximum offset left of the control before the string is rejected for use as a smart chainage. If either the start or end point is further left than this value the string will not be used.*

*If **blank**, no string is rejected for use as a smart chainage on the LHS of the control string.*

***Note** - as per normal modifier behaviour the left offset should be entered as positive unless wishing to only use strings completely to the RHS of the control string.*

Max os right real box

*If **not blank**, the maximum offset right of the control before the string is rejected for use as a smart chainage. If either the start or end point is further right than this value the string will not be used.*

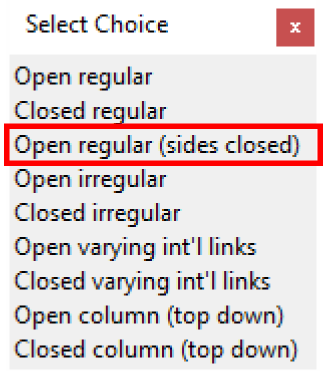
*If **blank**, no string is rejected for use as a smart chainage on the RHS of the control string.*

***Note** - as per normal modifier behaviour the right offset should be entered as positive unless wishing to only use strings completely to the LHS of the control string.*

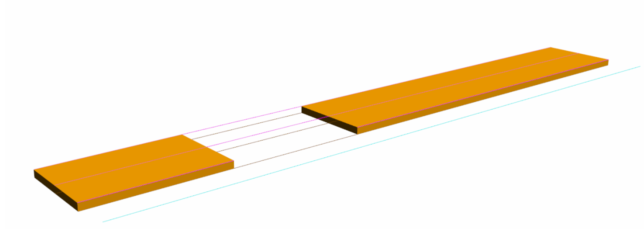
17.8 Create Shapes

The option ***Open regular (sides closed)*** has been added to **Shape type**.

Shape type choice box



*If **Open regular (sides closed)**, the shape will only be formed when all of the nominated strings exist. E.g. it will form multiple shapes if strings come and go along the length of the apply. No end caps will be formed, **<u>open sides will be closed</u>** and the trimesh will have no volume.*



17.9 Pavement Manager

Position of option on menu: **Design =>Pavement =>Pavement Manager**

Now documented In the v15 reference manual

This option activates a menu to create pavement styles for use in the **MTF** and the **Trimesh** pavement options

This option is **new**, but you will find the old option for creating pavement styles under the adjacent menu:

Design->Pavement->Design Pavement Old->Pavement Manager

Pavement Manager Features

Unlimited layers

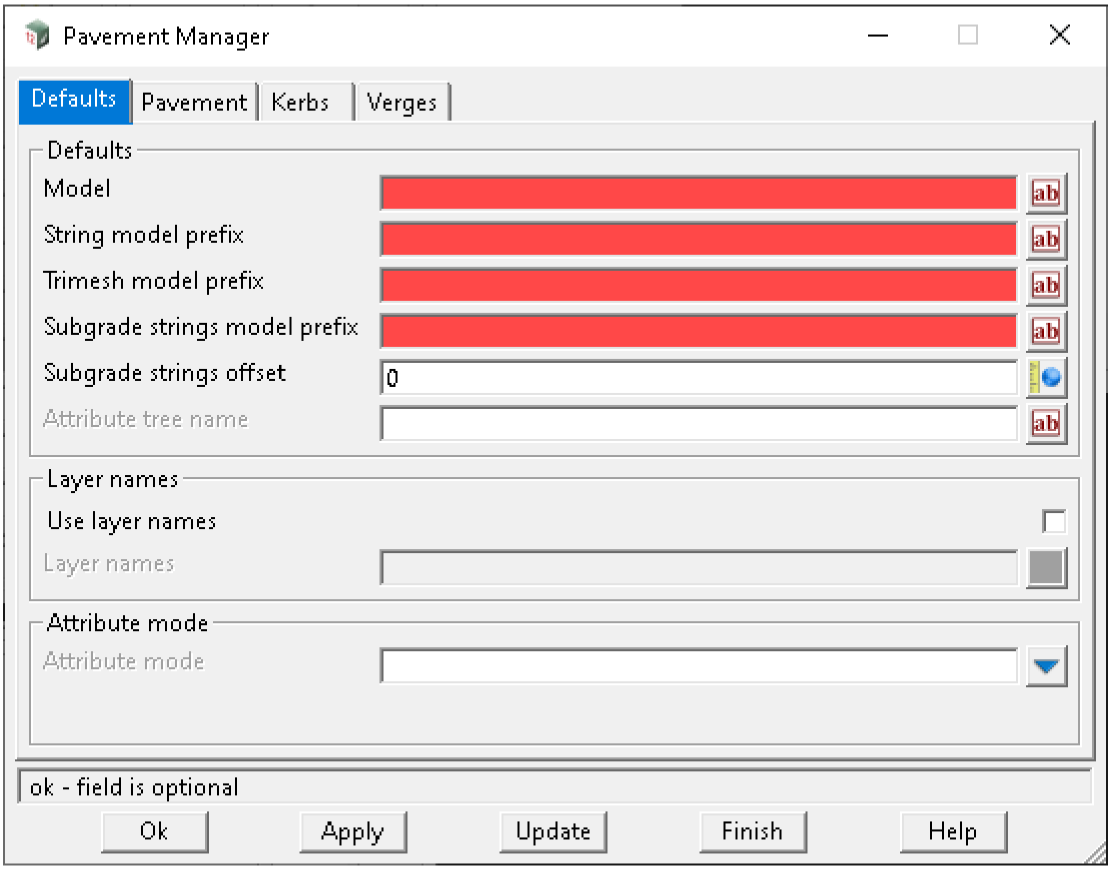
Duplication or copy and paste (in a grid system)

Start/end offsets and slope for every layer

Attribute selection for each layer

Layer Names file to set default layer names and descriptions

Selecting **Pavement manager** brings up the **Pavement manager** panel.



Buttons at Bottom

Ok button

Saves and exits the option.

Apply button

Saves.

Updates button

Refreshes the panel.

For information on each **Pavement Manager** tab go to

See Defaults Tab

See Pavement Tab

See Kerbs Tab

See Verges Tab

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

Field Description	Type	Defaults	Pop-Up
Defaults Tab			
Defaults			

The fields underneath the Defaults heading form part of the model naming convention when using the trimesh snippets e.g.

Trimesh model: ***MESH PAVEMENT*** *(Plus other settings from the snippet)*

Trimesh strings model: ***MESH STRS PAVEMENT*** *(Plus other settings from the snippet)*

Field Description	Type	Defaults	Pop-Up
Model	text box		
String model prefix	text box		
Trimesh model prefix	text box		
Subgrade strings model prefix	text box		
Subgrade strings offset	input box	0.001	
Attribute tree name	text box		
Layer names			
Use layer names	tick box	ticked	
Layer names	file box		

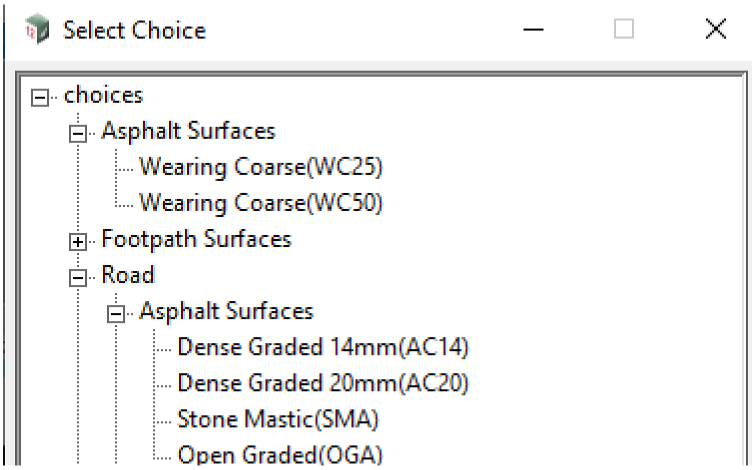
Layer names and descriptions can be set as a ***choice list*** *for Pavement, Kerbs and Verges.*

There is a library example called ***layer_names.12dpln***

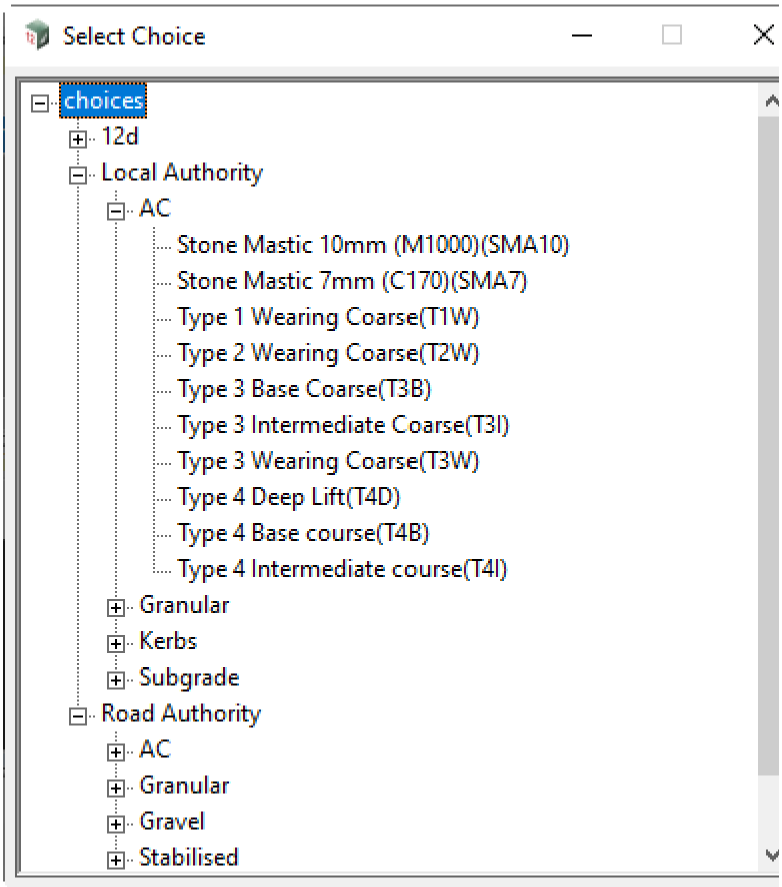
File Extract:

Name	***Description***	***Choice list headings***
WC25	*Wearing Coarse*	*Asphalt Surfaces*
WC50	*Wearing Coarse*	*Asphalt Surfaces*
FPPAV	*Paved Footpath*	*Footpath Surfaces*
FPCONC	*Concrete Footpath*	*Footpath Surfaces*
AC14	*Dense Graded 14mm*	*Road/Asphalt Surfaces*

AC20	*Dense Graded 20mm*	*Road/Asphalt Surfaces*
SMA	*Stone Mastic*	*Road/Asphalt Surfaces*
OGA	*Open Graded*	*Road/Asphalt Surfaces*
PCP	*Plain*	*Road/Concrete Pavements*
CRCP	*Continuously Reinforced*	*Road/Concrete Pavements*
JRCP	*Jointed Reinforced*	*Road/Concrete Pavements*
SFCP	*Steel Fibre Reinforced*	*Road/Concrete Pavements*



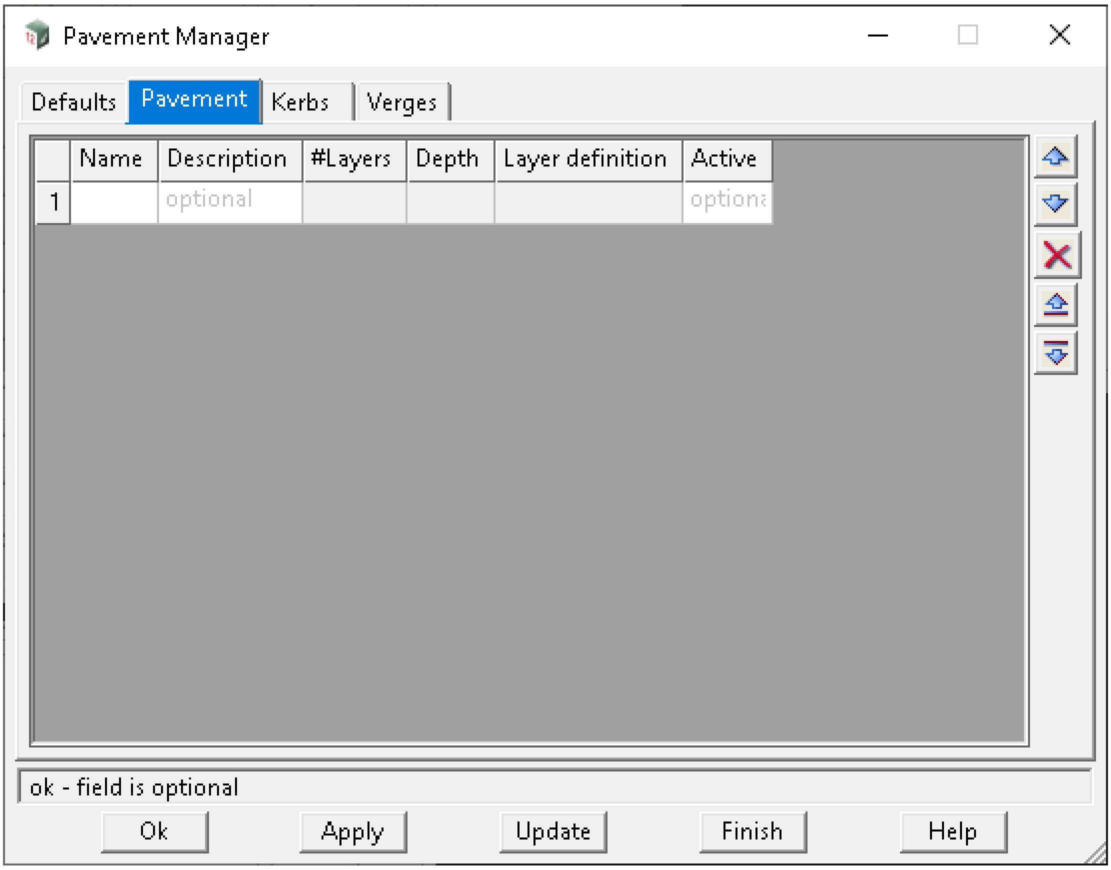
*A second example file called **Pavement_layer_names.12dpln** is also available:*



Attribute mode	choice box	Default, Custom, Metaconnex, Grid

The choice of attribute mode affects what type of options are displayed, when creating pavements, kerbs and or verges.

Pavement Tab



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

Field Description	Type	Defaults	Pop-Up
Name	input		

Pavement type name.

Description	input		

Pavement type description.

#Layers	info only		

Number of layers in pavement type.

Depth	info only		

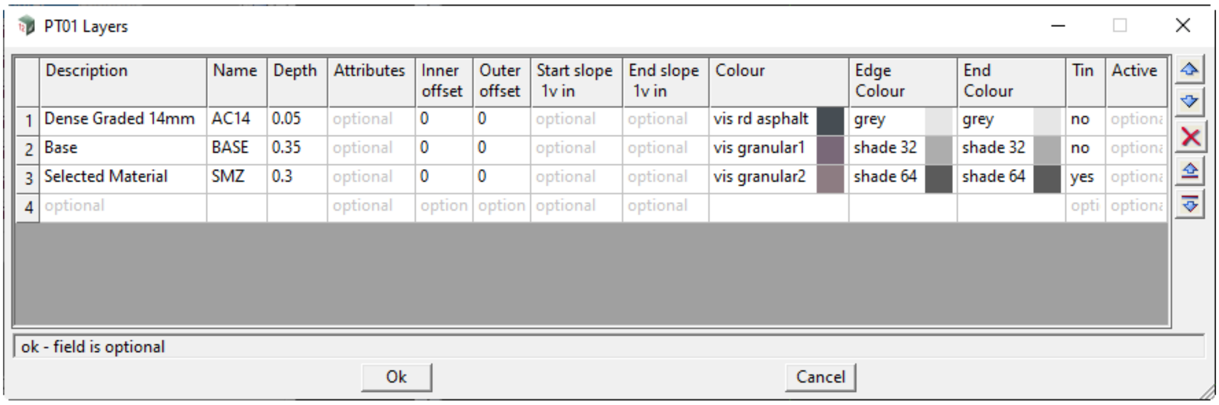
Total depth of layers in pavement type (m).

Layer definition	LMB		

LMB to activate layer creation panel.

Layer Definition

]



	Description	Name	Depth	Attributes	Inner offset	Outer offset	Start slope 1v in	End slope 1v in	Colour	Edge Colour	End Colour	Tin	Active
1	Dense Graded 14mm	AC14	0.05	optional	0	0	optional	optional	vis rd asphalt	grey	grey	no	optiona
2	Base	BASE	0.35	optional	0	0	optional	optional	vis granular1	shade 32	shade 32	no	optiona
3	Selected Material	SMZ	0.3	optional	0	0	optional	optional	vis granular2	shade 64	shade 64	yes	optiona
4	optional			optional	option	option	optional	optional				opti	optiona

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

Field Description Type Defaults Pop-Up

Description LMB

If layer names file is used, LMB will activate choice list for layer description and name.

Name input

Pavement layer name.

Attributes LMB

Attribute choice activated.

Inner offset real

Layer offset from 1st link in snippet.

(+ve to the outside of link and -ve to the inside)

Outer offset real

Layer offset from 2nd link in snippet.

(+ve to the outside of link and -ve to the inside)

Start slope 1v in real

Layer start slope from 1st link in snippet.

(+ve to the outside of link and -ve to the inside)

End slope 1v in real

Layer start slope from end link in snippet.

(+ve to the outside of link and -ve to the inside)

Colour input

Trimesh colour (vis colours will display a texture with visualisation module).

Edge Colour input

Trimesh edge colour.

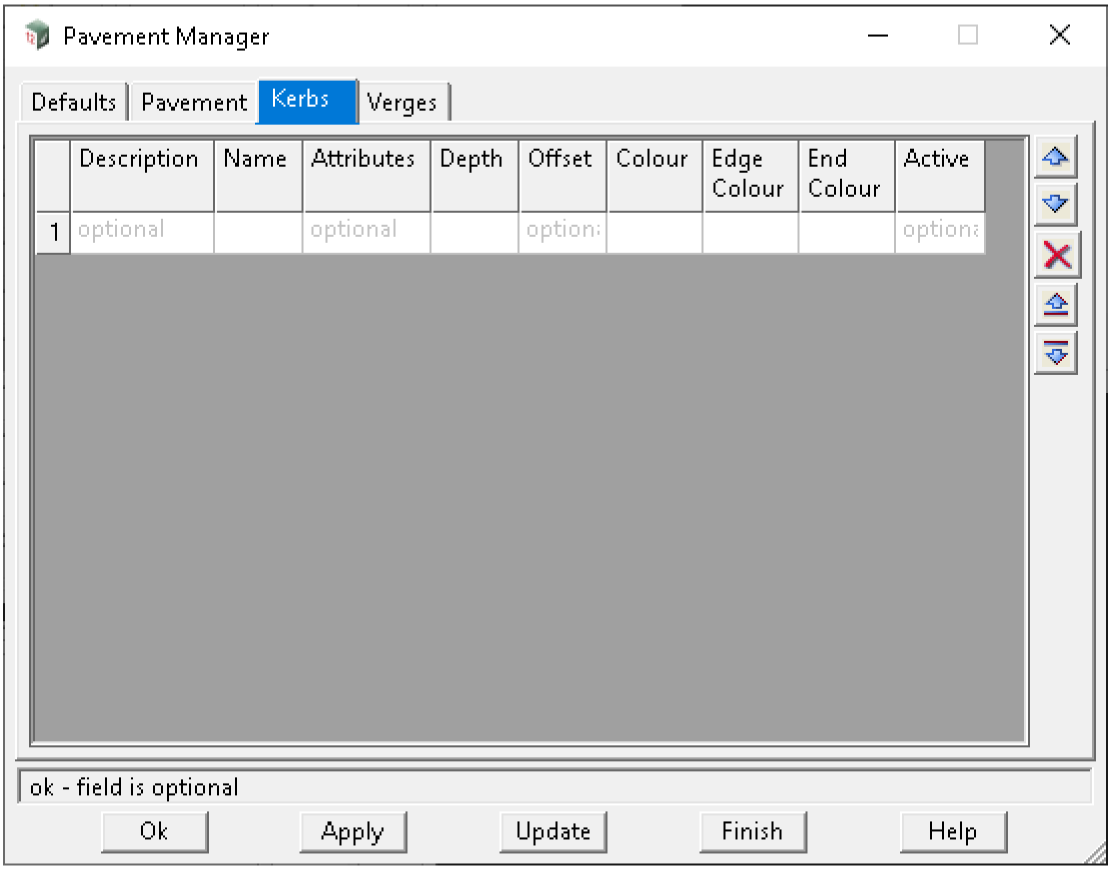
End Colour input

Trimesh end colour.

Tin input

Create a bottom tin of the layer.

Kerbs Tab



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

Field Description Type Defaults Pop-Up

Description LMB

If layer names file is used, LMB will activate choice list for the kerb layer description and name.

Name input

Kerb layer name.

Attributes LMB

Attribute choice activated.

Depth real

Depth at kerb lip (typically) in metres.

Offset real

Offset behind back of kerb (typically) in metres.

Colour input

Trimesh colour (vis colours will display a texture with visualisation module).

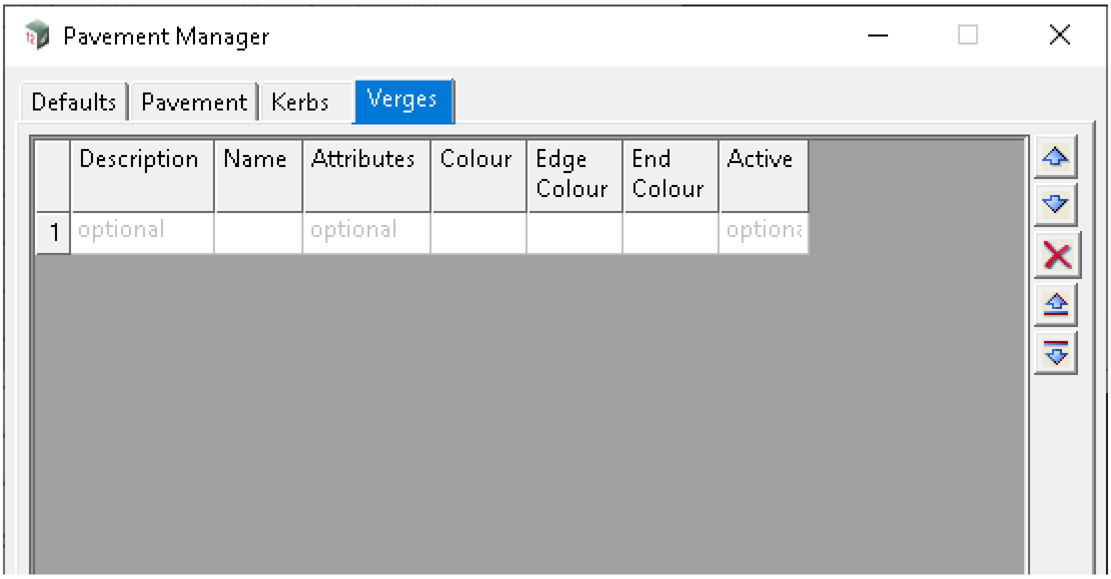
Edge Colour input

Trimesh edge colour.

End Colour input

Trimesh end colour.

Verges Tab



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

Field Description Type Defaults Pop-Up

Description LMB

If layer names file is used, LMB will activate choice list for the verge layer description and name.

Name input

Verges layer name.

Attributes LMB

Attribute choice activated.

Colour input

Trimesh colour (vis colours will display a texture with visualisation module).

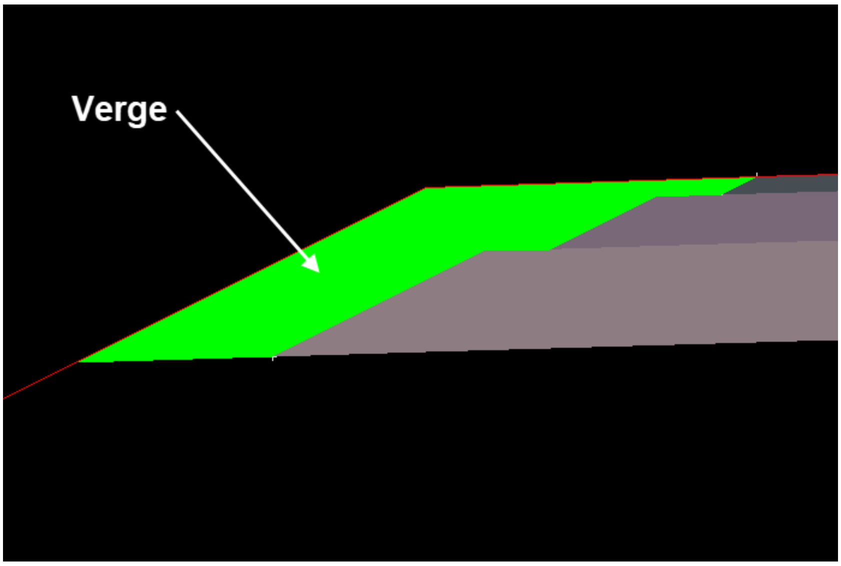
Edge Colour input

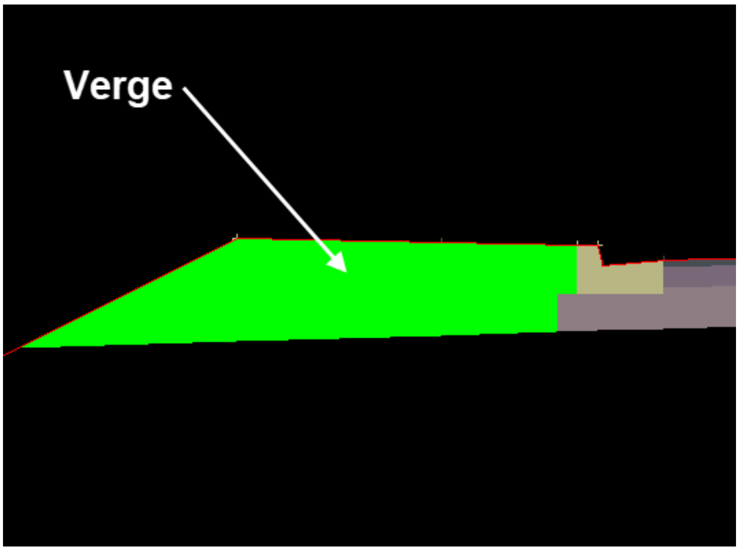
Trimesh edge colour.

End Colour input

Trimesh end colour.

Active choice


Verge


Verge

17.10 TRI_PAVEMENT_NEW_FROM_ATTRS.mtfsnippet

Now documented In the v15 reference manual

This snippet is used in conjunction with the **new** Pavement Manager

Details such as layer name, colour, depth etc have been defined separately in the manager.

The snippet is used to place the pavement by selection of design links.

The MTF modifier called "Snippet" is used.

MTF Snippet

Snippet	$LIB\TRI_PAVEMENT_NEW_KERB_FRO...
⊟ Chainages	
Alias	
⊟ Start chainage	
Mode	Start (ref)
Extension ref	
⊟ End chainage	
Mode	End (ref)
Extension ref	
Interval	
Pavement type	PT01
Kerb type	SA
Pavement extent	Full
Trimesh suffix (Ref Name -> refer info)	All Chars
Trimesh suffix (Descriptor -> refer Info)	A
Start link mode	Reference
Start Link	
Start string	
Start layer	Design
Reference - Named grade	Horizontal*
Start link slope (Named grade)	Vertical*
Lip of kerb link	KLL
Back of kerb link	KBL
Kerb links layer	Design

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

Field Description	Type	Defaults	Pop-Up
Reference_type	choice box		

A range from pavement manager.

Kerb_type	choice box		

A range from pavement manager.

Trimesh Ref Name Suffix	choice box	All Chars	

This option will add the Reference Alignment name to the names of all pavement elements created, including model names.

Ref name RS01, then RS01 is added.

*Models created:MESH PAVEMENT **RS01**MESH PAVEMENT STRS **RS01***

***Note**: MESH PAVEMENT & MESH PAVEMENT STRS are taken from the Pavement Manager, under the **Defaults tab**.*

Trimesh Suffix	input		

*This suffix is used to make up the **unique name** of the trimesh and strings **NOT** the model names.*

e.g. Suffix = A and snippet used on LHS

*Mesh name = AC14-L-A- **RS01** (Layer name-side-suffix-ref)*

Mesh strings name:

*AC14-L1-Z-L-A- **RS01** (Layer name-layer number-str-side-suffix-ref)*

Start link mode	choice box	Reference	

***Reference** refers to the AM selected reference string.*

***3d Cut of Link** (maybe a lane line e.g.).*

***2d Cut of Link, Height from Named Grade** refers to a link on another layer from which a height is derived from the Reference at the named grade.*

***3d Cut of String** refers to an external string from which a height is derived from the Reference.*

***2d Cut of String, Height from Named Grade** refers to an external string from which a height is derived from the Reference at the named grade.*

Start Link, Start String, Start Layer and Named Grade

Fill in only what is required, depending on what is chosen as Start Link Mode.

Start link slope (name grade)	choice box	Vertical	

This grade is used on each layer if there is no "Start slope" defined in the pavement style.

End link slope	choice box		

***3d Cut of Link** (maybe edge of shoulder e.g.).*

***2d Cut of Link, Height from Named Grade** refers to a link on another layer from which a height is derived from the Reference at the named grade.*

***3d Cut of String** refers to an external string from which a height is derived from the Reference.*

***2d Cut of String, Height from Named Grade** refers to an external string from which a height is derived from the Reference at the named grade.*

End Link, End String, End Layer and Named Grade

Fill in only what is required, depending on what is chosen as End Link Mode.

End link slope (named grade) choice box Vertical

This grade is used on each layer if there is no "End slope" defined in the pavement style.

Depth Type choice box Vertical

The depth is measured vertical or normal to the surface created by the start and end links or named grade.

Bottom surface mode choice box Use Road Surface

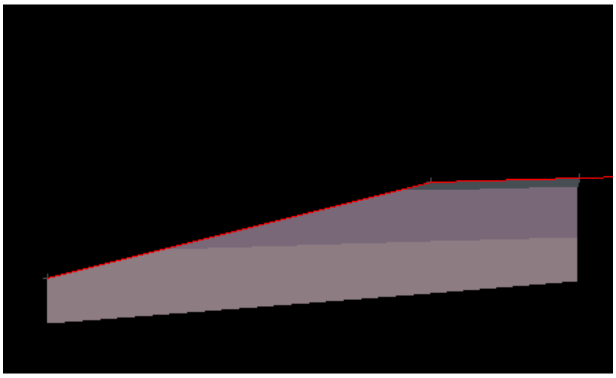
This option refers to pavement that extends past the end link.

Use Road Surface *pertains to the start link and the end link.*

Bottom surface named grade input Horizontal

This option is for when the slope defined by the start and end points selected is different than the slope required for the bottom of the last pavement layer.

e.g. Start & end links may be varied, and you wish to project the bottom of the last layer at a constant grade to assist in draining the adjacent pavement.

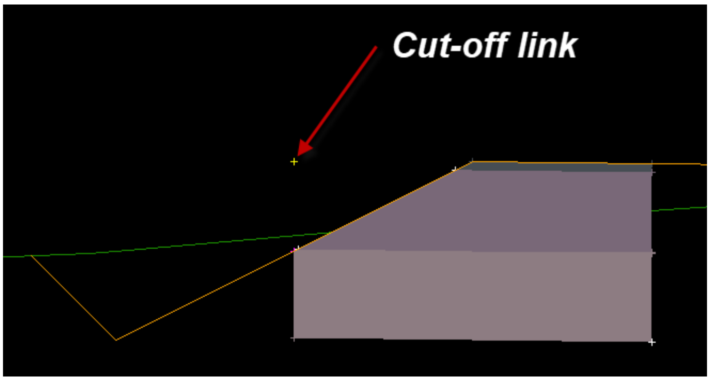


Pavement cut-off Link input

A valid link on any layer that can be used to control the extents of the pavement that gets extended out to the batter slope.

Cut-off link layer name input

A valid layer for the link above.



Comment

Information entered here will show up in the MTF modifier, and can be read without opening up the entire snippet panel.

Buttons at Bottom

Ok button

Will apply any changes and close the panel.

Apply button

Will apply any changes and if the Auto recalc is set on the main MTF.

***Note**: Panel size and position are saved in the working folder:*

mtf_panel_sizes.4d

This file can be moved to your $user for all subsequent projects.

17.11 TRI_PAVEMENT_NEW_KERB_FROM_ATTRS.mtfsnippet

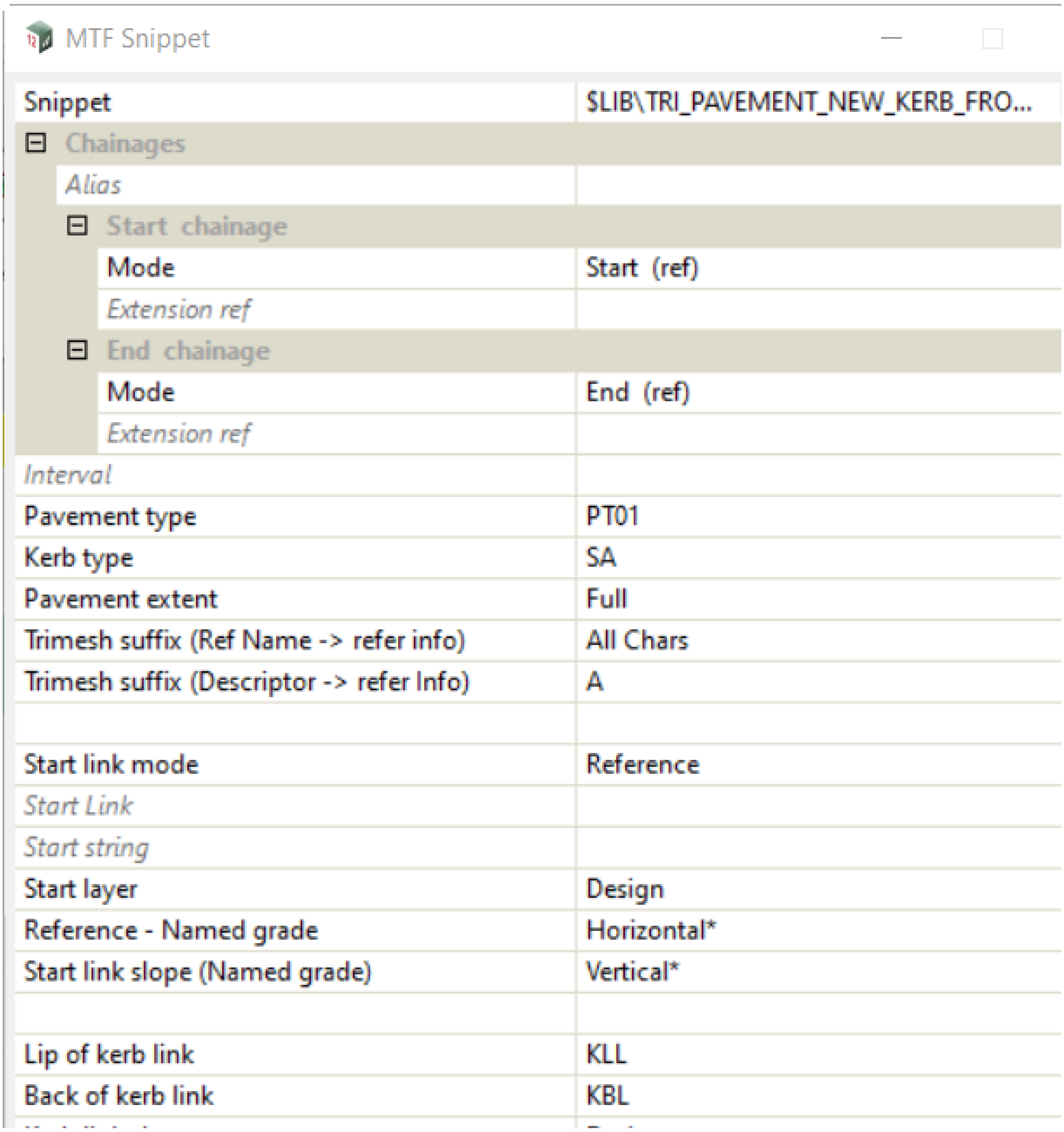
Now documented In the v15 reference manual

This snippet is used in conjunction with the **new** Pavement Manager

Details such as layer name, colour, depth etc have been defined separately in the manager.

The snippet is used to place the pavement by selection of design links.

The MTF modifier called "Snippet" is used.



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

Field Description Type Defaults Pop-Up

Pavement type choice box

A range from pavement manager.

Kerb_type choice box

A range from pavement manager.

Trimesh Ref Name Suffix choice box All Chars

This option will add the Reference Alignment name to the names of all pavement elements created, including model names.

Ref name RS01, then RS01 is added.

*Models created:MESH PAVEMENT **RS01** MESH PAVEMENT STRS **RS01***

***Note**: MESH PAVEMENT & MESH PAVEMENT STRS are taken from the Pavement Manager, under the **Defaults tab**.*

Trimesh Suffix input

*This suffix is used to make up the **unique name** of the trimesh and strings*

***NOT** the model names*

e.g. Suffix = A and snippet used on LHS

*Mesh name = AC14-L-A- **RS01** (Layer name-side-suffix-ref)*

Mesh strings name:

*AC14-L1-Z-L-A- **RS01** (Layer name-layer number-str-side-suffix-ref)*

Start link mode choice box Reference

***Reference** refers to the AM selected reference string.*

***3d Cut of Link** refers to a Design Link (maybe a lane line e.g.).*

***2d Cut of String, Height from Design** refers to an external string, like a survey edge of bitumen, from which a height is derived from the design surface above.*

Start Link, Start String and Start Link Layer Name

Fill in only what is required, depending on what is chosen as Start Link Mode.

Start link slope (name grade) choice box Vertical

This grade is used on each layer if there is no "Start slope" defined in the pavement style.

Up of kerb link name box

A valid design layer link name (e.g. KLL).

Back of kerb link name box

A valid design layer link name (e.g. KIL).

Kerb links layer input Design

Generally, the layer is design.

Pavement slope (behind kerb) choice box Vertical*

This grade is used on each layer if there is no "End slope" defined in the pavement style.

Named grade kerb base choice box Horizontal*

this option refers to the base of the kerb. It can use the road surface, but that surface needs to defined *as a named grade prior.*

Pavement mode (below kerb) choice box Use Road Surface

This option refers to pavement that extends under the kerb.

***Use Road Surface** pertains to the start link and the lip of kerb.*

*The second choice is **Named grade** which needs to be defined prior.*

Named grade below kerb choice box Horizontal*

*This option is only used if the above pavement mode has been set to **Named grade**.*

Pavement extent choice box Full

*If set to **Full**, then the kerb and the entire pavement from the start link, is created.*

*If set to **Kerb only**, then only the kerb and the pavement under the kerb, is created.*

Comment

Information entered here will show up in the MTF modifier, and can be read without opening up the entire snippet panel.

Buttons at Bottom

Ok button

Will apply any changes and close the panel.

Apply button

Will apply any changes and if the Auto recalc is set on the main MTF.

***Note**: Panel size and position are saved in the working folder:*

mtf_panel_sizes.4d

***This file can be moved to your $user for all subsequent projects**.*

17.12 TRI_PAVEMENT_NEW_TO_TIN_FROM_ATTRS.mtfsnippet

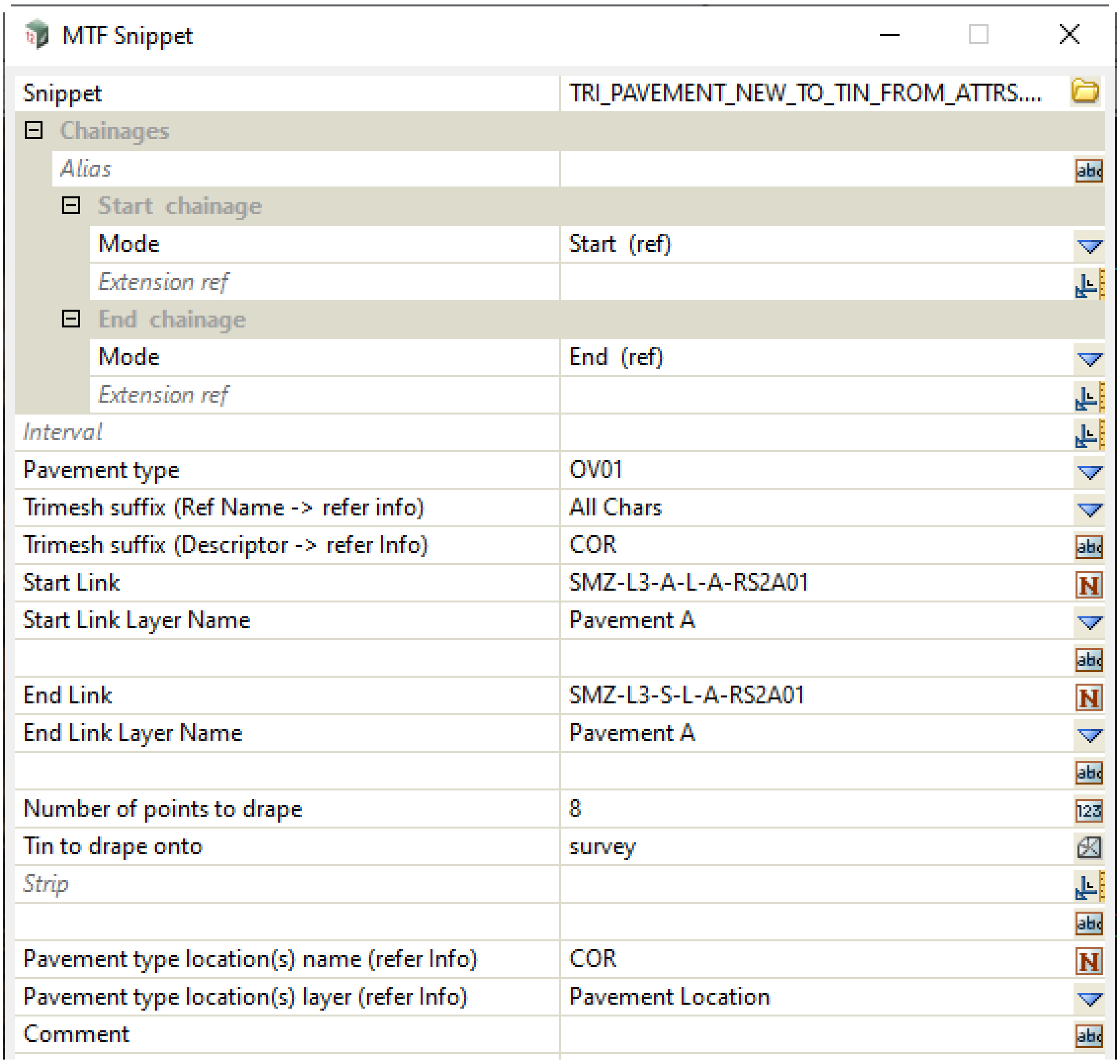
Now documented In the v15 reference manual

This snippet is used in conjunction with the **new** Pavement Manager

Details such as layer name, colour, depth etc have been defined separately in the manager.

The snippet is generally is used to place corrector material under a pavement. A tin is specified to extend down to.

The MTF modifier called "Snippet" is used.



Field Description	Type	Defaults	Pop-Up
Pavement_type	choice box		

A range from pavement manager.

***Note**: Only the first layer will be used for the trimesh created.*

Trimesh Ref Name Suffix	choice box	All Chars	

This option will add the Reference Alignment name to the names of all pavement elements created, including model names.

Ref name RS01, then RS01 is added

*Models created: MESH PAVEMENT **RS01** MESH PAVEMENT STRS **RS01***

***Note**: MESH PAVEMENT & MESH PAVEMENT STRS are taken from the Pavement Manager, under the **Defaults tab**.*

Trimesh Suffix input

*This suffix is used to make up the **unique name** of the trimesh and strings **NOT** the model names.*

e.g. Suffix = A and snippet used on LHS

*Mesh name = AC14-L-A- **RS01** (Layer name-side-suffix-ref)*

Mesh strings name:

*AC14-L1-Z-L-A- **RS01** (Layer name-layer number-str-side-suffix-ref)*

Start link choice box

***Reference** can be accessed by using "HINGE".*

Start link layer name choice box Design

Layer choice (could be layer from previous pavement snippet).

End link choice box

End link layer name choice box Design

Layer choice (could be layer from previous pavement snippet).

Number of points to drape integer

The number of points to drape onto tin to form the base of the trimesh.

Tin to drape onto choice box

Tin must exist.

Strip real box optional

Distance strip off the tin surface (+ ve value).

The two options below can be used to position the snippet instead of the start and end chainages at the top of the snippet.

The name and layer can be defined by using the snippet below (beforehand)

INSERT_PAVEMENT_TYPE_LOCATION.MTFSNIPPET

Pavement type location(s) name input optional

Location name (e.g. PT01).

Pavement type location(s) layer input optional

Location layer (e.g. Pavement location).

Comment

Information entered here will show up in the MTF modifier, and can be read without opening up the entire snippet panel.

Buttons at Bottom

Ok button

Will apply any changes and close the panel.

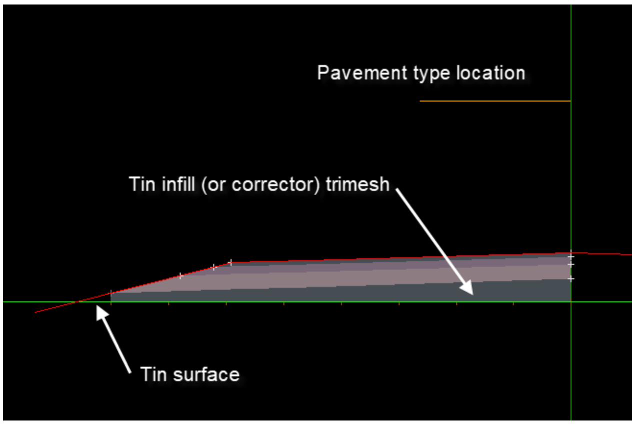
Apply button

Will apply any changes and if the Auto recalc is set on the main MTF.

***Note**: Panel size and position are saved in the working folder:*

mtf_panel_sizes.4d

This file can be moved to your $user for all subsequent projects.



17.13 INSERT_PAVEMENT_TYPE_LOCATION.MTFSNIPPET.mtfsnippet

Now documented In the v15 reference manual

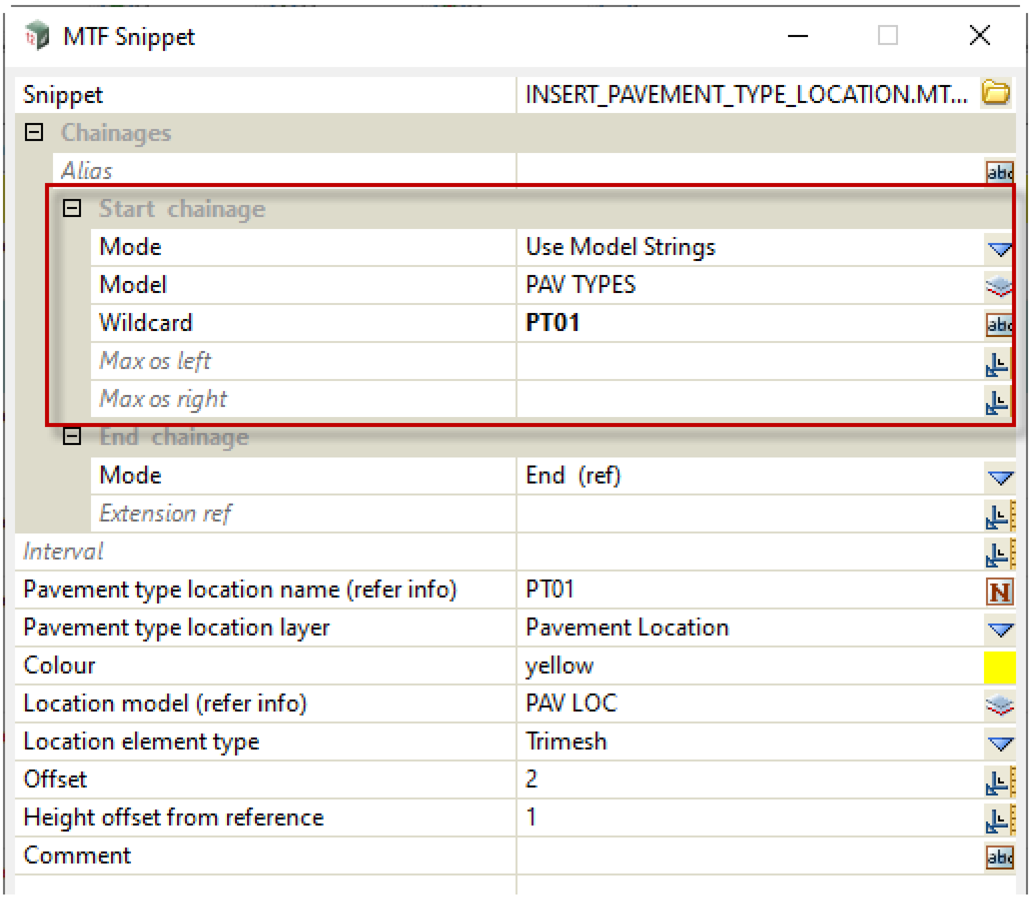
This snippet is used in conjunction with the **new** Pavement Manager

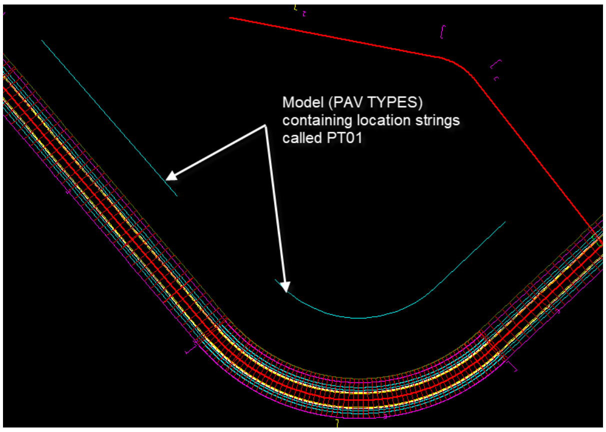
And any relevant NEW pavement snippets that use it

The snippet can create links on a user specified layer, that can then be used in other pavement snippets.

This process is used instead of the start/end chainages at the top of that snippet panel.

The MTF modifier called "Snippet" is used.





NOTE: The snippet is placed using the mode "Use model strings"

This enables the user to simply draw strings to define pavement locations

Field Description Type Defaults Pop-Up

Pavement type location name (refer info) input box

Link name that refers to the pavement type.

Pavement type location layer (refer info) layer box

Layer for the links.

Colour colour box red available colours

Colour of polygon and or trimesh chosen below.

Location model (refer info) model box available models

Model for polygon and or trimesh chosen below. It is optional so if not used, then no polygon or trimesh will be created.

Location element type colour box Polygon

The 3d Polygon and/or a Trimesh is mainly used for a visual location of the pavement type (add to perspective and section view e.g.).

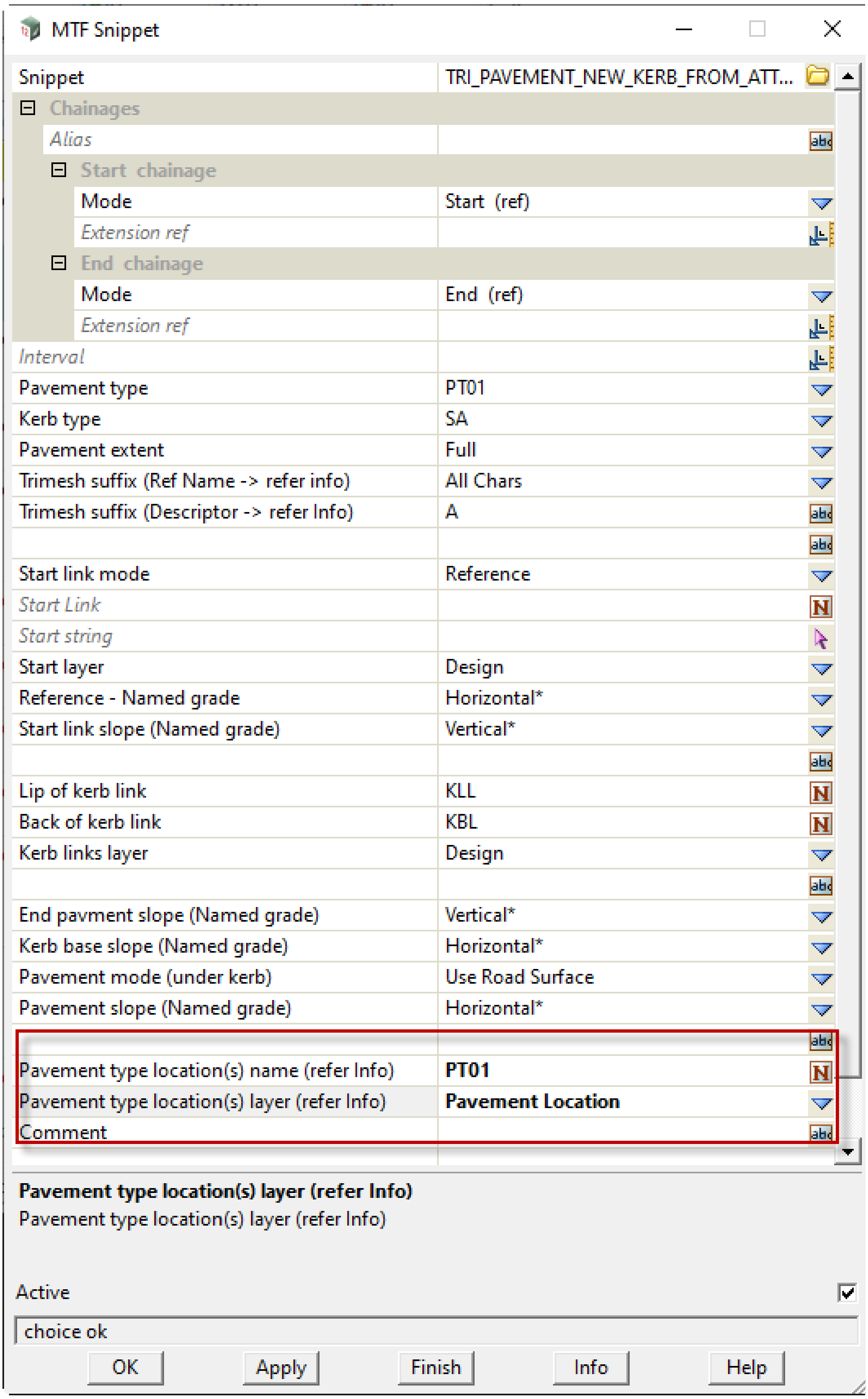
Offset real box 2

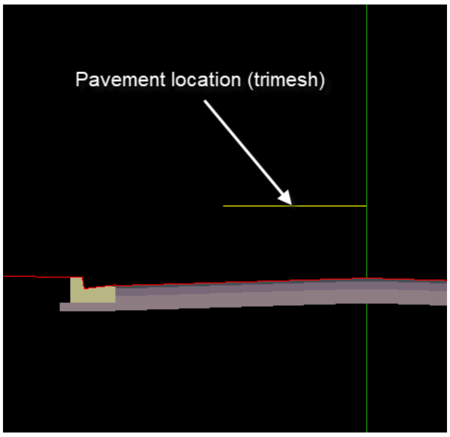
Will be used for the polygon width (measured from the reference).

Height offset from reference real box 1

Position height above the reference string.

The Pavement type location(s) are then used in most of the "NEW" supplied snippets e.g. TRI_PAVEMENT_NEW_FROM_ATTRS.MTFSNIPPET.


MTF Snippet
Snippet
TRI_PAVEMENT_NEW_KERB_FROM_ATT...
Chainages
Alias
Start chainage
Mode
Start (ref)
Extension ref
End chainage
Mode
End (ref)
Extension ref
Interval
Pavement type
PT01
Kerb type
SA
Pavement extent
Full
Trimesh suffix (Ref Name -> refer info)
All Chars
Trimesh suffix (Descriptor -> refer Info)
A
Start link mode
Reference
Start Link
Start string
Start layer
Design
Reference - Named grade
Horizontal*
Start link slope (Named grade)
Vertical*
Lip of kerb link
KLL
Back of kerb link
KBL
Kerb links layer
Design
End pavment slope (Named grade)
Vertical*
Kerb base slope (Named grade)
Horizontal*
Pavement mode (under kerb)
Use Road Surface
Pavement slope (Named grade)
Horizontal*
Pavement type location(s) name (refer Info)
PT01
Pavement type location(s) layer (refer Info)
Pavement Location
Comment
Pavement type location(s) layer (refer Info)
Pavement type location(s) layer (refer Info)
Active
choice ok
OK
Apply
Finish
Info
Help


Pavement location (trimesh)

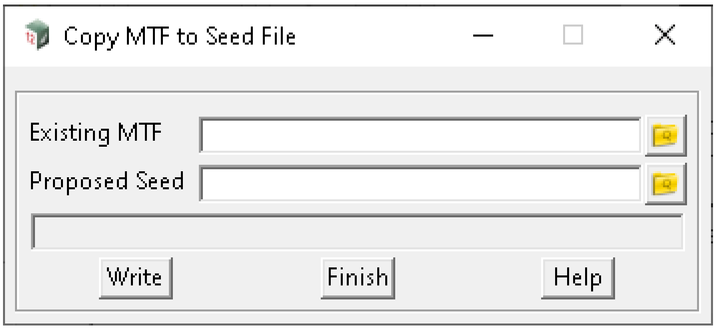
17.14 Copy MTF to seed

Position of option on menu: **Design =>MTF =>Copy MTF to seed**

Now documented In the v15 reference manual

This option allows you to copy an existing MTF to a seed file (mtf_seed).

Selecting **Copy MTF to seed** brings up the **Copy MTF to Seed File** panel.



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

Field Description	Type	Defaults	Pop-Up
Existing MTF	file box		*.mtf files

The existing MTF file.

Proposed Seed	file box		*.mtf_seed files

New name for the seed file.

Buttons at Bottom

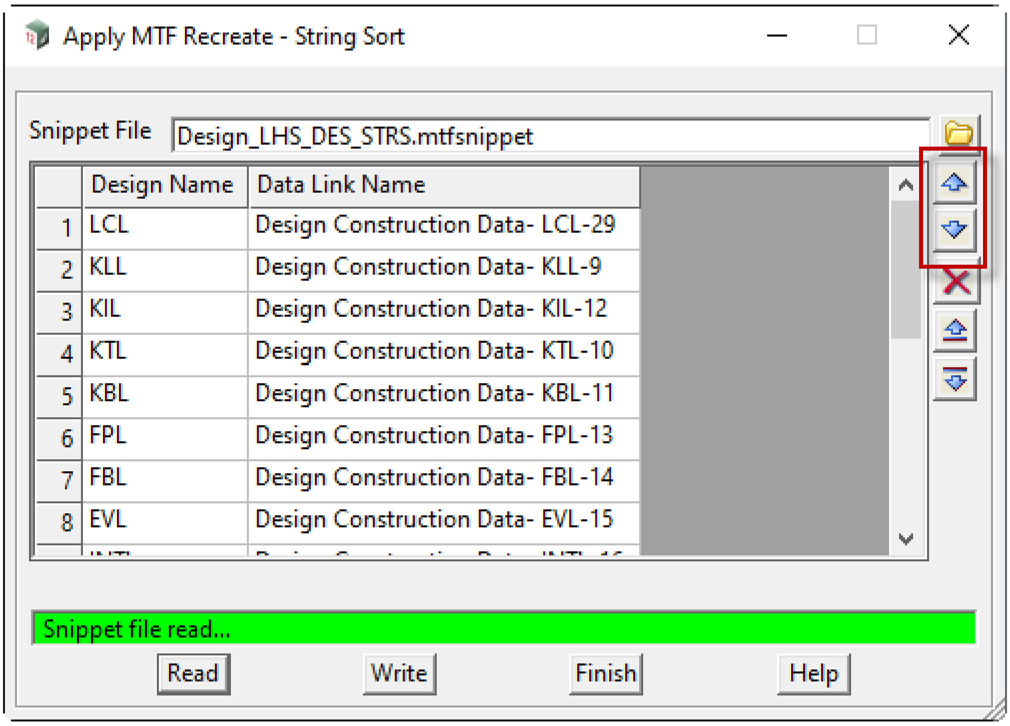
Write button

Write file (copies existing mtf to an mtf_seed file).

17.15 Apply MTF - Recreate String Sort

Position of option on menu: **Design =>Apply =>Apply MTF recreate string sort**

Now documented In the v15 reference manual



In the above panel a snippet for the LHS of the recreate has been selected. All the strings that are created, via an "insert_absolute" command, are displayed in the grid.

The final design link name and the corresponding unique string in the construction data model are displayed.

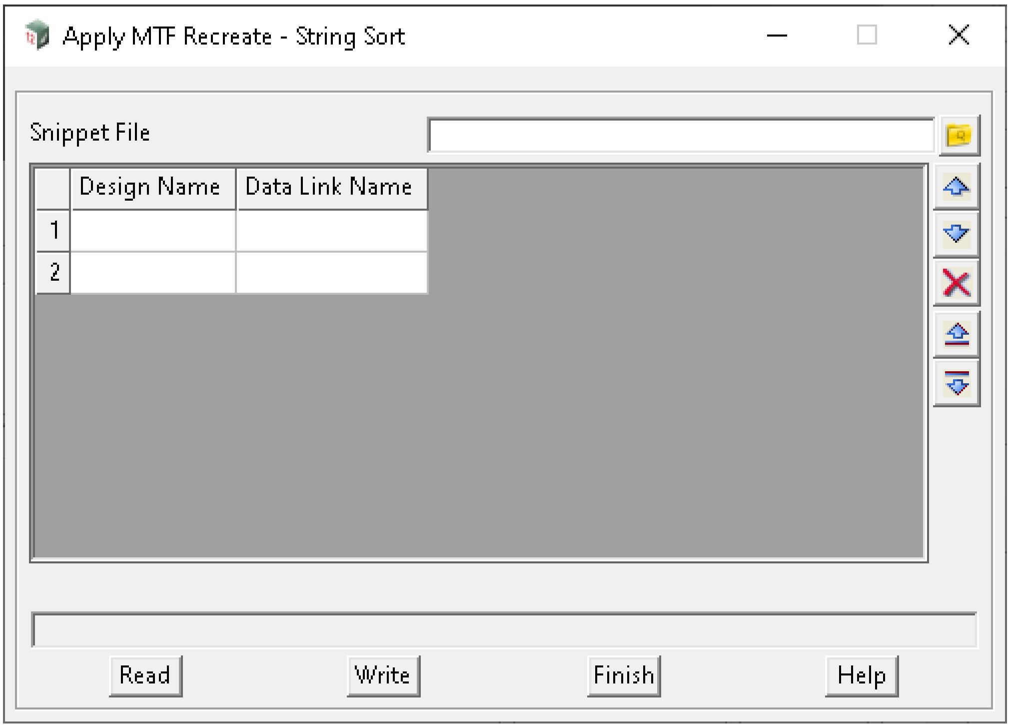
An effort is made to sort the strings into their position relative to the reference alignment. In some circumstances this automated process may fall short.

This "recreate sort", allows you to move any string up or down in the grid and write out the new ordered snippet.

In this example the design string "LCL" was in position 7 in the grid, but had to go ahead of the "KLL" string.

Note: The design strings may look correct, but their position in the data base, when created, may affect some modifiers.

Selecting **Apply MTF recreate string sort** displays the **Apply MTF Recreate - String Sort** panel.



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

Field Description	Type	Defaults	Pop-Up
Snippet file	file box		*.mtfsnippet

Snippet file created using the Apply MTF Recreate.

Grid	selections		

Lines read from the file, which can be moved up or down via the arrows highlighted.

Buttons at Bottom

Read button

Read the file and fills out the grid.

Write button

Write the file (overwrites the existing file).

17.16 Debugging Snippets

See 17.16.1 Print Messages and Log Lines to the Output Window

17.16.1 Print Messages and Log Lines to the Output Window

Now documented In the V15 reference manual

(c) user_message_log_eval_token, user_message_print_eval_token

user_message_log_eval_token "text_msg" st_ch extra_st end_ch extra_end

user_message_print_eval_token "text_msg" st_ch extra_st end_ch extra_end

"text_msg" user defined text which has a token embedded in it, these 2 snippet commands simply indicate to the snippet processor there is a token embedded in the message that needs evaluating, it is not an error is the message has no token, it will printed/logged as is.

st_ch extra_st end_ch extra_end - optional

st_ch is a chainage

extra_st is added to st_ch to give the **start chainage**

end_ch is a chainage

extra_end is added to end_ch to give the **end chainage**

Print to or create a log line in the Output Window of the text **text_msg** with all embedded tokens evaluated.

The log lines are produced for every section in the chainage range given by the start chainage and the end chainage.

If the start and end chainage modes are omitted, they are taken to be from the start to the end of the reference string.

user_message_print_eval_tok "The road is $(RWIDTH)m wide!" $(SCH) 0 $(ECH) 0

user_message_log_eval_tok "The road is $(RWIDTH)m wide!" $(SCH) 0 $(ECH) 0

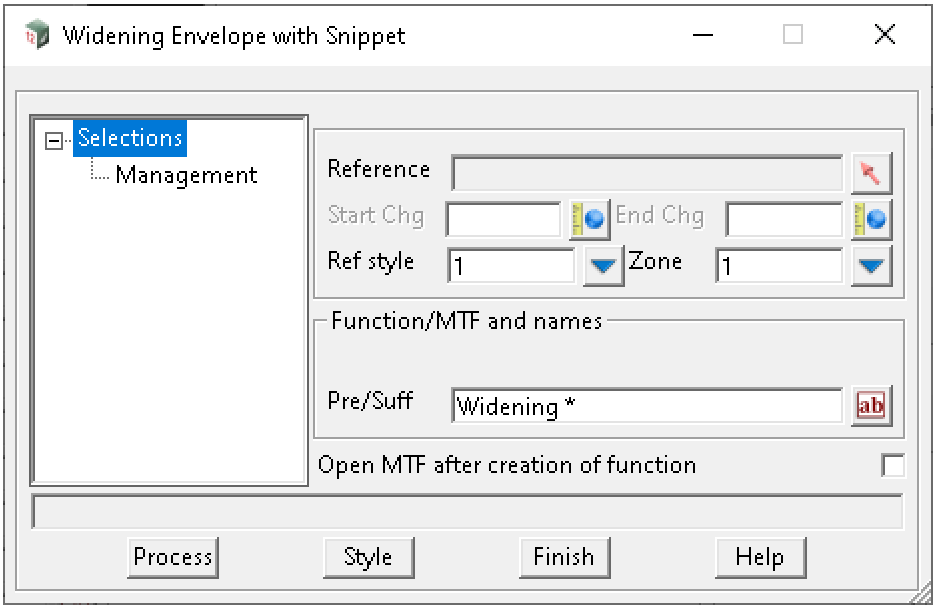
For every section between the start and the end chainage, this will evaluate $(RWIDTH) then print or log the text to the Output Window, "The road is 11.7m wide!"

17.17 Road Widening - with Snippet

Position of option on menu: **Design =>Roads =>More =>Road widening (with snippet)**

Now documented In the v15 reference manual

Selecting **Road widening (with snippet)** brings up the **Widening Envelope with Snippet** panel.



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

Field Description	Type	Defaults	Pop-Up
Reference	string select		
Select super alignment.			
Start Chg	real box		
Optional start chainage.			
End Chg	real box		
Optional end chainage.			
Ref style	choice box	1	1-10
*Reference styles can be created and set under "**Style**".*			
Zone	choice box	1	1-10
Zones are part of the Ref style			

***Note**: Refer toolbar menu, see 9.2.28 Road Toolbar.*

Pre/Suff input box Widening *

Function/MTF uses this name plus the name of the reference alignment.

Open MTF after creation of function tick box not ticked

*If **ticked**, an edit panel for the MTF is displayed.*

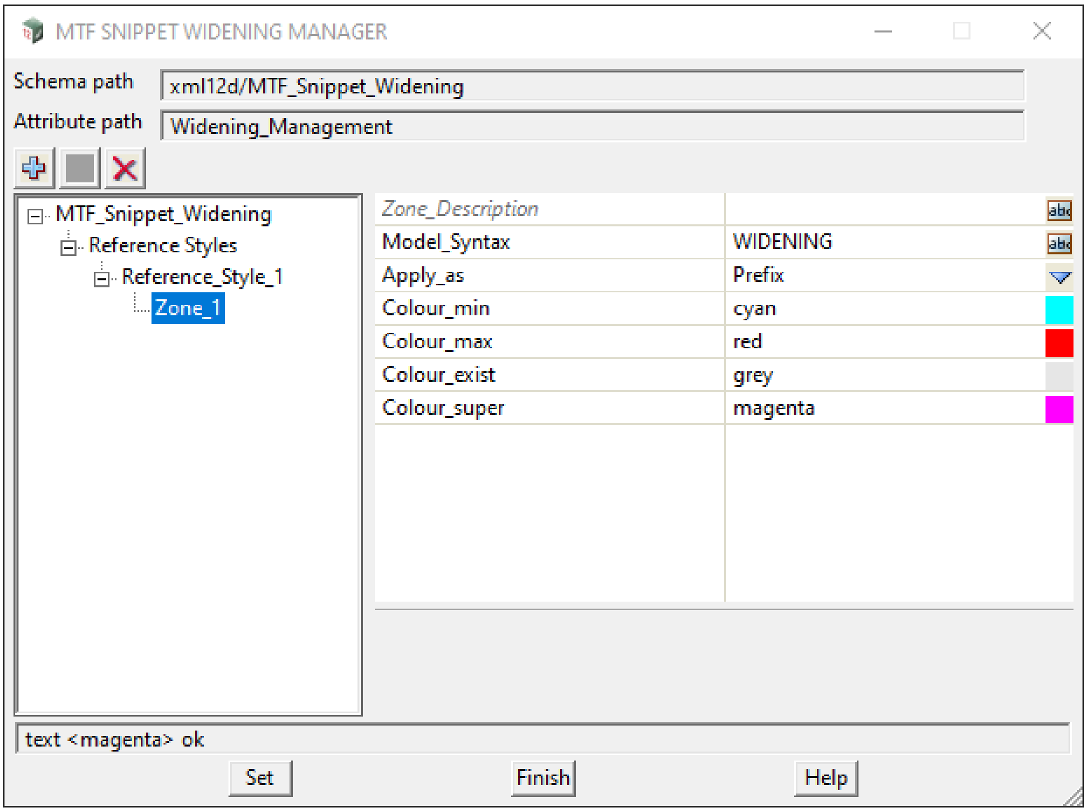
Buttons at Bottom

Process button

Process data selected with values entered.

Style button

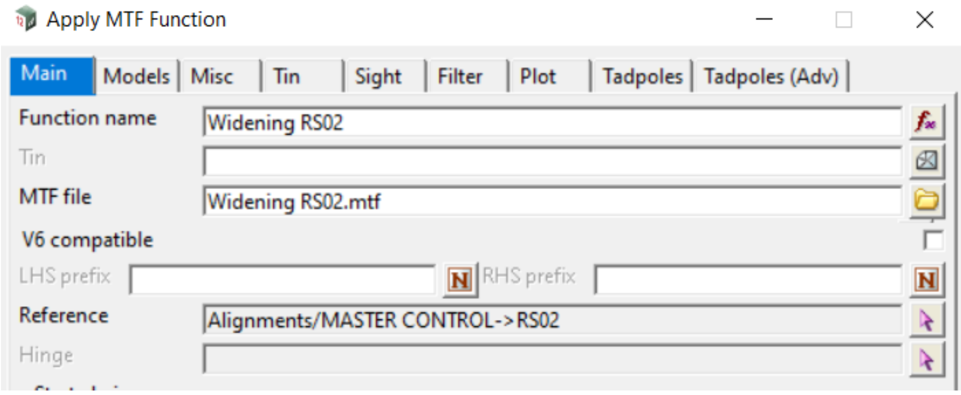
Displays the panel below where you can create other styles.

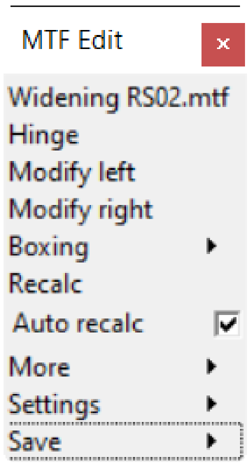


 *Selecting the add button above allows you to add other Reference styles and Zones. (10 maximum for each).*

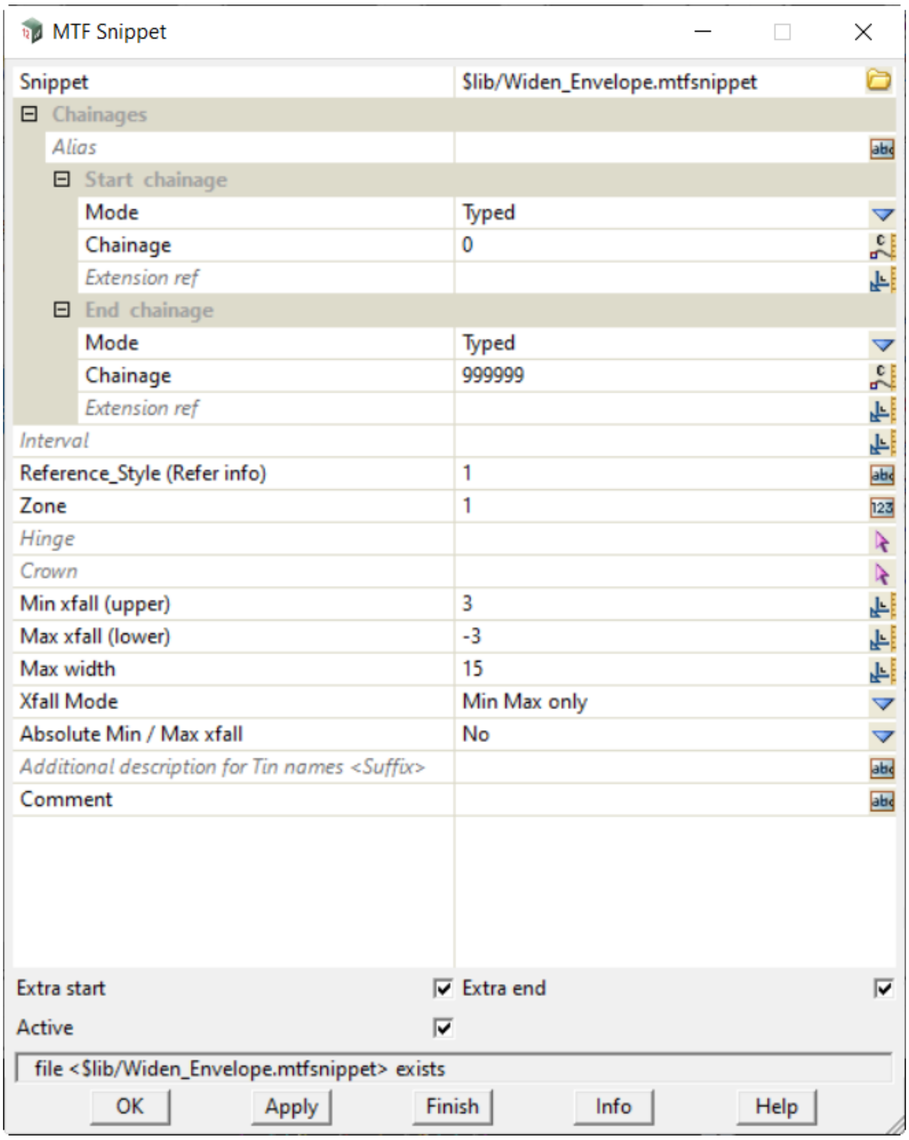
For more information see 19.11.12.5.1. Road Widening Manager.

Xfall envelope selections





The snippet below comes from the "**Modify left**" in the MTF created.

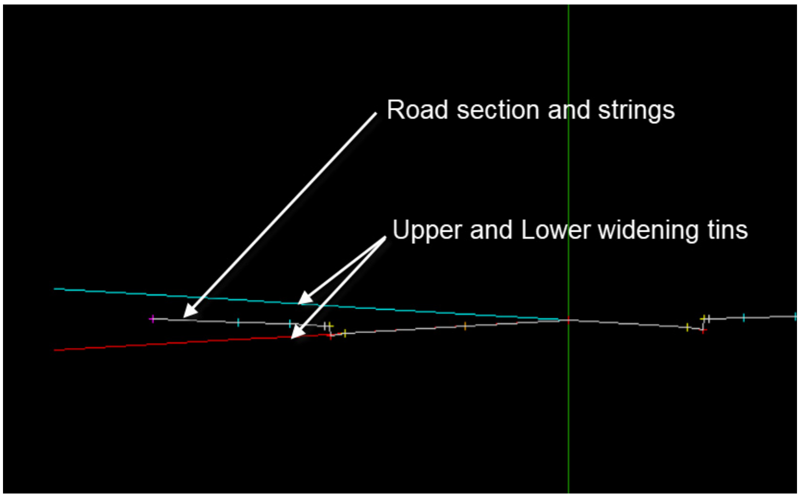


The snippet below comes from the first run when the function/MTF is created.

It uses the Upper and Lower xfalls, positioned at the reference string.

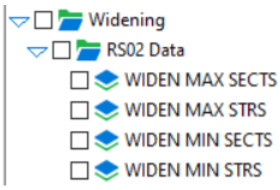
Xfall mode (Min Max only)

*Refer section view **below**, showing the profiled design road section and the two widening tins.*



Default model for tins as per below:

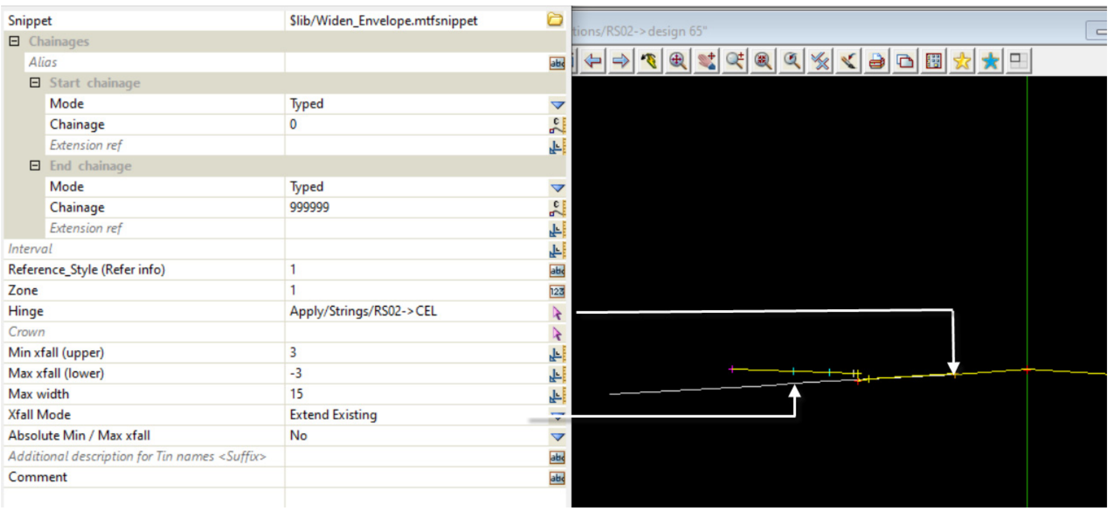
Extra default models for widening strings and sections, as per below:



Xfall mode (Extend existing)

It uses the reference string, and a hinge selection to define and extend the existing xfall.

*Refer section view **below**, showing the profiled design road section and the widening tin.*

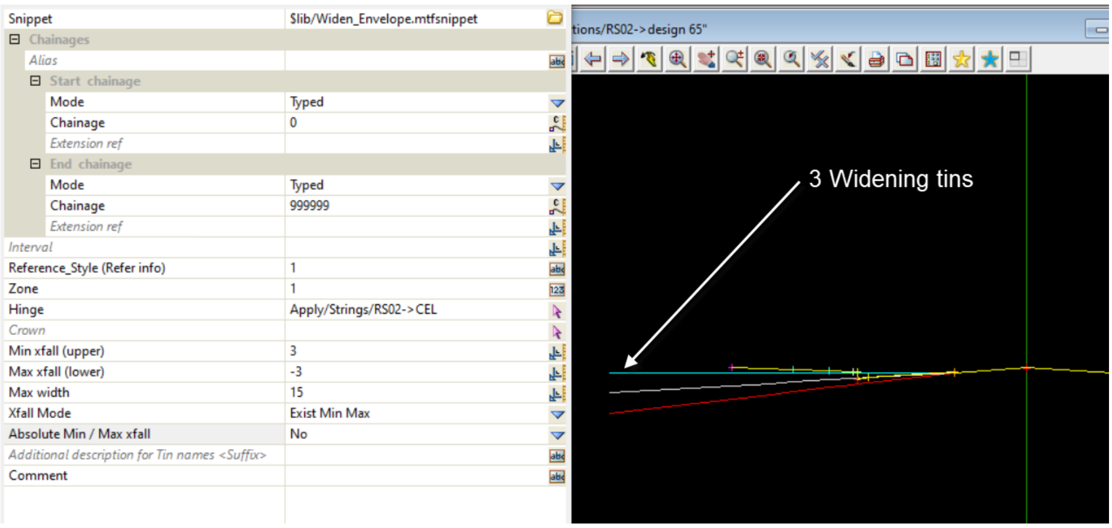


Xfall mode (Exist Min Max)

It uses the reference string, and a hinge selection to define and extend the existing xfall. The upper and lower xfalls are relative to the existing.

(Absolute Min / Max xfall is set to "No")

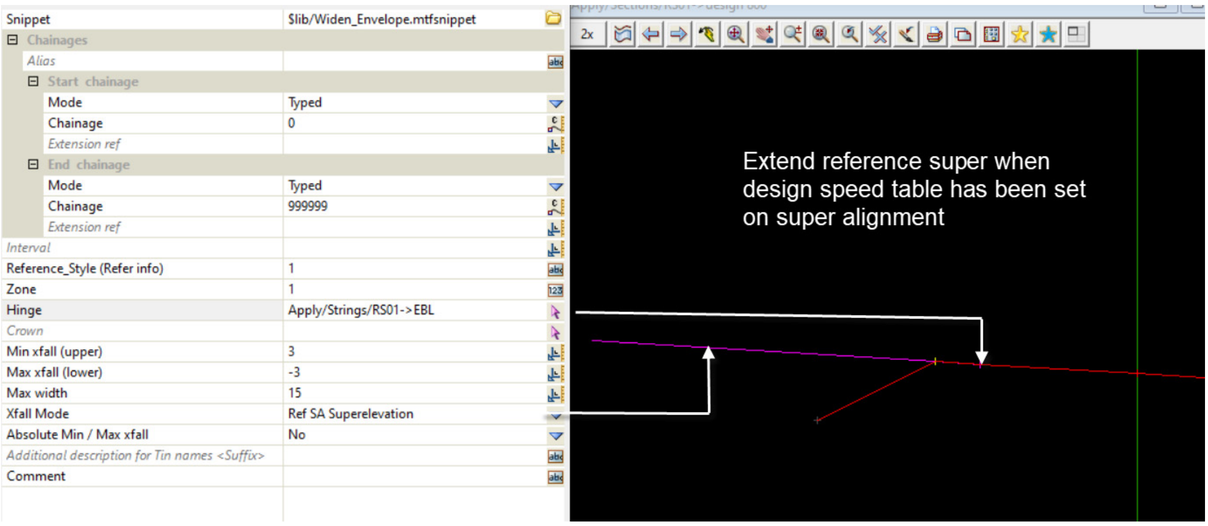
*Refer section view **below**, showing the profiled design road section and the 3 widening tins.*



Xfall mode (Ref SA Superelevation)

It uses the reference string, and a hinge selection to define and extend a xfall that matches the superelevation on the reference alignment.

*Refer section view **below**, showing the profiled design road section and the widening tin.*



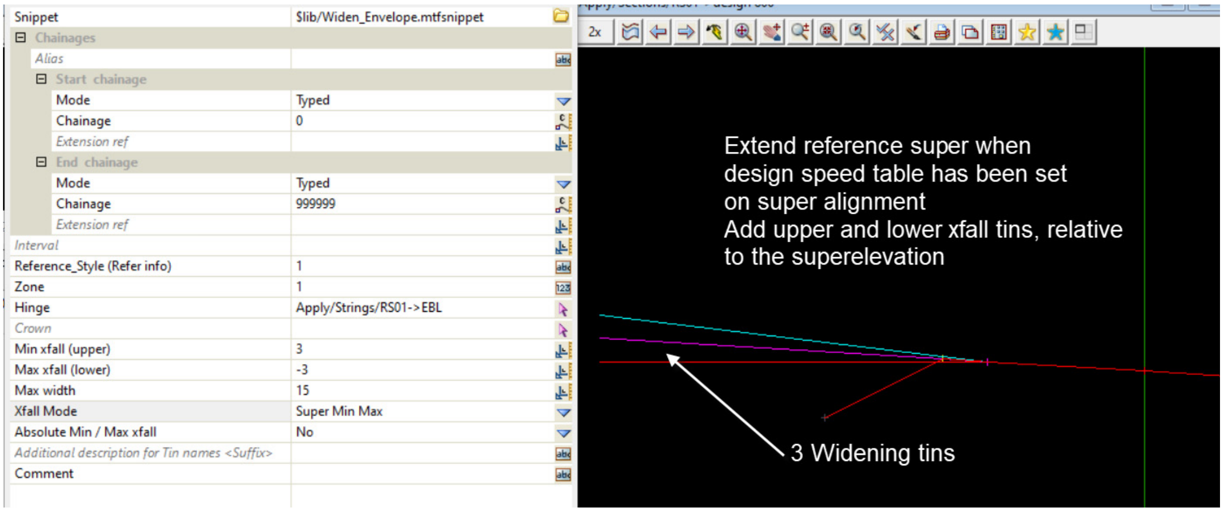
Xfall mode (Super Min Max)

It uses the reference string, and a hinge selection to define and extend a xfall that matches the superelevation on the reference alignment.

The upper and lower xfalls are relative to the superelevation.

(Absolute Min / Max xfall is set to "No")

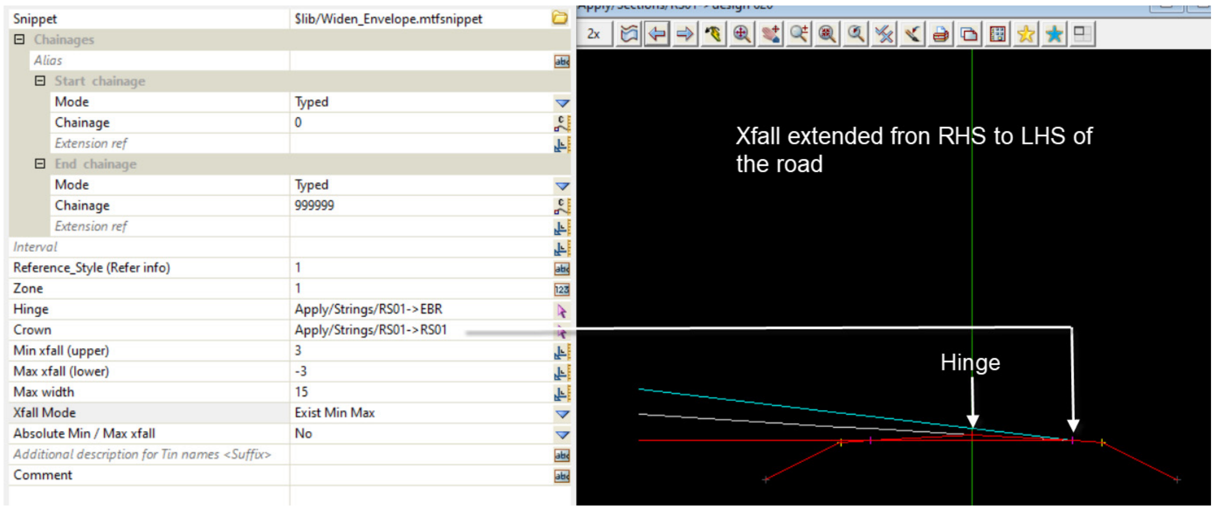
*Refer section view **below**, showing the profiled design road section and the widening tins.*



Crown and Hinge selection

The two strings can be used to extend the xfall between the two strings.

***Note**: As the widening snippet uses external strings to generate the tins, selection can be from any side of the reference string.*



17.17.0.0.1 Road Widening Manager

This option creates widening styles for use in the **MTF** file. Setting project attributes which are then used within the "WIDENING_ENVELOPE_FROM_ATTRS.mtfsnippet"

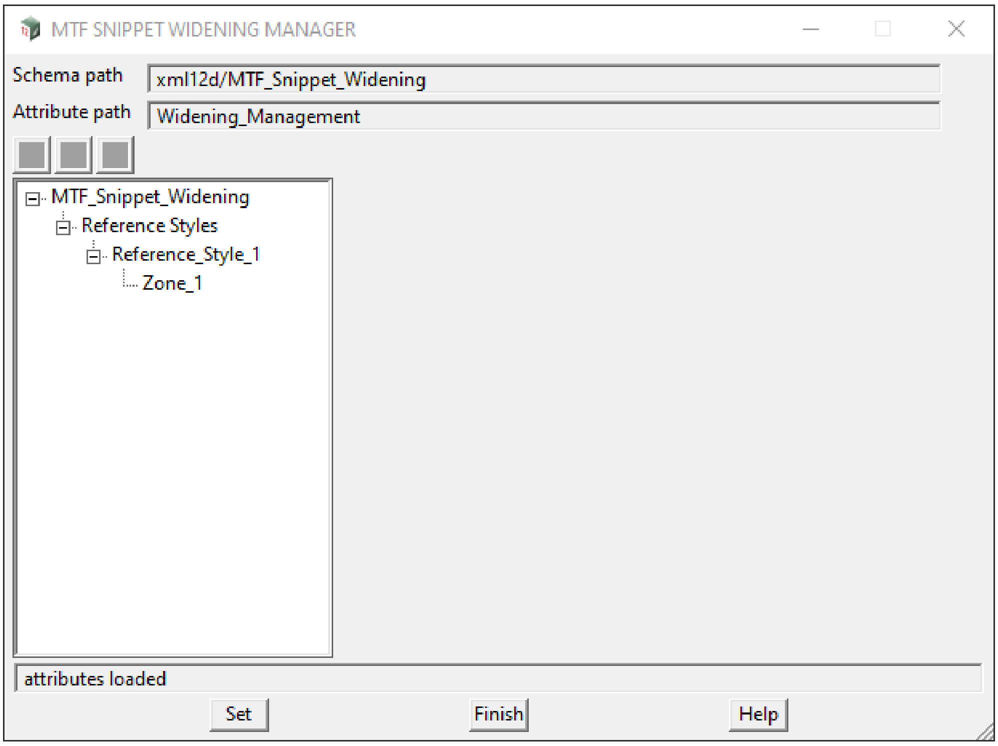
There are up to ten reference styles and each style consists of a possible further ten zones.

For example, when the Snippet Widening Manager is first activated, a default widening management style is created, called **Reference_Style_1**.

Under "Reference_Style_1" a default **Zone_1** is created with the defined attributes required for the snippet.

The widening management style information is stored as Project attributes under the tree **Widening Management**. The defined styles are only available within the current project.

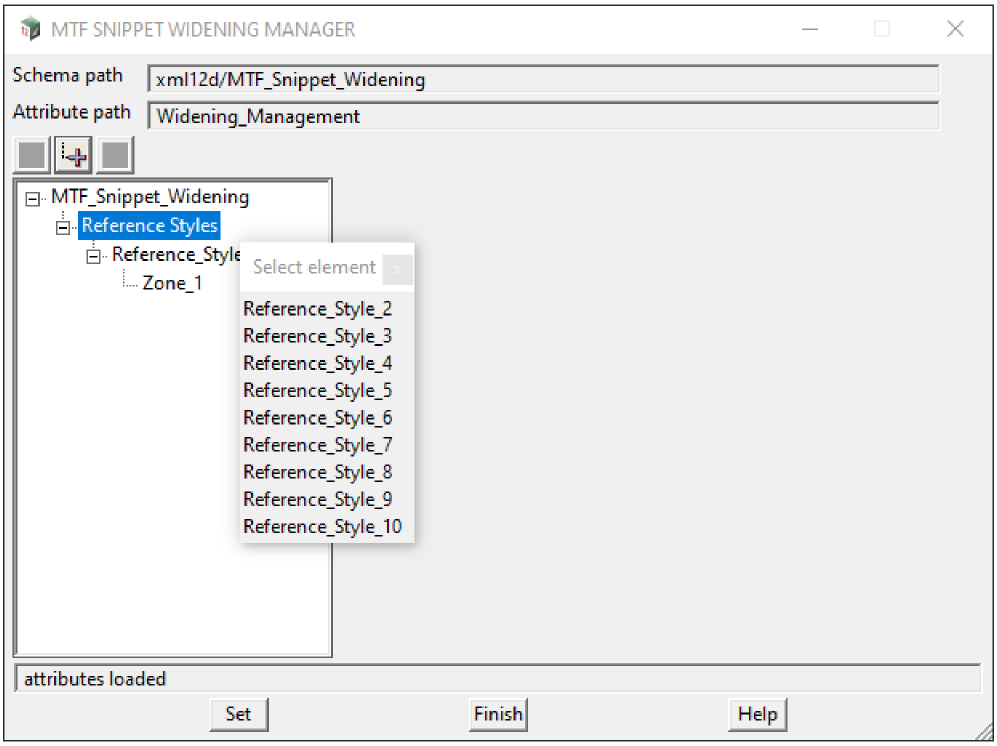
Selecting **Widening manager** brings up the **MTF Snippet Widening Manager** panel.



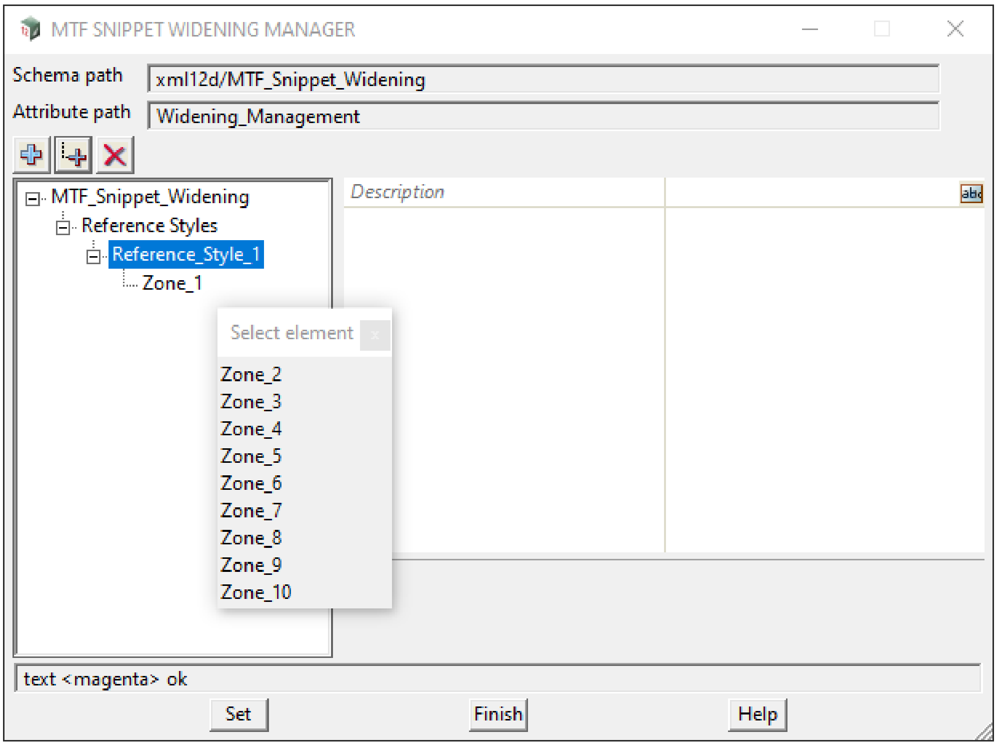
The fields and buttons used in this panel have the following functions:

Field Description	Type	Defaults	Pop-Up
Reference Styles	file box		*.12dpm files

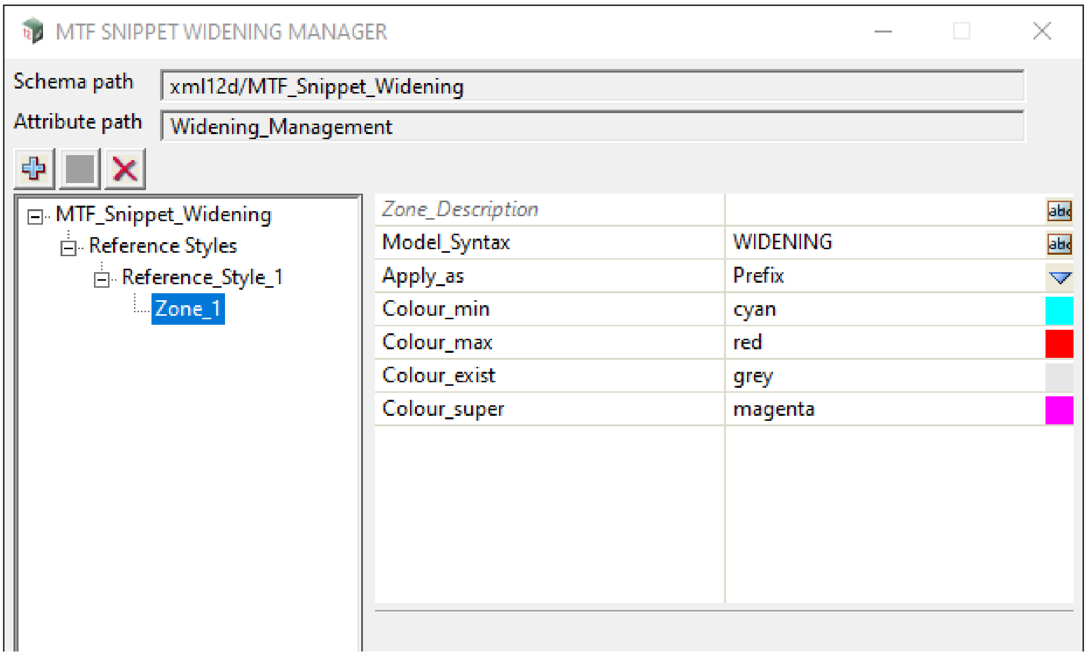
*When **Reference Styles** is highlighted, the **Add child** icon + appears and clicking on the + activates a drop down menu with up to nine new styles: Selecting a new **Reference_Style_n** will add it to the current lists of **Reference Styles**.*



*When the new **Reference_Style_n** is highlighted, the Add child icon + appears and clicking on the + activates a drop down menu with the new Zone number to be added.*



*Selecting a **Zone** will add it as a child of the highlighted **Reference Style**.*



Snippet attribute parameters

For each Zone created a number of individual parameters can be set for use within the MTF snippet. They include.

Zone_Description text box

This is an optional field to help differentiate between many Zones if used.

Model_Syntax text box WIDENING

Forms part of the final TIN model name used in the snippet eg. Model_synax + SA Name + Snippet Suffix.

Apply_as text box Prefix

Choice of Prefix or Suffix for the application of the model syntax.

Colour_min colour box cyan available colours

Colour used for the production of the minimum xfall tin.

Colour_max colour box red available colours

Colour used for the production of the maximum xfall tin.

Colour_exist colour box grey available colours

Colour used for the production of the existing xfall tin.

Colour_super colour box magenta available colours

Colour used for the production of the SA Superelevation xfall tin.

Buttons at Bottom

Set button

*Saves the information about the Widening Styles as Project attributes in the tree **Widening Management**.*

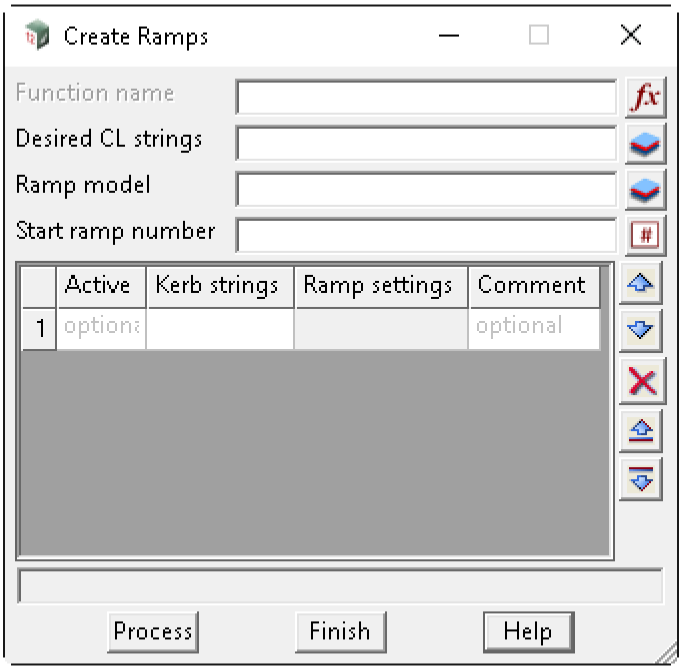
17.18 Create Ramps and Driveways

Position of option on menu: **Design =>Roads =>Create ramps/driveways**

Now documented In the v15 reference manual

This option has been developed to create one or more pram ramps or driveway locations that can be square or skew (angled) as often found from the kerb return geometry provided.

Selecting **Create ramps/driveways** brings up the **Create Ramps** panel



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

Field Description	Type	Defaults	Pop-Up
Function name	function box		available create ramps functions

*Name of the function to define the **calculation** for reprocessing. If the function already exists and is picked from the list provided, the information from the existing function will be placed in the appropriate panel fields.*

Desired CL Strings	model box		available models

This model contains the locations and directions from which to calculate the directions from the centre of the new ramps. It is suggested the model contains construction strings (uniquely named) and these strings need to cross the SA Kerb Return strings provided in the grid below.

Ramp Model	model box		available models

Model name required into which the newly created ramp strings will be produced.

Start ramp number	text box		

The starting number for the ramp strings produced into the ramp model.

Grid area options by column

Active optional choice

Selection of the cell for each row listed under active, users can choose (via RMB) "yes or no" to calculate the ramp information for that location.

Kerb Strings model box available model

This model selection contains the kerb return profile strings from which you intend to apply the modified invert, back and top of kerb strings to form the pram location.

Ramp Settings

Calculation settings per ramp location to be produced. These settings are stored as attributed for the calculation and can be modified or copied of required for additional ramps.For more information on the Ramp Settings Panel see 17.18.1 Ramp Settings Panel.

Buttons at bottom

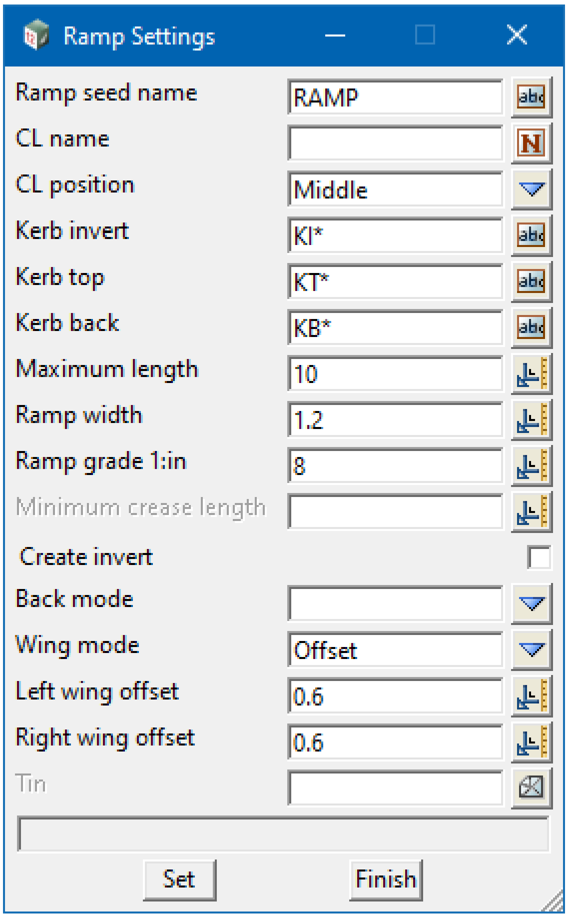
Process button

Once selected, the values provided above in the panel are calculated and any new ramp strings are generated into the "Ramp model".

Finish button

If selected the "Create ramp" panel will close and not undertake any calculations.

17.18.1 Ramp Settings Panel



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

Field Description | Type | Defaults | Pop-Up

Ramp seed name | text box | RAMP

The seed name (defaulted to RAMP) is produced at the pre string name and is added before the "start ramp number" provided above. Hence each ramp string produced for the function has a unique name. eg RAMP01, RAMP02 etc.*

CL name | name box

The string name selected to build the ramp from. This string is uniquely named within the "Desired CL strings" model provided above.

CL position | choice box | Middle | Left, Middle, Right

Given the "CL name" string provided above, the position of the new ramp and geometry/offsets regarding the placing of calculated strings.

Kerb invert | text box | KI*

String name to be placed on the created ramp string at the time of processing.

Kerb top | text box | KT*

String name to be placed on the created ramp string at the time of processing.

Kerb back | text box | KB*

String name to be placed on the created ramp string at the time of processing.

Maximum length real box 10

Given the length and grade of ramp information provided below this is the maximum length over which to form the strings.

Ramp width real box 1.2

Width of the new ramp to be calculated from the CL name string based on the position selected above.

Ramp grade 1:in real box 8

Grade of the new ramp strings calculated from the height of the "Kerb Strings" height where the intersection of the "CL name" string intersects. Note: The "Kerb String" intersected much have valid heights for the ramp to be calculated.

Minimum crease length real box

*If **not blank**, the value entered will be the minimum length for a crease at the base of the ramp.*

If a crease is not required enter a large value so the minimum will not be met.

Create invert tick box not ticked

*If **not ticked**, no kerb invert string is produced in the final process.*

*If **ticked**, a kerb invert string is produced over the width of the ramp based off the geometry provided above, given the width and position of the ramp set.*

Back mode choice box Perpendicular to CL
Parallel to invert

Given the "CL name" string provided above, the position of the new ramp and geometry/offsets regarding the placing of calculated strings.

Wing mode choice box Offset Offset, Angle

??.

Left wing offset real box 0.6

??.

Right wing offset real box 0.6

??.

Tin tin box available tins

*If **blank**, then calculation of the ramp grade is used to determine the length of the ramp produced.*

*If **not blank**, the name of the tin to calculate the length of the ramp, given the desired grade and height of CL name string at the position of the invert.*

Comment text box

Optional note/comment for each row of the grid selection to allow users to document some feature for help in location of the ramp produced.

17.19 Track

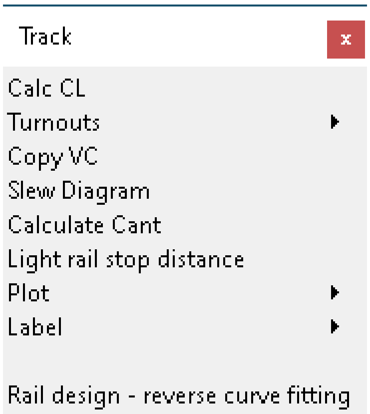
Position of menu: **Design =>Track**

The Track options are for working on rail design.

The ***Track*** options have their own Help system which is brought up by clicking on **Help** on the **Track menu**, or clicking **Help** on each of the **Track panels.**

Now documented In the V15 reference manual

The **Track** walk-right menu is



See

17.19.1 Calc CL Panel
17.19.2 Track Turnouts
17.19.3 Copy VC
17.19.4 Rail Slew Calculator
17.19.5 Calculate Cant
17.19.6 Light Rail Stopping Distance
17.19.7 Track Plot
17.19.8 Track Label

17.19.1 Calc CL Panel

Position of menu: **Design =>Track =>Calc CL**

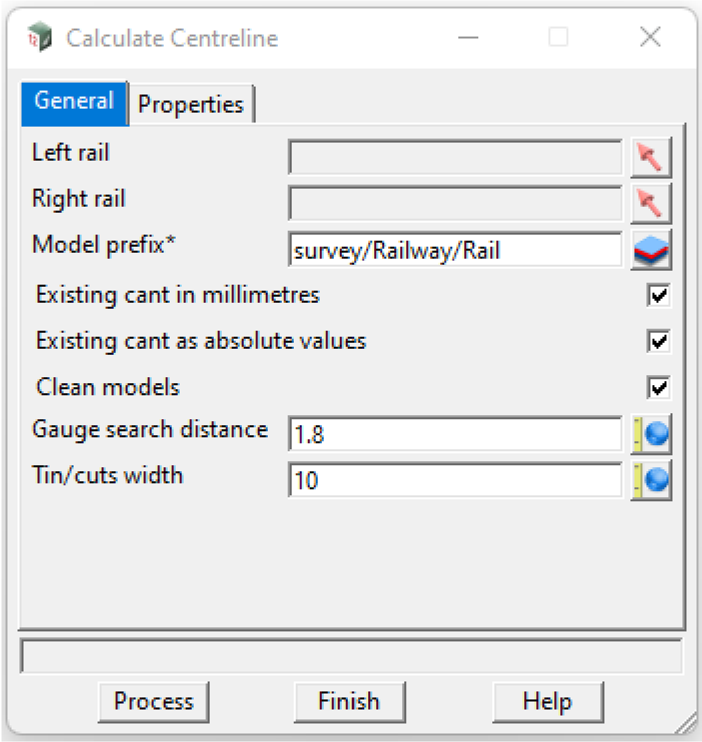
The Calc CL Panel panel generates a super string of points between two surveyed rail strings to create an existing centreline at the low rail height. This can be used to check the slew, the lifting/ lowering and the line-of-best-fit between design alignments generated by ***12d Model*** and the original surveyed rail centreline. The **Model for CL** points is used by the 17.19.4 Rail Slew Calculator to generate slew calculations between a design alignment and the original surveyed rail centreline. The CAD Regression tools can be used to generate geometry of the original survey rail centreline.

The Calc CL panel also develops: a centreline, tin and cut strings of the existing cant; a tin and cut strings of the low rail; cut strings of the left and right rail levels; and a tin of each segment angle which can be used in conjunction with the existing cant tin to approximate the extents of curves, tangents and spirals for use in horizontal CAD Regression.

The cut strings generated can be used as Cuts - Long Section cut strings inside the Long Section Plot PPF Editor to tabulate the track lift/lower values on a long section plot. Alternately generated centrelines can be used as offset strings Boxes - Offset String Titles/Heights/Depths and tinsBoxes - Offset String Titles/Heights/Depths can also be used in a long section plot.

Vertex attributes are also generated at each vertex on the centreline low leg.

Selecting **Calc CL** displays the **Calculate Centreline** panel.



Tabs
General tab
Properties tab

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

Field Description	Type	Defaults	Pop-Up

General tab

Left Rail string select

String for the surveyed left rail.

Right Rail	string select		

String for the surveyed right rail.

Model prefix*	model box	survey/Railway/Rail	available models

*Model prefix/suffix that can be added to names and models in the properties tab where the wildcard * character is replaced with the text entered in* ***model prefix ****.

Existig cant in milimetres	tick box	ticked

If ***ticked****, existing cant values generated are in millimetres.*

If ***not ticked****, existing cant values generated are in metres.*

Existing cant as absolute values	tick box	ticked

If ***ticked****, existing cant values generated are positive values.*

If ***not ticked****, existing cant values generated are positive values when the right rail is higher than the left rail, and negative values when the left rail is higher than the right rail.*

Clean Models	tick box	ticked

Cleans all models before elements are generated. Models cleaned are all that are selected (where the ***Use*** *tickbox is ticked) in the* ***Properties*** *tab.*

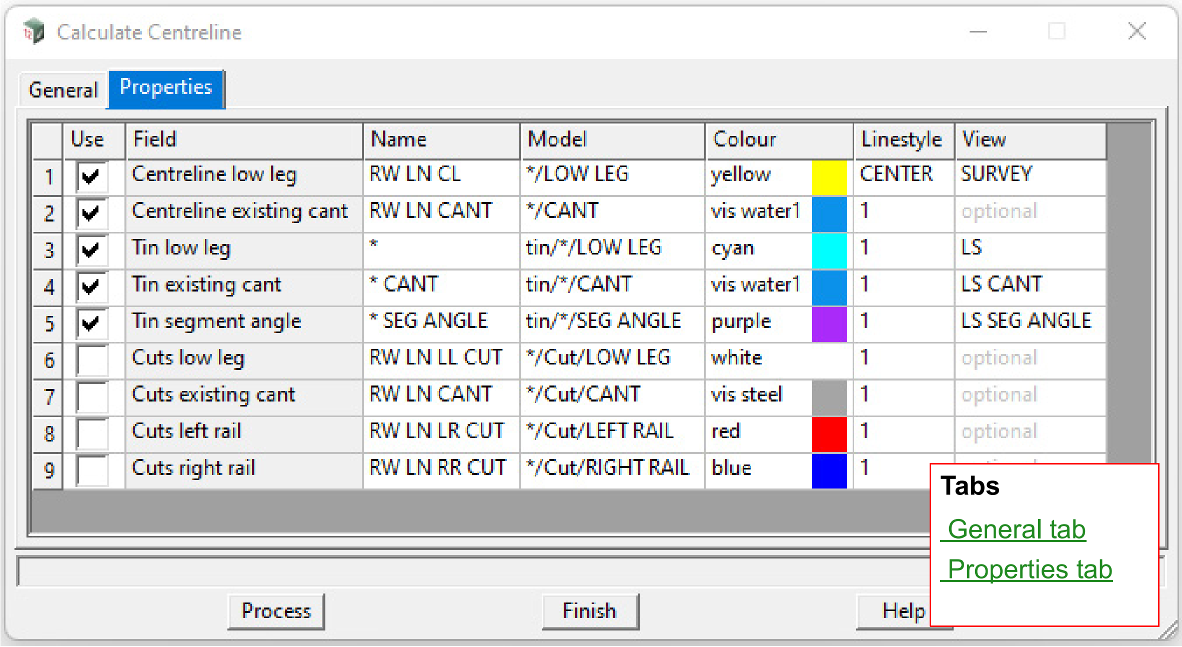
Gauge search distance	real box	1.8

The search distance considered for a point to be created between two rail survey pickups. A value larger than the gauge of the tracks should be entered.

Tins/cuts width	real box	10

The width of the tin and cut strings that will be generated.

Properties tab



Tabs
General tab
Properties tab

Use tick box

*If **ticked**, the element(s) on the corresponding model will be generated.*

*If **not ticked**, the corresponding model will not be generated.*

Field input box

Non-editable text field to display a description of the element(s) to be generated.

Name name box available names

Name applied to element(s) generated.

Model model box available models

Model names applied to element(s) generated.

Colour colour box available colours

Colour applied to element(s) generated.

Linestyle linestyle box

Linestyle applied to element(s) generated.

View view box available views

Element(s) generated will be added to the view selected. If the view does not exist, then the view will be created.

Fields

***Centreline low leg**: A centreline is generated which is between the two rails and has the lowest rail height applied to the z-coordinate.*

***Centreline existing cant**: A centreline is generated which is between the two rails and has the existing cant value applied to the z-coordinate. This existing cant value is affected by the **existing cant in millimetres** tick box and the **existing cant as absolute values** tick box in the **General** tab.*

Tin low leg*: A tin is generated which is the width specified in the* ***tin/cuts width*** *field in the* ***General*** *tab and has the lowest rail height applied to the z-coordinate.*

Tin existing cant*: A tin is generated which is the width specified in the* ***tin/cuts width*** *field in the* ***General*** *tab and has the existing cant value applied to the z-coordinate. This existing cant value is affected by the* ***existing cant in millimetres*** *tick box and the* ***existing cant as absolute values*** *tick box in the* ***General*** *tab.*

Tin segment angle*: A tin is generated which is the width specified in the* ***tin/cuts width*** *field in the* ***General*** *tab and has the segment angle value applied to the z-coordinate. The angle is the radian angle of the segment preceding the point multiplied by 100 for display purposes. The segment angle can be viewed alongside the existing cant tin in a section view to determine the extents of tangents, spirals, and curves when horizontal regression is calculated.*

Cuts low leg*: A series of cut strings are generated across the two rails which have the lowest rail height applied to the z-coordinate. The width of the cut strings is specified in the* ***tin/cuts width*** *field in the* ***General*** *tab.*

Cuts existing cant*: A series of cut strings are generated across the two rails which have the existing cant value applied to the z-coordinate. This existing cant value is affected by the* ***existing cant in millimetres*** *tick box and the* ***existing cant as absolute values*** *tick box in the* ***General*** *tab.*

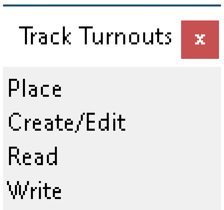
Cuts left rail*: A series of cut strings are generated across the two rails which have the left rail height applied to the z-coordinate. The width of the cut strings is specified in the* ***tin/cuts width*** *field in the* ***General*** *tab.*

Cuts right rail*: A series of cut strings are generated across the two rails which have the right rail height applied to the z-coordinate. The width of the cut strings is specified in the* ***tin/cuts width*** *field in the* ***General*** *tab.*

17.19.2 Track Turnouts

Position of menu: **Design =>Track =>Turnouts**

The **Track Turnouts** walk-right menu is



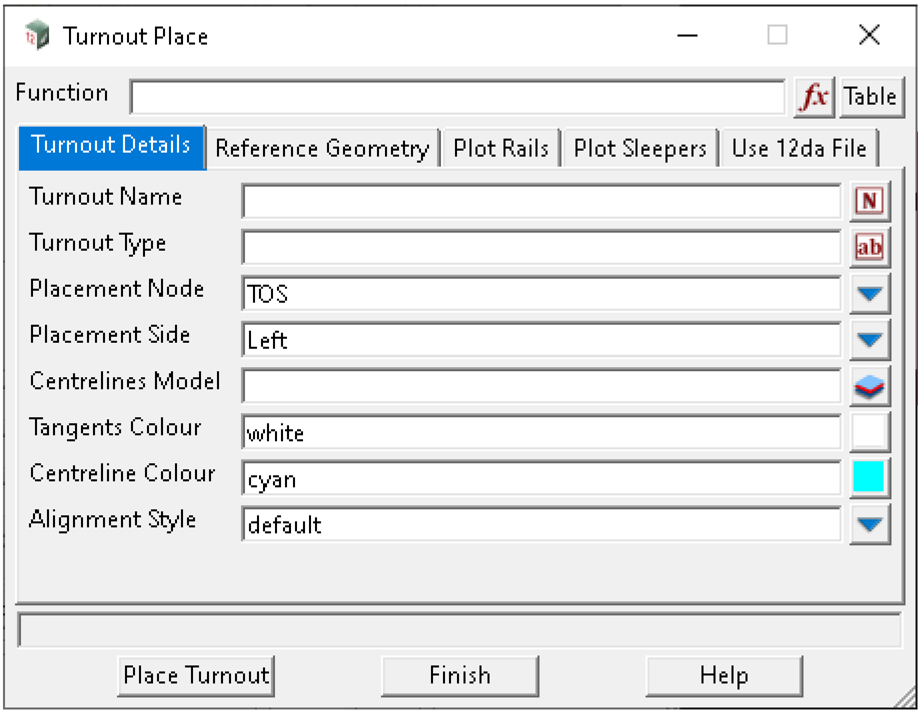
See
17.19.2.1 Turnout Place
17.19.2.2 Turnouts Create/ Edit
17.19.2.3 Read Turnouts
17.19.2.4 Write Turnouts File

17.19.2.1 Turnout Place

Position of option on menu: **Design =>Track =>Turnouts => Place**

The ***Turnout Place*** panel can generate rails, sleepers, and centrelines, and place elements from a 12da file of a turnout with a variety of placement modes.

Selecting **Place** displays the **Turnout Place** panel.



Tabs

[Turnout Details Tab]
[Reference Geometry Tab]
[Plots Rail Tab]
[Plots Sleepers Tab]
[Use 12da File Tab]

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

Field Description	Type	Defaults	Pop-Up
Function	function box		all function

The name of the function.

Table	button		

*The table displays a panel containing a grid box of all **Turnout Place** functions where a function can be selected and loaded.*

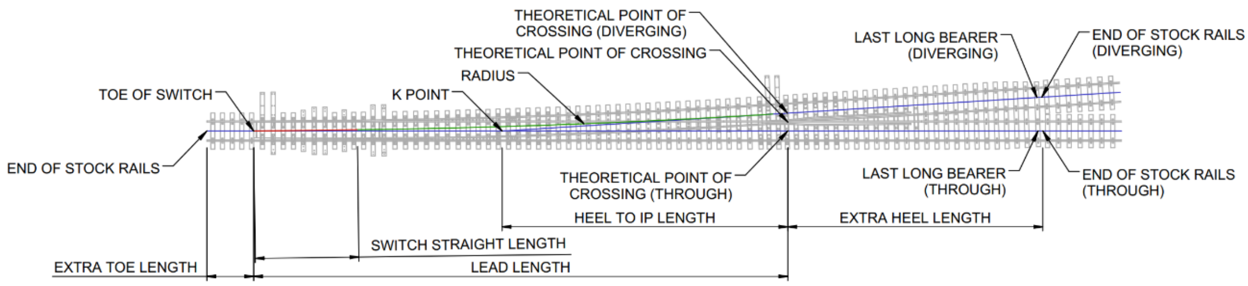
Turnout Details Tab

Turnout Name	name box		available names

The name of the turnout to be placed.

Turnout Type	custom box		all turnouts

Selecting the Turnout Type button opens a panel and a list of turnout types that have either been imported by 17.19.2.3 Read Turnouts *or created in* 17.19.2.2 Turnouts Create/ Edit.



Placement Node	choice box	TOS	Front End, TOS, TPC Main, TPC Loop, K Main, K Loop, Back Main, Back Loop

*If **Front End** is selected, the turnout will be placed from the end of stock rails on the facing direction side of the turnout.*

*If **TOS** is selected, the turnout will be placed from the Toe of Switch (TOS).*

*If **TPC Main** is selected, the turnout will be placed from the Theoretical Point of Crossing (TPC) on the through track.*

*If **TPC Loop** is selected, the turnout will be placed from the Theoretical Point of Crossing (TPC) on the diverging track. Note: If **Reference Type Fx line point & direction** is selected in the **Reference Geometry** tab, then the **Bearing** value will be set for the diverging track.*

*If **K Main** is selected, the turnout will be placed from the K Point, which is the intersection point of the through and diverging track. Note: If **Reference Type Fx line point & direction** is selected in the **Reference Geometry** tab, then the **Bearing** value will be set for the through track.*

*If **K Loop** is selected, the turnout will be placed from the K Point, which is the intersection point of the through and diverging track. Note: If **Reference Type Fx line point & direction** is selected in the **Reference Geometry** tab, then the **Bearing** value will be set for the diverging track.*

*If **Back Main** is selected, the turnout will be placed from the end of stock rails on the through track.*

*If **Back Loop** is selected, the turnout will be placed from the end of stock rails on the diverging track.*

Centrelines Model	model box		available models

The name of the model that the centrelines will be generated onto.

Tangents Colour	colour box	white	available colours

The colour that the tangents elements will be coloured.

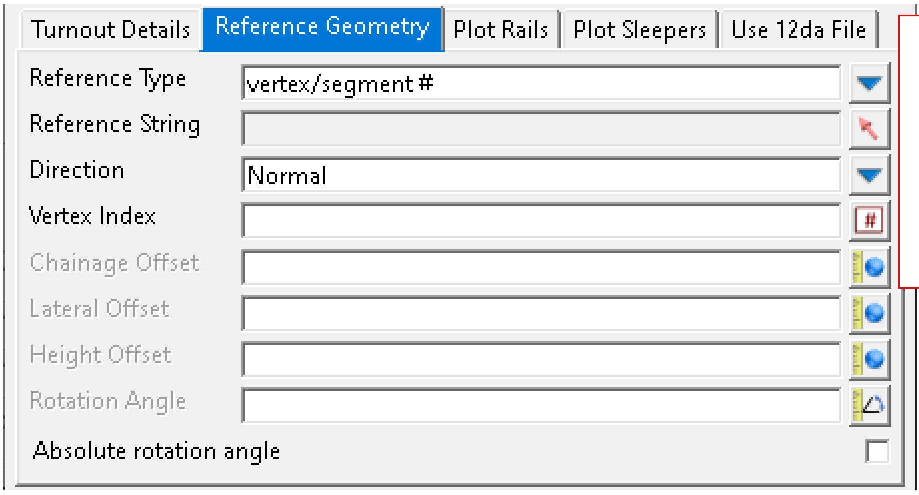
Centreline Colour	colour box	cyan	available colours

The colour that the centreline elements will be coloured.

Alignment Style	style box	default	alignment styles

The alignment style applied to the super alignment that is generated for the diverging track.

Reference Geometry Tab



Tabs

[Turnout Details Tab]
[Reference Geometry Tab]
[Plots Rail Tab]
[Plots Sleepers Tab]
[Use 12da File Tab]

Reference Type	choice box	unknown	turnout types

*Specifies which method for placement of the turnout. The options are **Fx line point & direction**, **tag origin**, **vertex/segment #**, **at chainage**, **dropped point**, and **dropped tag**.*

Reference String	select box		

The string that the turnout will be placed along.

Direction	choice box	Normal	Normal, Reverse

The direction that the turnout will be placed.

*If **Normal** is selected then the turnout will be placed in the direction of increasing chainage of the Reference String.*

*If **Reverse** is selected then the turnout will be placed in the direction of decreasing chainage of the Reference String.*

Point	xyz box		

*Field displayed when **Fx line point & direction** is selected as the **Reference Type**.*

The coordinate at which the turnout is to be placed.

Bearing	angle box		

*Field displayed when **Fx line point & direction** is selected as the **Reference Type**.*

The horizontal bearing at which the turnout is to be angled.

Grade	real box		

*Field displayed when **Fx line point & direction** is selected as the **Reference Type**.*

*The absolute vertical grade of the turnout strings that are generated. The grade is calculated from the **Placement Node** in the Turnout Details tab.*

Tag Name	tag box		all tags

*Field displayed when **tag origin** is selected as the **Reference Type**.*

*The tag name to retrieve the origin point at which the turnout is to be positioned. **Note: This feature has not been implemented yet.***

Vertex Index	integer box		

*Field displayed when **vertex/segment #** is selected as the **Reference Type**.*

*The vertex number of the **Reference String** at which the turnout is to be positioned.*

Chainage real box

*Field displayed when **at chainage** is selected as the **Reference Type**.*

*The chainage of the **Reference String** at which the turnout is to be positioned.*

Drop Point xyz box

*Field displayed when **dropped point** is selected as the **Reference Type**.*

The location on the Reference String perpendicular to the drop point coordinate at which the turnout is to be positioned.

Tag Name tag box all tags

*Field displayed when **dropped tag** is selected as the **Reference Type**.*

*The tag name to retrieve the tag location at which the turnout is to be positioned. **Note: This feature has not been implemented yet.***

Chainage Offset real box

*For the final turnout placement location, the value of **Chainage Offset** is added to the chainage of the turnout placement point along the **Reference String**.*

Lateral Offset real box

*The horizontal offset distance away from the **Reference String** at which the turnout is to be positioned.*

Height Offset real box

*The vertical offset distance away from the **Reference String** at which the turnout is to be positioned.*

Rotation Angle real box

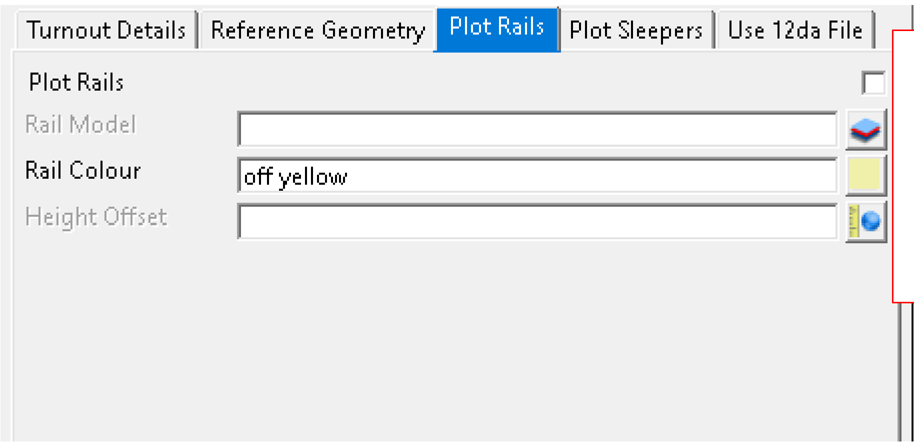
*For the final turnout rotation angle, the value of **Rotation Angle** is added to the rotation of the turnout of the **Reference String**.*

Absolute rotation angle tick box not ticked

*If **ticked**, the turnout rotation angle will be set by the **Rotation Angle**.*

*If **unticked**, the Rotation Angle value will be added relative to the **Reference String** angle.*

Plots Rail Tab



Tabs
[Turnout Details Tab]
[Reference Geometry Tab]
[Plots Rail Tab]
[Plots Sleepers Tab]
[Use 12da File Tab]

Plot Rails tick box not ticked

*If **ticked**, rails will be generated for the turnout.*

Rail Model model box available models

The name of the model that the rails will be generated onto.

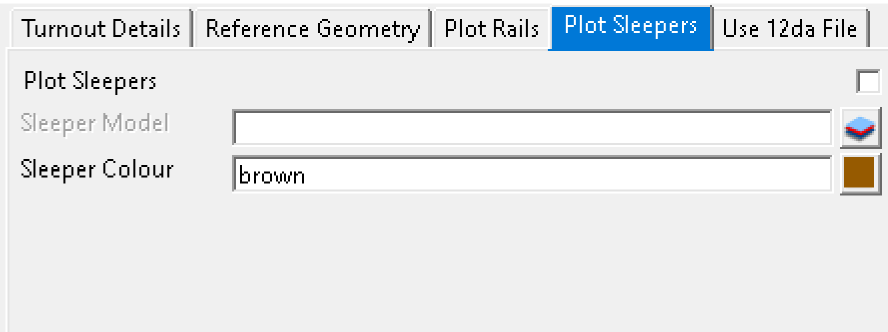
Rail Colour colour box off yellow available colours

The colour that the rails will be coloured.

Height Offset real box

The vertical offset distance that the rails will be generated.

Plots Sleepers Tab



Tabs

[Turnout Details Tab](#)
[Reference Geometry Tab](#)
[Plots Rail Tab](#)
[Plots Sleepers Tab](#)
[Use 12da File Tab](#)

Plot Sleepers tick box not ticked

*If **ticked**, sleepers will be generated for the turnout.*

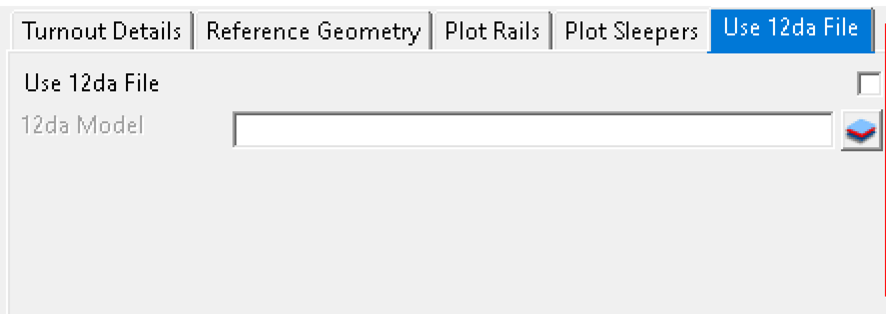
Sleeper Model model box available models

The name of the model that the sleepers will be generated onto.

Sleeper Colour colour box brown available colours

The colour that the sleepers will be coloured.

Use 12da File Tab



Tabs

[Turnout Details Tab](#)
[Reference Geometry Tab](#)
[Plots Rail Tab](#)
[Plots Sleepers Tab](#)
[Use 12da File Tab](#)

Use 12da File tick box not ticked

*If **ticked**, elements in the 12da file will be used to generate additional elements for the turnout. **Note: This feature has not been implemented yet.***

12da Model model box available models

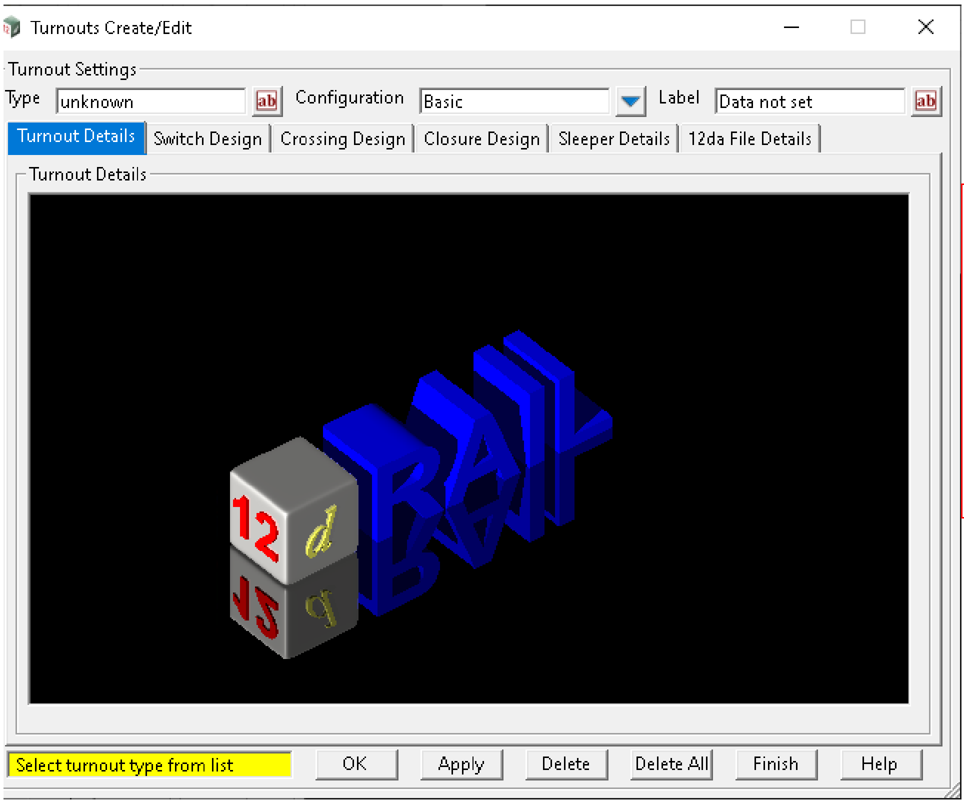
*The name of the model that the 12da elements will be generated onto. **Note: This feature has not been implemented yet.***

17.19.2.2 Turnouts Create/ Edit

Position of option on menu: **Design =>Track =>Turnouts =>Create/Edit**

The **Turnout Create/Edit** panel enables the creation or modification of turnout types that can be generated onto a location with 17.19.2.1 Turnout Place.

Selecting Create/Edit displays the **Turnout Create/Edit** panel.



Tabs

Turnout Details tab
Switch Design tab
Crossing Design tab
Closure Design tab
Sleeper Details tab
12da File Details tab

Buttons at Bottom

Ok button

*Saves the turnout parameters into the currently selected turnout **Type** and closes the panel.*

Apply button

*Saves the turnout parameters into the currently selected turnout **Type**.*

Delete button

*Deletes the currently selected turnout **Type**.*

Delete All button

Deletes all turnout types that are in the current 12d project.

Turnout Details tab

Turnout details

Type custom box all turnout types

Selecting the Type field opens a panel where the following functions are available:

The Select button: Selecting a turnout type and then clicking the Select button loads that turnout type.

The Sameas button: Selecting an element of a turnout that has previously been placed with 17.19.2.1 Turnout Place *loads that turnout type.*

The New button: A new turnout type can be created.

Configuration choice box basic all configuration types

Turnout configuration consists of the following choices: ***Basic****,* ***Catchpoint****,* ***Tangential****, various Dual Gauge configurations and* ***from library file****.*

Basic*: A basic turnout is generated using the switch angle and simple lengths along the tangents.*

Catchpoint*: A catchpoint is generated using simple lengths along the* ***Reference String****.*

Tangential*: A tangential turnout is generated using the switch angle and simple lengths along the tangents. The turnout radius is tangential to the* ***Reference String****.*

Dual Gauge*: A Dual Gauge turnout is generated using the switch angle and simple lengths along the tangents.*

From library file*: Note: This feature has not been implemented yet.*

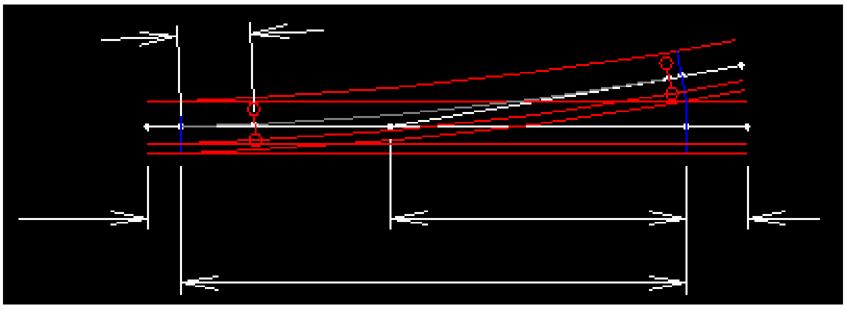
Label custom box

A label that is displayed as the turnout heading at the top of the Turnout Details window.

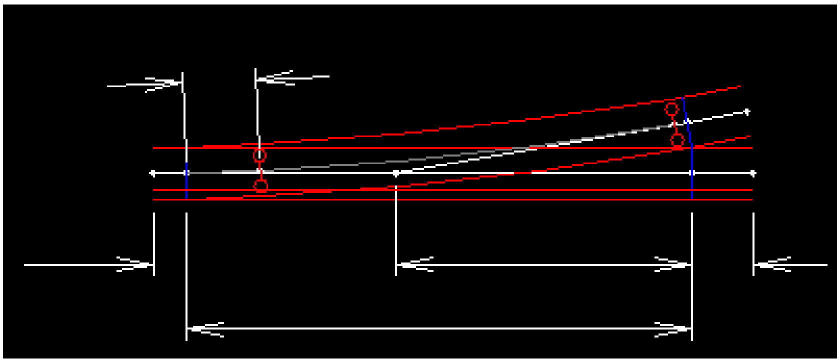
Types of Dual Gauge Configurations

Configuration	Common rail side	Through track	Diverging track
Dual_Gauge_A	Diverging	Dual gauge	Dual gauge
Dual_Gauge_B	Diverging	Dual gauge	Wider
Dual_Gauge_C	Diverging	Wider	Dual gauge
Dual_Gauge_D	Diverging	Dual gauge	Narrower
Dual_Gauge_E	Diverging	Narrower	Dual gauge
Dual_Gauge_F	Diverging	Wider	Narrower
Dual_Gauge_G	Diverging	Narrower	Wider
Dual_Gauge_H	Through	Dual gauge	Dual gauge
Dual_Gauge_I	Through	Dual gauge	Wider
Dual_Gauge_J	Through	Wider	Dual gauge
Dual_Gauge_K	Through	Dual gauge	Narrower
Dual_Gauge_L	Through	Narrower	Dual gauge
Dual_Gauge_M	Through	Wider	Narrower
Dual_Gauge_N	Through	Narrower	Wider

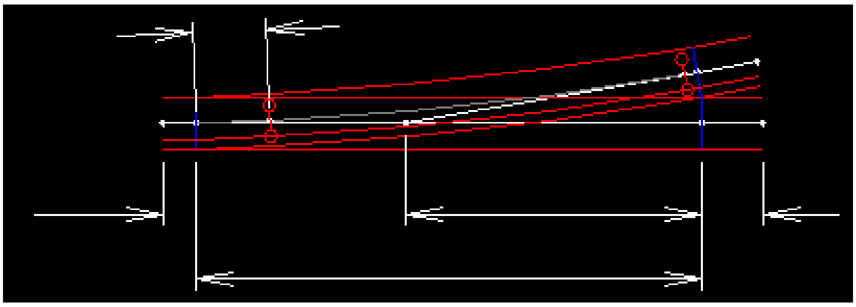
Dual_Gauge_A*: Common rail on the diverging side. Both tracks are dual gauge.*



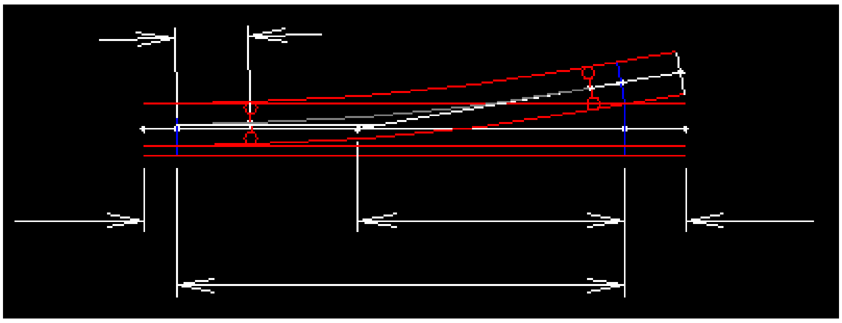
Dual_Gauge_B: *Common rail on the diverging side. Through track is dual gauge. Diverging track is wider gauge.*



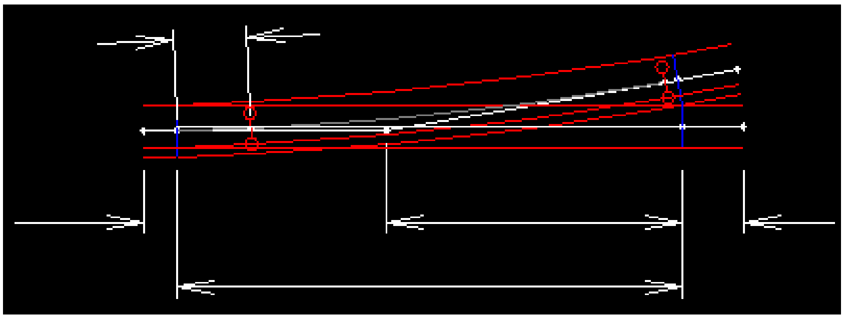
Dual_Gauge_C: *Common rail on the diverging side. Through track is wider gauge. Diverging track is dual gauge.*



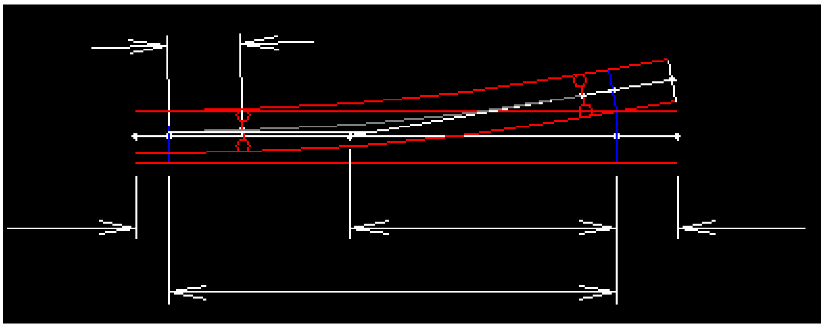
Dual_Gauge_D: *Common rail on the diverging side. Through track is dual gauge. Diverging track is narrower gauge.*



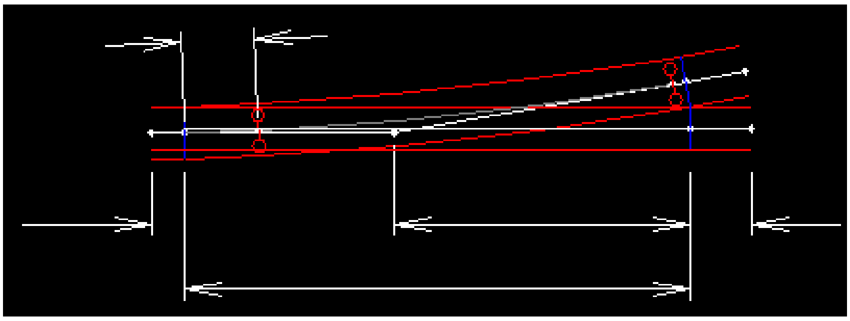
Dual_Gauge_E: *Common rail on the diverging side. Through track is narrower gauge. Diverging track is dual gauge.*



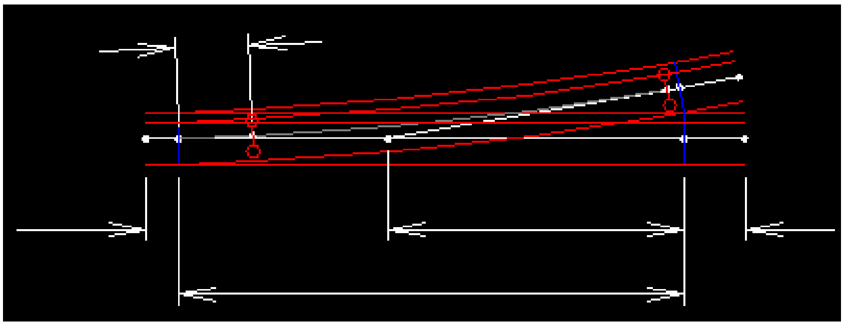
Dual_Gauge_F*: Common rail on the diverging side. Through track is wider gauge. Diverging track is narrower gauge.*



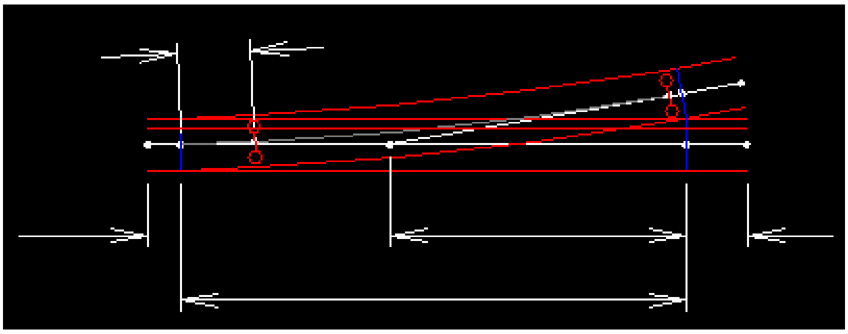
Dual_Gauge_G*: Common rail on the diverging side. Through track is narrower gauge. Diverging track is wider gauge.*



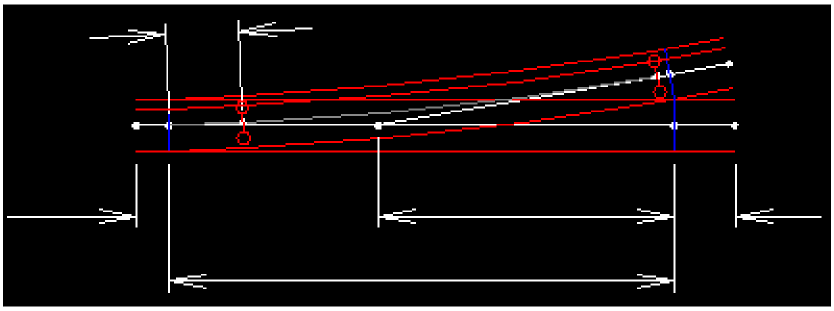
Dual_Gauge_H*: Common rail on the through side. Both tracks are dual gauge.*



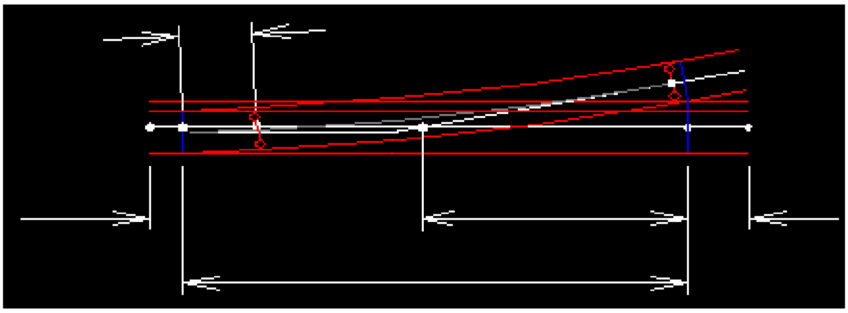
Dual_Gauge_I*: Common rail on the through side. Through track is dual gauge. Diverging track is wider gauge.*



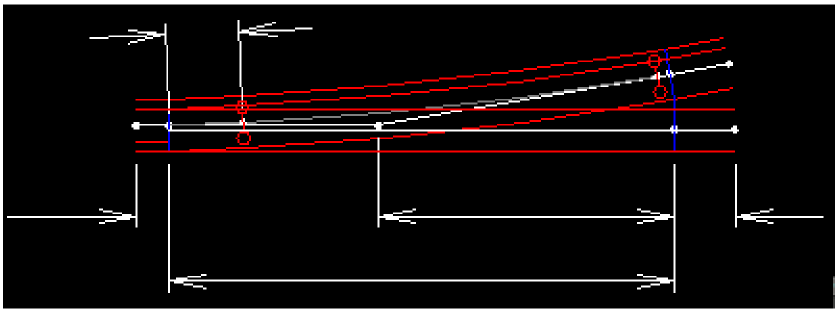
Dual_Gauge_J: *Common rail on the through side. Through track is wider gauge. Diverging track is dual gauge.*



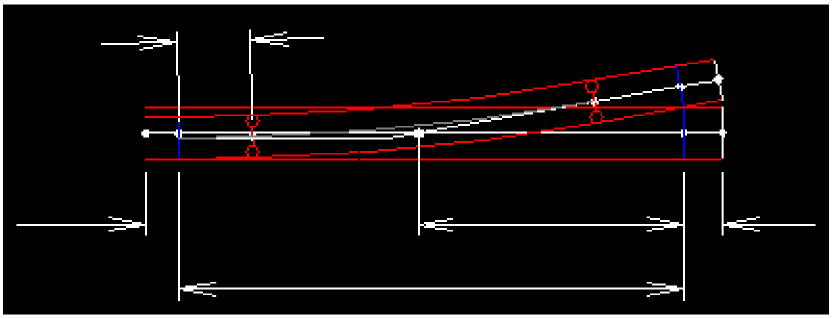
Dual_Gauge_K: *Common rail on the through side. Through track is dual gauge. Diverging track is narrower gauge.*



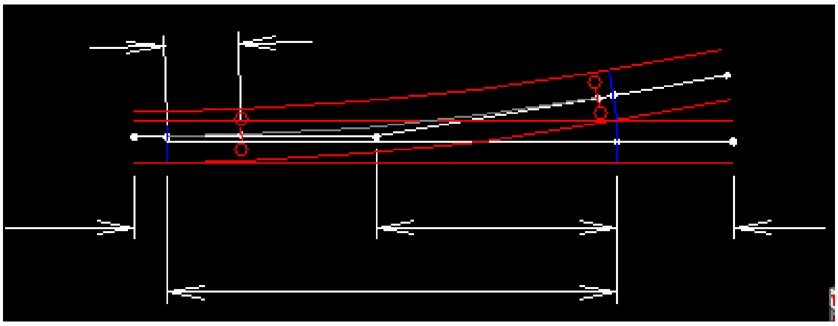
Dual_Gauge_L: *Common rail on the through side. Through track is narrower gauge. Diverging track is dual gauge.*



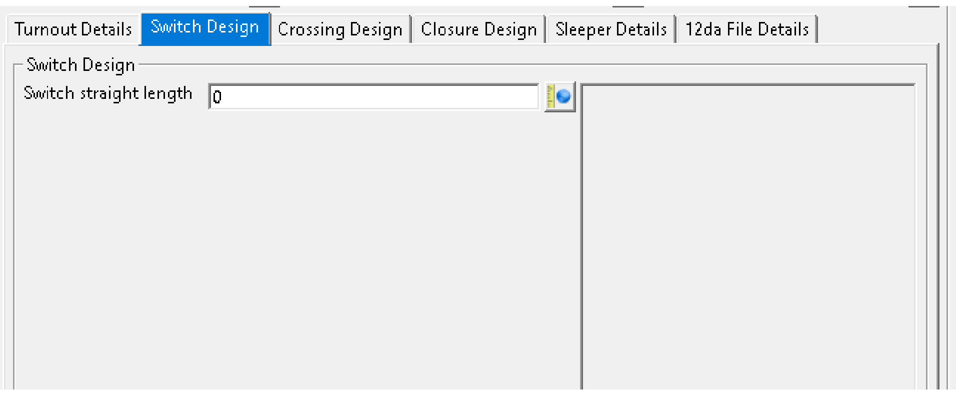
Dual_Gauge_M: *Common rail on the through side. Through track is wider gauge. Diverging track is narrower gauge.*



***Dual_Gauge_N**: Common rail on the through side. Through track is narrower gauge. Diverging track is wider gauge.*



Switch Design tab

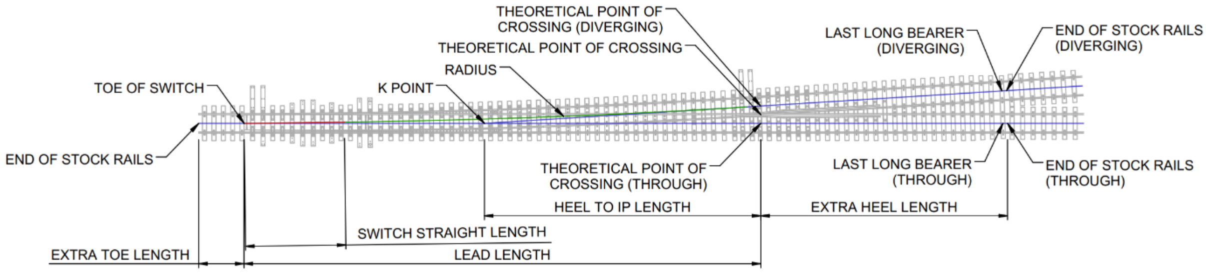


Tabs
Turnout Details tab
Switch Design tab
Crossing Design tab
Closure Design tab
Sleeper Details tab
12da File Details tab

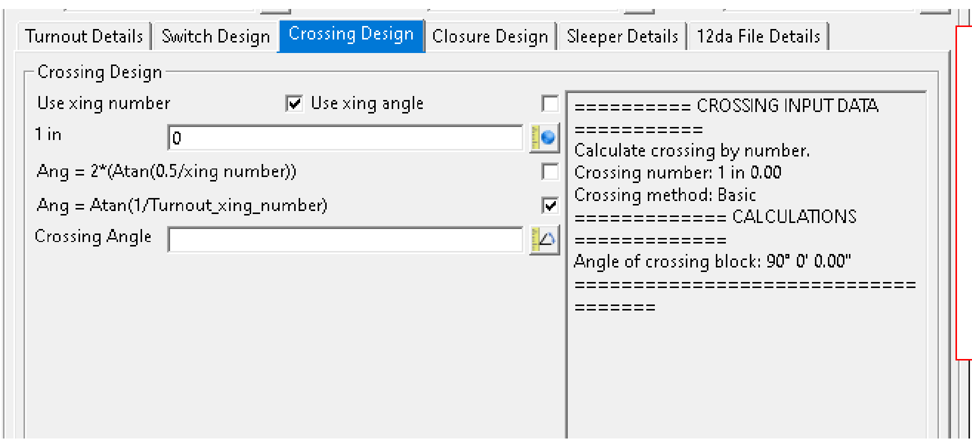
Switch straight length real box 0

*If **Configuration** field is set to **Catchpoint**: The length of the straight part of the switch rail.*

*If **Configuration** field is set to any other configuration: The length of the straight part of the turnout centreline. This straight floats off the end of the **Reference String** at the toe of switch and the angle is adjusted until a free arc of the turnout radius is tangential with the loop tangent.*



Crossing Design tab



Tabs

Turnout Details tab

Switch Design tab

Crossing Design tab

Closure Design tab

Sleeper Details tab

12da File Details tab

Use xing nmber tick box ticked

Specify the turnout crossing angle as a ratio 1 in x.

Use xing angle tick box not ticked

Specify the turnout crossing angle in degrees.

1 in real box 0

Value of the turnout crossing angle as a ratio 1 in x.

Ang = 2*(Atan(0.5/xing number) tick box not ticked

Standard method for calculating the crossing angle in degrees from a ratio.

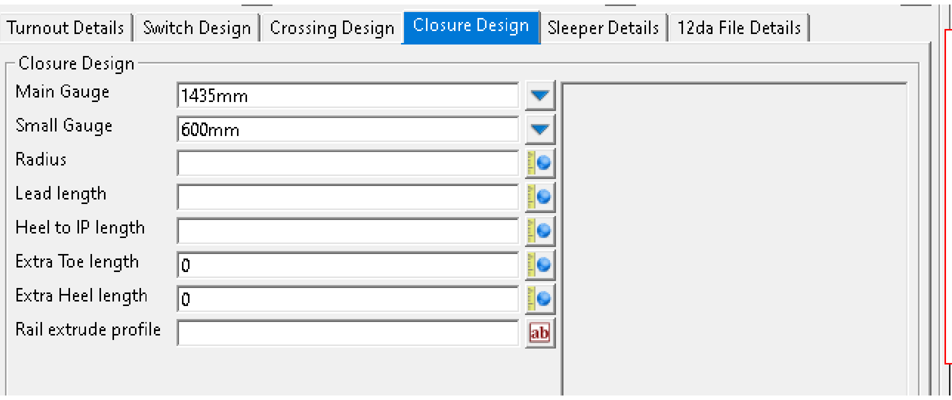
Ang = Atan(1/Turnout_xing number) tick box ticked

Modified method for calculating the crossing angle in degrees from a ratio.

Crossing Angle angle box

Value of the turnout crossing angle in degrees. The Angular system is controlled by the Project Settings.

Closure Design tab



Tabs

[Turnout Details tab](#)
[Switch Design tab](#)
[Crossing Design tab](#)
[Closure Design tab](#)
[Sleeper Details tab](#)
[12da File Details tab](#)

Main Gauge choice box 1435mm all gauges

The railway track gauge which is the minimum distance between two rails.

Small Gauge choice box 600mm all gauges

For dual gauge turnouts the smaller railway track gauge.

Radius real box

The radius of the centreline of the turnout leg.

Lead length real box

The length from the Toe of the Switch to the Theoretical Point of Crossing.

Heel to IP length real box

Non-editable, information field for the distance between the heel and the intersection point, or the distance between K point and the theoretical point of crossing.

Extra Toe length real box 0

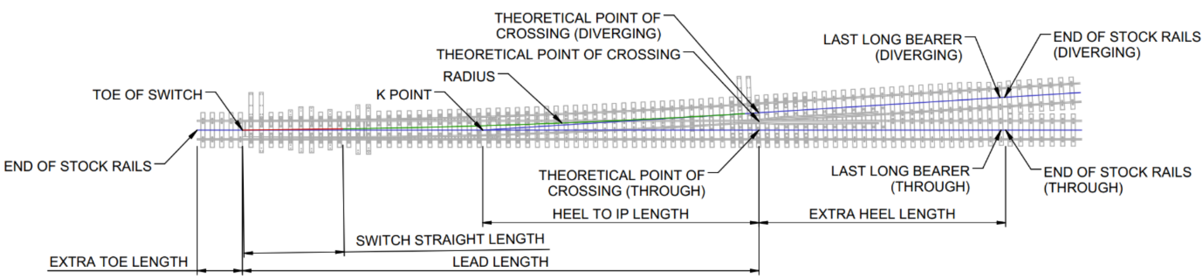
The distance from the Toe of the Switch to front end of the rails at the toe of the turnout. This is also the distance between the Front End and the TOS nodes.

Extra Heel length real box 0

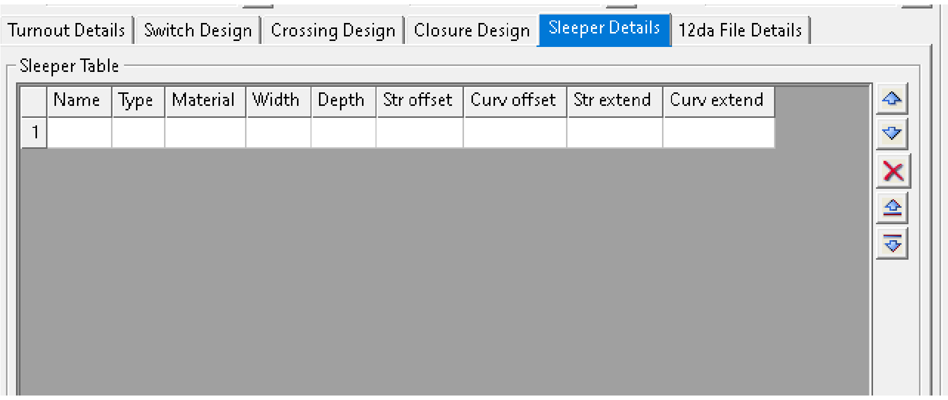
The distance from the Theoretical Point of Crossing to the back end of the turnout rails.

Rail extrude profile custom box all profiles

A rail profile can be selected to generate three-dimensional rails that can be displayed in perspective views. To create a rail profile refer to 17.19.7.2 Rail Profiles Create/Edit.



Sleeper Details tab



Tabs

Turnout Details tab
Switch Design tab
Crossing Design tab
Closure Design tab
Sleeper Details tab
12da File Details tab

Name name box available names

The name for the sleeper element.

Type text box

The type of sleeper.

Material choice box

The sleeper material. The material field contains the following choices: Timber, Concrete and Steel.

Width real box

The width of the sleeper.

Depth real box

The depth of the sleeper.

Str offset real box

The longitudinal distance between the Toe of Switch (TOS) and the centre of the sleeper on the through side.

Curv offset real box

The longitudinal distance between the Toe of Switch (TOS) and the centre of the sleeper on the diverging side.

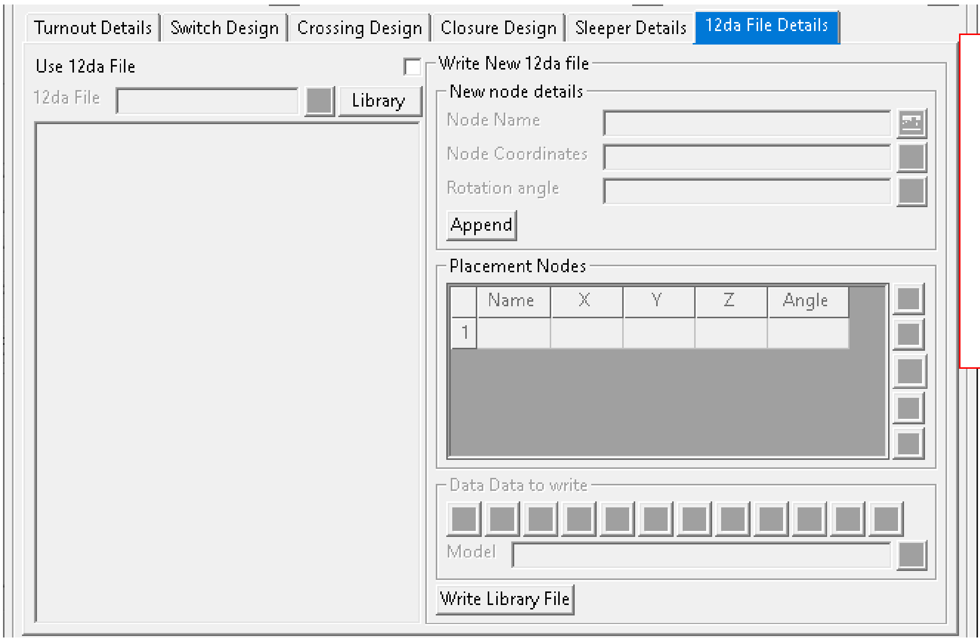
Str extend real box

The offset distance from the running rail to the end of sleeper on the through side.

Curv extend real box

The offset distance from the running rail to the end of sleeper on the diverging side.

12da File Details tab



Tabs

[Turnout Details tab]
[Switch Design tab]
[Crossing Design tab]
[Closure Design tab]
[Sleeper Details tab]
[12da File Details tab]

Use 12da File tick box not ticked

*If **ticked**, a 12da file is used. **Note: This feature has not been implemented yet.***

12da File file box *.12da files

Filename of the 12da file to import.

Library button

*Opens a panel containing 12da files that can be previewed and selected. **Note: This feature has not been implemented yet.***

New node details

Node Name button

The placement node name.

Node Coordinates xyz box

The location of the placement node.

Rotation angle angle box

The angle of the placement node.

Append angle box

*Adds the fields from the **New node details** to the **Placement Nodes** table.*

Data to write source box

Data selection type.

Write Library File button

*Writes a 12da file with the elements selected in the **Data to write** field and information in the Placement Nodes table. **Note: This feature has not been implemented yet.***

17.19.2.3 Read Turnouts

Position of option on menu: **Design =>Track =>Turnouts =>Read**

The **Read Turnouts** panel reads a *.turnouts file which imports **Turnout Types**. These turnouts can be edited in 17.19.2.2 Turnouts Create/ Edit, can be placed with17.19.2.1 Turnout Place and turnouts exported to a file with 17.19.2.4 Write Turnouts File.

Selecting Read displays the Read Turnout panel.

.

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

Field Description	Type	Defaults	Pop-Up
Turnout file	file box		*.turnouts

*Name of the file to read in the **Turnout Types**.*

Buttons at Bottom

Read button

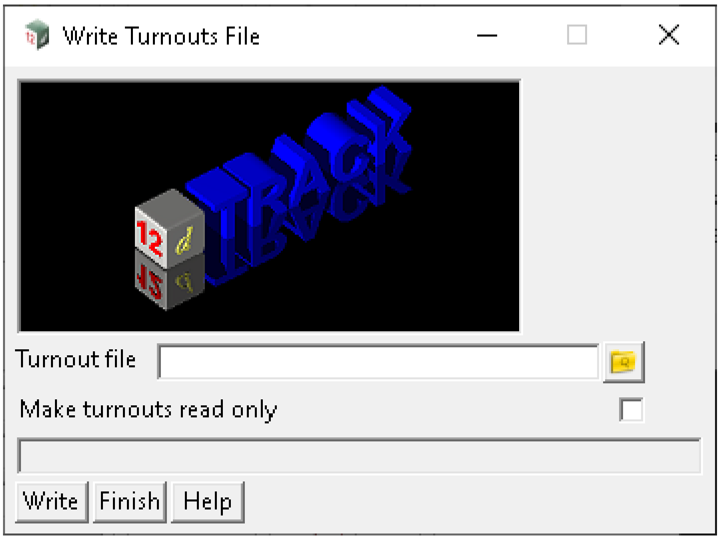
*Reads the *.turnouts file and imports the Turnout Types.*

17.19.2.4 Write Turnouts File

Position of option on menu: **Design =>Track =>Turnouts =>Write**

The **Write Turnouts** panel writes a *.turnouts file which exports **Turnout Types**.

Selecting **Write** displays the Write Turnouts File panel.



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

Field Description	Type	Defaults	Pop-Up
Turnout file	file box		*.turnouts

*Name of the file to write out the **Turnout Types**.*

Field Description	Type	Defaults	Pop-Up
Make turnouts read only	tick box	not ticked	

*If **ticked**, adds a read-only attribute to the entry in the **Turnouts file** which restricts modification when that **Turnout Type** has been imported.*

Buttons at Bottom

Write button

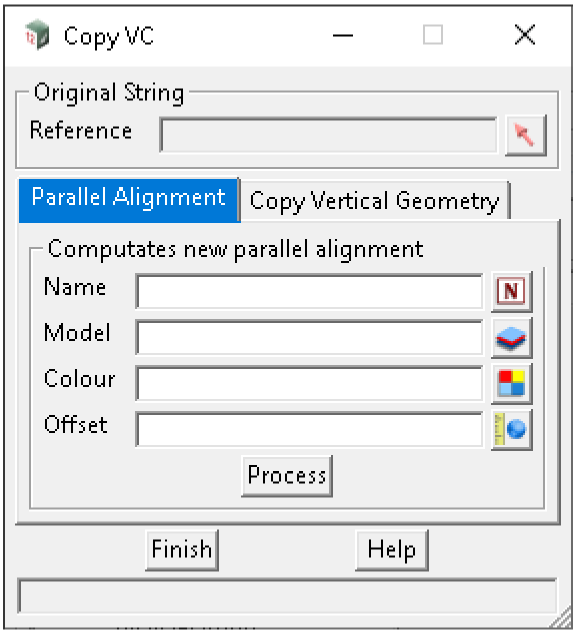
*Writes the *.turnouts file.*

17.19.3 Copy VC

Position of menu: **Design => Track => Copy VC**

The **Copy VC** panel has two functions. Parallel alignment computes a new alignment with an offset from the **Reference** string. Copy Vertical Geometry copies the vertical geometry from an original string **Reference** Super Alignment to a **New String** Super Alignment**.**

Selecting **Copy VC** displays the **Copy VC** panel.



Tabs

[Parallel Alignment Tab](#)
[Copy Vertical Geometry Tab](#)

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

Field Description | Type | Defaults | Pop-Up

Original String

Reference — string select

*If **Parallel Alignment**, reference string for a new alignment to be computed from.*

*If **Copy Vertical Geometry**, reference string for the vertical geometry to be copied from.*

Parallel Alignment Tab

Computes new parallel alignment

Name — name box — available names

Name of the new alignment.

Model — model box — available models

Model of the new alignment.

Colour — colour box — white — available colour

Colour of the new alignment.

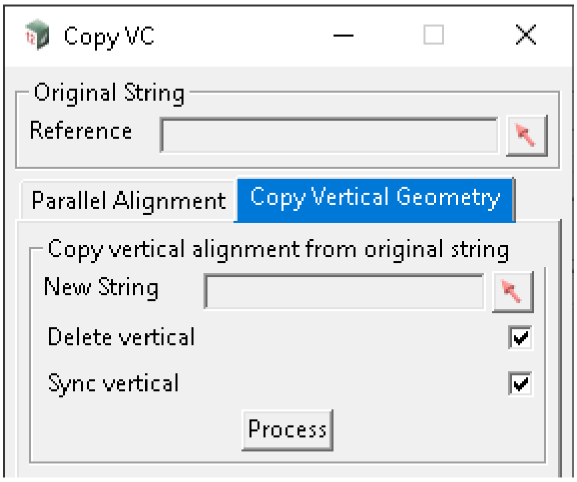
Offset — real box

*The offset distance that the new string will be paralleled from the **Reference** string.*

Process button

Runs the function.

Copy Vertical Geometry Tab



Tabs

[Parallel Alignment Tab](#)

[Copy Vertical Geometry Tab](#)

Copy vertical alignment from original string

New String string select

String that the reference string's vertical geometry will be copied onto.

Delete vertical tick box ticked

*If **ticked**, the vertical geometry will be deleted before the vertical geometry is copied.*

Sync vertical tick box ticked

*If **ticked**, the **Vertical Sync** property of the **New String** Super Alignment property will be set.*

Process button

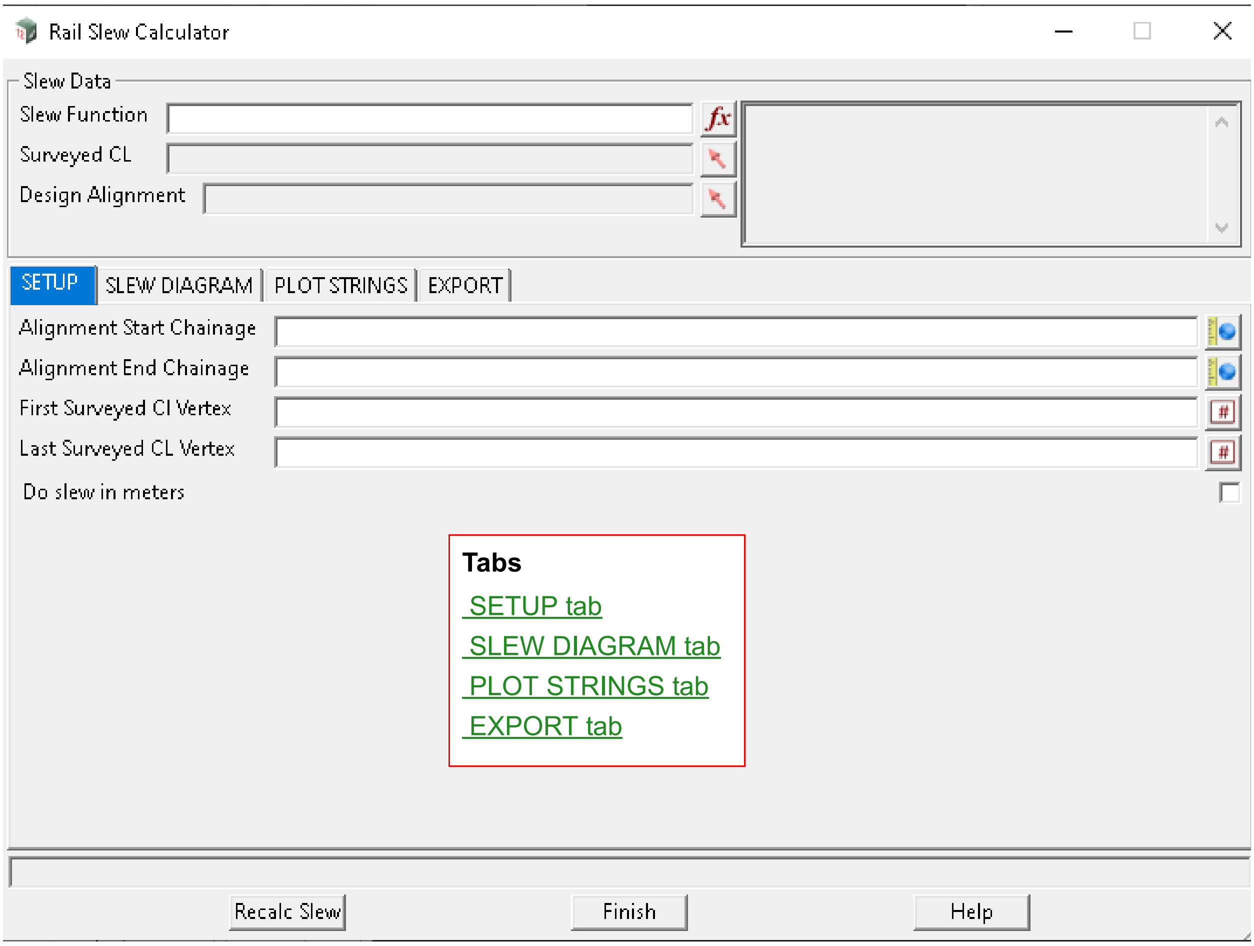
Runs the function.

17.19.4 Rail Slew Calculator

Position of menu: **Design => Track => Slew Diagram**

The Rail Slew Calculator calculates slew offsets between a surveyed centreline (which can be generated in Calc CL Panel) to a **Design Alignment**.

Selecting **Slew Diagram** displays the **Rail Slew Calculator** panel.



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

Field Description	Type	Defaults	Pop-Up

Slew Data

Slew Function — function box — available functions

Name of the rail slew calculator function.

Surveyed CL — string select

String for the surveyed centreline. This can be generated by the Calc CL Panel.

Design Alignment — string select

String for the design alignment.

SETUP tab

Alignment Start Chainage real select

*Start chainage of the **Design Alignment**. This field is automatically populated once a **Design Alignment** has been selected.*

Alignment End Chainage real select

*End chainage of the **Design Alignment**. This field is automatically populated once a **Design Alignment** has been selected.*

First Surveyed CL Vertex integer box

*First vertex of the **Surveyed CL**. This field is automatically populated once a **Surveyed CL** string has been selected.*

Last Surveyed CL Vertex integer box

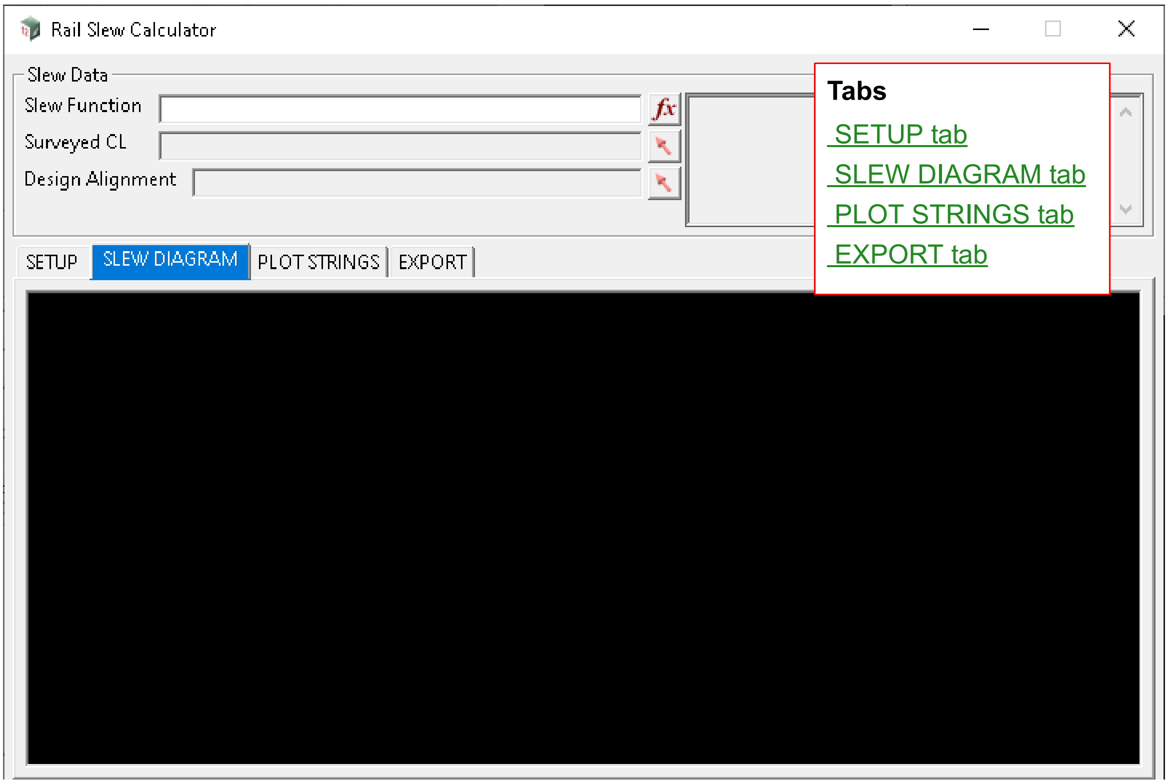
*Last vertex of the **Surveyed CL**. This field is automatically populated once a **Surveyed CL** string has been selected.*

Do slew in metres tick box not ticked

*If **ticked**, it generates the slew values in metres. If unticked, it generates the slew values in millimetres.*

SLEW DIAGRAM tab

The **SLEW DIAGRAM** tab displays the slew in a graph box and plots the radius of the **Surveyed CL** and **Design Alignment** at each point based on the versine of surrounding points. This graph can assist in determining the line-of-best-fit and optimisation of the slew for the **Design Alignment**.



Pick button

This option sets the graph box to pick mode. When in this mode the graph box will display the X (chainage) and Y (slew/radius) as the mouse hovers over a location in the graph.

Fit button

This option sets the graph box to fit mode. This option will calculate the extent of the items plotted in the graph box and zoom out to show them. After the fit is complete the graph will return to pick mode.

Pan button

This option sets the graph box to panning mode. Click once to commence panning, then move the mouse and click a second time to stop panning.

Zoom button

This option sets the graph box to zoom mode. Click once to commence zooming, then move the mouse and click a second time to stop zooming. Moving the mouse left and right will reduce and increase the X scale factor and moving the mouse down and up will reduce or increase the Y scale factor.

Window button

This option sets the graph box to window mode. Click once to select the first corner of a window and click a second time to select the second corner. After the window is complete the graph will return to pick mode.

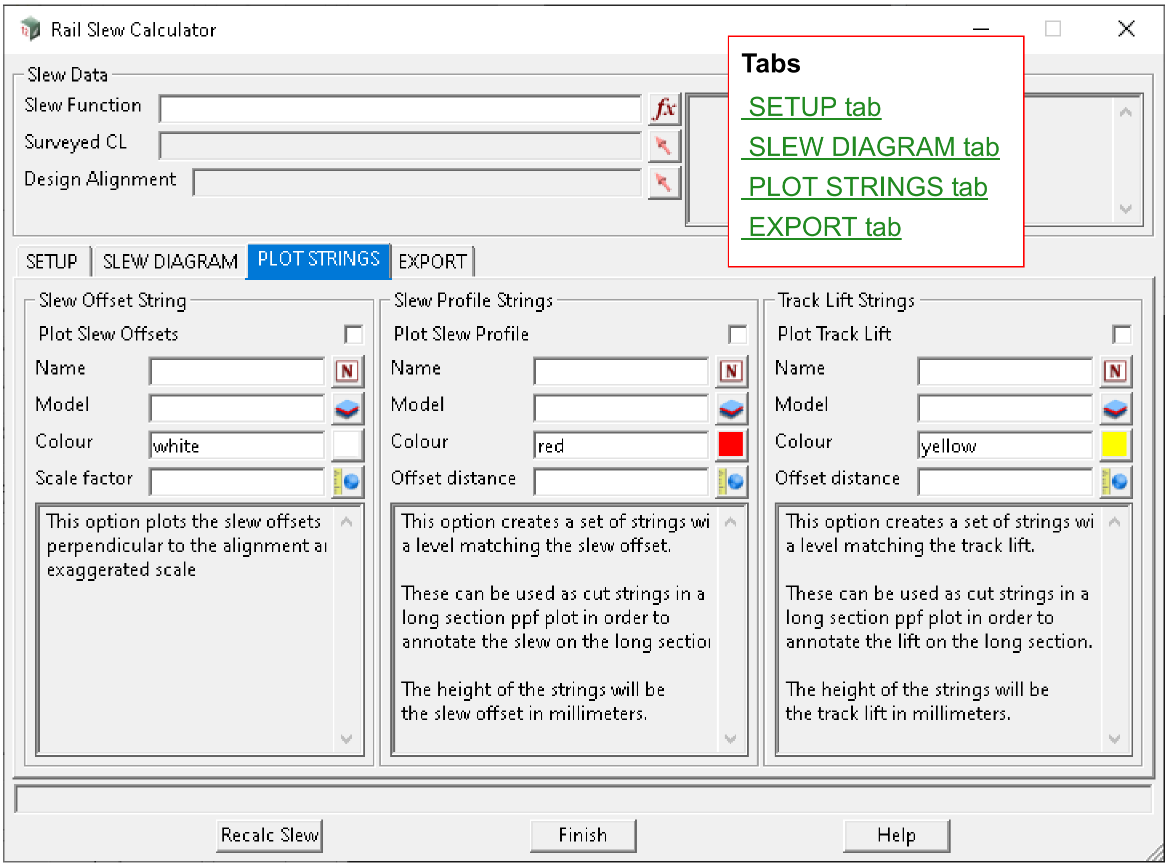
PLOT STRINGS tab

The PLOT STRINGS tab consists of Slew Offset String, Slew Profile String and Track Lift String creation.

Plotting a Slew Offset String generates a super string that is based on the slew offsets between the **Surveyed CL** and the **Design Alignment** in plan. The slew offset string generated is perpendicular to the **Design Alignment** at an exaggerated scale if it is specified in the scale factor field. This generated Super String also contains Super Vertex Text at each vertex showing the left << and right >> direction, and the amount of slew, which can be viewed in a Plan view.

Plotting Slew Profile Strings generates a series of cross sections centred about the **Design Alignment** that are at a height level that matches the slew offset between the **Surveyed CL** and the **Design Alignment** in millimetres. Slew profile strings can be used as Cuts - Long Section strings in a Long Section Plot PPF Editor to annotate the slew amount on the long section.

Plotting Track Lift Strings generates a series of cross sections centred about the **Design Alignment** that are at a height level that matches the height offset between the **Surveyed CL** and the **Design Alignment** in millimetres. Track lift strings can be used as Cuts - Long Section strings in a Long Section Plot PPF Editor to annotate the lift/lowering on the long section.



Tabs
SETUP tab
SLEW DIAGRAM tab
PLOT STRINGS tab
EXPORT tab

Slew Data

Plot Slew Offsets tick box not ticked

*If **ticked**, the slew offset string model will be created.*

Name name box available names

Name of the slew offset element.

Model model box available models

Model for the slew offset string.

Colour colour box white available colours

Colour of the slew offset string.

Scale factor real box

*The scale factor applied to the slew value, that affects the perpendicular distance between the slew offset string and the **Design Alignment**.*

Slew Profile Strings

Plot Slew Profile tick box not ticked

*If **ticked**, the slew profile strings model will be created.*

Name name box available names

Name of the slew offset element.

Model model box available models

Model for the slew offset string.

Colour colour box available colours

Colour of the slew offset string.

Scale factor real box

The scale factor applied to the slew value, that affects the perpendicular distance between the slew offset string and the ***Design Alignment****.*

Track Lift Strings

Plot Track Lift tick box not ticked

If ***ticked****, the track lift strings model will be created.*

Name name box available names

Name of the track lift elements.

Model model box available models

Model for the track lift strings.

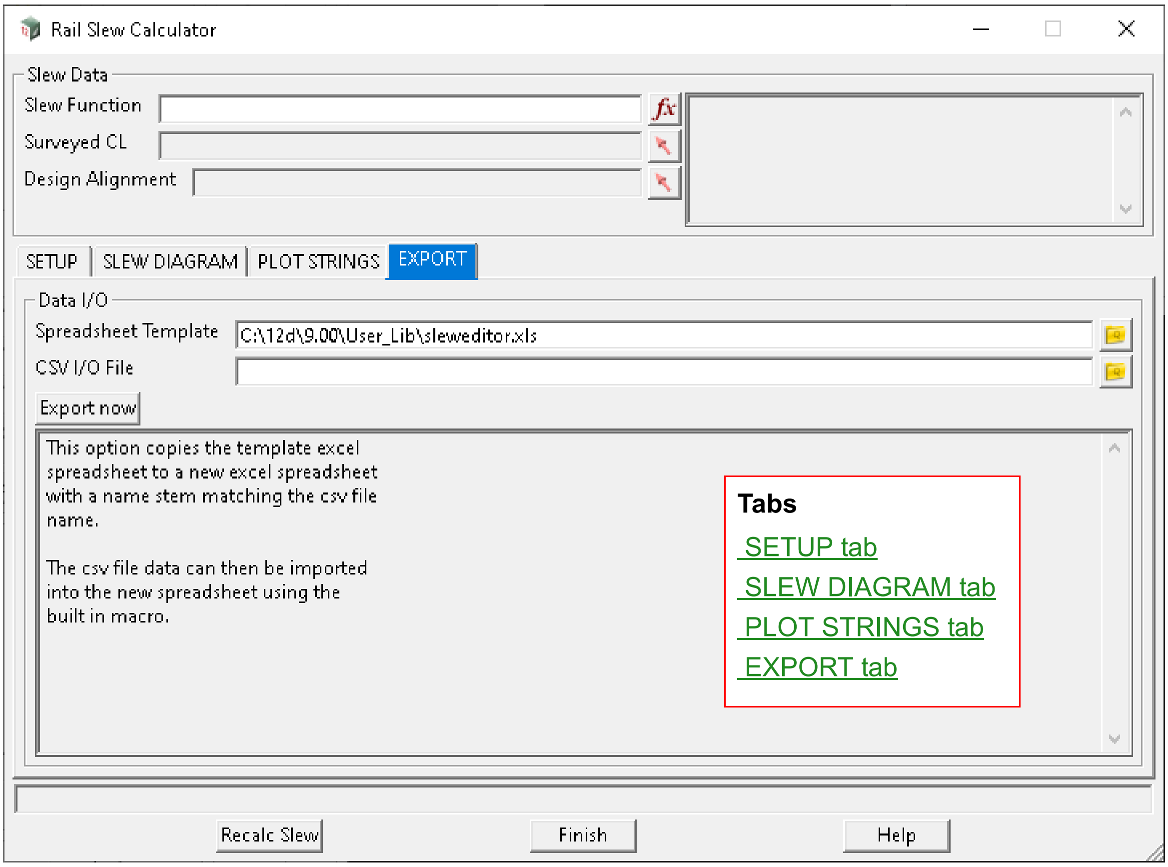
Colour colour box available colours

Colour of the track lift strings.

Offset Distance real box

The offset distance either side of the ***Design Alignment*** *for the start and end of the track lift strings. The length of the track lift strings created is the offset distance multiplied by 2.*

EXPORT tab



Spreadsheet Template	file box	$LIB\sleweditor.xls	*.xls files

Name of the XLS template file that is copied and renamed to the name stem entered in the ***CSV I/O File*** *field with an *.xls extension.*

CSV I/O File	file box		*.csv files

Name of the CSV output file to be created.

17.19.5 Calculate Cant

Position of menu: **Design => Track => Calculate Cant**

The Calculate Cant panel is used to calculate cants along a design **Rail CL Alignment**. The **DESIGN LIMITS** tab features user-defined constants to check if any of the design element values exceed these limits. In the **CANT GRAPH** tab, a table and graph are displayed. The table highlights values that exceed the design limits and the graph allows visualisation of the design element values and an option to plot this graph into a model. The **DEFAULTS** tab allows speed overrides for specified chainages and cant overrides for curves that meet a specified speed and radius. The **OUTPUTS** tab allows for: the **Cant Stations** to be exported to a stationing report file or a spreadsheet; an alignment setout to be exported; an MTF to be created.

Abbreviations used

Ca: Applied cant in mm

Cd/Def: Cant deficiency in mm

Ce: Equilibrium cant in mm

Lateral Accel/ACC: Lateral acceleration in m/s²

R: Radius of the curve in m

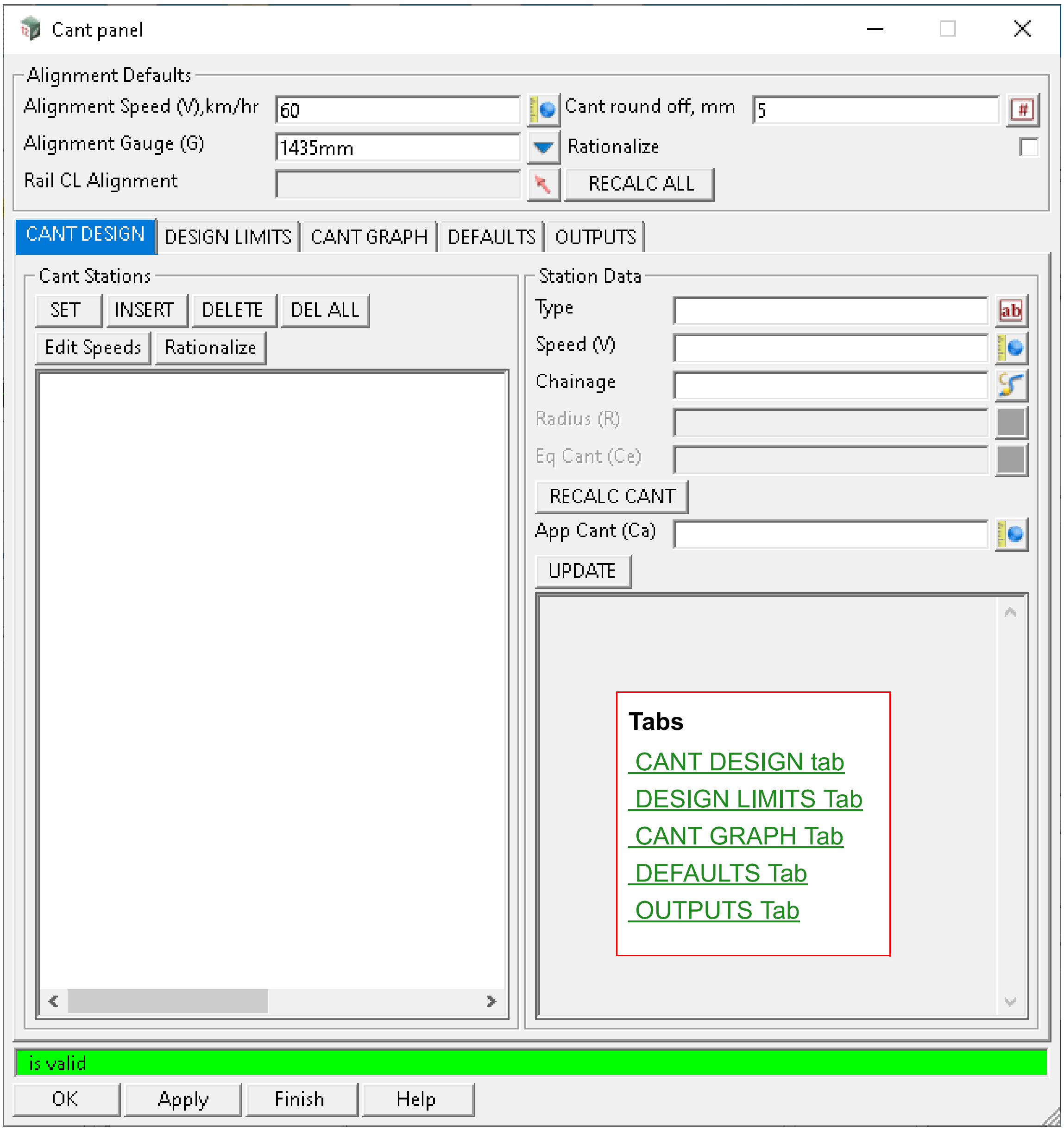
ROCC: Rate of change of cant in mm/s or 1v in ?h

ROCD: Rate of change of cant deficiency in mm/s or 1v in ?h

T: Time in element in s

V: Vehicle speed in km/h

Selecting **Calculate Cant** displays the **Cant** panel.



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

Field Description Type Defaults Pop-Up

Alignment Defaults

Alignment Speed (V), km/hr real box 60

*Default speed of the design alignment. When a **Rail CL Alignment** is initially selected, or the **RECALC ALL** button is clicked, all segments will use the speed entered to calculate the cant for that segment.*

Alignment Gauge (G) choice box 1435mm available rail gauges

Rail gauge of the section. The gauge is the distance between the running rails.

Rail CL Alignment string select

Design rail centreline.

Cant round off, mm integer box 5

Rounding to the nearest multiple in millimetres for cant values to be applied.

Rationalize tick box not ticked

*Deletes duplicate entries in the **Cant Stations** list.*

RECALC ALL button

*Calculates all cants using the default **Alignment Speed (V)**.*

Buttons at Bottom

OK button

Saves all editable fields in the Cant panel and then closes the panel.

Apply button

Saves all editable fields in the Cant panel.

CANT DESIGN tab

Cant Stations

SET button

*Updates the **Cant Station**. This sets the **Speed (V), Chainage** and **App Cant (Ca)** fields and should be run after the **RECALC CANT** button has been clicked to save the **Cant Station**.*

INSERT button

*Inserts a **Cant Station** with values matching the **Cant Station** currently selected.*

DELETE button

*Deletes a selected **Cant Station**.*

DEL ALL button

*Deletes all **Cant Stations**.*

Edit Speeds button

Displays a dialogue panel where a speed can be applied between a start and end chainage.

Rationalize button

*Deletes duplicate entries in the **Cant Stations** list.*

Station Data

Type custom box

*Description or name of the **Cant Station**.*

Speed (V) real box

*Speed of the **Cant Station** section.*

Chainage chainage box

*Start chainage of the **Cant Station** section.*

Radius (R)

*Radius of the **Cant Station** section. This is automatically set based on the chainage of the **Rail CL Alignment** after the **RECALC CANT** button is pressed.*

Eq Cant (Ce)

*Equilibrium cant. This is automatically calculated after the **RECALC CANT** button is pressed.*

RECALC CANT button

*Recalculates the **Station Data** fields. This populates the **Radius (R)** field based on the **Chainage** entered along the **Rail CL Alignment**, and calculates the Eq Cant (Ce) and **App Cant (Ca)**.*

*Note: **RECALC CANT** will not save the **Cant Station**. **SET** or **UPDATE** needs to be clicked after the **RECALC CANT** button has been run to save the **Cant Station**.*

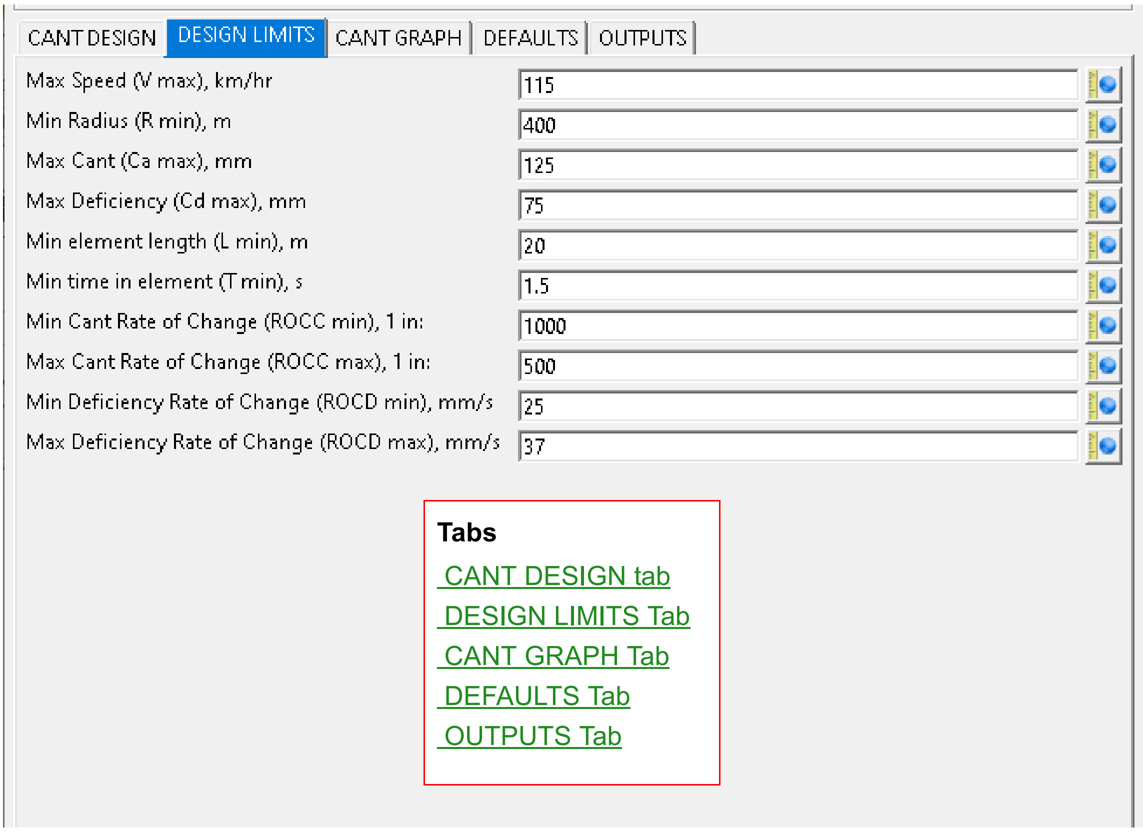
App Cant (Ca) real box

*Applied cant. This is automatically calculated after the **RECALC CANT** button is pressed.*

Update button

*Updates the **Cant Station**. This sets the **Speed (V)**, **Chainage** and **App Cant (Ca)** fields and should be run after the **RECALC CANT** button has been clicked to save the **Cant Station**.*

DESIGN LIMITS Tab



Max Speed (V max), km/hr real box 115

Maximum speed in kilometres per hour allowable.

Min Radius (R min), m real box 400

Minimum radius in metres allowable.

Max Cant (Ca max), mm real box 125

Maximum cant in millimetres allowable.

Max Deficiency (Cd max), mm real box 75

Maximum cant deficiency in millimetres allowable.

Min element length (L min), m real box 20

Minimum element length in metres allowable.

Min time in element (T min), s real box 1.5

Minimum time in curve or tangent element in seconds allowable.

Min Cant Rate of Change (ROCC min), 1 in: real box 1000

Minimum rate of change of cant in 1v in ?h allowable.

Max Cant Rate of Change (ROCC max), 1 in: real box 500

Maximum rate of change of cant in 1v in ?h allowable.

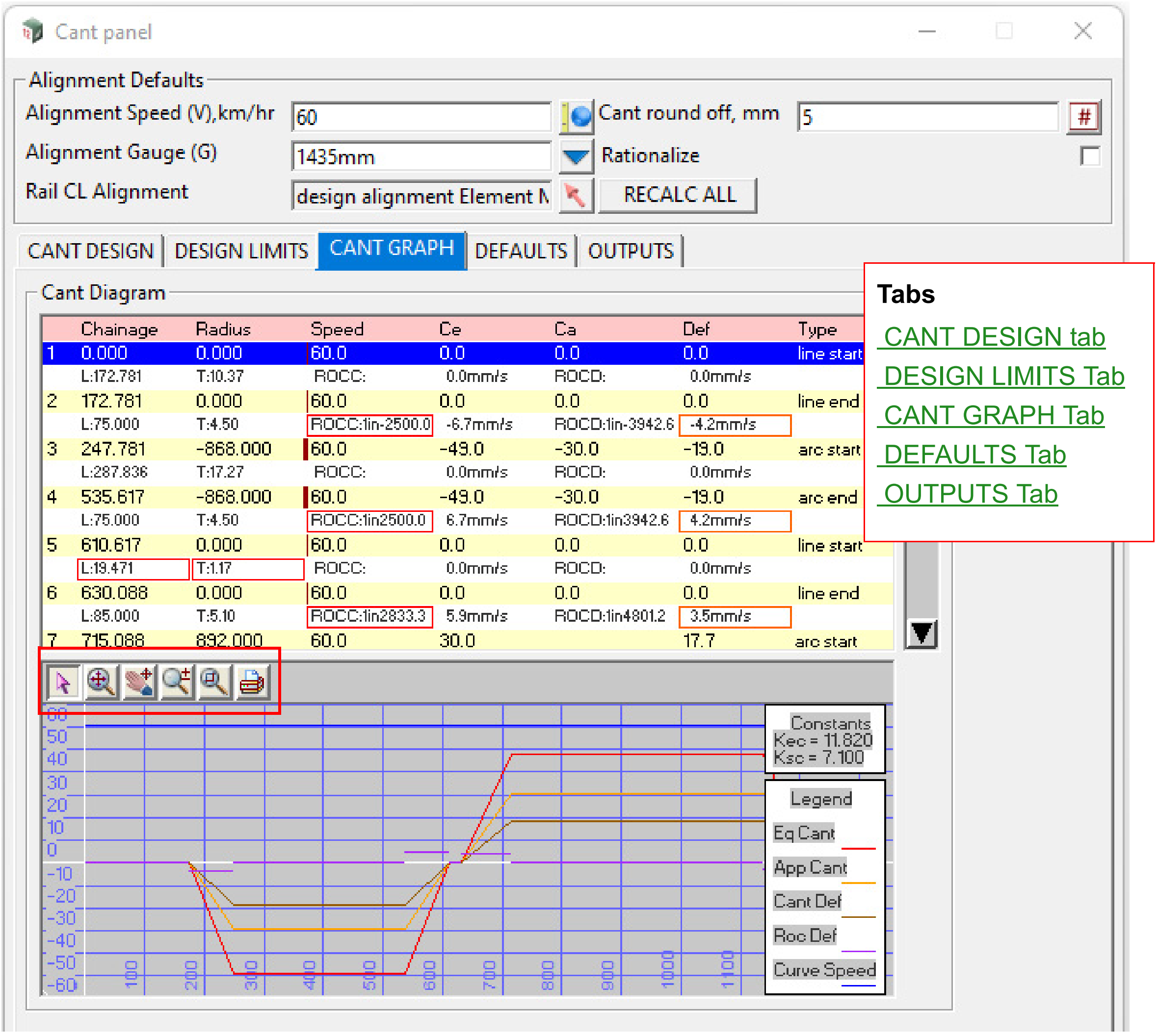
Min Deficiency Rate of Change (ROCD min), mm/s real box 1000

Minimum rate of change of cant deficiency in millimetres per second allowable.

Max Deficiency Rate of Change (ROCD max), mm/s real box 500

Maximum rate of change of cant deficiency in millimetres per second allowable.

CANT GRAPH Tab



Pick button

Sets the graph box to pick mode. When in this mode the graph box will display the X (chainage) and Y value as the mouse hovers over a location in the graph.

Fit button

Sets the graph box to fit mode. This option will calculate the extent of the items plotted in the graph box and zoom out to show them. After the fit is complete the graph will return to pick mode.

Pan button

Sets the graph box to panning mode. Click once to commence panning, then move the mouse and click a second time to stop panning.

Zoom button

Sets the graph box to zoom mode. Click once to commence zooming, then move the mouse and click a second time to stop zooming. Moving the mouse left and right will reduce and increase the X scale factor and moving the mouse down and up will reduce or increase the Y scale factor.

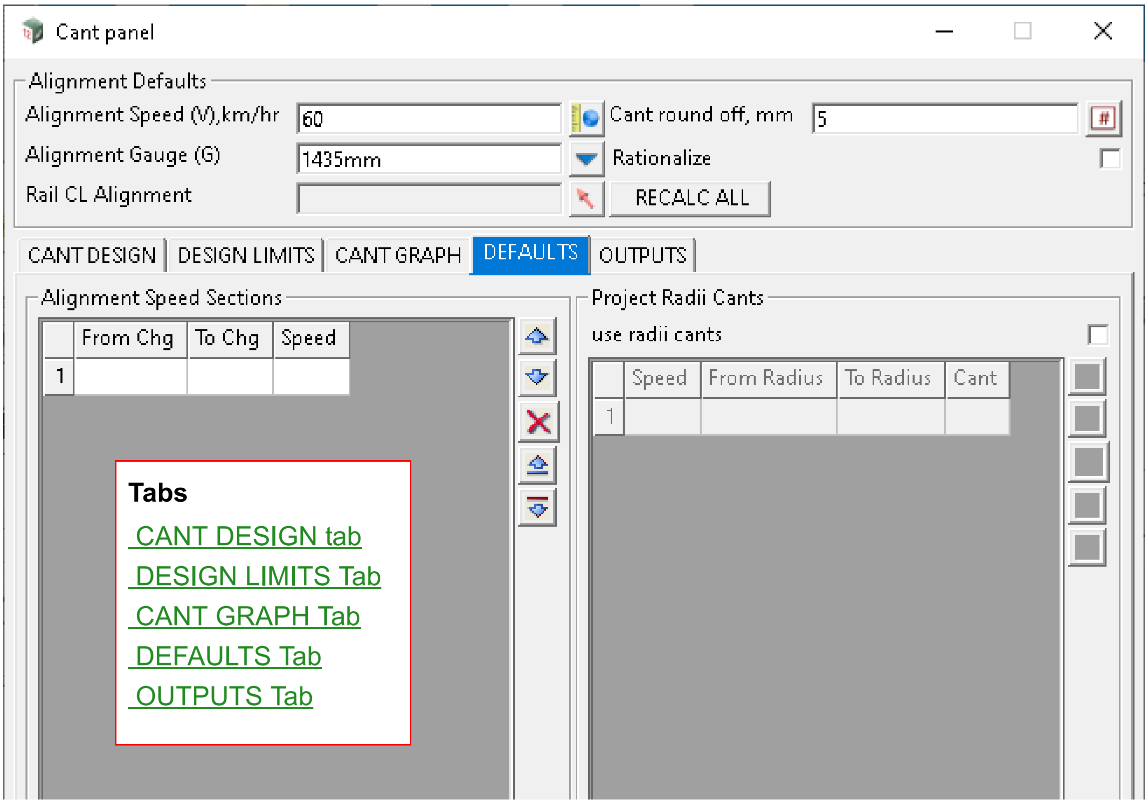
Window button

Sets the graph box to window mode. Click once to select the first corner of a window and click a second time to select the second corner. After the window is complete the graph will return to pick mode.

Plot button

Plots the graph to a specified model at a specified scale.

DEFAULTS Tab



Alignment Speed Sections

From Chg real box

From chainage; to set a speed override between two chainages.

To Chg real box

To chainage; to set a speed override between two chainages.

Speed real box

A speed override to apply between two chainages. Once the ***From Chg***, ***To Chg*** *and* ***Speed*** *fields have been entered, then the* ***Apply*** *and* ***RECALC ALL*** *buttons have been clicked, this will override the default* ***Alignment Speed (V), km/hr*** *for the* ***Cant Stations*** *within those chainages.*

Project Radii Cants

use radii cants tick box not ticked

*If **ticked**, then a cant override can be applied to any curve that meets a **Speed** and a radius range. This will also function in conjunction with **Alignment Speed Sections**.*

Speed real box

A speed condition to apply a cant override if the curve tested meets that speed.

From Radius real box

A lower radius range condition to apply a cant override if the curve tested meets that radius. A positive radius value should be entered.

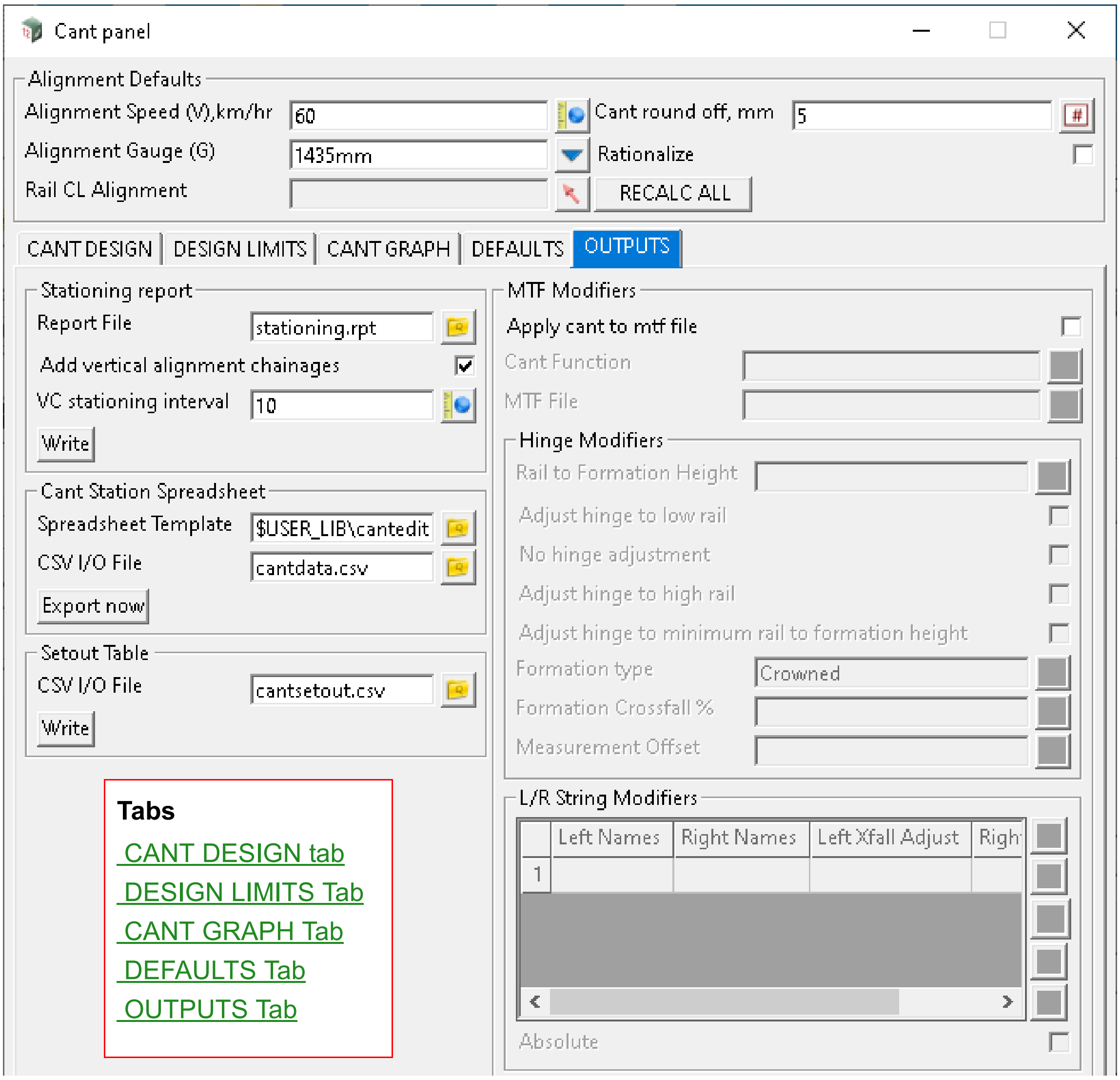
To Radius real box

An upper radius range condition to apply a cant override if the curve tested meets that radius. A positive radius value should be entered.

Cant real box

*A cant override to apply if the **Speed** and radius range conditions are met. Once the **Speed**, **From Radius**, and **To Radius** fields have been entered, then the **Apply** and **RECALC ALL** buttons have been clicked, this will override the **App Cant (Ca)** for the **Cant Stations** meeting those conditions. A positive cant value should be entered unless negative superelevation is desired.*

OUTPUTS Tab



Tabs
CANT DESIGN tab
DESIGN LIMITS Tab
CANT GRAPH Tab
DEFAULTS Tab
OUTPUTS Tab

Stationing report

Report File file box stationing.rpt all *.rpt files

*Name of the rpt file to export **Cant Stations**.*

Add vertical alignment chainages tick box ticked

*If **ticked**, vertical alignment Point of Vertical Curve (PVC) and Point of Vertical Tangency (PVT) chainages will be added to the **Report File**.*

VC stationing interval real box 10

*Includes additional stations through vertical curves at specified increments in the **Report File**.*

Write button

*Exports the Stationing **Report File** containing **Cant Stations** and additional stations through vertical curves if specified.*

Cant Station Spreadsheet

Spreadsheet Template file box all *.xls files

*Name of the XLS template file that is copied and renamed to the name stem entered in the **CSV I/O File*** *field with an *.xls extension.*

CSV I/O File file box cantsetout.csv all *.csv files

Name of the CSV output file to be created.

Export now button

*Exports the **Cant Station Spreadsheet Template** and **CSV I/O File**. The *.csv file exported can be imported into the *.xls file created.*

Setout Table

CSV I/O File file box cantsetout.csv all *.csv files

Name of the CSV output file to be created.

Write button

*Exports the Setout Table **CSV I/O File.***

MTF Modifiers

Apply cant to mtf file tick box not ticked

*If **ticked**, creates an **MTF File**.*

Cant Function function box

*Name of the MTF **Cant Function**.*

MTF File file box all *.mtf files

Name of the MTF file to be created.

Hinge Modifiers

Rail to Formation Height real box

Vertical offset from top of rail to top of formation. The value entered should be positive.

Adjust hinge to low rail tick box not ticked

Adds hinge adjustments to the MTF File based on the low rail.

No hinge adjustment tick box not ticked

*No hinge adjustments are added to the **MTF File**.*

Adjust hinge to high rail tick box not ticked

*Adds hinge adjustments to the **MTF File** based on the high rail.*

Adjust hinge to minimum rail to formation height tick box not ticked

*Allows for the **Formation Type**, **Formation Crossfall, %** and **Measurement Offset** fields to be populated.*

Formation type choice box Crowned

A choice of Crowned or Projected formation types can be chosen.

Formation Crossfall % real box

*When used in conjunction with a **Measurement Offset**, this affects the hinge height based on a crossfall and offset.*

Measurement Offset real box

*When used in conjunction with a **Formation Crossfall %**, this affects the hinge height based on a crossfall and offset.*

L/R String Modifiers

Left Names name field

*Adds Left MTF modifiers to the **MTF File** adjusting the link name matching the name specified in the*

Left Names field and the start and end xfall matching the ***Left Xfall Adjust*** *field.*

Right Names name field

Adds Right MTF modifiers to the ***MTF File*** *adjusting the link name matching the name specified in the* ***Right Names*** *field and the start and end xfall matching the* ***Right Xfall Adjust*** *field.*

Left Xfall Adjust real field

Adds Left MTF modifiers to the ***MTF File*** *adjusting the link name matching the name specified in the* ***Left Names*** *field and the start and end xfall matching the* ***Left Xfall Adjust*** *field.*

Right Xfall Adjust real field

Adds Right MTF modifiers to the ***MTF File*** *adjusting the link name matching the name specified in the* ***Right Names*** *field and the start and end xfall matching the* ***Right Xfall Adjust*** *field.*

Absolute tick box not ticked

If ***ticked****, the xfall is set to the values given in the* ***Left/Right Xfall Adjust*** *fields.*

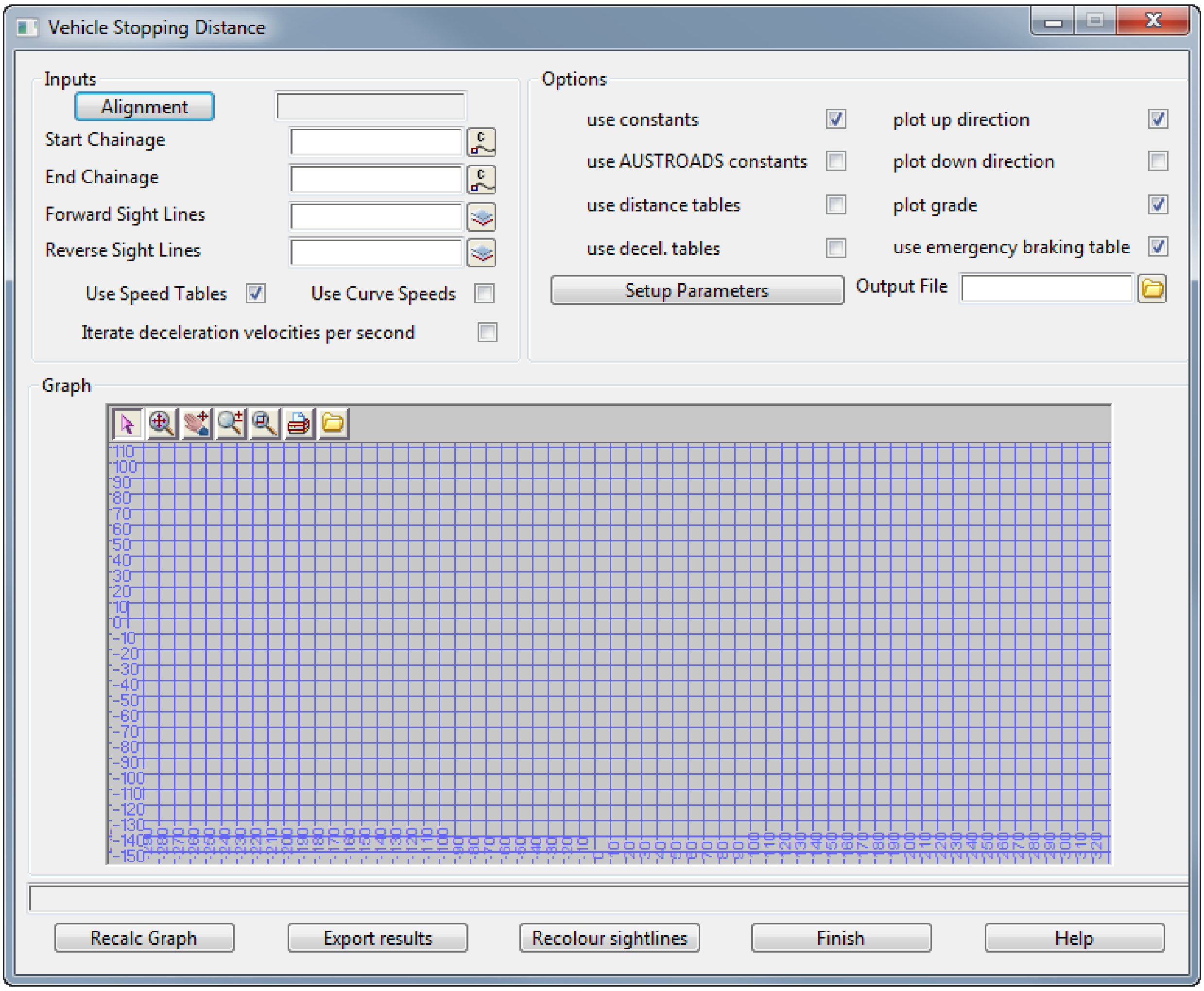
If ***not ticked****, the values given in the* ***Left/Right Xfall Adjust*** *fields are added to the existing xfall.*

17.19.6 Light Rail Stopping Distance

Position of menu: **Design => Track => Light rail stop distance**

The Light rail stop distance panel is used to calculate the sight distance, normal stopping distance and emergency stopping distance of light rail. The prerequisites to running Light rail stop distance include to have created Forward Direction and Reverse Direction Sight Lines in either 19.13.8 Sight Distance - Tin Only or 19.13.1 Sight Distance Enhanced, and applying speeds in 17.19.5 Calculate Cant to the **Alignment** string.

Selecting **Light rail stop distance** displays the **Vehicle Stopping Distance** panel.



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

Field Description	Type	Defaults	Pop-Up

Inputs

Alignment button

*String to be used for calculating the stopping distance. The **Alignment** string would typically be the design alignment centreline.*

Start Chainage real box

*Start chainage on the **Alignment** string for calculating stopping distance from. This is automatically populated with the **Alignment** string start chainage when selected.*

End Chainage real box

*End chainage on the **Alignment** string for calculating stopping distance to. This is automatically populated with the **Alignment** string end chainage when selected.*

Forward Sight Lines model box available models

*Model containing the calculated sightlines strings in the **forward** direction generated in either 19.12.8 Sight Distance - Tin Only or 19.13.1 Sight Distance Enhanced.*

Reverse Sight Lines model box available models

*Model containing the calculated sightlines strings in the **reverse** direction generated in either 19.12.8 Sight Distance - Tin Only or 19.13.1 Sight Distance Enhanced.*

Use Speed Tables tick box ticked

*If **ticked**, the calculations are based on the **Alignment Speed Sections** table with **Alignment Speed (V), km/hr** default speed used where no speed section is defined. This is attached to the **Alignment**, which is set up in the **DEFAULTS** tab of* 17.19.5 Calculate Cant.

Use Curve Speeds tick box not ticked

*If **ticked**, the calculations are based on the speed assigned to each Cant Station of the **Alignment**, which is set up in the **CANT DESIGN** tab of* 17.19.5 Calculate Cant.

Iterate deceleration velocities per second tick box not ticked

*If **ticked**, the normal stopping distance and emergency stopping distance are dynamically calculated every second during vehicle deceleration.*

Options

use constants tick box ticked

*If **ticked**, the calculations are based on the constants set up in the **Setup Parameters** button.*

use AUSTROADS constants tick box not ticked

*If **ticked**, the calculations are based on the Austroads constants.*

use distance tables tick box not ticked

*If **ticked**, the calculations are based on a distance values table dialogue panel, which appears when the **Alignment** button is clicked.*

use decel. tables tick box not ticked

*If **ticked**, the calculations are based on a deceleration values table dialogue panel, which appears when the **Alignment** button is clicked.*

Setup Parameters button

*opens a panel containing constant parameters which include **Overspeed value (km/hr)**, **Reaction time (s)**, **Normal Deceleration (m/s2)**, **Normal Change per % (-ve) grade**, **Emergency Deceleration (m/s2)**, and **Emergency Change per % (-ve) grade**. These parameters are used in the calculations and will only appear when the **use constants** tick box is **ticked**.*

plot up direction tick box ticked

*Displays the **Graph** using values of the **Alignment** in the up direction (increasing chainage).*

plot down direction tick box not ticked

*displays the **Graph** using values of the **Alignment** in the down direction (decreasing chainage).*

plot grade tick box ticked

*Displays the grade in the **Graph**. This is named **grade(%)*10** in the **Legend**.*

use emergency braking table tick box ticked

*Displays the emergency stopping distance in the **Graph**. This is named **emerg sight dist** in the **Legend**.*

Output File file box all *.csv files

*Filename for *.csv file output of vehicle stopping distance calculations. The **Recalc Graph** and then **Export results** buttons must be clicked to export the file.*

Graph

Pick button

*Sets the graph box to pick mode. A right-click will display the running values at any chainage that the mouse hovers over. A left-click will apply the brake from the chainage hovered over when clicked. In apply brake mode a black line will appear in the **Graph** showing deceleration. Left clicking will also write out the calculations to the Output Window.*

Fit button

Sets the graph box to fit mode. This option will calculate the extent of the items plotted in the graph box and zoom out to show them. After the fit is complete the graph will return to pick mode.

Pan button

Sets the graph box to panning mode. Click once to commence panning, then move the mouse and click a second time to stop panning.

Zoom button

Sets the graph box to zoom mode. Click once to commence zooming, then move the mouse and click a second time to stop zooming. Moving the mouse left and right will reduce and increase the X scale factor and moving the mouse down and up will reduce or increase the Y scale factor.

Window button

Sets the graph box to window mode. Click once to select the first corner of a window and click a second time to select the second corner. After the window is complete the graph will return to pick mode.

Plot button

Plots the graph to a specified model at a specified scale.

Export results (in graph) button

*Exports the calculations to a file specified in the **Output File** file box. **Recalc Graph** should be clicked before exporting the results.*

Buttons at Bottom

Recalc graph button

*Recalculates the vehicle stopping distances. This should be run before displaying the graph and before the **Export results** button is clicked.*

Export results button

*Exports the calculations to a file specified in the **Output File** file box. **Recalc Graph** should be clicked before exporting the results.*

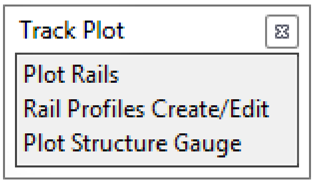
Recolour sightlines button

*Changes the colour of the sight lines in **Forward Sight Lines** and **Reverse Sight Lines** models to green, and changes the colour of the sight lines that fail to red.*

17.19.7 Track Plot

Position of menu: **Design =>Track =>Plot**

The **Track Plot** walk-right menu is



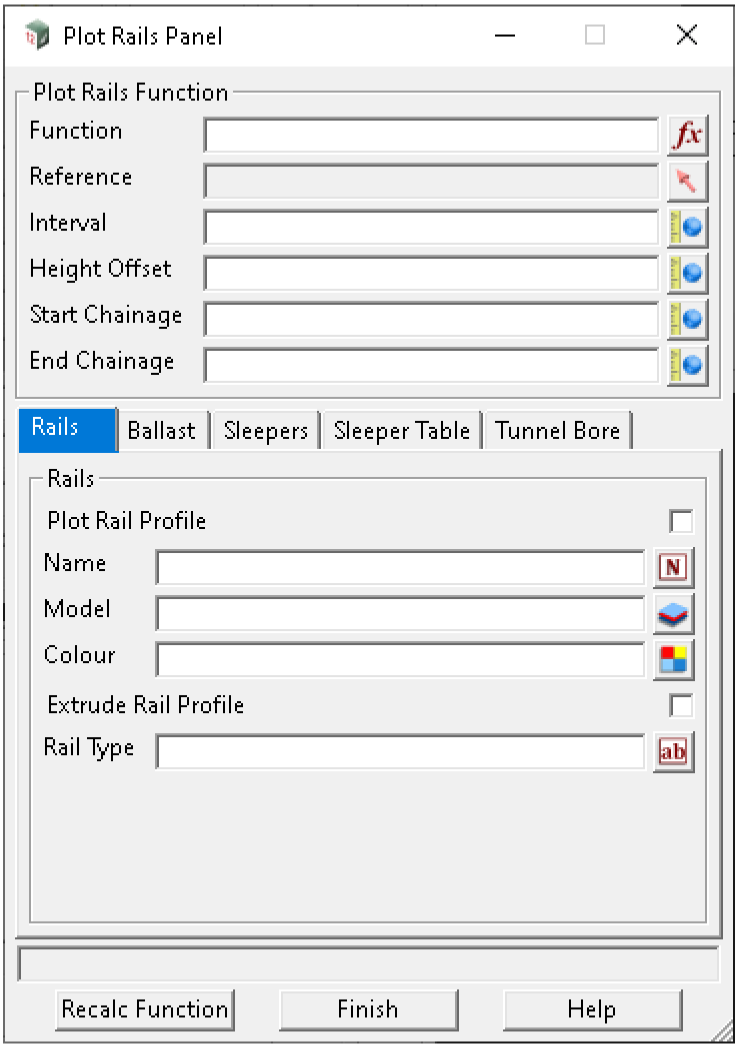
See
[17.19.7.1 Plot Rails Panel](#)
[17.19.7.2 Rail Profiles Create/Edit](#)
[17.19.7.3 Structure Gauge Panel](#)

17.19.7.1 Plot Rails Panel

Position of option on menu: **Design =>Track =>Plot =>Plot Rails**

The Plot Rails panel creates rails, ballast, sleepers, and tunnel bore strings. The prerequisites to running **Plot Rails** are applying the cant in the 17.19.5 Calculate Cant panel to the **Reference** string and to create a **Rail Type** in 17.19.7.2 Rail Profiles Create/Edit if **Extrude Rail Profile** is selected. Plotting rails and sleepers generates Super Strings of each element that display as line strings in plan and section views, and that display as 3D elements in the perspective view. Plotting ballast generates sections and Super Strings for the ballast shoulder and ballast toe that interfaces a **Formation Tin**. Plotting tunnel bore generates a cylinder along the alignment that can be viewed in the plan, section and perspective views.

Selecting **Plot Rails** displays the Plot Rails **Place** panel.



Tabs
Rails tab
Ballast tab
Sleepers tab
Sleeper Table tab
Tunnel Bore tab

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

Field Description	Type	Defaults	Pop-Up

Plot Rails Function

Function	function box		available functions

Name of the function.

Reference string select available functions

__Reference__ string that all rail, ballast, sleepers and tunnel bore strings generated are based on. The __Reference__ string would typically be the design alignment centreline. Cant values defined in 17.19.5 Calculate Cant *must be applied to the __Reference__ string before running the plot rails panel.*

Interval real box

Chainage increment between sections and vertices on strings.

Height Offset real box

Vertical distance above/below the reference string to generate all rail, ballast, sleepers and tunnel bore strings.

Start Chainage real box

The __Reference__ string start chainage for generating strings from. This is automatically populated with the __Reference__ string start chainage when selected.

End Chainage real box

The __Reference__ string end chainage for generating strings up to. This is automatically populated with the __Reference__ string end chainage when selected.

Buttons at Bottom

Recalc Function real box

Creates/updates the __Function__ and generates the strings.

Rails tab

Plot Rail Profiles tick box not ticked

If __ticked__, rail strings are generated.

Name name box available names

*Name prefix of the rail string generated. This name is suffixed by * left and * right.*

Model model box available models

Name of the model for the rail strings to be generated onto.

Colour colour box available colours

The colour for the rail strings.

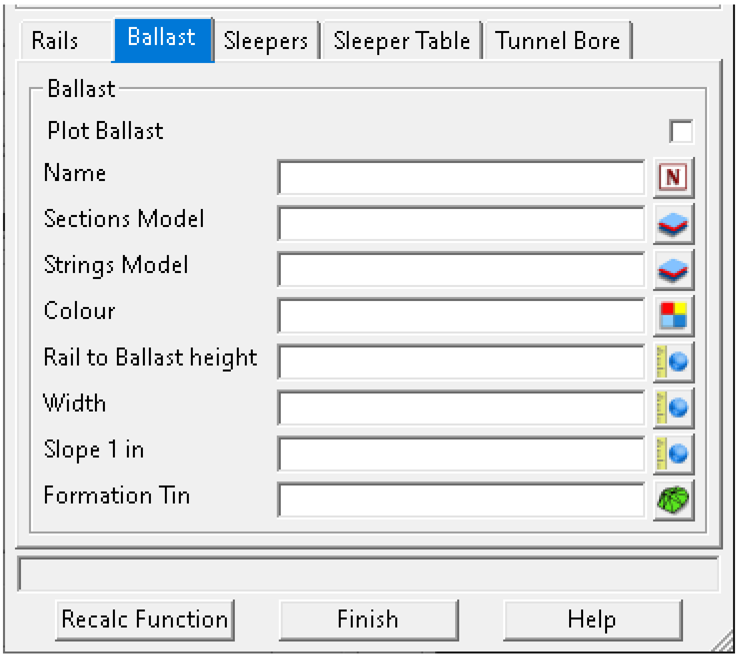
Extrude Rail Profile tick box not ticked

If __ticked__, rail strings in the perspective view will be generated with the rail profile specified in the __Rail Type__ field.

Rail Type custom box available profiles

The rail profile type to be applied to the rail strings that can be viewed in a perspective view.

Ballast tab



Tabs
Rails tab
Ballast tab
Sleepers tab
Sleeper Table tab
Tunnel Bore tab

Ballast

Plot Ballast tick box not ticked

*If **ticked**, ballast strings and sections are generated.*

Name name box available names

*Name prefix of the ballast strings and sections generated. This name is suffixed by the chainage for sections, * l and * r for the ballast shoulders, and * intl and * intr for the ballast toes.*

Sections Model model box available models

Name of the model for the ballast sections to be generated onto.

Strings Model model box available models

Name of the model for the ballast strings to be generated onto.

Colour colour box available colours

The colour for the ballast sections and strings.

Rail to Ballat height real box

Vertical offset from top of rail to top of ballast. The value entered should be negative.

Width real box

The cross-sectional top width of the ballast; the width between ballast shoulders.

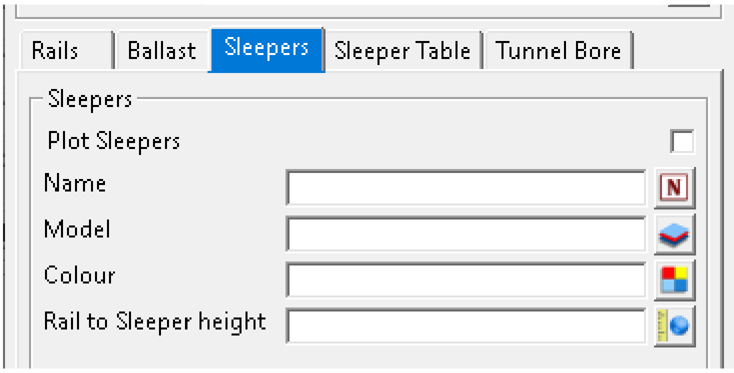
Slope 1 in real box

*The ballast batter side slope measured as **1** vertical **in** x horizontal. The slope at which the ballast shoulder meets the formation at the ballast toe. The value entered should be positive.*

Formation Tin tin box

The rail formation tin for which the ballast toe interfaces.

Sleepers tab



Tabs

[Rails tab]
[Ballast tab]
[Sleepers tab]
[Sleeper Table tab]
[Tunnel Bore tab]

Sleepers

Plot Sleepers tick box not ticked

*If **ticked**, sleeper strings are generated. Values in the **Sleeper Table** tab need to also be defined before sleeper strings are generated,*

Name name box available names

Name prefix of the sleeper strings generated. This name is suffixed by the chainage of the sleeper.

Model model box available models

Name of the model for the sleeper strings to be generated onto.

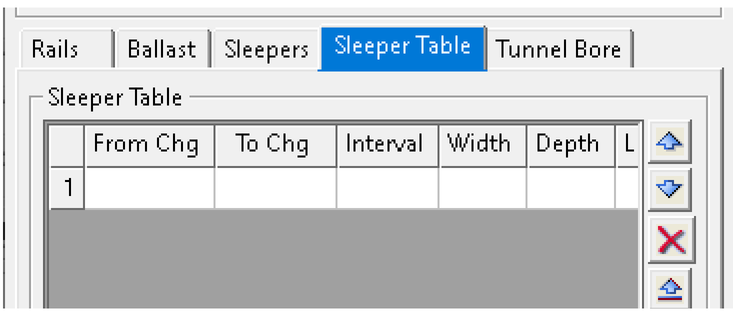
Colour colour box available colours

The colour for the sleeper strings.

Rail to Sleeper height real box

Vertical offset from top of rail to top of sleeper. The value entered should be negative.

Sleeper Table tab



Tabs

[Rails tab]
[Ballast tab]
[Sleepers tab]
[Sleeper Table tab]
[Tunnel Bore tab]

Sleeper Table

From Chg real box

Start chainage for the sleepers to be generated from.

To Chg real box

End chainage for the sleepers to be generated to.

Interval real box

The spacing between sleeper centres.

Width real box

The plan width of the sleeper.

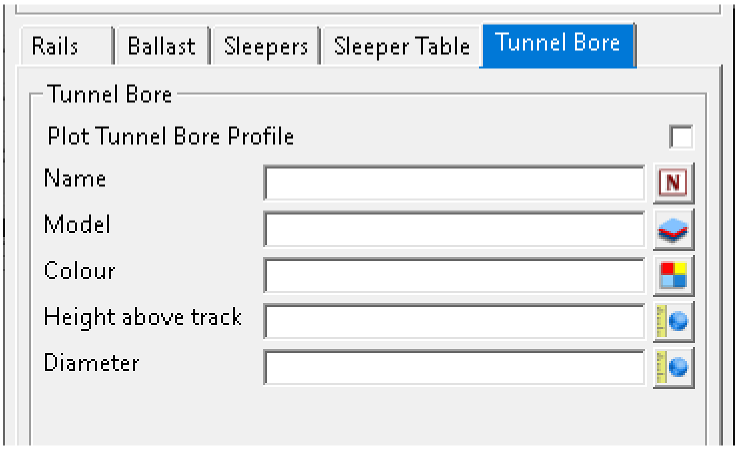
Depth real box

The plan depth of the sleeper.

Length real box

The plan length of the sleeper.

Tunnel Bore tab



Tabs
Rails tab
Ballast tab
Sleepers tab
Sleeper Table tab
Tunnel Bore tab

Tunnel Bore

Plot Tunnel Bore Profile tick box not ticked

If ***ticked****, tunnel bore strings are generated.*

Name name box available names

Name for the tunnel bore strings.

Model model box available models

Name of the model for the tunnel bore strings to be generated onto.

Colour colour box available colours

The colour for the tunnel bore strings.

Height above track real box

Vertical offset from top of rail to the cross-sectional centre of the tunnel bore cylinder.

Diameter real box

The cross-sectional radius of the tunnel bore.

Start Chainage real box

The ***Reference*** *string start chainage for generating strings from. This is automatically populated with the* ***Reference*** *string start chainage when selected.*

End Chainage real box

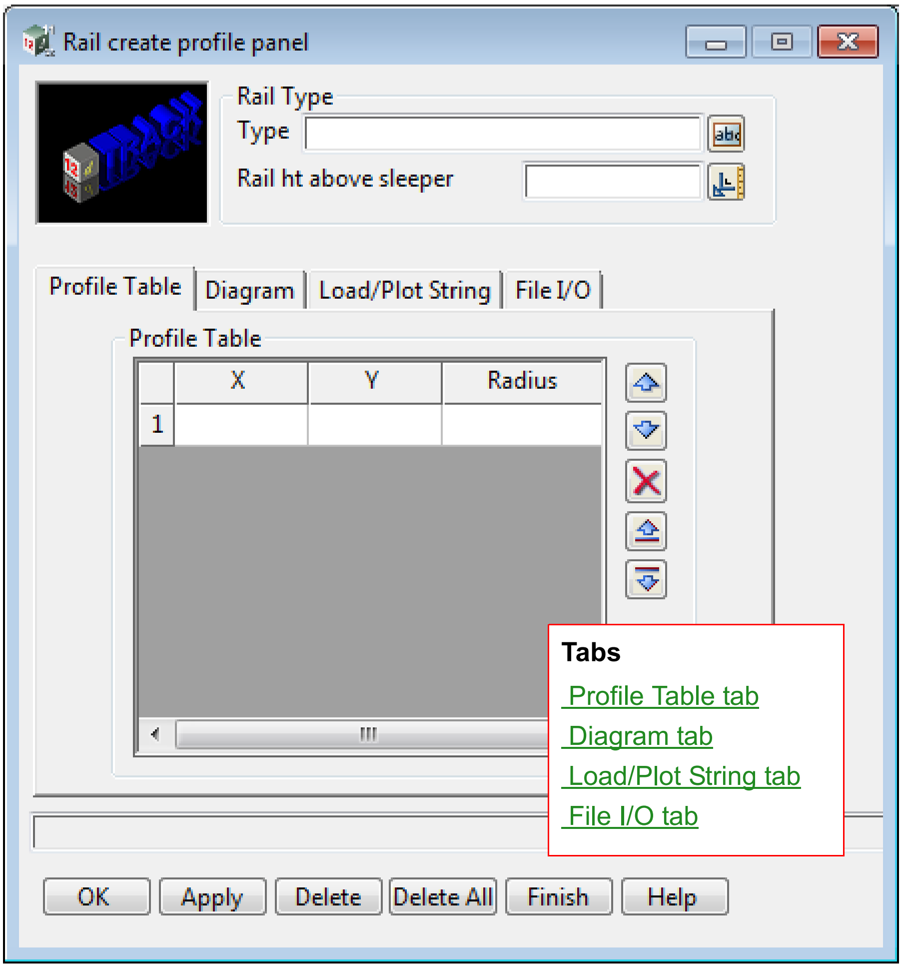
The ***Reference*** *string end chainage for generating strings up to. This is automatically populated with the* ***Reference*** *string end chainage when selected.*

17.19.7.2 Rail Profiles Create/Edit

Position of option on menu: **Design =>Track =>Plot =>Rail Profiles Create/Edit**

The Rail Profiles Create/Edit creates a library of **Rail Type** rail profiles that can be imported from a file and exported to a file. Rail profiles are typically created by selecting a string in a model. Rail profiles can be used in 17.19.7.1 Plot Rails Panel to generate Super Strings of design rails that display as line strings in plan and section views, and display as rail profiles in perspective views.

Selecting **Rail Profiles Create/Edit** displays the **Rail create profile** panel.



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

Field Description	Type	Defaults	Pop-Up
Rail Type			
Type	custom box		available rail profiles

*Name of the **Rail Type** rail profile.*

Rail ht above sleeper	real box		

Height from the top of sleeper to the top of rail.

Buttons at Bottom

OK	button		

*Creates/updates the rail profile **Type** and closes the panel.*

Apply button

*Creates/updates the rail profile **Type**.*

Delete button

*Deletes the currently selected rail profile **Type**.*

Delete All button

*Deletes all rail profiles stored in the Rail **Type** library.*

Profile Table tab

X real box

X coordinates for the rail profile vertices.

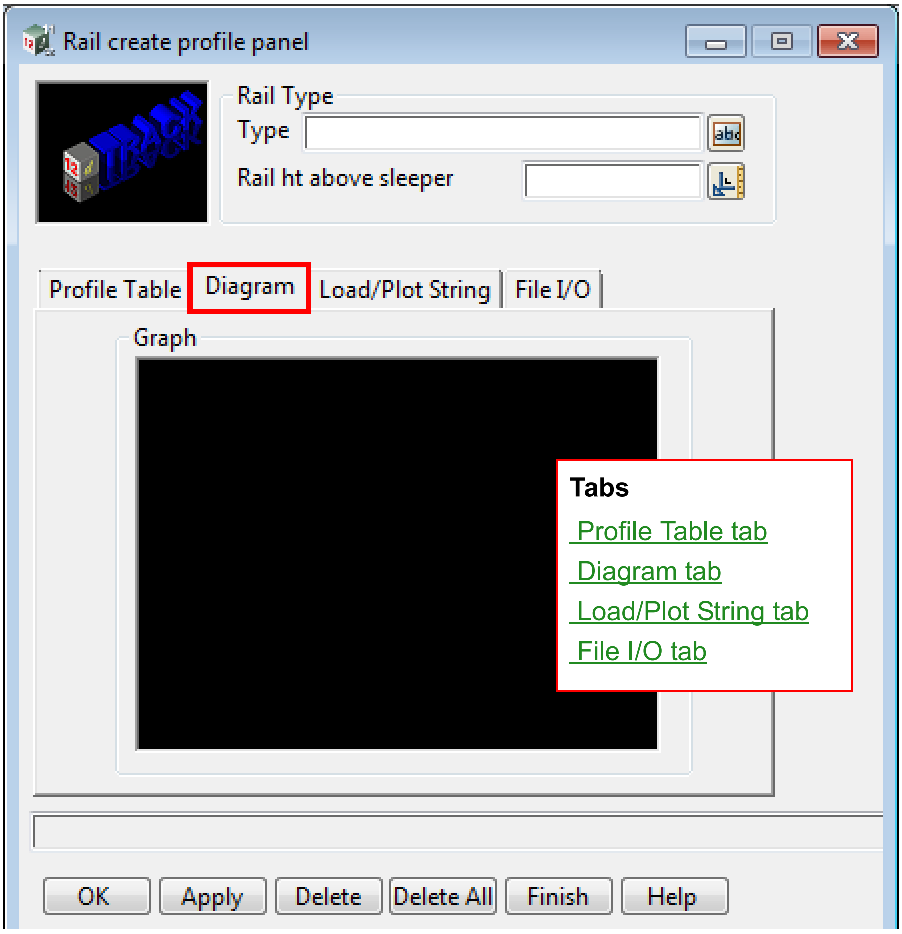
Y real box

Y coordinates for the rail profile vertices.

Radius real box

Radius of each rail profile segment.

Diagram tab

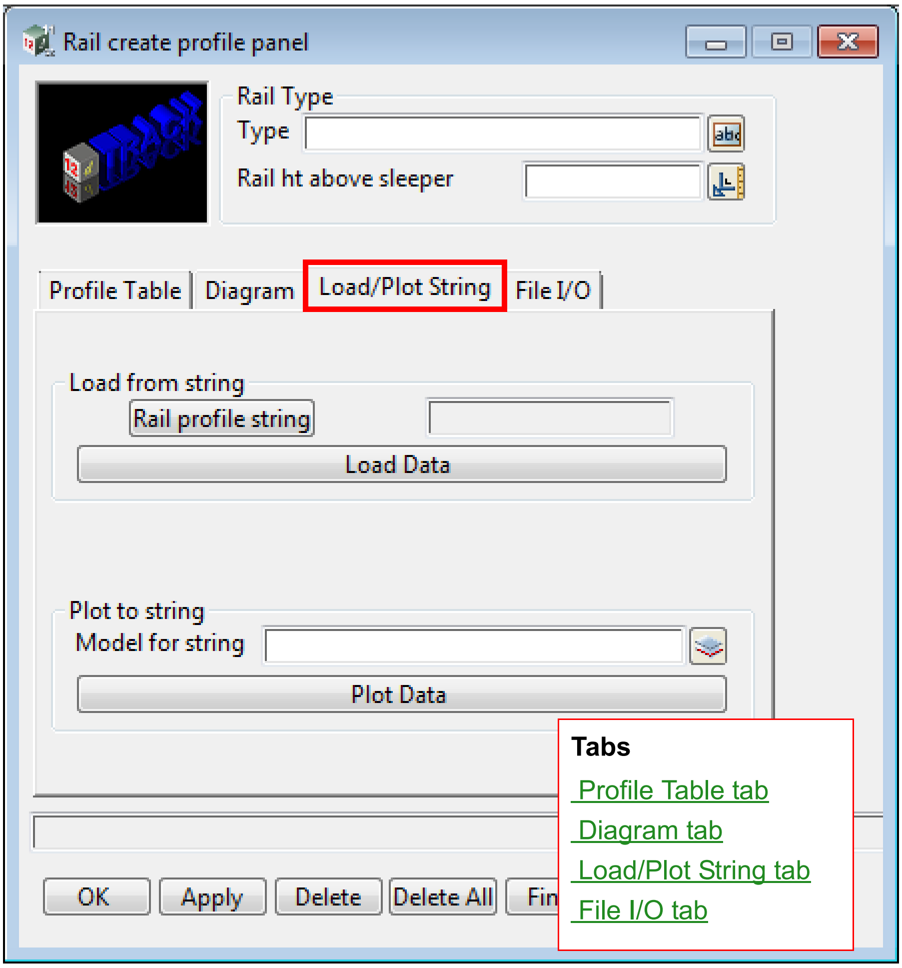


Tabs
Profile Table tab
Diagram tab
Load/Plot String tab
File I/O tab

Graph graph

*Graph of the **Rail Type**. Holding left-click pans, a middle-click fits view, and holding right-click zooms in/out.*

Load/Plot String tab



Tabs
Profile Table tab
Diagram tab
Load/Plot String tab
File I/O tab

Load from string

Rail profile string string select

*String selection to choose an element to create a **Rail Type**.*

Load Data button

*Once a string has been selected, clicking the **Load Data** button populates the **Profile Table** and the **Diagram** graph.*

Plot to string

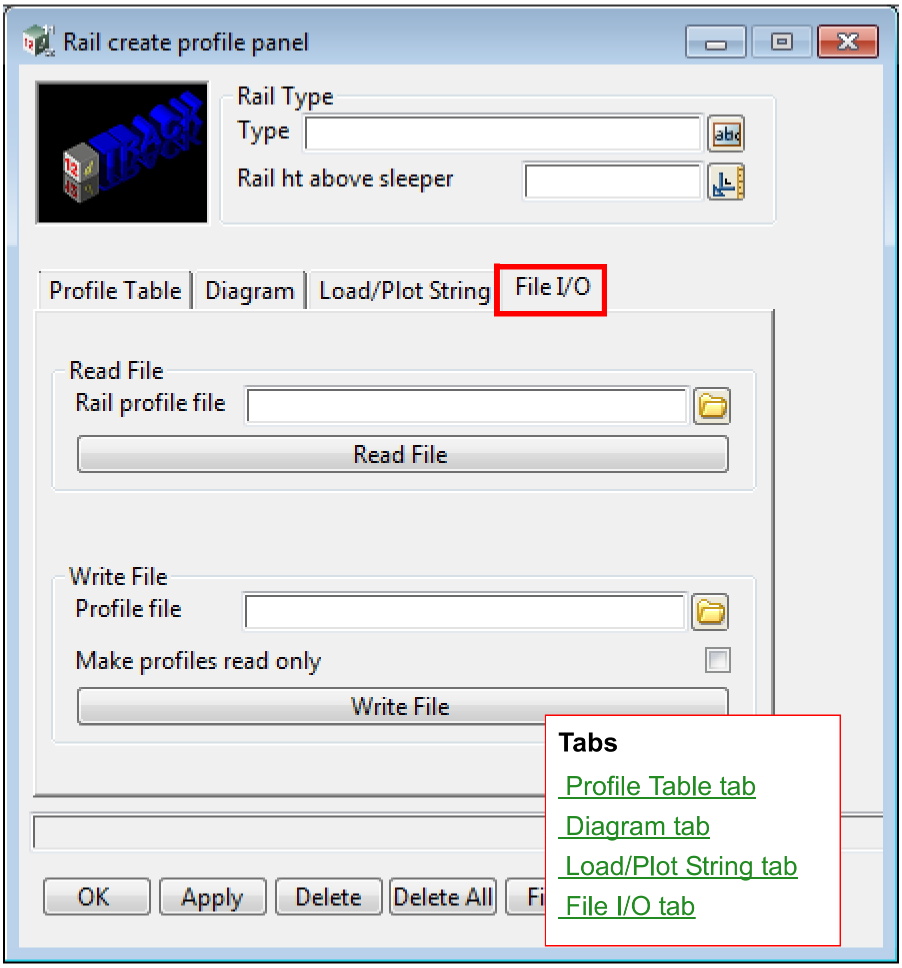
Model for string model box available models

*Model for the **Rail Type** to be drawn.*

Plot Data button

*Once a rail profile has been added to the **Rail Type** library, **Plot Data** will draw that profile onto the model selected in **Model for string**.*

File I/O tab



Tabs
Profile Table tab
Diagram tab
Load/Plot String tab
File I/O tab

Read File

Rail profile file File box *.profiles files

File to read rail profiles from.

Read File button

*Imports all rail profiles stored in the **Rail profile file** into the **Rail Type** library.*

Write File

Profile file file box

File to write rail profiles to.

Make profiles read only tick box not ticked

*Adds a read-only attribute to the entry in the **Profile file** which restricts modification of **Rail ht above sleeper** and the **Profile Table** when that **Rail Type** has been imported.*

Write File button

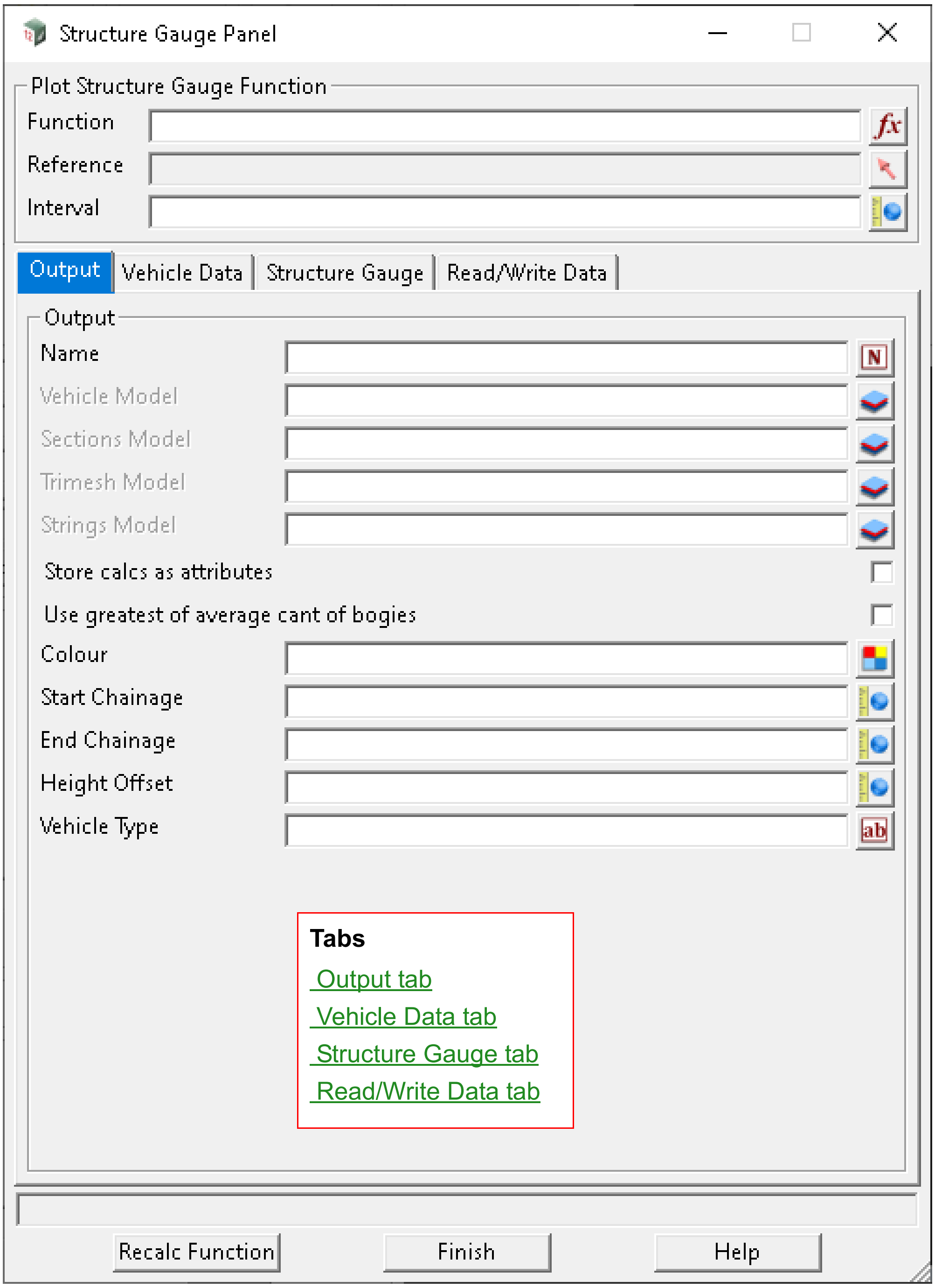
*Exports all profiles in the **Rail Type** library.*

17.19.7.3 Structure Gauge Panel

Position of option on menu: **Design =>Track =>Plot=>Plot Structure Gauge**

The Plot Structure Gauge panel creates a structure clearance envelope along a **Reference** string. The prerequisites to running **Plot Structure Gauge** are applying the cant in the 17.19.5 Calculate Cant panel to the **Reference** string. A structure gauge profile should be defined first in the Structure Gauge tab, then a vehicle should be defined using a structure gauge profile. Both the structure gauge and vehicle details can be imported and exported to file. Strings, sections, trimesh and front/centre/end throw centrelines can be generated.

Selecting **Plot Structure Gauge** displays the **Structure Gauge** panel.



Tabs
Output tab
Vehicle Data tab
Structure Gauge tab
Read/Write Data tab

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

Field Description	Type	Defaults	Pop-Up
Plot Structure Gauge Function			
Function	function box		available functions

Name of the function.

Reference	string select		available functions

***Reference** string that structure gauge elements generated are based on. The **Reference** string would typically be the design alignment centreline. Cant values defined in 17.19.5 Calculate Cant must be applied to the **Reference** string before running the plot structure gauge panel*

Interval	real box		

Chainage increment between sections and vertices on strings.

Buttons at Bottom

Recalc Function	button		

*Creates/updates the **Function** and generates the elements for the models defined in the **Output** tab.*

Output tab

Name	name box		available names

Name stem for the structure gauge generated strings.

Vehicle Model	model box		available models

*Name of the model for the vehicle strings to be generated onto. The model generated contains the front throw, centre throw and end throw centrelines which are the length of the **Vehicle Length** and are generated at every **Interval**. This is optional.*

Sections Model	model box		available models

*Name of the model for the structure gauge sections to be generated onto. The sections are cut at a chainage increment specified in the **Interval** field. Note: sections will only display correctly in a perspective view. The **Trimesh Model** should be added to section views. This is optional.*

Trimesh Model	model box		available models

*Name of the model for the structure gauge trimesh to be generated onto. The **Trimesh Model** is the best model to display the structure gauge in section and perspective views. This is optional.*

Strings Model	model box		available models

Name of the model for the structure gauge strings to be generated onto. The vertices along the strings are generated at the chainage increment specified in the Interval field. This is optional.

Store Calcs as attributes	tick box	not ticked	

*If **ticked**, attributes are generated on the **Vehicle Model** and **Sections Model**. The attributes include front/back bogie chainages, front/back bogie cant, vehicle cant and front/centre/end throw values.*

Use greatest of average cant of bogies	tick box	not ticked	

*If **ticked**, the greatest average cant of bogies is used.*

Colour	colour box		available colours

*The colour for the strings/trimesh generated on the **Sections Model**, **Trimesh Model** and **Strings Model**.*

Start Chainage	real box		

*The **Reference** string start chainage for generating the structure gauge from. This is automatically populated with the **Reference** string start chainage when selected. Note: The structure gauge cannot be* *generated for one vehicle length from the start of the **Reference** string.*

End Chainage real box

*The **Reference** string end chainage for generating the structure gauge up to. This is automatically populated with the **Reference** string end chainage when selected. Note: The structure gauge cannot be generated for one vehicle length from the end of the **Reference** string.*

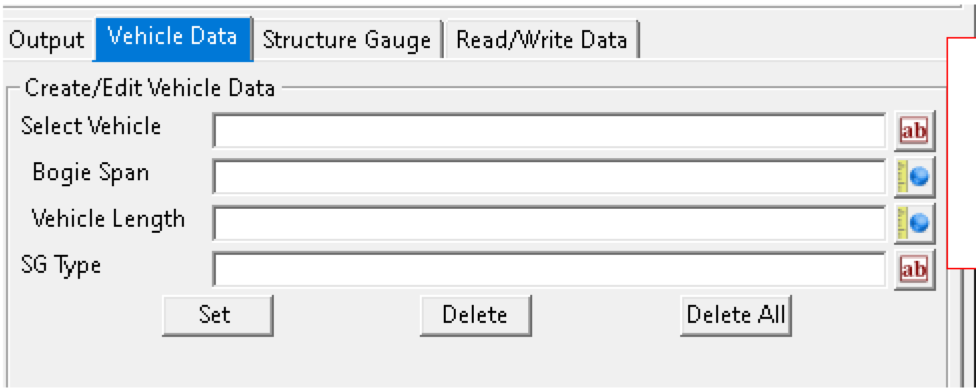
Height Offset real box

Vertical distance above/below the reference string to generate the structure gauge.

Vehicle Type custom box available vehicles

*Name of the vehicle that the structure gauge shall be based on. The vehicle is configured in the **Vehicle Data** tab under the **Select Vehicle** field.*

Vehicle Data tab



Tabs
Output tab
Vehicle Data tab
Structure Gauge tab

Create/Edit Vehicle Data

Select Vehicle custom box available vehicles

Name of the vehicle.

Bogie Span real box

The distance between the centre of the bogies of the vehicle.

Vehicle Length real box

The body length of the vehicle.

SG Type custom box available SG’s

*Name of the associated structure gauge profile. This is configured in the **Structure Gauge** tab under the **Select SG** field.*

Set button

*Creates/updates vehicle specified in the **Select Vehicle** field.*

Delete button

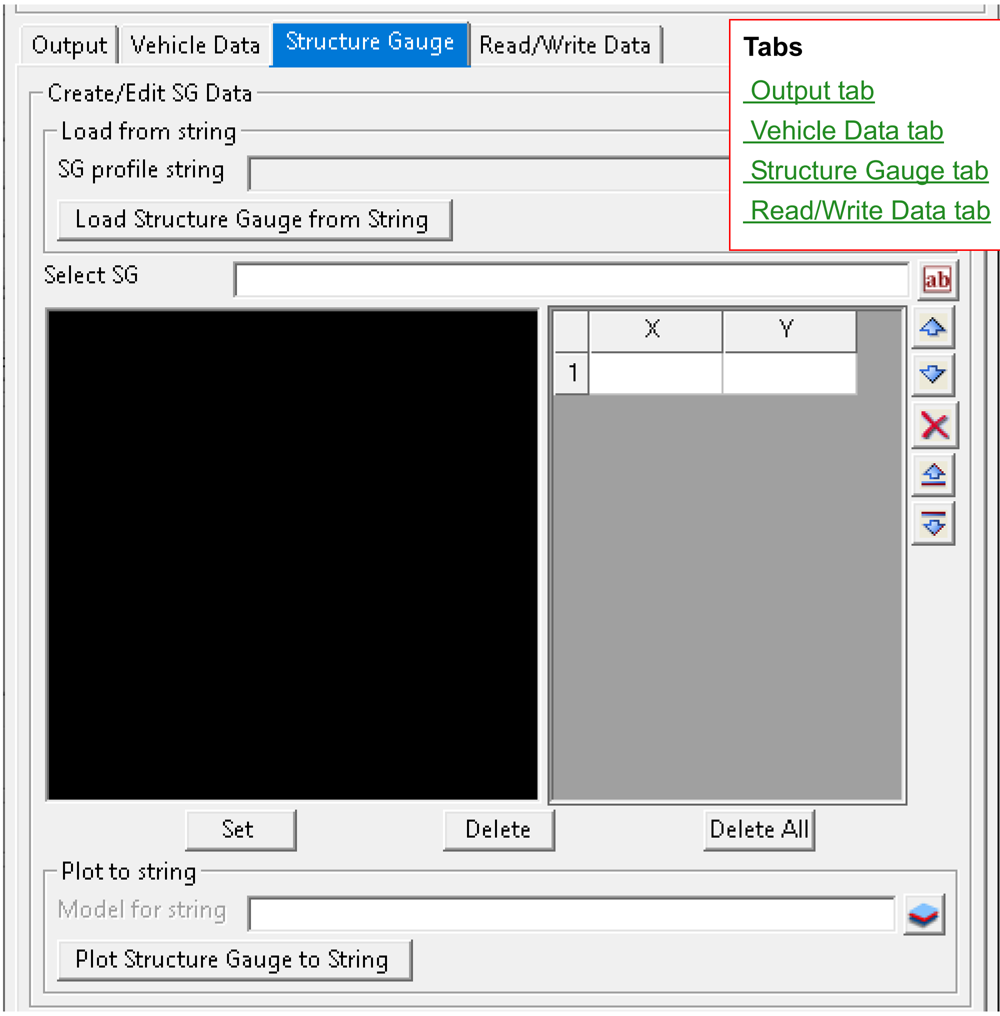
*Deletes the vehicle specified in the **Select Vehicle** field.*

Delete All button

Deletes all vehicles stored in the vehicle library.

Structure Gauge tab

Tabs
[Output tab]
[Vehicle Data tab]
[Structure Gauge tab]
[Read/Write Data tab]



Create/Edit SG Data

Load from string

SG profile string string select

String selection to choose an element to create a structure gauge profile.

Load Structure Gauge from String button

*Once a string has been selected in the **SG profile string** field, clicking on this button will populate **Select SG**, graph and XY table.*

Select SG custom box available SG's

Name for the structure gauge profile.

Pick button

This option sets the graph box to pick mode. When in this mode the message area will display the X and Y coordinates as the mouse hovers over a location in the graph.

Fit button

This option sets the graph box to fit mode. This option will calculate the extent of the items plotted in the graph box and zoom out to show them. After the fit is complete the graph will return to pick mode.

Pan button

This option sets the graph box to panning mode. Click once to commence panning, then move the *mouse and click a second time to stop panning.*

Zoom button

This option sets the graph box to zoom mode. Click once to commence zooming, then move the mouse and click a second time to stop zooming. Moving the mouse left and right will reduce and increase the scale factor.

Window button

This option sets the graph box to window mode. Click once to select the first corner of a window and click a second time to select the second corner. After the window is complete the graph will return to pick mode.

X real box

X coordinates for the structure gauge vertices.

Y real box

Y coordinates for the structure gauge vertices.

Set button

Creates/updates the structure gauge profile stored with the name specified in ***Select SG****.*

Delete button

Deletes the structure gauge profile stored with the name specified in ***Select SG****.*

Delete All button

Deletes all structure gauge profiles.

Plot to string

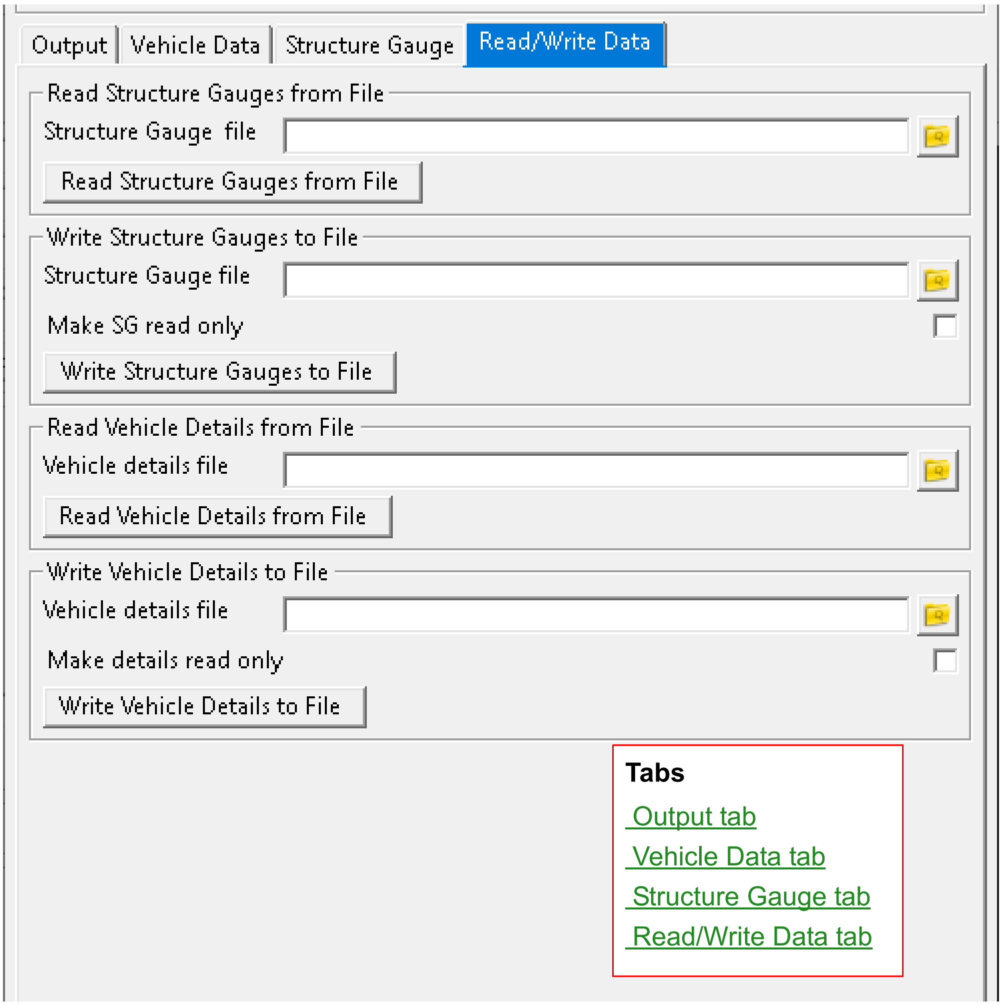
Model for string model box available models

Name of the model for the structure gauge profile to be generated onto.

Plot Structure Gauge to String button

Generates the structure gauge profile onto the model specified in ***Model for string*** *based on the values entered in the X and Y table.*

Read/Write Data tab



Tabs
Output tab
Vehicle Data tab
Structure Gauge tab
Read/Write Data tab

Read Structure Gauges from File

Structure Gauge file file box available *.profiles

Name of the file for structure gauge profiles to be imported from.

Read Structure Gauges from File button

*Imports structure gauge profiles from the *.profiles file specified in the **Structure Gauge file** field. These structure gauge profiles are added to the **Select** SG **list** in the **Structure Gauge** tab.*

Write Structure Gauges to File

Structure Gauge file file box available *.profiles

Name of the file for structure gauge profiles to be exported to.

Write Structure Gauges to File button

*Exports structure gauge profiles to the *.profiles file specified in the **Structure Gauge file** field. These structure gauge profiles are entries stored in the **Select SG** list in the **Structure Gauge** tab.*

Make SG read only tick box not ticked

*Adds a read-only attribute to the entry in the **Structure Gauge file** which restricts modification of structure gauge profiles that have been imported.*

Read Vehicle Details from File

Vehicle details file file box available *.profiles

Name of the file for vehicle details to be imported from.

Read Vehicle Details from File button

*Imports vehicle details from the *.profiles file specified in the **Vehicle details file** field. These vehicle details are added to the **Select Vehicle** list in the **Vehicle Data** tab.*

Write Vehicle Details to File

Vehicle details file **file box** available *.profiles

Name of the file for vehicle details to be exported to.

Write Vehicle Details to File button

*Exports vehicle details to the *.profiles file specified in the **Vehicle details file** field. These vehicle details are entries stored in the **Select Vehicle** list in the Vehicle **Data** tab.*

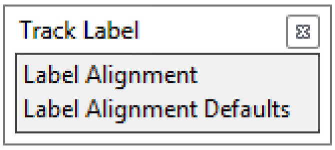
Make details read only tick box not ticked

*Adds a read-only attribute to the entry in the **Vehicle details file** which restricts modification of vehicle details that have been imported.*

17.19.8 Track Label

Position of menu: **Design =>Track =>Label**

The **Track Label** walk-right menu is

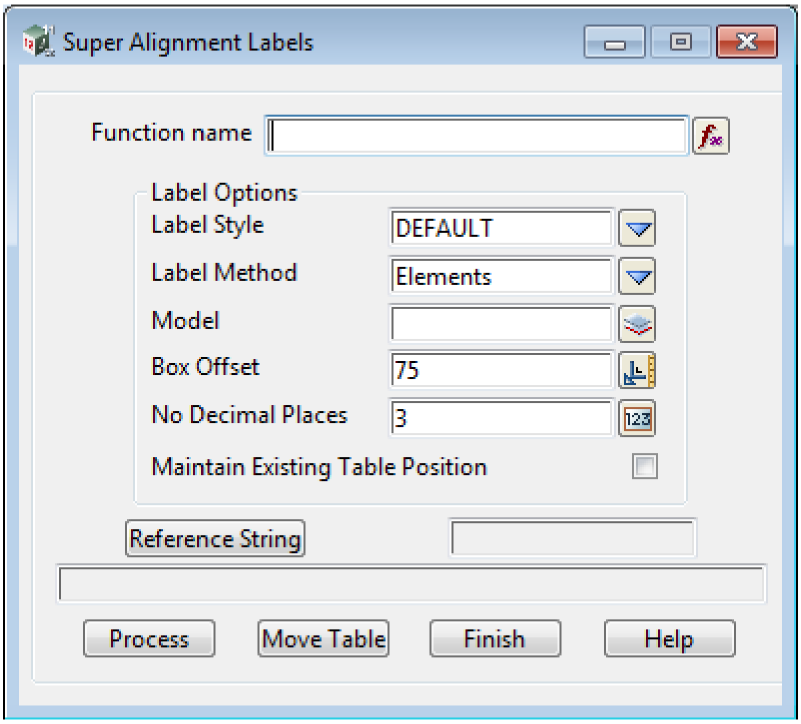


See
17.19.8.1 Label Alignment
17.19.8.2 Label Alignment Defaults

17.19.8.1 Label Alignment

Position of option on menu: **Design =>Track =>Label=>Label Alignment**

The **Label Alignment** panel generates either IPs and Tangent labels or horizontal segment labels called Elements labels along the design alignment. The prerequisites to running **Label Alignment** are applying the cant in the 17.19.5 Calculate Cant panel to the **Reference string**.



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

Field Description	Type	Defaults	Pop-Up
Function name	function box		available functions

Name of the function to store the panel settings.

Label Options

Label Stye	choice box	DEFAULT	all label styles

*Choice of label style to control how the information along the **Reference String** is displayed. Label styles are created, updated and deleted in* 17.19.8.2 Label Alignment Defaults.

Label Method	choice box	IPs. Tangents	label methods

Choice of labelling method between the labelling of IPs and Tangents, or Elements which are labelled at each horizontal segment.

Base Mode	model box		all models

*If **Label Style - Use model suffix** in* 17.19.8.2 Label Alignment Defaults *has been **ticked**, then **Base Model** is a model name stem to generate text and table elements onto. 4 models are created **Base Model**, Base Model labels, **Base Model** stationing, and **Base Model** tables.*

*If **Label Style - Use model suffix** in* 17.19.8.2 Label Alignment Defaults *has been **unticked**, then all elements are generated onto the **Base Model**.*

Box offset	real box	75	

*Horizontal offset distance for tables and text elements to be located away from the **Reference String**.*

No Decimal Places integer box 3

Number of decimal places to be displayed for text created.

Note: This feature has not been implemented yet.

Maintain Existing Table Position tick box not ticked

*If **ticked**, tables that have been moved with the **Move Table** button will retain their location when the **Process** button has been clicked.*

Clean ALL models with base name tick box not ticked

*If **ticked**, models created with the same Base Model name will be cleaned.*

Note: This feature has not been implemented yet.

Reference String button

Reference string for the labels to be created. This is typically the design alignment centreline.

Buttons at Bottom

Process button

*Creates/updates the label **Function** and generates the elements for the models prefixed with the **Base Model** name stem.*

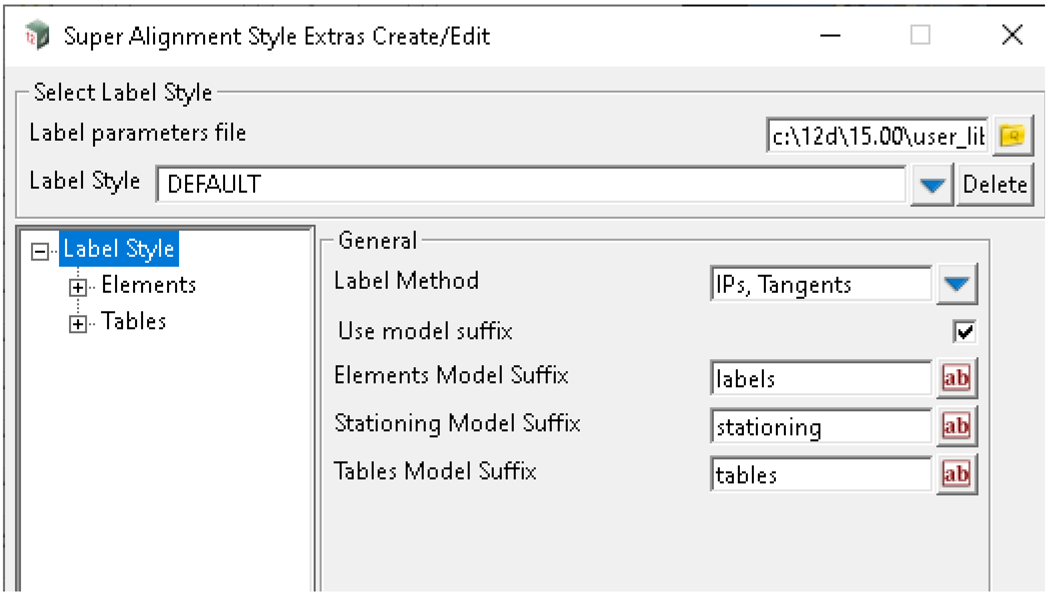
Move Table button

*Once tables have been generated, clicking on the **Move Table** button and then clicking on an element from one of these tables allows that table to be moved to another location. The **Maintain Existing Table Position** tick box is automatically ticked when a table has been moved to ensure that it doesn't revert to the default location when the **Process** button has been clicked.*

17.19.8.2 Label Alignment Defaults

Position of option on menu: **Design =>Track =>Label=>Label Alignment Defaults**

Label Styles in the 17.19.8.1 Label Alignment panel are saved in a **Label parameters file** (*.lpf) and are created, modified or deleted in the Label Alignment Defaults panel. The **Label Style** controls how the labelling information is presented.



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

Field Description	Type	Defaults	Pop-Up

Select Label Style

Label parameters file	file box		all *.lpf fies

*Name of the parameter file that will store the **Label Style** definitions.*

Label Style	choice box	DEFAULT	all label styles

*List of **Label Styles**. A **Label Style** can be selected or [new] can be selected which will open a panel to create a new **Label Style**.*

Delete	button		

*Deletes the currently selected **Label Style**.*

General

Label Method	choice box		all label methods

*Intended **Label Method** of* 17.19.8.1 Label Alignment *for the current **Label Style**. 'IPs, Tangents' or 'Elements' are the two options that can be selected.*

Use model suffix	tick box	ticked	

*If **ticked**, separates the generated elements into Elements Model Suffix, Stationing Model Suffix and Tables Model Suffix.*

*If **unticked**, puts all generated elements on **Base Model** specified in* 17.19.8.1 Label Alignment.

Elements Model Suffix	custom box	labels	

*When Elements has been selected in the **Label Method** field specified in* 17.19.8.1 Label Alignment, *elements are generated on a model prefixed with the **Base Model** field from* 17.19.8.1 Label Alignment *and suffixed with **Elements Model suffix**.*

Stationing Model Suffix custom box stationing

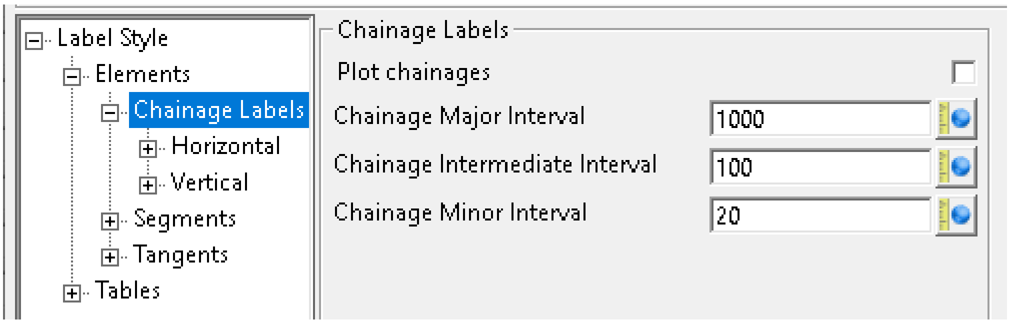
When Elements has been selected in the ***Label Method*** *field specified in* 17.19.8.1 Label Alignment*, elements are generated on a model prefixed with the* ***Base Model*** *field from* 17.19.8.1 Label Alignment *and suffixed with* ***Stationing Model suffix****.*

Note: This feature has not been implemented yet*.*

Tables Model Suffix custom box tables

When IPs, Tangents has been selected in the ***Label Method*** *field specified in* 17.19.8.1 Label Alignment*, elements are generated on a model prefixed with the Base Model field from* 17.19.8.1 Label Alignment *and suffixed with Tables Model suffix.*

Chainage Labels



Chainage Labels

Plot chainages tick box not ticked

*If **ticked**, chainage labels are created.*

Chainage Major Interval real box 1000

*Chainage increment for major chainages to be generated along the **Reference String**.*

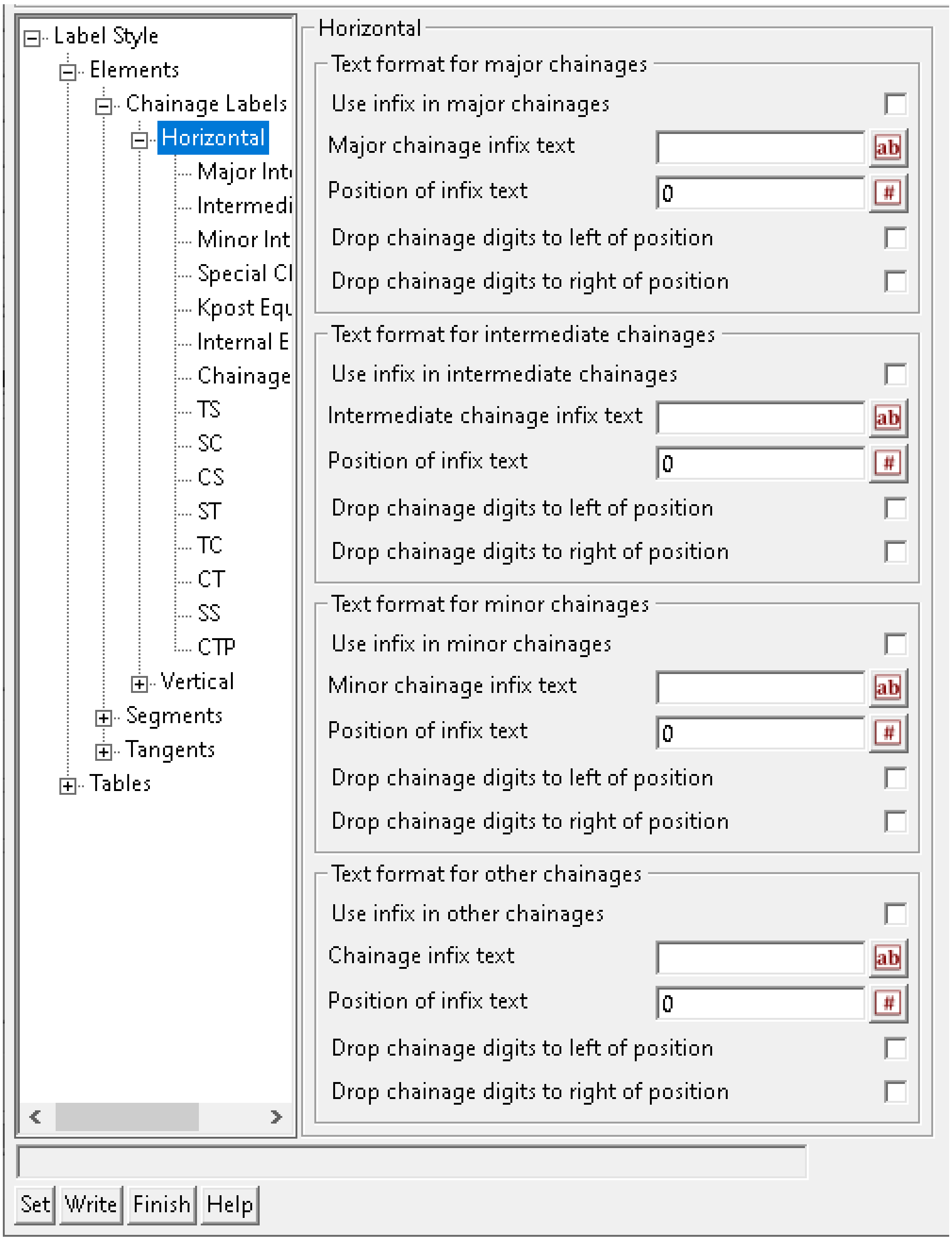
Chainage Intermediate Intervalreal box 100

*Chainage increment for intermediate chainages to be generated along the **Reference String**.*

Chainage Minor Interval real box 20

*Chainage increment for minor chainages to be generated along the **Reference String**.*

Horizontal



Horizontal

Text format for major chainages

Use infix in major chainages tick box not ticked

*If **ticked**, **Major chainage infix text** is infixed to major chainages.*

Major chainage infix text text box

Text to be infixed to the major chainages.

Position of infix text integer box

*If **Drop chainage digits to left of position** is **ticked**, the number of characters to retain at the end of the chainage value and to be prefixed by **Major chainage infix text**.*

*If **Drop chainage digits to right of position** is **ticked**, the number of characters to remove at the end of the chainage value and to be suffixed by **Major chainage infix text**.*

Drop chainage digits to left of position tick box not ticked

*Refer to **Position of infix text** above.*

Drop chainage digits to right of position tick box not ticked

*Refer to **Position of infix text** above.*

Text format for intermediate chainages

Use infix in intermediate chainages tick box not ticked

*If **ticked**, **Intermediate chainage infix text** is infixed to intermediate chainages.*

Intermediate chainage infix text custom box

Text to be infixed to the intermediate chainages.

Position of infix text custom box

*If **Drop chainage digits to left of position** is **ticked**, the number of characters to retain at the end of the chainage value and to be prefixed by **Intermediate chainage infix text**.*

*If **Drop chainage digits to right of position** is **ticked**, the number of characters to remove at the end of the chainage value and to be suffixed by **Intermediate chainage infix text**.*

Drop chainage digits to left of position tick box not ticked

*Refer to **Position of infix text** above.*

Drop chainage digits to right of position tick box not ticked

*Refer to **Position of infix text** above.*

Text format for minor chainages

Use infix in intermediate chainages tick box not ticked

*If **ticked**, **Minor chainage infix text** is infixed to minor chainages.*

Intermediate chainage infix text custom box

Text to be infixed to the minor chainages.

Position of infix text custom box

*If **Drop chainage digits to left of position** is **ticked**, the number of characters to retain at the end of the chainage value and to be prefixed by **Minor chainage infix text**.*

*If **Drop chainage digits to right of position** is **ticked**, the number of characters to remove at the end of the chainage value and to be suffixed by **Minor chainage infix text**.*

Drop chainage digits to left of position tick box not ticked

*Refer to **Position of infix text** above.*

Drop chainage digits to right of position tick box not ticked

*Refer to **Position of infix text** above.*

Text format for other chainages

Use infix in intermediate chainages tick box not ticked

*If **ticked**, **Other chainage infix text** is infixed to all other chainages.*

Intermediate chainage infix text custom box

Text to be infixed to all other chainage labels.

Position of infix text custom box

*If **Drop chainage digits to left of position** is **ticked**, the number of characters to retain at the end of the* *chainage value and to be prefixed by **Other chainage infix text**.*

*If **Drop chainage digits to right of position** is **ticked**, the number of characters to remove at the end of the chainage value and to be suffixed by **Other chainage infix text**.*

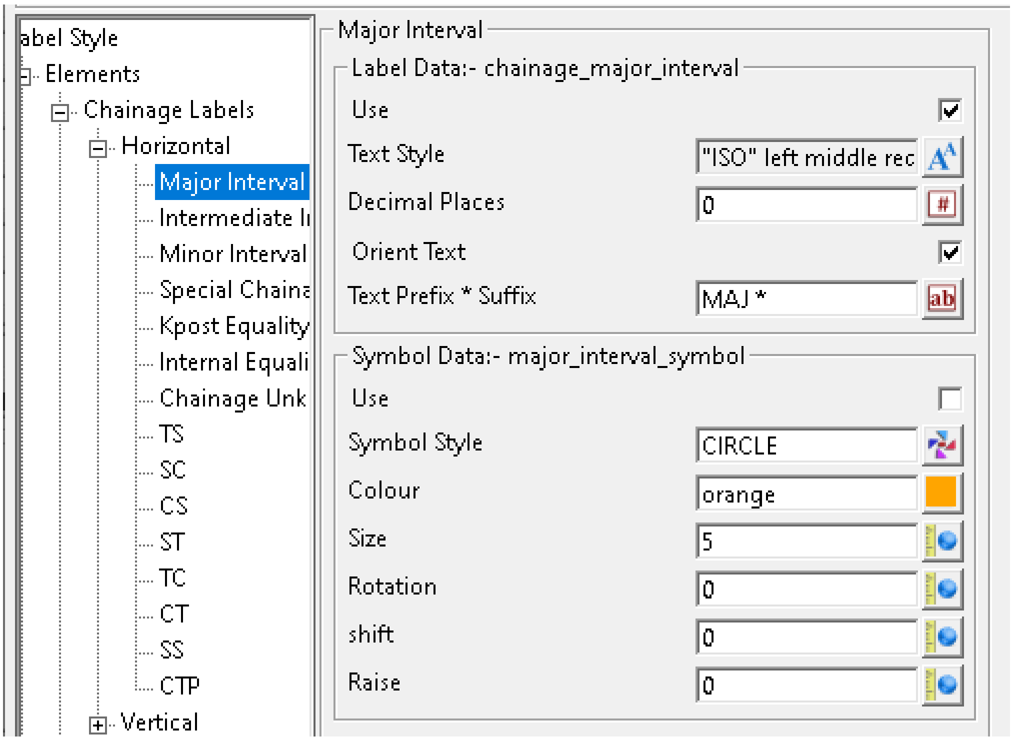
Drop chainage digits to left of position *tick box* *not ticked*

*Refer to **Position of infix text** above.*

Drop chainage digits to right of position tick box not ticked

*Refer to **Position of infix text** above.*

Horizontal >Major Interval



Major Interval

Label Data:- chainage_major_interval

Use tick box ticked

*If **ticked**, major chainage labels will be displayed at the increment specified in **Chainage Labels**.*

Text Style text style box all styles

Text style for the properties of the chainage labels.

Decimal Places integer box 0

The number of decimal places for the chainage labels.

Orient Text tick box ticked

*If **ticked**, the **Text Style Angle** and symbol **Rotation** will be relative to the **Reference String**.*

*If **not ticked**, the **Text Style Angle** and symbol **Rotation** will be relative to the world.*

Text Prefix * Suffix text box MAJ*

*Text to add to the prefix or suffix of the chainage value. The asterisk * denotes where the chainage* *value will be placed.*

Symbol Data:- major_interval_symbol

Use tick box not ticked

*If **ticked**, it will create a symbol at every major interval on the **Reference String**.*

Symbol Style symbol box CIRCLE

*Name of the symbol to place at every major interval on the **Reference String**.*

Colour colour box orange

Colour of the symbol.

Size real box 5

Size of the symbol.

Rotation real box 0

*Rotation of the symbol. The rotation angle is affected by **Orient Text**.*

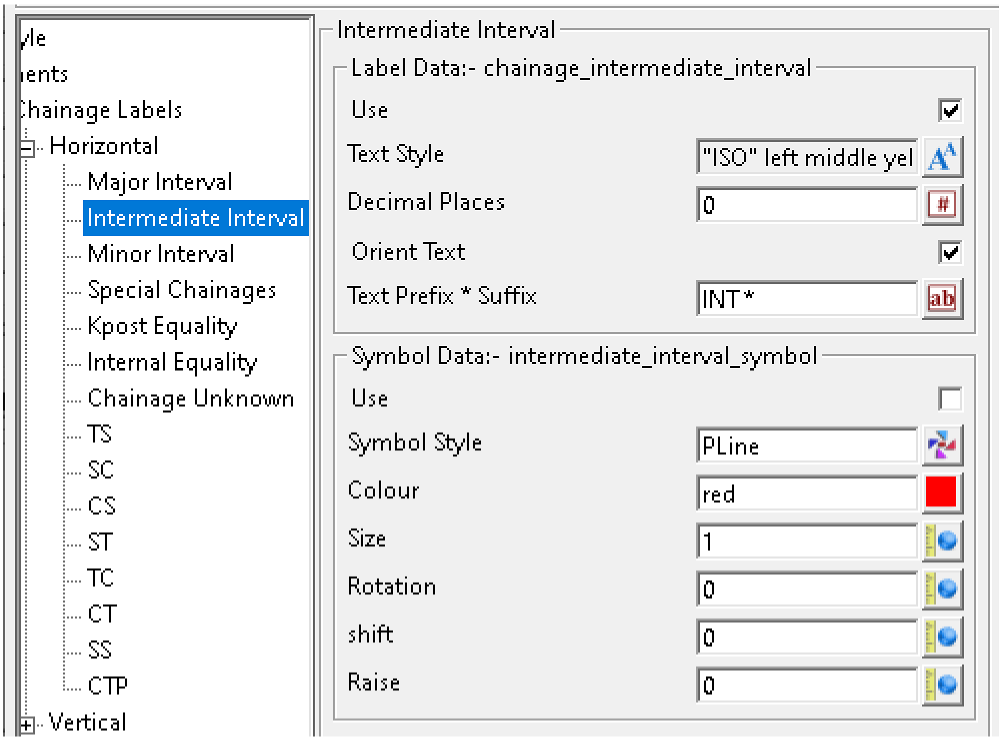
shift real box 0

Distance shifted to the left/right on the X plane.

Raise real box 0

Distance raised/lowered on the Y plane.

Horizontal - Intermediate Interval



Intermediate Interval

Label Data:- chainage_intermediate_interval

Use tick box ticked

*If **ticked**, intermediate chainage labels will be displayed at the increment specified in **Chainage Labels**.*

Text Style	text style box		all styles

Text style for the properties of the chainage labels.

Decimal Places	integer box	0

The number of decimal places for the chainage labels.

Orient Text	tick box	ticked

*If **ticked**, the **Text Style Angle** and symbol **Rotation** will be relative to the **Reference String**.*

*If **not ticked**, the **Text Style Angle** and symbol **Rotation** will be relative to the world.*

Text Prefix * Suffix	text box	INT *

*Text to add to the prefix or suffix of the chainage value. The asterisk * denotes where the chainage value will be placed.*

Symbol Data:- intermediate_interval_symbol

Use	tick box	not ticked

*If **ticked**, it will create a symbol at every intermediate interval on the **Reference String**.*

Symbol Style	symbol box	PLine

*Name of the symbol to place at every intermediate interval on the **Reference String**.*

Colour	colour box	red	available colours

Colour of the symbol.

Size	real box	1

Size of the symbol.

Rotation	real box	0

*Rotation of the symbol. The rotation angle is affected by **Orient Text**.*

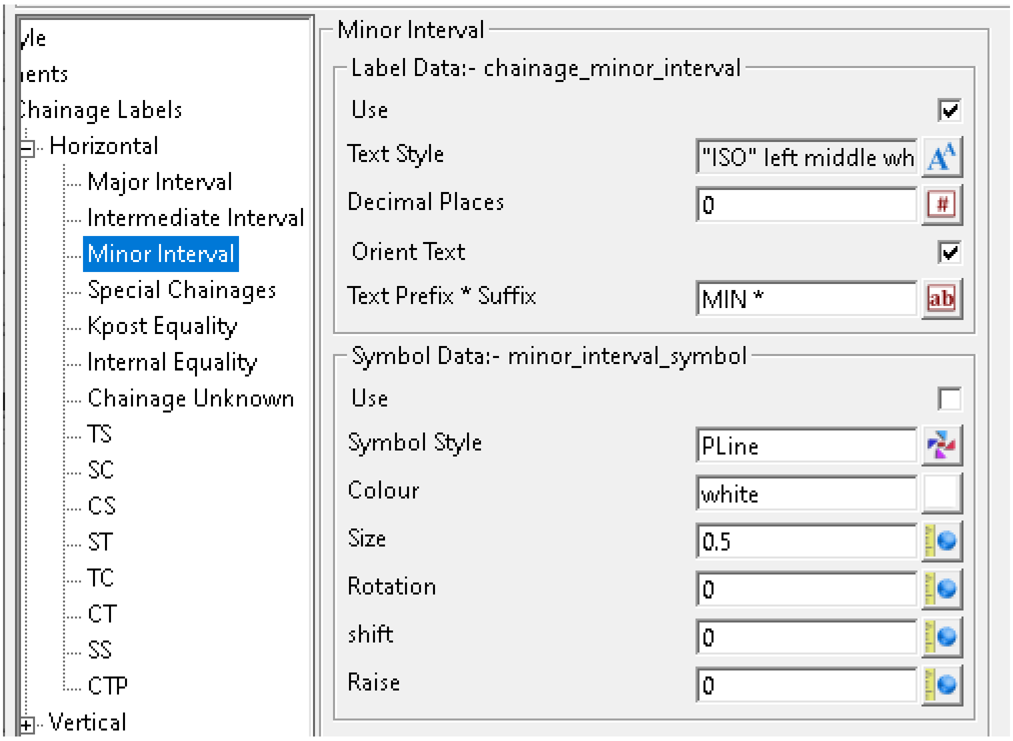
shift	real box	0

Distance shifted to the left/right on the X plane.

Raise	real box	0

Distance raised/lowered on the Y plane.

Horizontal >Minor Interval



Minor Interval

Label Data:- chainage_minor_interval

Use tick box ticked

*If **ticked**, minor chainage labels will be generated at the increment specified in **Chainage Labels**.*

Text Style text style box all styles

Text style for the properties of the chainage labels.

Decimal Places integer box 0

The number of decimal places for the chainage labels.

Orient Text tick box ticked

*If **ticked**, the **Text Style Angle** and symbol **Rotation** will be relative to the **Reference String**.*

*If **not ticked**, the **Text Style Angle** and symbol **Rotation** will be relative to the world.*

Text Prefix * Suffix text box MIN*

*Text to add to the prefix or suffix of the chainage value. The asterisk * denotes where the chainage value will be placed.*

Symbol Data:- minor_interval_symbol

Use tick box not ticked

*If **ticked**, it will create a symbol at every minor interval on the **Reference String**.*

Symbol Style symbol box PLine

*Name of the symbol to place at every minor interval on the **Reference String**.*

Colour colour box white all colours

Colour of the symbol.

Size real box 0.5

Size of the symbol.

Rotation real box 0

Rotation of the symbol. The rotation angle is affected by ***Orient Text****.*

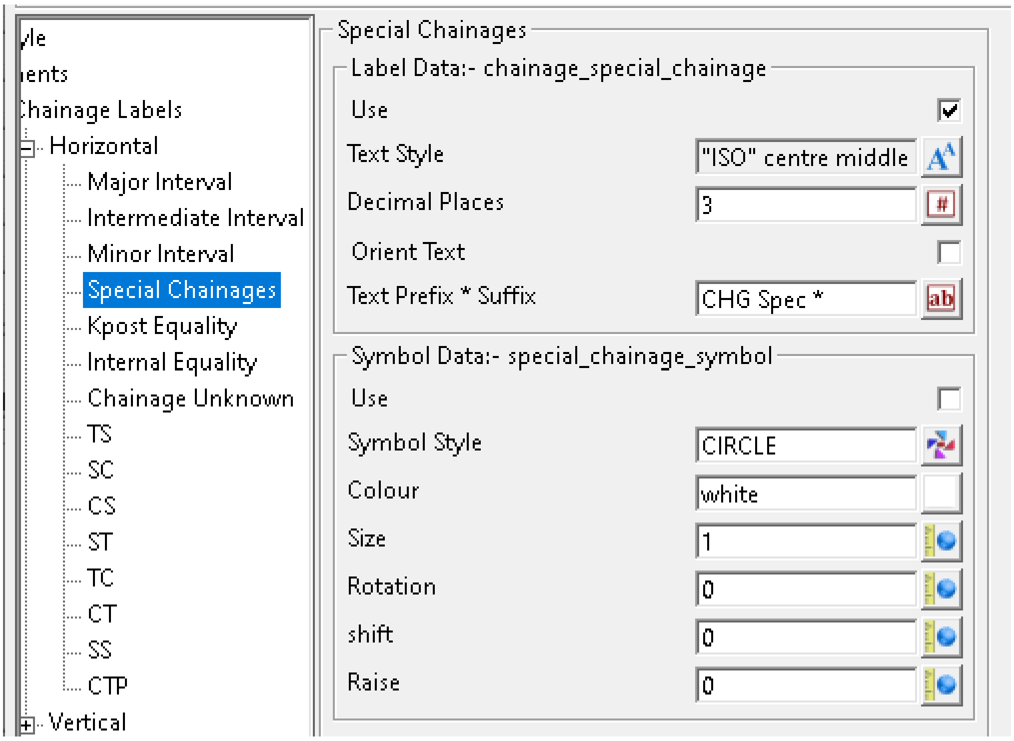
shift real box 0

Distance shifted to the left/right on the X plane.

Raise real box 0

Distance raised/lowered on the Y plane.

Horizontal >Special Chainages



Special Chainages

Label Data:- chainage_special_chainage

Use tick box ticked

If ***ticked****, special chainage labels will be generated.* ***Note: This feature has not been implemented yet.***

Text Style text style box all styles

Text style for the properties of the special chainage labels.

Decimal Places integer box 3

The number of decimal places for the special chainage labels.

Orient Text tick box ticked

If ***ticked****, the* ***Text Style Angle*** *and symbol* ***Rotation*** *will be relative to the* ***Reference String****.*

If ***not ticked****, the* ***Text Style Angle*** *and symbol* ***Rotation*** *will be relative to the world.*

Text Prefix * Suffix text box CHG Spec*

*Text to add to the prefix or suffix of the chainage value. The asterisk * denotes where the special* *chainage value will be placed.*

Symbol Data:- special_chainage_symbol

Use tick box not ticked

*If **ticked**, it will create a symbol at every special chainage on the **Reference String**.*

Symbol Style symbol box CIRCLE

*Name of the symbol to place at every special chainage on the **Reference String**.*

Colour colour box white available colours

Colour of the symbol.

Size real box 1

Size of the symbol.

Rotation real box 0

*Rotation of the symbol. The rotation angle is affected by **Orient Text**.*

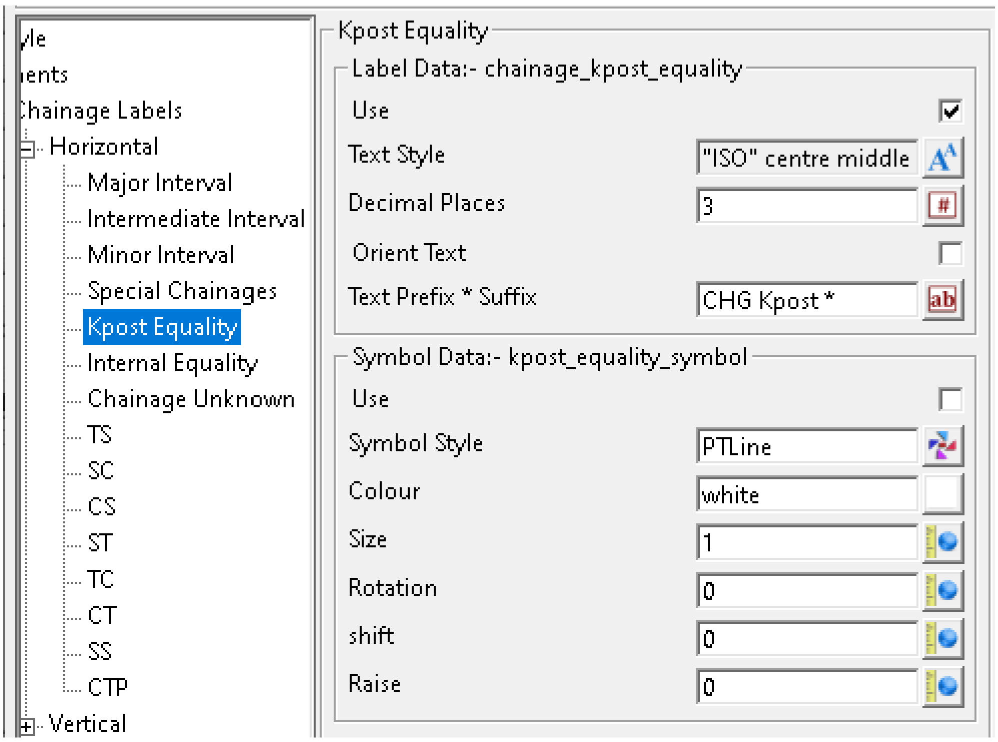
shift real box 0

Distance shifted to the left/right on the X plane.

Raise real box 0

Distance raised/lowered on the Y plane.

Horizontal >Kpost Equality



Kpost Equality

Label Data:- chainage_kpost_equality

Use tick box ticked

*If **ticked**, Kpost Equality labels will be generated. **Note: This feature has not been implemented yet.***

Text Style text style box all styles

Text style for the properties of the Kpost chainage labels.

Decimal Places integer box 3

The number of decimal places for the Kpost chainage labels.

Orient Text tick box not ticked

*If **ticked**, the **Text Style Angle** and symbol **Rotation** will be relative to the **Reference String**.*

*If **not ticked**, the **Text Style Angle** and symbol **Rotation** will be relative to the world.*

Text Prefix * Suffix text box CHG Kpost*

*Text to add to the prefix or suffix of the chainage value. The asterisk * denotes where the Kpost chainage value will be placed.*

Symbol Data:- kpost_equality_symbol

Use tick box not ticked

*If **ticked**, it will create a symbol at every Kpost chainage on the **Reference String**.*

Symbol Style symbol box PtLine

*Name of the symbol to place at every Kpost chainage on the **Reference String**.*

Colour colour box white available colours

Colour of the symbol.

Size real box 1

Size of the symbol.

Rotation real box 0

*Rotation of the symbol. The rotation angle is affected by **Orient Text**.*

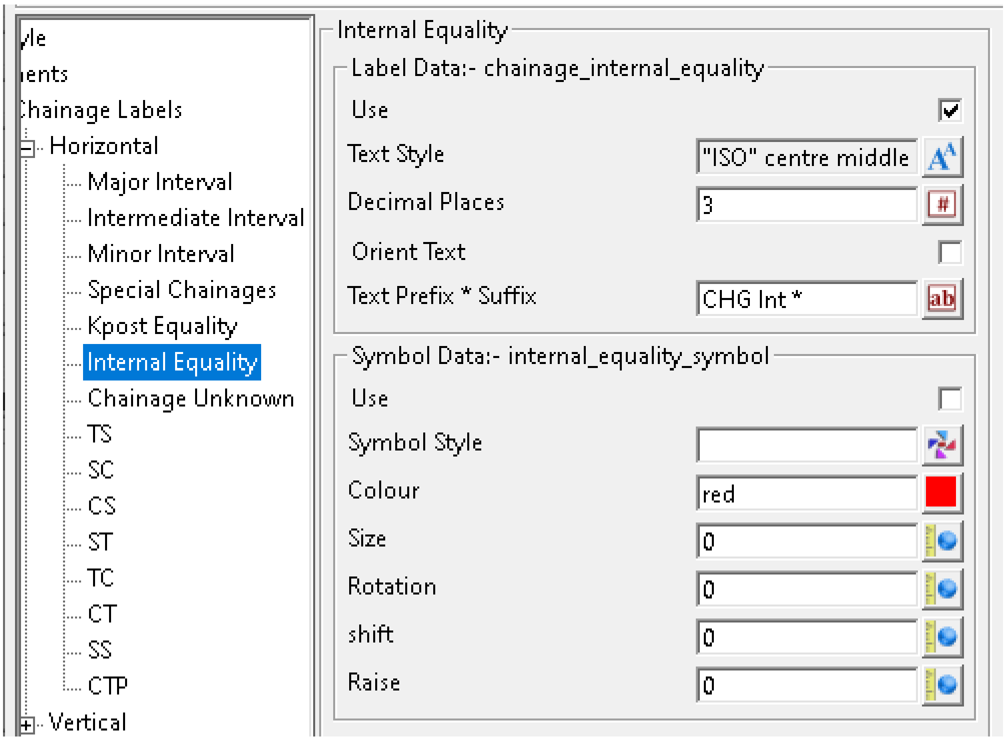
shift real box 0

Distance shifted to the left/right on the X plane.

Raise real box 0

Distance raised/lowered on the Y plane.

Horizontal >Internal Equality



Internal Equality

Label Data:- chainage_internal_equality

Use tick box ticked

*If **ticked**, Internal Equality labels will be generated.* ***Note: This feature has not been implemented yet.***

Text Style text style box all styles

Text style for the properties of the internal chainage labels.

Decimal Places integer box 3

The number of decimal places for the internal chainage labels.

Orient Text tick box not ticked

*If **ticked**, the **Text Style Angle** and symbol **Rotation** will be relative to the **Reference String**.*

*If **not ticked**, the **Text Style Angle** and symbol **Rotation** will be relative to the world.*

Text Prefix * Suffix text box CHG Int*

*Text to add to the prefix or suffix of the chainage value. The asterisk * denotes where the internal chainage value will be placed.*

Symbol Data:- internal_equality_symbol

Use tick box not ticked

*If **ticked**, it will create a symbol at every Kpost chainage on the **Reference String**.*

Symbol Style symbol box

*Name of the symbol to place at every internal chainage on the **Reference String**.*

Colour colour box red available colours

Colour of the symbol.

Size real box 0

Size of the symbol.

Rotation real box 0

Rotation of the symbol. The rotation angle is affected by ***Orient Text****.*

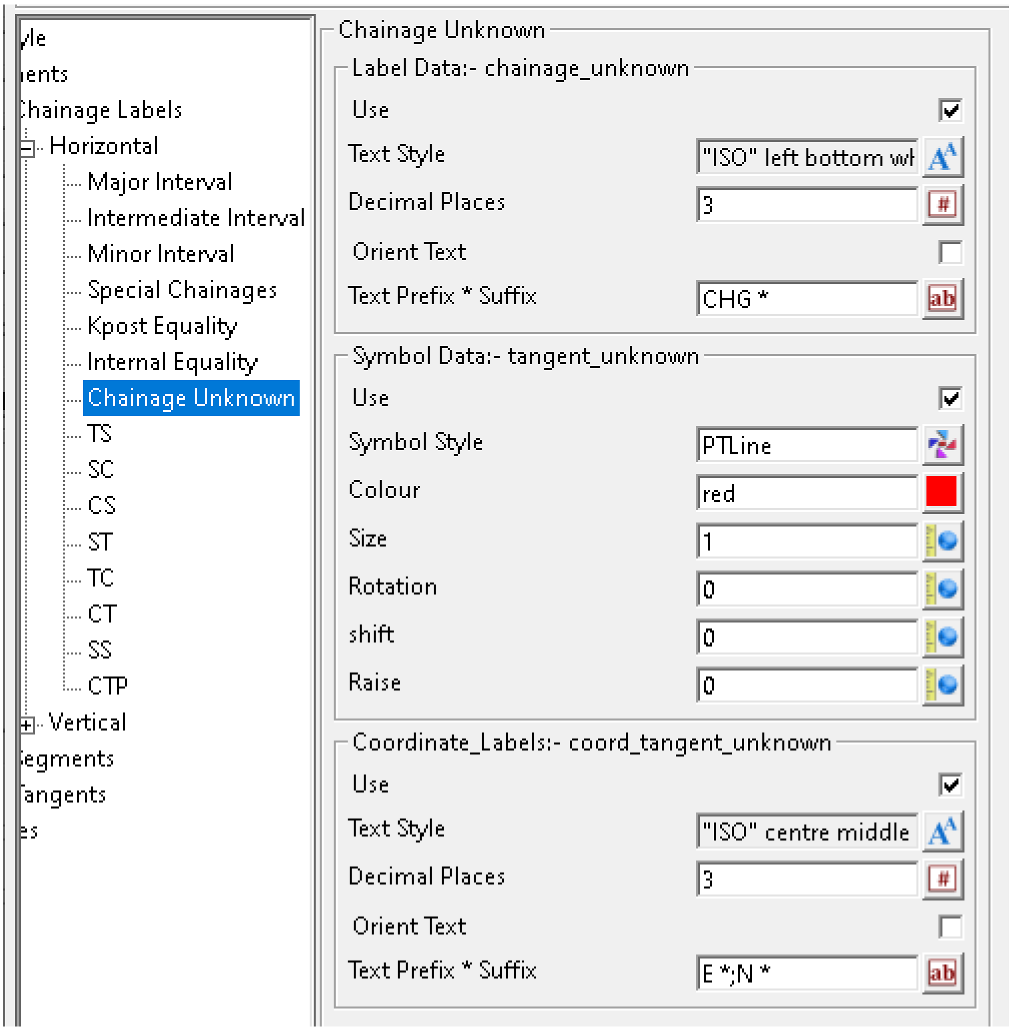
shift real box 0

Distance shifted to the left/right on the X plane.

Raise real box 0

Distance raised/lowered on the Y plane.

Horizontal >Chainage Unknown



Chainage Unknown

Label Data:- chainage_unknown

Use tick box ticked

*If **ticked**, chainage unknown labels will be generated.*

Text Style text style box all styles

Text style for the properties of the chainage unknown labels.

Decimal Places integer box 3

The number of decimal places for the chainage unknown chainage labels.

Orient Text tick box ticked

*If **ticked**, the **Text Style Angle** and symbol **Rotation** will be relative to the **Reference String**.*

*If **not ticked**, the **Text Style Angle** and symbol **Rotation** will be relative to the world.*

Text Prefix * Suffix text box CHG *

*Text to add to the prefix or suffix of the chainage value. The asterisk * denotes where the chainage unknown chainage value will be placed.*

Symbol Data:- tangent_unknown

Use	tick box	ticked	

*If **ticked**, it will create a symbol at every chainage unknown chainage on the **Reference String**.*

Symbol Style	symbol box	PTLine	

*Name of the symbol to place at every chainage unknown chainage on the **Reference String**.*

Colour	colour box	red	available colours

Colour of the symbol.

Size	real box	1	

Size of the symbol.

Rotation	real box	0	

*Rotation of the symbol. The rotation angle is affected by **Orient Text**.*

shift	real box	0	

Distance shifted to the left/right on the X plane.

Raise	real box	0	

Distance raised/lowered on the Y plane.

Coordinate_Labels:- coord_tangent_unknown

Use	tick box	ticked	

*If **ticked**, coordinate labels of chainage unknown locations will be generated. **Note: This feature has not been implemented yet.***

Text Style	text style box		all styles

Text style for the properties of the coordinate labels of chainage unknown locations.

Decimal Places	integer box	3	

The number of decimal places for the coordinate labels of chainage unknown locations.

Orient Text	tick box	not ticked	

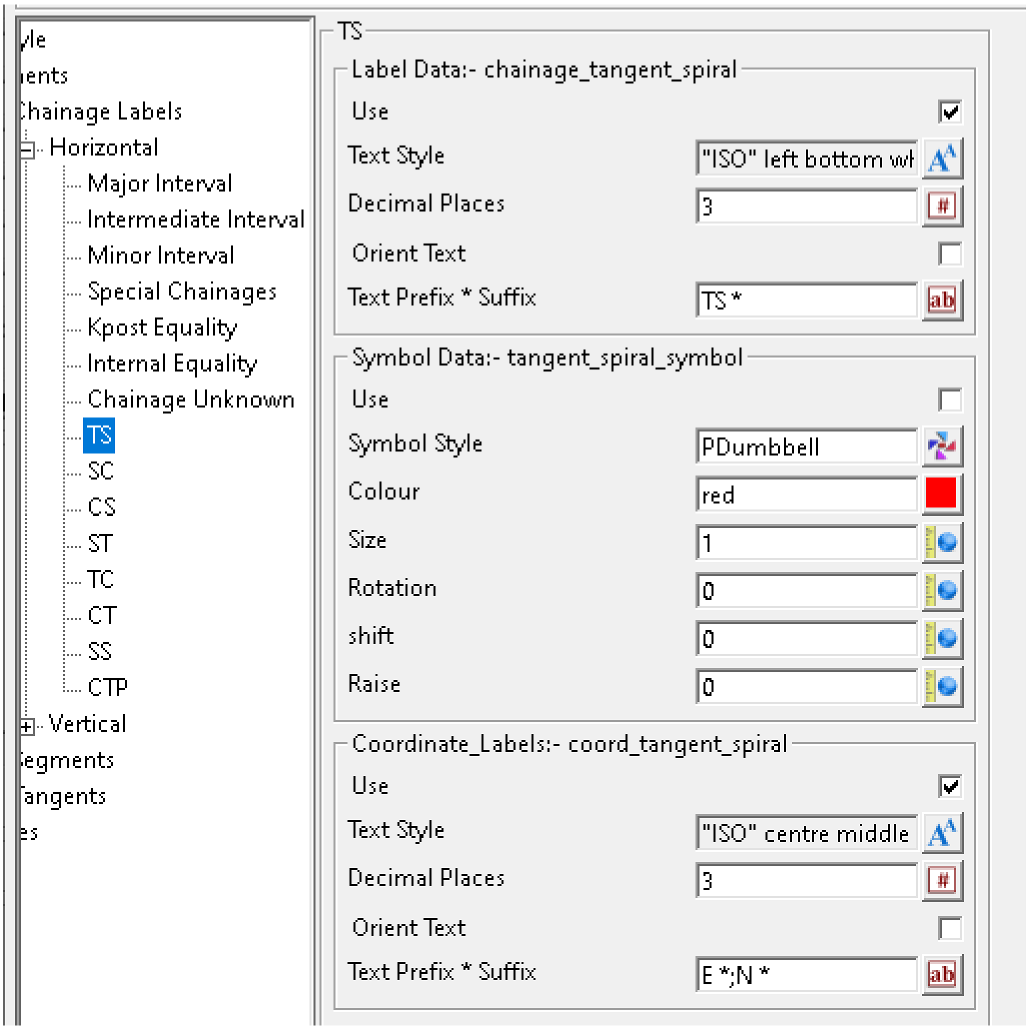
*If **ticked**, the **Text Style Angle** and symbol **Rotation** will be relative to the **Reference String**.*

*If **not ticked**, the **Text Style Angle** and symbol **Rotation** will be relative to the world.*

Text Prefix * Suffix	text box	CHG Int*	

*Text to add to the prefix or suffix of the coordinate value. The asterisk * denotes where the coordinate labels of chainage unknown value will be placed.*

Horizontal >TS



TS

Label Data:- chainage_tangent_spiral

Use tick box ticked

*If **ticked**, tangent-spiral (TS) labels will be generated. **Note: This feature has not been implemented yet.***

Text Style text style box all styles

Text style for the properties of the chainage labels.

Decimal Places integer box 3

The number of decimal places for the chainage labels.

Orient Text tick box not ticked

*If **ticked**, the **Text Style Angle** and symbol **Rotation** will be relative to the **Reference String**.*

*If **not ticked**, the **Text Style Angle** and symbol **Rotation** will be relative to the world.*

Text Prefix * Suffix text box TS *

*Text to add to the prefix or suffix of the chainage value. The asterisk * denotes where the chainage value will be placed.*

Symbol Data:- tangent_spiral_symbol

Use tick box not ticked

*If **ticked**, it will create a symbol at every chainage on the **Reference String**. **Note: This feature has not been implemented yet.***

Symbol Style symbol box PDumbbell

*Name of the symbol to place at every chainage on the **Reference String**.*

Colour colour box red available colours

Colour of the symbol.

Size real box 1

Size of the symbol.

Rotation real box 0

*Rotation of the symbol. The rotation angle is affected by **Orient Text**.*

shift real box 0

Distance shifted to the left/right on the X plane.

Raise real box 0

Distance raised/lowered on the Y plane.

Coordinate_Labels:- coord_tangent_spiral

Use tick box ticked

*If **ticked**, coordinate labels of the locations will be generated. **Note: This feature has not been implemented yet.***

Text Style text style box all styles

Text style for the properties of the coordinate labels of the locations.

Decimal Places integer box 3

The number of decimal places for the coordinate labels of the locations.

Orient Text tick box not ticked

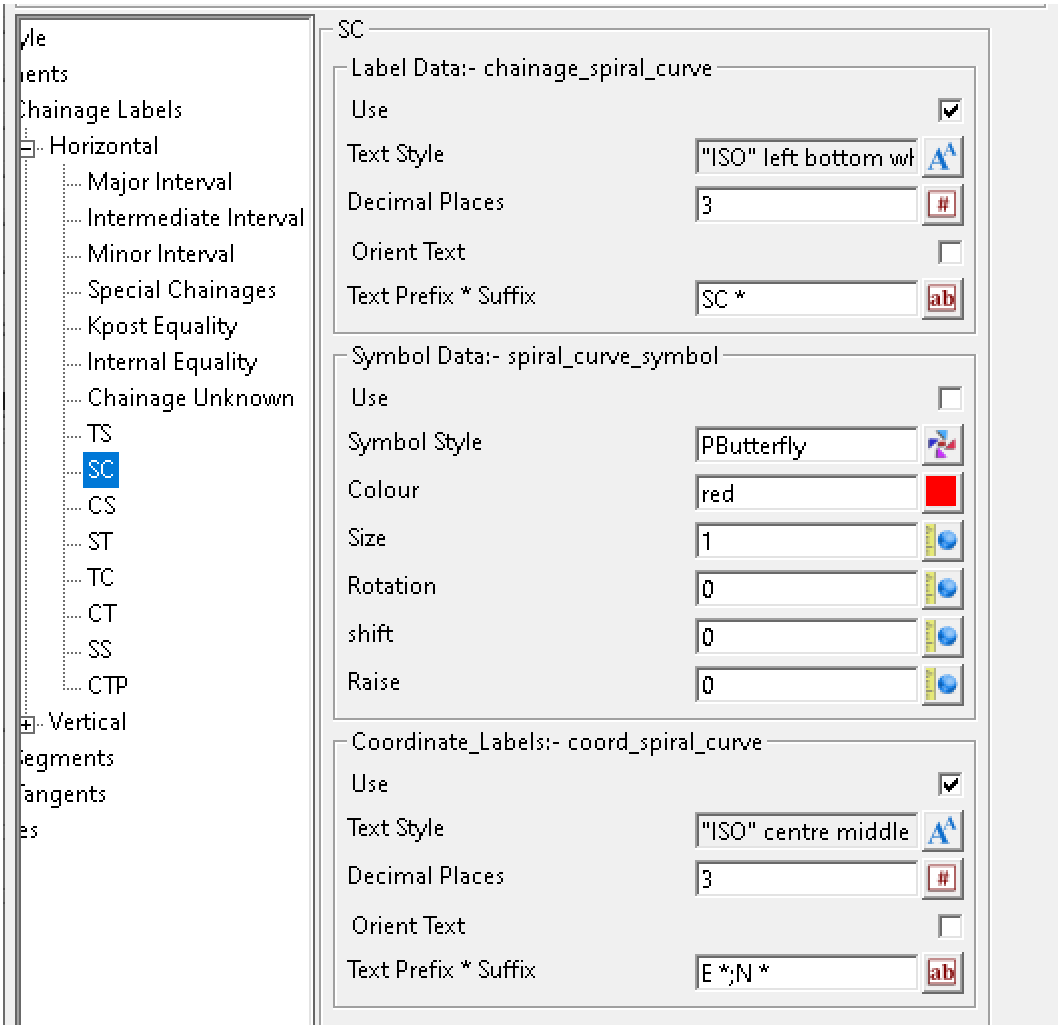
*If **ticked**, the **Text Style Angle** and symbol **Rotation** will be relative to the **Reference String**.*

*If **not ticked**, the **Text Style Angle** and symbol **Rotation** will be relative to the world.*

Text Prefix * Suffix text box E *;N *

*Text to add to the prefix or suffix of the coordinate value. The asterisk * denotes where the coordinate labels of value will be placed.*

Horizontal >SC



SC

Label Data:- chainage_spiral_curve

Use tick box ticked

*If **ticked**, spiral-curve (SC) labels will be generated. **Note: This feature has not been implemented yet.***

Text Style text style box all styles

Text style for the properties of the chainage labels.

Decimal Places integer box 3

The number of decimal places for the chainage labels.

Orient Text tick box not ticked

*If **ticked**, the **Text Style Angle** and symbol **Rotation** will be relative to the **Reference String**.*

*If **not ticked**, the **Text Style Angle** and symbol **Rotation** will be relative to the world.*

Text Prefix * Suffix text box SC *

*Text to add to the prefix or suffix of the chainage value. The asterisk * denotes where the chainage value will be placed.*

Symbol Data:- spiral_curve_symbol

Use	tick box	not ticked	

*If **ticked**, it will create a symbol at every chainage on the **Reference String**. **Note: This feature has not been implemented yet.***

Symbol Style	symbol box	PButterfly	

*Name of the symbol to place at every chainage on the **Reference String**.*

Colour	colour box	red	available colours

Colour of the symbol.

Size	real box	1	

Size of the symbol.

Rotation	real box	0	

*Rotation of the symbol. The rotation angle is affected by **Orient Text**.*

shift	real box	0	

Distance shifted to the left/right on the X plane.

Raise	real box	0	

Distance raised/lowered on the Y plane.

Cooordinate_Labels:- coord_spiral_curve

Use	tick box	ticked	

*If **ticked**, coordinate labels of the locations will be generated. **Note: This feature has not been implemented yet.***

Text Style	text style box		all styles

Text style for the properties of the coordinate labels of the locations.

Decimal Places	integer box	3	

The number of decimal places for the coordinate labels of the locations.

Orient Text	tick box	not ticked	

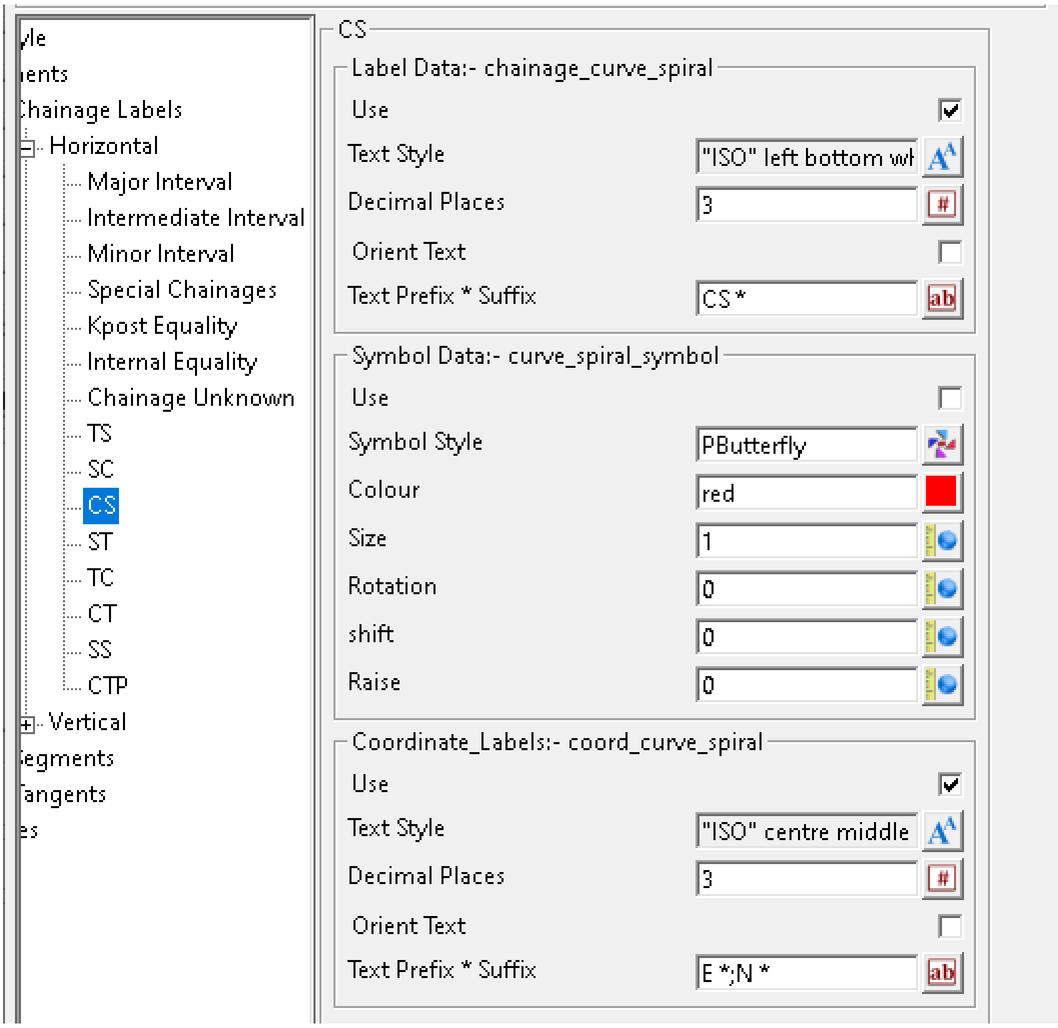
*If **ticked**, the **Text Style Angle** and symbol **Rotation** will be relative to the **Reference String**.*

*If **not ticked**, the **Text Style Angle** and symbol **Rotation** will be relative to the world.*

Text Prefix * Suffix	text box	E *;N *	

*Text to add to the prefix or suffix of the coordinate value. The asterisk * denotes where the coordinate labels of value will be placed.*

Horizontal >CS



CS

Label Data:- chainage_curve_spiral

Use tick box ticked

*If **ticked**, curve-spiral (CS) labels will be generated. **Note: This feature has not been implemented yet.***

Text Style text style box all styles

Text style for the properties of the chainage labels.

Decimal Places integer box 3

The number of decimal places for the chainage labels.

Orient Text tick box not ticked

*If **ticked**, the **Text Style Angle** and symbol **Rotation** will be relative to the **Reference String**.*

*If **not ticked**, the **Text Style Angle** and symbol **Rotation** will be relative to the world.*

Text Prefix * Suffix text box CS *

*Text to add to the prefix or suffix of the chainage value. The asterisk * denotes where the chainage value will be placed.*

Symbol Data:- curve_spiral_symbol

Use tick box not ticked

*If **ticked**, it will create a symbol at every chainage on the **Reference String**. **Note: This feature has not been implemented yet.***

Symbol Style symbol box PButterfly

*Name of the symbol to place at every chainage on the **Reference String**.*

Colour colour box red available colours

Colour of the symbol.

Size real box 1

Size of the symbol.

Rotation real box 0

*Rotation of the symbol. The rotation angle is affected by **Orient Text**.*

shift real box 0

Distance shifted to the left/right on the X plane.

Raise real box 0

Distance raised/lowered on the Y plane.

Cooordinate_Labels:- coord_curve_spiral

Use tick box ticked

*If **ticked**, coordinate labels of the locations will be generated. **Note: This feature has not been implemented yet.***

Text Style text style box all styles

Text style for the properties of the coordinate labels of the locations.

Decimal Places integer box 3

The number of decimal places for the coordinate labels of the locations.

Orient Text tick box not ticked

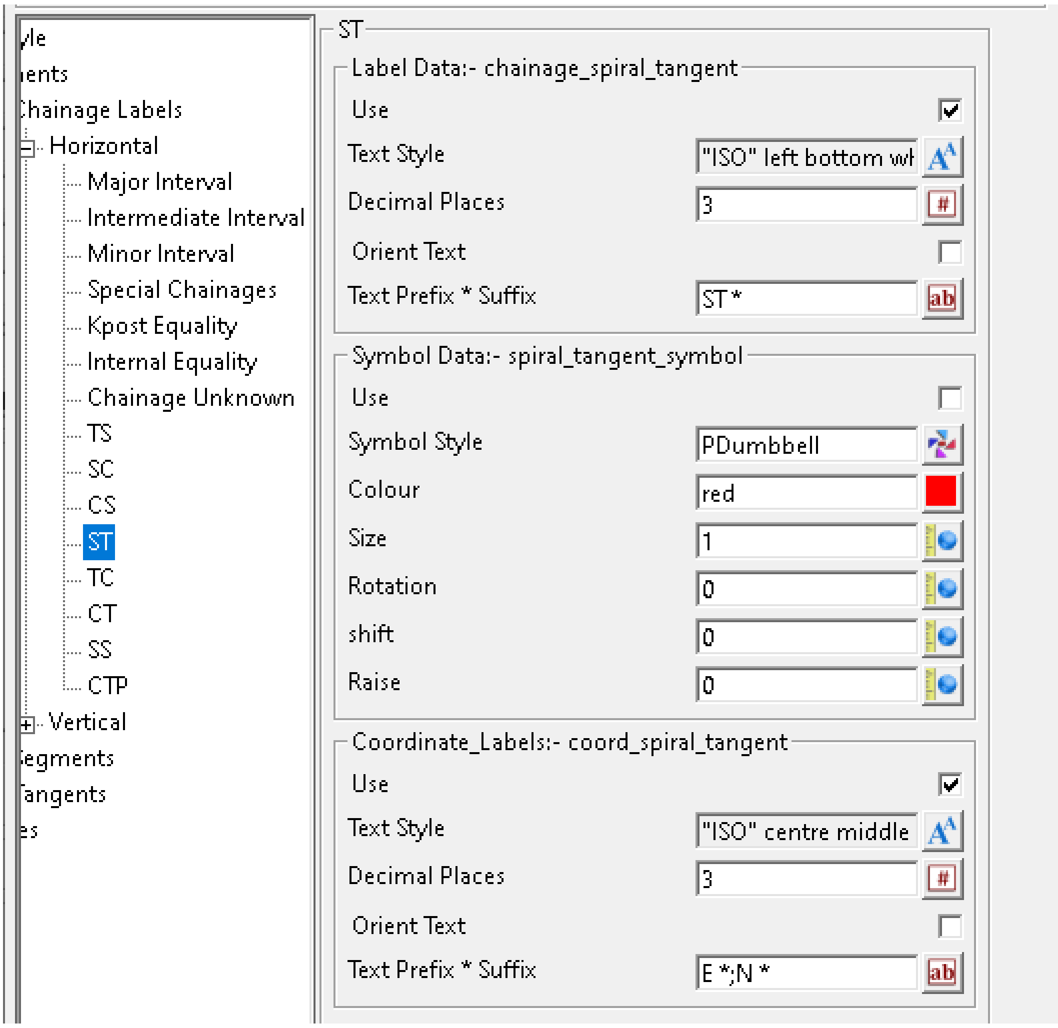
*If **ticked**, the **Text Style Angle** and symbol **Rotation** will be relative to the **Reference String**.*

*If **not ticked**, the **Text Style Angle** and symbol **Rotation** will be relative to the world.*

Text Prefix * Suffix text box E *;N *

*Text to add to the prefix or suffix of the coordinate value. The asterisk * denotes where the coordinate labels of value will be placed.*

Horizontal >ST



ST

Label Data:- chainage_spiral_tangent

Use tick box ticked

*If **ticked**, spiral-tangent (ST) labels will be generated. **Note: This feature has not been implemented yet.***

Text Style text style box all styles

Text style for the properties of the chainage labels.

Decimal Places integer box 3

The number of decimal places for the chainage labels.

Orient Text tick box not ticked

*If **ticked**, the **Text Style Angle** and symbol **Rotation** will be relative to the **Reference String**.*

*If **not ticked**, the **Text Style Angle** and symbol **Rotation** will be relative to the world.*

Text Prefix * Suffix text box ST *

*Text to add to the prefix or suffix of the chainage value. The asterisk * denotes where the chainage value will be placed.*

Symbol Data:- spiral_tangent_symbol

Use	tick box	not ticked	

*If **ticked**, it will create a symbol at every chainage on the **Reference String**. **Note: This feature has not been implemented yet.***

Symbol Style	symbol box	PDumbell	

*Name of the symbol to place at every chainage on the **Reference String**.*

Colour	colour box	red	available colours

Colour of the symbol.

Size	real box	1	

Size of the symbol.

Rotation	real box	0	

*Rotation of the symbol. The rotation angle is affected by **Orient Text**.*

shift	real box	0	

Distance shifted to the left/right on the X plane.

Raise	real box	0	

Distance raised/lowered on the Y plane.

Cooordinate_Labels:- coord_spiral_tangent

Use	tick box	ticked	

*If **ticked**, coordinate labels of the locations will be generated. **Note: This feature has not been implemented yet.***

Text Style	text style box		all styles

Text style for the properties of the coordinate labels of the locations.

Decimal Places	integer box	3	

The number of decimal places for the coordinate labels of the locations.

Orient Text	tick box	not ticked	

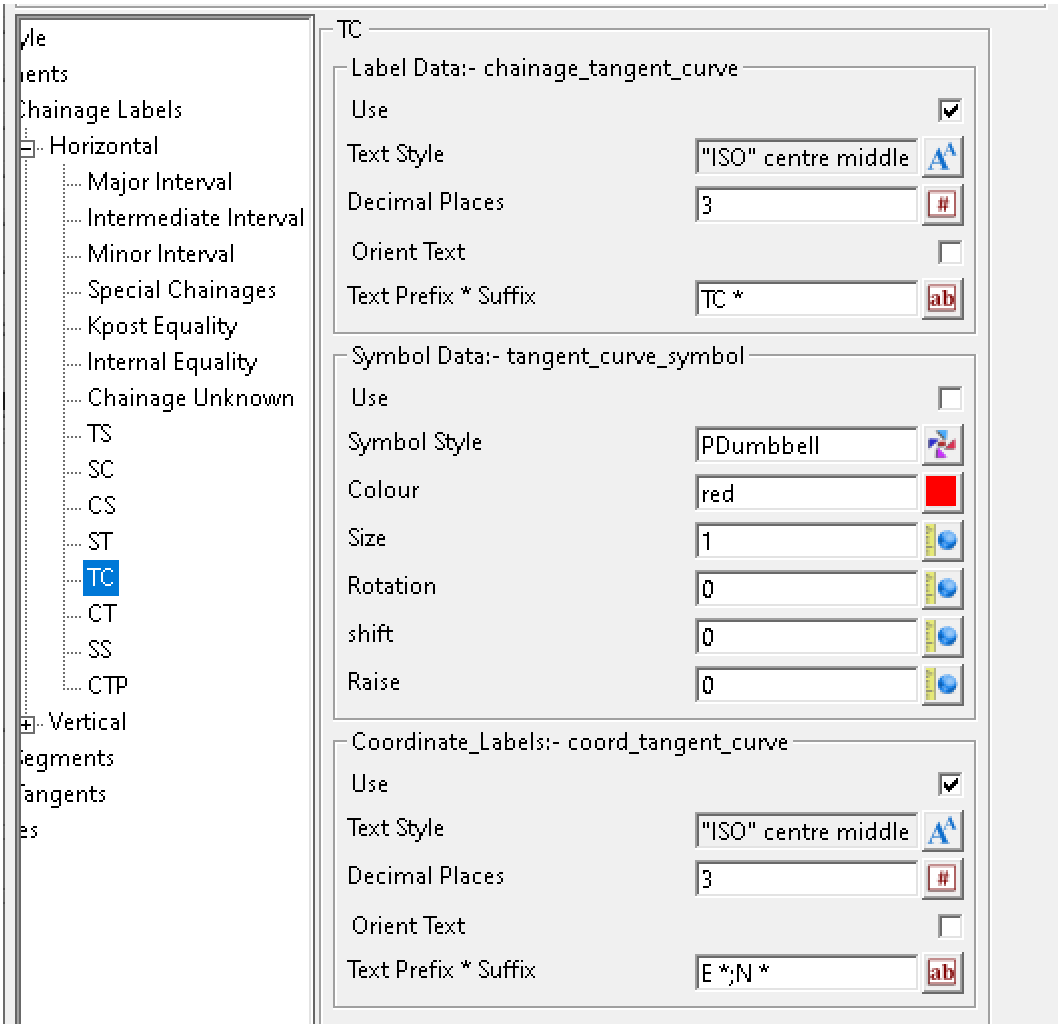
*If **ticked**, the **Text Style Angle** and symbol **Rotation** will be relative to the **Reference String**.*

*If **not ticked**, the **Text Style Angle** and symbol **Rotation** will be relative to the world.*

Text Prefix * Suffix	text box	E *;N *	

*Text to add to the prefix or suffix of the coordinate value. The asterisk * denotes where the coordinate labels of value will be placed.*

Horizontal >TC



TC

Label Data:- chainage_tangent_curve

Use tick box ticked

*If **ticked**, tangent-curve (TC) labels will be generated. **Note: This feature has not been implemented yet.***

Text Style text style box all styles

Text style for the properties of the chainage labels.

Decimal Places integer box 3

The number of decimal places for the chainage labels.

Orient Text tick box not ticked

*If **ticked**, the **Text Style Angle** and symbol **Rotation** will be relative to the **Reference String**.*

*If **not ticked**, the **Text Style Angle** and symbol **Rotation** will be relative to the world.*

Text Prefix * Suffix text box TC *

*Text to add to the prefix or suffix of the chainage value. The asterisk * denotes where the chainage value will be placed.*

Symbol Data:- tangent_curve_symbol

Use tick box not ticked

*If **ticked**, it will create a symbol at every chainage on the **Reference String**. **Note: This feature has not been implemented yet.b***

Symbol Style symbol box PDumbbell

*Name of the symbol to place at every chainage on the **Reference String**.*

Colour colour box red available colours

Colour of the symbol.

Size real box 1

Size of the symbol.

Rotation real box 0

*Rotation of the symbol. The rotation angle is affected by **Orient Text**.*

shift real box 0

Distance shifted to the left/right on the X plane.

Raise real box 0

Distance raised/lowered on the Y plane.

Cooordinate_Labels:- coord_tangent_curve

Use tick box ticked

*If **ticked**, coordinate labels of the locations will be generated. **Note: This feature has not been implemented yet.***

Text Style text style box all styles

Text style for the properties of the coordinate labels of the locations.

Decimal Places integer box 3

The number of decimal places for the coordinate labels of the locations.

Orient Text tick box not ticked

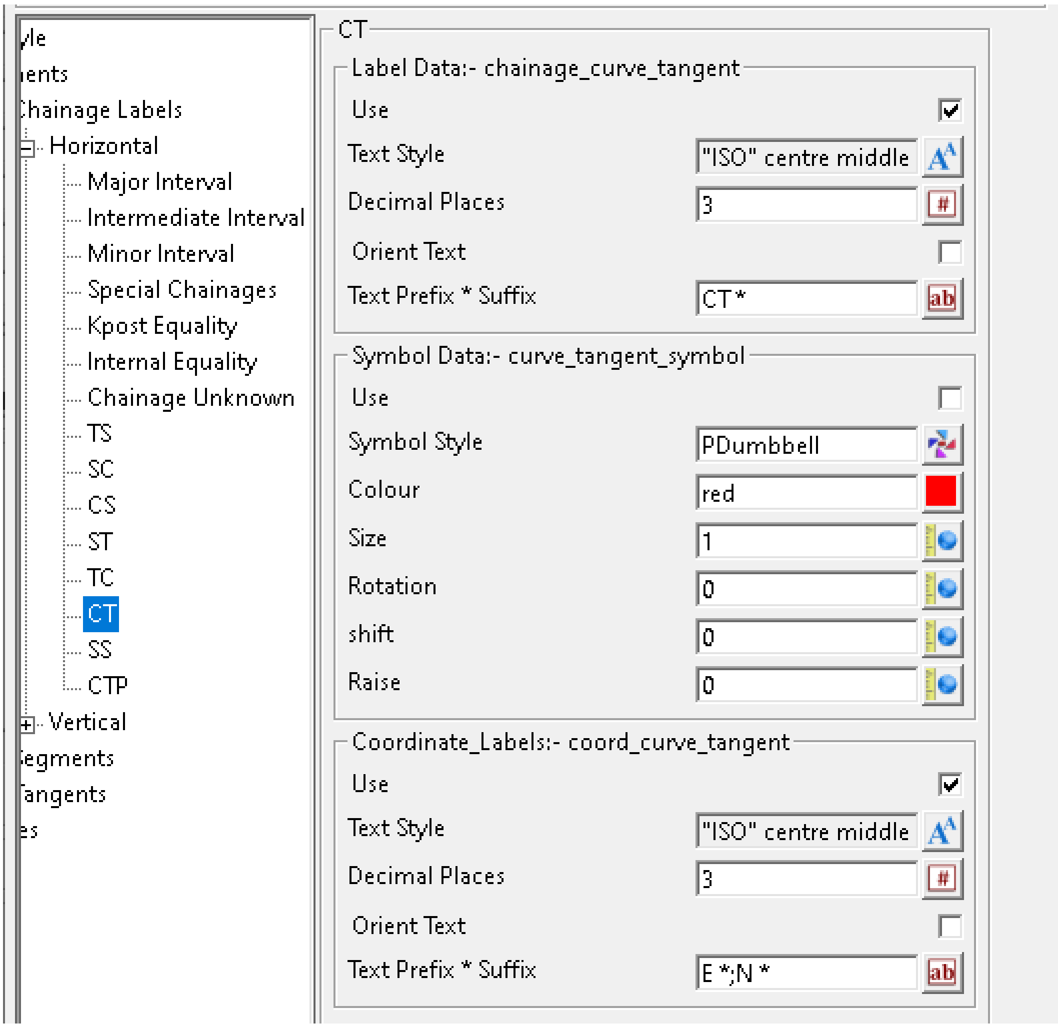
*If **ticked**, the **Text Style Angle** and symbol **Rotation** will be relative to the **Reference String**.*

*If **not ticked**, the **Text Style Angle** and symbol **Rotation** will be relative to the world.*

Text Prefix * Suffix text box E *;N *

*Text to add to the prefix or suffix of the coordinate value. The asterisk * denotes where the coordinate labels of value will be placed.*

Horizontal >CT



CT

Label Data:- chainage_curve_tangent

Use tick box ticked

*If **ticked**, curve-tangent (CT) labels will be generated. **Note: This feature has not been implemented yet.***

Text Style text style box all styles

Text style for the properties of the chainage labels. For information on textstyles refer to 4.10.3 Textstyle.

Decimal Places integer box 3

The number of decimal places for the chainage labels.

Orient Text tick box not ticked

*If **ticked**, the **Text Style Angle** and symbol **Rotation** will be relative to the **Reference String**.*

*If **not ticked**, the **Text Style Angle** and symbol **Rotation** will be relative to the world.*

Text Prefix * Suffix text box CT *

*Text to add to the prefix or suffix of the chainage value. The asterisk * denotes where the chainage value will be placed.*

Symbol Data:- curve_tangent_symbol

Use tick box not ticked

*If **ticked**, it will create a symbol at every chainage on the **Reference String**. **Note: This feature has not been implemented yet.***

Symbol Style symbol box PDumbbell

*Name of the symbol to place at every chainage on the **Reference String**.*

Colour colour box red available colours

Colour of the symbol.

Size real box 1

Size of the symbol.

Rotation real box 0

*Rotation of the symbol. The rotation angle is affected by **Orient Text**.*

shift real box 0

Distance shifted to the left/right on the X plane.

Raise real box 0

Distance raised/lowered on the Y plane.

Cooordinate_Labels:- coord_curve_tangent

Use tick box ticked

*If **ticked**, coordinate labels of the locations will be generated. **Note: This feature has not been implemented yet.***

Text Style text style box all styles

Text style for the properties of the coordinate labels of the locations.

Decimal Places integer box 3

The number of decimal places for the coordinate labels of the locations.

Orient Text tick box not ticked

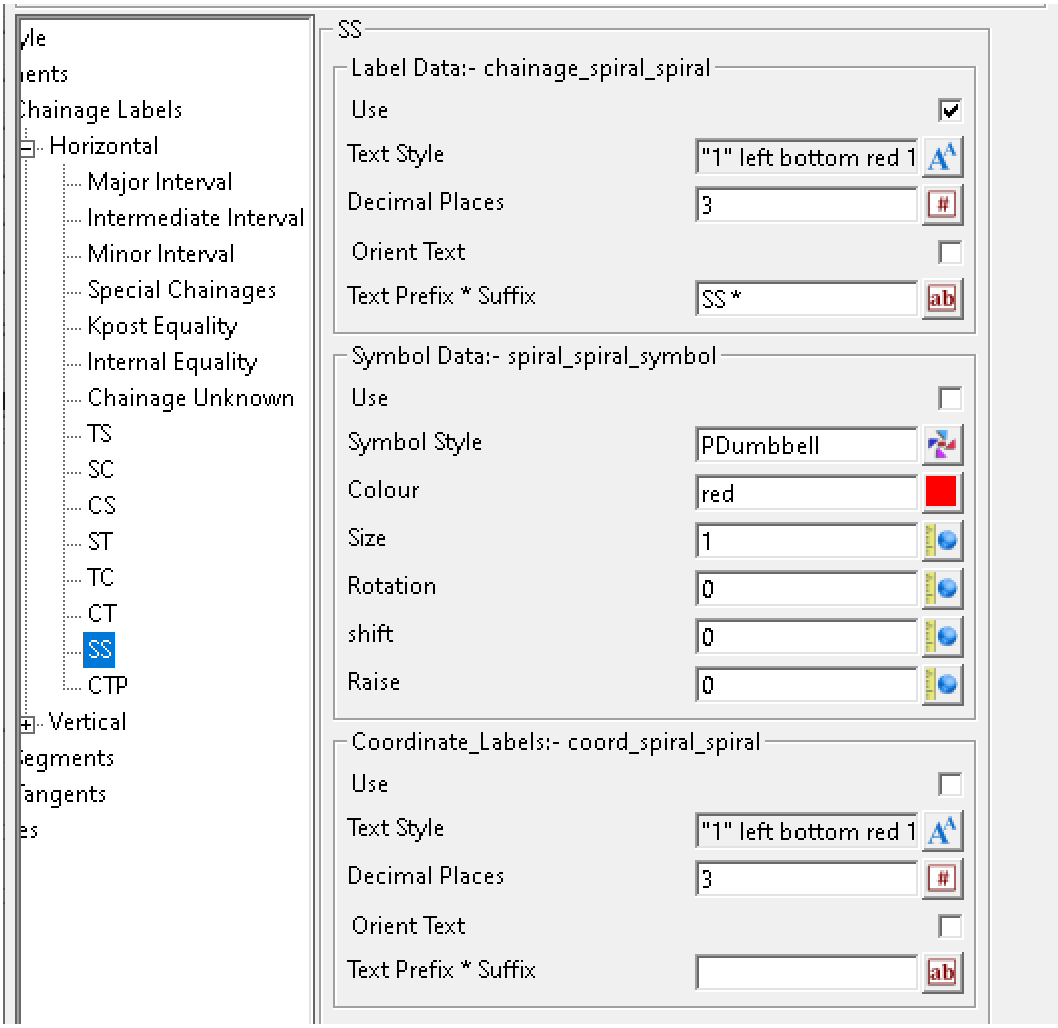
*If **ticked**, the **Text Style Angle** and symbol **Rotation** will be relative to the **Reference String**.*

*If **not ticked**, the **Text Style Angle** and symbol **Rotation** will be relative to the world.*

Text Prefix * Suffix text box E *;N *

*Text to add to the prefix or suffix of the coordinate value. The asterisk * denotes where the coordinate labels of value will be placed.*

Horizontal >SS



SS

Label Data:- chainage_spiral_spiral

Use tick box ticked

*If **ticked**, spiral_spiral (SS) labels will be generated. **Note: This feature has not been implemented yet.***

Text Style text style box all styles

Text style for the properties of the chainage labels.

Decimal Places integer box 3

The number of decimal places for the chainage labels.

Orient Text tick box not ticked

*If **ticked**, the **Text Style Angle** and symbol **Rotation** will be relative to the **Reference String**.*

*If **not ticked**, the **Text Style Angle** and symbol **Rotation** will be relative to the world.*

Text Prefix * Suffix text box SS *

*Text to add to the prefix or suffix of the chainage value. The asterisk * denotes where the chainage value will be placed.*

Symbol Data:- spiral_spiral_symbol

Use tick box not ticked

*If **ticked**, it will create a symbol at every chainage on the **Reference String**. **Note: This feature has not been implemented yet.***

Symbol Style symbol box PDumbbell

*Name of the symbol to place at every chainage on the **Reference String**.*

Colour colour box red available colours

Colour of the symbol.

Size real box 1

Size of the symbol.

Rotation real box 0

*Rotation of the symbol. The rotation angle is affected by **Orient Text**.*

shift real box 0

Distance shifted to the left/right on the X plane.

Raise real box 0

Distance raised/lowered on the Y plane.

Cooordinate_Labels:- coord_spiral_spiral

Use tick box not ticked

*If **ticked**, coordinate labels of the locations will be generated. **Note: This feature has not been implemented yet.***

Text Style text style box all styles

Text style for the properties of the coordinate labels of the locations.

Decimal Places integer box 3

The number of decimal places for the coordinate labels of the locations.

Orient Text tick box not ticked

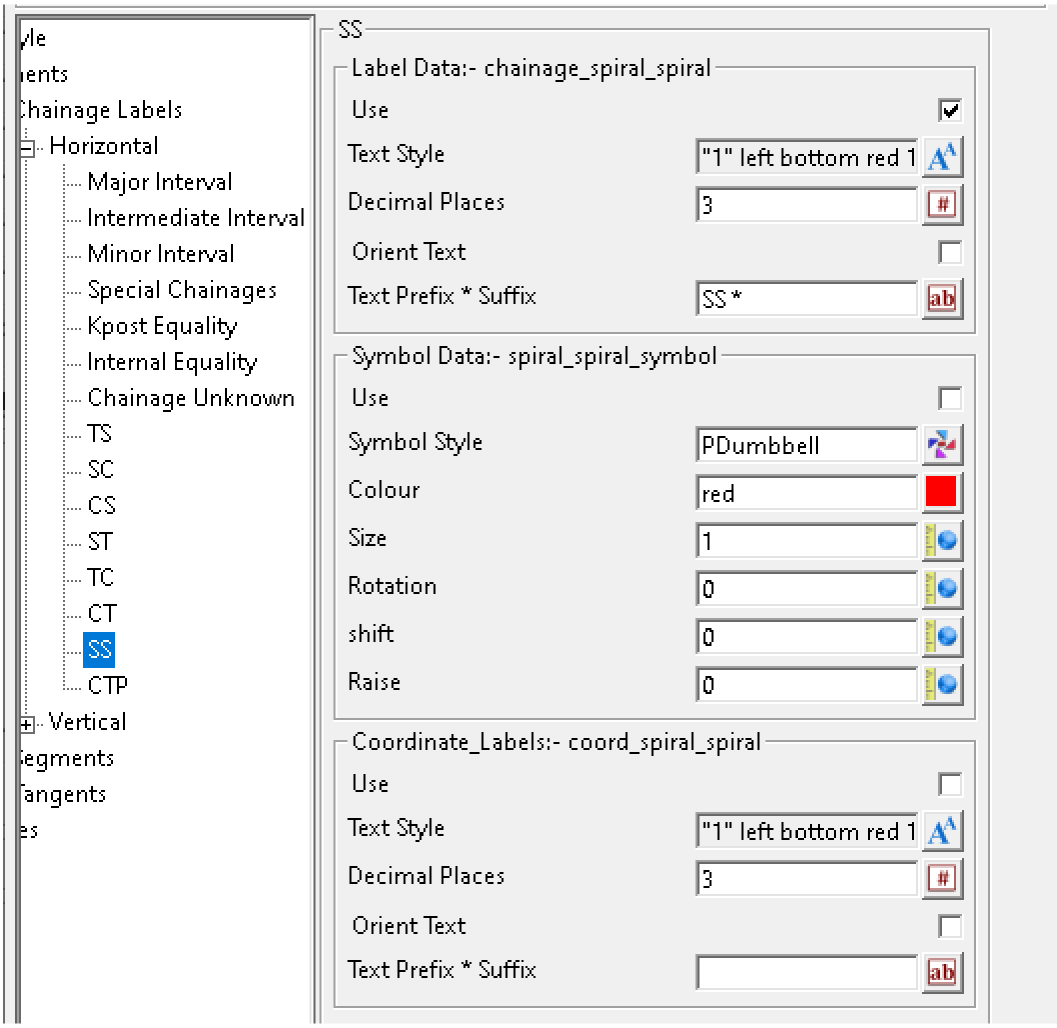
*If **ticked**, the **Text Style Angle** and symbol **Rotation** will be relative to the **Reference String**.*

*If **not ticked**, the **Text Style Angle** and symbol **Rotation** will be relative to the world.*

Text Prefix * Suffix text box E *;N *

*Text to add to the prefix or suffix of the coordinate value. The asterisk * denotes where the coordinate labels of value will be placed.*

Horizontal >CTP



CTP

Label Data:- chainage_common_tangent

Use tick box ticked

*If **ticked**, common tangent point (CTP) labels will be generated. **Note: This feature has not been implemented yet.***

Text Style text style box all styles

Text style for the properties of the chainage labels.

Decimal Places integer box 3

The number of decimal places for the chainage labels.

Orient Text tick box not ticked

*If **ticked**, the **Text Style Angle** and symbol **Rotation** will be relative to the **Reference String**.*

*If **not ticked**, the **Text Style Angle** and symbol **Rotation** will be relative to the world.*

Text Prefix * Suffix text box CTP *

*Text to add to the prefix or suffix of the chainage value. The asterisk * denotes where the chainage value will be placed.*

Symbol Data:- common_tangent_symbol

Use tick box not ticked

*If **ticked**, it will create a symbol at every chainage on the **Reference String**. **Note: This feature has not been implemented yet.***

Symbol Style symbol box PDumbbell

*Name of the symbol to place at every chainage on the **Reference String**.*

Colour colour box red available colours

Colour of the symbol.

Size real box 1

Size of the symbol.

Rotation real box 0

*Rotation of the symbol. The rotation angle is affected by **Orient Text**.*

shift real box 0

Distance shifted to the left/right on the X plane.

Raise real box 0

Distance raised/lowered on the Y plane.

Cooordinate_Labels:- coord_commom_tangent

Use tick box not ticked

*If **ticked**, coordinate labels of the locations will be generated. **Note: This feature has not been implemented yet.***

Text Style text style box all styles

Text style for the properties of the coordinate labels of the locations.

Decimal Places integer box 3

The number of decimal places for the coordinate labels of the locations.

Orient Text tick box not ticked

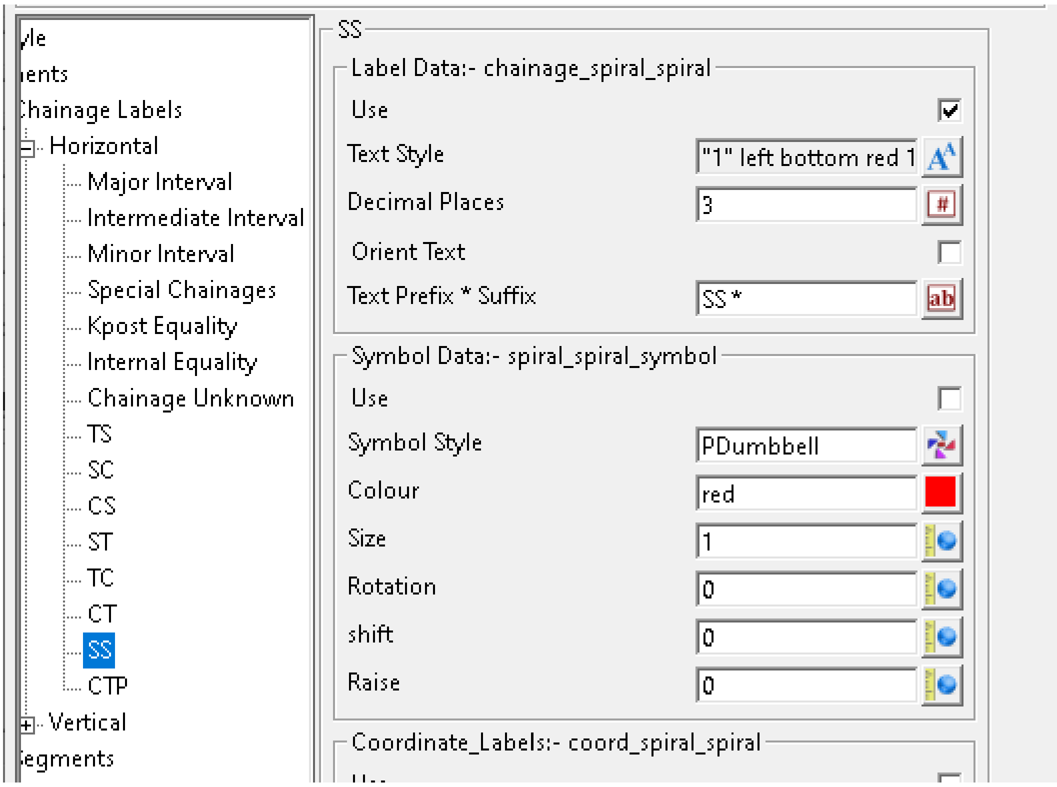
*If **ticked**, the **Text Style Angle** and symbol **Rotation** will be relative to the **Reference String**.*

*If **not ticked**, the **Text Style Angle** and symbol **Rotation** will be relative to the world.*

Text Prefix * Suffix text box E *;N *

*Text to add to the prefix or suffix of the coordinate value. The asterisk * denotes where the coordinate labels of value will be placed.*

Vertical >Unknown



Unknown

Label Data:- chainage_vert_unknown

Use tick box ticked

*If **ticked**, unknown vertical point labels will be generated.*

Text Style text style box all styles

Text style for the properties of the chainage labels.

Decimal Places integer box 3

The number of decimal places for the chainage labels.

Orient Text tick box not ticked

*If **ticked**, the **Text Style Angle** and symbol **Rotation** will be relative to the **Reference String**.*

*If **not ticked**, the **Text Style Angle** and symbol **Rotation** will be relative to the world.*

Text Prefix * Suffix text box Chd *

*Text to add to the prefix or suffix of the chainage value. The asterisk * denotes where the chainage value will be placed.*

Symbol Data:- vert_unknown_symbol

Use tick box not ticked

*If **ticked**, it will create a symbol at every chainage on the **Reference String**.*

Symbol Style symbol box CIRCLE

*Name of the symbol to place at every chainage on the **Reference String**.*

Colour colour box white available colours

Colour of the symbol.

Size	real box	1

Size of the symbol.

Rotation	real box	0

*Rotation of the symbol. The rotation angle is affected by **Orient Text**.*

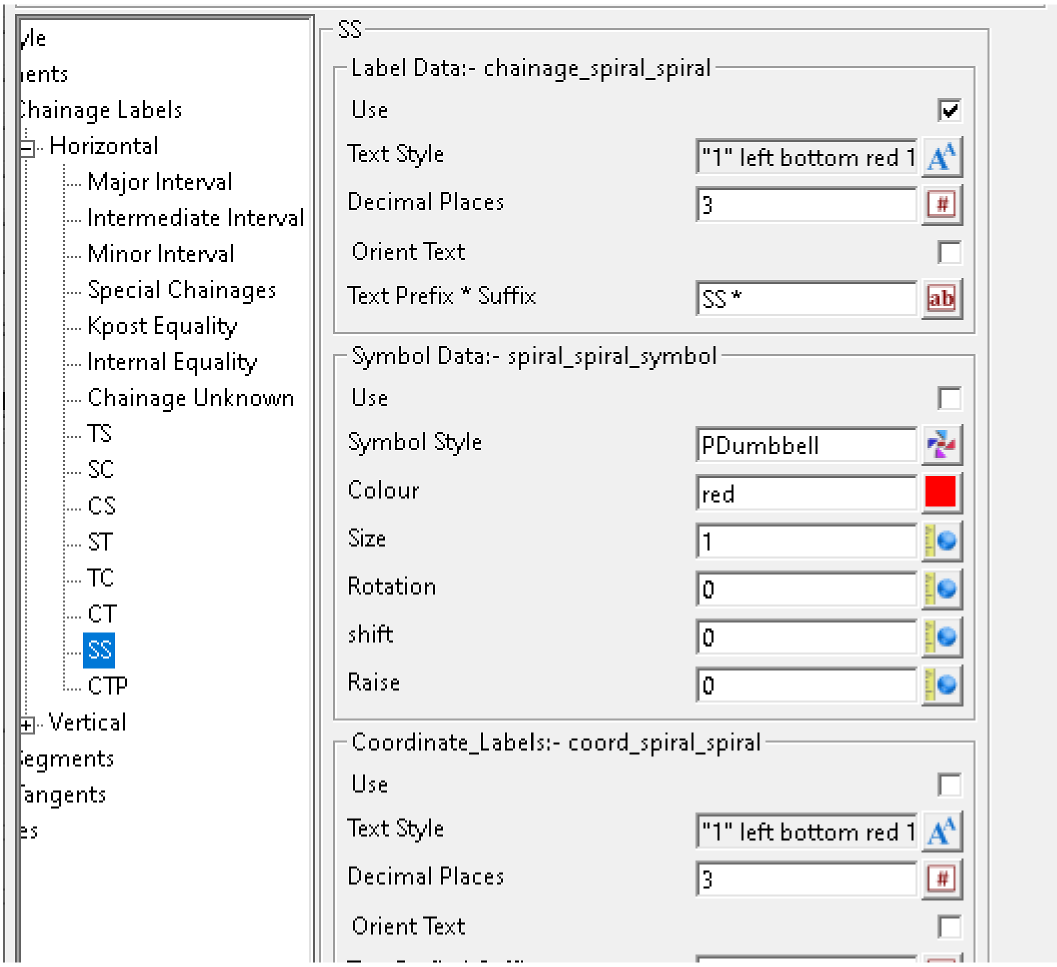
shift	real box	0

Distance shifted to the left/right on the X plane.

Raise	real box	0

Distance raised/lowered on the Y plane.

Vertical >TC



Unknown

Label Data:- chainage_vert_tc

Use tick box ticked

*If **ticked**, vertical tangent-curve labels will be generated.*

Text Style text style box all styles

Text style for the properties of the chainage labels.

Decimal Places integer box 3

The number of decimal places for the chainage labels.

Orient Text tick box not ticked

*If **ticked**, the **Text Style Angle** and symbol **Rotation** will be relative to the **Reference String**.*

*If **not ticked**, the **Text Style Angle** and symbol **Rotation** will be relative to the world.*

Text Prefix * Suffix text box Chd *

*Text to add to the prefix or suffix of the chainage value. The asterisk * denotes where the chainage value will be placed.*

Symbol Data:- vert_tc_symbol

Use	tick box	not ticked	

*If **ticked**, it will create a symbol at every chainage on the **Reference String**.*

Symbol Style	symbol box	CIRCLE	

*Name of the symbol to place at every chainage on the **Reference String**.*

Colour	colour box	white	available colours

Colour of the symbol.

Size	real box	1	

Size of the symbol.

Rotation	real box	0	

*Rotation of the symbol. The rotation angle is affected by **Orient Text**.*

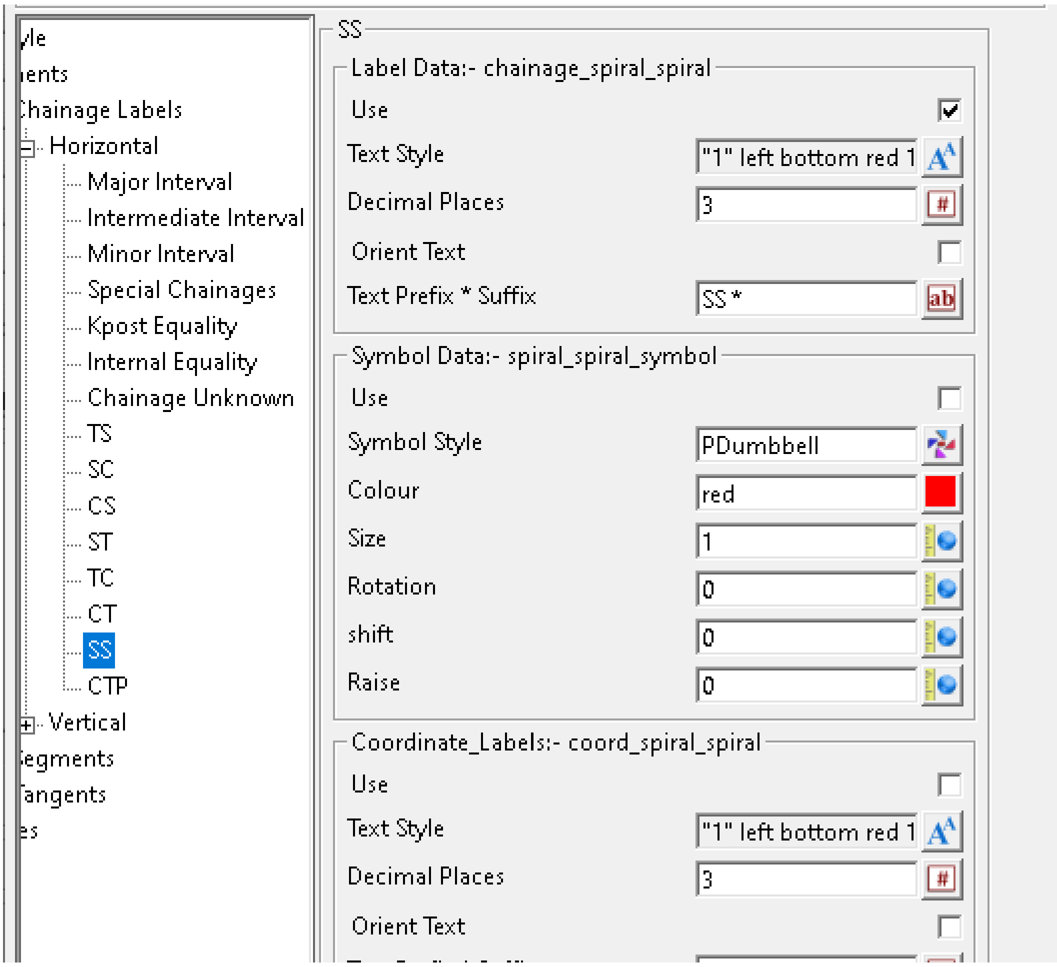
shift	real box	0	

Distance shifted to the left/right on the X plane.

Raise	real box	0	

Distance raised/lowered on the Y plane.

Vertical >CT



CT

Label Data:- chainage_vert_ct

Use tick box ticked

*If **ticked**, vertical curve-tangent labels will be generated.*

Text Style text style box all styles

Text style for the properties of the chainage labels.

Decimal Places integer box 3

The number of decimal places for the chainage labels.

Orient Text tick box not ticked

*If **ticked**, the **Text Style Angle** and symbol **Rotation** will be relative to the **Reference String**.*

*If **not ticked**, the **Text Style Angle** and symbol **Rotation** will be relative to the world.*

Text Prefix * Suffix text box Chd *

*Text to add to the prefix or suffix of the chainage value. The asterisk * denotes where the chainage value will be placed.*

Symbol Data:- vert_ct_symbol

Use tick box not ticked

*If **ticked**, it will create a symbol at every chainage on the **Reference String**.*

Symbol Style	symbol box	CIRCLE	

Name of the symbol to place at every chainage on the ***Reference String****.*

Colour	colour box	white	available colours

Colour of the symbol.

Size	real box	1	

Size of the symbol.

Rotation	real box	0	

Rotation of the symbol. The rotation angle is affected by ***Orient Text****.*

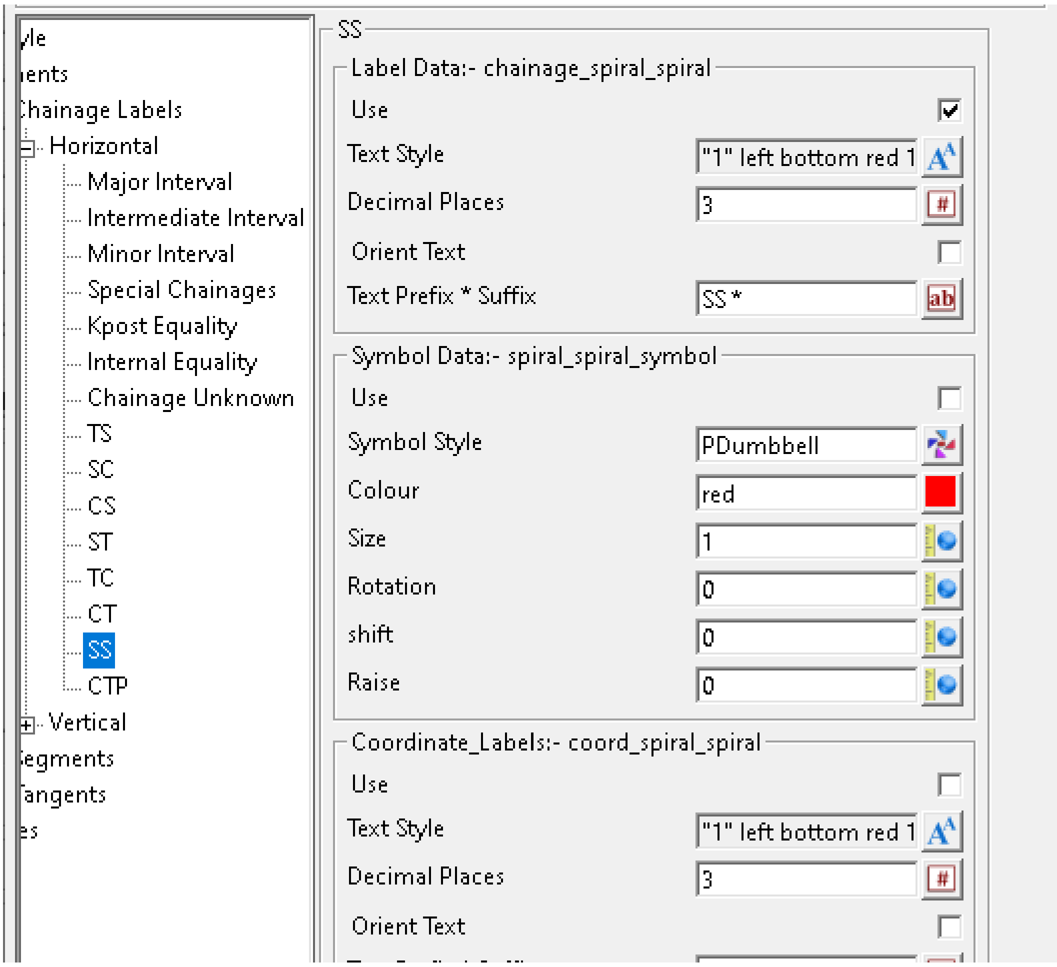
shift	real box	0	

Distance shifted to the left/right on the X plane.

Raise	real box	0	

Distance raised/lowered on the Y plane.

Vertical >CC



CC

Label Data:- chainage_vert_cc

Use tick box ticked

*If **ticked**, vertical curve-curve labels will be generated*

Text Style text style box all styles

Text style for the properties of the chainage labels. For information on textstyles refer to 4.10.3 Textstyle.

Decimal Places integer box 3

The number of decimal places for the chainage labels.

Orient Text tick box not ticked

*If **ticked**, the **Text Style Angle** and symbol **Rotation** will be relative to the **Reference String**.*

*If **not ticked**, the **Text Style Angle** and symbol **Rotation** will be relative to the world.*

Text Prefix * Suffix text box Chd *

*Text to add to the prefix or suffix of the chainage value. The asterisk * denotes where the chainage value will be placed.*

Symbol Data:- vert_cc_symbol

Use	tick box	not ticked	

*If **ticked**, it will create a symbol at every chainage on the **Reference String**.*

Symbol Style	symbol box	CIRCLE	

*Name of the symbol to place at every chainage on the **Reference String**.*

Colour	colour box	white	available colours

Colour of the symbol.

Size	real box	1	

Size of the symbol.

Rotation	real box	0	

*Rotation of the symbol. The rotation angle is affected by **Orient Text**.*

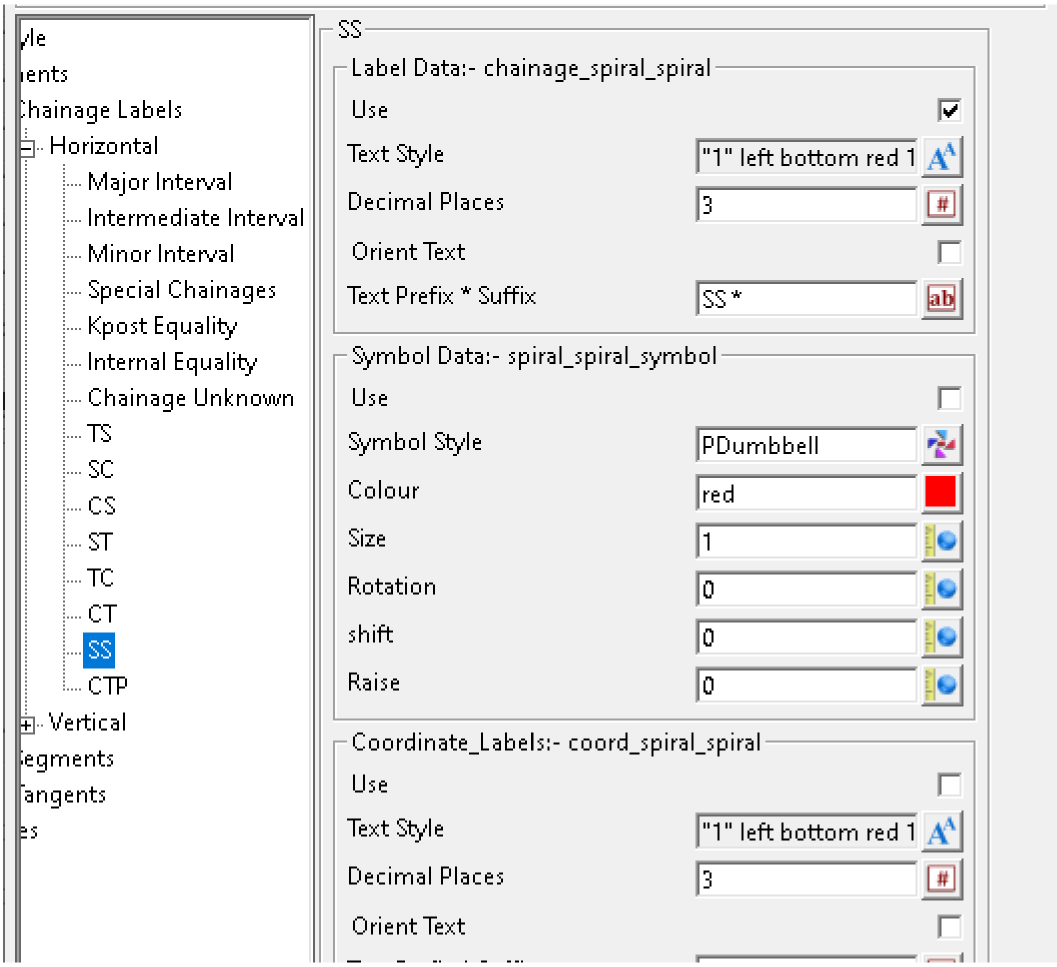
shift	real box	0	

Distance shifted to the left/right on the X plane.

Raise	real box	0	

Distance raised/lowered on the Y plane.

Vertical >Crest



Crest

Label Data:- chainage_vert_crest

Use tick box ticked

*If **ticked**, vertical curve crest labels will be generated. **Note: This feature has not been implemented yet.***

Text Style text style box all styles

Text style for the properties of the chainage labels.

Decimal Places integer box 3

The number of decimal places for the chainage labels.

Orient Text tick box not ticked

*If **ticked**, the **Text Style Angle** and symbol **Rotation** will be relative to the **Reference String**.*

*If **not ticked**, the **Text Style Angle** and symbol **Rotation** will be relative to the world.*

Text Prefix * Suffix text box Chd *

*Text to add to the prefix or suffix of the chainage value. The asterisk * denotes where the chainage value will be placed.*

Symbol Data:- vert_crest_symbol

Use	tick box	not ticked	

*If **ticked**, it will create a symbol at every chainage on the **Reference String**.*

Symbol Style	symbol box	CIRCLE	

*Name of the symbol to place at every chainage on the **Reference String**.*

Colour	colour box	white	available colours

Colour of the symbol.

Size	real box	1	

Size of the symbol.

Rotation	real box	0	

*Rotation of the symbol. The rotation angle is affected by **Orient Text**.*

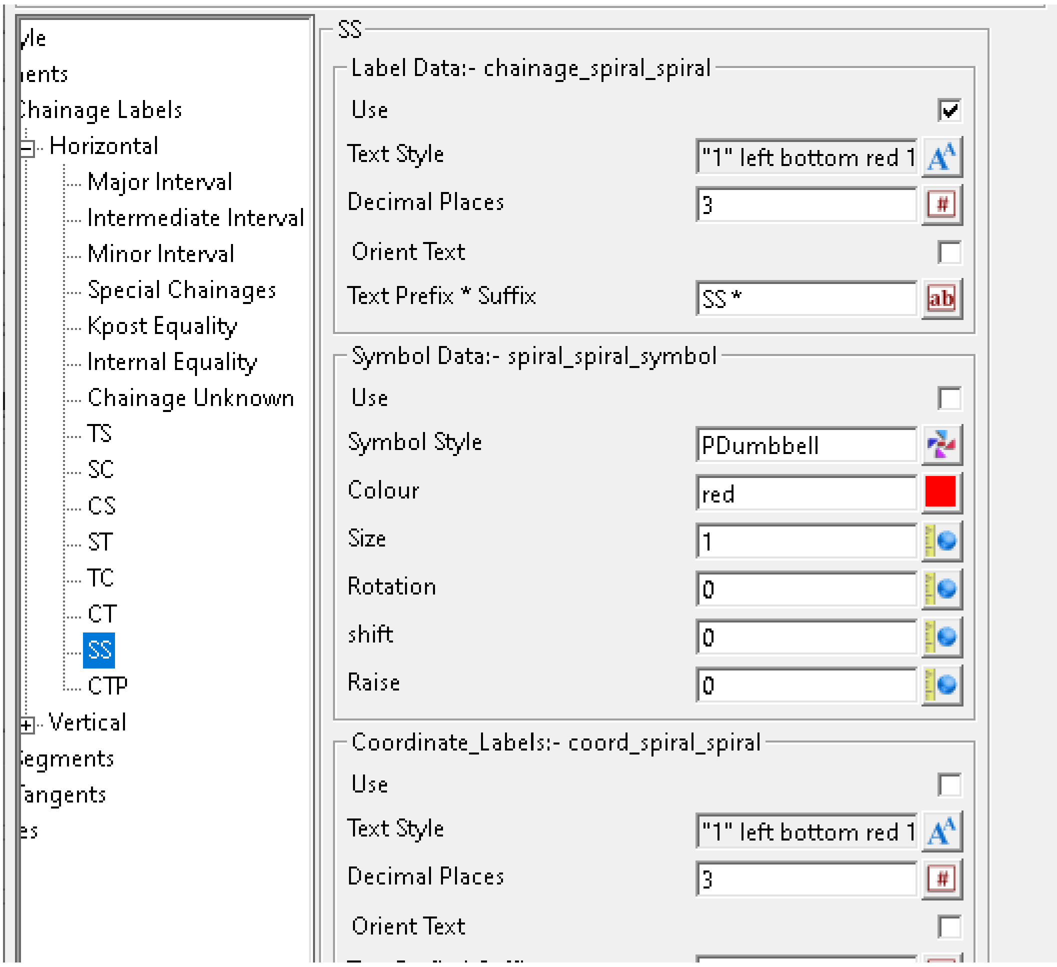
shift	real box	0	

Distance shifted to the left/right on the X plane.

Raise	real box	0	

Distance raised/lowered on the Y plane.

Vertical >Sag



Sag

Label Data:- chainage_vert_sag

Use tick box ticked

*If **ticked**, vertical curve crest labels will be generated. **Note: This feature has not been implemented yet.***

Text Style text style box all styles

Text style for the properties of the chainage labels.

Decimal Places integer box 3

The number of decimal places for the chainage labels.

Orient Text tick box not ticked

*If **ticked**, the **Text Style Angle** and symbol **Rotation** will be relative to the **Reference String**.*

*If **not ticked**, the **Text Style Angle** and symbol **Rotation** will be relative to the world.*

Text Prefix * Suffix text box Chd *

*Text to add to the prefix or suffix of the chainage value. The asterisk * denotes where the chainage value will be placed.*

Symbol Data:- vert_sag_symbol

Use	tick box	not ticked	

*If **ticked**, it will create a symbol at every chainage on the **Reference String**.*

Symbol Style	symbol box	CIRCLE	

*Name of the symbol to place at every chainage on the **Reference String**.*

Colour	colour box	white	available colours

Colour of the symbol.

Size	real box	1	

Size of the symbol.

Rotation	real box	0	

*Rotation of the symbol. The rotation angle is affected by **Orient Text**.*

shift	real box	0	

Distance shifted to the left/right on the X plane.

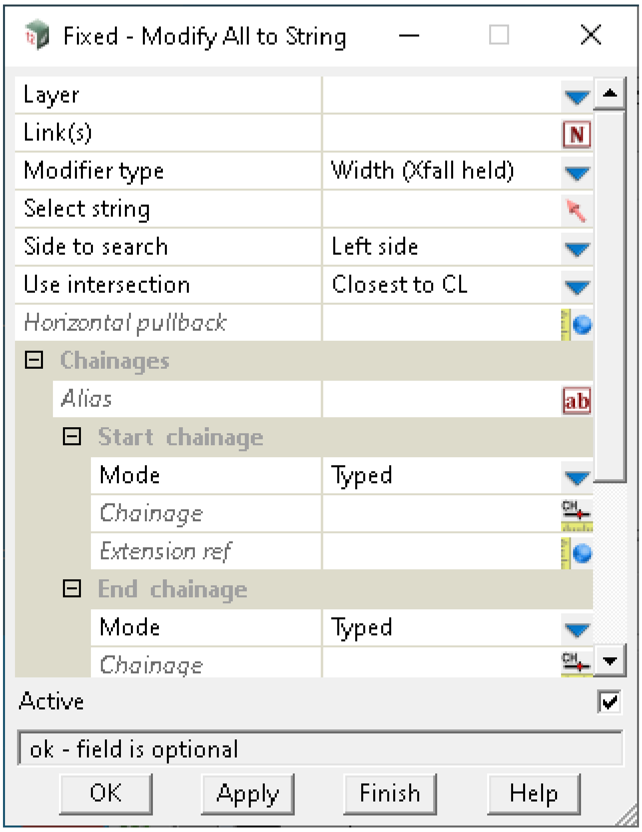
Raise	real box	0	

Distance raised/lowered on the Y plane.

17.20 Fixed Link - To String

The choice **current side** has been added to the **Side to search** option on the **Fixed - Modify All to String panel.**

Selecting the **To string** brings up the **Fixed - Modify All to String** panel.



Side to search	choice box	left side	left side, right side, both sides, current side

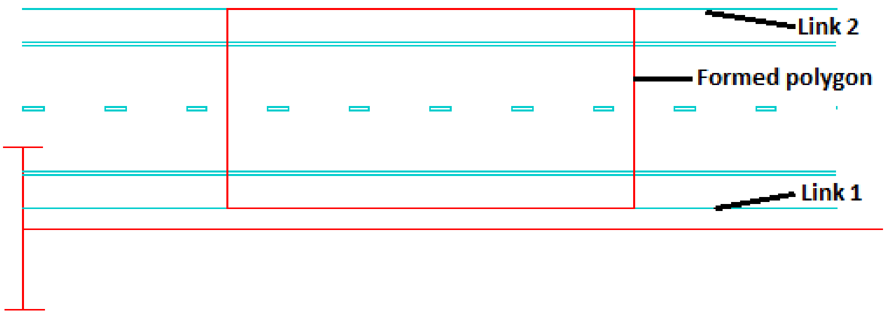
Side of the hinge string to start searching to find the string to define width/height/xfall.

If ***current side****, the search side is* ***left*** *for left side modifiers and* ***right*** *for right side modifiers.*

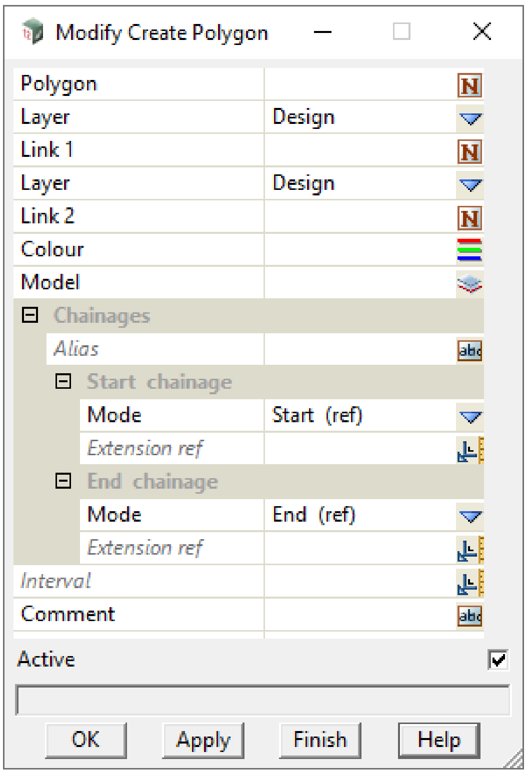
17.21 Create Polygon

The **Polygon** option creates a closed string from two links which forms a polygon within a specified model.

Note: Strings and sections are automatically created for all the MTF points in the default Layer **Design**.



Selecting **Polygon** brings up the panel **Modify Create Polygon**



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

Field Description	Type	Defaults	Pop-Up
Polygon	text box		

The name of the polygon closed string that is created by this modifier.

Layer	choice box	available Layers

*The layer containing **Link 1**.*

Link 1	text box	

The name of the link that will be used to form the one of the edges of the polygon.

Layer	choice box	available Layers

*The layer containing **Link 2**.*

Link 2	text box	

The name of the link that will be used to form the one of the edges of the polygon.

Colour	colour box	available colours

The colour of the polygon closed string that is created by this modifier.

Model	model box	available models

The model of the polygon closed string that is created by this modifier.

Alias, **Start Chainage**, **End Chainage**, **Interval**

Defines the start and end chainages to create polygon between.

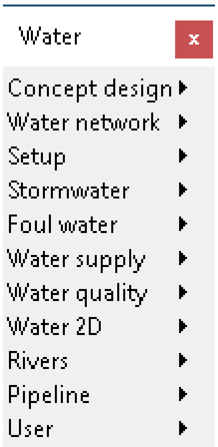
Comment, **Extra start**, **Extra End, Active, OK, Apply**

For information on these panel fields, see 20.2.2.1.1 Common Fields and Buttons on MTF Modifier Panels.

18 Water

There has been changes to the **Water** chapter in the ***12d Model Reference manual***.

In **V15** the **Water** menu has been totally rearranged.



See

See 18.1 Quick Water Network (QWN)

See 18.2 Property Controls And House Connections

See 18.3 Foul Water Tools

See 18.4 Drainage.4d File Editor

See 18.5 Create drainage.4d from Model

See 18.6 Create Drainage from Points and Line

See 18.7 Convert Water to Super Strings

See 18.8 TUFLOW Source String Utility

See 18.9 ESTRY Culverts

See 18.10 Xsection Interpolation

See 18.11 Catchments From Strings

See 18.12 Stormwater Tools

See 18.13 Stormwater Inlet Capacities

See 18.14 Capture Curve Viewer

See 18.15 Triangulate Grate Levels

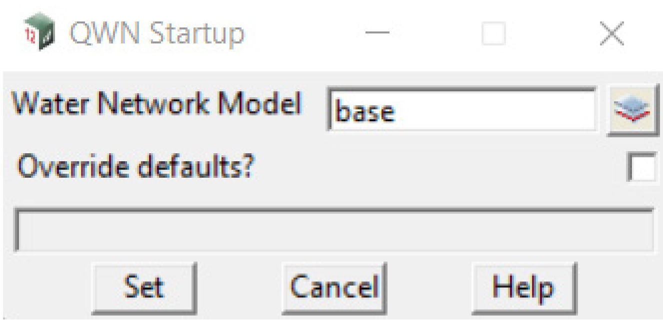
18.1 Quick Water Network (QWN)

Position of menu: **Water =>Water network =>Quick water network**

Now documented In the v15 reference manual

Upon start-up, the **Quick Water Network** (QWN) will provide you with a simplified **defaults panel** that allows you to specify the model that will be used when creating drainage data.

Selecting **Quick water network** brings up the **QWN Startup** panel.



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

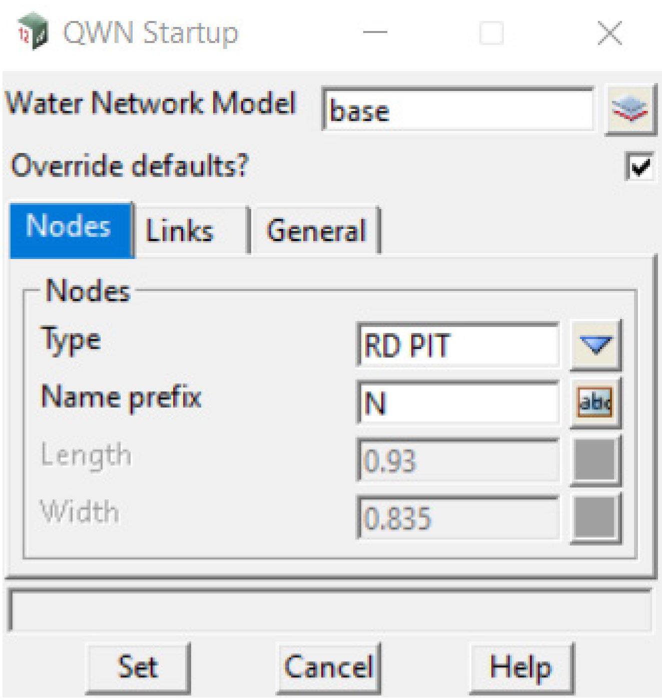
Field Description	Type	Defaults	Pop-Up
Water Network Model	model box	CAD ControlBar Input	available models

The model used to draw all drainage data in QWN.

Override defaults?	tick box	not ticked

Expands the panel to include options for specifying drainage defaults.

*Activating the **Override defaults?** tick box will expand the panel, presenting additional options.*



Nodes Tab
Links Tab
General Tab

Nodes Tab

Note:

1. Depending on data stored within the drainage.4d for the selected node type, some boxes may be disabled.

2. 'Diameter' will automatically adjust to 'length' if a width value is specified.

Nodes

Type choice box Drainage defaults

The default node type used when creating new nodes (types list from drainage.4d).

Name prefix input box Drainage defaults

The default name prefix assigned when creating new nodes (i.e. N1, N2…).

Diameter/length real box Drainage defaults OR drainage.4d over

The default pit diameter used when creating new nodes (depending on type, can be locked by drainage.4d) (will automatically update to 'length' if a width is specified).

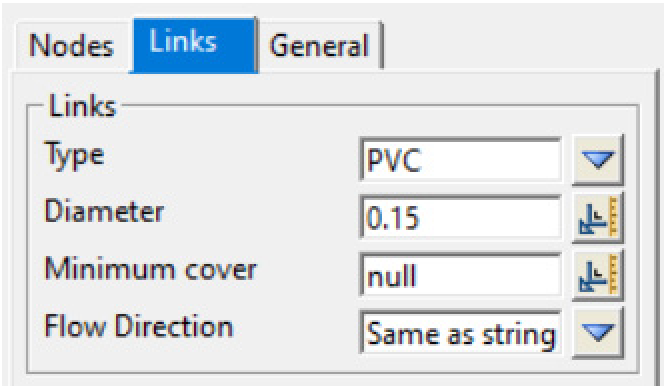
Width real box Drainage defaults OR drainage.4d over

The default pit width used when creating new nodes (depending on type, can be locked by drainage.4d.

Links Tab

***Note**:*

Unless a surface tin is specified, minimum cover will always default to null values



[Nodes Tab](#)
[Links Tab](#)
[General Tab](#)

Links

Type choice box Drainage defaults

The default type used when creating new links (types list from drainage.4d).

Diameter choice box Drainage defaults

The default pipe diameter used when creating new links.

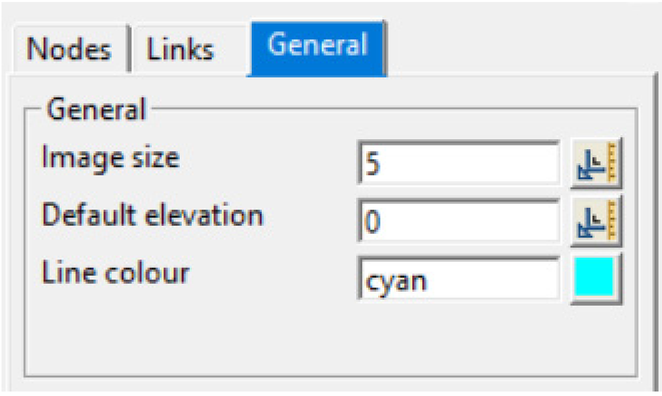
Minimum cover real box Drainage defaults

The default minimum cover used when creating new links.

Flow direction choice box Same as string direction

The default flow direction when creating new links (with or against string direction).

General Tab



Nodes Tab
Links Tab
General Tab

General

Image size real box 5

The default super overlay image size.

Default elevation real box CAD ControlBar input

The default elevation new nodes/links are created at.

Line colour colour box cyan available colours

The default line colour for links/nodes created in the drainage network.

Buttons at Bottom

Set button

Accept the defaults and return to the main panel.

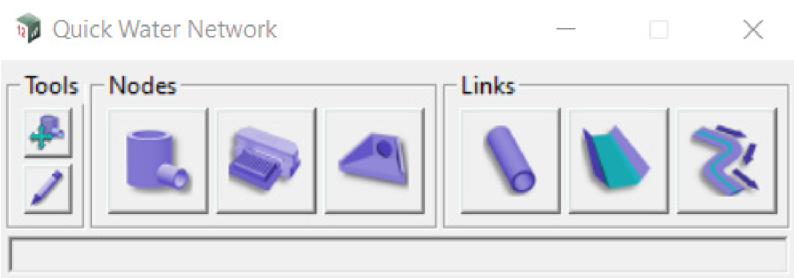
Cancel button

Close the panel and cancel the macro.

Help button 12d Reference Manual

Access this document in the reference manual.

Main Panel



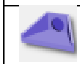
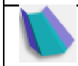
The main Quick Water Network panel contains 3 separate subsections:

1. Tools
2. Nodes
3. Links

Many of the buttons on this panel have additional functionality for left [LB] middle [MB] and right [RB] mouse button clicks. Hovering over any button on the panel will show the button operations in the message box at the bottom of the panel in the format [LB] [MB] [RB]. For example, hovering over the 'Node' button on the left side of the Nodes area will display:

<Node> [create] [] [edit]

which indicates that a left mouse click will create a new node, middle mouse click will do nothing, and a right mouse click will allow editing of an existing node. All buttons and their corresponding mouse click operations are described below:

Image	Left Button Click	Middle Button Click	Right Button Click	Pop-Up
	Move Node			
	Edit Node	Defaults	Edit Link	
NODES				
	Create node		Edit Node	
	Create inlet node		Edit Node	
	Create headwall node		Edit Node	
LINKS				
	Create single segment pipe	Create multiple segment pipe	Edit Link	
	Create single segment trapezoidal channel	Create multiple segment trapezoidal channel	Edit Link	
	Create bypass channel			

Creating any of the objects (nodes/links) enters a selection state, where a location must be specified for the new object to be placed. Note that in QWN, link vertices that are not placed on existing nodes will automatically generate a node at the selected location. Editing nodes or links will also prompt a selection, after which an edit node/edit link panel will be opened.

The Edit Node, Edit Link and Edit Catchment panels are described below.

[Edit Node Panel](#)

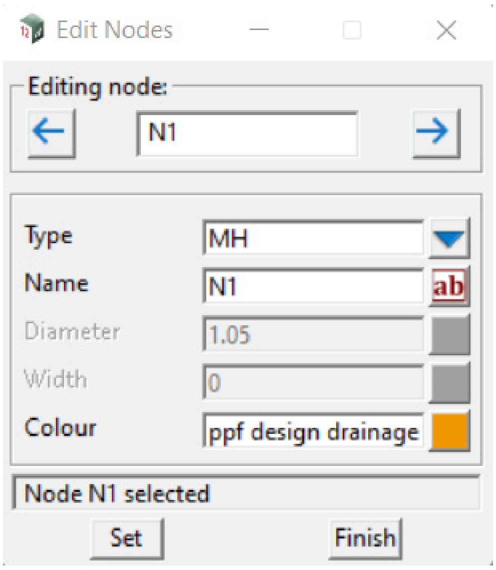
[Edit Link Panel](#)

[Defaults Panel](#)

Edit Node Panel

This panel is split into two sections - the first contains two buttons for cycling between nodes on the current model, as well as an input box that displays the name of the currently selected node. Note that selected nodes will be highlighted in green. This box may have text typed in to manually select a node by name.

The second section contains widgets that specify the drainage properties of the current node. Note that as in the **defaults panel**, some inputs may be locked by the drainage.4d depending on the node type selected. Diameter will also automatically update to 'length' if a width parameter is specified.



 button

Select the previous node vertex in the current drainage string.

 button

Select the next node vertex in the current drainage string.

Editing Node: input box Selected node name

Select a node in the model by typing its name.

Type choice box Current node type

Set the type of the currently selected node.

Name input box Current node name

Set the name of the currently selected node.

Diameter/Length real box Current node diameter

Set the diameter/length (whichever is relevant) of the currently selected node.

Width real box Current node width

Set the width of the currently selected node.

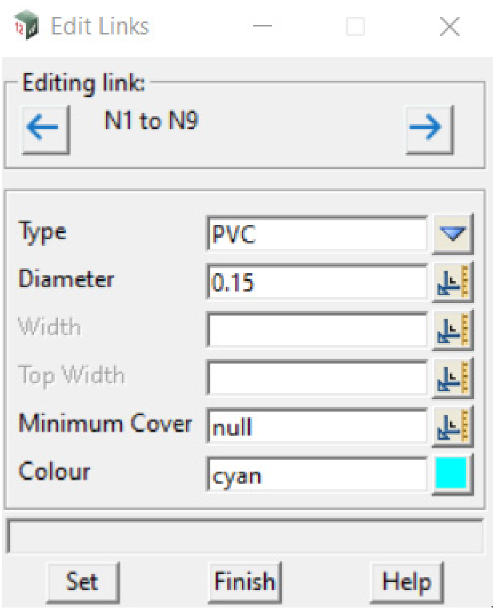
Colour colour box Current node colour available colours

Set the string colour of the currently selected node.

Edit Link Panel

This panel contains information relevant to the currently selected link. The border title on this panel will display the selected link, based on the nodes it connects. Like the edit node panel, the arrows can be used to cycle through links in the current model (current link is highlighted in green). The diameter, width, and top width boxes will automatically assign the pipe shape (either circular, rectangular or trapezoidal depending on inputs).

Note that at present, the drainage.4d overwrites do not affect the boxes in this panel but **will** affect what properties can ultimately be set (depending on pipe type selected). For a comprehensive list of predefined pipe dimensions and properties, please consult Water -> Water Setup - > Edit drainage.4d.



Type choice box Selected link type

Set the type of the currently selected link.

Diameter/height real box Current link diameter

Set the diameter of the currently selected link (used for height if a width/top width is specified).

Width real box Current link width

Set the width of the currently selected link.

Top Width real box Current link top width

Set the trapezoidal top width of the currently selected link.

Minimum cover real box Current link cover

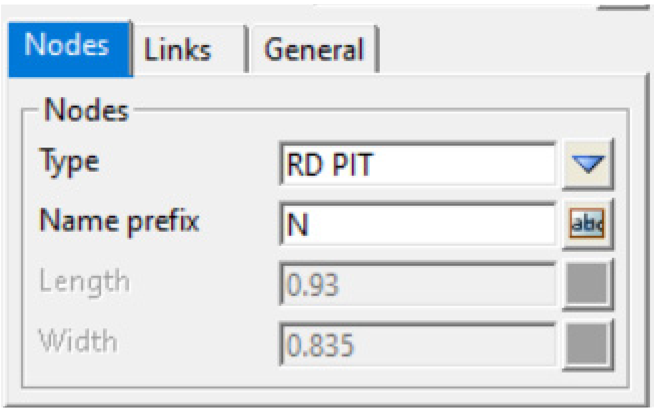
Set the cover of the currently selected link.

Colour colour box Current link colour available colours

Set the string colour of the currently selected link.

Defaults Panel

Using the middle mouse button [MB] on the 'edit' button in **main panel** will open the **defaults panel**. While the water model box is disabled after start-up, all the other input fields may be changed to modify the project defaults for QWN. Note that changing defaults does **not** override the properties of any nodes/links that have already been created, but instead establishes the default properties for any future objects that are created.



Nodes Tab
Links Tab
General Tab

Nodes Tab

Nodes

Type choice box Drainage defaults

The default node type used when creating new nodes (types list from drainage.4d).

Name prefix input box Drainage defaults

The default name prefix assigned when creating new nodes (i.e. N1, N2…).

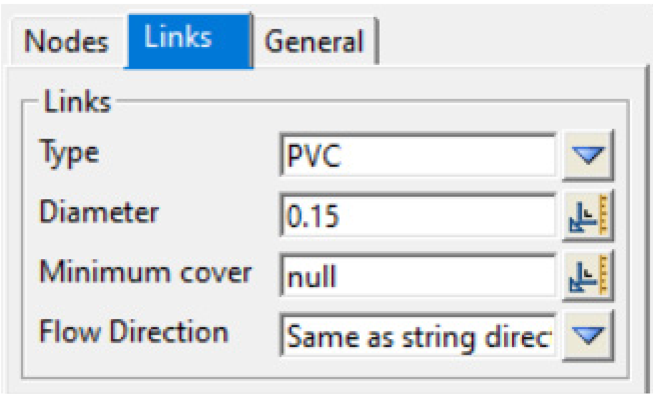
Diameter/length real box Drainage defaults OR drainage.4d over

The default pit diameter used when creating new nodes (depending on type, can be locked by drainage.4d) (will automatically update to 'length' if a width is specified).

Width real box

The default pit width used when creating new nodes (depending on type, can be locked by drainage.4d.

Links Tab



Nodes Tab
Links Tab
General Tab

Links

Type choice box Drainage defaults

The default type used when creating new links (types list from drainage.4d).

Diameter choice box Drainage defaults

The default pipe diameter used when creating new links.

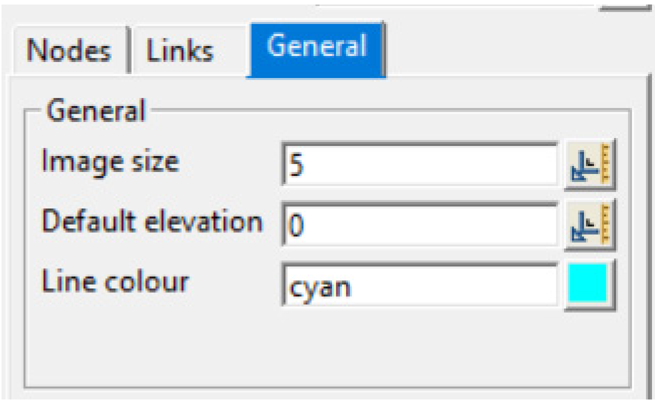
Minimum cover real box Drainage defaults

The default minimum cover used when creating new links.

Flow direction choice box Same as string direction

The default flow direction when creating new links (with or against string direction).

General Tab



[Nodes Tab]
[Links Tab]
[General Tab]

General

Image size real box 5

The default super overlay image size.

Default elevation real box CAD ControlBar input

The default elevation new nodes/links are created at.

Line colour colour box cyan available colours

The default line colour for links/nodes created in the drainage network.

Buttons at Bottom

Set button

Accept the defaults and return to the main panel.

Cancel button

Close the panel and cancel the macro.

Help button 12d Reference Manual

Access this document in the reference manual.

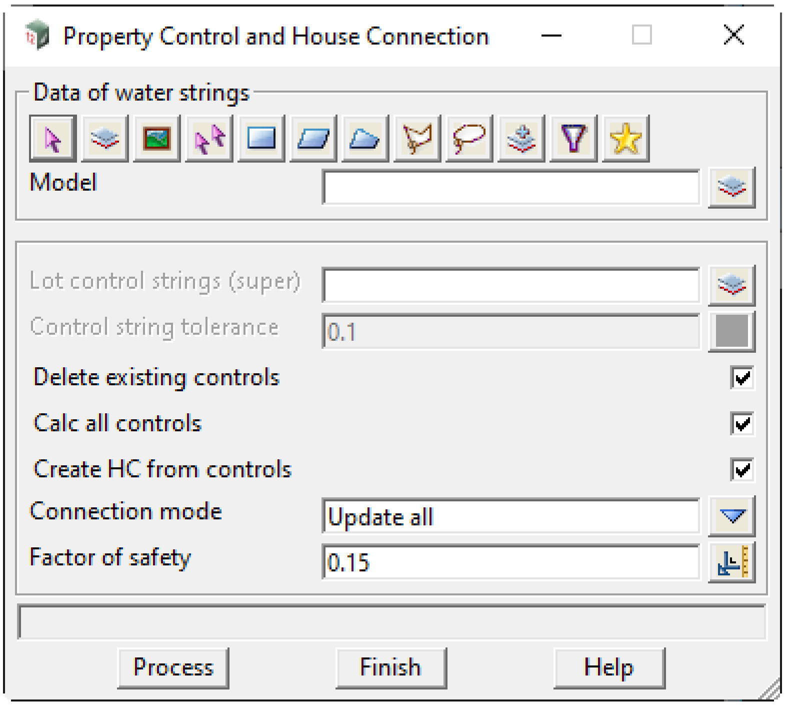
18.2 Property Controls And House Connections

Position of menu: **Water =>Foul water tools =>Controls/house connections**

Now documented In the v15 reference manual

The Property control and house connection option provides a quicker way to create and update property control and house connection. Originally you can only do it with only one pipeline at a time. This option allows multiple pipelines to be chosen and executed at the same time.

Selecting **Controls/house Connections** brings up the **Create/Update Property Controls and House Connections** panel.



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

Field Description   Type   Defaults   Pop-Up

Data source of water strings   data source

Data selection type.

Control strings (super)   model box

OPTIONAL -.The model including all controls to connect to water strings (must have type super).

Control string tolerance   input number   0.1

OPTIONAL - The tolerant distance from controls to water string. This field is required if Lot control string is used.

Delete existing controls   tick box   ticked

*If **ticked**, existing controls beforehand is deleted.*

Calc all controls   tick box   ticked

*If **ticked**, property controls is created.*

Create house connection from controls   tick box   ticked

*If **ticked**, a house connection is created (connection from water string to property control).*

House connection mode	choice box	Update all	Removing 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 number	0.15

The connection height for the control is adjusted by this depth from the control connection depth.

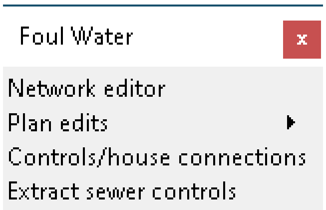
Buttons at Bottom

Process	button

Calculate controls and/or create house connections.

18.3 Foul Water Tools

Position of menu: Water =>Foul Water



See

18.3.1 Controls/house Connections

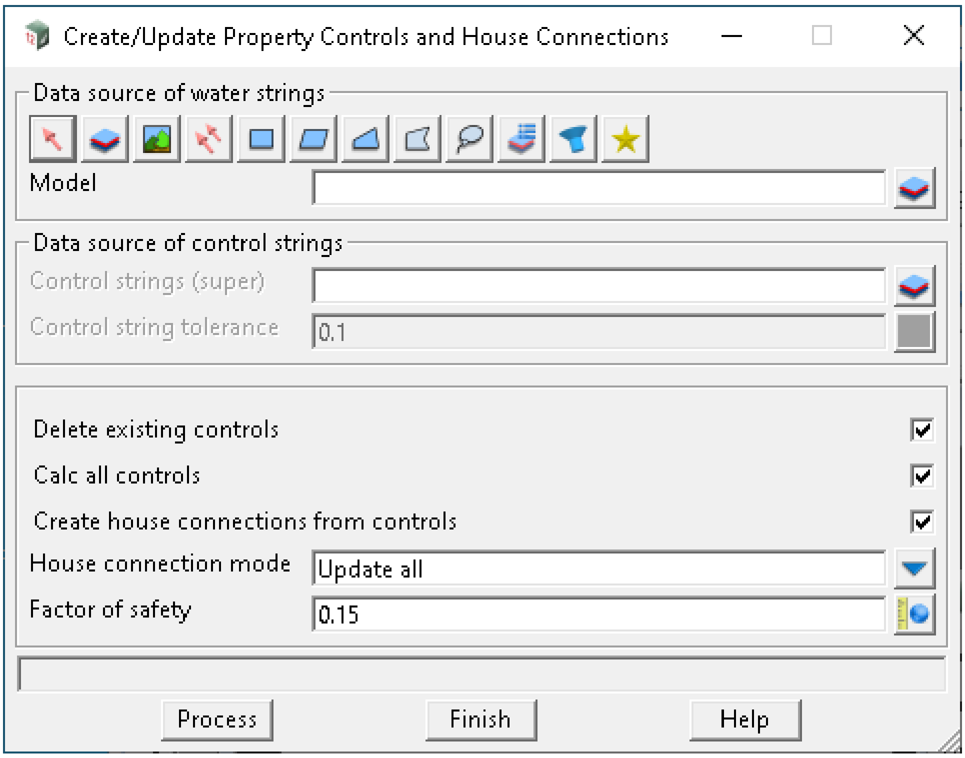
18.3.1 Controls/house Connections

Position of menu: Water =>Foul water tools =>Controls/house connections

Now documented In the v15 reference manual

The Property control and house connection option provides a quicker way to create and update property control and house connection. Originally you can only do it with only one pipeline at a time. This option allows multiple pipelines to be chosen and executed at the same time.

Selecting **Controls/house Connections** brings up the **Create/Update Property Controls and House Connections** panel.



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

Field Description	Type	Defaults	Pop-Up
Data source of water strings	data source		

Data selection type.

Control strings (super)	model box		

OPTIONAL -.The model including all controls to connect to water strings (must have type super).

Control string tolerance	input number	0.1	

OPTIONAL - The tolerant distance from controls to water string. This field is required if Lot control string is used.

Delete existing controls	tick box	ticked	

*If **ticked**, existing controls beforehand is deleted.*

Calc all controls	tick box	ticked	

*If **ticked**, property controls is created.*

Create house connection from controls	tick box	ticked	

*If **ticked**, a house connection is created (connection from water string to property control).*

House connection mode	choice box	Update all	Removing 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 number	0.15	

The connection height for the control is adjusted by this depth from the control connection depth.

Buttons at Bottom

Process	button		

Calculate controls and/or create house connections.

18.4 Drainage.4d File Editor

Position of menu: **Water =>Setup =>Edit drainage.4d**

Now documented In the v15 reference manual

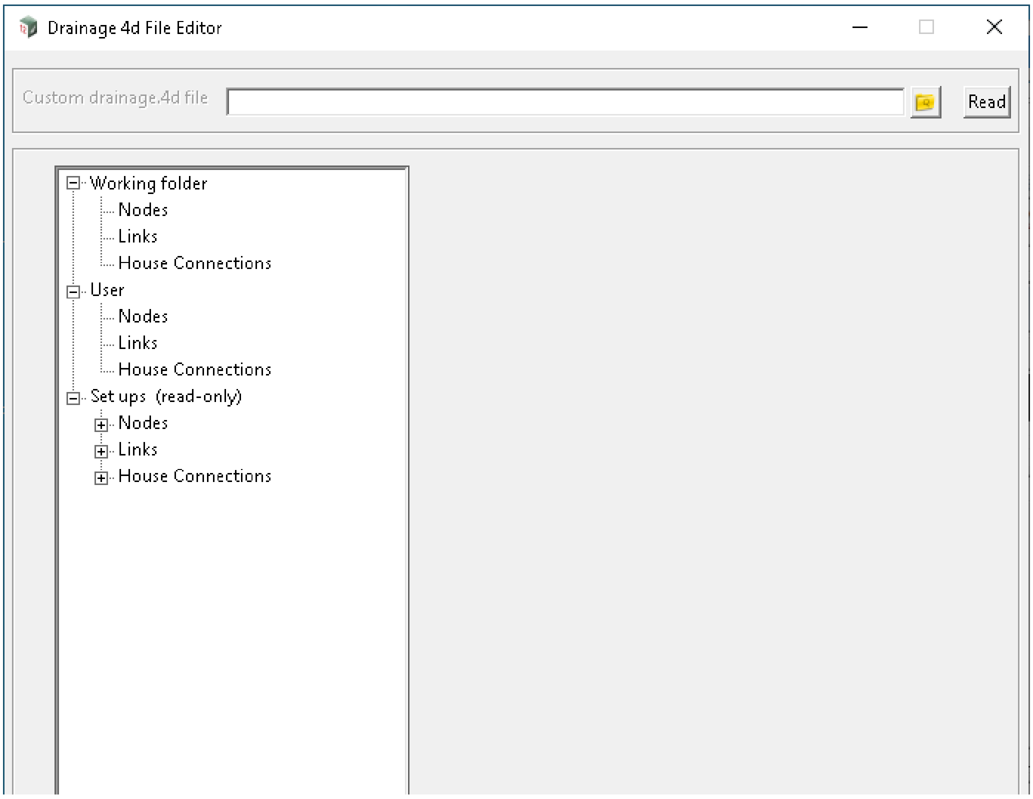
This option edits the XML version of drainage.4d.

For information about where how to find and create drainage.4d (xml) files, see 13.8 Style XML Files.

When the "**Drainage.4d File Editor**" started, standard drainage.4d files from current, user and set_ups folders are loaded under "Working folder", "User" and "Set ups" nodes. "User" and "Set ups" are marked as "read-only" if the drainage.4d file is found under the user or set_ups folder.

The panel consists of 4 parts.

Selecting **Edit drainage.4d** brings up the **Drainage.4d File Editor** panel.



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

Field Description	Type	Defaults	Pop-Up
Custom drainage.4d file	file box	dialogue box	

The custom file which users would like to modify.

The tree control on the left hand side and the details on the right hand side.

Each root not is equivalent to a drainage.4d file. When selecting a root node or a sub node from the tree box, there will be dynamic icons on the left hand side of the tree control to indicate which actions the users can perform on the current node. On the right hand side of the tree, all the details of the current node are shown.

There are three branches on each of the root node. They are water nodes, water links and house *connections.*

Buttons at bottom

Set button

To set the current details of the node.

Write button

To save the current drainage.4d file.

Command buttons on the left hand side

Add button

Add a new node.

Copy button

Copy the current node with all of its child nodes to the clipboard.

Paste button

Paste the data stored in the clipboard. The operation is allowed when clipboard data is compatible with the currently selected node.

Delete button

Delete the current node and all of its child nodes.

Move to top button

Move the current node to the top of the branch.

Move up button

Move the current node one place up.

Move down button

Move the current node one place down.

Move to bottom button

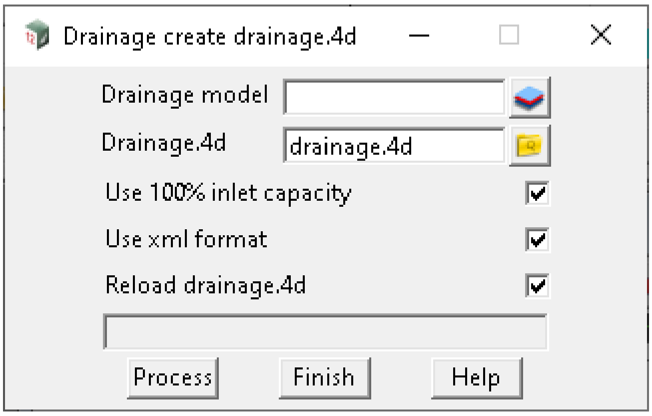
Move the current node to the bottom of the branch.

18.5 Create drainage.4d from Model

Position of option on menu: **Water =>Water setup =>Create drainage.4d from model**

Now documented In the v15 reference manual

The Drainage create drainage.4d panel has been updated.



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

Field Description	Type	Defaults	Pop-Up
Drainage model	model box		

Water strings in the model will be scanned for node and link types (not house connections).

Drainage.4d	file box		*.4d

File to be created. xml format does not support Append.

Use 100% inlet capacity	tick box	ticked	

Nodes in the drainage.4d file be created with 100% inlet capacity set in the inlet equation.

Use XML format	tick box	ticked	

*If **ticked**, the file created will be in the V14 xml format. Append is not supported.*

Reload drainage4d	tick box	ticked	

*If **ticked**, the drainage.4d file will be loaded (12d Model restart is not required). Any open panels with node and link type boxes will need to be closed and re opened.*

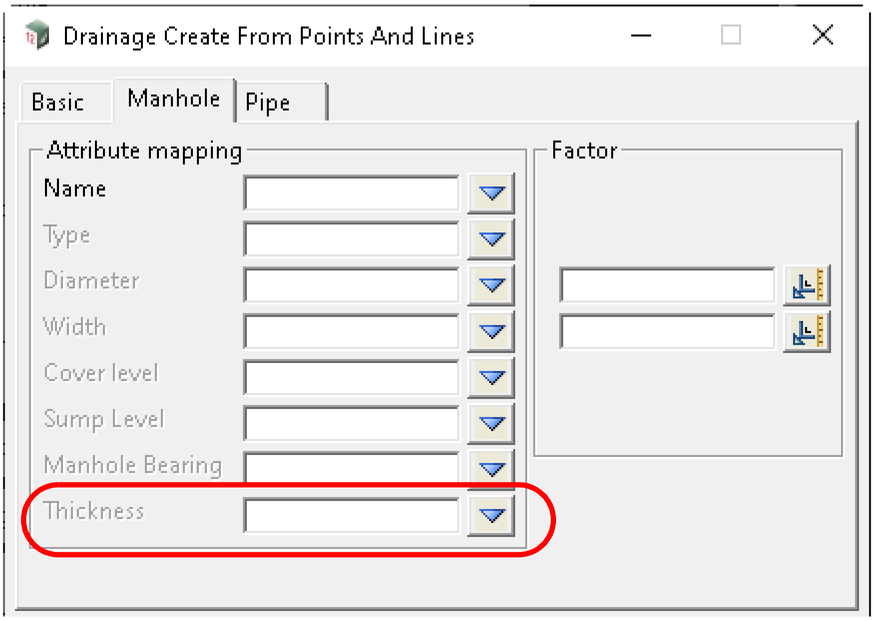
18.6 Create Drainage from Points and Line

Position of option on menu: **Water =>Water network =>Create =>Create from pts and lines**

Now documented In the v15 reference manual

This is the **Drainage Create from Pts and Lines** with a thickness added for manholes and pipes.

This will be extended to all the thicknesses before the release.



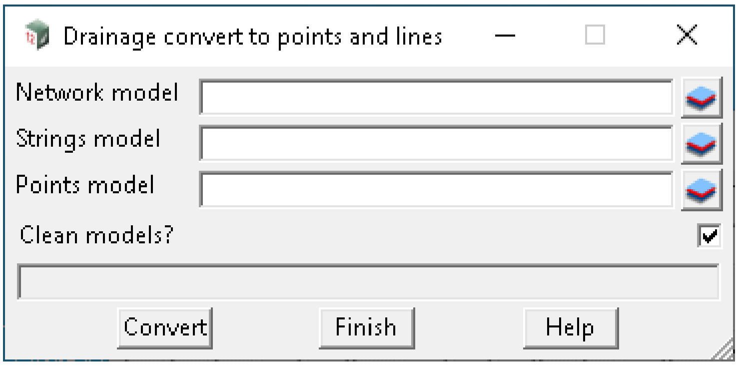
18.7 Convert Water to Super Strings

Position of option on menu: **Water =>Water network =>Convert =>Convert to super**

Now documented In the v15 reference manual

This option converts the **Water** strings selected from a model, into separate **Super** string components representing the nodes, links and house connections.

Selecting **Convert to super** brings up the **Convert Water to Super Strings** panel.



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

Field Description	Type	Defaults	Pop-Up
Water string inputs			
Water model	model box		available models

Model containing the Water strings to convert. Entering or selecting a model will initially check that the model exists and contains Water strings. If so, a count of the Water strings, nodes, links and house connections is written to the status bar, and the Model column is populated in the Super string outputs grid, if not already.

String name mask(s) for inclusion text box

*Water string names to include. Names are specified by mask, which may include wildcards * and ?. Multiple masks are separated by spaces. Use ? for a space within an individual mask.*

String name mask(s) for exclusion text box

*Water string names to exclude. Names are specified by mask, which may include wildcards * and ?. Multiple masks are separated by spaces. Use ? for a space within an individual mask.*

Node type mask(s) for exclusion text box

*Node types to exclude. Node types are specified by mask, which may include wildcards * and ?. Multiple masks are separated by spaces. Use ? for a space within an individual mask.*

Link type mask(s) for exclusion text box

*Link types to exclude. Link types are specified by mask, which may include wildcards * and ?. Multiple masks are separated by spaces. Use ? for a space within an individual mask.*

Link line options

Link line justification	choice box	invert	obvert, centre, invert

The vertical justification of the link line Super string components.

Arc in links	choice box	as arcs	as arcs, as straights, use arc-to-chord tolerance

If arcs exist in the Water string links, this setting controls how the arcs will be represented in the link line components.

Arc-to-chord tolerance	real box	0.1	

only used when Arcs in links is set to "use arc-to-chord tolerance". Defines the maximum distance between the original arc and each chord.

Multi-cell links as multiple lines	tick box	ticked	

Whether to convert multi-cell links into multiple link line components.

Link lines as conduits	tick box	ticked	

Whether to set matching conduit dimensions on the link line components. Circular and rectangular conduit shapes only.

Add segments to meet node centres	tick box	not ticked	

Whether to add additional, horizontal segments to the end of each link line component, to meet its connecting node centres in plan.

Super string outputs

Components	choice box	all	Node cover points, Node grate points Node sump points, Node setout points, Node walls internal, Node walls external, Link lines, House connection levels

*Defines the Super string output component for each row of the grid. Each of the component choices may be specified in the grid zero or more times. The Node * points choices create individual Super string points of each node's: cover, grate and sump level (at node centre), and setout level (at setout x,y). The Node walls * choices create closed Super string polygons of the internal and external walls of each node's chamber, at the sump and bottom levels respectively. The Link lines choice creates Super strings of each link. The House connection levels choice creates horizontal Super strings for each house connection, perpendicular to the Water string at the specified side and length, at the house connection level.*

Create	tick box	ticked	

Whether to create each component.

Model	model box column		available models

Model for each component. If any of the model names in this column are blank, they can be automatically populated by entering or selecting a model in the Water model box, where the water model name is used as a prefix in the component model name. The models specified for each component are allowed to be the same as each other, but will be unique if they are all automatically populated.

Name by	choice box	name	name, type, nothing

Defines the base name of each component to be the original node/link/connection name or type, or nothing.

Name pre*postfix	choice box		name, type, nothing

Optional prefix and/or postfix to apply to the base name (*) of each component.

Colour override	colour box column		available colours

Optional colour for each component. If unspecified, the component will adopt the colour of the original node/link/connection.

Copy attributes tick box ticked

Whether to copy the original node/link attributes to each node/link component. For house connections, whether to create a useful set of new string attributes on the component.

To attribute group text box column

Optional attribute group name to use for each component, when copying attributes.

Clean output models(s) beforehand tick box ticked

Whether to clean the output model(s) beforehand.

Buttons at Bottom

Run button

Runs the option.

Finish button

Removes the panel from the screen.

Help button

Launches the 12d help for the option.

18.8 TUFLOW Source String Utility

Position of option on menu: Water =>Water 2D =>Water 2D tools => TUFLOW source string utility

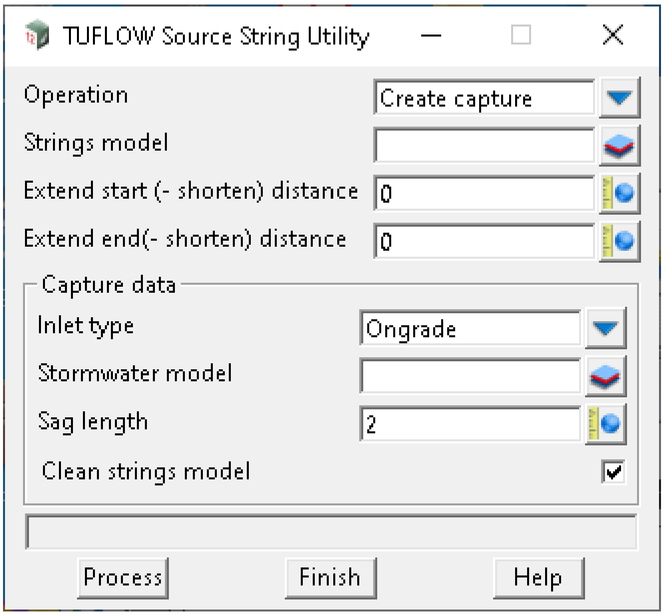
Now documented In the v15 reference manual

This panel creates or modifies strings that are used to select the 2d cells that:

Inlet hydrographs are applied to.

Inlet capture flow from.

On selecting the **TUFLOW source string utility** option, the **TUFLOW Source String Utility** panel is displayed.



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

Field Description	Type	Defaults	Pop-Up
Operation	choice box	Catchment	Create capture, Adjust catchments

*If **Create Capture**: Creates strings used in 2d connection zones model (WNE->Global->Utility models tab).*

*If **Adjust Catchments**: Modified strings used in 2d catchment flow model (WNE->Global->Utility models tab). These strings are typically created via the **Downhill strings** option using the **Split resultant strings at drainage inlets** (Advanced tab).*

Strings model	model box		available models

*Model for new strings for **Create Capture** and existing strings for **Adjust Catchments**.*

Extend start (- shorten) distance real box 0

New strings for Create Capture and existing strings for Adjust Catchments will have the start of the string extended or shortened by this distance.

Extend end (- shorten) distance real box 0

New strings for Create Capture and existing strings for Adjust Catchments will have the end of the *string extended or shortened by this distance.*

Capture data

*These fields are used only when **Create Capture** is selected above.*

Inlet type choice box Ongrade Ongrade,Sag

*If **Ongrade**: For inlets in the Stormwater model below that are tagged as Ongrade (via the WNE), a capture line is created from the road centre line to the road setout string and then extended/shortened using the distances above. The road centre line and setout strings must be set via the WNE before running this option.*

*If **Sag**: For inlets in the Stormwater model below that are tagged as Sag (via the WNE), a capture line is created from along the road setout string using the Sag length below. The extend distances above are not used.*

Stormwater model model box available models

Ongrade and Sag inlets in this model are processed.

Sag length real box

Capture strings of this length are created with 50% on each side of the inlet centre.

Clean strings model tick box ticked

*All strings in the **Strings model** above are deleted before the processing. If creating strings for both Sag and Ongrade this is usually on for the first and off for the second.*

Buttons at Bottom

Process button

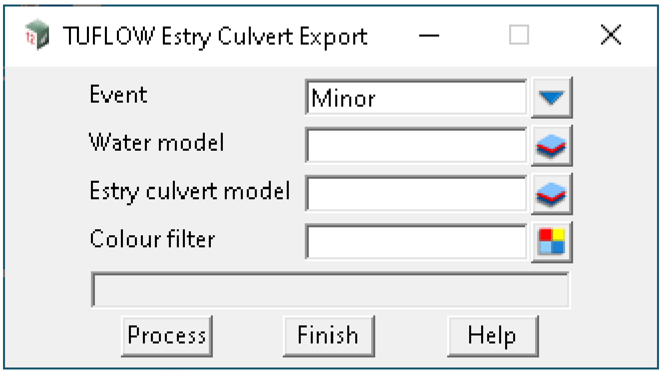
Process the option.

18.9 ESTRY Culverts

Position of option on menu: **Water =>Water 2D =>Water 2D tools => ESTRY culverts**

Now documented In the v15 reference manual

Selecting **ESTRY culverts** brings up the **TUFLOW Estry Culvert Export** panel.



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

Field Description	Type	Defaults	Pop-Up
Event	choice box	Minor	Minor, Major

Appended to attributes where indicated. For more information on ESTRY attributes see ESTRY Attributes.

Water model	model box		available models

Source model for water strings.

Estry culvert model	model box		available models

Super strings with ESTRY attributes, elevations and pipe/culvert size will be created. The model is not cleaned first.

See ESTRY Attributes below for details of the attributes created. The size dimensions and elevations on the resulting super string are for visualisation only.

Colour filter	colour box		available colours

Only links matching this colour will be exported. String colour is checked when no link colour is specified.

Buttons at Bottom

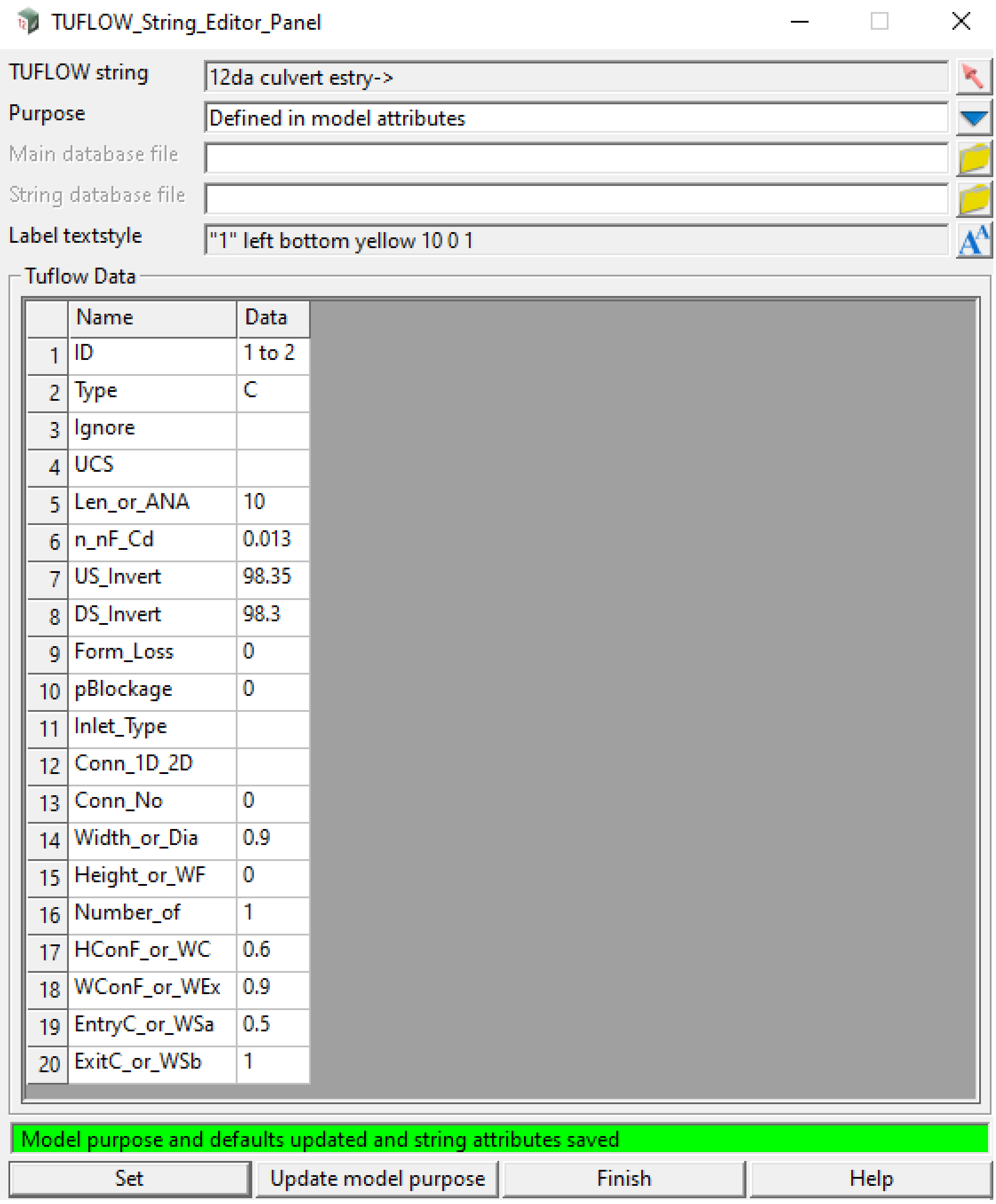
Process	button

Process the option.

ESTRY Attributes

The **ESTRY attributes** are shown in the image below and are retrieved from the water link as follows.

Water String			Super string		
Property/attribute	Name	Default	ESTRY Attributes	Typical Vaue	Note
Property	Link Name		ID	1 to 2	
Property	width		Type	C	C if no width, R if width set
always blank			Ignore	always blank	
text attribute	use channel storage		UCS		
Property	length		Len_or_ANA	10	
real attribute	roughness n	0.013	n_nF_Cd	0.013	uses model default if avail
Property	us invert		US_Invert	98.35	
Property	ds invert		DS_Invert	98.3	
real attribute	dyn minor loss	0	Form_Loss	0	
real attribute	entrance blockage percent		pBlockage	0	appends suffix minor/major
always blank			Inlet_Type	always blank	
always blank			Conn_1D_2D	always blank	
		0	Conn_No	0	
Property	diameter/width		Width_or_Dia	0.9	circular pipe diameter, box width
Property	diameter/width		Height_or_WF	0	box height
Property	number of links		Number_of	1	
real attribute	height contraction coefficient	0.6	HConF_or_WC	0.6	
real attribute	width contraction coefficient	0.9	WConF_or_WEx	0.9	
real attribute	dyn inlet loss	0.5	EntryC_or_WSa	0.5	
real attribute	dyn outlet loss	1	ExitC_or_WSb	1	

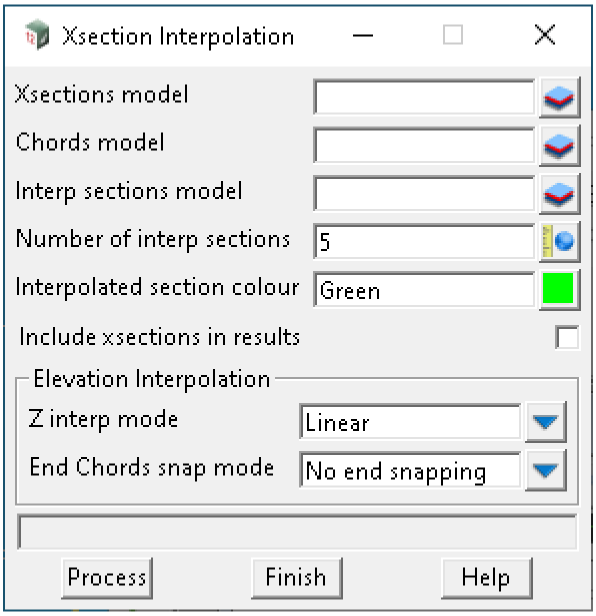

TUFLOW_String_Editor_Panel
TUFLOW string
12da culvert estry->
Purpose
Defined in model attributes
Main database file
String database file
Label textstyle
"1" left bottom yellow 10 0 1
Tuflow Data
Name
Data
1 ID 1 to 2
2 Type C
3 Ignore
4 UCS
5 Len_or_ANA 10
6 n_nF_Cd 0.013
7 US_Invert 98.35
8 DS_Invert 98.3
9 Form_Loss 0
10 pBlockage 0
11 Inlet_Type
12 Conn_1D_2D
13 Conn_No 0
14 Width_or_Dia 0.9
15 Height_or_WF 0
16 Number_of 1
17 HConF_or_WC 0.6
18 WConF_or_WEx 0.9
19 EntryC_or_WSa 0.5
20 ExitC_or_WSb 1
Model purpose and defaults updated and string attributes saved
Set
Update model purpose
Finish
Help

18.10 Xsection Interpolation

Position of option on menu: **Water =>Water 2D =>Water 2D tools =>Xsection interpolation**

The **Xsection Interpolation** panel performs a 3d interpolation of xsections using chords. Typically it is needed for bathymetry data being combined with Lidar scans.

On selecting the **Xsection interpolation** option, the **Xsection Interpolation** panel is displayed.



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

Field Description	Type	Defaults	Pop-Up
Xsections model	model box		available models

Existing super string cross sections with elevations.

The strings must start at the same chord (low chainage chord).

The strings must all end at the same chord (high chainage chord) that is different to the starting chord.

The xsections must not intersect.

Chords model	model box		available models

Existing super strings that intersect every xsection and never intersect each other.

*The chord that intersects the start of the xsections in called the **low chainage chord**.*

*The chord that intersects the end of the xsections in called the **high chainage chord**.*

All other chords are called internal chords.

The must be a low chainage chord and a high chainage chord. Internal chords are optional.

See Zinterp and snap modes below to check if elevations are required for the low and/or high chainage chords.

The chords must all start at the same xsection (starting xsection).

The chords must all end at the same xsection (ending xsection) that must be different than the starting xsection.

Interp sections model model box available models

This model is cleaned before each run. Interpolated xsections are placed in this mode optionally a copy of the source xsections (see Include xsections in results).

Number of interp sections real box 5

The number of xsection to be created between the strings in the Xsection model.

Interpolated section colour colour box Green available colours

New interpolated xsections will have this colour.

Include xsections in results tick box ticked

*When selected the strings in the **Xsection model** will be copied into the **Interpolated sections** model.*

Elevation Interpolation

Zinterp mode choice box Linear, Low chainage chord, High chainage chord Low, high average

Linear

The x,y,z locations of the interpolated cross sections are determined by assigning elevations to the chords from the intersection with the xsections. The chords between the sections are split into Number of section + 1 segments. The xsection is then created by joining the high chainage end of the segments.

Low chainage chord

The low chainage chord must have elevation for this mode.

Xsections are created as described in the linear mode above.

Xsection are translated vertically so that the low chainage xsection vertex elevation equals the low chainage chord elevation.

High chainage chord

The high chainage chord must have elevation for this mode.

Xsections are created as described in the linear mode above.

Xsection are translated vertically so that the high chainage xsection vertex elevation equals the high chainage chord elevation.

Low, high average

The low and high chainage chords must have elevations for this mode.

Xsections are created as described in the linear mode above.

Xsection are translated vertically using the average of the offsets used in the low and high chainage offsets described above.

End Chords snap mode choice box No end snapping, Snap low chainage end to chord, Snap high chainage end to chord, Snap both ends to chord

No end snapping

No vertical adjustments to the low and high chainage vertices on xsection.

Snap low chainage end to chord

The low chainage chord must have elevation for this mode.

The low chainage vertex on the xsection is adjusted to match the low chord elevation.

Snap high chainage end to chord

The high chainage chord must have elevation for this mode.

The high chainage vertex on the xsection is adjusted to match the high chord elevation.

Snap both ends to chord

The low and high chainage chords must have elevations for this mode.

The low and high chainage vertices on the xsection are adjusted to match the low and high chord elevations respectively.

Buttons at Bottom

Process button

Process the option.

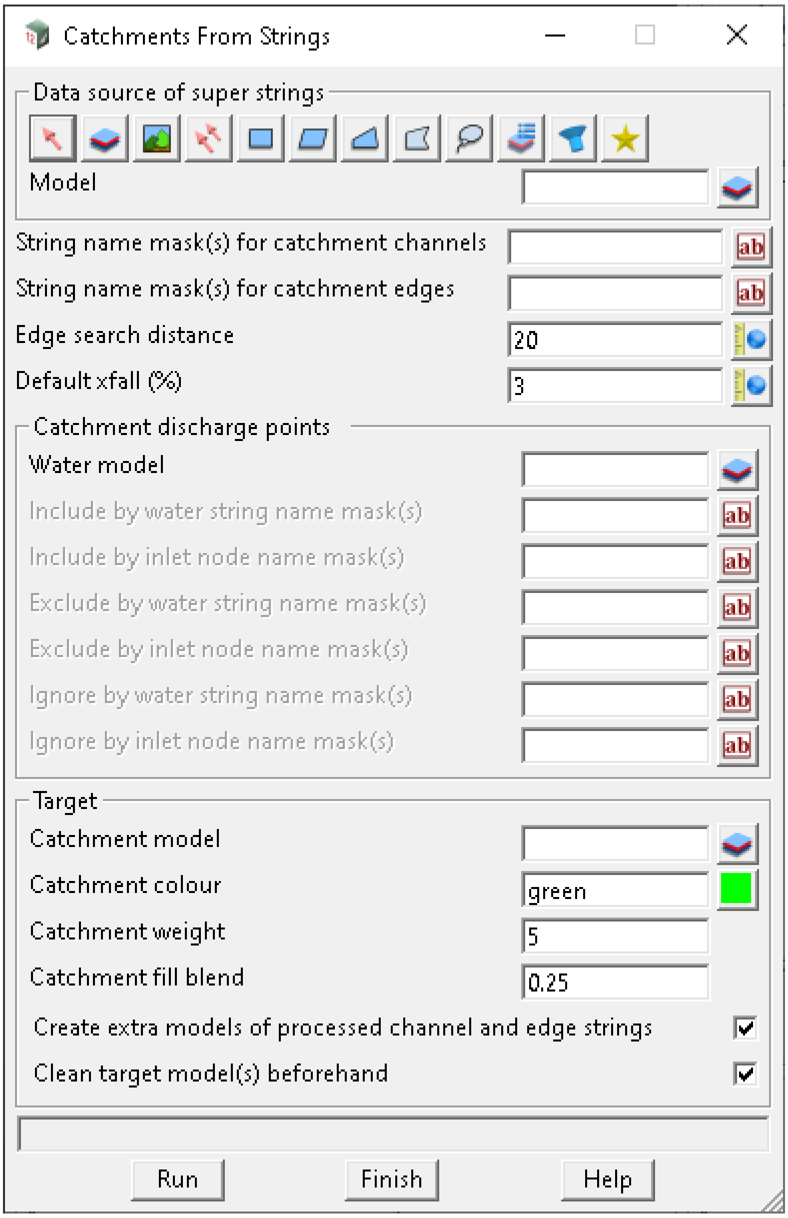
18.11 Catchments From Strings

Position of option on menu: **Water =>Stormwater =>Catchments from Strings**

Now documented In the v15 reference manual

This option creates catchment polygons to suit the stormwater inlets of a water model, based on a selection of Super strings with z-values - typically road design strings - such as from Apply MTF functions.

On selecting the **Catchment from strings** option, the **Catchment From Strings** panel is displayed.



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

Field Description	Type	Defaults	Pop-Up

Data source of super strings data source

Use the most appropriate 12d Model data selection method, to select the Super strings to be considered as the basis for creating the catchment polygons. The strings should have z-values.

String name mask(s) for catchments channels text box

*Super string names from the data source, to consider as catchment channels -- typically the channel invert strings. Names are specified by mask, which may include wildcards * and ?. Multiple masks are separated by spaces. Use ? for a space within an individual mask.*

String name mask(s) for catchments edges text box

*Super string names from the data source, to consider as catchment edges -- typically the road crown and verge strings. Names are specified by mask, which may include wildcards * and ?. Multiple masks are separated by spaces. Use ? for a space within an individual mask.*

Edge search distance real box 20

Maximum distance to look for edge strings from channel strings.

Default xfall (%) real box 3

Optional xfall to adopt between channel and edge strings, when forming catchment polygons. If unspecified, the xfall measured between channel and edge will be adopted. The xfall is combined with the grade measured along the channel string, to define the angles of the catchment lines connecting the channels to the edges. Better looking results will typically be obtained within most road reserves, by setting this value to the predominant xfall of the road carriageways.

Catchment discharge points

Water model model box available model

Model containing the stormwater inlet nodes to consider as discharge points, defined on Water strings. Outlet and manhole nodes will be ignored. Only those inlet nodes found within one node diameter (or 0.1 units, whichever is larger) of a channel string, will be eligible for consideration as a catchment discharge point.

Include by water string name mask(s) text box

*Water string names to include. Names are specified by mask, which may include wildcards * and ?. Multiple masks are separated by spaces. Use ? for a space within an individual mask. Leaving this blank is the same as specifying *.*

Include by inlet node name mask(s) text box

*Inlet node names to include. Names are specified by mask, which may include wildcards * and ?. Multiple masks are separated by spaces. Use ? for a space within an individual mask. Leaving this blank is the same as specifying *.*

Exclude by water string name mask(s) text box

*Water string names to exclude. Excluded discharge points will not get catchments created, but may be used to define the upstream ends of other catchment channels. Names are specified by mask, which may include wildcards * and ?. Multiple masks are separated by spaces. Use ? for a space within an individual mask.*

Exclude by inlet node name mask(s) text box

*Inlet node names to exclude. Excluded discharge points will not get catchments created, but may be used to define the upstream ends of other catchment channels. Names are specified by mask, which may include wildcards * and ?. Multiple masks are separated by spaces. Use ? for a space within an individual mask.*

Ignore by water string name mask(s) text box

Water string names to ignore. Ignored discharge points are treated as though they do not exist. Names *are specified by mask, which may include wildcards * and ?. Multiple masks are separated by spaces. Use ? for a space within an individual mask.*

Ignore by inlet node name mask(s) text box

*Inlet node names to ignore. Ignored discharge points are treated as though they do not exist. Names are specified by mask, which may include wildcards * and ?. Multiple masks are separated by spaces. Use ? for a space within an individual mask.*

Target

Catchment method model box available models

Model in which to create catchment polygons.

Catchment colour colour box green available colours

Colour for catchment polygons.

Catchment weight real box 5

Line weight (pixels on screen, or mm on paper) for catchment polygons.

Catchment fill blend real box 0.25

Opacity for catchment polygons. A value of 0 will apply no fill. A value between 0 and 1 will create translucent polygons. A value of 1 will create opaque polygons. (The catchment colour is also used as the fill colour.)

Create extra models of processed channel and edge strings tick box ticked

*Whether to create two additional output models, using the name of the catchment model as a prefix. If **ticked**, processed channel strings are created in cyan, with a model name ending in " channel strings" and processed edge strings are created in magenta, with a model name ending in " edge strings". These extra models may be useful in more complex cases, where a catchment polygon cannot be created automatically. The channel and edge strings may be used to form these more complex catchment polygons, manually.*

Clean target model(s) beforehand tick box ticked

Whether to clean the target model(s) beforehand.

Buttons at Bottom

Run button

Runs the option.

Finish button

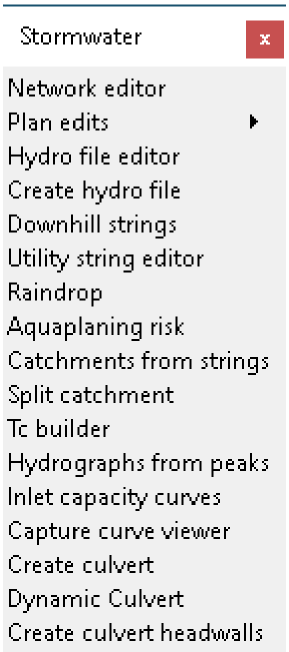
Removes the panel from the screen.

Help button

Launches the 12d help for the option.

18.12 Stormwater Tools

The names of the options **Drainage rainfall editor** and **Create rainfall file** on the **Stormwater** menu has been changed to **Hydro file editor** and **Create hyrdo file** respectively.



See

18.13 Stormwater Inlet Capacities
18.14 Capture Curve Viewer

18.13 Stormwater Inlet Capacities

Now documented In the v15 reference manual

Position of option on menu: **Water => Stormwater =>Inlet capacity curves**
Water => Water setup =>Inlet capacity curves

Background: Stormwater Inlet Capacity - *12d Model* and HEC-22

A common question is "Where do I get stormwater inlet capacity curves for my roadway stormwater design?

Usually not on eBay.

However, the University of South Australia has a full size road test rig to determine stormwater inlet capacities. If you are looking for a more theoretical approach, the U.S. Department of Transportation, **Urban Drainage Design Manual - HEC-22** has design procedures. ***12d Model*** uses these procedures as the basis for their inlet capacity routines for roadway on-grade and sag inlets.

This option analyses a range of road depths, grades and cross falls, plots the inlet curves and inserts them directly into the ***12d Model*** drainage.4d file.

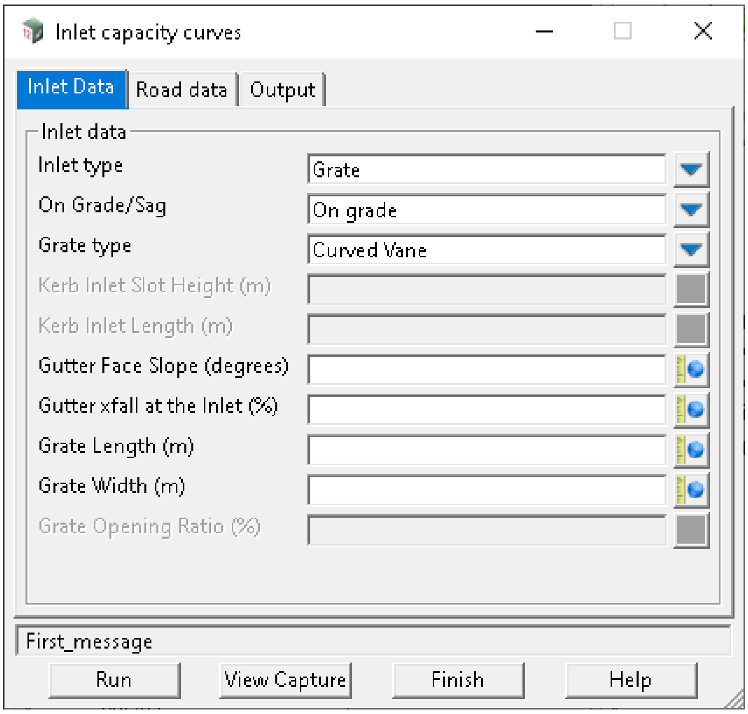
Inlet Capacity option

This routine calculates the inlet capacity for roadway kerb, grate and combination inlets based on principles from the U.S. Department of Transportation, Hydraulic Engineering Circular No. 22, Third Edition URBAN DRAINAGE DESIGN MANUAL. It is highly recommended that the user reads Section **4.4 Drainage Inlet Design** before using this option. https://www.fhwa.dot.gov/engineering/hydraulics/pubs/10009/10009.pdf

Inlet capacities calculations are very sensitive to input data. To assist in sensitivity, test these routine plot the curves to a model for checking and comparison.

Fields in the panel will become disabled when they are not needed for the inlet calculations selected.

Selecting **Inlet capacity** brings up the **Inlet Curves** panel.



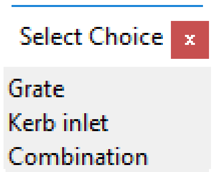
Inlet data tab
Road data tab
Output tab

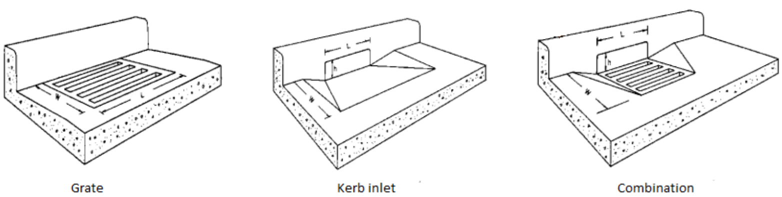
The fields and buttons used in this panel have the following functions:

Field Description	Type	Defaults	Pop-Up

Inlet data tab

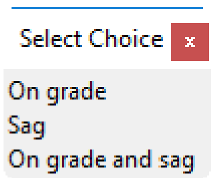
Inlet type choice box





Depending on the inlet type selected some boxes may be disabled.

On Grade/Sag choice box

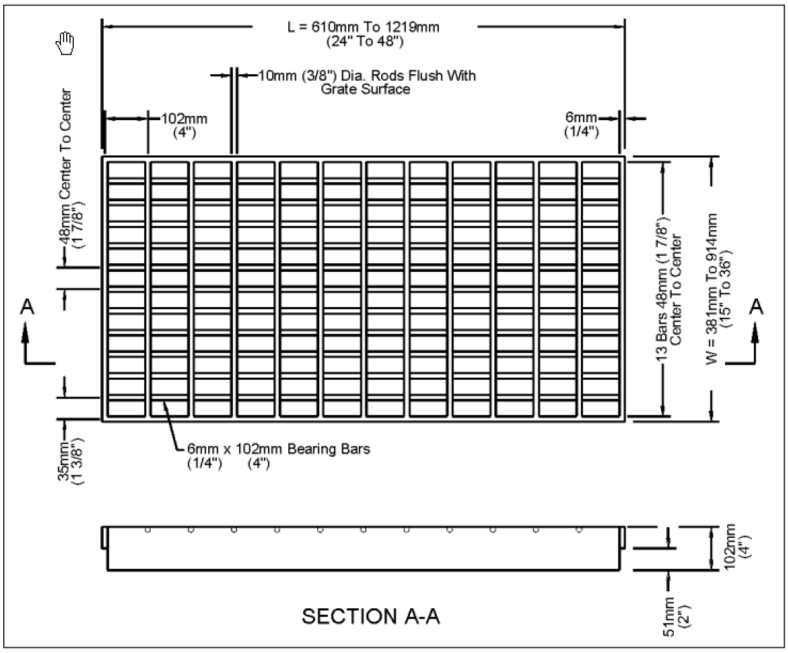


Depending on the On-grade or Sag type selected some boxes may be disabled.

Grate type choice box

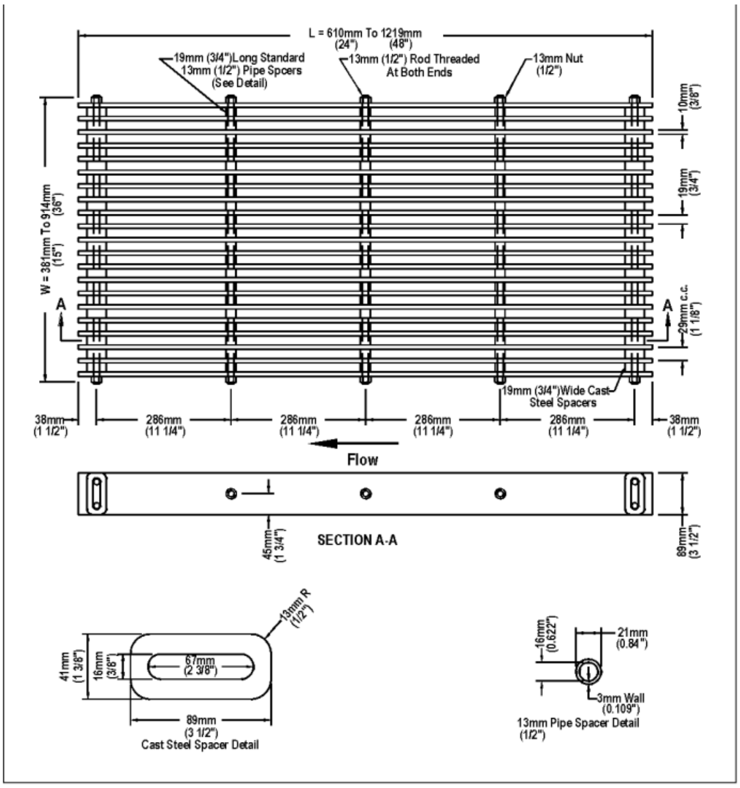
Bar P50 *- Parallel bar grate with bar spacing 48 mm (1-7/8 in) on centre (Original Imperial name was Bar P-1-7/8).*

Bar P50 -100 *- Parallel bar grate with bar spacing 48 mm (1-7/8 in) on centre and 10 mm (3/8 in) diameter lateral rods spaced at 102 mm (4 in) on centre (Original Imperial name was Bar P-1-7/8-4).*

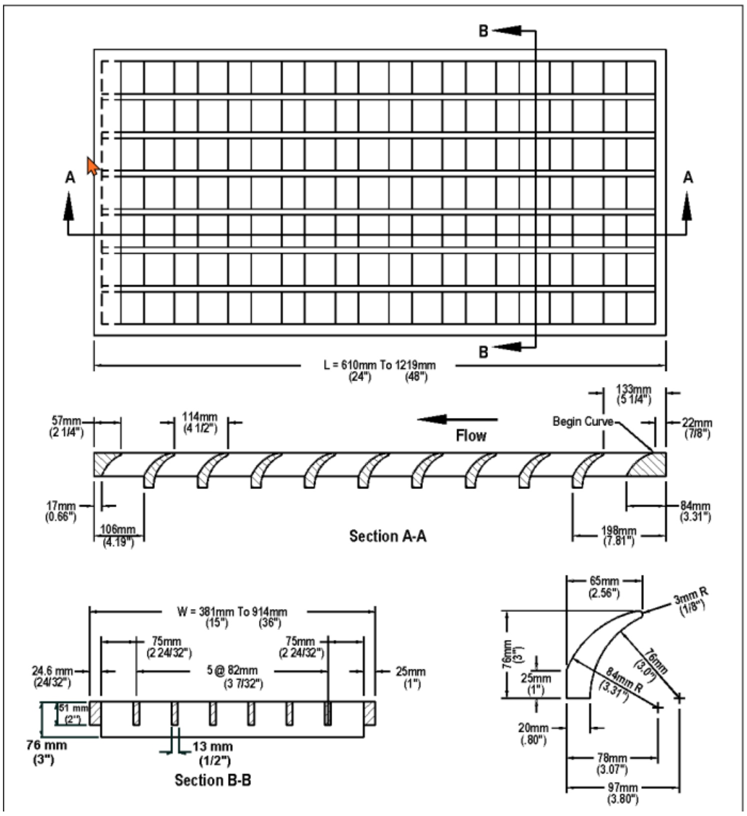


Bar P50 and Bar P50 - 100 grate (P50 is this grate without 10mm (3/8") transverse rods).

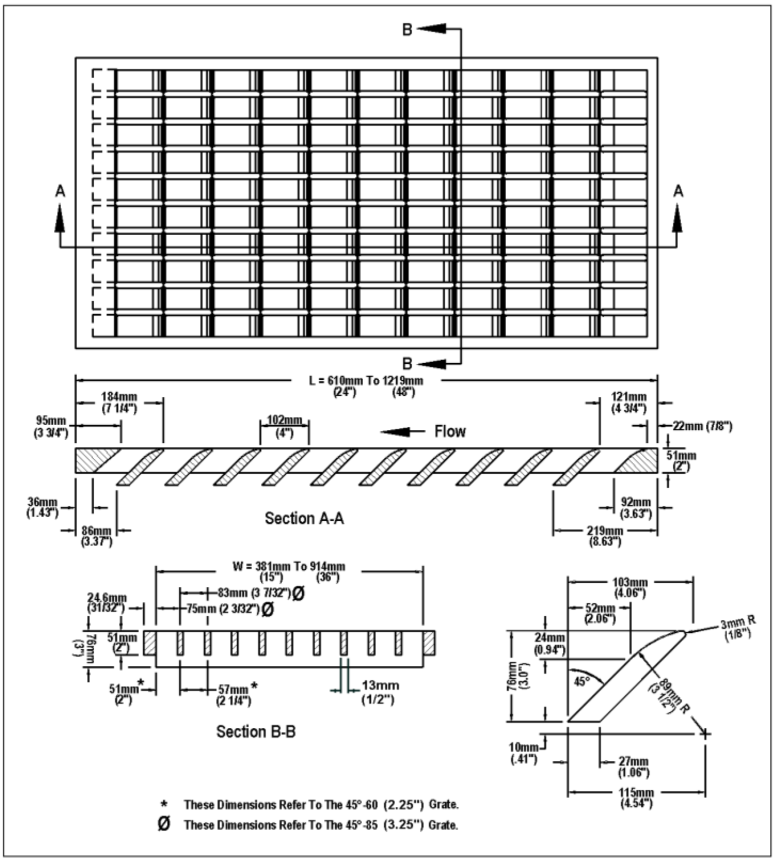
Bar P30 *- Parallel bar grate with 29 mm (1-1/8 in) on centre bar spacing (Original Imperial name was Bar P-1-1/8)*



Curved Vane *- Curved vane grate with 83 mm (3-1/4 in) longitudinal bar and 108 mm (4-1/4 in) transverse bar spacing on centre (Original Imperial name was Vane Grate).*

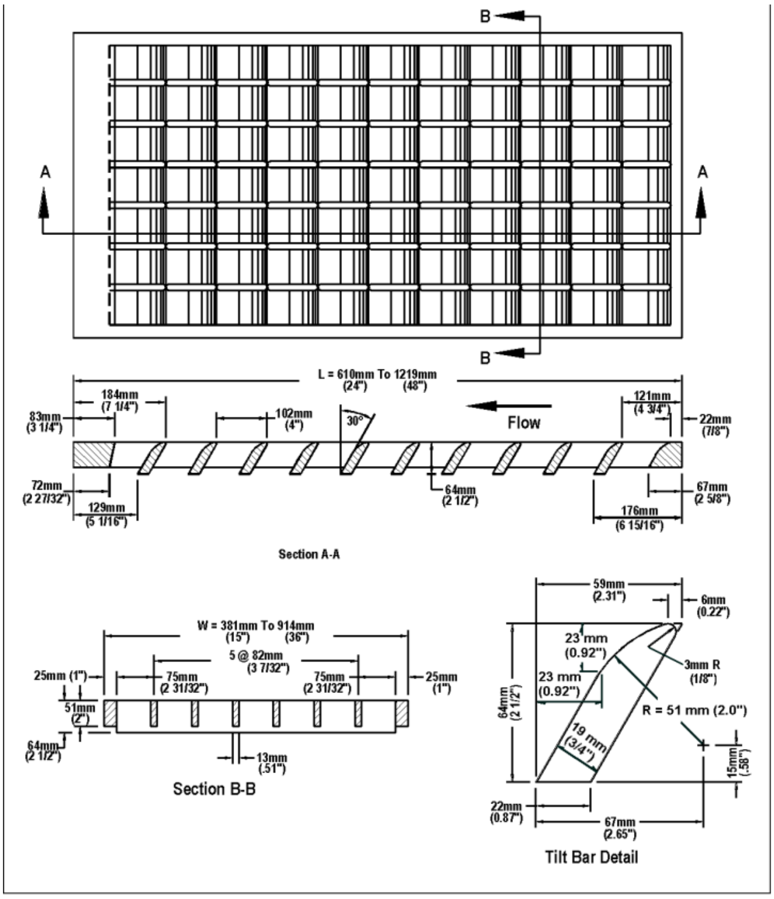


45°- 85 Tilt Bar *- 45° Tilt-bar grate with 83 mm (3-1/4 in) longitudinal bar and 102 mm (4 in)* *transverse bar spacing on centre (Original Imperial name was 45° Tilt-bar).*

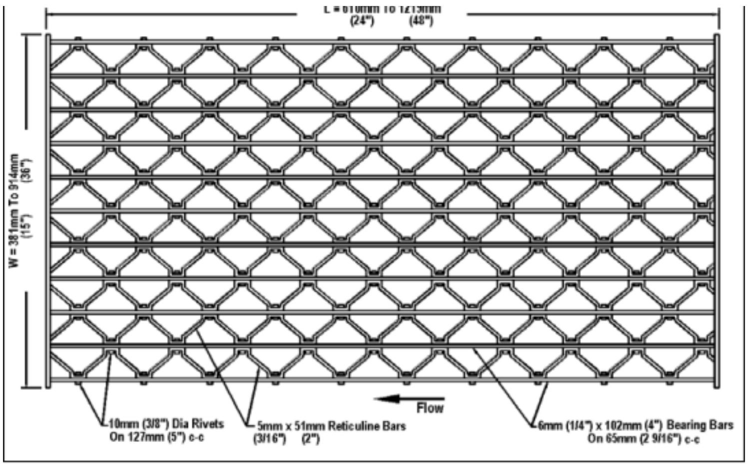


45°- 60 (2.25") and 45°- 85 (3.25") Tilt-bar grates (45°- 60 not supported).

***30°- 85 Tilt Bar** - 30° Tilt-bar grate with 83 mm (3-1/4 in) longitudinal bar and 102 mm (4 in) transverse bar spacing on centre (Original Imperial name was 30° Tilt-bar).*



Reticuline *- "Honeycomb" pattern of lateral bars and longitudinal bearing bars (Original Imperial name was Reticuline).*



Kerb inlet slot height real box

Kerb opening heights vary in dimension, however, a typical maximum height is approximately

0.1 to 0.15 m (4 to 6 in).

0.2

Kerb inlet length real box

Length of the kerb opening (m). The procedure used to calculate the length of kerb necessary to obtain complete capture described in Section 4.4.4 of the HEC-22 document referenced above.

Gutter xfall at the inlet (%) real box

Gutter crossfall at the inlet (%).

Grate length (m) real box

Length of the grate in parallel to the gutter (m).

Grate width (m) real box

Width of the grate in perpendicular to the gutter (m).

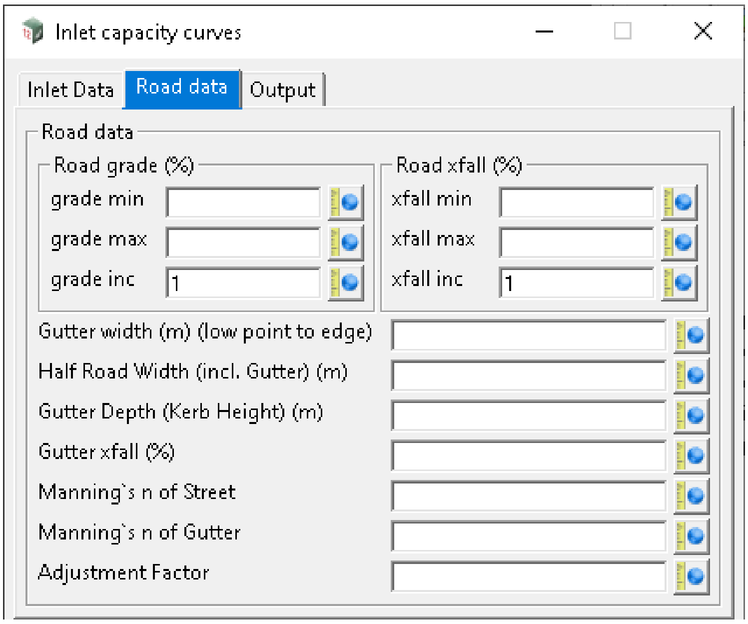
Grate opening ratio (%) real box

Ratio if grate area to grate opening (%). A grate inlet in a sag location operates as a weir to depths dependent on the size of the grate and as an orifice at greater depths. Grates of larger dimension will operate as weirs to greater depths than smaller grates. These inlet types require the clear area of opening of the grate.

Tests of three grates for the Federal Highway Administration showed that for flat bar grates, such as the P-50x100 and P-30 grates, the clear opening is equal to the total area of the grate less the area occupied by longitudinal and lateral bars.

Road data tab

Inlet capture curves can be created for a sag curve and/or a family of on-grade curvecurves. For on-grade curves the parameters for road grade and crossfall are used to create a family of grade-crossfall curves.



Inlet data tab
Road data tab
Output tab

Road data

Road grade (%)

grade min real box

The flattest longitudinal grade for which a curve will be created.

grade max real box

The Steepest longitudinal grade for which a curve will be created.

grade inc real box

The increment used in creation of the curves.

e.g., for a min grade of 1% and a max grade of 4% and an increment of 0.5% 7 curves will be created.

Road xfall (%)

xfall min real box

The flattest road crossfall for which a curve will be created.

xfall max real box

The steepest road crossfall for which a curve will be created.

xfall inc real box

The increment used in creation of the curves.

e.g., for a min crossfall of 1% and a max crossfall of 4% and an increment of 0.5% 7 curves will be created (or 49 curves if we use the 1% - 4% longitudinal grades).

Gutter depth (m) real box

The distance from the low point of the gutter to the top of the kerb.

Gutter xfall (%) real box

The grade of the gutter from the low point of the gutter to the gutter lip.

Gutter face slope (deg) real box

The vertical angle of the face of the kerb.

Manning's n of Street real box

The roughness of the roadway (excluding the gutter) expressed in terms of Manning's n.

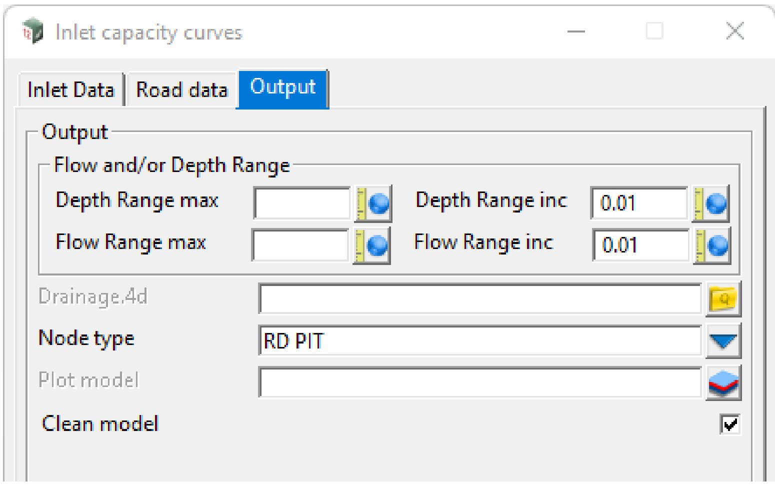
Manning's n of Gutter real box

The roughness of the kerb and gutter expressed in terms of Manning's n.

Adjustment Factor real box

A multiplier applied to the calculation of gutter flow using izzards formula.

Output tab



Inlet data tab
Road data tab
Output tab

Output

Flow and/or Depth Range

Depth Range max real box

The maximum depth that will be used in the creation of a sag curve (curves always start at 0).

Depth Range inc real box .01

The depth increment used to determine the maximum number of points in the sag curve.

Flow Range max (m3/s) real box

The maximum flow that will be used in the creation of the on-grade curves (curves start at 0).

Flow Range inc. (m3/s) real box ,01

The flow increment that will be used in the creation of the on-grade curves.

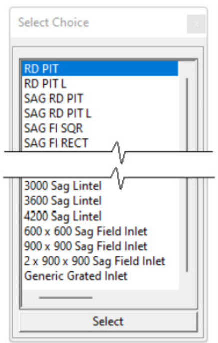
Drainage.4d file box

This is the name of the drainage.4d file (only available with XML format drainage.4d files).

*If a file has been selected the capture curves created when **Run** is clicked with be written to the **Node Type** selected below.*

To create a new drainage.4d file enter its name in this field.

Node type choice box



The choice box displays a list of all nodes in the currently selected drainage.4d file. If no file has been selected the list shows the node types in the default drainage.4d file.

To create a new node type simply enter a new name in this field and a new entry will be created. Note that this feature is not available in most choice boxes.

Plot model model box

If a plot model is selected a plot of the inlet capacity curve(s) will be created and added to the Plot model. (This option has been largely superseded by the ***Capture Curve Viewer*** *option selected via the* ***View Capture*** *button below).*

Clean model tick box

If ***ticked****, the model* ***Plot model*** *will be cleaned before the new plot is created.*

Butons at Bottom

Run button

Generate the family of Sag and/or On-grade curves with the results written to the drainage.4d files and/or the ***Plot Model****.*

View Capture button

Opens the 18.14 Capture Curve Viewer *panel and display the curves for any of the Node Types in the drainage.4d file. (This macro effectively deprecates the need for the Plot Model option).*

Finish button

Closes this panel.

Help button

Opens this help file.

18.14 Capture Curve Viewer

Now documented In the v15 reference manual

Position of option on menu: **Setup => Capture curve viewer (Water theme)**
Water => Stormwater =>Capture curve viewer
Water => Water setup =>Capture curve viewer

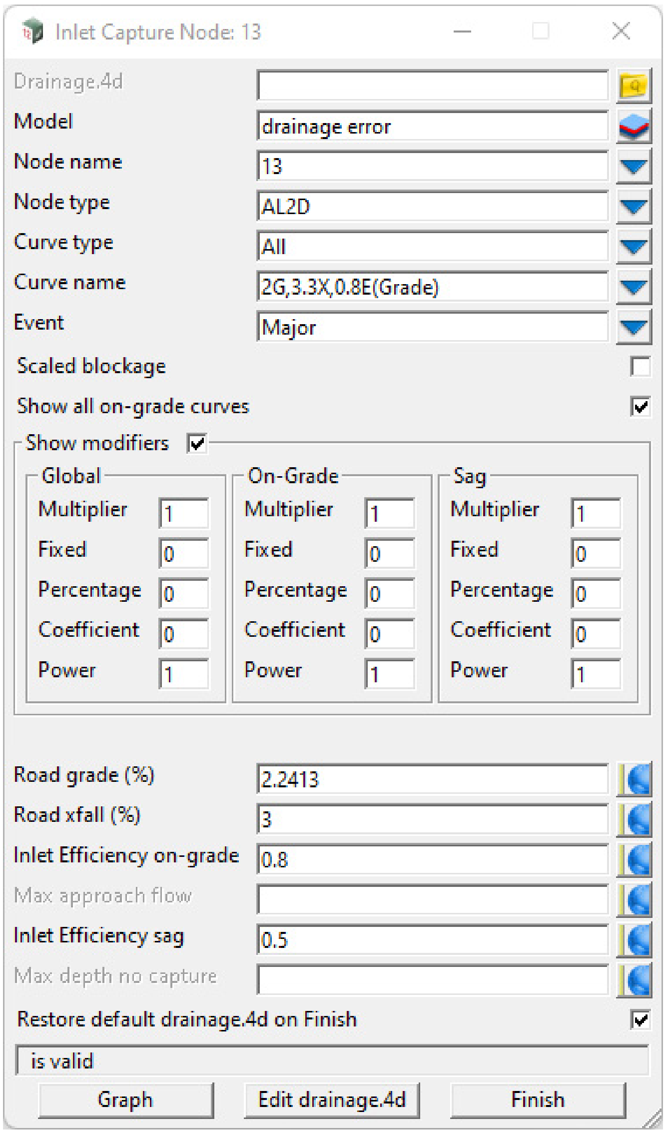
Background: Stormwater Inlet Capacity (pit capture) - 12d Model

The drainage.4d file is a behemoth. It is powerful but complex and not for the feint-hearted.

This option allows the user to test the sensitivity of captured flow to various drainage.4d parameters and give the modeller confidence in the selection of input data.

Where an individual node is selected the panel will show a combination of data from the drainage.4d file and the stormwater model (both model and string element data).

Selecting **Capture curve viewer** brings up the **Inlet Capture Node** panel.



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

Field Description	Type	Defaults	Pop-Up

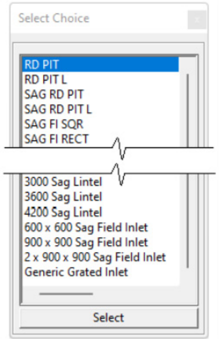
Drainage.4d file box *.4d files

The name of the drainage.4d file currently being interrogated. If blank the currently loaded drainage.4d file will be used.

Model model box available models

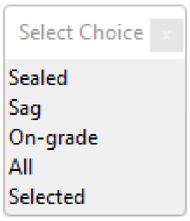
The name of the stormwater model. If blank the road grade, crossfall and efficiency will not be loaded from the stormwater model and used in the calculation of captured flow.

Node name choice box



The choice box displays a list of all nodes in the currently selected drainage.4d file. If no file has been selected the list shows the node types in the default drainage.4d file.

Curve type choice box



*Select the type of curve to display in the graph for the selected **Node Type**. If a stormwater model has been selected the value displayed will be that of the selected model, otherwise "All" will be the default.*

***Sealed** - will display results only for sealed node types.*

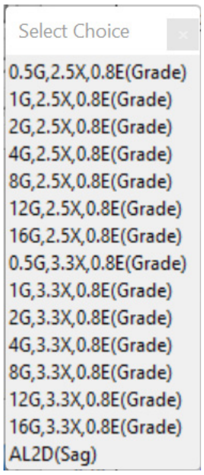
***Sag** - will display results only for the sag curve.*

***On-grade** - will display only results for the on-grade curves with the curve representing the road grade and crossfall shown with a bold line-style.*

***All** - will display all the curves in the drainage.4d file. If a stormwater model has been selected the sag curve will be shown with a bold line-style, as will be the on-grade graph corresponding to the roadway grade and crossfall read from the stormwater model (this name will also be shown in the **Curve Name** choice box.*

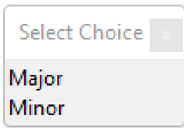
***Selected** - will display results only for the curve shown in the **Curve Name** choice box.*

Curve name model box



*If the **Curve Type** option above is" Selected" then the curve name selected in this option will be shown in the graph. If there are on-grade curves available the default curve shown will be that matching the road grade and crossfall shown below.*

Event choice box



*The event type (major or minor) is used to decide which **Inlet Efficiency** value to load from the stormwater model.*

Scaled Blockage tick box not ticked

Adjust the approach flow according to the on-grade efficiency. Has no effect on Sag curves.

Show all on-grade curves tick box ticked

If enabled the entire family of on-grade curves will be shown. If not, only the curve corresponding to the grade and crossfall below will be displayed.

Show modifiers tick box ticked

Toggling this tick box will collapse and expand the curve modifiers shown below.

Global/On-grade/Sag modifiers

The drainage.4d file allows the inlet capture to be defined by an equation, a curve or a combination of both. The global modifiers are applied in addition to the on-grade or sag modifiers. The interaction of these modifiers can be quite complex so the modeller is encouraged to experiment with these parameters and use the graph to interpret the changes.

Multipier real box

As the name suggests the multiplier adjusts the captured flow.

e.g., a multiplier of 2 will double the captured flow, 0.5 will halve it.

Fixed real box

A fixed captured flow is added to any existing capture curve.

Percentage real box

For on-grade inlets a percentage of the approach flow is added to any existing capture curve.

Coefficient real box

This is the coefficient used in a power equation for on-grade inlets.

Power real box

This is the exponent used in a power equation for on-grade inlets.

Road Grade (%) real box

The longitudinal grade at the selected node. The on-grade curve corresponding to this grade is shown with a bold line-type.

Road xfall (%) real box

The road crossfall at the selected node. The on-grade curve corresponding to this grade is shown with a bold line-type.

Inlet Efficiency on-grade real box

The efficiency of an on-grade inlet for the selected event type. This is the opposite of blockage. i.e., an inlet that is 20% blocked has an efficiency of 0.8.

Max approach flow real box

Restrict the inlet capture of an on-grade curve to the value captured at this approach flow.

Inlet Efficiency Sag real box

The efficiency of a sag inlet for the selected event type. This is the opposite of blockage. i.e., an inlet that is 20% blocked has an efficiency of 0.8.

Max depth no capture real box

Set the inlet capture of a sag curve to zero until this depth is exceeded, after which the original depth vs capture curve is applied.

Restore default drainage.4d on Finish tick box ticked

If a drainage.4d file name has been entered in this panel, the data from this file is loaded into memory and will be used after this panel is closed. Selecting this tick box will cause original drainage.4d file to be reloaded into memory.

Graph button

Open the Capture Curve graph. *See* 18.14.1 Graph Panel.

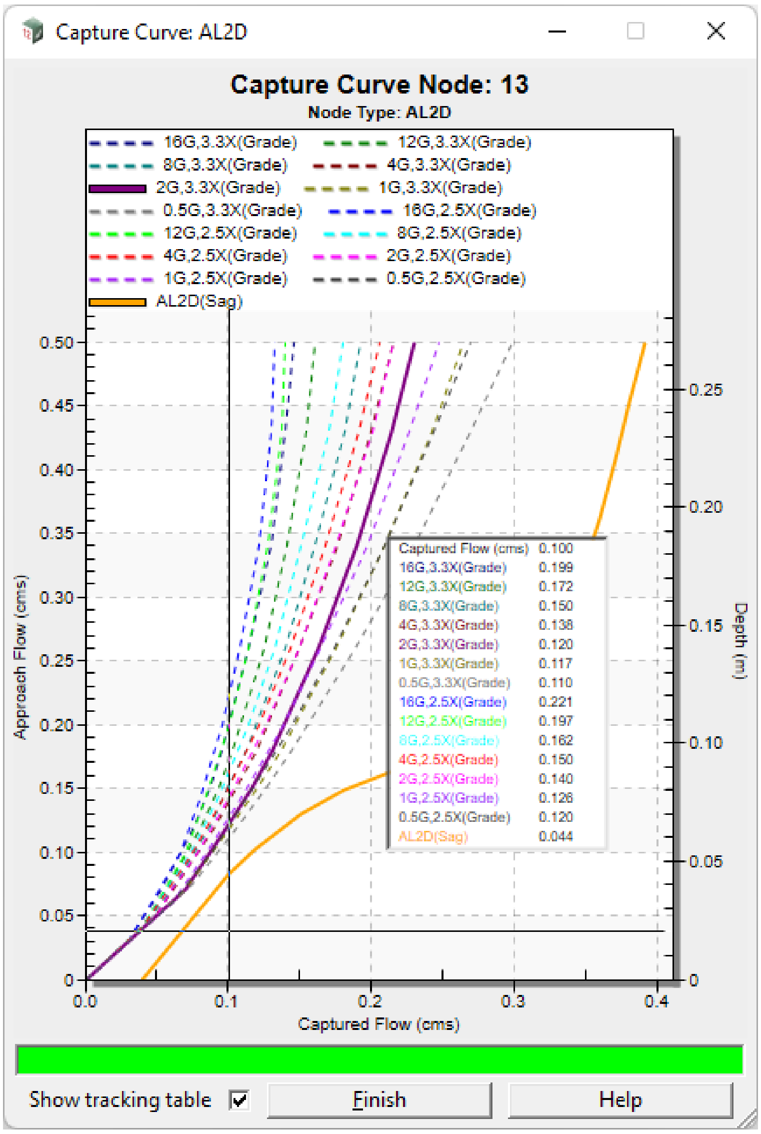
Edit drainage.4d button

Open the Drainage.4 File Editor.

Finish button

Close the panel.

18.14.1 Graph Panel



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

Field Description	Type	Defaults	Pop-Up
Show tracking table	tick box	ticked	

The tracking table tracks the cursor as it moves about the screen displaying the captured flow and the equivalent captured flows for on-grade pits and depth for sag pits. Disabling this tick box removes the tracking table and changes the cursor style.

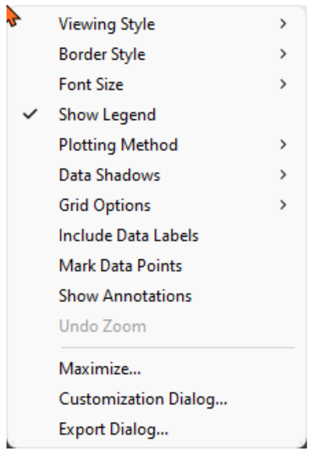
Finish button

Closes this panel. The panel can be re-opened by clicking the Graph button on the main panel.

Help button

Opens this help file.

RB Mouse



There are numerous display options available and the modeller is encouraged to experiment.

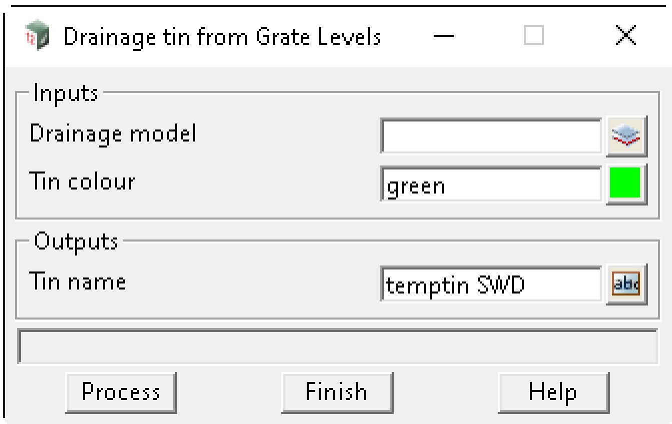
18.15 Triangulate Grate Levels

Position of option on menu: **Water =>Water network =>Tools =>Triangulate grate levels**

Now documented In the v15 reference manual

This option allows the user to create a tin from the current grate levels on the drainage model. The option will also retain strings that can be used for retriangulation.

On selecting the **Triangulate grate levels** option, the Drainage tin from Grate Levels panel is displayed.



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

Field Description	Type	Defaults	Pop-Up
Inputs			
Drainage model	model box		available models
Drainage model to create a tin.			
Tin colour	colour box	green	available colours
Colour for the created tin.			
Outputs			
Tin name	text box	temptin SWD	
Name for the created tin.			
Buttons at Bottom			
Process	button		
Creates the Tin.			

19 Dynamic Water Supply

There has been changes to the **Dynamic Water Supply** chapter in the ***12d Model Reference manual***.

See 19.1 Dynamic Water Supply - Rule Builder

See 19.2 Dynamic Water Supply - Control Builder

19.1 Dynamic Water Supply - Rule Builder

Now documented In the v15 reference manual

This option allows for definition of rule-based controls that modify links based on a combination of conditions, during analysis.

Each rule is a series of statements of the general form:

RULE ruleID

IF condition_1

AND condition_2

OR condition_3

AND condition_4

etc.

THEN action_1

AND action_2

etc.

ELSE action_3

AND action_4

etc.

PRIORITY value

where

ruleID	=	an ID label assigned to the rule
condition_#	=	a condition clause
action_#	=	an action clause
Priority	=	a priority value (e.g. a number from 1 to 5)

The rule builder is intended to assist with achieving the correct rule syntax, without requiring an in-depth knowledge of the rule format.

Notes:

1.Only the **RULE**, **IF** and **THEN** portions of a rule are required; the other portions are optional.

2.When mixing **AND** and **OR** clauses, the **OR** operator has a higher precedence than **AND**, i.e.

IF A or B and C

Is equivalent to

IF (A or B) and C

If the interpretation was intended to be

IF A or (B and C) then this would need to be expressed using two rules as in

IF A THEN …

IF B and C THEN …

3.The PRIORITY value is used to determine which rule applies when two or more rules require that conflicting actions be taken on a link. A rule without a priority value always has a lower priority than one with a value. For two rules with the same priority value, the rule that appears first is given the higher priority.

Condition Clause Format:

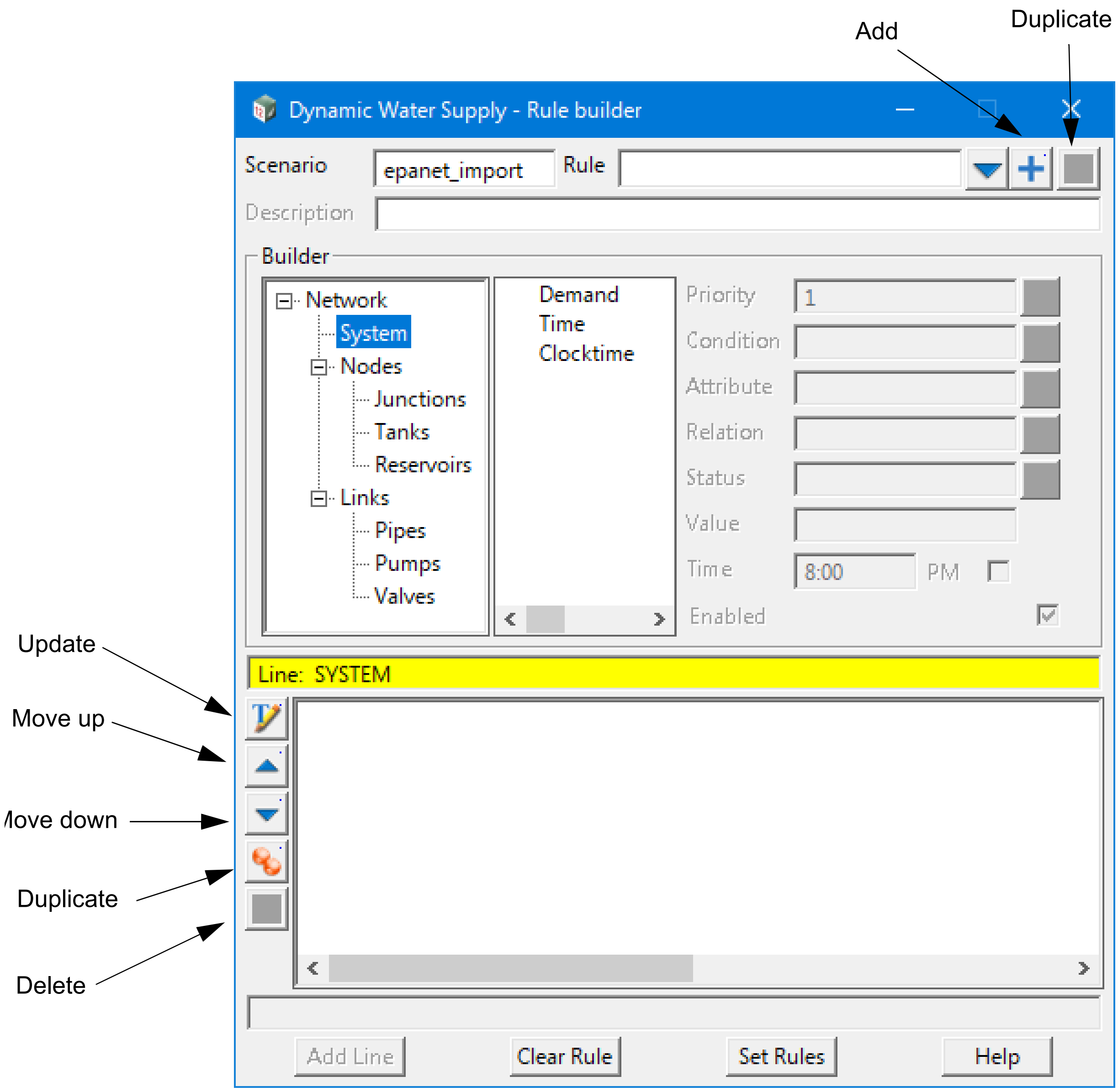
A condition clause in a Rule-Based Control takes the form of:

<object> <id> <attribute> <relation> <value>

where

object	=	a category of network object (i.e. NODE, JUNCTION, PUMP etc)
id	=	the object's ID label (not required for SYSTEM objects)
attribute	=	an attribute or property of the object
relation	=	a relational operator
value	=	an attribute value

After clicking the **Rule Builder** button on the Water Network Editor, the **Dynamic Water Supply - Rule Builder** panel.



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

Field Description Type Defaults Pop-Up

Scenario input box

The DWS prefix that was set in the WNE. Controls the attribute group that the rules and controls will be stored under for analysis. This is a read-only field.

Rule choice box

The rule name. A model can have as many rules as required to allow the analysis to operate in an effective and intended manner. Each.rule is required to have a unique ID. Rules already set can be selected via their ID here for review/editing.

Add Rule button

Prompts the user for a name and then creates a new rule with the name.

Duplicate Rule button

Prompts the user for a new name and then duplicates the currently selected rule with the new name.

Description input box

An optional description can be provided for the currently selected rule.

Priority choice box

<Not currently used - future development>

Condition choice box

Rule condition clause (Eg, IF, AND, OR, THEN, ELSE).

Attribute choice box

An attribute belonging to the condition clause. The attributes available depend on the object type related to the rule line that is being written.

For Node-type objects (Node, Junction, Reservoir) the following attributes can be used:

DEMAND

HEAD

PRESSURE

For Tanks the following attributes can be used:

LEVEL

FILLTIME (hours needed to fill a tank)

DRAINTIME (hours needed to empty a tank)

For Link-type objects (Pumps, Valves, Pipes) the following attributes can be used:

FLOW

STATUS

SETTING (pump speed or valve setting)

For a System object, the following attributes can be used:

DEMAND (total system demand)

TIME (hours from the start of simulation - decimal)

CLOCKTIME (12-hour clock time with AM or PM appended)

Relation choice box

The relation operator used for the condition clause. Relation operators consist of the following:

=

<>

<

>

<=

>=

IS

NOT

BELOW

ABOVE

Status choice box

Defines the status of selected links during the simulation. The status value can be OPEN or CLOSED. For control valves (i.e. PRVs, FCVs etc) this means that the valve is either fully opened or closed, not active at its control setting. The setting value can be a speed setting for pumps or a valve setting for valves. Check valves cannot have a preset status. Available choices are:

OPEN

CLOSED

SETTING

Value real box

Value to be used in the Condition clause (refer condition clause format at the top of this section).

Time input box

A time value, either the time since start of the simulation in decimal hours (i.e. 1.25) or the Clocktime in 12-hour format (i.e. 8:15).

PM tick box

Allows the user to choose AM or PM for a Clocktime object (not used for time since start of simulation).

Enabled tick box

Allows the user to disable a rule for analysis, without deleting the rule. Any disabled rules will not appear after returning to the WNE.

Update line button

Updates the currently selected line in the rule conditions list, with the values in the widgets on the panel.

Move up button

Moves the line currently selected in the rule conditions list, up one level.

Move down button

Moves the line currently selected in the rule conditions list, down one level.

Duplicate line button

Duplicates the line currently selected in the controls list box at the bottom of the list.

Delete line button

Deletes the line currently selected in the rule conditions list.

Buttons at Bottom

Add Line button

Adds the line being built, into the current rule. Not active until the line syntax has been correctly built.

Clear Rule button

Clears all lines from the current rule.

Set Rules button

Sets all of the rule data that has been modified in the panel and returns to the WNE for inclusion in the model.

19.2 Dynamic Water Supply - Control Builder

Now documented In the v15 reference manual

This option allows for definition of controls that modify links based on a single condition, during analysis.

Each control is a single line statement of the general form:

LINK linkID status **IF NODE** nodeID **ABOVE/BELOW** value

LINK linkID status **AT TIME** time

LINK linkID status **AT CLOCKTIME** clocktime **AM/PM**

where

linkID	=	a link ID label
status	=	OPEN or CLOSED, a pump speed setting, or a control valve setting
nodeID	=	a node ID label
value	=	a pressure for a junction or a water level for a tank
time	=	a time since the start of the simulation in decimal hours
clocktime	=	a 12-hour clock time (hours:minutes)

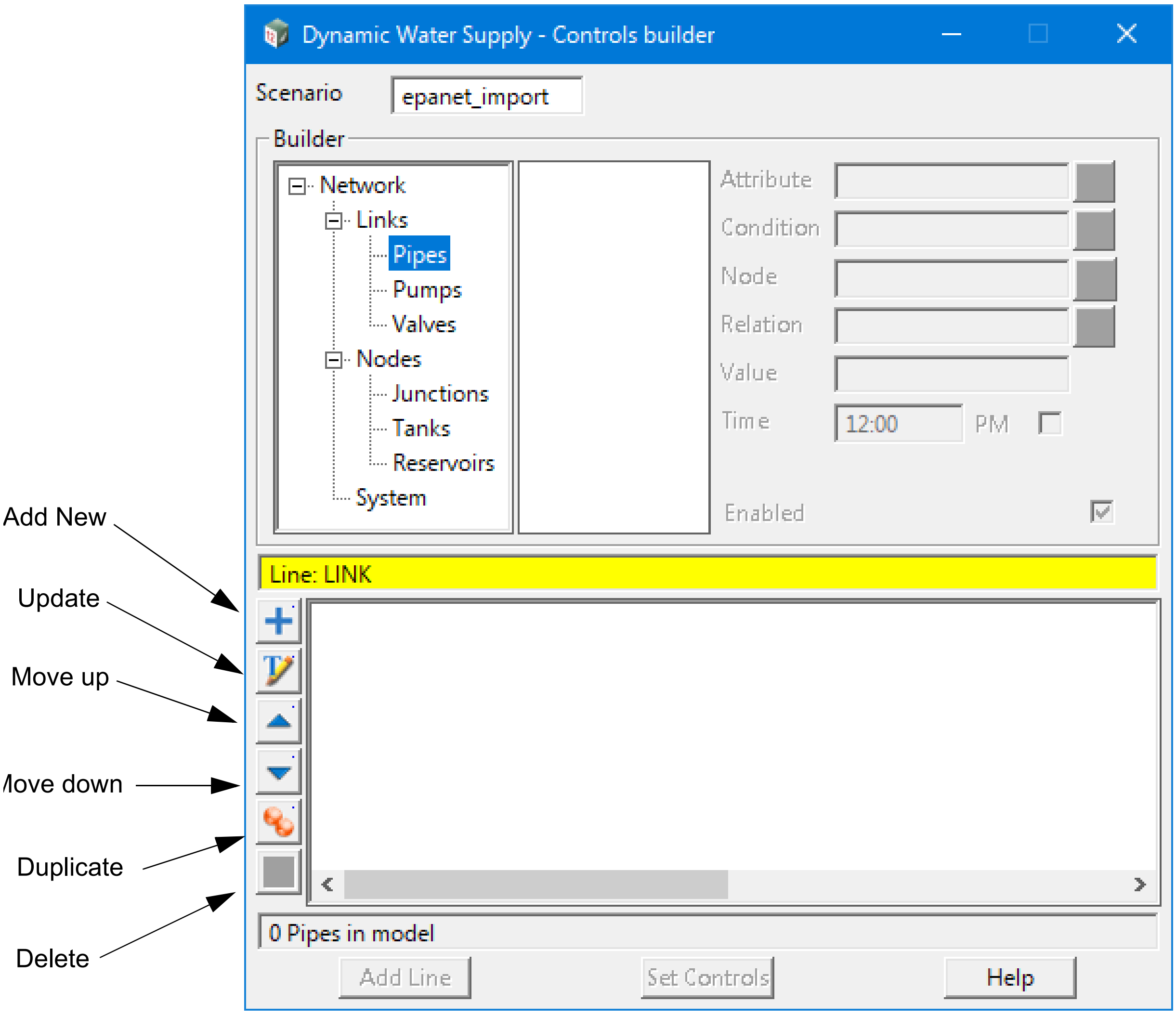
The rule builder is intended to assist with achieving the correct rule syntax, without requiring an in-depth knowledge of the rule format.

Notes:

1. Simple controls are used to change link status or settings based on tank water level, junction pressure, time into the simulation or time of day.

2. Refer to the section on Rule Builder in the subsection 'Status' for conventions used in specifying link status and setting, particularly for control valves.

After clicking the **Control Builder** button on the Water Network Editor, the **Dynamic Water Supply - Control Builder** panel.



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

Field Description	Type	Defaults	Pop-Up

Scenario input box

The DWS prefix that was set in the WNE. Controls the attribute group that the rules and controls will be stored under for analysis. This is a read-only field.

Add Rule button

Prompts the user for a name and then creates a new rule with the name.

Attribute choice box

An attribute belonging to the condition clause. The attributes available depend on the object type related to the rule line that is being written.

For Node-type objects (Node, Junction, Reservoir) the following attributes can be used:

DEMAND

HEADPRESSURE

For Tanks the following attributes can be used:

LEVEL

FILLTIME (hours needed to fill a tank)

DRAINTIME (hours needed to empty a tank)

For Link-type objects (Pumps, Valves, Pipes) the following attributes can be used:

FLOW

STATUS

SETTING (pump speed or valve setting)

For a System object, the following attributes can be used:

DEMAND (total system demand)

TIME (hours from the start of simulation - decimal)

CLOCKTIME (12-hour clock time with AM or PM appended)

Condition choice box

Rule condition clause (IF or AT)

Node choice box

Allows the user to select the node that is to be used for evaluation of the control. Not required for TIME or CLOCKTIME controls.

Relation choice box

The relation operator used for the condition clause. Relation operators consist of the following:

ABOVE

BELOW

Not required for TIME or CLOCKTIME controls.

Value real box

Value to be used in the Condition clause (refer condition clause format at the top of this section). Not used for TIME or CLOCKTIME controls.

Time input box

A time value, either the time since start of the simulation in decimal hours (i.e. 1.25) or the Clocktime in 12-hour format (i.e. 8:15).

PM tick box

Allows the user to choose AM or PM for a Clocktime object (not used for time since start of simulation).

Enabled tick box

Allows the user to disable a control for analysis, without deleting the control. Any disabled controls will not appear after returning to the WNE.

after returning to the WNE.

Update line button

Updates the currently selected line (Control) in the controls list box with the values in the widgets on the panel.

Move up button

Moves the line currently selected in the controls list box, up one level.

Move down button

Moves the line currently selected in the controls list box, down one level.

Duplicate line button

Duplicates the line currently selected in the controls list box at the bottom of the list.

Delete line button

Deletes the line currently selected in the controls list box.

Buttons at Bottom

Add line button

Adds the line being built, into the current set of model controls. Not available until the line syntax has been correctly built.

Set Controls button

Sets all of the controls that have been modified in the panel and returns to the WNE for inclusion in the model.

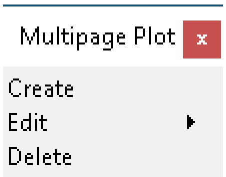
20 Plot

In **V14** the menu was called **Plots** and in **V15** this has been renamed **Plot** and has been totally rearranged.

See
20.1 Multipage Plots

20.1 Multipage Plots

Position of menu: **Plot =>Multipage plots**



20.1.1 Multipage Plot Create
20.1.2 Multipage Plot Edit
20.1.3 Multipage Plot Delete

20.1.1 Multipage Plot Create

Position of option on menu: **Plot =>Multipage plot =>Creates**

20.1.1.1 Icons and Fields for the Book

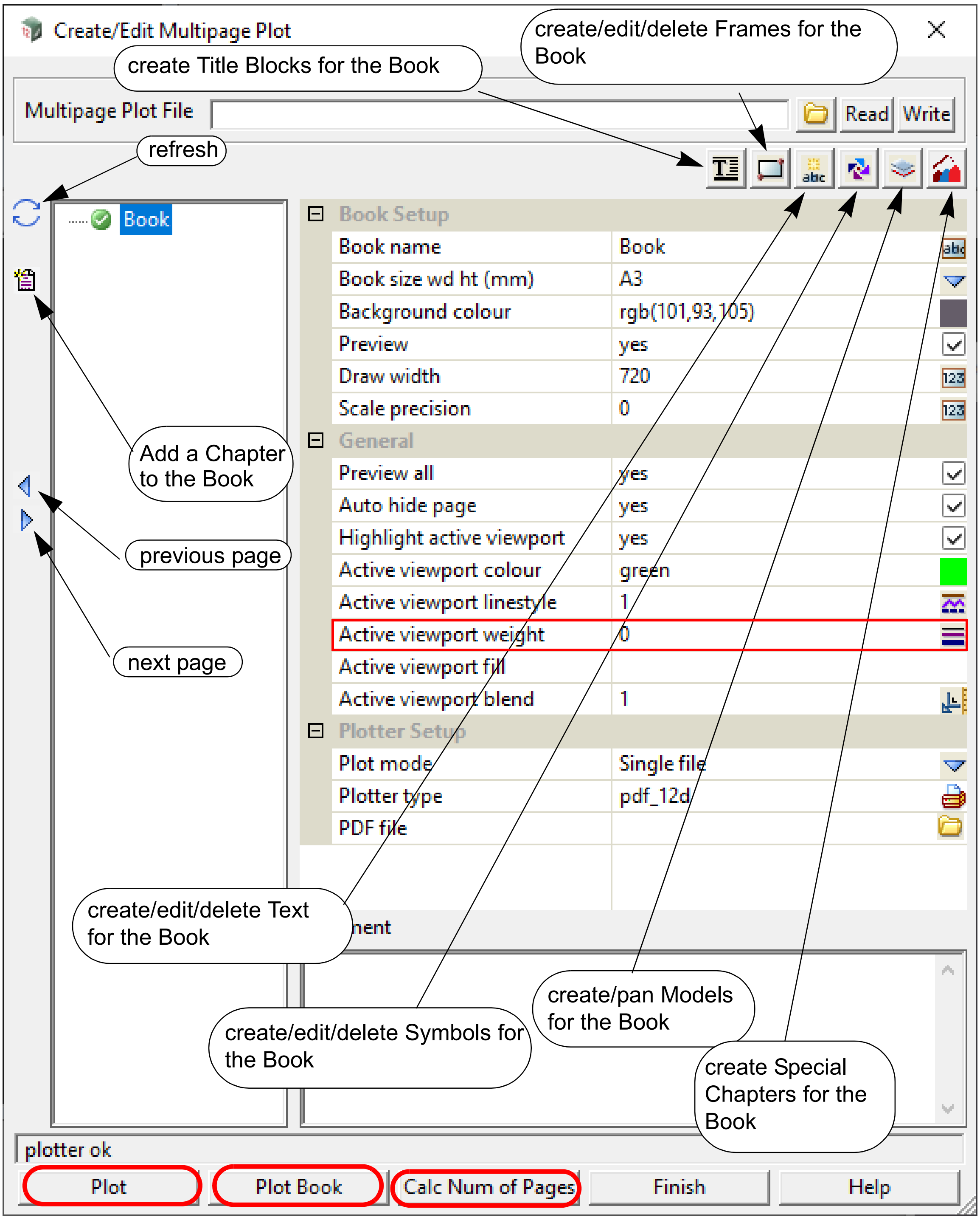
The option "Active" has been **deleted** from under the Book Setup tab on the *Create/Edit Multipage Plot* panel.

Active tick box ticked

*if **ticked**, the currently selected node is made active and will be used when plotting. The Node's active/ inactive icon will be set to active.*

*if **not ticked**, the currently selected node is made inactive and it (and all of its Subnodes) will be ignored when plotting. The Node's active/inactive icon will be set to inactive.*

***Note**: this tick box is linked to the Node's active/inactive icon. Changing one also changes the other.*



Active viewport weight has been **added** to the *Create/Edit Multipage Plot* panel.

Active viewport weight	weight box	0	available weights

the weight used for the border when highlighting the active viewport.

20.1.2 Multipage Plot Edit

Position of option on menu: **Plot =>Multipage plots =>Edit**

20.1.3 Multipage Plot Delete

Position on menu: **Plot =>Multipage plots =>Delete**

20.1.4 Create/Edit Multipage Plot

See

20.1.1.1 Icons and Fields for the Book
20.1.4.1 Node Diagram Frame
20.1.4.2 MPS Text $variables
20.1.4.3 Node Diagram Chapter
20.1.4.4 $variables

20.1.4.1 Node Diagram Frame

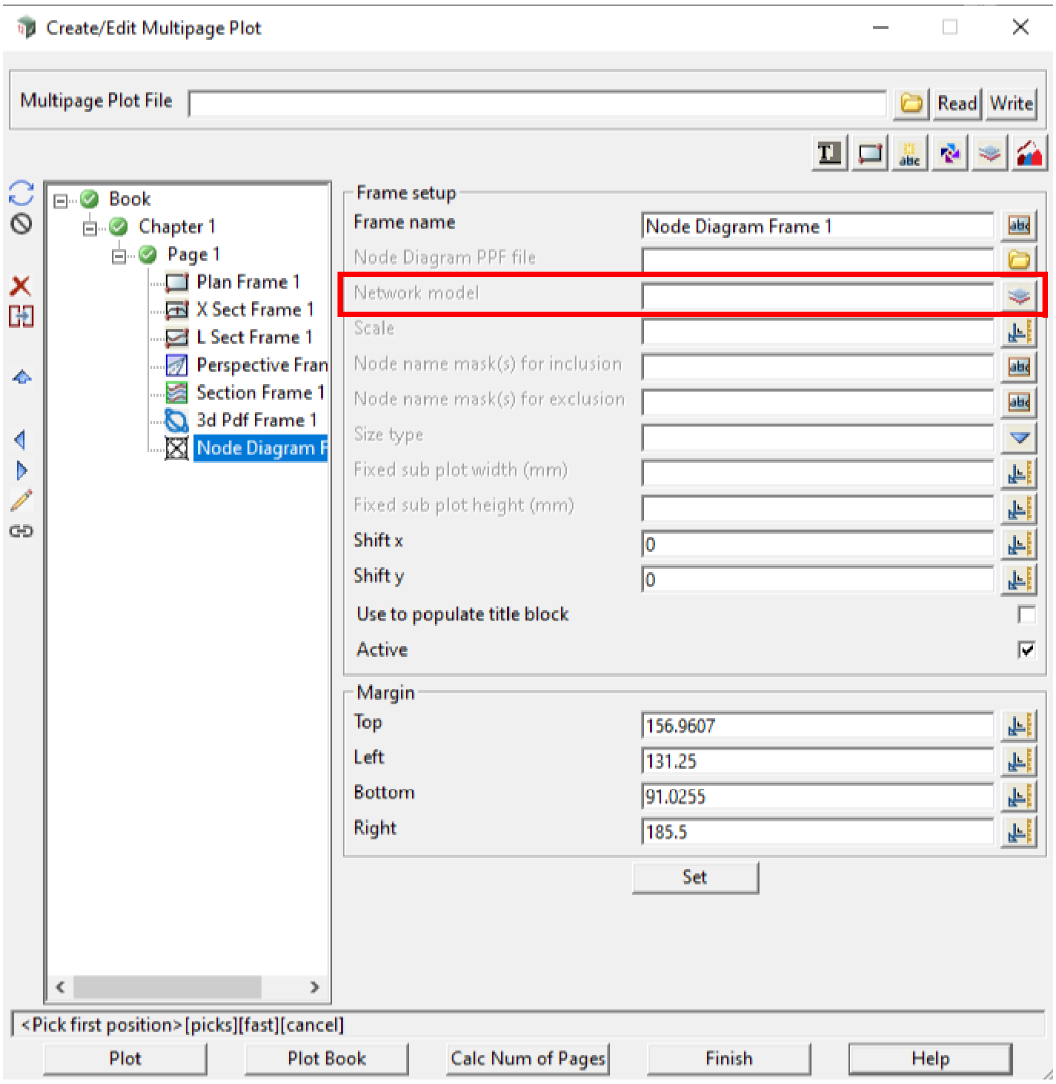
Netword Model has been added under Frame Setup menu on the **Create/Edit Multipage Plot** panel.

Network model Model box available models

the model containing the water string whose nodes are to be plotted.

if ***not blank****, this value will override the existing value of the* ***Network model*** *field in the* ***Node Diagram PPF file*** *when plotting.*

if ***blank****, no overriding will occur and the* ***Network model*** *field value specified in the* ***Node Diagram PPF file*** *will be used when plotting.*



20.1.4.2 MPS Text $variables

(h) **$folder** variable has been added to MPS text $variables.

(i) **$project** variable has been added to MPS text $variables.

$folder *which at plot time is replaced by the full path name of the working folder for the current project.*

$project *which at plot time is replaced the name of the current project.*

20.1.4.3 Node Diagram Chapter

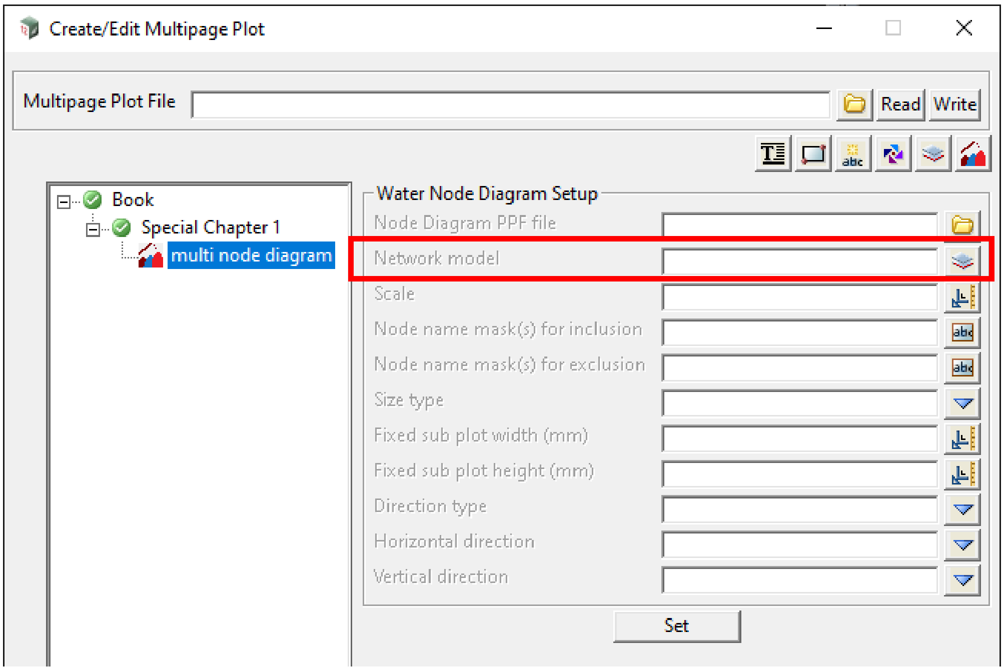
Netword Model has been added under Water Node Diagram Setup tab on the **Create/Edit Multipage Plot** panel.

Network model Model box available models

the model containing the water string whose nodes are to be plotted.

*if **not blank**, this value will override the existing value of the **Network model** field in the **Node Diagram PPF file** when plotting.*

*if **blank**, no overriding will occur and the **Network model** field value specified in the **Node Diagram PPF file** will be used when plotting.*



20.1.4.4 $variables

20.1.4.4.1 MPS Text and Text Frame $variables

Text can be inserted at the Book, Chapter and Page level or can be attached to a Frame (referred to as Text Frame).

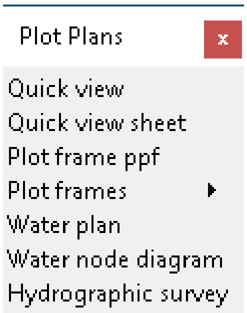
The $variables **$vertical_exaggeration**, **$scale** and **$frame** only make sense when they are used as a **Text Frame** and not just straight Text.

BAD	GOOD
NOT WORKING	WORKING
PARTIAL	NOT SUPPORTED
UNSURE	

$VARIABLE	Text and Text Frame $variables									
	Book	Chapter	Page	Plan	X Section	Long Section	Perspective	Section	3D PDF	Water Node
$vertical_exaggeration										
$scale										
$frame										
$total_pages										
$current_page										
$book										
$chapter										
$page										
$user										
$time										
$project_attribute										
$synergy_attribute										
$project_details										

20.2 Plans

Position of menu: **Plot =>Plans**

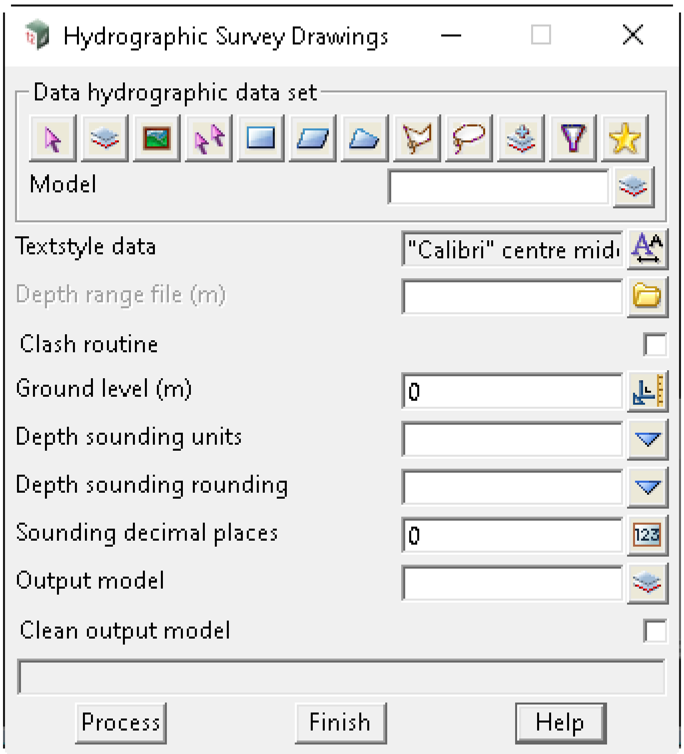


20.2.1 Hydrographic Survey Drawings

20.2.1 Hydrographic Survey Drawings

This panel takes an input dataset of points which will be converted to an output of depth soundings.

Selecting **Hydrographic survey** brings up the **Hydrographic survey drawings** panel.



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

Field Description	Type	Defaults	Pop-Up
Hydrographic data set	source box	mode	

data set containing points to create depth soundings from. Find more info 4.24.3 Data Source.

Selected data source	input	Model	

source of data to process.

Textstyle data	textstyle data box	"Calibri" centre middle white 20 0.268 0.75	textstyle info panel

contains the parameters for defining the visual representation of the depth soundings.

Depth range file	file box	*drf	file directory

file containing specific colours for depth ranges, depth soundings with z values that lie within the depth ranges (m) will be assigned a given colour. Find more info 17.11.5 Depth Range File.

Clash routine	tick box	not ticked	

*if **ticked**, outputted depth soundings will not overlap each other.*

Ground level	real box	0	measures menu

determines the height in metres that the depth soundings are measure relative to.

Depth sounding units	choice box		Metres Decimetres Millimetres

determines whether the depth soundings are displaying the inputted heights in metres.

Depth sounding rounding	choice box	0	Round Round up

determines whether the displayed depth soundings are rounded normally or rounded up.

Sounding decimal places	integer box	0	

displayed depth soundings will be rounded to the given number of decimal places.

Output model	model box		select model panel

the chosen output model the depth soundings will be outputted to.

Clean output model	tick box	not ticked	

*if **ticked**, the chosen output model will be cleaned before the depth soundings are added to the output model.*

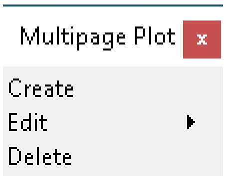
Buttons at Bottom

Process	button

run the option.

20.3 Multipage Plots (MPS)

Position of option on menu: Plot =>Multipage plots



20.3.1 Multipage Plot Create
20.3.2 Multipage Plot Edit
20.3.3 Multipage Plot Delete

The **Multipage Plots** option, commonly referred to as **MPS**, is a heavily customisable option for producing multiple pages of technical drawings that are output as pdf files.

MPS has a tree-like structure that is made up of nodes. The top level Node is called the **Book** Node and there can only ever be one **Book** Node per **MPS**.

Each **Book** Node is made up of one or more **Chapter** Nodes, which in turn is made up of one or more **Page** Nodes. Each **Page** Node represents a single pdf page. There are also **Special Chapter** Nodes which are capable of producing multiple pdf pages.

The Node hierarchy of the tree structure allows other Node types (**Title Blocks**, **Frames**, **Text**, **Symbols** and **Models**) to be defined once at the **Book** or **Chapter** level and apply to all the **Page** Nodes beneath them in the tree.

For example, for **Text**:

Text can be defined at the **Book** level and will appear on all the **Pages** of all the **Chapters** of the **Book**.

If **Text** is defined at the **Chapter** level, it will appear on all the **Pages** of that **Chapter**.

If **Text** is defined at the **Page** level, it will appear on that **Page** only.

Text can also be defined for each individual **Frame** at any level of the tree.

Another benefit of the tree structure is that entire sections of the tree can be made inactive to stop them plotting. For example; individual **Page** Nodes or whole **Chapters** can be made inactive if the user desires.

Each **Page** of the **MPS** can be made up of any number of plotting areas (called **Frames**). These **Frames** can be of the type **Plan**, **X-Section**, **Long Section**, **Perspective**, **Section**, **3D PDF** and **Node Diagram**. The **Plan Frame** is for drawing part of a Plan View, the **X-Section Frame** draws a cross section at a selected chainage from a **X-Section PPF**, the **Long Section Frame** draws a chainage range from a **Long Section PPF**, the **Perspective Frame** is for drawing part of a Perspective View, the **Section Frame** is for drawing part of a Section View, the **3D PDF Frame** is for drawing part of a Perspective View as a 3D PDF and the **Node Diagram Frame** draws plan diagrams of the water nodes from a **Water Node Diagram PPF**.

The **Pages** can also have user defined Title Blocks.

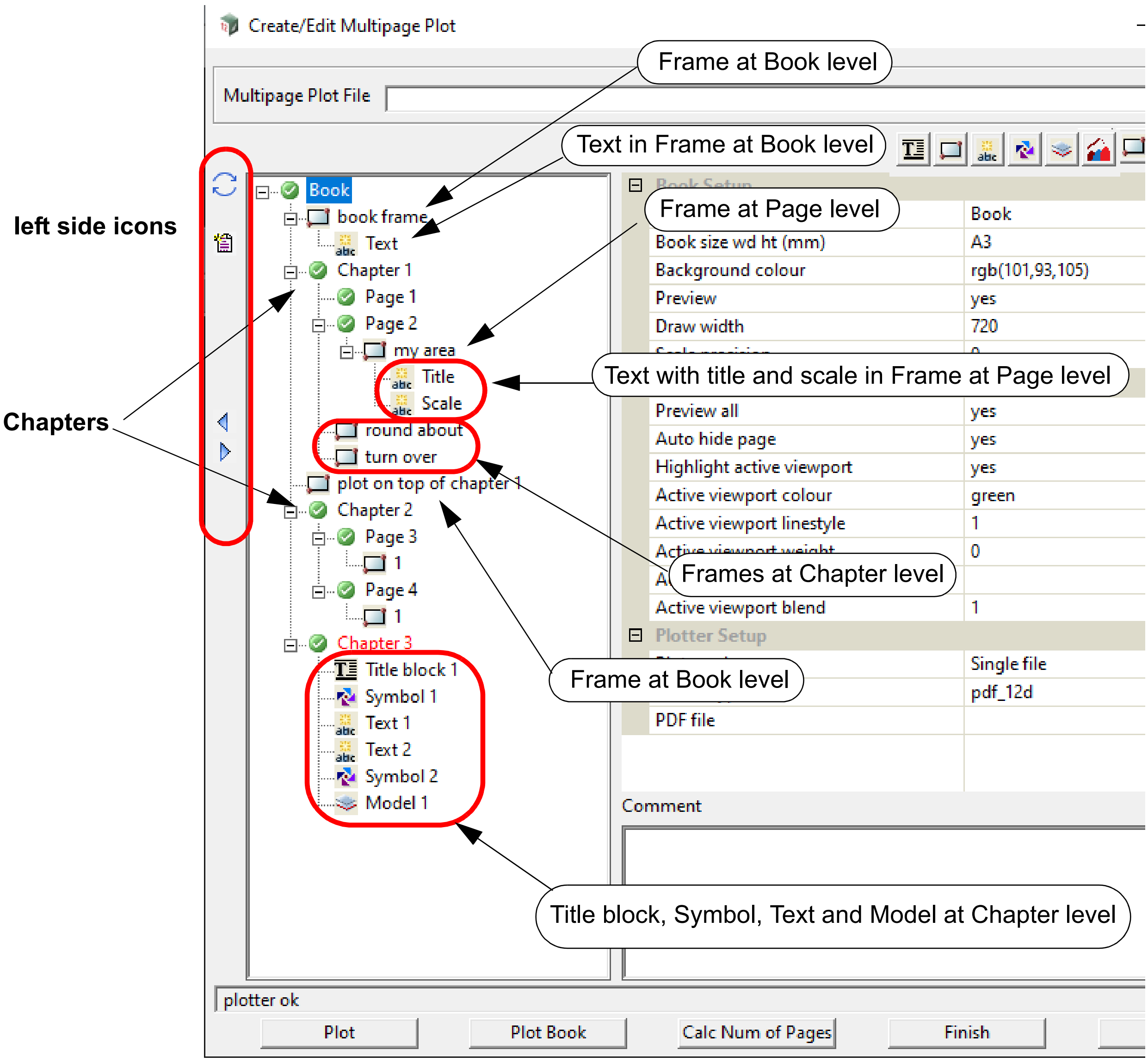
There are also **Special Chapters** that hold all the pages generated by a PPF file (eg. **X-Section**, **Long Section**, **Water Long Section** and **Water Node Diagram** PPFs). **Plot Frames** also have a **Special Chapter** that operates without a PPF.

These Chapters cannot have any additional Pages added to them. For more information on these **Special Chapters**, see 20.3.4.11 Special Chapter.

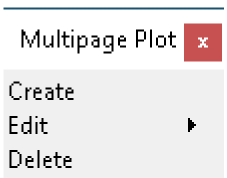
Finally all of the **Pages** in a **Book** can be plotted at once, or each **Chapter** plotted individually, or any selection of **Pages** plotted to a pdf.

Important Note

The order of the **Nodes** in the tree is important because that is the plotting order of the **Multipage Plots**.



The **Multipage Plot** menu is:



20.3.1 Multipage Plot Create
20.3.2 Multipage Plot Edit
20.3.3 Multipage Plot Delete

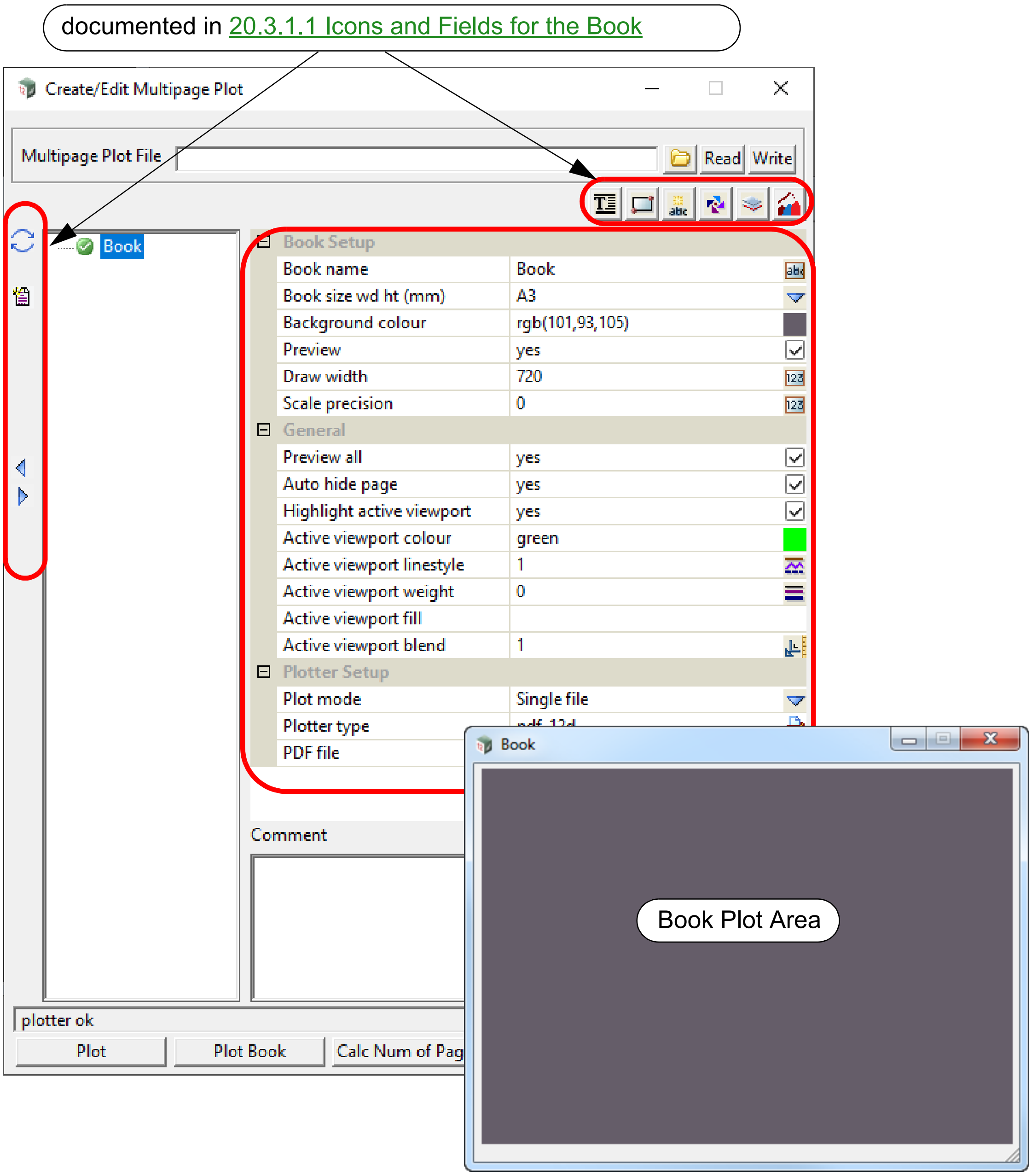
and the complete documentation is given in 20.3.4 Create/Edit Multipage Plot.

20.3.1 Multipage Plot Create

Position of option on menu: **Plot =>Multipage plots =>Create**

Multipage Plot Create is for creating a new Multipage Plot file (*.12dmpsf).

Selecting **Create** will bring up the ***Create/Edit Multipage Plot*** panel in its default state**.** The tree will only contain the Book Node.



The default name for the **Book node** is "Book" but that can be changed.

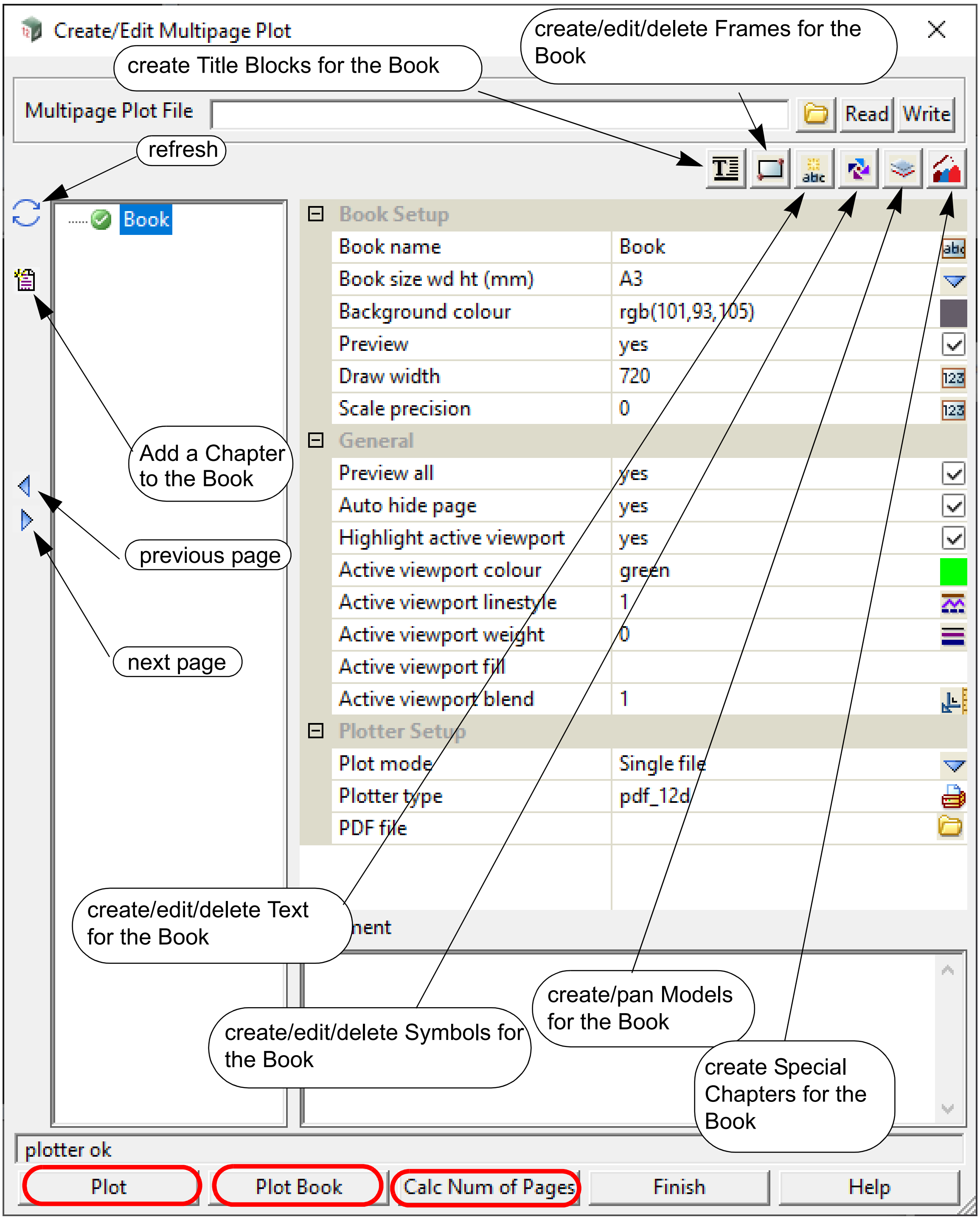
Books can contain **Chapters** which in turn contain the **Pages** that make up the Multipage plot.

Chapters and **Pages** are described in 20.3.4.1 Chapter. and 20.3.4.2 Page.

Books are also the only **Node** that can contain a **Special Chapter**, which is described in 20.3.4.11 Special Chapter.

All the icons and fields for the **Book** Node are documented in 20.3.1.1 Icons and Fields for the Book.

20.3.1.1 Icons and Fields for the Book



The icons, fields and buttons used in this panel have the following functions:

Field Description	Type	Defaults	Pop-Up
Multipage Plot File	file box		*.12dmpsf, *.12dpsf

the file that the MPS information will either be read in from or written out to.

Field Description	Type	Defaults	Pop-Up
Read	button		

read into the panel the MPS information contained within the file specified by the ***Multipage Plot File*** *field.*

*Note: Can also read in **V11 Plot Sheet Files** (*.12dpsf).*

Write button

*write the MPS information contained within the panel out to the file specified by the **Multipage Plot File** field.*

Icons on the Left Side

The icons on the left side change depending on what is applicable for the currently selected node.

The icons common to most Nodes are described in 20.3.4.3 Icons on the Left Side.

The icon that is special for a Book is:

New Chapter icon

*create a new **Chapter** Node for the **Book**. See* 20.3.4.1 Chapter

Icons on the Top Right

The icons are described in 20.3.4.4 Icons on the Top Right.

Book Setup

Book name text box Book

the name of the Book Node.

*Note: the **Book name** can include **project attributes** as part of the name. For example:*

Book size wd ht (mm) sheet box A3 defined sheet sizes

the size of the page (in millimetres) for the Book.

*The **Book page size** is given as width followed by one or more spaces and the height. Or clicking on the choice icon brings up the defined **Page sizes** and one can be selected from the pop-up list. Once a size has been typed in, or selected from the pop up, the **Book Plot Area** panel is drawn with an aspect ratio to match the selected page size.*

*If there is a Page size in the selected user title block file, the Page size is automatically set to that size and the **Book Page size** does not need to be used.*

Background colour colour box rgb (101,93,105) available colours

the colour of the background for the Book Node.

Preview tick box ticked

*if **ticked**, the contents of the Frame and Title Block Nodes of the Book Node will be approximately drawn ("previewed") in the **Book Plot Area**.*

*if **not ticked**, the contents of the Frame and Title Block Nodes will not be drawn in the **Book Plot Area**.*

Draw width integer box 720

*the width in pixels of the **Book Plot Area** panel. This will change if the **Book Plot Area** is resized.*

*the height is then automatically determined by the aspect ratio of the Book Node (which is defined by **Book size wd ht (mm)**).*

Scale precision integer box 0

the number of decimal places used for a Text $variable at the Book level.

General

Preview all tick box ticked

*if toggled to **ticked**, then the **Preview** field of each Chapter, Special Chapter and Page Node in the tree will be set to **ticked**.*

*if toggled to not **ticked**, then the **Preview** field of each Chapter, Special Chapter and Page Node in the tree will be set to **not ticked**.*

***Note**: the **Preview** field value can be set individually on each Chapter, Special Chapter and Page Node in the tree; and those values will take precedence over this Book level setting.*

Auto hide page tick box ticked

*if **ticked**, then only the **Plot Area** of the selected Book, Chapter, Special Chapter or Page Node will be displayed. When a different Book, Chapter, Special Chapter or Page Node is selected then the **Plot Area** of the currently displayed Node is removed and the newly selected Nodes' is displayed.*

*if **not ticked**, then the **Plot Areas** of **all** the Book, Chapter, Special Chapter and Page Nodes in the tree will be displayed regardless of the currently selected node.*

Highlight active viewport tick box ticked

*if **ticked**, then the active viewport will be highlighted in the Key Plan (if one is present).*

*If **not ticked**, then the active viewport will NOT be highlighted.*

***Note:** See* 20.3.4.7.6.2 Creating a Key Plan for Plan Frames *for more information.*

Active viewport colour colour box green available colours

the colour for the active viewport.

Active viewport linestyle linestyle box 1 available linestyles

the linestyle for the active viewport.

Active viewport weight weight box 0 available weights

the weight used for the border when highlighting the active viewport.

Active viewport fill colour box 1 available colours

if not blank, the active viewport will be filled with this colour.

Active viewport blend measure box 1

the blend for the active viewport fill.

Plotter Setup

*if the **Plot** button is pressed then the following fields define how the plotting of the Book occurs.*

Plot mode choice box Single_file Single_file, Multiple_file, Chapter_file

*if **Single_file**, then the field **PDF file** is displayed and all the active Nodes in the tree are plotted to the pdf file whose name is given in the **PDF file** field.*

*if **Multiple_file**, then the field **Prefix** is displayed and each active Page Node in the tree is plotted to a different pdf file whose name will be the value of the **Prefix** field followed by the **Page name** of the Page Node.*

*if **Chapter_file**, then each active Chapter and Special Chapter Node in the tree is plotted to a different pdf file whose name will be the **Chapter name** or **Special Chapter name** of the Chapter or Special Chapter Node.*

Plotter type plotter box pdf_12d pdf plotters

*the **Plotter type** to use for the plotting. This can only ever be a pdf plotter.*

PDF file file box *.pdf files

*the name of the pdf file that will be produced when **Plot mode** is **Single file**.*

Prefix text box

*the **Prefix** that will be used to name the pdf files produced when **Plot mode** is **Multiple file**.*

Fields and Buttons at the Bottom

Comment text box

*user comments about the **Book**.*

Plot button

plot from the currently selected node. Allows any Chapter, Special Chapter or Page Node to be plotted individually.

Plot Book button

*plot the whole MPS tree from the **Book** Node down. Uses the **Plotter Setup** of the **Book** Node.*

Cal Num Pages button

calculates the number of pages that will be produced by the entire MPS tree. Value is written out to the panel message area.

Create and **Edit** share the same options. To see the full documentation for the **Create** options see 20.3.4 Create/Edit Multipage Plot.

Continue to 20.3.2 Multipage Plot Edit or return to 20.3 Multipage Plots (MPS).

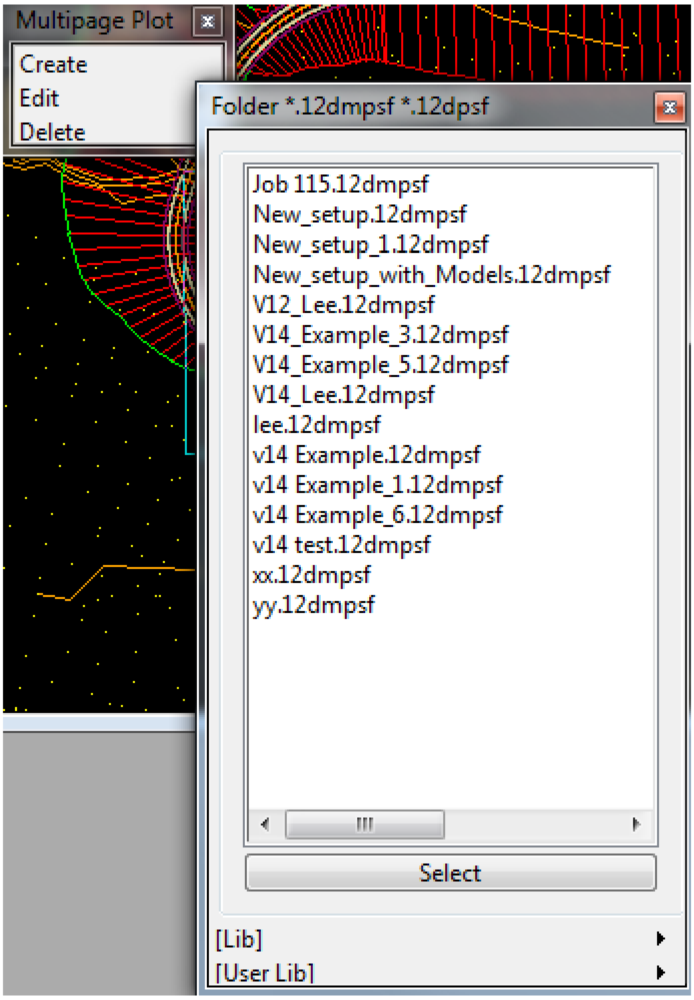
20.3.2 Multipage Plot Edit

Position of option on menu: **Plot =>Multipage plots =>Edit**

There are three different variations of the **Edit** option.

(1) Walking right on **Edit** when the **Multipage Plot** panel is pinned.

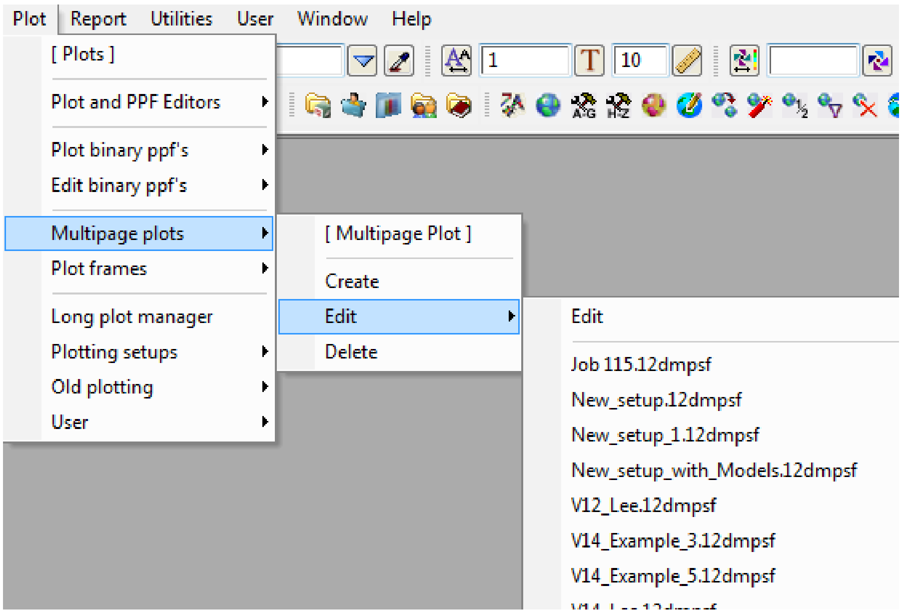
The list produced shows all the multipage plot sheet files (*.12dmpsf) in the **working folder**. It also has options to produce lists for the **[Lib]**, **[User Lib]** and any **[Customer Lib]** folders.



When an mpsf is selected the **Create/Edit Multipage Plot** panel will be brought up with the data from the selected mpsf already loaded in. See 20.3.4 Create/Edit Multipage Plot.

(2) Walking right on **Edit** when the **Multipage Plot** panel is NOT pinned.

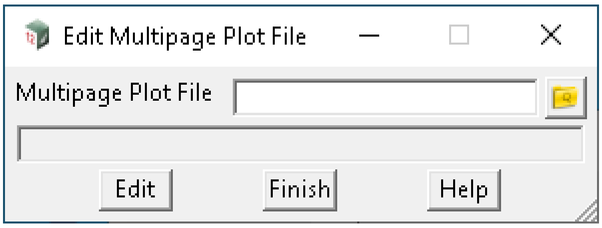
The walk right list produced shows all the multipage plot sheet files (*.12dmpsf) in the **working folder** only.



When an mpsf is selected the **Create/Edit Multipage** Plot panel will be brought up with the data from the selected mpsf already loaded in. See 20.3.4 Create/Edit Multipage Plot.

(3) Clicking directly on the **Edit**.

Clicking directly on **Edit** will bring up the **Edit Multipage Plot File** panel.



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

Field Description	Type	Defaults	Pop-Up
Multipage Plot File	file box		*.12dmpsf files

the multipage plot sheet file to edit.

Edit	button		

*if the mpsf specified in the **Multipage Plot File** field exists, then the **Create/Edit Multipage Plot** panel will be brought up with the data from the selected mpsf already loaded in. See* 20.3.4 Create/Edit Multipage Plot.

Note: **Edit** can also read in **V11 Plot Sheet Files** (*.12dpsf).

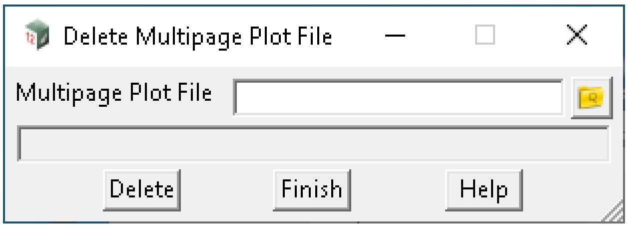
Continue to 20.3.3 Multipage Plot Delete or return to 20.3 Multipage Plots (MPS).

20.3.3 Multipage Plot Delete

Position on menu: **Plot =>Multipage plots =>Delete**

Multipage Plot Delete is for deleting an existing multipage plot file from disk.

Selecting **Delete** will bring up the **Delete Multipage Plot File** panel.



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

Field Description	Type	Defaults	Pop-Up
Multipage Plot File	file box		*.12dmpsf files

the multipage plot sheet file to delete.

Field Description	Type	Defaults	Pop-Up
Delete	button		

*if the mpsf specified in the **Multipage Plot File** field exists, then it will be deleted.*

Continue to 20.3.4 Create/Edit Multipage Plot or return to 20.3 Multipage Plots (MPS).

20.3.4 Create/Edit Multipage Plot

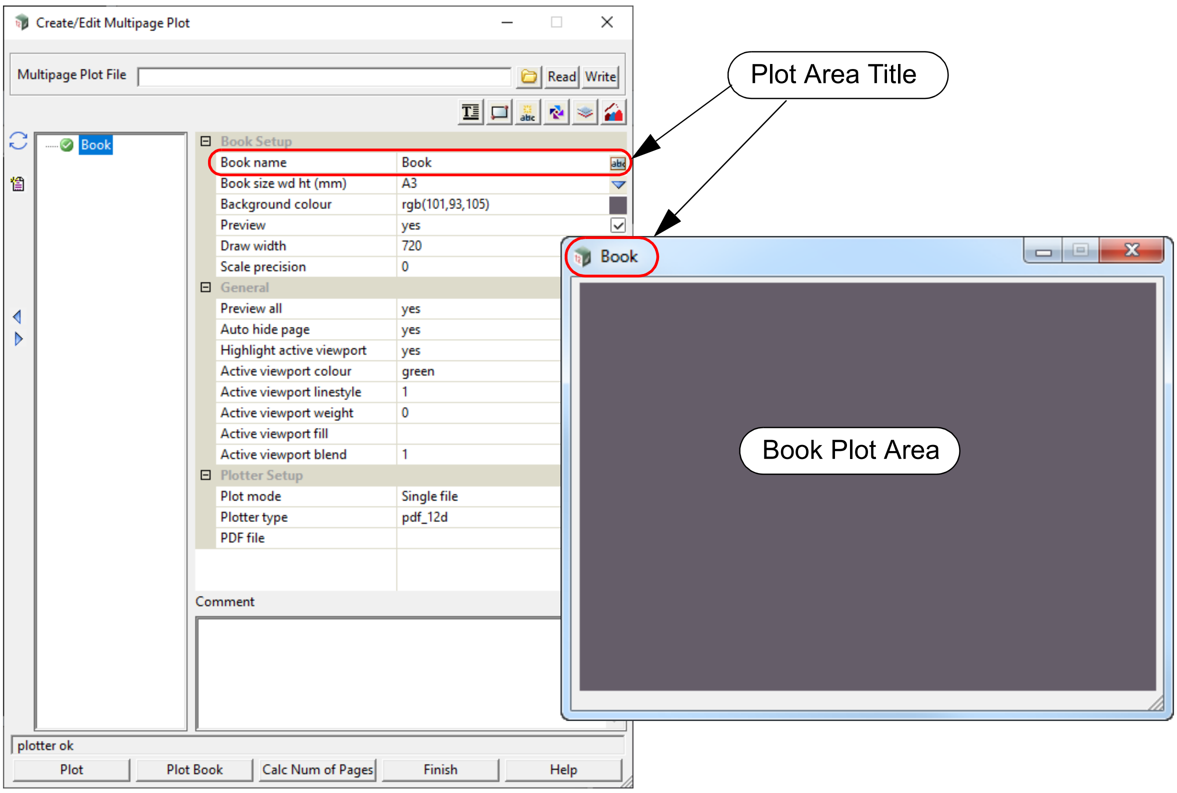
The **Create/Edit Multipage Plot** panel allows for the complete customisation of all the Nodes in the MPS tree and their Plot Areas. How the Nodes and Plot Areas are set up will determine everything about the produced pdf file.

The **Plot Area** represents the pdf page and shows the **relative location** and some values of many of the items that used in producing the plot for the selected Node. Many of the items can be edited from the **Plot Area**. For example, Frames can be resized and repositioned.

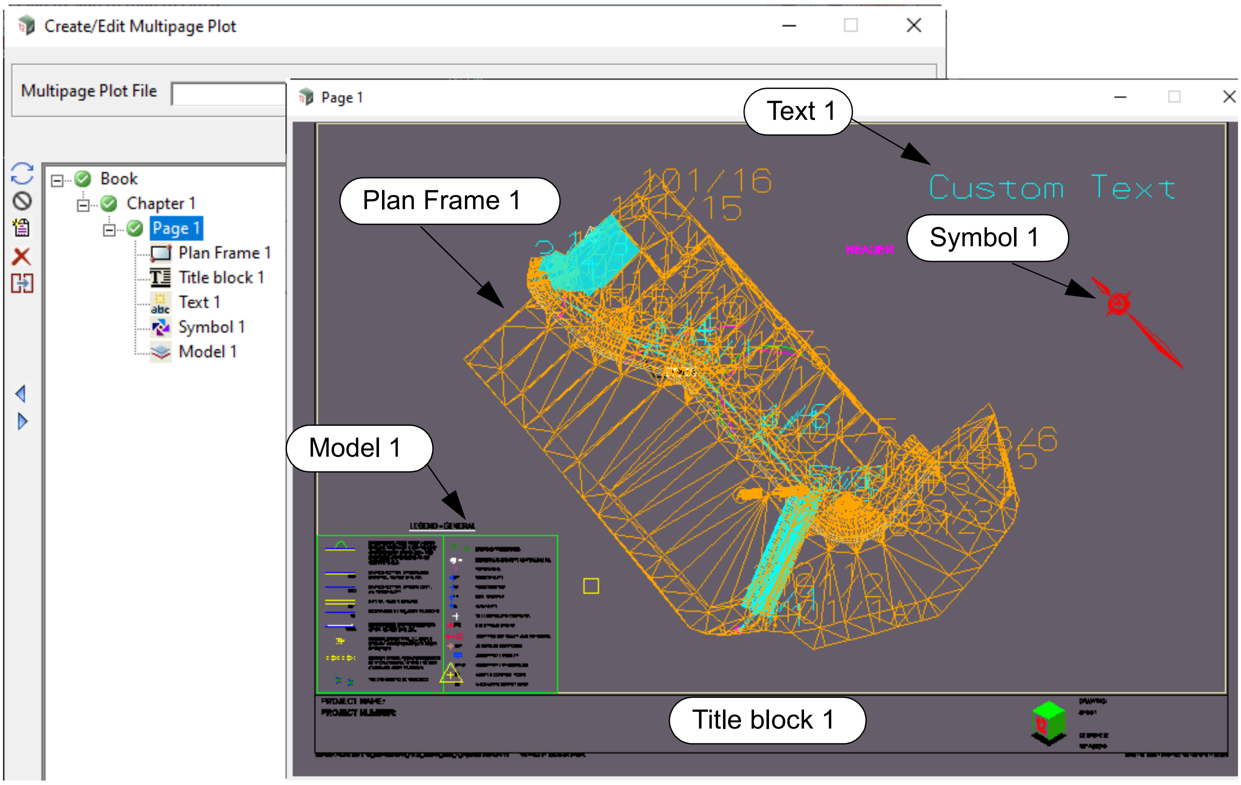
This is often referred to as the Preview window but beware, it is not intended to show exactly what the plotted page looks like. For that, press the **Plot** button.

The origin (0,0) of the **Plot Area** is the bottom left hand corner with the units in millimetres (mm). The aspect ratio of the **Plot Area** is declared in the **size wd ht (mm)** field of its respective Node (Book, Chapter, Special Chapter and Page).

The title that appears in title bar of the **Plot Area** window is set to the name of the currently selected Node (Book, Chapter, Special Chapter or Page).



When **Title Block**, **Frame**, **Text**, **Symbol** or **Model** Nodes are added to a Node, a representation will be displayed in the **Plot Area** of that Node. Having the representation of a Node appear in the **Plot Area** allows the user to easily see and manipulate the relative positions.



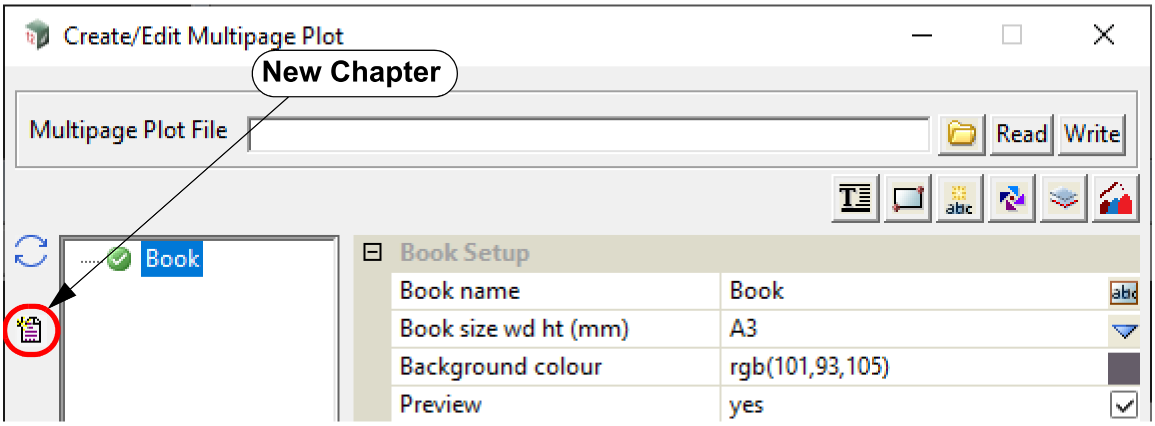
The complete documentation of the **Create/Edit Multipage Plot** panel now follows.

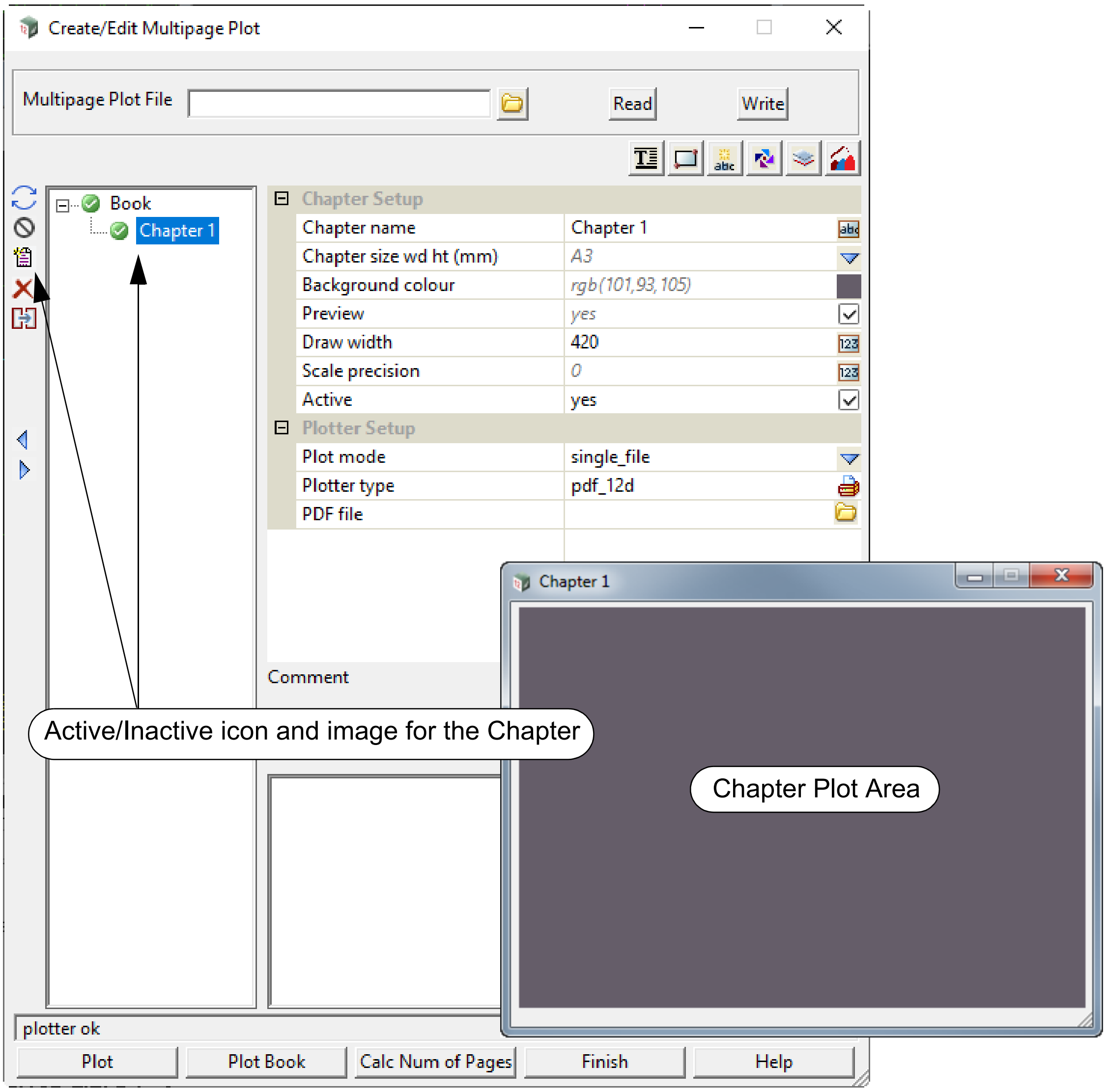
See

[20.3.4.1 Chapter](#)
[20.3.4.2 Page](#)
[20.3.4.3 Icons on the Left Side](#)
[20.3.4.6 Title Block](#)
[20.3.4.7 Frame](#)
[20.3.4.8 Text Icon for Use on a Book, Chapter, Page or Frame Node](#)
[20.3.4.9 Symbol Icon for Use on a Book, Chapter, Page or Frame Node](#)
[20.3.4.10 Model Icon for Use on a Book, Chapter or Page](#)
[20.3.4.11 Special Chapter](#)

20.3.4.1 Chapter

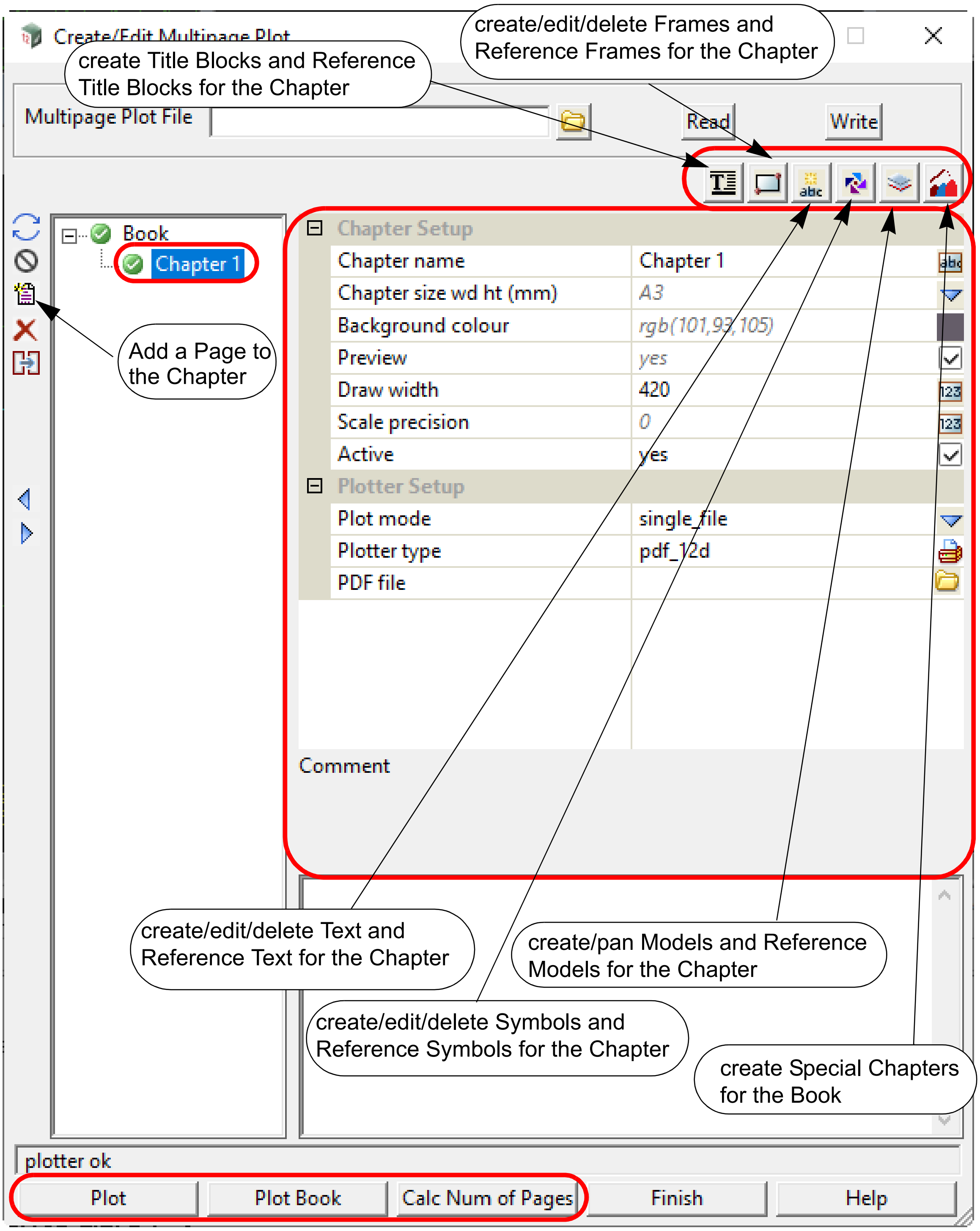
When the **Book** node is selected and the **New Chapter** is clicked, a new **Chapter** Node is created.





All the icons and fields for a **Chapter** Node are documented in 20.3.4.1.1 Icons and Fields for a Chapter.

20.3.4.1.1 Icons and Fields for a Chapter



The icons, fields and buttons used in this panel have the following functions:

Field Description	Type	Defaults	Pop-Up

Icons on the Left Side

The icons on the left side change depending on what is applicable for the currently selected node.

The icons common to most Nodes are described in 20.3.4.3 Icons on the Left Side

The icon that is special for a Chapter is:

New Page icon

*create a new **Page** Node for the **Chapter**. See* 20.3.4.2 Page.

Icons on the Top Right

The icons are described in 20.3.4.4 Icons on the Top Right.

Inherited Fields *

*Fields that support inheritance will be marked by a * symbol next to their **Field Description**.*

*For more information on **Inherited Fields** see,* 20.3.4.5 Inherited Fields *.

Chapter Setup

Chapter name text box Chapter n

*the name of this Chapter Node. The default is **Chapter n** where **n** is the first number (integer from zero) to make the **Chapter name** unique amongst all Chapter Nodes in the tree.*

***Note**: the **Chapter name** can include **project attributes** as part of the name. For example:*

Chapter size wd ht (mm)* sheet box Book node value defined sheet sizes

*if **not blank**, the size of the page (in millimetres) for this Chapter.*

*if **blank**, the value from the equivalent **Book** Node field will be used.*

*The **Chapter page size** is given as **width** followed by one or more spaces and the height. Or clicking on the choice icon brings up the defined **Page Sizes** and one can be selected from the pop-up list.*

*Once a size has been typed in, or selected from the pop up, the **Chapter Plot Area** panel is drawn with an aspect ratio to match the selected page size.*

*If there is a Page size in the selected user title block file, the Page size is automatically set to that size and the **Chapter Page size** does not need to be used.*

Background colour* colour box Book node value available colours

*if **not blank**, the colour of the background for this Chapter.*

*if **blank**, the value from the equivalent **Book** Node field will be used.*

Preview* tick box Book node value

*if **ticked**, the contents of the Frame and Title Block Nodes of this Chapter Node will be approximately drawn ("previewed") in the **Chapter Plot Area**.*

*if **not ticked,** the contents of the Frame and Title Block Nodes will not be drawn in the **Chapter Plot Area**.*

***Note:** Re-establishing an inheritance link cannot be done for this field since it only has two states and cannot be left 'blank' in the same way as other fields.*

Draw width* integer box Book node value

*if **not blank**, the width in pixels of the Chapter Plot Area panel. This will change if the Chapter Plot Area is resized.*

*if **blank**, the value from the equivalent Book Node field will be used.*

*the height is then automatically determined by the aspect ratio of this Chapter Node (which is defined by **Chapter size wd ht (mm)**).*

Scale precision* integer box Book node value

*if **not blank**, the number of decimal places used for a Text $variable at the Chapter level.*

*if **blank**, the value from the equivalent **Book** Node field will be used.*

Active	tick box		ticked

*if **ticked**, the currently selected node is made active and will be used when plotting. The Node's active/inactive icon will be set to active.*

*if **not ticked**, the currently selected node is made inactive and it (and all of its Subnodes) will be ignored when plotting. The Node's active/inactive icon will be set to inactive.*

***Note**: this tick box is linked to the Node's active/inactive icon. Changing one also changes the other.*

Plotter Setup

*if the **Plot** button is pressed then the following fields define how the plotting of this **Chapter** occurs.*

Plot mode	choice box	Single_file	Single_file, Multiple_file

*if **Single_file**, then the field **PDF file** is displayed and all the active Nodes in the **Chapter** are plotted to the pdf file whose name is given in the **PDF file** field.*

*if **Multiple_file**, then the field **Prefix** is displayed and each active Page Node in the **Chapter** is plotted to a different pdf file whose name will be the value of the **Prefix** field followed by the **Page name** of the Page Node.*

Plotter type*	plotter box	Book node value	pdf plotters

*the **Plotter type** to use for the plotting. This can only ever be a pdf plotter. This is an inherited field.*

*if **blank**, the value from the equivalent **Book** Node field will be used.*

PDF file	file box		*.pdf files

*the name of the pdf file that will be produced when **Plot mode** is **Single file**.*

Prefix	text box		

*the **Prefix** that will be used to name the pdf files produced when **Plot mode** is **Multiple file.***

Fields and Buttons at the Bottom

Comment	text box		

*user comments about this **Chapter**.*

Plot	button		

plot from the currently selected node. Allows any Chapter, Special Chapter or Page Node to be plotted individually.

Plot Book	button		

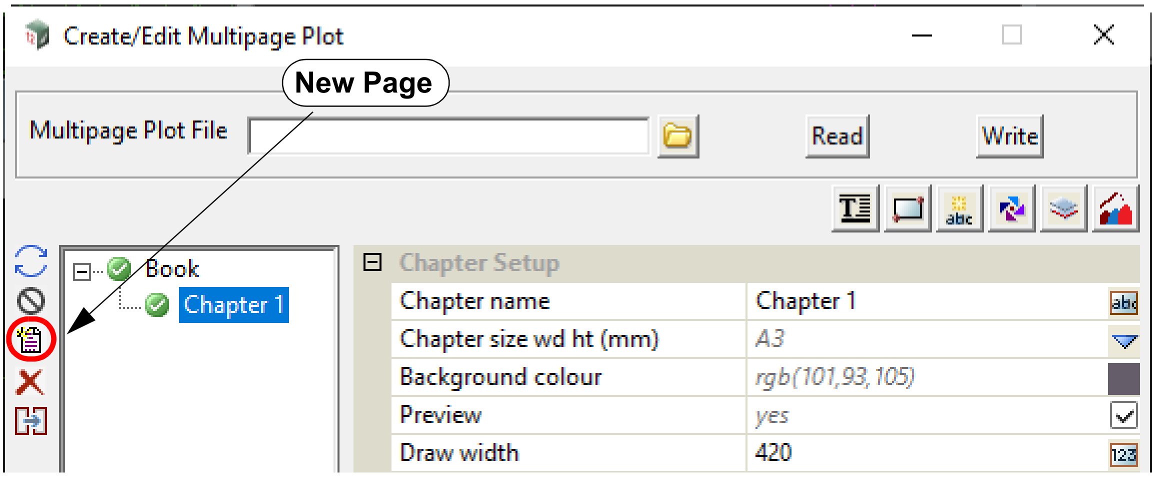
*plot the whole MPS tree from the **Book** Node down. Uses the **Plotter Setup** of the **Book** Node.*

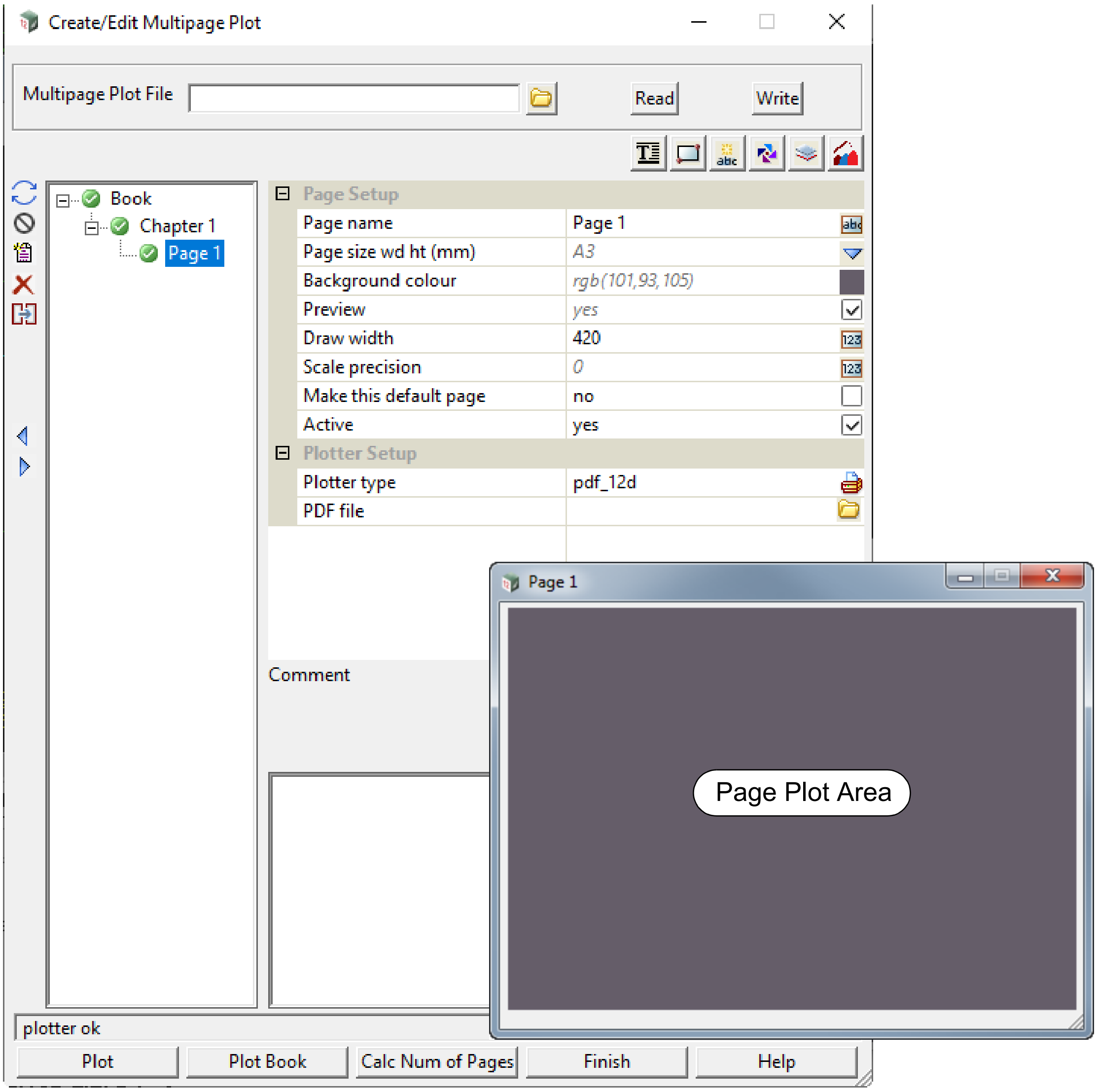
Important Note

If the **Chapter** is *inactive* then nothing in the Chapter will plot.

20.3.4.2 Page

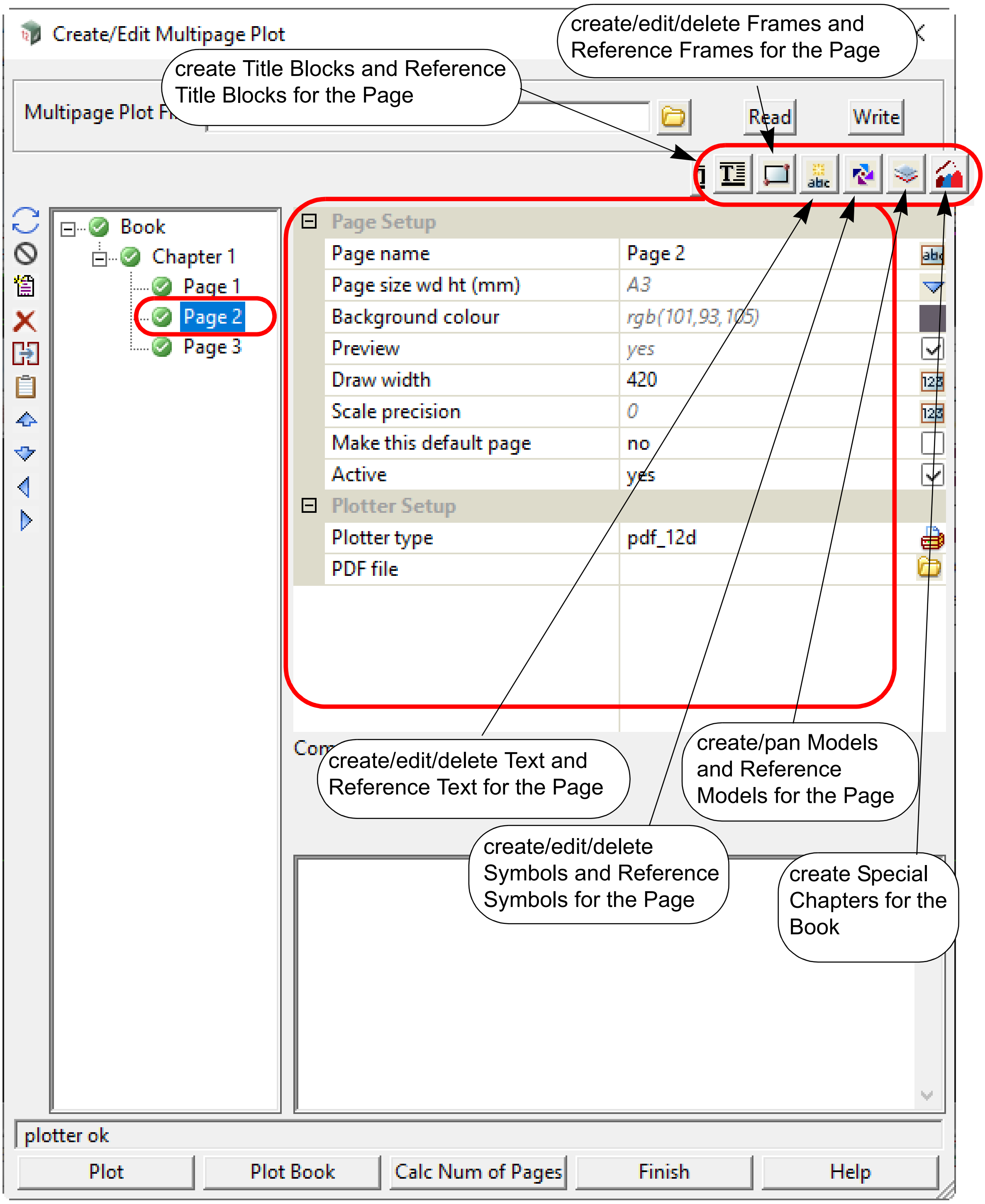
When a **Chapter** Node is selected and the **New Page** is clicked, a new **Page** Node is created.





All the icons and fields for a **Page** Node are documented in 20.3.4.2.1 Icons and Fields for a Page.

20.3.4.2.1 Icons and Fields for a Page



The icons, fields and buttons used in this panel have the following functions:

Field Description Type Defaults Pop-Up

Icons on the Left Side

The icons on the left side change depending on what is applicable for the currently selected node.

The icons common to most Nodes are described in 20.3.4.3 Icons on the Left Side.

The icon that is special for a Page is:

New Page icon

create a new ***Page*** *Node for the* ***Chapter*** *that the currently selected* ***Page*** *Node is a Subnode of. See* 20.3.4.2 Page.

Icons on the Top Right

The icons are described in 20.3.4.4 Icons on the Top Right.

Inherited Fields *

*Fields that support inheritance will be marked by a * symbol next to their* ***Field Description****.*

For more information on ***Inherited Fields*** *see,* 20.3.4.5 Inherited Fields *.

Page Setup

Page name text box Page n

the name of this Page Node. The default is ***Page n*** *where* ***n*** *is the first number (integer from zero) to make the* ***Page name*** *unique amongst all Page Nodes in the tree.*

Note*: the* ***Page name*** *can include* ***project attributes*** *as part of the name. For example:*

Page size wd ht (mm)* sheet box Chapter node value defined sheet sizes

if ***not blank****, the size of the page (in millimetres) for this Page.*
if ***blank****, the value from the equivalent Chapter Node field will be used.*

The ***Page size*** *is given as* ***width*** *followed by one or more spaces and the height. Or clicking on the choice icon brings up the defined* ***Page sizes*** *and one can be selected from the pop-up list.*

Once a size has been typed in, or selected from the pop up, the ***Page Plot Area*** *panel is drawn with an aspect ratio to match the selected page size.*

If there is a Page size in the selected user title block file, the Page size is automatically set to that size and the ***Page size*** *does not need to be used.*

Background colour* colour box Chapter node value available colours

if ***not blank****, the colour of the background for this Page.*

if ***blank****, the value from the equivalent* ***Chapter*** *Node field will be used.*

Preview* tick box Chapter node value

if ***ticked****, the contents of the Frame and Title Block Nodes of this Page Node will be approximately drawn ("previewed") in the* ***Page Plot Area****.*

if ***not ticked****, the contents of the Frame and Title Block Nodes will not be drawn in the* ***Page Plot Area****.*

Note: *Re-establishing an inheritance link cannot be done for this field since it only has two states and cannot be left 'blank' in the same way as other fields.*

Draw width* integer box Chapter node value

if ***not blank****, the width in pixels of the Page Plot Area panel. This will change if the Page Plot Area is resized.*
if ***blank****, the value from the equivalent Chapter Node field will be used.*
the height is then automatically determined by the aspect ratio of this Page Node (which is defined by ***Page size wd ht (mm)****).*

Scale precision* integer box Chapter node value

if ***not blank****, the number of decimal places used for a Text $variable at the Page level.*

if ***blank****, the value from the equivalent Chapter Node field will be used.*

Make this default page tick box not ticked

*if **ticked**, then any new Page Nodes that are created will be duplicates of this **default page** (including any Subnodes).*

*if **not ticked**, then any new Page Nodes that are created will follow the standard inheritance rules and inherit the Setup values of their parents.*

***Note**: there can only be one Page Node with this field ticked at any one time. When this field is ticked on a second Page Node the field on the first Page Node will be un-ticked.*

Active tick box ticked

*if **ticked**, the currently selected node is made active and will be used when plotting. The Node's active/ inactive icon will be set to active.*

*if **not ticked**, the currently selected node is made inactive and it (and all of its Subnodes) will be ignored when plotting. The Node's active/inactive icon will be set to inactive.*

Note: this tick box is linked to the Node's active/inactive icon. Changing one also changes the other.

Plotter Setup

*if the **Plot** button is pressed then the following fields define how the plotting of this **Page** occurs.*

Plotter type* plotter box Chapter node value pdf plotters

*the **Plotter type** to use for the plotting. This can only ever be a pdf plotter. This is an inherited field.*

*if **blank**, the value from the equivalent **Chapter** Node field will be used.*

PDF file file box *.pdf files

*the name of the pdf file that will be produced when plotting this **Page** individually.*

Fields and Buttons at the Bottom

Comment text box

*users comments about this **Page**.*

Plot button

plot from the currently selected node. Allows any Chapter, Special Chapter or Page Node to be plotted individually.

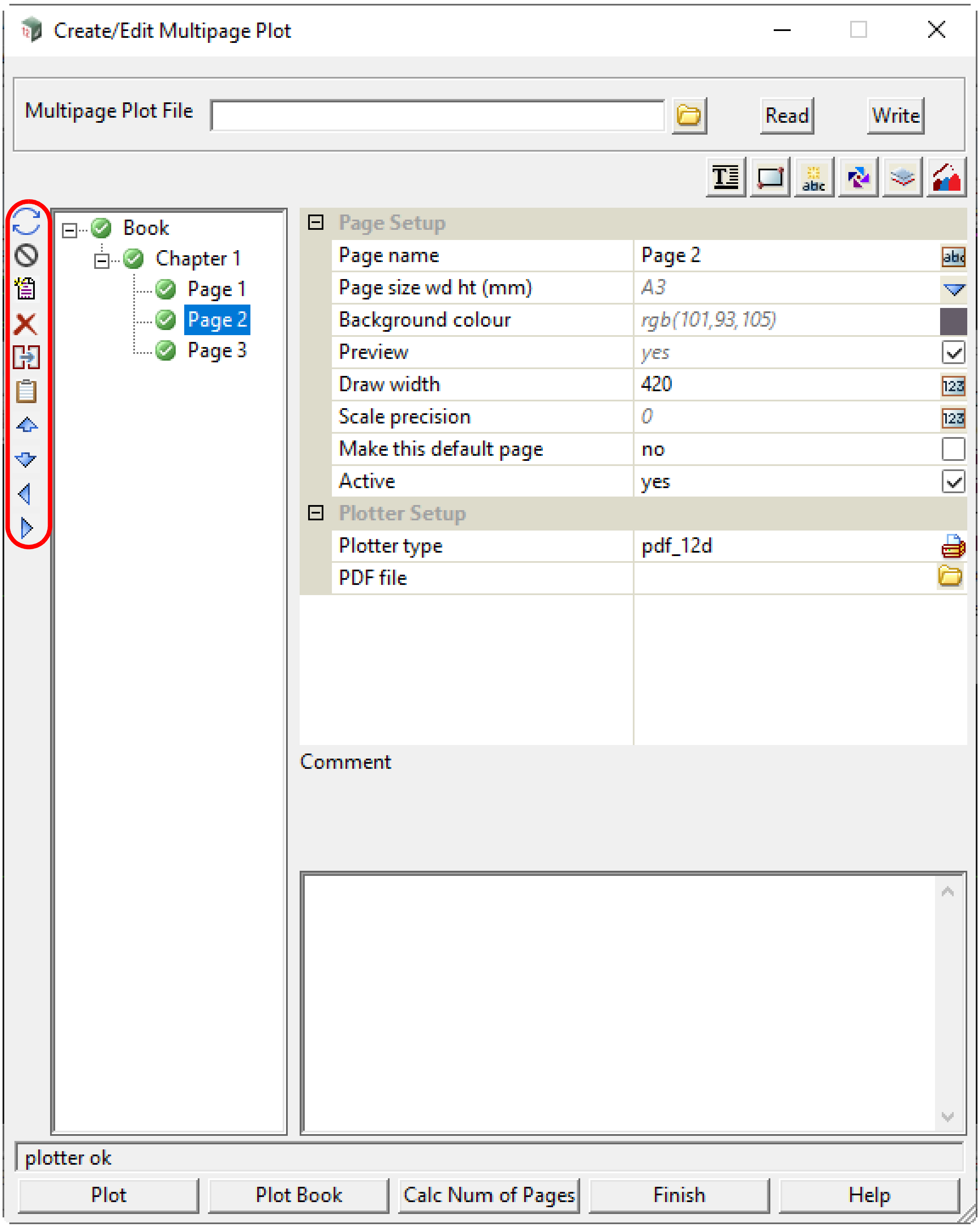
Plot Book button

*plot the whole MPS tree from the **Book** Node down. Uses the **Plotter Setup** of the **Book** Node.*

Important Note

If the **Page** is *inactive* then nothing in the **Page** will plot.

20.3.4.3 Icons on the Left Side



The **icons on the left side** of the panel operate on the nodes of the tree.

Only the icons that are applicable for the currently selected node will appear.

Icons on the Left Side

Refresh icon

refresh the field data in the tree and redraw the Plot Area drawings for the currently selected node and all its Subnodes.

*A typical use of **Refresh** is when data is added to, or removed from, a **model** and that **model** appears on a Node in the tree. A **Refresh** is needed to update the Plot Area of that Node to show the addition/removal.*

Activate icon

make the currently selected node active.

***Note**: this icon is linked to the Node's active tick box. Changing one also changes the other.*

Deactivate icon

make the currently selected node inactive.

***Note**: this icon is linked to the Node's active tick box. Changing one also changes the other.*

New Chapter or **New Page** icon

*if the **Book** Node is the currently selected node, then the icon will be **New Chapter** and will create a new **Chapter** Node for the **Book** when clicked.*

*if a **Special** Chapter Node is the currently selected node, then the icon will be **New Chapter** and will create a new **Chapter** Node for the **Book** when clicked.*

*if a **Chapter Node** is the currently selected node, then the icon will be **New Page** and will create a new **Page** Node for the **Chapter** when clicked.*

*if a **Page Node** is the currently selected node, then the icon will be **New Page** and will create a new **Page** Node for the **Chapter** that the currently selected **Page** Node is a Subnode of.*

Delete icon

delete the currently selected node (and all its Subnodes) from the tree.

Copy icon

copy the currently selected node (and all its Subnodes).

Paste icon

paste the copied node into the tree after the currently selected node.

Move Up icon

*move the currently selected node one position **up** the tree amongst its sibling nodes.*

***Note**: this icon only appears if the currently selected node has a sibling node above it in the tree.*

Move Down icon

*move the currently selected node one position **down** the tree amongst its sibling nodes.*

***Note**: this icon only appears if the currently selected node has a sibling node below it in the tree.*

Previous Page icon

*make the closest **Page** Node **up** the tree from the currently selected node the new currently selected node.*

***Note**: if there is no **Page** Node **up** the tree then this option will do nothing.*

Next Page icon

*make the closest **Page** Node **down** the tree from the currently selected node the new currently selected node.*

***Note**: if there is no **Page** Node **down** the tree then this option will do nothing.*

Edit icon

starts an edit on the currently selected node that allows its positioning to be adjusted via the Plot Area.

***Note**: this icon only appears if the currently selected node is a **Frame**, **Text** or **Symbol** Node.*

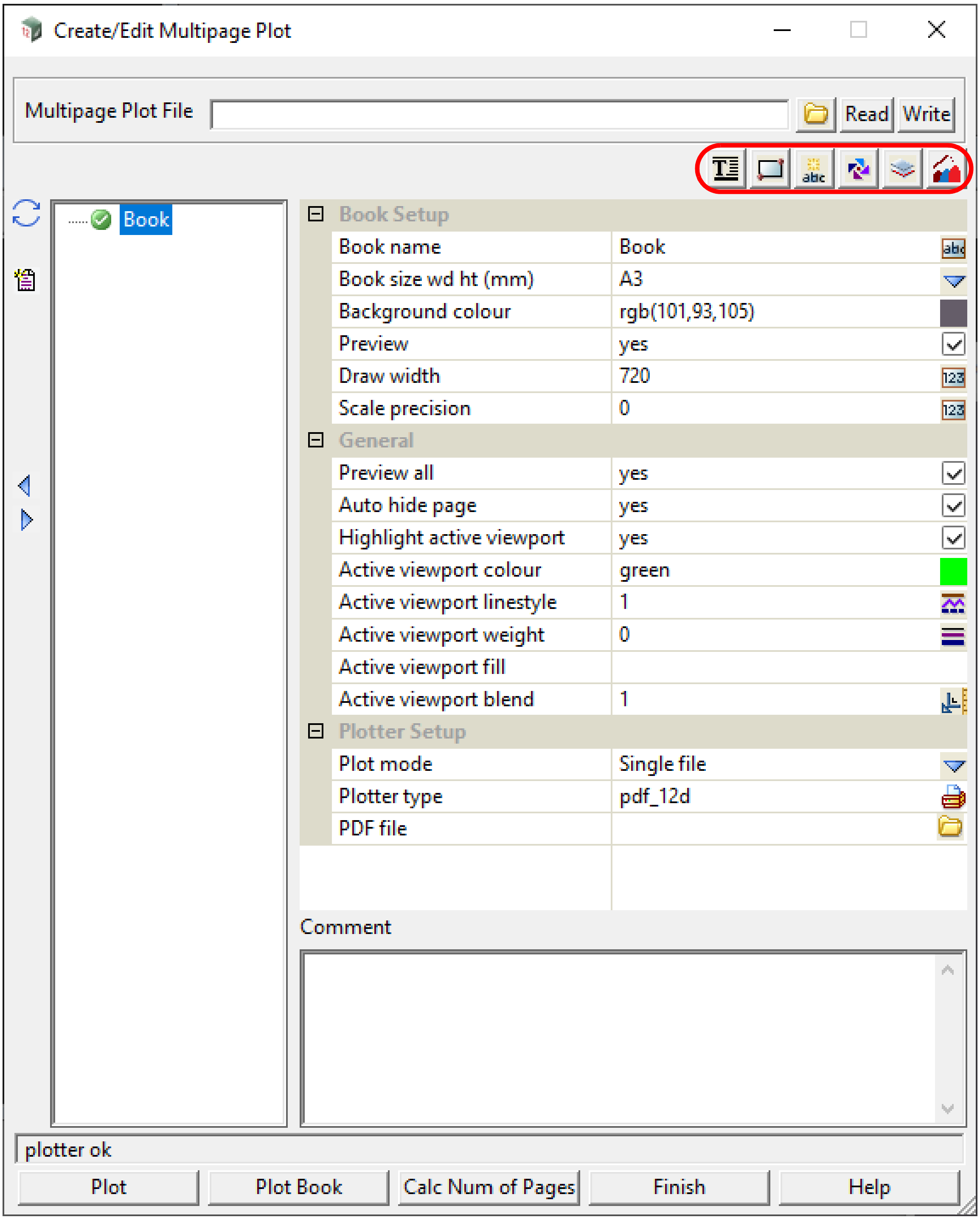
Pan icon

starts a pan edit on the currently selected node that allows the data it displays to be panned via the Plot

Area.

***Note**: this icon only appears if the currently selected node is a **Frame** or **Model** Node.*

20.3.4.4 Icons on the Top Right



Icons on Top Right

*The **Title block**, **Frame**, **Text**, **Symbol** and **Model** icons can be used to create these items at the **Page** level.*

Title block icon

*create **Title Blocks** and **Reference Title Blocks** for the currently selected node. For more detailed information, see* 20.3.4.6 Title Block.

Frame icon

*create/edit/delete **Frames** and **Reference Frames** for the currently selected node. For more detailed* *information, see* 20.3.4.7 Frame.

Text icon

*create/edit/delete **Text** and **Reference Text** for the currently selected node. For more detailed information, see* 20.3.4.8 Text Icon for Use on a Book, Chapter, Page or Frame Node

Symbol icon

*create/edit/delete **Symbols** and **Reference Symbols** for the currently selected node. For more detailed information, see* 20.3.4.9 Symbol Icon for Use on a Book, Chapter, Page or Frame Node.

Model icon

*create/pan **Models** and **Reference Models** for the currently selected node. For more detailed information, see* 20.3.4.10 Model Icon for Use on a Book, Chapter or Page.

Special Chapter icon

*create **Special Chapters** for the Book. For more detailed information, see* 20.3.4.11 Special Chapter.

20.3.4.5 Inherited Fields *

There are a variety of cases where the value of a field is not explicitly set for the currently selected **Node** but is instead inherited from another Node above it in the MPS tree. These are called **Inherited Fields**. A field that is currently inheriting its value can be identified by the value appearing greyed out (grey scale font colour). Most of the fields for new **Chapter**, **Special Chapter**, **Page** and **Reference Nodes** are set to inherit by default for convenience.

Fields that support inheritance will be marked by a * symbol next to their **Field Description** in their **Node** types documentation.

While a field is inheriting it will reflect any changes made to the parent **Node's** value.

A field's inheritance can be severed at any time by manually entering a new value into it. This severance can be confirmed by the before greyed out value now appearing as fully opaque (black font colour).

A severed inheritance link can also be re-established at any time* by clearing out the value for a field. This will cause the field to repopulate from its parent **Node**. The value will appear greyed out once again to denote its inherited origin.

*inheritance links CANNOT currently be re-established for tick box type fields as there is no way to 'clear out' their value in the same way as other field types. So, show great care when severing tick box inheritance as it is permanent.

Options are being explored to rectify this hole in functionality.

Chapter/Special Chapter Nodes inherit values from the **Book Node**.

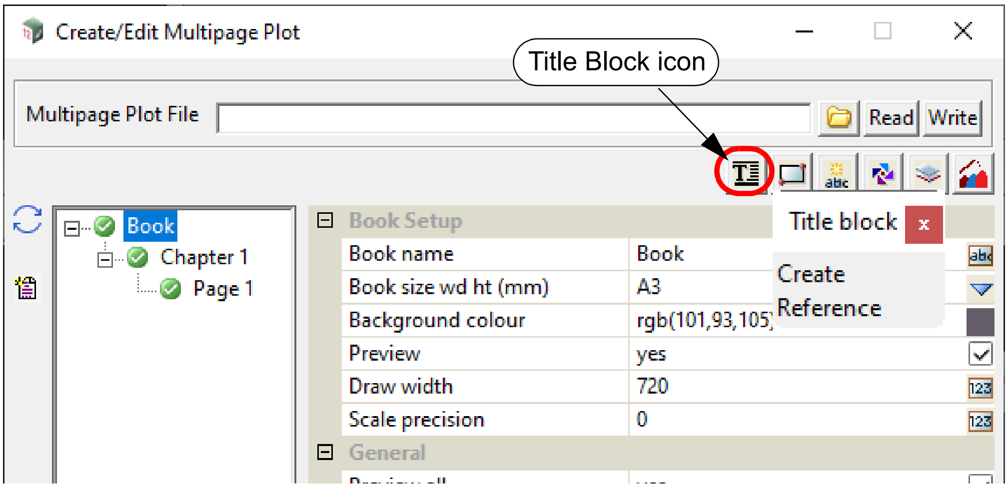
Page Nodes inherit values from their **Chapter Node**.

Reference Nodes inherit values from the **Node** that they reference.

20.3.4.6 Title Block

A **Title Block** Node can be inserted as a Subnode to any Book, Chapter, Special Chapter or Page Node in the tree by clicking the **Title Block** icon at the top right of the Editor panel.

If the currently selected node is a Book, Chapter, Special Chapter or Page Node then the **Title Block** will be inserted as a Subnode of the currently selected node.
If the currently selected node is any other kind of Node then the **Title Block** will be inserted as a Subnode of the Book, Chapter, Special Chapter or Page Node that the currently selected node is a Subnode of.



There are two options when adding a **Title Block** to a Node:

Title Block - Create

Create a new blank **Title Block** Node.

See 20.3.4.6.1.1 Creating a Title Block Node.

Title Block - Reference

Create a new **Reference Title Block** Node that will reference an existing **Title Block** Node to get its default field values. These values can then be freely modified by the user.

See 20.3.4.6.1.2 Creating a Reference Title Block Node.

Note: no **Reference** Nodes can be inserted at the **Book** level.

Important Note:

Title Block and **Reference Title Block** Nodes will be represented in the **Plot Area** if their parent node has the **Preview** field **ticked**.

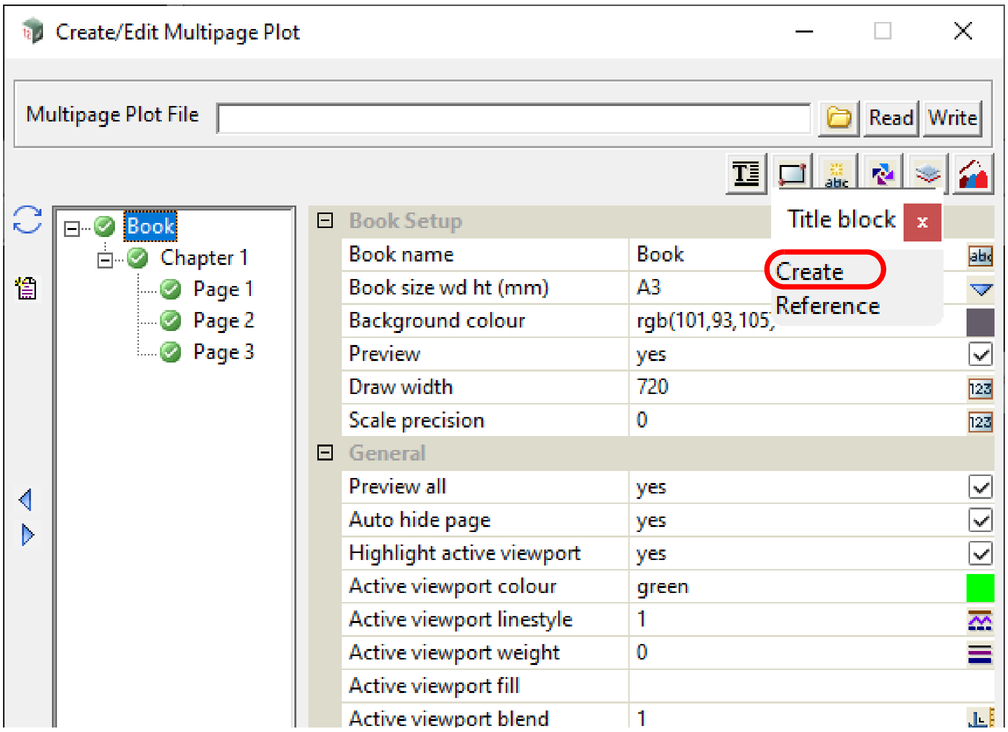
20.3.4.6.1 Creating Title Blocks

20.3.4.6.1.1 Creating a Title Block Node

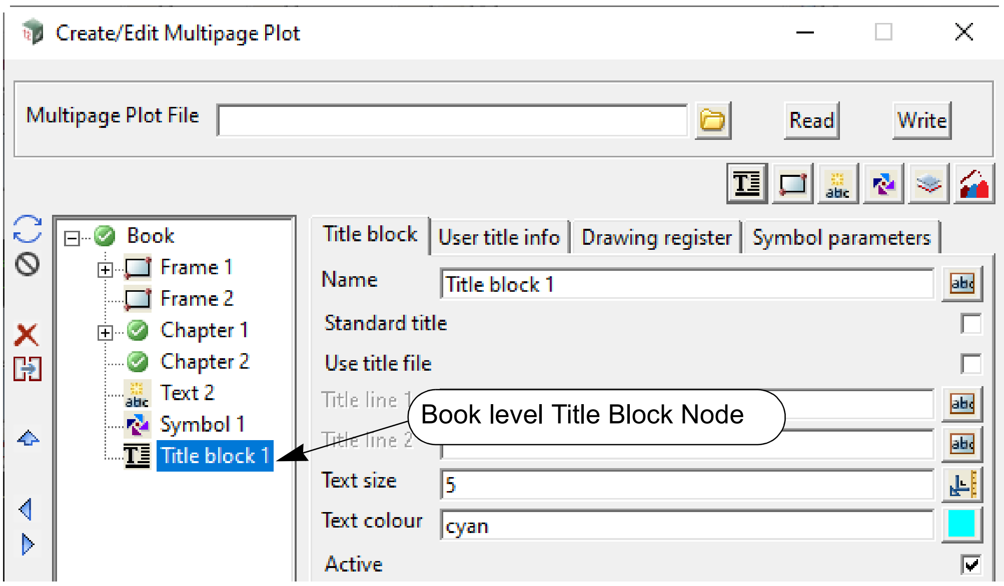
The process for creating a **Title Block** Node at the **Book** level will be described in detail here. The same process can also be used to create a **Title Block** Node at the Chapter, Special **Chapter** or **Page** level.

To create a **Title Block** Node at the **Book** level the currently selected node must be either the **Book** Node itself or an existing **Book** Subnode (excluding Chapter or Special Chapter Nodes).

Clicking the **Title Block** icon at the top right of the Editor panel will bring up the **Title Block** menu.



Selecting **Create** from the **Title Block** menu will result in the new **Title Block** Node being inserted at the **Book** level.

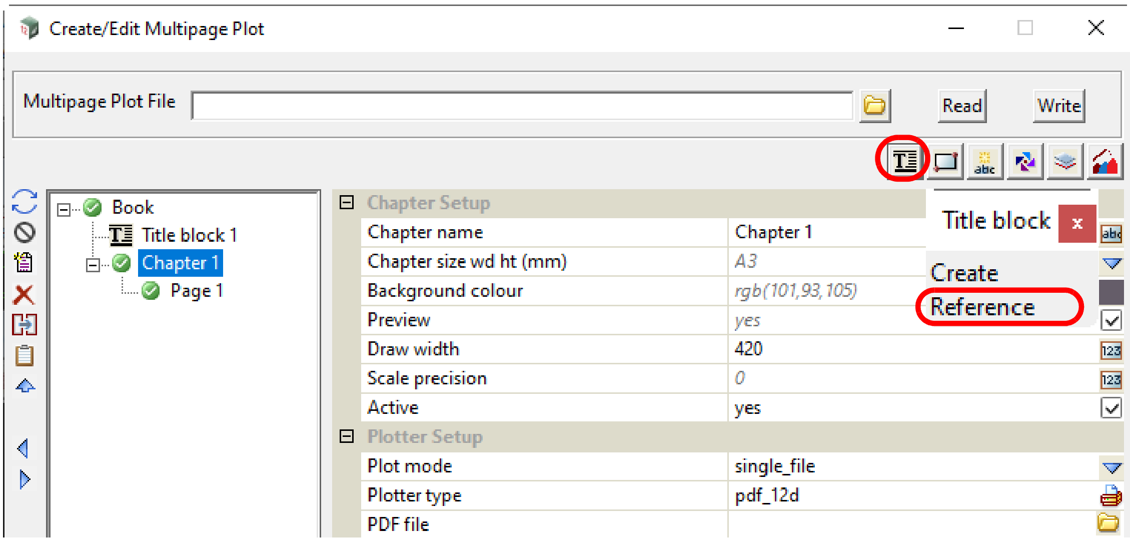


20.3.4.6.1.2 Creating a Reference Title Block Node

The process for creating a **Reference Title Block** Node at the **Chapter** level will be described in detail here. The same process can also be used to create a **Reference Title Block** Node at the **Special Chapter** or **Page** level.

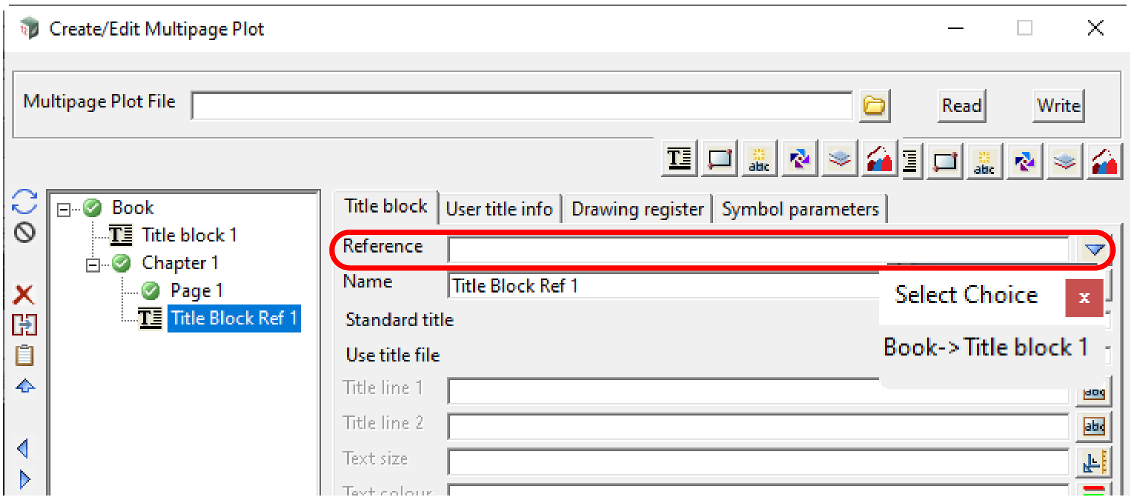
To create a **Reference Title Block** Node at the **Chapter** level the currently selected node must be either the **Chapter** Node itself or an existing **Chapter** Subnode (excluding Page Nodes).

Clicking the **Title Block** icon at the top right of the Editor panel will bring up the **Title Block** menu.



Selecting **Reference** from the **Title Block** menu will result in the new **Reference Title Block** Node being inserted at the **Chapter** level.

Note: no **Reference** Nodes can be inserted at the **Book** level.
The newly inserted **Reference Title Block** Node has a blank Reference field.

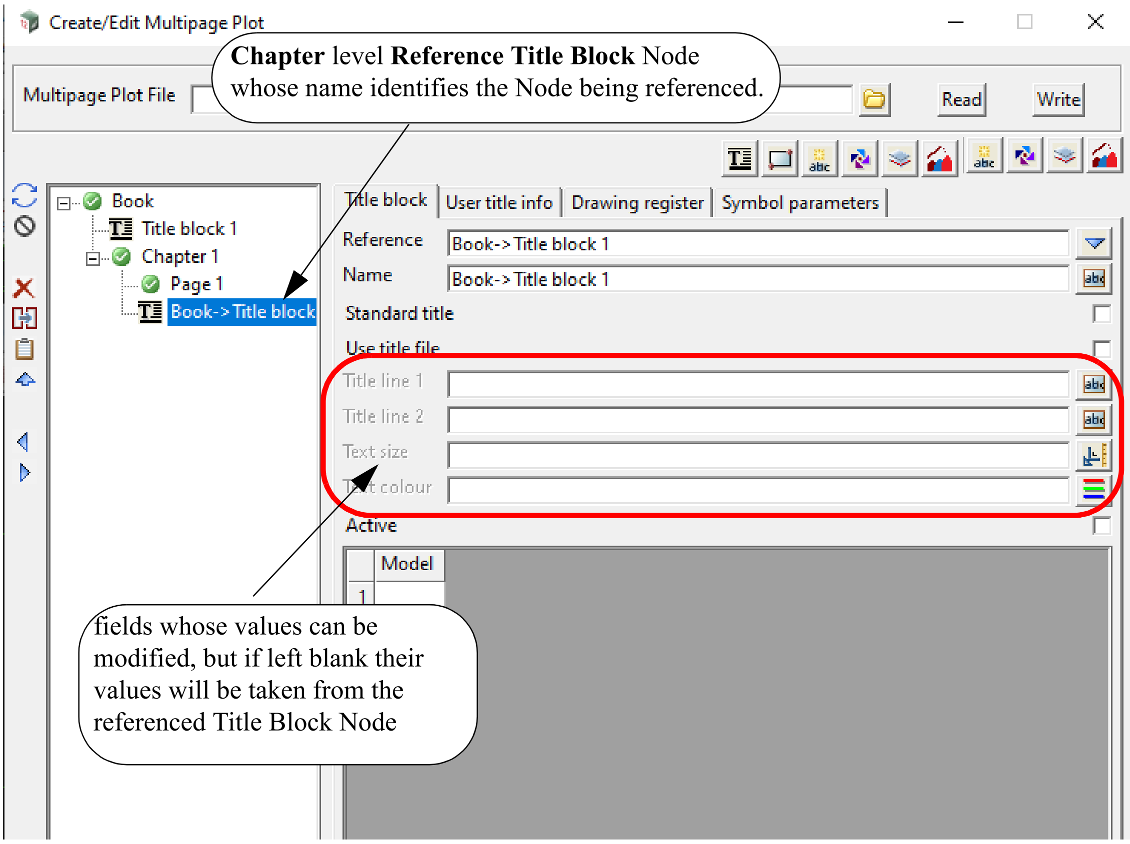


The drop-down list of the **Reference** field will show all of the existing **Title Block** Nodes that the **Reference Title Block** Node could reference. Only Nodes from higher levels of the tree can be referenced so in this **Chapter** case the list will only contain **Title Block** Nodes from **Book** level.

Once a **Title Block** Node to reference has been selected the name of the **Reference Title Block** Node will be changed to the full tree path of the referenced **Title Block** Node. The Node name can be freely modified by the user.

All of the fields of the **Reference Title Block** Node will appear blank to show that they are being referenced. All the referenced fields will use the values of the equivalent field of the referenced **Title**

Block Node. A referenced field can be overridden by entering a value into its blank field. This new field value will then be used when plotting the **Reference Title Block** Node.



Neat Tricks

If you don't want a **Book** level **Title Block** Node to plot for a particular **Chapter**, then create a **Reference Title Block** Node for the **Chapter** and have that Node reference the **Book** level **Title Block** Node that you don't want to plot and make the **Reference Title Block** Node inactive.

Conversely if there is an inactive **Book** level **Title Block** Node that you do want to plot for a particular **Chapter**, then create a **Reference Title Block** Node for the **Chapter** and have that Node reference the inactive **Book** level **Title Block** Node that you want to plot. As long as the **Reference Title Block** Node remains active it will plot.

These tricks can be applied to many other scenarios.

20.3.4.6.2 Icons and Fields for Title Block Nodes

The icons, fields and buttons used in this panel have the following functions:

Field Description | Type | Defaults | Pop-Up

Icons on the Left Side

The icons on the left side change depending on what is applicable for the currently selected node.

The icons common to most Nodes are described in 20.3.4.3 Icons on the Left Side.

Icons on the Top Right

The icons are described in 20.3.4.4 Icons on the Top Right.

Buttons at the Bottom of each Tab

Set button

must be pressed for any new field values in any of the tabs to take effect.

Title Block Tab

Reference choice box — referenceable Title Block Nodes

the Title Block Node that this Node is referencing.

*when a Node is selected from the drop-down list the **Name** field value will be changed to the full tree path of the referenced Title Block Node.*

***Note**: this field only appears for Reference Title Block Nodes.*

Name text box — Title Block n

*the name of this Title Block Node. The default is **Title Block n** where **n** is the first number (integer from zero) to make the **Name** unique amongst all Title Block Nodes in the tree.*

Standard title tick box — not ticked

*if **ticked**, a standard 12d title block will be used.*

Use title file tick box — not ticked

*if **ticked**, a user defined title file will be used.*

Title line 1 text box

*if **Standard title** is **ticked**, then **Title line 1** is the first line of title text.*

*if **Use title file** is **ticked**, then **Title line 1** is substituted for the Title Block variable $title_1.*

Title line 2 text box

*if **Standard title** is **ticked**, then **Title line 2** is the second line of title text.*

*if **Use title file** is **ticked**, then **Title line 2** is substituted for the Title Block variable $title_2.*

Text size measure box — 5

*if **Standard title** is **ticked**, then this is the text size of title text.*

Text colour colour box — cyan — available colours

*if **Standard title** is **ticked**, then this is the colour of title text.*

Active tick box — ticked

*if **ticked**, the currently selected node is made active and will be used when plotting. The Node's active/inactive icon will be set to active.*
*if **not ticked**, the currently selected node is made inactive and will be ignored when plotting. The Node's active/inactive icon will be set to inactive.*
***Note**: this tick box is linked to the Node's active/inactive icon. Changing one also changes the other.*

Grid of models grid of model boxes — available models

*if **not blank**, the models in the grid are plotted as part of the plot.*

For more information on plot data models, see 27.2.7.1.1.1 Plot Data Models.

User Title Info Tab

Title file file box available title files

the name of the title block file (.tbf) to use. If a valid tbf exists, the ***Name*** *fields of the grid will be populated using aliases of the title block variables $user_text_n that are specified in the tbf.*

Name output

the alias for the nth user text specified in the title block file.

Value text box

the text to be substituted in for associated user text ***Name****.*

Time format text box

the format to be used for the title block variable $time.

For more information on the available time formatting options, see 27.2.7.2.6.1 Specifying the Format for $time - Time Format.

Start page number integer box 1

used as the starting value for the title block variable $page_number.

if ***blank****, then $page_number will start at 1.*

Start drawing number integer box 1

used as the starting value for the title block variable $drawing_number.

if ***blank****, then $drawing_number will start at 1.*

Drawing number prefix text box

used as the value for the title block variable $drawing_number_prefix.

Drawing number postfix text box

used as the value for the title block variable $drawing_number_postfix.

Drawing Register Tab

Enable drawing register tick box ticked

if ***ticked****, the drawing register fields are used.*

Register type choice box Excel
CSV

the type of file that is being used for the drawing register.

if ***EXCEL****, use an Excel file.*

if ***CSV****, use a CSV file.*

Register file file box available register files

the name of the drawing register file to use.

if ***Register type*** *is* ***EXCEL****, then will accept a .xlsx or .xls file.*

if ***Register type*** *is* ***CSV****, then will accept a .csv file.*

Worksheet text box

if ***not blank*** *and* ***Register type*** *is* ***EXCEL****, then the name of the worksheet to use in the* ***Register file****.*

Grid

the names and values in this grid are used to generate a search query that will identify the row to be used from the drawing register for each title block.

Name text grid cell

name of the column in the drawing register to search through for the associated ***Value****.*

Value text grid cell

*value to search for in the specified column (**Name**) of the drawing register.*

20.3.4.6.3 MPS Title Block $variables

Title Block $variables in MPS are populated from a Frame Node of the users choosing at the level where plotting is currently occurring.

The Frame Node to use is identified by the **Use to populate title block** field that is present on all Page level Frame Nodes. Only one Frame Node on each Page may have the field set at any given time, so there can only ever be one Frame Node linked to a Title Block Node.

For the $variables to populate correctly the specified Frame Node must appear before the Title Block Node in the plotting order.

If no Frame Node is specified for the population of the $variables or if the specified Frame Node appears after the Title Block Node in the plotting order, then the $variables will not be populated correctly. This will most likely result in the $variables having their default values, which is predominately blank/empty. Scale $variables are an exception and usually default to 1000.

The Title Block Node will only set the $variables that are associated with the Frame Node type that it populates from.

eg. If we are populating from a Long Section Frame, then the Plan Frame specific $variable $rotation will not be set.

For more information on plot specific $variables see 27.2.7.2.8 Plot Details.

Note: The Title Block behaviour described above was introduced in ***V14 C2g***. Before that the Title Block $variables were populated off of the last active Frame Node on each level. To guarantee upwards compatibility 12d model automatically sets the **Use to populate title block** field on Frame Nodes when reading a pre ***V14 C2g*** mpsf so that the old 'last frame' behaviour is preserved in newer versions where it is no longer standard.

For more information on the various Frame Nodes and their fields (including the **Use to populate title block** field) see:

20.3.4.7.6 Plan Frame

20.3.4.7.7 X Section Frame

20.3.4.7.8 Long Section Frame

20.3.4.7.9 Perspective Frame

20.3.4.7.10 Section Frame

20.3.4.7.11 3d PDF Frame

20.3.4.7.12 Node Diagram Frame

20.3.4.6.3.1 $plot_file

The plot file $variable is much more dynamic in MPS than standard plotting. It will change to match the name of the current Book, Chapter or Page Node that is being plotted.

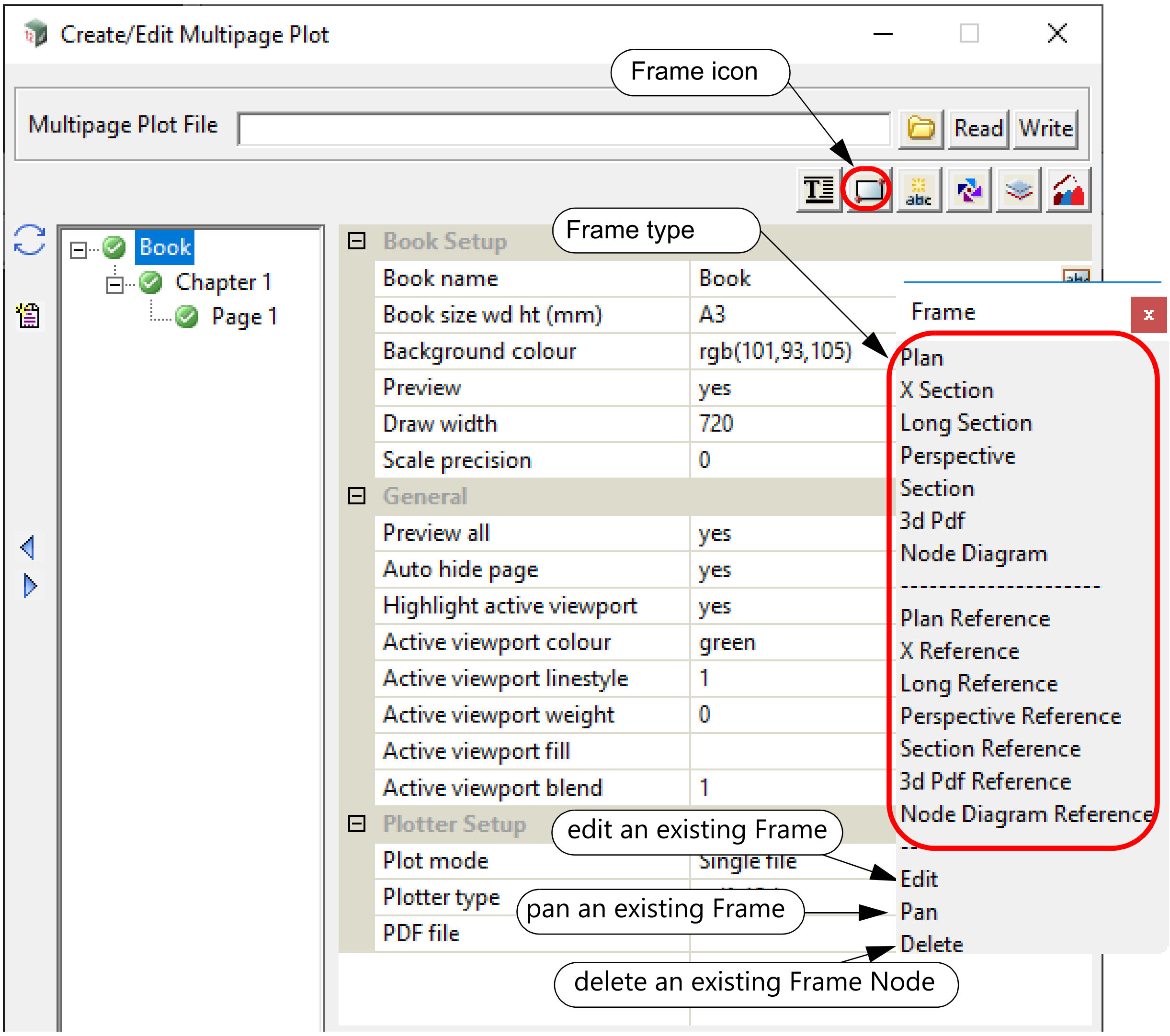
20.3.4.6.3.2 $scale/$horizontal_scale/$vertical_exaggeration

In the case where there are multiple Frame Nodes being plotted at the same level and you want to plot the $scale (or $horizontal_scale or $vertical_exaggeration) value for more than one of them you will not be able to do so using Title Blocks alone. It is recommended that you use Frame level Text Nodes (Frame Text) to accomplish this. Frame Text has been tailored to handle some $variables in a much more flexible way.

For more detailed information, see 20.3.4.8.2 Creating Frame Text and 20.3.4.8.6 MPS Text $variables.

20.3.4.7 Frame

A **Frame** Node can be inserted as a Subnode to any Book, Chapter, Special Chapter or Page Node in the tree by clicking the **Frame** icon at the top right of the Editor panel.



Frame - Create

[20.3.4.7.1 Creating Frames for a Book](#)
[20.3.4.7.2 Creating Frames in a Chapter](#)
[20.3.4.7.3 Creating Frames on a Page](#)

Frame - Edit

Used to move or modify the **Plot Area Frame** of a **Frame** Node. The **Frame** to edit is identified by pick from the **Plot Area**. A **Frame** can only be picked from the **Plot Area** it was created on. eg. A Book level **Frame** cannot be picked from a Page level **Plot Area**.

Note: a **Frame** can also be edited by selecting its **Frame** Node in the tree and clicking the **Edit** icon on the left hand side.

For further information see 20.3.4.7.13 Edit Frame.

Frame - Pan

Used to pan the drawing inside the **Plot Area Frame** of a **Frame** Node. The **Frame** to pan is identified by pick from the **Plot Area**. A **Frame** can only be picked from the **Plot Area** it was created on. eg. A Book level **Frame** cannot be picked from a Page level **Plot Area**.

Note: a **Frame** can also be panned by selecting its **Frame** Node in the tree and clicking the **Pan** icon on the left hand side.

Frame - Delete

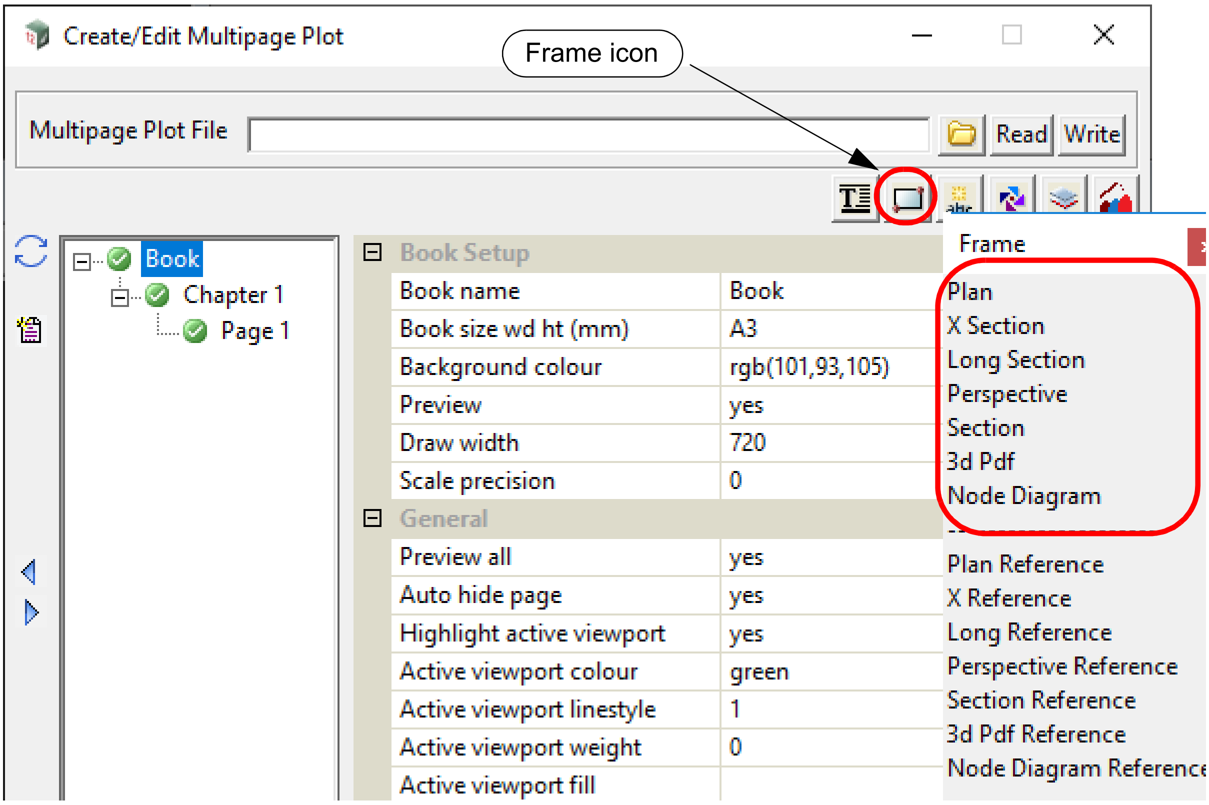
Used to delete a **Frame** Node from the tree. The **Frame** Node to delete is identified by picking its **Frame** from the **Plot Area**. A **Frame** can only be picked from the **Plot Area** it was created on. eg. A Book level **Frame** cannot be picked from a Page level **Plot Area**.

Note: a **Frame** Node can also be deleted by selecting it in the tree and clicking the **Delete** icon on the left hand side.

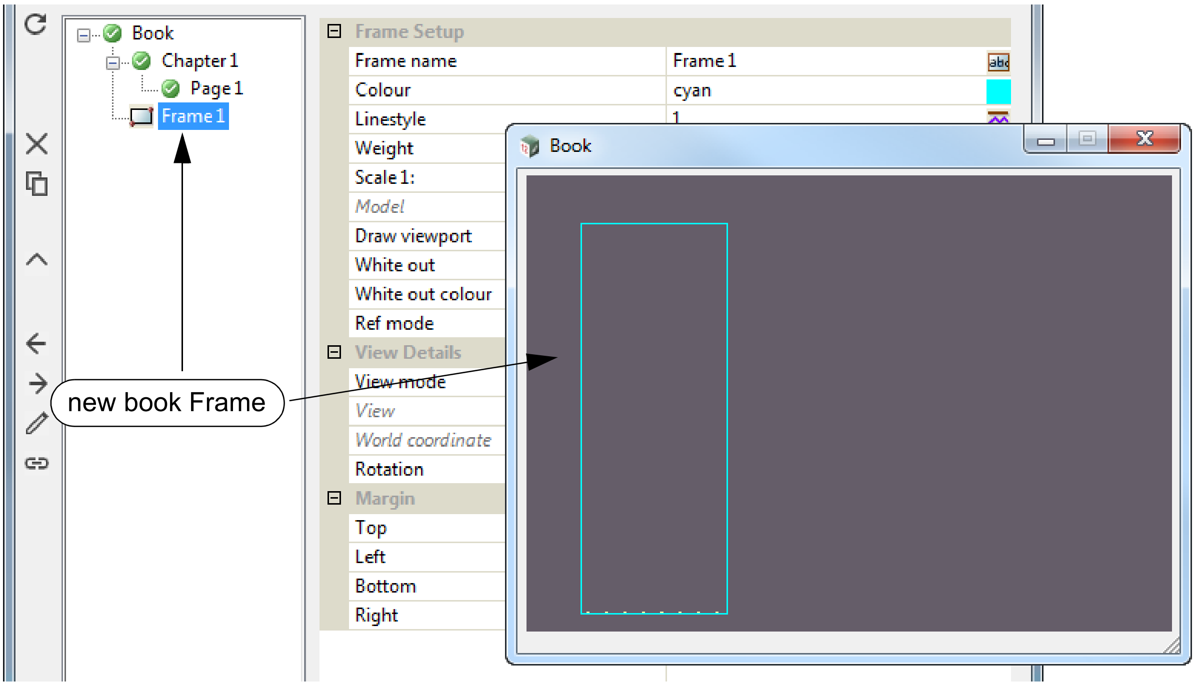
20.3.4.7.1 Creating Frames for a Book

20.3.4.7.1.1 Frames for a Book

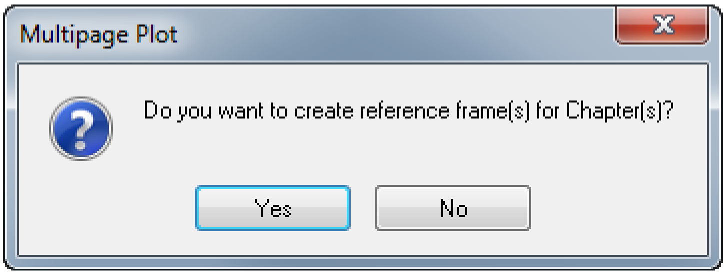
To create a **Frame** for the **Book**, click on **Book** to display the **Book Plot Area** and then click on the **Frame** icon and select either **Plan**, **X Section**, **Long Section**, **Perspective, Section** or **Pdf 3d**.



The user then creates a new **Book Frame** by drawing the rectangle representing the Frame in the **Book Plot Area**.
A **Book Frame** node is then automatically created at the bottom of the **Book** level with the name **Frame n** where **n** is the next integer that makes the name **Frame n** unique for the **Book Frames**.



The **Multipage Plot Yes-No** panel then comes up and asks if you want to create reference frames of the Frame for each **Chapter** in the Book.



(a) If **Yes** is selected, a **Book Frame** called "Frame n" is created and the field **Ref mode** for the **Book Frame** is set to ***Ref at Chapter***.

Then for each **Chapter** in the **Book**, a **Chapter Frame** is created and each **Chapter Frame** references back to the **Book Frame**.

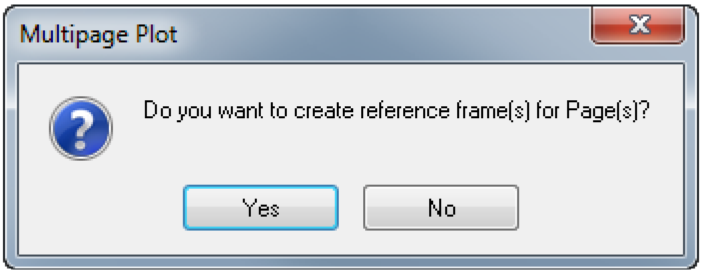
The name of the **Reference Chapter Frame** in each Chapter will be "Book ->Frame n"

Note:

If the **Book Frame** is **Referenced** in a **Chapter**, then in that **Chapter** all the fields of the reference Book Frame initially have the values from the Book Frame but can then be optionally overridden at the Chapter level.

(b) If **No** is selected, then no **Chapter Frames** referencing back to the **Book Frame** are created.

The **Multipage Plot Yes-No** panel then comes up and asks if you want to create reference frames for each **Page** in the Book.



(a) If **Yes** is selected and **Yes** was **also** selected for the Chapter Reference question, a **Page Frame** is created for each **Page** in the **Book** and the created **Page Frame** references back to the **Chapter Frame** which in turn references back to the **Book Frame**.

The name of the **Reference Page Frame** will be "Chapter m ->Book ->Frame n" where "Chapter m" is the name of the Chapter.

The field **Ref mode** for the **Chapter Frame** is set to ***Ref at Page***.

Note:
If the **Book Frame** is **Referenced** in a **Chapter** and that **Chapter Frame** is **Referenced** in a **Page**, then for that **Page**, all the fields of the Reference Book-Chapter Frame initially have the values from the Book Frame but the values can be optionally overridden at the Chapter level, and/or overridden at the **Page** level. So what is used on the Page is determined by the values at the Book, Chapter and page level.

(b) If **Yes** is selected and **No** was selected for the Chapter Reference question, a **Book Frame** is created AND a **Page Frame** is created for each **Page** in the **Book** and the created **Page Frame** references back to the **Book Frame.** For more information see 20.3.4.7.14 Reference Frames.

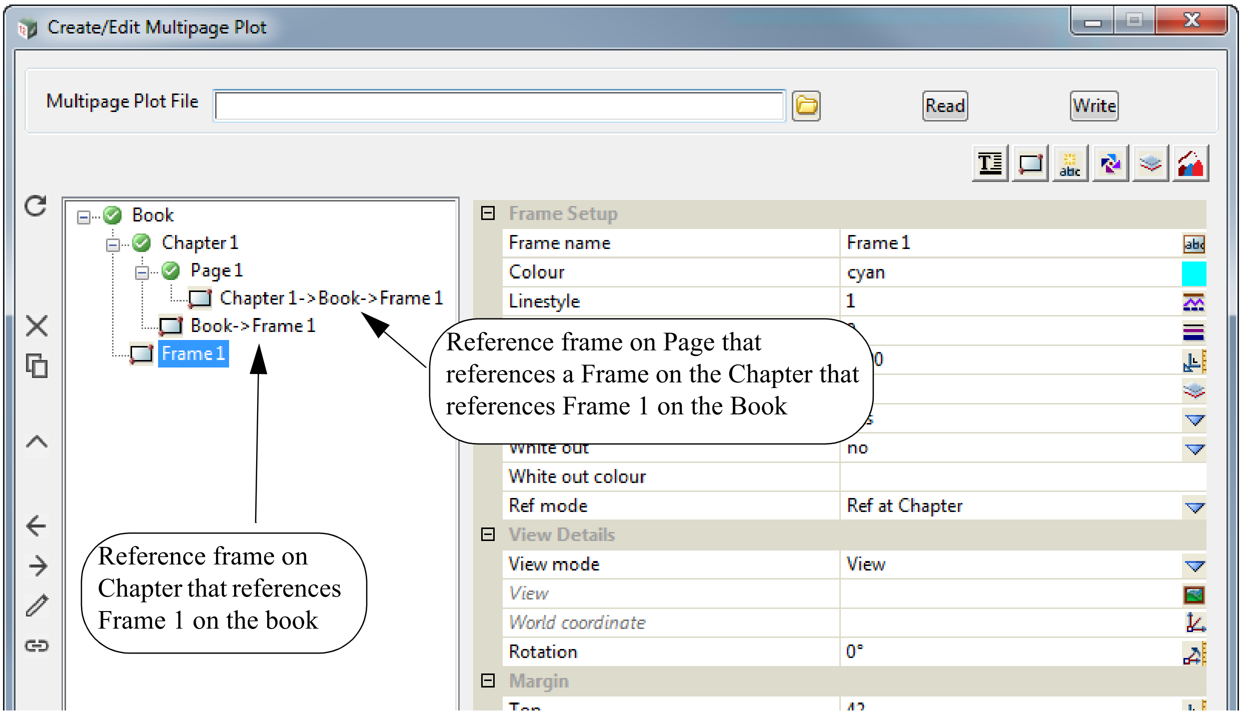
The name of the **Reference Page Frame** will be "Book ->Frame n" where "Frame n" is the name of the Book Frame.

The field **Ref mode** for the **Book Frame** is set to ***Ref at Page***.

Note:
If the **Book Frame** is **Referenced** in a **Page a**nd not to a Chapter Frame that then references to the Book Frame**,** then in that **Page** all the fields of the reference Book Frame initially have the values from the Book Frame but they can then be optionally overridden at the Page level.

(c) If **No** is selected, then no **Page Frames** referencing back to the **Book Frame** are created.

NOTE:
If the **Book Frame** is **NOT Referenced** in either a **Chapter** or a **Page**, the **Book Frame** and its contents are used without modification for all the **Pages** in the **Book**.



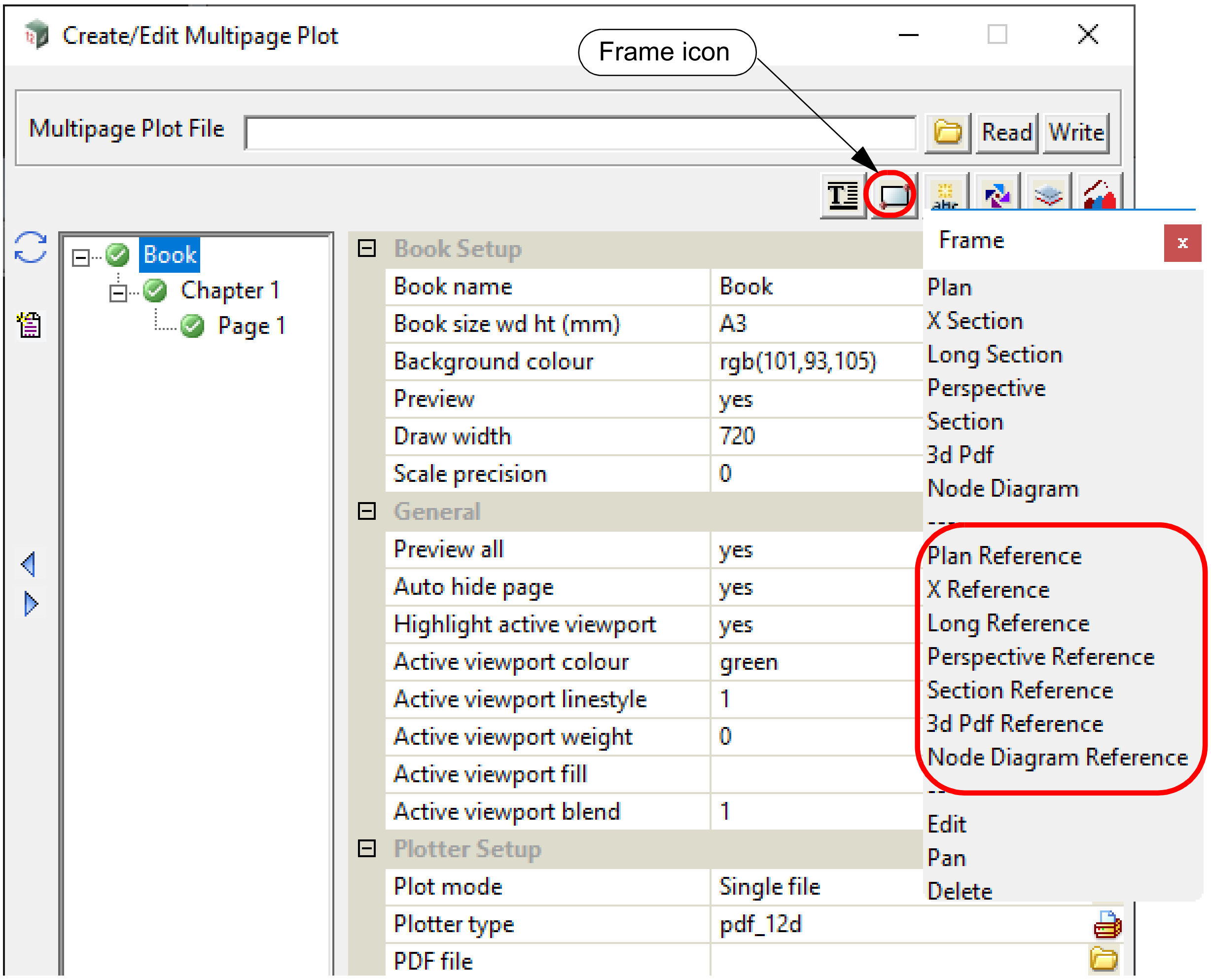
For the description on creating and editing Frames, see 20.3.4.7.5 Common Information About Frames.

Important Notes

1. The order of the items in the Tree is important as it is the drawing order. See 20.3.4.7.4 Plotting Order of Frame Nodes.
2. **Book Frame** names have to be unique within the **Book**.

20.3.4.7.1.2 No Reference Frames for a Book

The options **Plan Reference**, **X Reference**, **Long Reference, Perspective Reference, Section Reference** or **Pdf 3d Reference DO NOT** work for a **Book**.

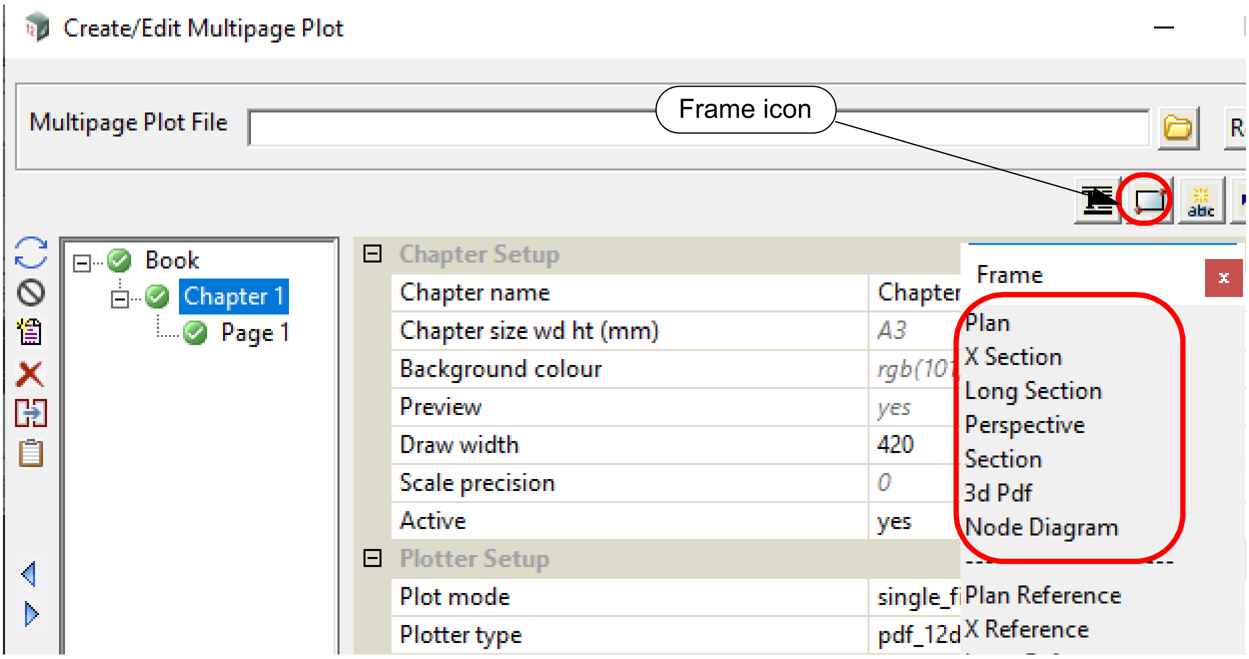


Selecting any of the menu items **Plan Reference**, **X Reference, Long Reference**, **Perspective Reference**, **Section Reference** or **Pdf 3d Reference** will do nothing.

20.3.4.7.2 Creating Frames in a Chapter

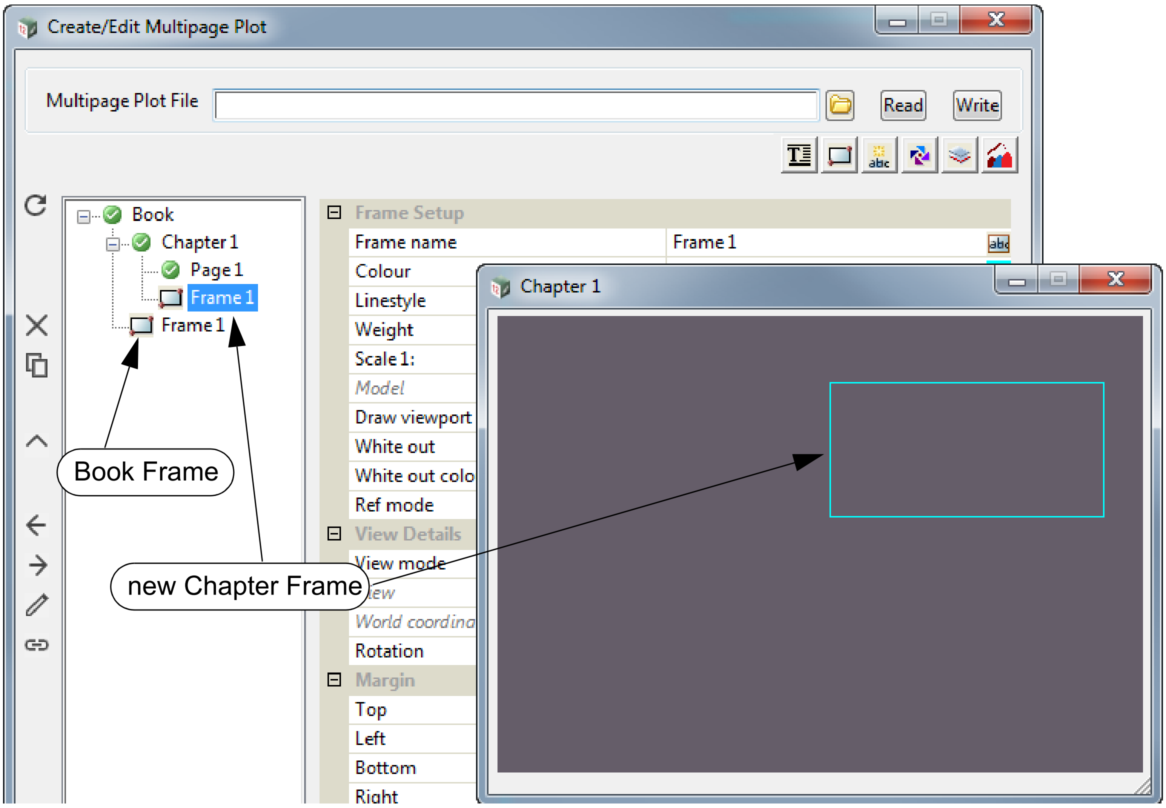
20.3.4.7.2.1 Frames for a Chapter

To create a **Frame** for a **Chapter**, click on the **Chapter** to display the **Chapter Plot Area** and then click on the **Frame** icon and select either **Plan**, **X Section**, **Long Section, Perspective, Section** or **Pdf 3d**.

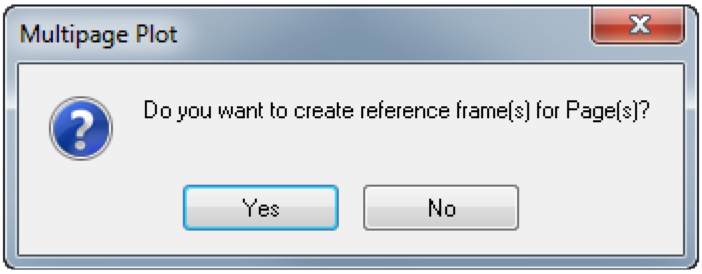


The user then creates a new **Chapter Frame** in the **Chapter Plot Area**.

A **Chapter Frame** node in the highlighted **Chapter** is then automatically created at the bottom of that **Chapter** with the name **Frame n** where **n** is the next integer that makes the name **Frame n** unique for the **Chapter Frames** for that highlighted *Chapter*.



The **Multipage Plot Yes-No** panel then comes up and asks if you want to create reference frames for each **Page** in the **Chapter**.



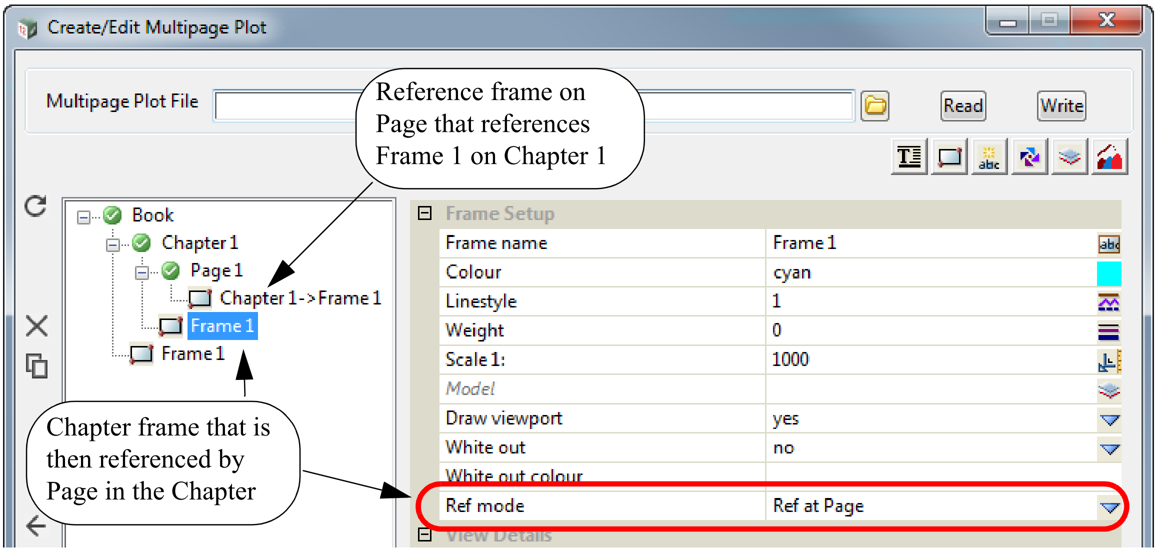
(a) If **Yes** is selected, a **Chapter Frame** called "Frame n" is created and the field **Ref mode** for the **Chapter Frame** is set to ***Ref at Page***.

Then for each **Page** in the **Chapter**, a **Page Frame** is created for each **Page** (a **Reference Page Frame**) and each **Page Frame** references back to the **Chapter Frame.**

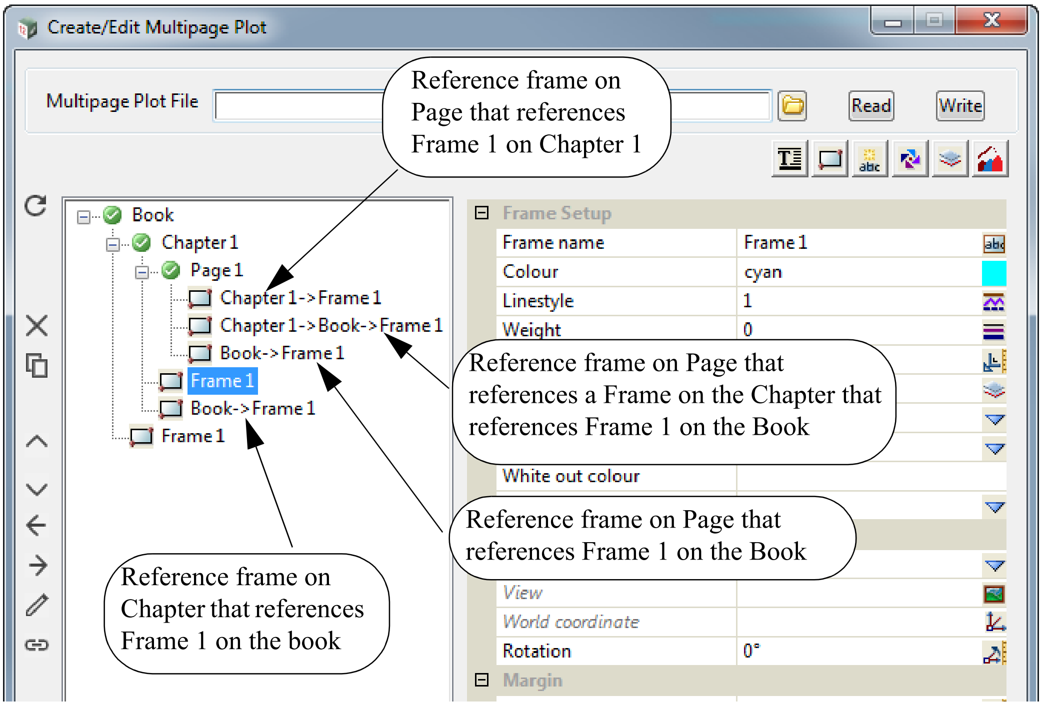
The name of the **Reference Page Frame** in each Page in the Chapter is "Chapter m ->Frame n" where "Chapter m" is the name of the **Chapter**.

(b) If **No** is selected, then no **Page Frames** referencing back to the **Chapter Frame** are created.

NOTE:
If the **Chapter Frame** is **NOT Referenced** in a **Page**, the **Chapter Frame** and its contents are used without modification for all the **Pages** in the **Chapter**.



Even though there are two Frames named "Frame 1", they are different because one is a Book Frame and the other is a Chapter Frame.



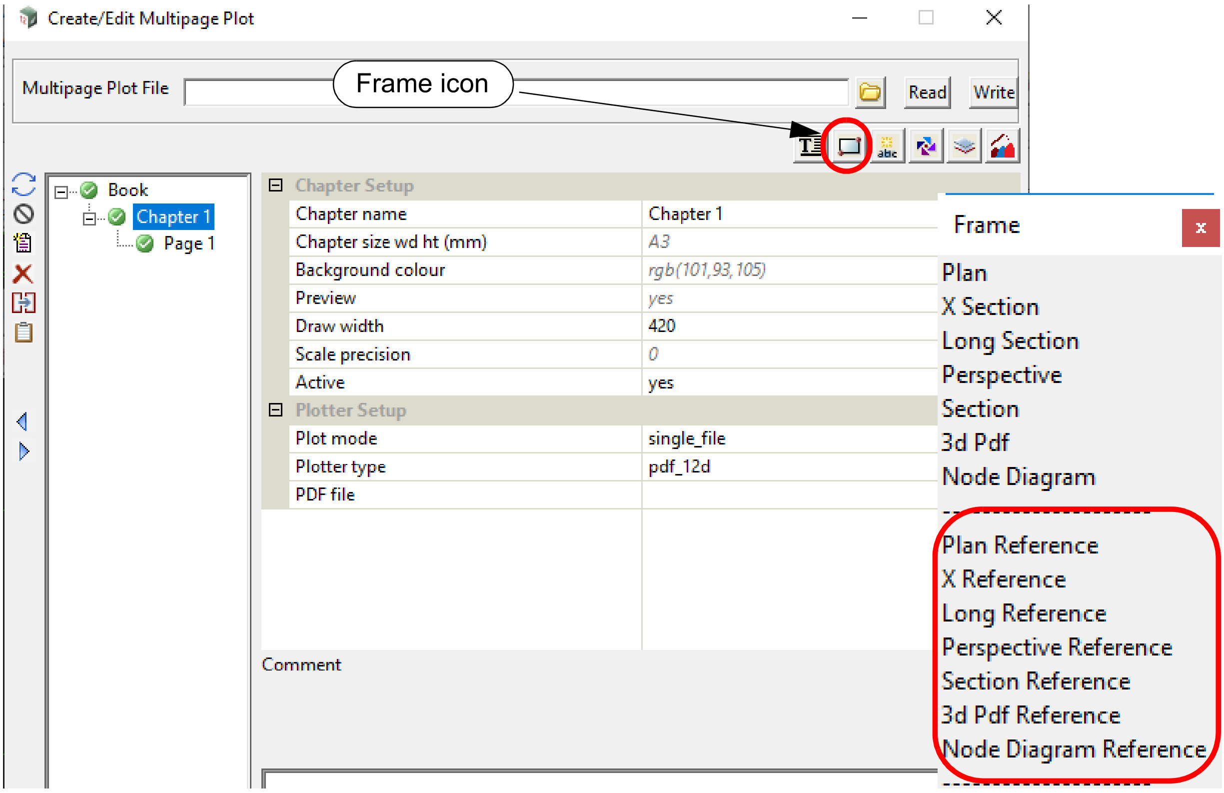
For the description on creating and editing Frames, see 20.3.4.7.5 Common Information About Frames

Important Notes

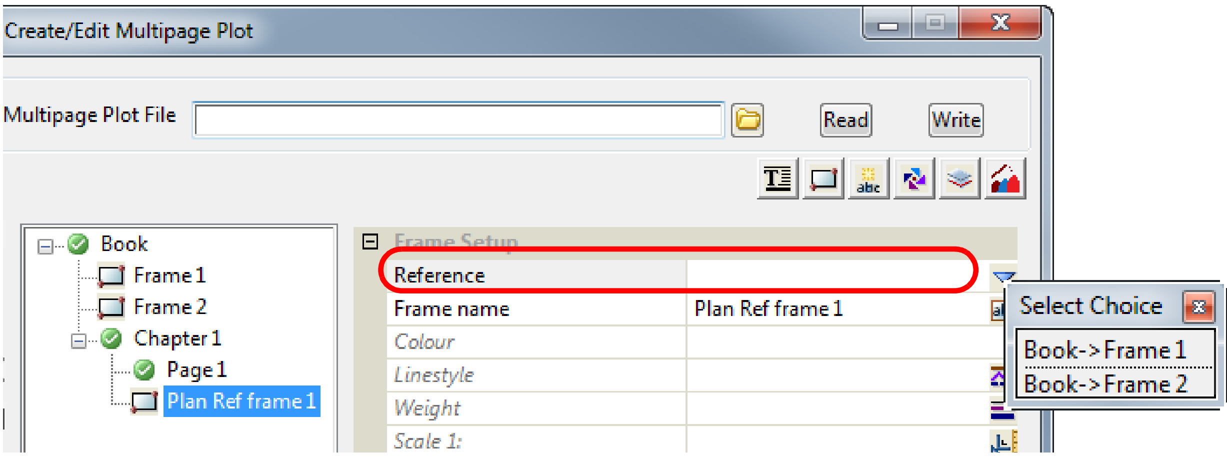
1. The order of the items in the Tree is important as it is the drawing order. See 20.3.4.7.4 Plotting Order of Frame Nodes.
2. **Chapter Frame** names have to be unique within a **Chapter**.

20.3.4.7.2.2 Reference Frames for a Chapter

The create a **Reference Frame** for the **Chapter**, click on **Chapter** to display the **Chapter Plot Area** and then click on the **Frame** icon and select either **Plan Reference**, **X Reference**, **Long Reference, Perspective Reference**, **Section Reference** or **Pdf 3d Reference**.



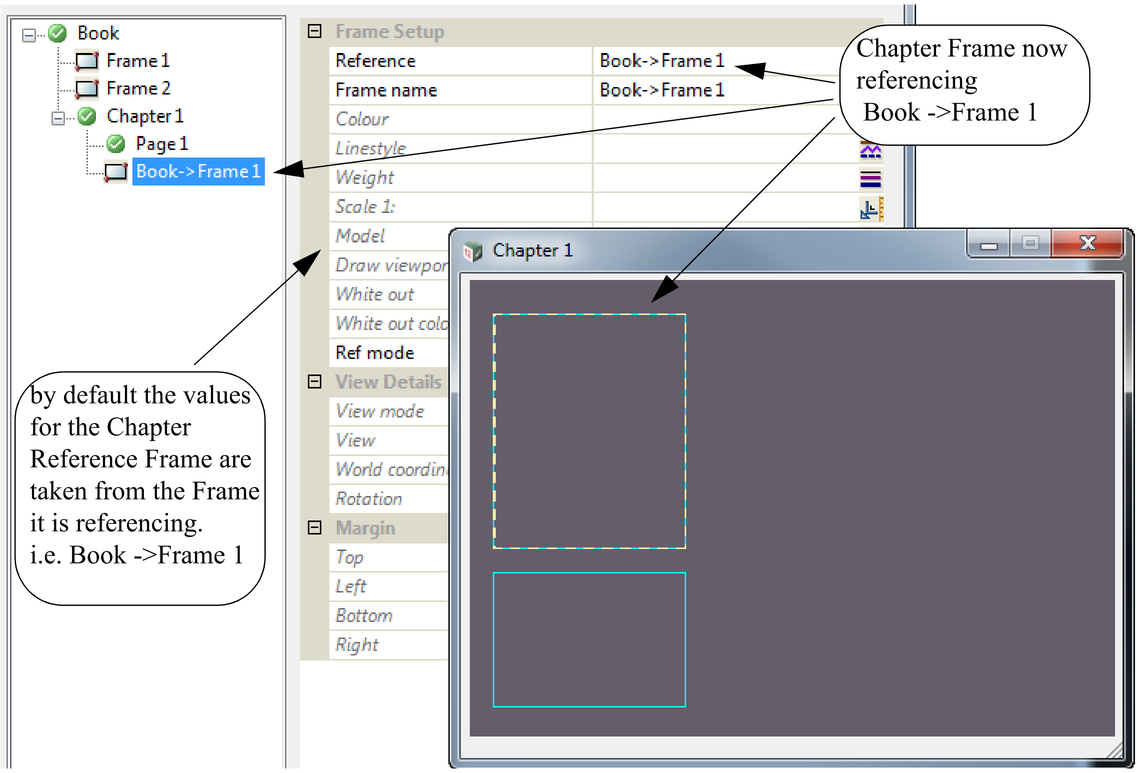
A new **Chapter Reference Frame** is created but it has a blank ***Reference field.***



The Choice pop-up for the ***Reference field*** lists the existing **Book Frames** that this **Frame** could reference.

Once a **Frame** is selected, it is drawn in the **Chapter Plot Area** and the name of the **Frame** is changed to the full path name of the **Frame** that is referencing. If that name already exists then " **n**" is appended to the name where n is an integer starting with 1.

All the **Frame Setup** values are blank as their values are taken from the **Book Frame** being referenced but any of them can be changed and the changed values will be used for this **Chapter Reference Frame**.



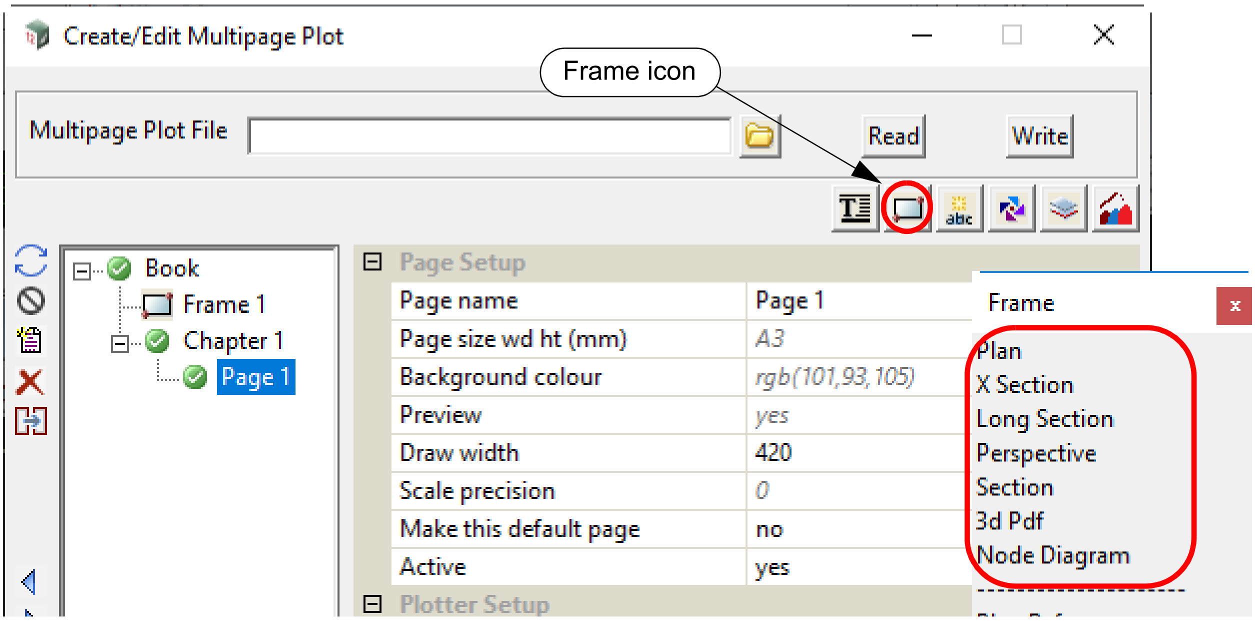
Book
Frame 1
Frame 2
Chapter 1
Page 1
Book->Frame 1
Frame Setup
Reference
Book->Frame 1
Frame name
Book->Frame 1
Colour
Linestyle
Weight
Scale 1:
Model
Draw viewpor
White out
White out colo
Ref mode
View Details
View mode
View
World coordin
Rotation
Margin
Top
Left
Bottom
Right
Chapter 1
Chapter Frame now referencing Book ->Frame 1
by default the values for the Chapter Reference Frame are taken from the Frame it is referencing. i.e. Book ->Frame 1

20.3.4.7.3 Creating Frames on a Page

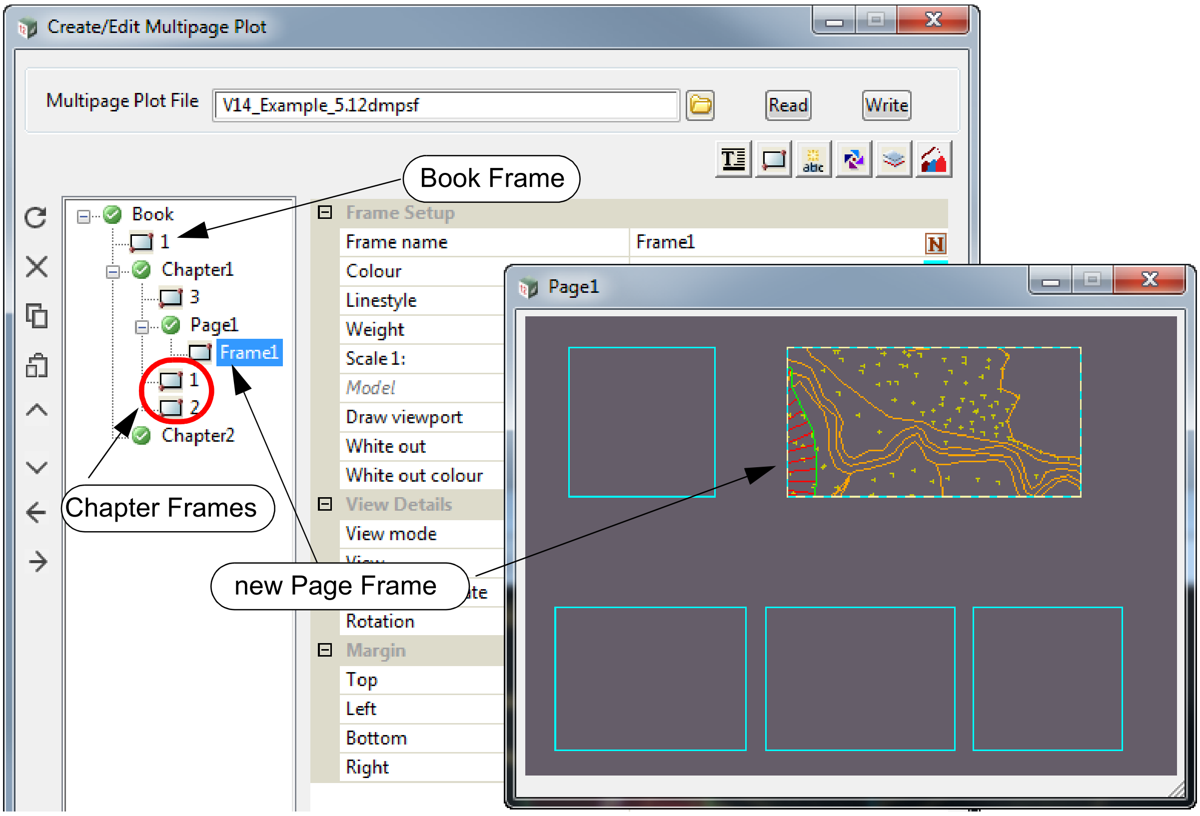
[20.3.4.7.3.1 Frames for a Page](#)
[20.3.4.7.3.2 Reference Frames for a Page](#)

20.3.4.7.3.1 Frames for a Page

To create a **Frame** for a **Page**, click on the **Page** to display the **Page Plot Area** and then click on the **Frame** icon and select either **Plan**, **X Section**, **Long Section**, **Perspective**, **Section**, **3d Pdf** or **Node Diagram**.



The user then creates a new **Page Frame** in the **Page Plot Area.**
A **Page Frame node** in for that **Page** is then automatically created at the bottom of that **Page** with the name **Frame n** where **n** is the next integer that makes the name **Frame n** unique for the **Page Frames** for that highlighted *Page*.



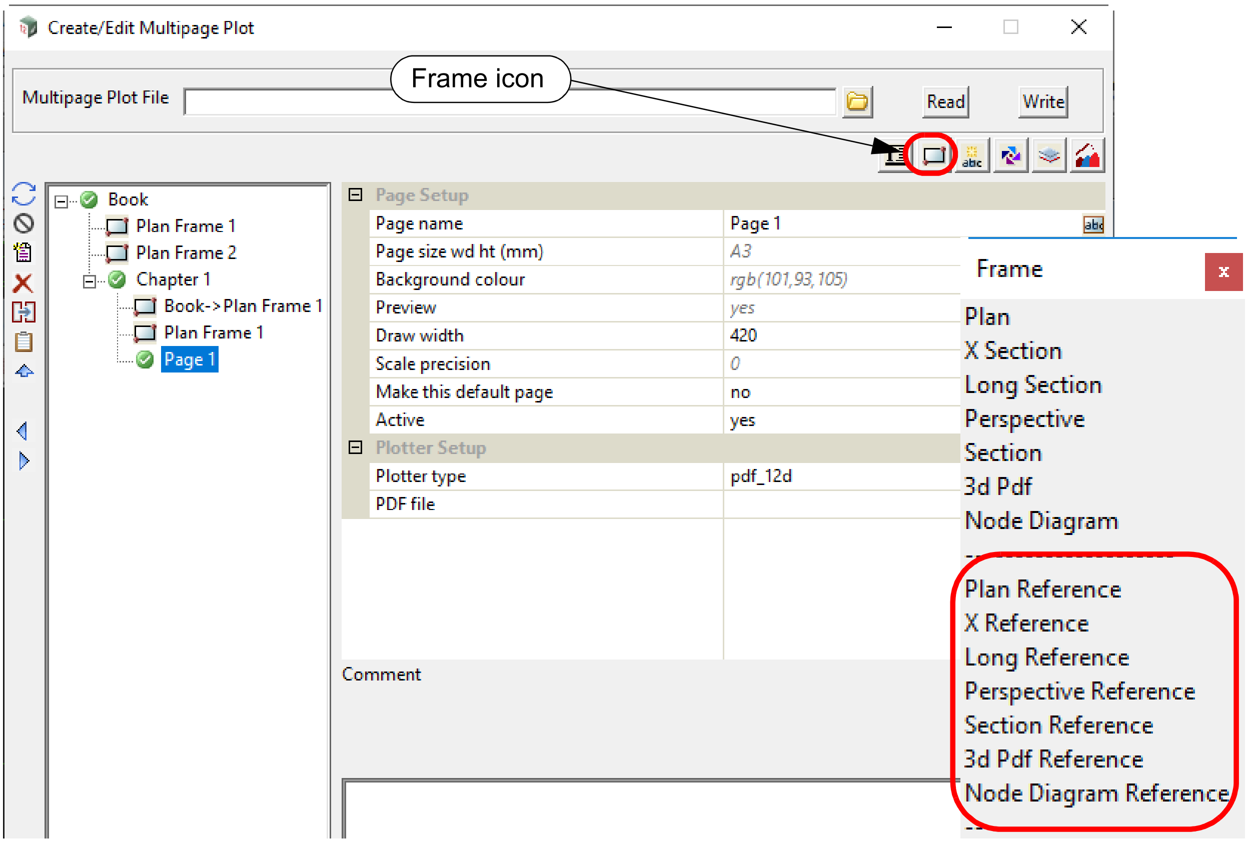
For the description on creating and editing Frames, see [20.3.4.7.5 Common Information About Frames](#).

Important Notes

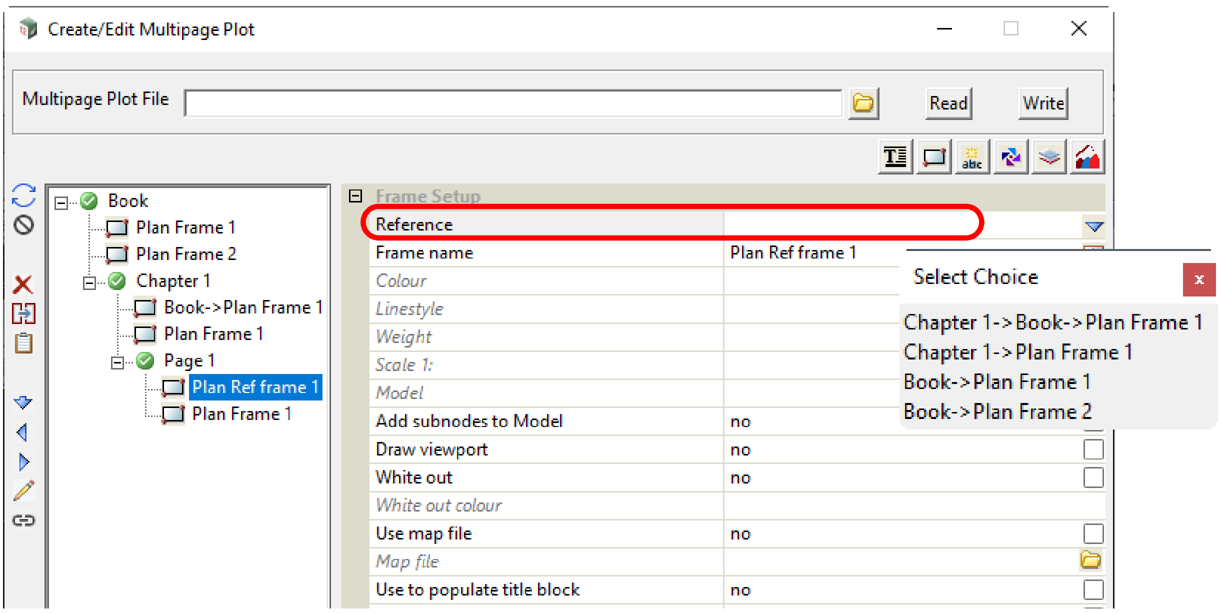
1. The order of the items in the Tree is important as it determines the drawing order in each page of the plot. See [20.3.4.7.4 Plotting Order of Frame Nodes](#).
2. **Page Frame** names have to be unique within the same **Page**.

20.3.4.7.3.2 Reference Frames for a Page

The create a **Reference Frame** for a **Page**, click on **Page** node to display the **Page Plot Area** and then click on the **Frame** icon and select either **Plan Reference**, **X Reference**, **Long Reference**, **Perspective Reference**, **Section Reference**, **3d Pdf Reference** or **Node Diagram Reference**.



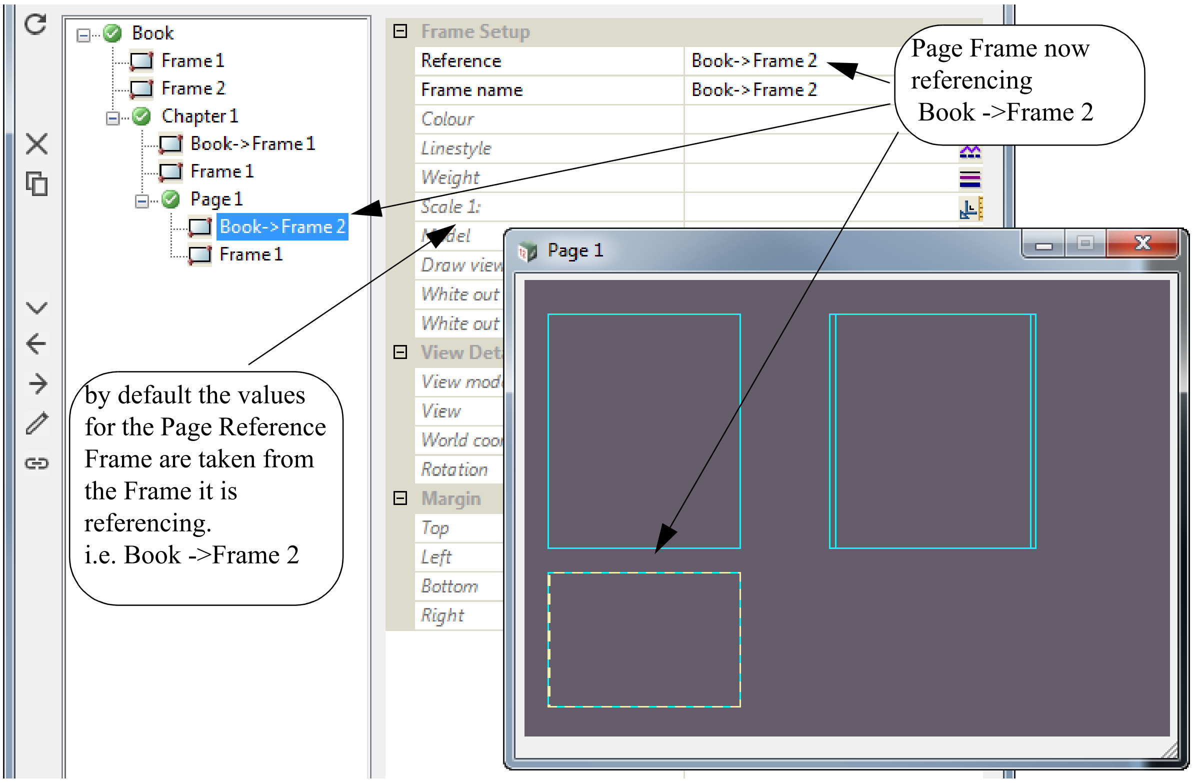
A new **Page Reference Frame** is created but it has a blank ***Reference field.***



The Choice pop-up for the ***Reference field*** lists the existing **Book Frames** and **Chapter Frames** that the **Page** is in, that this **Frame** could reference.

Once a **Frame** is selected, it is drawn in the **Page Plot Area** and the name of the Frame is changed to the full path name of the Frame that is referencing. If that name already exists then " **n**" is appended to the name where n is an integer starting with 1.

All the **Frame Setup** values are blank as their values are taken from the **Frame** being referenced but any of them can be changed and the changed values will be used for this **Page Reference Frame**.



20.3.4.7.4 Plotting Order of Frame Nodes

The order of the **Frame node** in the tree is important because it determines the plotting order of the **Frame**.

All the **Book Frame nodes** are plotted on each **Page**, but if the **Book Frame node** is in the tree before a **Page** then the **Book Frame** is plotted before the **Page** is plotted.

Similarly if the **Book Frame node** is in the tree after a **Page** then the **Book Frame** is plotted after the **Page** is plotted. See 20.3.4.10.5 Examples of Model Nodes.

All the **Chapter Frame nodes** are plotted on each **Page** in the **Chapter** but if the **Chapter Frame node** appears in the tree before a **Page** in the **Chapter** then the **Chapter Frame** is plotted before that **Page** is plotted.

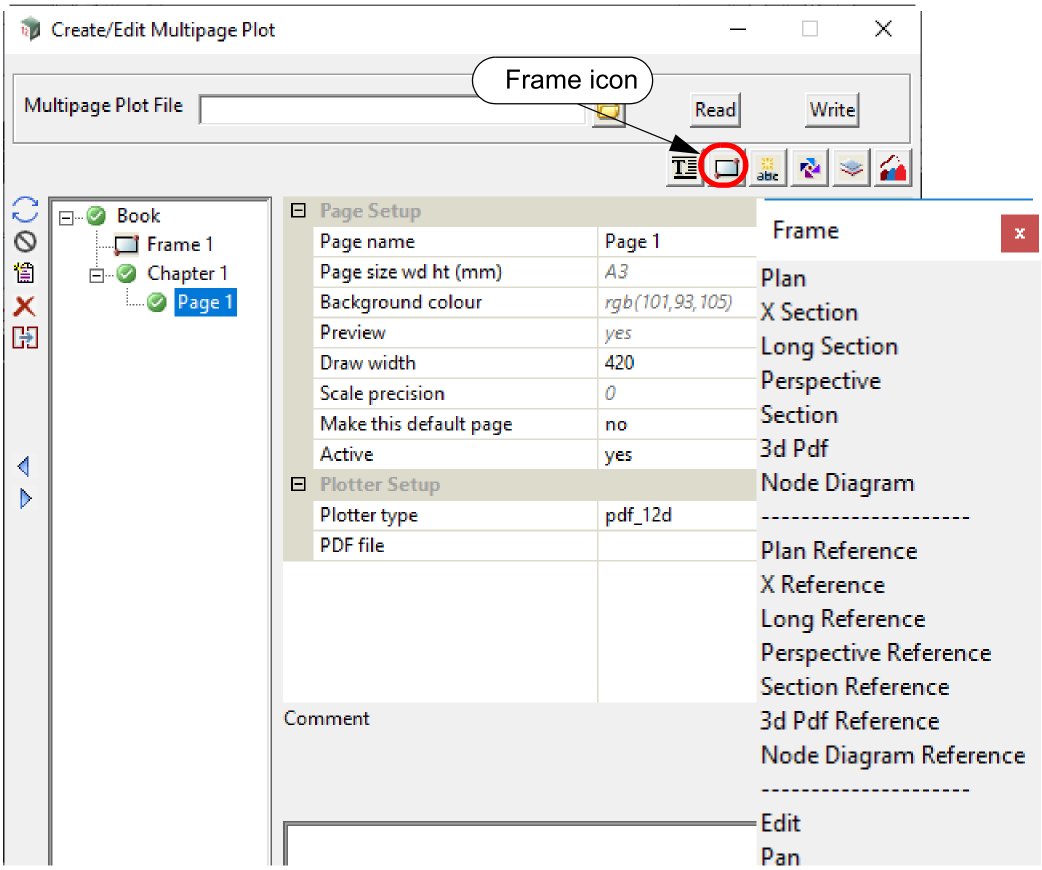
Similarly if the **Chapter Frame node** is in the tree after a **Page** in the **Chapter** then the **Chapter Frame** is plotted after the **Page** is plotted. See 20.3.4.10.5 Examples of Model Nodes.

Finally for a **Page node**, the order of the plotting is in the order of the items in the **Page** subtree.

20.3.4.7.5 Common Information About Frames

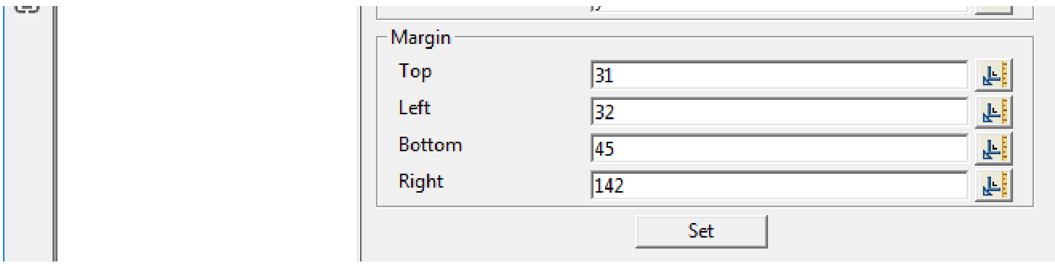
Clicking on the **Frame** icon brings up the **Frame** menu

.



There are three different Frames (plotting areas) that can be created on the Page: **Plan**, **X-Section** and **Long Section**, and each type is created by selecting the relevant option on the **Frame** menu.

The size of a Frame is usually initially set by drawing the frame on the relevant **Plot Area**. The position and size for the frame is then written to the **Top**, **Left**, **Bottom** and **Right** fields on the panel. The frame can be resized by typing values into these fields and then pressing **Set**.



Inherited Fields *

*Fields that support inheritance will be marked by a * symbol next to their **Field Description**.*

***Note**: Only **Reference Frame** fields have inheritance support.*

*For more information on **Inherited Fields** see,* 20.3.4.5 Inherited Fields *.

Margins

Top* real box

the distance in millimetres from the top of the frame to the top of the Plot Area.
*This value can be edited and the size of the Frame will adjust accordingly when the **Set** button is pressed.*

Left* real box

the distance in millimetres from the left side of the frame to the left side of the Plot Area.
*This value can be edited and the size of the Frame will adjust accordingly when the **Set** button is pressed.*

Bottom* real box

the distance in millimetres from the bottom of the frame to the bottom of the Plot Area.
*This value can be edited and the size of the Frame will adjust accordingly when the **Set** button is pressed.*

Right* real box

the distance in millimetres from the right side of the frame to the right side of the Plot Area.
*This value can be edited and the size of the Frame will adjust accordingly when the **Set** button is pressed.*

A **Reference frame** creates a Frame that references an existing Frame.

There are a number of different Reference Frame that can be created on the Page: **Plan Reference**, **X-Section Reference**, **Long Section Reference** and **Perspective Reference**, and each type is created by selecting the relevant option on the **Frame** menu. See 20.3.4.7.14 Reference Frames.

Edit is used to move/resize a Frame on the Book, Chapter or Page or display information about the Frame.

After selecting **Edit**, the Frame to edit is picked in the relevant Plot Area. See 20.3.4.7.13 Edit Frame.

Note that a Frame can also be Edited by highlighting the Frame's node in the tree and pressing the left hand side **Edit** icon.

Pan uses the mouse cursor inside a frame to pan the drawing inside the Frame.

After selecting **Pan**, the Frame to Pan is picked in the relevant Plot Area.

Note that a Frame can also be panned by highlighting the Frame's node in the tree and pressing the left hand side **Pan** icon.

Delete is used to delete a Frame.

After selecting **Delete**, the Frame to delete is picked in the relevant Plot Area.

Note that a Frame can also be deleted by highlighting the Frame's node in the tree and pressing the left hand side **Delete** icon.

The types of Frames are **Plan**, **X-Section**, **Long Section, Perspective, Section, 3d pdf** and **Node diagram**:

The **Plan frame** is for drawing part of a Plan View. The Plan Frame is displayed as line work on nominated views to indicate the region of the plan view that will be drawn on the plot. See 20.3.4.7.6 Plan Frame.

The **X-Section frame** allows you to select a **X-Section PPF**, and then a chainage from the model in the selected PPF. If it will fit, that x-section is drawn using the settings from the PPF. See 20.3.4.7.7 X Section Frame.

The **Long Section frame** allows you to select a **Long Section PPF** and then a chainage range. If it will fit, that chainage range for the long section is drawn using the settings from the PPF. See 20.3.4.7.8 Long Section Frame.

The **Perspective frame** is for drawing the image that is displayed on a Perspective View. See 20.3.4.7.9 Perspective Frame.

The **Section frame** is for drawing the image that is displayed on a Section View. See 20.3.4.7.10 Section Frame.

The **3d pdf frame** is for creating a 3d pdf of all the data in the models on a Perspective view and adding it as a 3d pdf to the plot. See 20.3.4.7.11 3d PDF Frame.

The **Node diagram** is for creating a structure node diagram for the node of a water string. See 20.3.4.7.12 Node Diagram Frame.

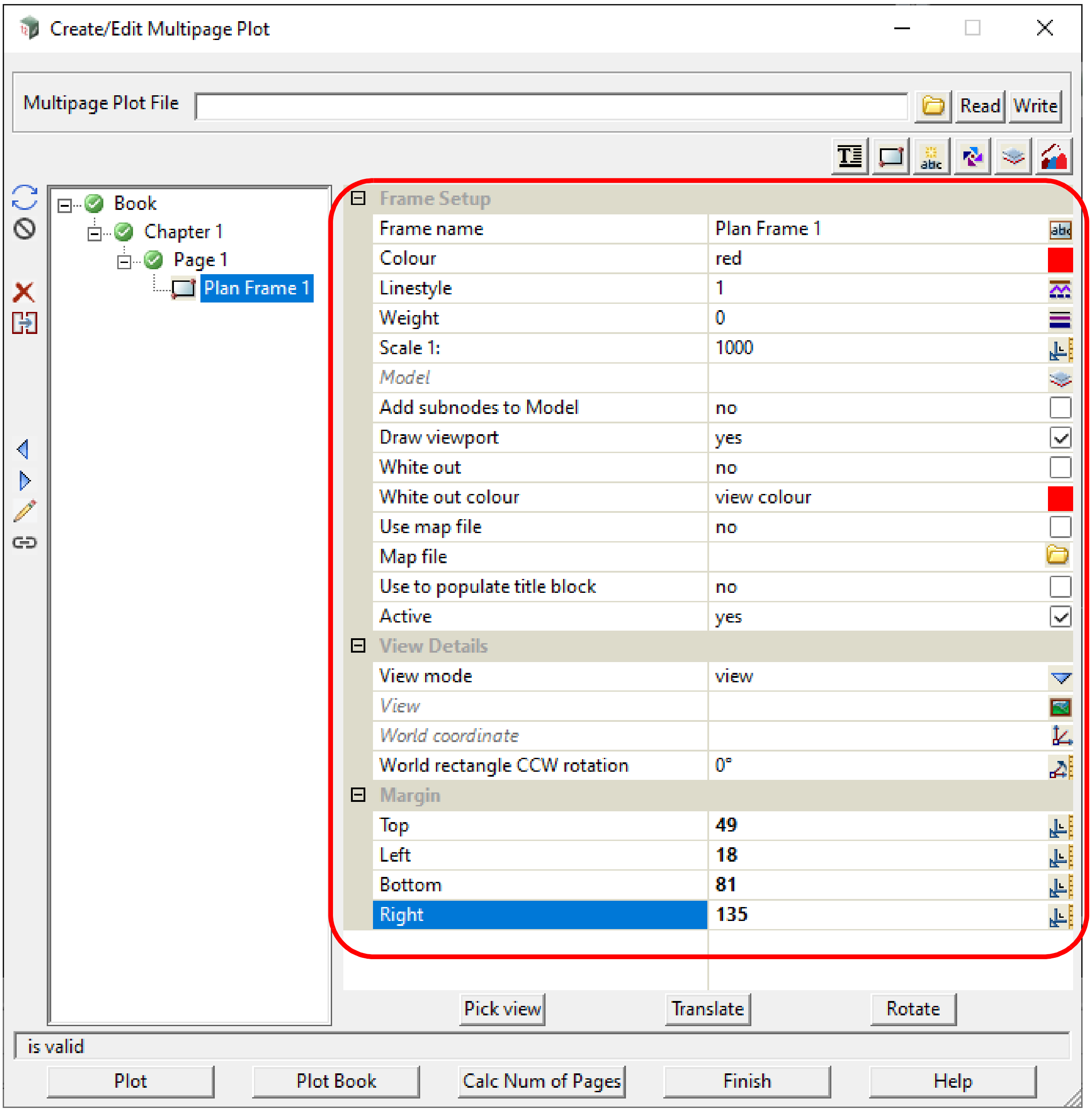
20.3.4.7.6 Plan Frame

After selecting **Plan** on the **Frame** menu, a rectangle for the Plan Frame is drawn on the Book, Chapter or Page Plot Area.

After each **Plan Frame** is drawn, a new subnode of the tree is created, and information such as Frame name, colour and scale for the new Plan Frame is displayed in the right had side of the **Create/Edit Multipage Plot** panel. These values can be changed. Settings such as name, colour and scale can be entered.

The position of the **Frame** on the page is given in **Margins** - **Top**, **Left**, **Bottom** and **Right**.

What is to be plotted in the **Frame** is defined by either a **Plan View** or a **Plan View Favourite** as selected in the ***View Details*** section.



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

Field Description Type Defaults Pop-Up

Inherited Fields *

*Fields that support inheritance will be marked by a * symbol next to their **Field Description**.*

*Note: Only **Reference Frame** fields have inheritance support.*

*For more information on **Inherited Fields** see,* 20.3.4.5 Inherited Fields *.

Frame Setup

Frame name	text box	Plan Frame n	

*name for this Plan frame. The default name is **Plan Frame n** where **n** is the first number to make the name "Plan Frame n" unique for **this** node (Book, Chapter or Page) in the tree. The name must be unique amongst all the frames on this node.*

Colour*	colour box	red	available colours

*the colour for the border of the Plan Frame that is drawn when **Draw viewport** is **ticked**.*

Linestyle*	linestyle box	1	available linestyles

*the linestyle for the border of the Plan Frame that is drawn when **Draw viewport** is **ticked**.*

Weight*	weight box	0	

*the weight for the border of the Plan Frame that is drawn when **Draw viewport** is **ticked**.*

Scale 1:*	measure box	1000	

the scale of the drawing in the plan frame is 1:value.

*The size of the **Plan Frame** drawn on the Plot Area (which is in millimetres) and the **Scale 1:** value determines the width and height **in world units** of the World rectangle that is to be plotted to the plan frame.*

Model*	model box		

*if **not blank**, when this Multipage plot is being edited, a string of the World rectangle for the plan frame is added to this model.*

*if **blank**, no string of the World rectangle for the plan frame is created.*

***Note:** the entered model and created string are locked for the duration of the Multipage plot edit. So any 12d option that requires a lock to be acquired on one of these elements will not be usable.*

Add subnodes to Model*	tick box	not ticked	

*if **ticked**, then any Text or Symbol Subnodes that this Plan Frame has will also be added to the **Model** specified above.*

*if **not ticked**, then the Subnodes will not be added to the **Model**.*

Draw viewport*	tick box	ticked	

*if **ticked**, the border of the Plan Frame is drawn on the plot.*

*If **not ticked**, the border of the Plan Frame is NOT drawn on the plot.*

White out*	tick box	not ticked	

*if **ticked**, the Plan Frame is drawn on the plot and the frame area is first drawn in the **White out colour**.*

White out colour*	colour box	view colour	available colours

*the colour to be used for the white out if **White out** is **ticked**.*

Use map file*	tick box	not ticked	

*if **ticked**, the **Map file** given is applied to all the data to be drawn in the Plan Frame.*
*If **not ticked**, the **Map file** is not used.*

Map file*	Map file box		available Map files

*the **map file** to use if* **Use Map file** *is **ticked**.*

***Note: Map file** does not support some of the more complex 12d objects (Rasters, Point Clouds, etc.) and may result in unexpected or incomplete output when used on these objects.*

Use to populate title block tick box

this field only appears on Frame Nodes that exist at the Page level.

*if **ticked**, then any Title Block Nodes operating at this level will populate their $variables from this Plan Frame Node.*
*if **not ticked**, then this Plan Frame Node will not be used for Title Block $variable population.*

*When created, if this Plan Frame Node is the first Frame Node on the Page AND there is a Title Block Node operating on this level, then this field will default to **ticked**.*
*if otherwise, then this field will default to **not ticked**.*

***Note:** this field is exclusive between all Frame Nodes on a Page. ie. Only one Frame Node on each Page may have this field set to **ticked**. Ticking this field on a second Frame Node on a Page will results in the field being **un-ticked** on the first Frame Node of that Page.*

For more information, see 20.3.4.6.3 MPS Title Block $variables.

Active tick box ticked

*if **ticked**, the Plan Frame node is made active and will be used when plotting. The node's active/inactive icon will be set to active.*
*If **not ticked**, the Plan Frame node will be ignored when plotting. The node's active/inactive icon will be set to inactive.*
***Note**: This tick box is linked to the node's active/inactive icon. Changing one also changes the other.*

Margins

*the position of the **Frame** on the page is given in **Margins** - **Top**, **Left**, **Bottom** and **Right**.*

See Margins.

The size of the **Plan Frame** drawn on the Plot Area (which is in millimetres) and the **Scale 1:** value determines the width and height **in world units** of the world rectangle that is the area to be plotted. What is actually plotted inside the plan frame is given in the section **View Details**.

What is in **View Details** depend on the choice for **View mode.**

See

.20.3.4.7.6.1.1 Plan Frame - View Details - View mode - View
20.3.4.7.6.1.2 Plan Frame - - View Details - View mode - View Favourite

20.3.4.7.6.1 Plan Frame - View Details - View mode - View

View mode can be either **view** or **view_favourite.**

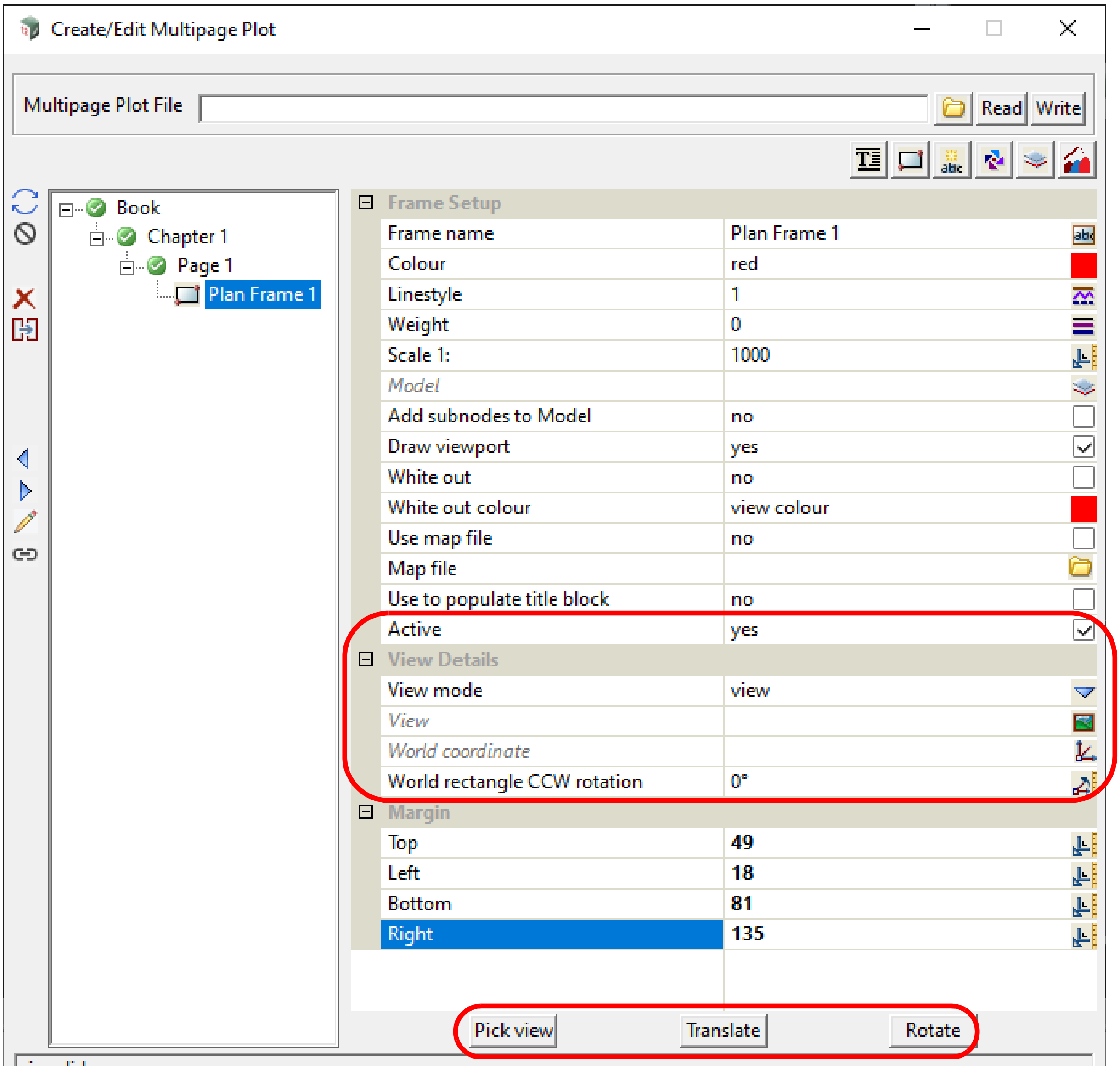
For **view**, the information for what is displayed in the Frame is taken from a View that the user selects. See 20.3.4.7.6.1.1 Plan Frame - View Details - View mode - View

For **view_favourite**, the information for what is displayed in the Frame is first taken from a selected **View Favourite** although some of the values can then be changed. See 20.3.4.7.6.1.2 Plan Frame - - View Details - View mode - View Favourite.

20.3.4.7.6.1.1 Plan Frame - View Details - View mode - View

If ***View mode*** is set to **view**, then a **plan view** is selected using the **Pick view** button and the selected *View* provides all the information about models and settings for the plot.

The position of the pick defines the world coordinate for the centre of a Word Rectangle that determines what is drawn in the Frame. The **Scale** together with the millimetre size of the Frame determines how large the World Rectangle is in world units.



Once a view is selected, the name of the plan view is written to the **View** field, the (x,y) coordinate of the centre of the view is written to the **World coordinate** field**.** The **World rectangle CCW Rotation** is initially set to **0**.

The **Pick view** option will repeat until <Esc> or another option is chosen.

A new view can be selected, or the fields in the View Details modified, to define the view information.

The fields and buttons used in this section of the panel when **View mode** is set to **View** have the following functions.

Field Description	Type	Defaults	Pop-Up

View Details

View mode*	choice box	View	View, View favourites

*when **View**.*

View*	view box		available views

*the View that the World rectangle will take its information from to plot. An outline of the World rectangle is displayed on the View whilst the **Create/Edit Multipage Plot** panel is open.*

World coordinate*	xyz pick box	1	measures

the world coordinate for the centre of the World rectangle.

*If a new **World coordinate** is entered or selected, that becomes the new centre of the World rectangle.*

World rectangle CCW Rotation*	angle box	0	angle measures

the angle of rotation of the World rectangle measured in the counter clockwise direction from the positive x-axis.

*If a new **Rotation** is entered, it becomes the rotation of the **World rectangle**.*

Margins

The margins give the size of the Frame in the Plot Area. See Margins *in* 20.3.4.7.5 Common Information About Frames.

Buttons

*The buttons **Translate** and **Rotate** are also for editing the position and rotation of the World rectangle on the Plan view.*

Pick view	buttons

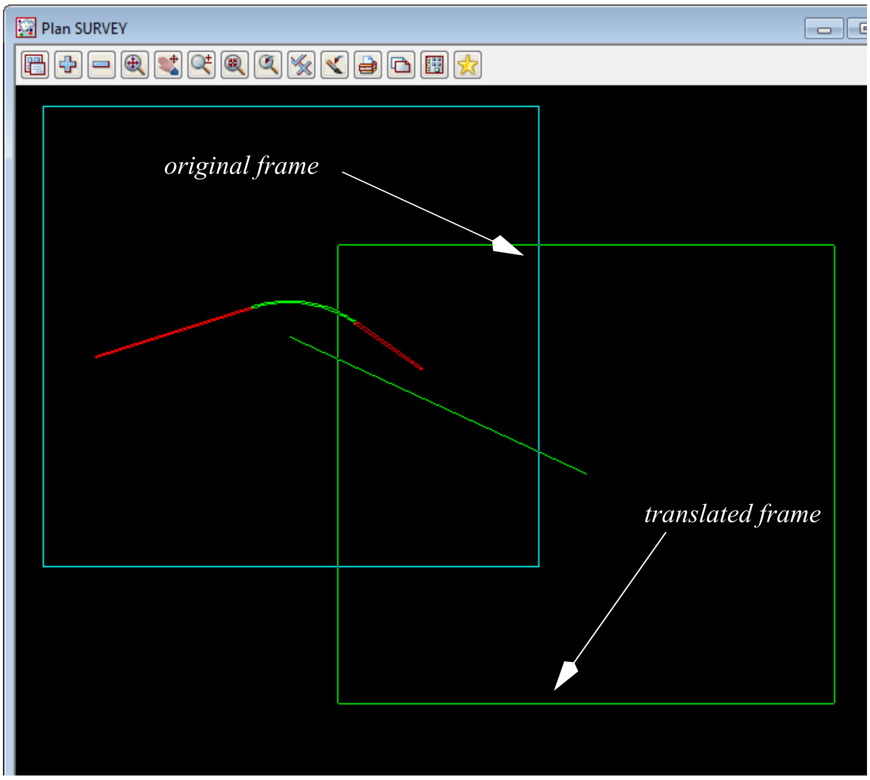
*after pressing the **Pick view**, when you select a position on a Plan View, the coordinate of the pick becomes the centre of the World rectangle for the Plan Frame and the World rectangle is drawn on the view. The name of the view is written to the **View** field and the pick coordinates are written to the **World Coordinate** field.*

*If there is a value in the **Rotation** field then it is maintained and used for the World rectangle.*

Translate	button

*after pressing the **Translate** button, when you move over a Plan View (even without the World rectangle for the Plan Frame on it), the centre of the World Rectangle will be tentatively moved to the position of the cursor on the Plan view. And when the position is accepted (MB), the new position is taken as the centre of the World rectangle. The coordinates of the new centre are written to the **World Coordinate** field*

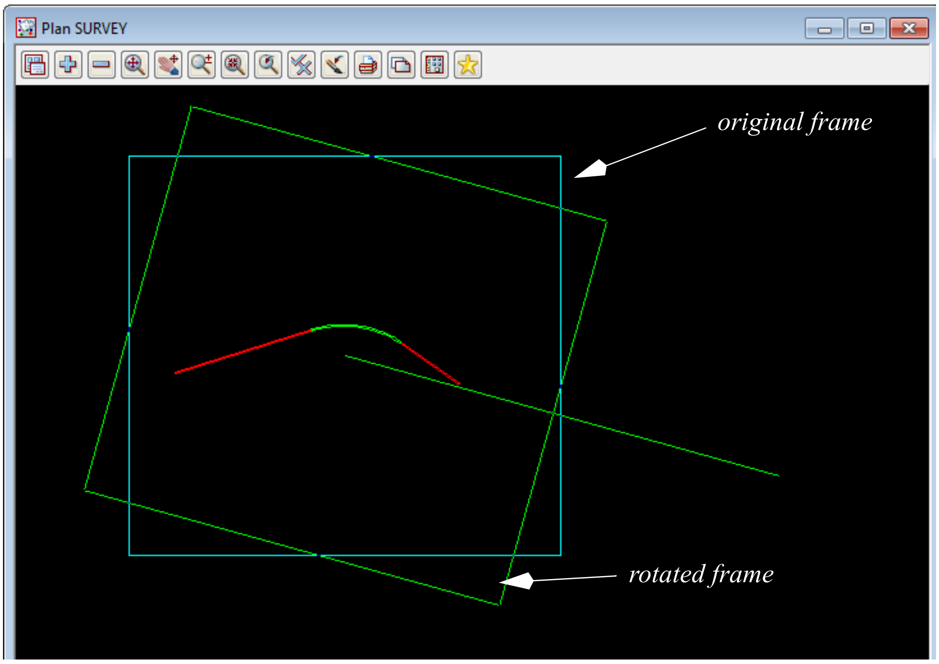
*Although the new centre can be selected on any Plan view, the World rectangle stays on the View given in the **View** field. The option will repeat until <Esc> or another option is chosen.*



Rotate button

*after pressing the **Rotate** button, when you move over a Plan View (even without the World rectangle for the Plan Frame on it), the World Rectangle will be tentatively rotated to the angle made from the centre of the rectangle to the cursor and this taken as the angle of the rectangle. And when the position is accepted (MB) the new angle is taken as the angle of the World rectangle. The new angle is written to the **Rotation** field.*

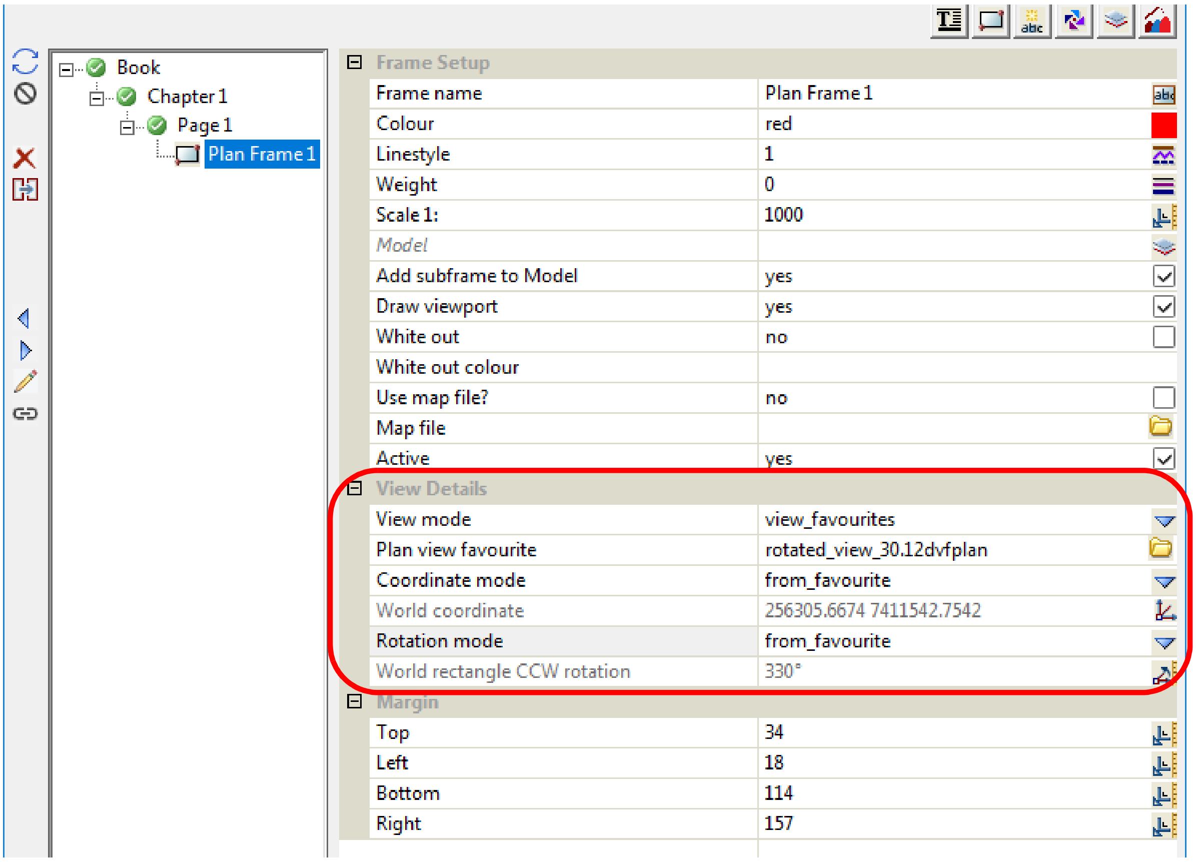
*Although the new angle can be selected on any Plan view, the World rectangle stays on the View given in the **View** field. The option will repeat until <Esc> or another option is chosen.*



20.3.4.7.6.1.2 Plan Frame - - View Details - View mode - View Favourite

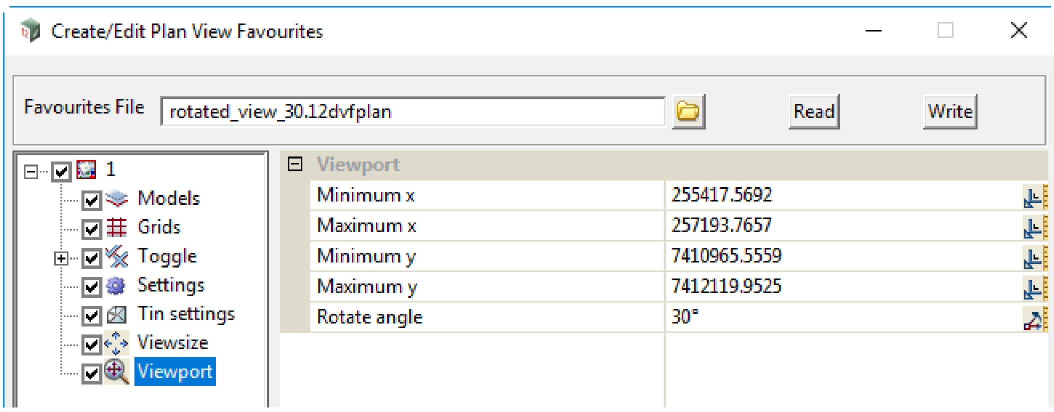
If **View mode** is set to **view_favourite**, then a **Plan view favourite** is selected in the **Plan view favourite** field and the selected **Plan Favourite** provides all the information about models and settings for the plot

.



Once a *Plan View favourite* is selected in the **Plan view favourite** field, the **Coordinate mode** is set to **from_favourite** and the **World coordinate** is set to the centre of the Minimum and Maximum x and y given in the **Viewport** section of the *Plan view favourite*.

The **Rotate mode** is set to **from_favourite** and the **World rectangle CCW rotation** is set as the **negative** of the **Rotate angle** given in the **Viewport** section of the *Plan view favourite* (and converted to an angle between 0 and 360 degrees).



If in **View Details**, the **Coordinate mode** is changed to **from_panel**, the **World coordinate** can be modified and the new coordinate becomes the centre of the World Rectangle.

If the **Rotation mode** is changed to **from_frame**, the **World rectangle CCW rotation** can be modified and the new value becomes the rotation of the World rectangle.

The fields and buttons used in this section of the panel when **View mode** is set to **View favourites** have the following functions.

Field Description	Type	Defaults	Pop-Up

View Details

View mode*	choice box	View	view, view_favourites

*set to **view_favourites**.*

Plan view favourite*	plan view favourite box		

*the View that the World rectangle will take its information from for the plot. An outline of the World rectangle is displayed on the View whilst the **Create/Edit Multipage Plot** panel is open.*

Coordinate mode*	choice box		from_favourite, from_frame

*if **from_favourite**, the world coordinate for the centre of the World rectangle is set as the centre of the Minimum and Maximum x and y given in the Viewport section of the Plan view favourite. This value is written to the **World coordinate** field. When **from_favourite,** the value in **World coordinate** can not be modified.*

*If **from_frame**, the world coordinate is taken from the **World coordinate** field. When **from_frame,** the value in **World coordinate CAN** be modified.*

World coordinate*	xyz pick box	1	measures

the world coordinate for the centre of the World rectangle.

*If **Coordinate mode** is changed to **from_frame** and a new **World coordinate** is entered or selected, the new value becomes the new centre of the World rectangle.*

Rotation mode*	choice box		from_favourite, from_frame

*if **from_ favourite**, the **World rectangle CCW rotation** field is set as the negative of the **Rotate angle** given in the **Viewport** section of the Plan view favourite. This is necessary so that the plot is identical to that given by the Plan view favourite. When **from_favourite,** the value in **World rectangle CCW rotation** can not be modified.*

*If **from_frame**, the rotation angle is taken from the **World rectangle CCW rotation** field. When **from_frame,** the value in **World rectangle CCW rotation CAN** be modified.*

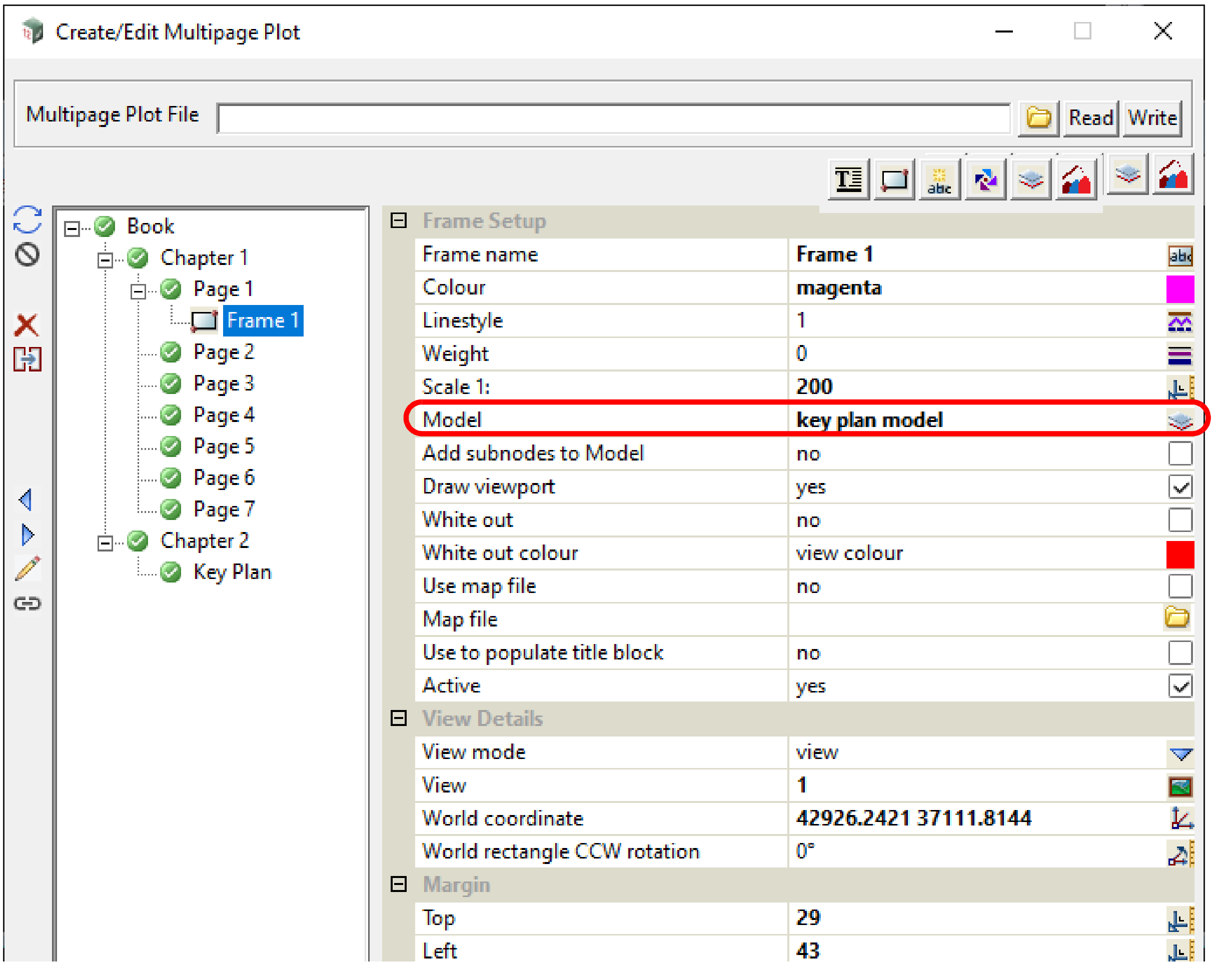
World rectangle CCW rotation*	angle box	0	angle measures

the angle of rotation of the World rectangle measured in the counter clockwise direction from the positive x-axis.

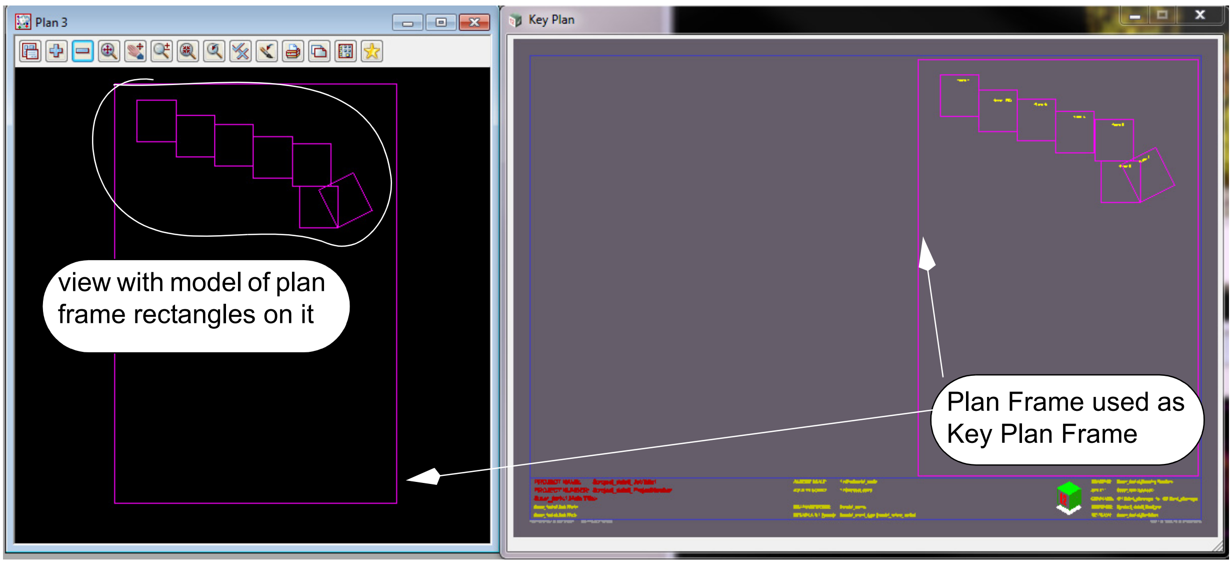
*If **Rotation mode** is changed to **from_frame** and a new **World rectangle CCW rotation** is entered, that new value becomes the rotation of the World rectangle.*

20.3.4.7.6.2 Creating a Key Plan for Plan Frames

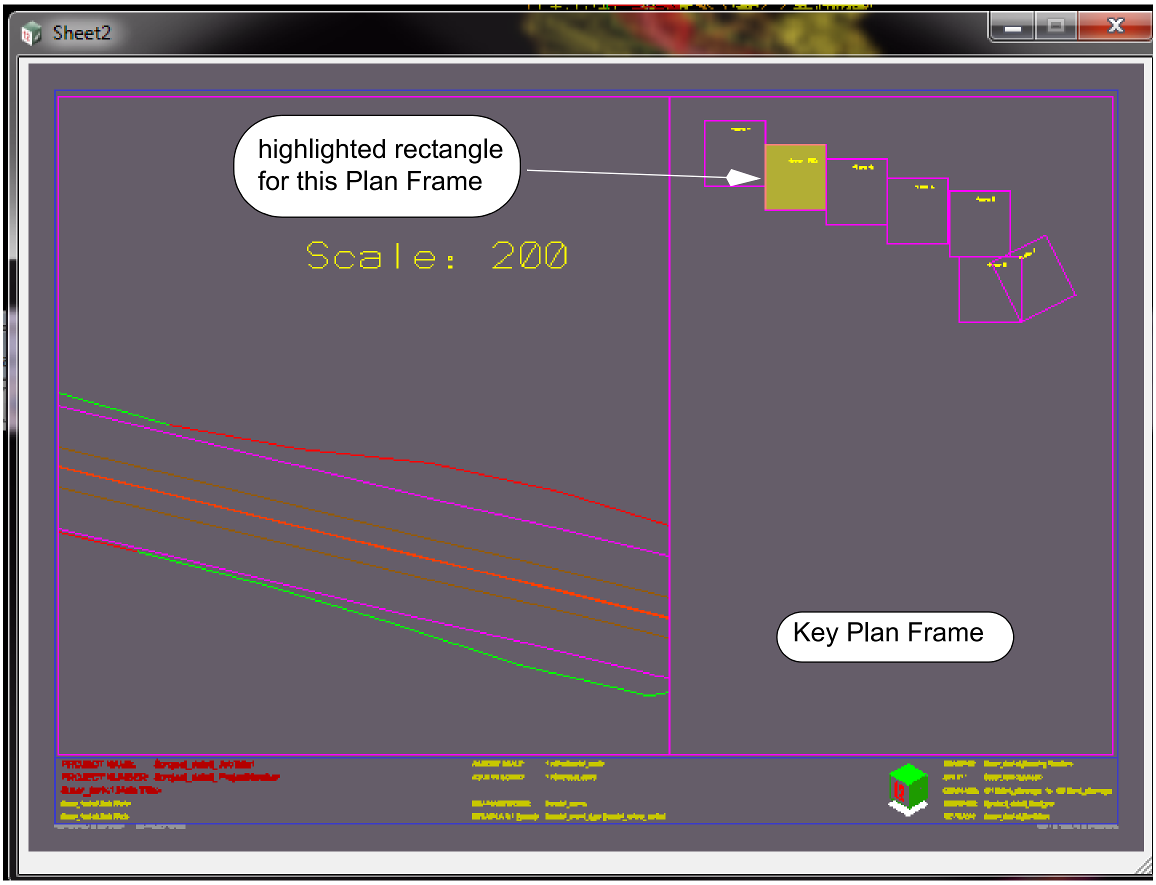
A Key Plan of selected Plan Frames can be easily created by first creating a model that rectangles of the required Plan Frames are added to (eg key plan model) and then selecting that model as the **Model** for each of the selected Plan Frames.



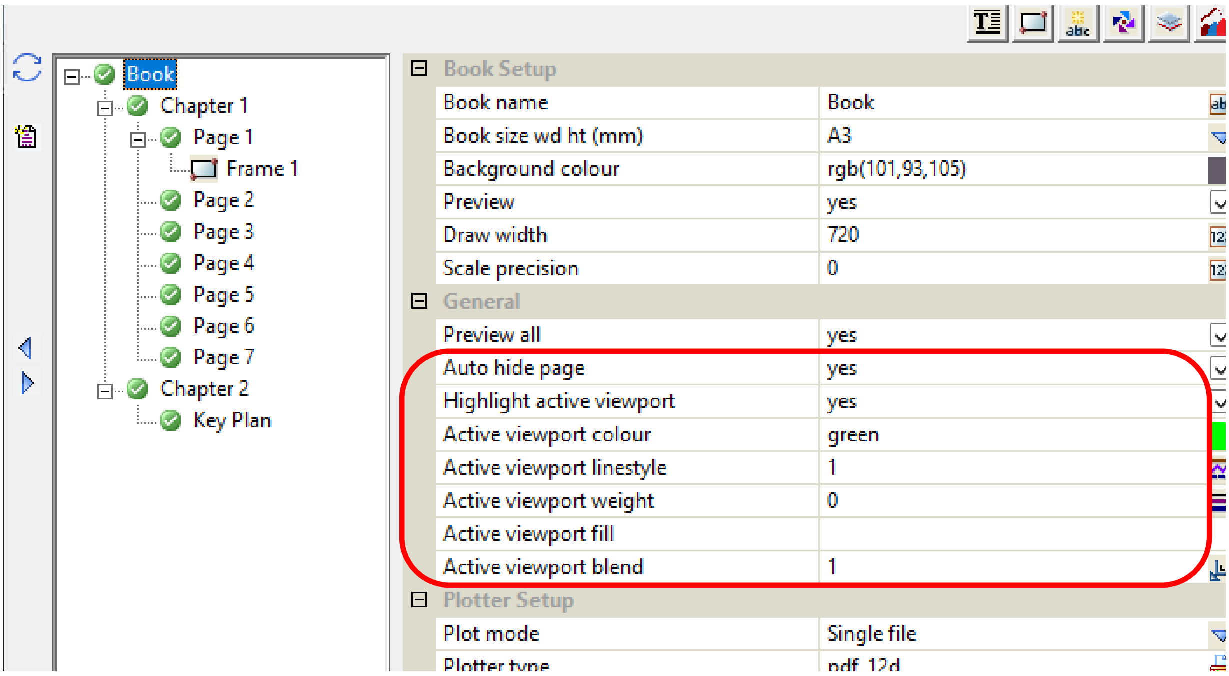
Then add the models containing the rectangles of the selected Plan Frames to a Plan view and create a Plan Frame on that view that contains the rectangles.



Now whenever a Plan Frame is placed on the same **Sheet** as a Key Plan Frame that contains the rectangle for that Plan Frame, the rectangle for the Plan Frame will be highlighted in the Key Plan if the **Highlight Active Viewport** is on in the **Sheets** node (this is the default setting).

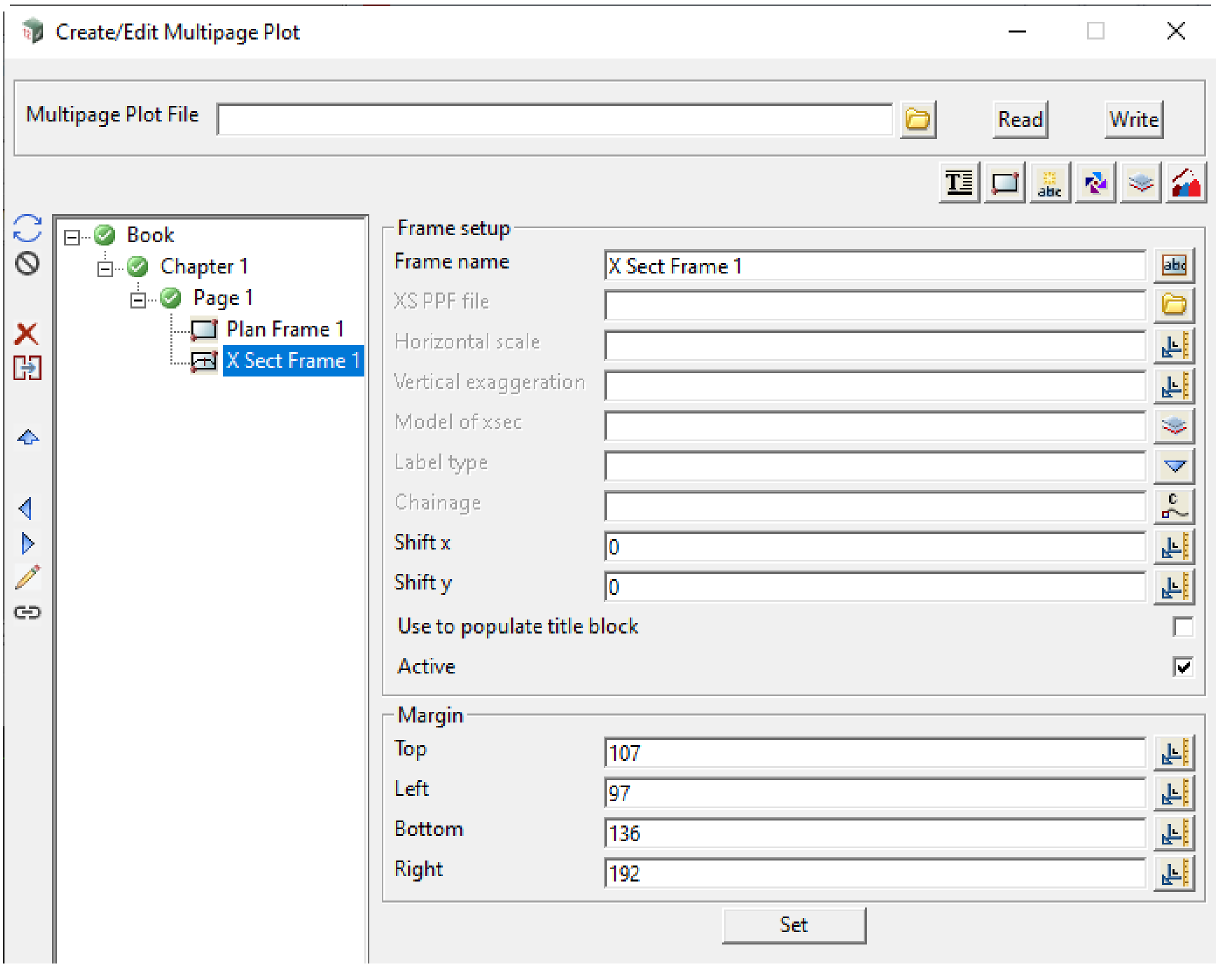


The settings for the Highlight such as **Active viewport fill** colour and **Active viewport blend** can be changed on the **Sheets** node.
Note that if an **Active viewport fill** is specified, **Active viewport colour** and **Active viewport linestyle** will be ignored.



20.3.4.7.7 X Section Frame

After selecting **X Section** in the **Frame** menu, a rectangle for the Cross Section Frame is drawn on the Plot Area and a new subnode of the Book, Chapter or Page node is created.



Fields for the new X Section frame are displayed in the right had side of the **Create/Edit Multipage Plot** panel.

Information such as frame name, ppf file, chainage and x and y shifts can then be entered.

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

Field Description	Type	Defaults	Pop-Up

Frame Setup

Frame name text box X Sect Frame n

*name for this X Section Frame. The default is **X Sect Frame n** where **n** is the first number to make the name "X Sect Frame n" unique for this node (Book, Chapter or Page) in the tree. The name must be unique amongst all the frames on this node.*

XS PPF file x section ppf box available x section ppfs

the selected PPF file that contains all the information for drawing a cross section plot.

Horizontal scale real box measures

*if **not blank**, the horizontal scale to use when plotting the cross section.*
*If **blank**, the horizontal scale from the **XS PPF file** is used.*

Vertical exaggeration real box measures

*if **not blank**, the vertical exaggeration to use when plotting the cross section.*
*If **blank**, the vertical exaggeration from the **XS PPF file** is used.*

Model of xsec model box available models

*if **not blank**, the model of x-sections to use when selecting the cross section.*
*If **blank**, the model of x-sections from the **XS PPF file** is used.*

Label type choice box centre line, boxes

*if **not blank**, the label type to use when plotting the cross section.*
*If **blank**, the label type from the **XS PPF file** is used.*

Chainage real box measures

*the chainage of the cross section from the **PPF file** to plot.*

Shift X real box 0 measures

the horizontal (x) shift to the drawing position of the x section that is drawn in the frame.

Shift Y real box 0 measures

the vertical (y) shift to the drawing position of the x section that is drawn in the frame.

Use to populate title block tick box

this field only appears on Frame Nodes that exist at the Page level.

*if **ticked**, then any Title Block Nodes operating at this level will populate their $variables from this X Section Frame Node.*
*if **not ticked**, then this X Section Frame Node will not be used for Title Block $variable population.*

*when created, if this X Section Frame Node is the first Frame Node on the Page AND there is a Title Block Node operating on this level, then this field will default to **ticked**.*
*if otherwise, then this field will default to **not ticked**.*

***Note:** this field is exclusive between all Frame Nodes on a Page. ie. Only one Frame Node on each Page may have this field set to **ticked**. Ticking this field on a second Frame Node on a Page will results in the field being **un-ticked** on the first Frame Node of that Page.*

For more information, see 20.3.4.6.3 MPS Title Block $variables.

Active tick box ticked

*if **ticked**, the X Section Frame node is made active and will be used when plotting. The node's active/inactive icon will be set to active.*
*If **not ticked**, the X Section Frame node will be ignored when plotting. The node's active/inactive icon will be set to inactive.*
***Note**: This tick box is linked to the node's active/inactive icon. Changing one also changes the other.*

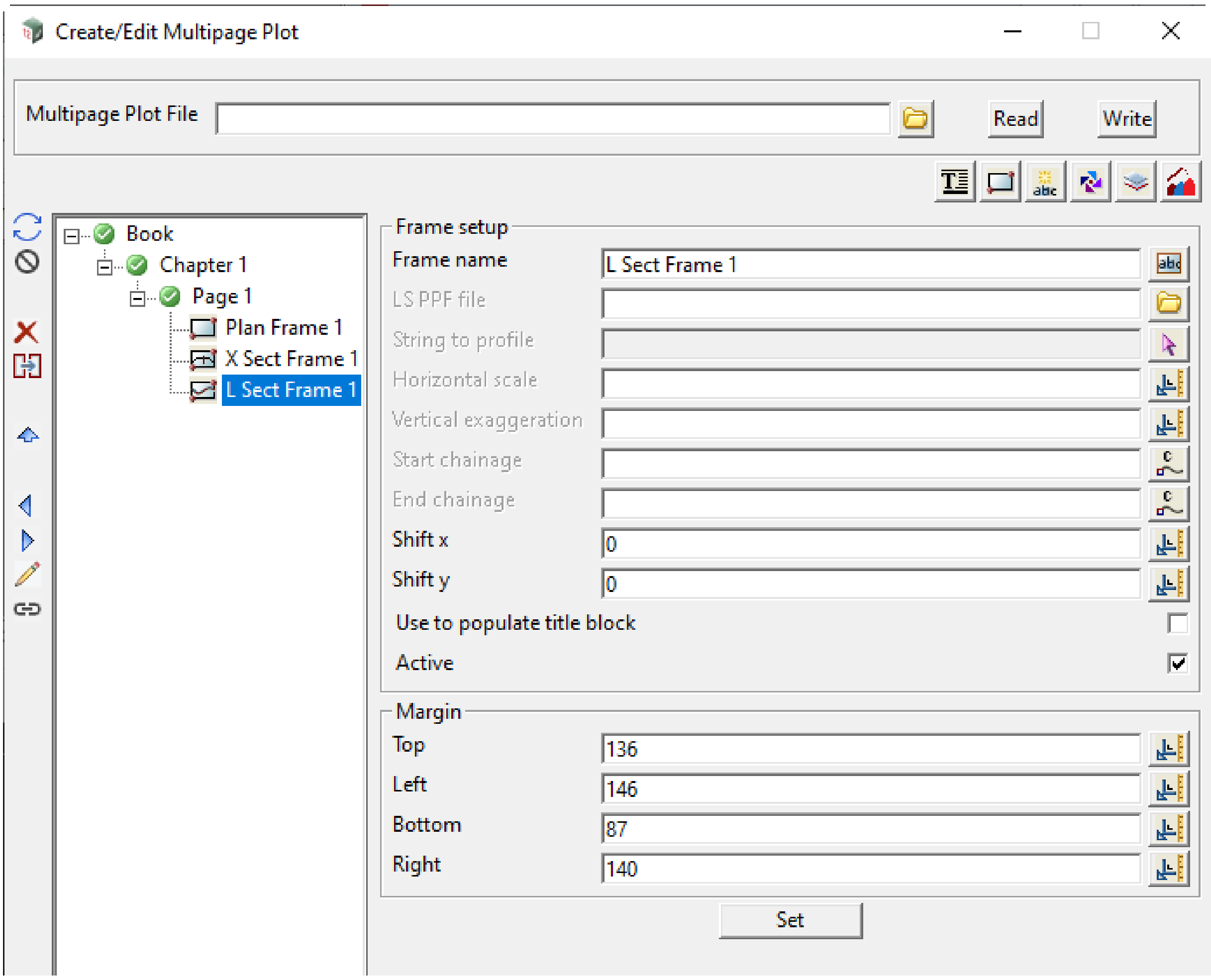
Margins

The margins give the size of the Frame in the Plot Area. See Margins *in* 20.3.4.7.5 Common Information About Frames.

After the **X- Section** Frame is created and the **XS PPF** and other information filled in, then **if** it will fit, the cross section at chainage **Chainage** is drawn in the x-section frame.

20.3.4.7.8 Long Section Frame

After selecting **Long Section** in the **Frame** menu, a rectangle for the Long Section Frame is drawn on the Plot Area and a new subnode of the Book, Chapter or Page node is created.



Fields for the new Long-Section frame are displayed in the right had side of the **Create/Edit Multipage Plot Sheet** panel.

Information such as frame name, ppf file, start and end chainage, and x and y shifts can then be entered.

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

Field Description Type Defaults Pop-Up

Frame Setup

Frame Name text box

*name for this Long Section frame. The default **L Sect Frame n** where **n** is the initial position of the frame node in the tree for this Book, Chapter or Page. The name must be unique amongst all the frames on this node.*

LS PPF file long section ppf box available l sec ppfs

*name for this Long Section Frame. The default is **L Sect Frame n** where **n** is the first number to make the name "L Section Frame n" unique for this node (Book, Chapter or Page) in the tree. The name must be unique amongst all the frames on this node.*

String to profile string select box

*if **not blank**, the string to do the long section for is selected.*
*If **blank**, the string from the **LS PPF file** is used.*

Horizontal scale real box measures

*if **not blank**, the horizontal scale to use when plotting the long section.*
*If **blank**, the horizontal scale from the **LS PPF file** is used.*

Vertical exaggeration real box measures

*if **not blank**, the vertical exaggeration to use when plotting the long section.*
*If **blank**, the vertical exaggeration from the **LS PPF file** is used.*

Start/End chainage real box measures

the start and end chainage of the part of the long section to plot.

Shift X real box 0 measures

the horizontal (x) shift to the drawing position of the long section that is drawn in the frame.

Shift Y real box 0 measures

the vertical (y) shift to the drawing position of the long section that is drawn in the frame.

Use to populate title block tick box

this field only appears on Frame Nodes that exist at the Page level.

*if **ticked**, then any Title Block Nodes operating at this level will populate their $variables from this Long Section Frame Node.*
*if **not ticked**, then this Long Section Frame Node will not be used for Title Block $variable population.*

*when created, if this Long Section Frame Node is the first Frame Node on the Page AND there is a Title Block Node operating on this level, then this field will default to **ticked**.*
*if otherwise, then this field will default to **not ticked**.*

***Note:** this field is exclusive between all Frame Nodes on a Page. ie. Only one Frame Node on each Page may have this field set to **ticked**. Ticking this field on a second Frame Node on a Page will results in the field being **un-ticked** on the first Frame Node of that Page.*

For more information, see 20.3.4.6.3 MPS Title Block $variables.

Active choice box Yes, No

*if **ticked**, the Long Section Frame node is made active and will be used when plotting. The node's active/inactive icon will be set to active.*
*If **not ticked**, the Long Section Frame node will be ignored when plotting. The node's active/inactive icon will be set to inactive.*
***Note:** This tick box is linked to the node's active/inactive icon. Changing one also changes the other.*

Margins

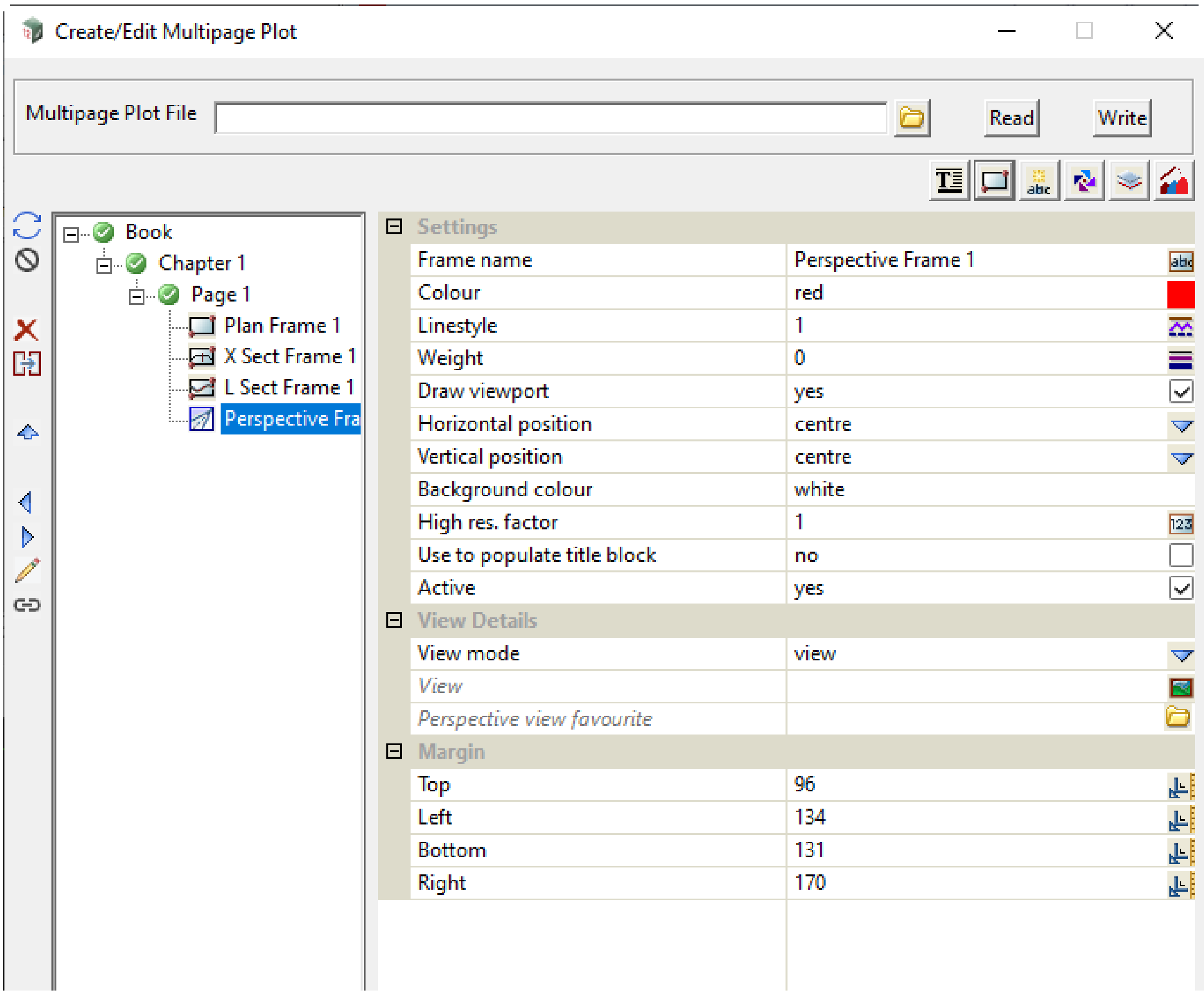
The margins give the size of the Frame in the Plot Area. See Margins *in* 20.3.4.7.5 Common Information About Frames.

After the Long-Section Frame is created and the **LS PPF** and other information filled in, then (if it will fit) the long section plot between the **Start chainage** and **End chainage** of the alignment in the long section ppf is drawn in the Long Section Frame.

20.3.4.7.9 Perspective Frame

After selecting **Perspective** in the **Frame** menu, a rectangle for the Perspective Frame is drawn on the Plot Area and a new subnode of the Book, Chapter or Page node is created.

Note: Perspective Frames can not show anything inside the Frame displayed on the **Plot Area**. Plotting the node is the only way to view them.



Fields for the new Perspective frame are displayed in the right hand side of the **Create/Edit Multipage Plot Sheet** panel.

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

Field Description Type Defaults Pop-Up

Inherited Fields *

*Fields that support inheritance will be marked by a * symbol next to their **Field Description**.*

***Note**: Only **Reference Fra0me** fields have inheritance support.*

*For more information on **Inherited Fields** see,* 20.3.4.5 Inherited Fields *.

Frame Setup

Frame name text box Perspective Frame n

*name for this Perspective Frame. The default is **Perspective Frame n** where **n** is the first number to make the name "Perspective Frame n" unique for this node (Book, Chapter or Page) in the tree. The name must be unique amongst all the frames on this node.*

Colour* colour box red available colours

*the colour for the border of the Perspective Frame that is drawn when **Draw viewport** is **ticked**.*

Linestyle* linestyle box 1 available linestyles

*the linestyle for the border of the Perspective Frame that is drawn when **Draw viewport** is **ticked**.*

Weight* weight box 0

*the weight for the border of the Perspective Frame that is drawn when **Draw viewport** is **ticked**.*

Draw viewport* choice box Yes, No

*if **ticked**, the border around the Perspective Frame is drawn.*
*If **not ticked**, the border around the Perspective Frame is NOT drawn.*

Position of the view in the perspective Frame

The plot of the view is fitted as large as possible into the area defined by the Perspective Frame. Unless the aspect ration of the view is exactly the same as the aspect ration of the Perspective Frame, the plot will not totally fill the Perspective Frame The horizontal and vertical positions are then used to position the plot inside the Perspective Frame.

Horizontal position* choice box centre centre, left, right

*if **centre**, the centre of the plot is placed so that it is half way between the left margin and the right sides of the Perspective Frame.*

*If **left**, the left hand side of the plot is placed on the left side of the Perspective Frame*

*If **right**, the right hand side of the plot is placed on the right side of the Perspective Frame.*

Vertical position* choice box centre centre, bottom, top

*if **centre**, the centre of the plot is placed so that it is half way between the top and the bottom of the Perspective Frame.*

*If **bottom**, the bottom of the plot is placed on the bottom of the Perspective Frame.*

*If **top**, the top of the plot is placed on the top of the Perspective Frame.*

Background colour* colour box white available colours

the background colour to use for the plot.

If blank it uses the Background from the used View or View favourite.

High res. factor* integer box 1

*the number of pixels used in the plotting of the perspective view in the horizontal and vertical direction is multiplied by the integer **High res. factor**.*

*Hence the resultant plot will have **(High res. factor** x **High res. factor)** times as many pixels as there are pixels in the original view.*

Use to populate title block tick box

this field only appears on Frame Nodes that exist at the Page level.

*if **ticked**, then any Title Block Nodes operating at this level will populate their $variables from this Perspective Frame Node.*
*if **not ticked**, then this Perspective Frame Node will not be used for Title Block $variable population.*

*when created, if this Perspective Frame Node is the first Frame Node on the Page AND there is a Title Block Node operating on this level, then this field will default to **ticked**.*
*if otherwise, then this field will default to **not ticked**.*

***Note:** this field is exclusive between all Frame Nodes on a Page. ie. Only one Frame Node on each Page may have this field set to **ticked**. Ticking this field on a second Frame Node on a Page will results in the field being **un-ticked** on the first Frame Node of that Page.*

For more information, see 20.3.4.6.3 MPS Title Block $variables.

Active tick box ticked

*if **ticked**, the Perspective Frame node is made active and will be used when plotting. The node's active/inactive icon will be set to active.*
*If **not ticked**, the Perspective Frame node will be ignored when plotting. The node's active/inactive icon will be set to inactive.*
***Note**: This tick box is linked to the node's active/inactive icon. Changing one also changes the other*

View Details

View mode* choice box View view, view_favourites

*if **View mode** is **view**, the **View** field is used:*

View* view box available views

the View that the Perspective Frame will take its information from to plot.

*if **View mode** is **view_favourites**, the **Perspective view favourite** field is used:*

Perspective view favourite* perspective view favourite box

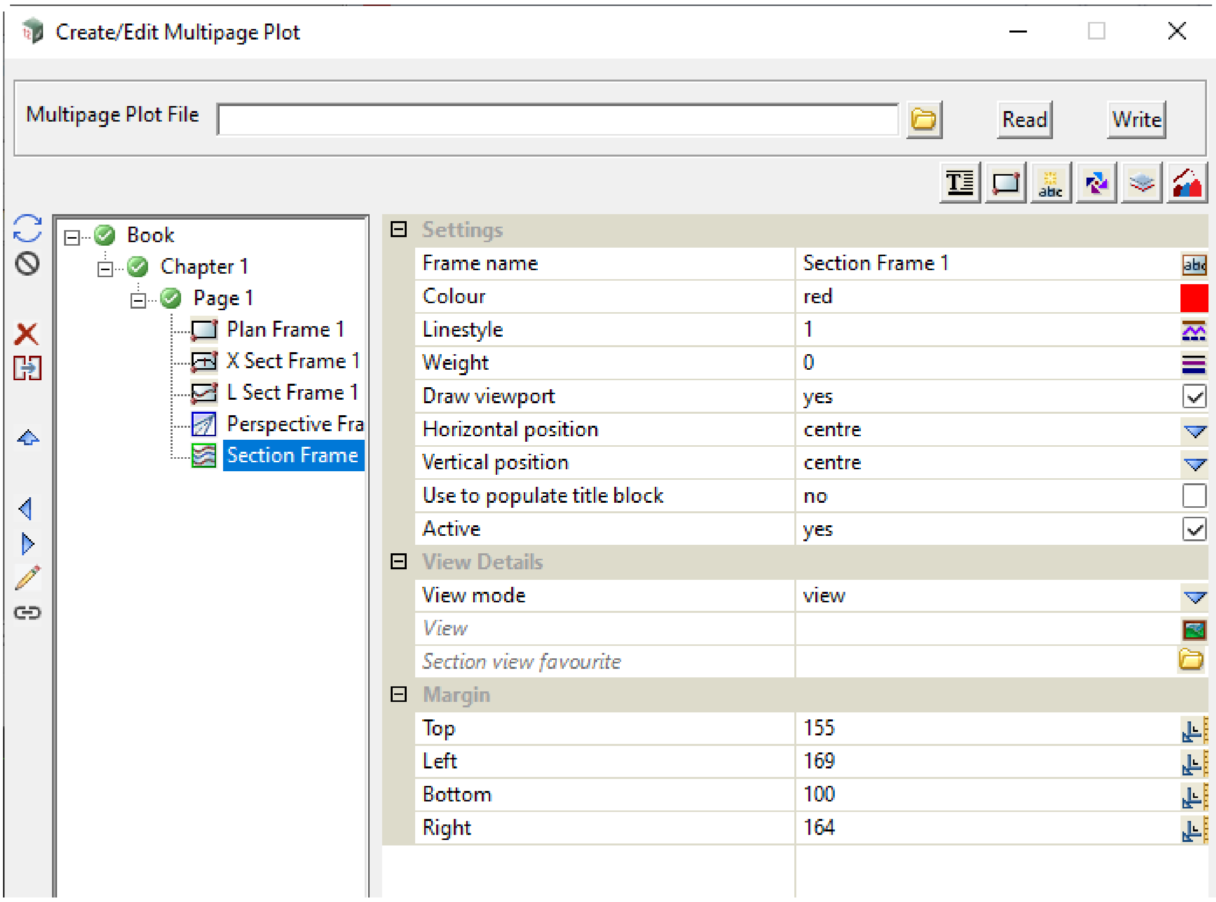
the Perspective view favourite that is used to define all the information that will be displayed in the plot of the Perspective Frame.

Margins

The margins give the size of the Frame in the Plot Area. See Margins *in* 20.3.4.7.5 Common Information About Frames.

20.3.4.7.10 Section Frame

After selecting **Section** in the **Frame** menu, a rectangle for the Section Frame is drawn on the Plot Area and a new subnode of the Book, Chapter or Page node is created.



Fields for the new Sections frame are displayed in the right hand side of the **Create/Edit Multipage Plot Sheet** panel.

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

Field Description Type Defaults Pop-Up

Inherited Fields *

*Fields that support inheritance will be marked by a * symbol next to their **Field Description**.*

***Note**: Only **Reference Frame** fields have inheritance support.*

*For more information on **Inherited Fields** see,* 20.3.4.5 Inherited Fields *.

Frame Setup

Frame name text box Section Frame n

*name for this Section Frame. The default is **Section Frame n** where **n** is the first number to make the name "Section Frame n" unique for this node (Book, Chapter or Page) in the tree. The name must be unique amongst all the frames on this node.*

Colour* colour box red available colours

*the colour for the border of the Section Frame that is drawn when **Draw viewport** is **ticked**.*

Linestyle* linestyle box 1 available linestyles

*the linestyle for the border of the Section Frame that is drawn when **Draw viewport** is **ticked**.*

Weight* weight box 0

*the weight for the border of the Section Frame that is drawn when **Draw viewport** is **ticked**.*

Draw viewport* tick box ticked

*if **ticked**, the border around the Section Frame is drawn.*
*If **not ticked**, the border around the Section Frame is NOT drawn.*

Position of the view in the perspective Frame

The plot of the view is fitted as large as possible into the area defined by the Section Frame. Unless the aspect ration of the view is exactly the same as the aspect ration of the Section Frame, the plot will not totally fill the Section Frame The horizontal and vertical positions are then used to position the plot inside the Section Frame.

Horizontal position* choice box centre centre, left, right

*if **centre**, the centre of the plot is placed so that it is half way between the left margin and the right sides of the Section Frame.*

*If **left**, the left hand side of the plot is placed on the left side of the Section Frame*

*If **right**, the right hand side of the plot is placed on the right side of the Section Frame.*

Vertical position* choice box centre centre, bottom, top

*if **centre**, the centre of the plot is placed so that it is half way between the top and the bottom of the Section Frame.*

*If **bottom**, the bottom of the plot is placed on the bottom of the Section Frame.*

*If **top**, the top of the plot is placed on the top of the Section Frame.*

Use to populate title block tick box

this field only appears on Frame Nodes that exist at the Page level.

*if **ticked**, then any Title Block Nodes operating at this level will populate their $variables from this Section Frame Node.*
*if **not ticked**, then this Section Frame Node will not be used for Title Block $variable population.*

*when created, if this Section Frame Node is the first Frame Node on the Page AND there is a Title Block Node operating on this level, then this field will default to **ticked**.*
*if otherwise, then this field will default to **not ticked**.*

***Note:** this field is exclusive between all Frame Nodes on a Page. ie. Only one Frame Node on each Page may have this field set to **ticked**. Ticking this field on a second Frame Node on a Page will results in the field being **un-ticked** on the first Frame Node of that Page.*

For more information, see 20.3.4.6.3 MPS Title Block $variables.

Active tick box ticked

*if **ticked**, the Section Frame node is made active and will be used when plotting. The node's active/inactive icon will be set to active.*
*If **not ticked**, the Section Frame node will be ignored when plotting. The node's active/inactive icon will be set to inactive.*
***Note**: This tick box is linked to the node's active/inactive icon. Changing one also changes the other.*

View Details

View mode* choice box View view, view_favourites

*if **View mode** is **view**, the **View** field is used:*

View* view box available views

the View that the Section Frame will take its information from to plot.

*if **View mode** is **view_favourites**, the **Section view favourite** field is used:*

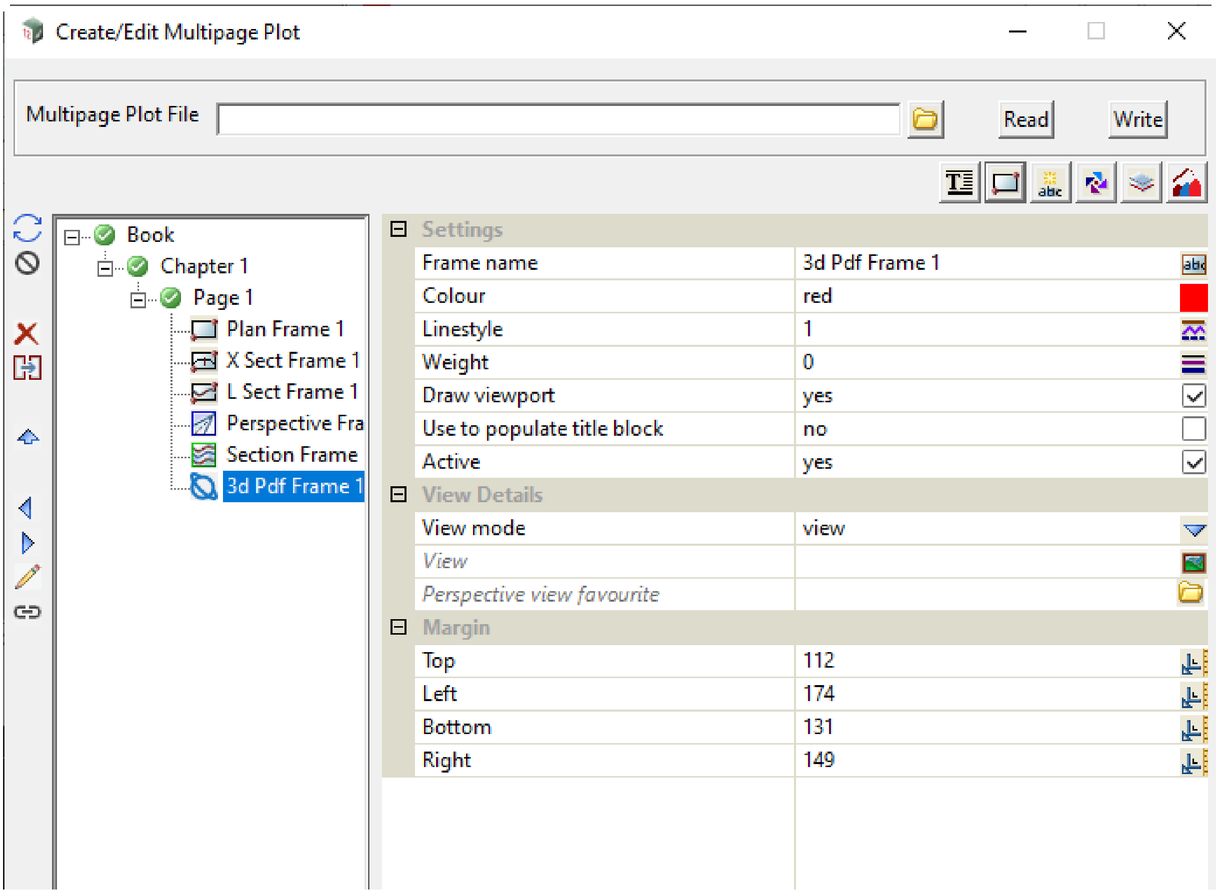
Section view favourite* section view favourite box *the Section view favourite that is used to define all the information that will be displayed in the plot of the Section Frame.*

Margins

The margins give the size of the Frame in the Plot Area. See Margins *in* 20.3.4.7.5 Common Information About Frames.

20.3.4.7.11 3d PDF Frame

After selecting **3d PDF** in the **Frame** menu, a rectangle for the 3d PDF Frame is drawn on the Plot Area and a new subnode of the Book, Chapter or Page node is created.



Fields for the new 3d Pdf Frame are displayed in the right hand side of the **Create/Edit Multipage Plot Sheet** panel.

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

Field Description	Type	Defaults	Pop-Up

Inherited Fields *

*Fields that support inheritance will be marked by a * symbol next to their **Field Description**.*

***Note**: Only **Reference Frame** fields have inheritance support.*

*For more information on **Inherited Fields** see,* 20.3.4.5 Inherited Fields *.

Frame Setup

Frame name	text box	3d Pdf Frame n	

*name for this 3d Pdf. The default is **3d Pdf Frame n** where **n** is the first number to make the name "3d Pdf Frame n" unique for this node (Book, Chapter or Page) in the tree. The name must be unique amongst all the frames on this node.*

Colour*	colour box	red	available colours

*the colour for the border of the 3d Pdf that is drawn when **Draw viewport** is **ticked**.*

Linestyle*	linestyle box	1	available linestyles

*the linestyle for the border of the 3d Pdf that is drawn when **Draw viewport** is **ticked**.*

Weight* weight box 0

*the weight for the border of the 3d Pdf that is drawn when **Draw viewport** is **ticked**.*

Draw viewport* choice box Yes, No

*if **ticked**, the border around the 3d Pdf is drawn.*
*If **not ticked**, the border around the 3d Pdf is NOT drawn.*

Use to populate title block tick box

this field only appears on Frame Nodes that exist at the Page level.

*if **ticked**, then any Title Block Nodes operating at this level will populate their $variables from this 3d Pdf Frame Node.*
*if **not ticked**, then this 3d Pdf Frame Node will not be used for Title Block $variable population.*

*when created, if this 3d Pdf Frame Node is the first Frame Node on the Page AND there is a Title Block Node operating on this level, then this field will default to **ticked**.*
*if otherwise, then this field will default to **not ticked**.*

***Note:** this field is exclusive between all Frame Nodes on a Page. ie. Only one Frame Node on each Page may have this field set to **ticked**. Ticking this field on a second Frame Node on a Page will results in the field being **un-ticked** on the first Frame Node of that Page.*

For more information, see 20.3.4.6.3 MPS Title Block $variables.

Active tick box ticked

*if **ticked**, the 3d Pdf Frame node is made active and will be used when plotting. The node's active/inactive icon will be set to active.*
*If **not ticked**, the 3d Pdf Frame node will be ignored when plotting. The node's active/inactive icon will be set to inactive.*
***Note:** This tick box is linked to the node's active/inactive icon. Changing one also changes the other.*

View Details

View mode* choice box View view, view_favourites

*if **View mode** is **view**, the **View** field is used:*

View* view box available views

the View that the Pdf 3d will take its information from to plot.

*if **View mode** set to **view_favourites**, the **Perspective view favourite field** is used:*

Perspective view favourite* perspective view favourite box

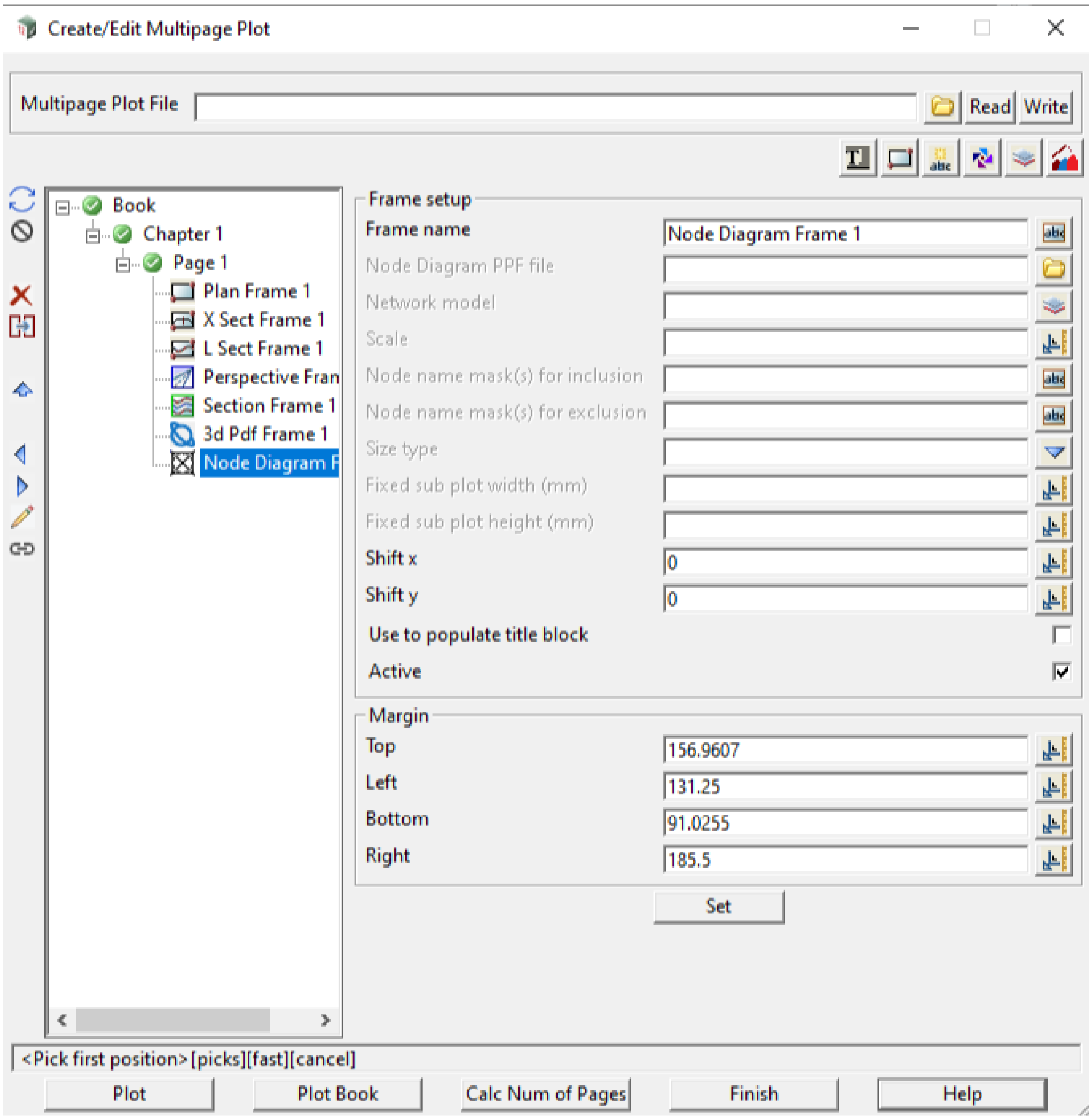
the Perspective view favourite that is used to define all the information that will be displayed in the plot of the Pdf 3d Frame.

Margins

The margins give the size of the Frame in the Plot Area. See Margins *in* 20.3.4.7.5 Common Information About Frames.

20.3.4.7.12 Node Diagram Frame

After selecting **Node diagram** in the **Frame** menu, a rectangle for the Node diagram Frame is drawn on the Plot Area and a new subnode of the Book, Chapter or Page node is created.



Fields for the new Node Diagram Frame are displayed in the right hand side of the **Create/Edit Multipage Plot Sheet** panel.

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

Field Description Type Defaults Pop-Up

Frame Setup

Frame name text box Node Diagram Frame n

*name for this Node Diagram Frame. The default is **Node Diagram Frame n** where **n** is the first number to make the name "Node Diagram Frame n" unique for this node (Book, Chapter or Page) in the tree. The name must be unique amongst all the frames on this node.*

Node diagram PPF file node diagram ppf box available node diagram ppfs

the selected PPF file that contains all the information for drawing a node diagram plot.

Network model Model box available models *the model containing the water string whose nodes are to be plotted.*

*if **not blank**, this value will override the existing value of the **Network model** field in the **Node Diagram PPF file** when plotting.*

*if **blank**, no overriding will occur and the **Network model** field value specified in the **Node Diagram PPF file** will be used when plotting.*

Scale real box measures

the scale to plot the node diagrams.

Node name mask(s) for inclusion text box

*if **not blank** then only those nodes whose name matches one in the name mask are considered for plotting. See* A Note on Name masks.

*If **blank**, all nodes are considered for plotting. So blank acts like "*".*

Node name mask(s) for exclusion text box

*if **not blank** then any node whose name matches one in the name mask is not plotted. See* A Note on Name masks.

*If **blank**, then no nodes are considered for excluding from plotting.*

Set sub plot size to choice box fixed size, diagram size

*if **fixed size**, each node diagram is drawn in a rectangle defined by **Sub plot width in mm** and **Sub plot height in mm**.*

*If **diagram size**, each node diagram is drawn in a rectangle of a size calculated to fit that particular node. So the size will be different for each node.*

Fixed sub plot width in mm real box

the width of the imaginary box to draw each node diagram in.

Fixed sub plot height in mm real box

the height of the imaginary box to draw each node diagram in.

Shift X real box 0 measures

the horizontal (x) shift to the drawing position of the node diagram that is drawn in the frame.

Shift Y real box 0 measures

the vertical (y) shift to the drawing position of the node diagram that is drawn in the frame.

Use to populate title block tick box

this field only appears on Frame Nodes that exist at the Page level.

*if **ticked**, then any Title Block Nodes operating at this level will populate their $variables from this Node Diagram Frame Node.*
*if **not ticked**, then this Node Diagram Frame Node will not be used for Title Block $variable population.*

*when created, if this Node Diagram Frame Node is the first Frame Node on the Page AND there is a Title Block Node operating on this level, then this field will default to **ticked**.*
*if otherwise, then this field will default to **not ticked**.*

***Note:** this field is exclusive between all Frame Nodes on a Page. ie. Only one Frame Node on each Page may have this field set to **ticked**. Ticking this field on a second Frame Node on a Page will results in the field being **un-ticked** on the first Frame Node of that Page.*

For more information, see 20.3.4.6.3 MPS Title Block $variables.

Active tick box ticked

*if **ticked**, the Node Diagram Frame node is made active and will be used when plotting. The node's active/inactive icon will be set to active.*
*if **not ticked**, the Node Diagram Frame node will be ignored when plotting. The node's active/inactive icon will be set to inactive.*
***Note:** This tick box is linked to the node's active/inactive icon. Changing one also changes the other.*

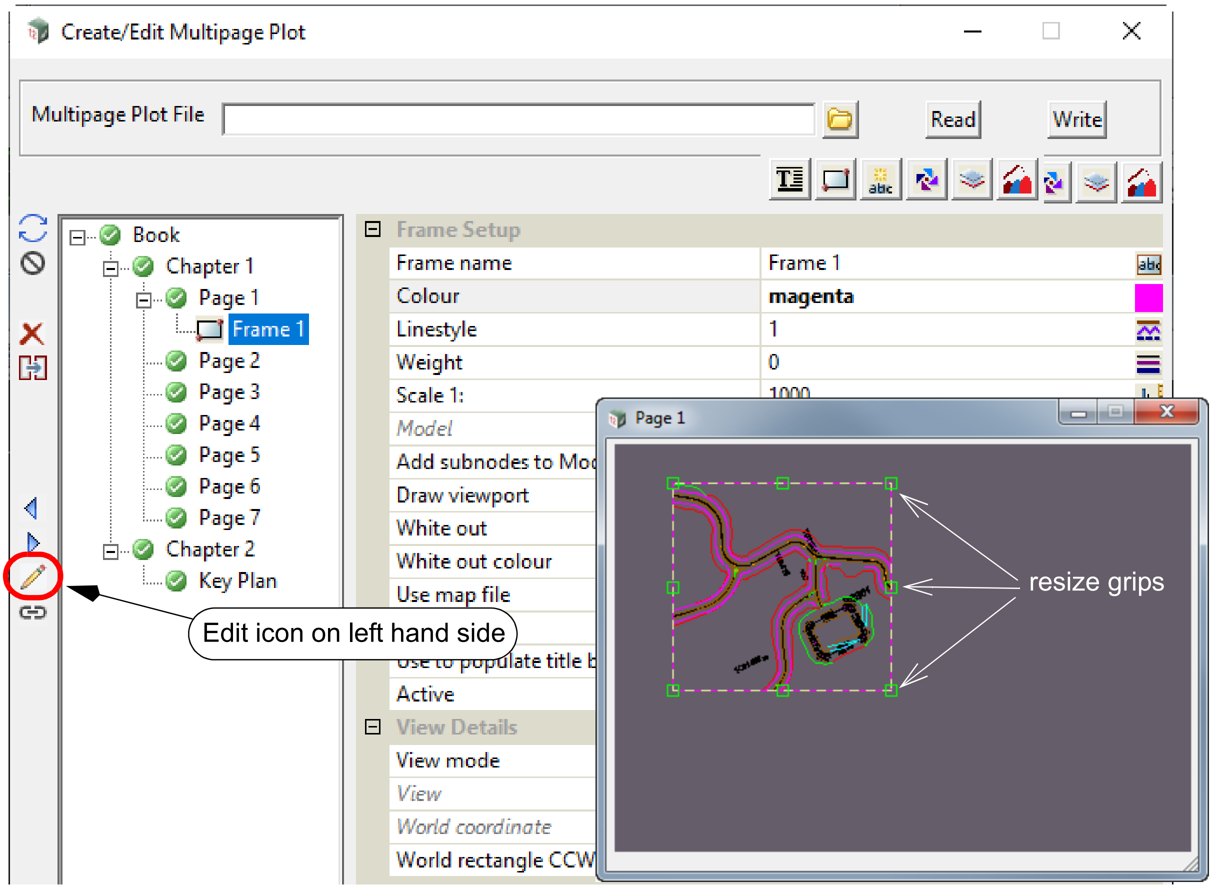
Margins

The margins give the size of the Frame in the Plot Area. See Margins *in* 20.3.4.7.5 Common Information About Frames.

20.3.4.7.13 Edit Frame

There are two ways of starting the Edit option for a Frame - one using the Frame node and the other by picking a Frame from a Plot Area.

(a) Clicking on and highlight the Frame node to be edited and then select the left had side **Edit** icon.

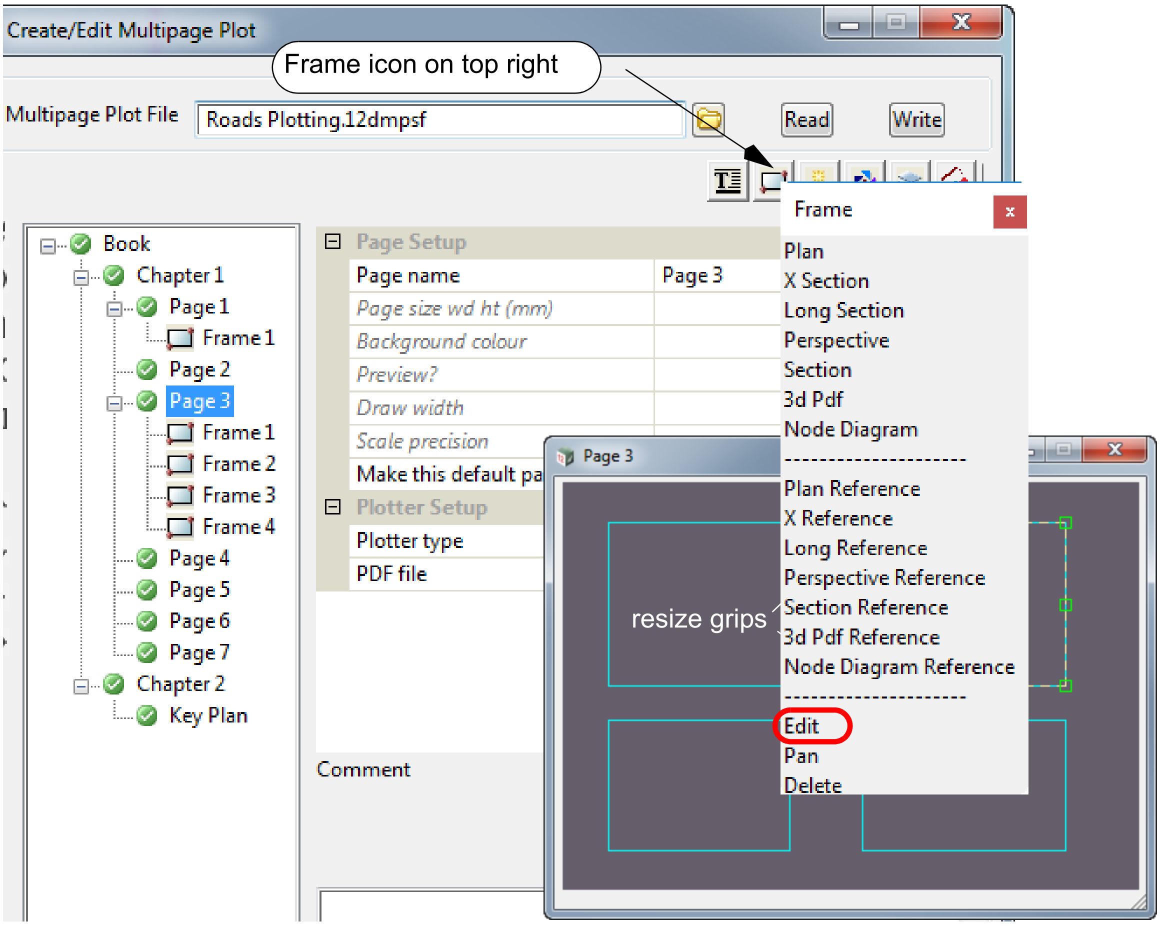


The frame is then highlighted in the Plot Area and resize grips displayed.

Plus when the cursor is inside a frame but not near the edge of a Frame, a **Move** grip is displayed. The **Move** grip is used to move the Frame around on the **Plot Area.**

(b) Click on the Book, Chapter or Page that the Frame is defined on, then click on the **Frame** icon on the top right and pick **Edit** from the **Frame** pop-up menu.

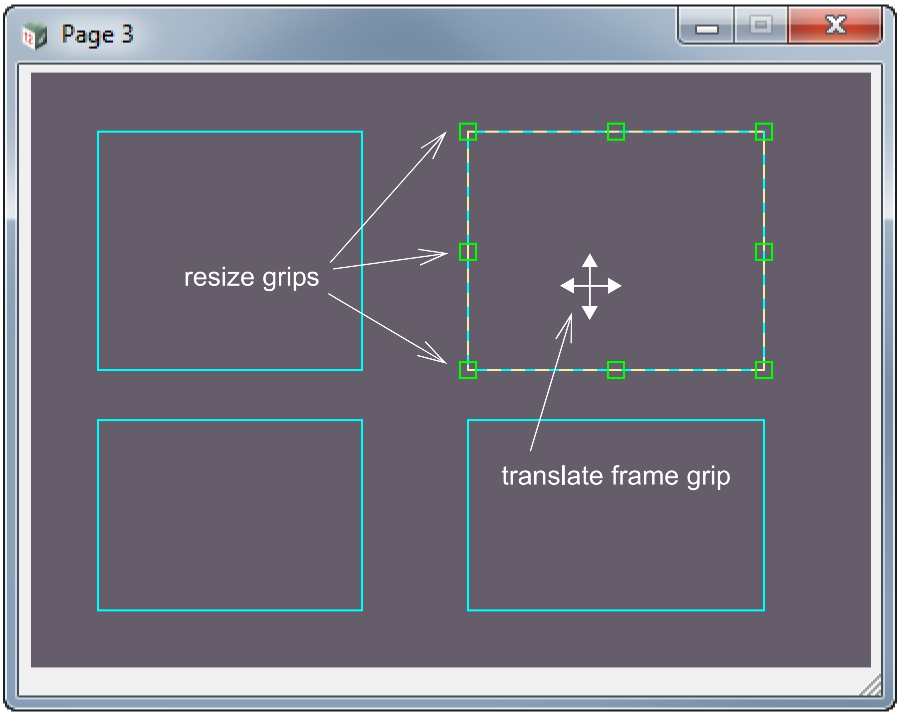
The Frame to Edit is then selected form the Plot Area by clicking LB **anywhere inside** the Frame **but don't accept it with MB**.



The Frame is then highlighted in the Plot Area and resize grips displayed.

For either (a) or (b), the Frame is highlighted, the **Resize** grips are displayed on the four corners and on the four sides of the Frame. These grips are used to resize the Frame, and hence the associated plotting area on the Plot Area.

When the cursor is inside a frame but not near the edge of a Frame, a **Translate** grip is displayed. The **Translate** grip is used to move the Frame around on the **Plot Area.**



For Case (b), if **MB** is clicked to accept the Frame, the information for the Frame is displayed in the right hand side of the **Create/Edit Multipage Plot** panel and the Frame node is highlighted in the tree.

For both cases, after the Resizing and Translating you can pick another Frame to resize or translate by simply clicking LB inside the new Frame.

20.3.4.7.14 Reference Frames

A Reference Frame is created in three ways:

(a) A **Chapter** or **Page node** is **highlighted** and either **Plan Reference**, **X Reference**, **Long Reference or Perspective Reference** is selected from the **Frame** menu.

A new **Frame** is created for the highlighted **Book**, **Chapter** or **Page** node.

This has been documented in 20.3.4.7.2.2 Reference Frames for a Chapter and 20.3.4.7.3.2 Reference Frames for a Page.

(b) When a **Frame** is created for a **Book**, you are asked "*Do you want to create reference frame(s) for Chapter(s)*? and "*Do you want to create reference frame(s) for Page(s)*?.

Depending on the answers, Reference Frames are created for all existing Chapters and/or Pages and new Reference Frames are created when new Chapters or Pages are added to the Book. For more information see 20.3.4.7.1.1 Frames for a Book.

(c) When a **Frame** is created for a **Chapter,** you are asked "*Do you want to create reference frame(s) for Page(s)*?.

If the answer is yes, Reference Frames are created for all existing Pages in the Chapter and new Reference Frames are created when Pages are added to the Chapter. For more information see 20.3.4.7.2.1 Frames for a Chapter.

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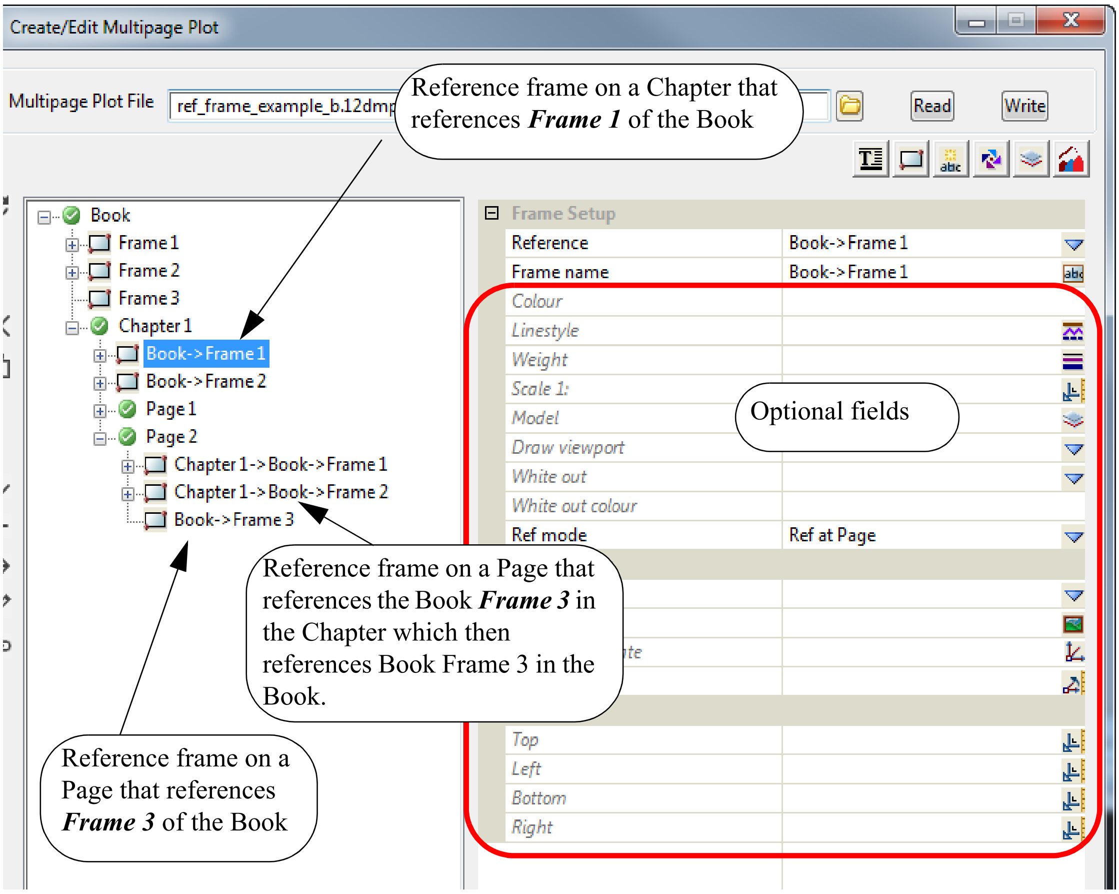


The fields used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up
Reference	Frame box		non Reference Frames

the name of the Frame that this frame is derived from.

That is, all the information for this Frame is derived from the Frame listed here.

Frame name text box

name for this frame. The default is the full name of the Frame it is referenced to.

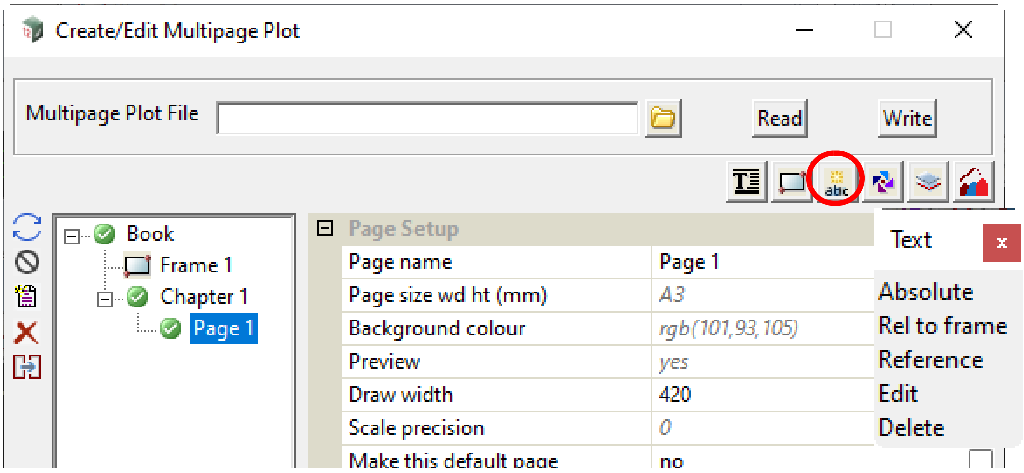
Optional Fields

the rest of the fields in the panel are optional and if blank, the values are taken from the referenced Frame.

See 20.3.5 Example Using Reference Frames.

20.3.4.8 Text Icon for Use on a Book, Chapter, Page or Frame Node

Text can be placed on a **Book**, **Chapter**, **Page** or **Frame** node using options on the **Text** menu which is brought up by clicking on the **Text** icon on the top right.



See

Text - Absolute and Rel to Frame
Text - Reference
Text - Edit
Text - Delete

Text - Edit

Edit: can be used to move or modify an existing Text on a **Plot Area** that the text was created on. For example, if the Text was created on a **Chapter Plot Area** then you need to highlight that **Chapter** and select the text on that **Chapter Plot Area** to edit it.

To **move** text after clicking on **Edit**, pick the text to move with LB **but don't accept it with MB.** The text can then be moved.

If **MB** is clicked to accept the text, the characters of the text is displayed in Text Area in the right hand side of the **Create/Edit Multipage Plot** panel. This can then be modified.

Note that a Text can also be edited by highlighting the Text node in the tree and pressing **Edit** on the left hand side.

Text - Delete

Delete: can be used to delete a **Text** by picking it on a **Plot Area.**

To **delete** a Text after clicking on **Delete**, pick and accept the Text on a **Plot Area** that the text was created on. For example, if the Text was created on a **Chapter Plot Area** then you need to highlight that **Chapter** and select the text on that **Chapter Plot Area** to delete it.

Note that a Text can also be deleted by highlighting the Text node in the tree and pressing **Delete** on the left hand side.

Text - Absolute and Rel to Frame

The options **Absolute** and **Rel to frame** are used when creating text on a plot.

For the **Book**, **Book Text** can be created by:

Highlighting the **Book** node, clicking on the **Text** icon and selecting **Absolute** from the **Text** menu.

This will create **Book Text**.

See 20.3.4.8.1 Creating Text at the Book, Chapter or Page Level.

For the **Book**, **Book Frame Text** can be created by either:

(a) highlighting a **Book Frame** node, clicking on the **Text** icon and selecting either **Absolute** or **Rel to frame** from the **Text** menu.

This will create **Book Frame Text** for the highlighted **Book Frame** node.

See20.3.4.8.2.1 Creating Frame Text by Highlighting the Frame Node.

(b) highlighting the **Book** node, clicking on the **Text** icon and selecting **Rel to frame** from the **Text** menu and then **picking** a **Book Frame** from the **Book Plot Area.**

This will create **Book Frame Text** for the **picked Book Frame**.

See20.3.4.8.2 Creating Frame Text.

For a **Chapter**, **Chapter Text** can be created by:

Highlighting the **Chapter** node, clicking on the **Text** icon and selecting **Absolute** from the **Text** menu.

This will create **Chapter Text**.

See 20.3.4.8.1 Creating Text at the Book, Chapter or Page Level.

For a **Chapter**, **Chapter Frame Text** can be created by either:

(a) highlighting a **Chapter Frame** node, clicking on the **Text** icon and selecting either **Absolute** or **Rel to frame** from the **Text** menu.

This will create **Chapter Frame Text** for the highlighted **Chapter Frame** node.

See20.3.4.8.2.1 Creating Frame Text by Highlighting the Frame Node.

(b) highlighting a **Chapter** node, clicking on the **Text** icon and selecting **Rel to frame** from the **Text** menu and then **picking** a **Chapter Frame** from the **Chapter Plot Area.**

This will create **Chapter Frame Text** for the **picked Chapter Frame**.

See20.3.4.8.2 Creating Frame Text

For a **Page**, **Page Text** can be created by:

Highlighting the **Page** node, clicking on the **Text** icon and selecting **Absolute** from the **Text** menu.

This will create **Page Text**.

See 20.3.4.8.1 Creating Text at the Book, Chapter or Page Level.

For a **Page**, **Page Frame Text** can be created by either:

(a) highlighting a **Page Frame** node, clicking on the **Text** icon and selecting either **Absolute** or **Rel to frame** from the **Text** menu.

This will create **Page Frame Text** for the highlighted **Page Frame** node.

See20.3.4.8.2.1 Creating Frame Text by Highlighting the Frame Node.

(b) highlighting a **Page** node, clicking on the **Text** icon and selecting **Rel to frame** from the **Text** menu and then **picking** a **Page Frame** from the **Page Plot Area.**

This will create **Page Frame Text** for the **picked Page Frame**.

See20.3.4.8.2 Creating Frame Text.

Text - Reference

The option **Reference** is not for creating new text but creates a **Text** node that **references** an existing **Text** node. This means that the **Reference Text** node has as default, all the values defined for the **Text** node that is being referenced BUT any of those values can be modified for the **Reference Text** node.

See 20.3.4.8.3 Reference Text.

Important Note:

The names of the **Book Text nodes** and **Book Frame Text nodes** must be unique amongst all the **Book Text nodes** AND the **Book Frame Text nodes.**

For a **Chapter**, the names of the **Chapter Text nodes** and the **Chapter Frame Text nodes** for **that Chapter** must be unique amongst all the **Chapter Text nodes** AND the **Chapter Frame Text nodes** for that **Chapter**.

Similarly for a **Page**, the names of the **Page Text nodes** and the **Page Frame Text nodes** for **that Page** must be unique amongst all the **Page Text nodes** AND the **Page Frame Text nodes** for that **Page**.

20.3.4.8.1 Creating Text at the Book, Chapter or Page Level

The process for creating **Book Text** will be described in detail but the steps are identical for **Chapter** and **Page** except that the word **Book** is replaced by **Chapter** or **Page** in the description.

Text is created at the **Book**, **Chapter** or **Page** level by first clicking on and highlighting either the **Book**, **Chapter** or **Page** node, then clicking on the **Text** icon on the top right to bring up the **Text** menu and finally selecting ***Absolute*** from the **Text** menu

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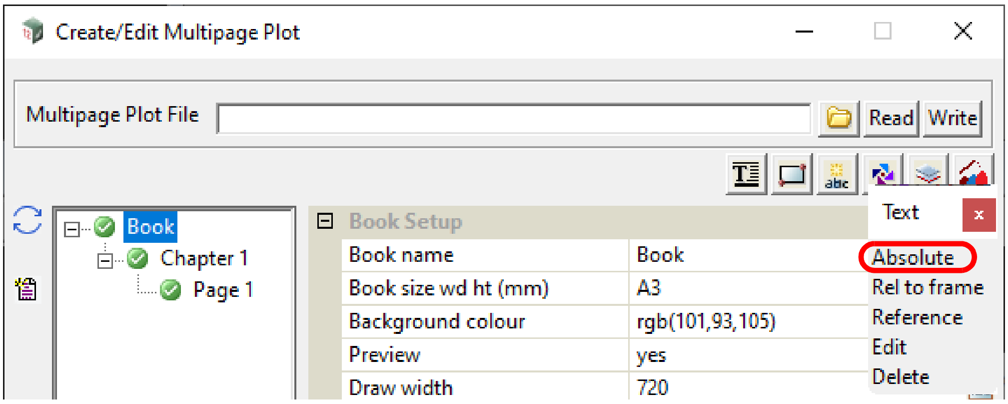
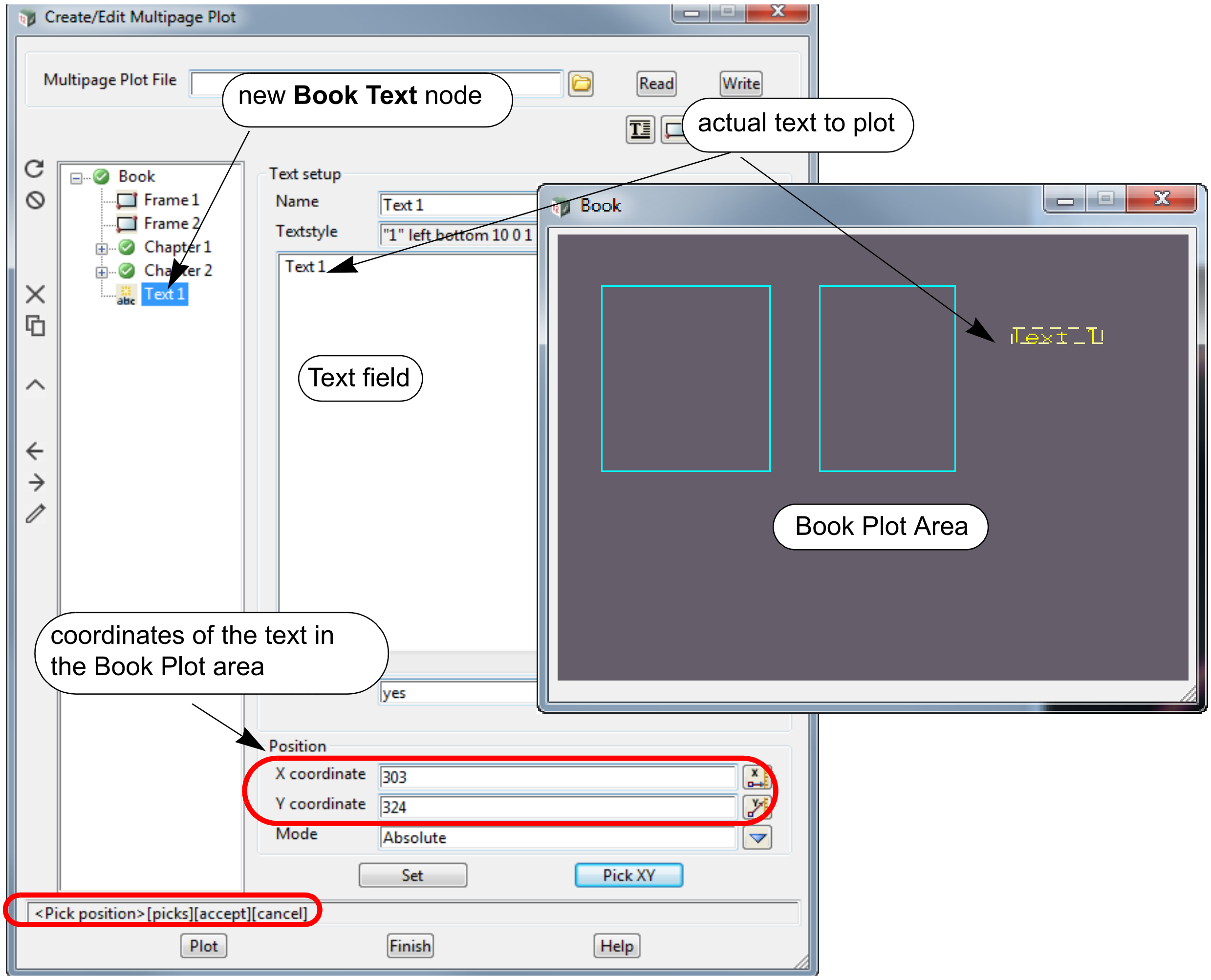


A position in the **Book Plot Area** for the text is then selected.

Once the text position is selected, a **Text** node is automatically added at the bottom of the **Book** with the default name **Text n** where **n** is the next integer that makes the **Text node** name unique amongst all the **Book Text nodes** AND the **Book Frame Text nodes**.

Similarly the name of a **Chapter Text node** must be unique amongst all the **Chapter Text nodes** AND the **Chapter Frame Text nodes** for that **Chapter**. And the name of a **Page Text node** must be unique amongst all the **Page Text nodes** AND the **Page Frame Text nodes** for that **Page**.

The default text "Text n" is added to the **Text** field and displayed in the **Book Plot Area**.



For documentation on the fields and icons used for **Book Text**, **Chapter Text** and **Page Text**, see 20.3.4.8.4 Icons and Fields for Text and Frame Text Nodes.

20.3.4.8.2 Creating Frame Text

Text can be **attached** to a **Frame** at either a **Book**, **Chapter** or **Page** level.

The main difference with **Frame Text** and **Book, Chapter** or **Page Text** is that **Frame Text** can be placed **Absolutely on the Page** or **Relative to the Frame.**

If the **Frame Text** is **Absolute**, then the **Text** is placed at a fixed position on the **Plot Area** that the **Frame** is on and if the **Frame** is moved, the **Text does not** move.

If the **Frame Text** is **Relative**, its position is **Relative to the Frame** the Text is on and if the Frame is **moved**, the **Frame Text moves with the Frame**.

There are two ways of selecting the **Frame** and then creating **Frame Text.**

1. Clicking on the **Frame node**.

   See 20.3.4.8.2.1 Creating Frame Text by Highlighting the Frame Node.

2. Picking a **Frame** from the **Plot Area**.

   See 20.3.4.8.2.2 Creating Frame Text by Picking a Frame from the Plot Area.

20.3.4.8.2.1 Creating Frame Text by Highlighting the Frame Node

The process for creating **Book Frame Text** will be described in detail but the steps are identical for **Chapter** and **Page** except that in the description, the word **Book** is replace by **Chapter** or **Page**.

To create **Frame Text** using the **Frame node**, click on and highlight the **Book Frame node**, **Chapter Frame node** or **Page Frame node** to add **Frame Text** to.

The **Plot Area** for the **Book**, **Chapter** or **Page** of the **Frame node** is then displayed and the **Frame** highlight on the **Plot Area**.

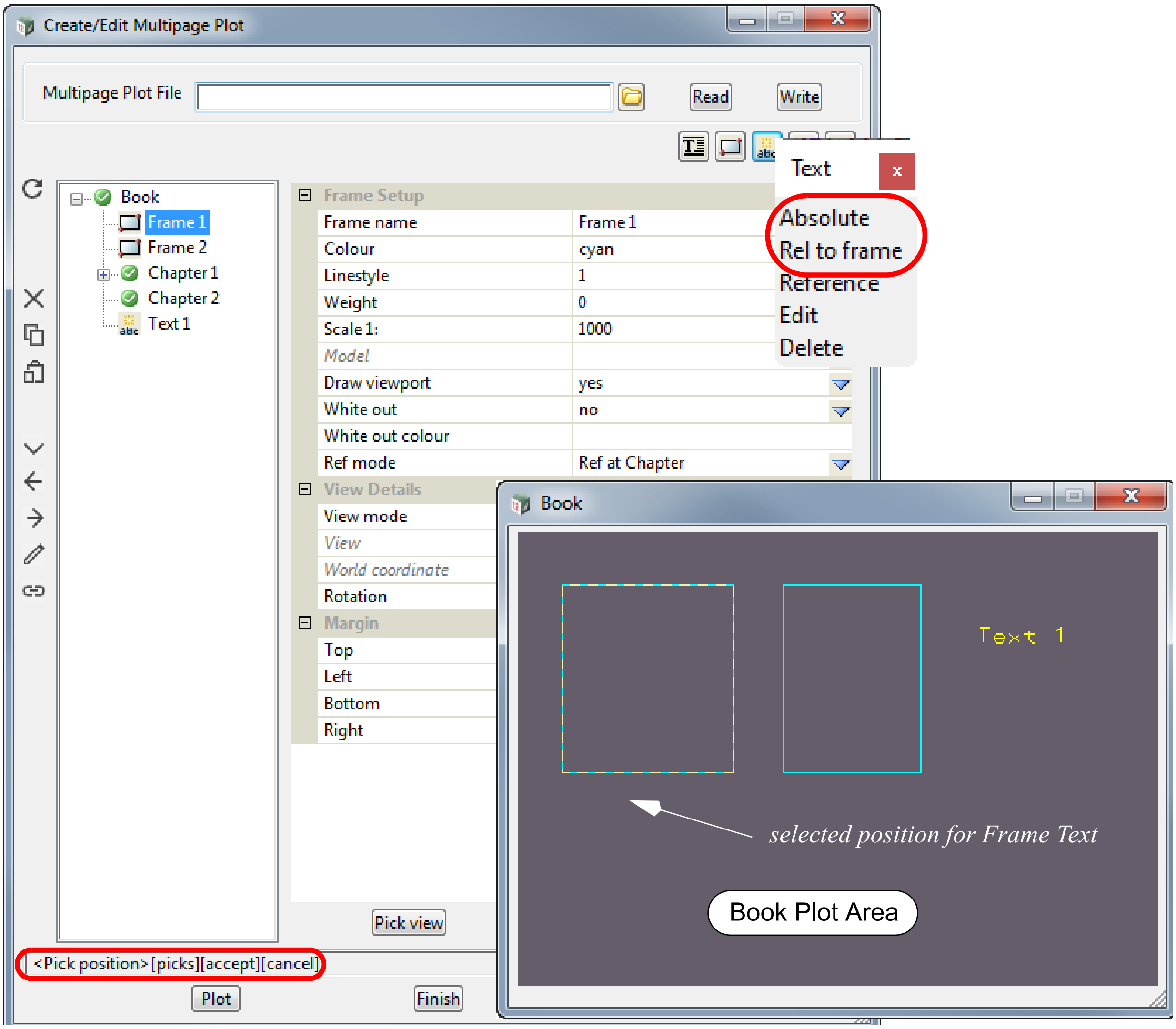
Next click on the **Text icon** at the top right to bring up the **Text** menu, and from the **Text** menu select:

(a) **Rel to frame** if you want the text in the Plot Area to move with the **Frame**

or

(b) **Absolute** if you want the text to have a fixed position on the **Plot Area**. The text does not move with the **Frame** but the Text will be deleted if the Frame is deleted.

After picking **Rel to Frame** or **Absolute**, the position for the **Fame Text** is selected in the **Plot Area**.

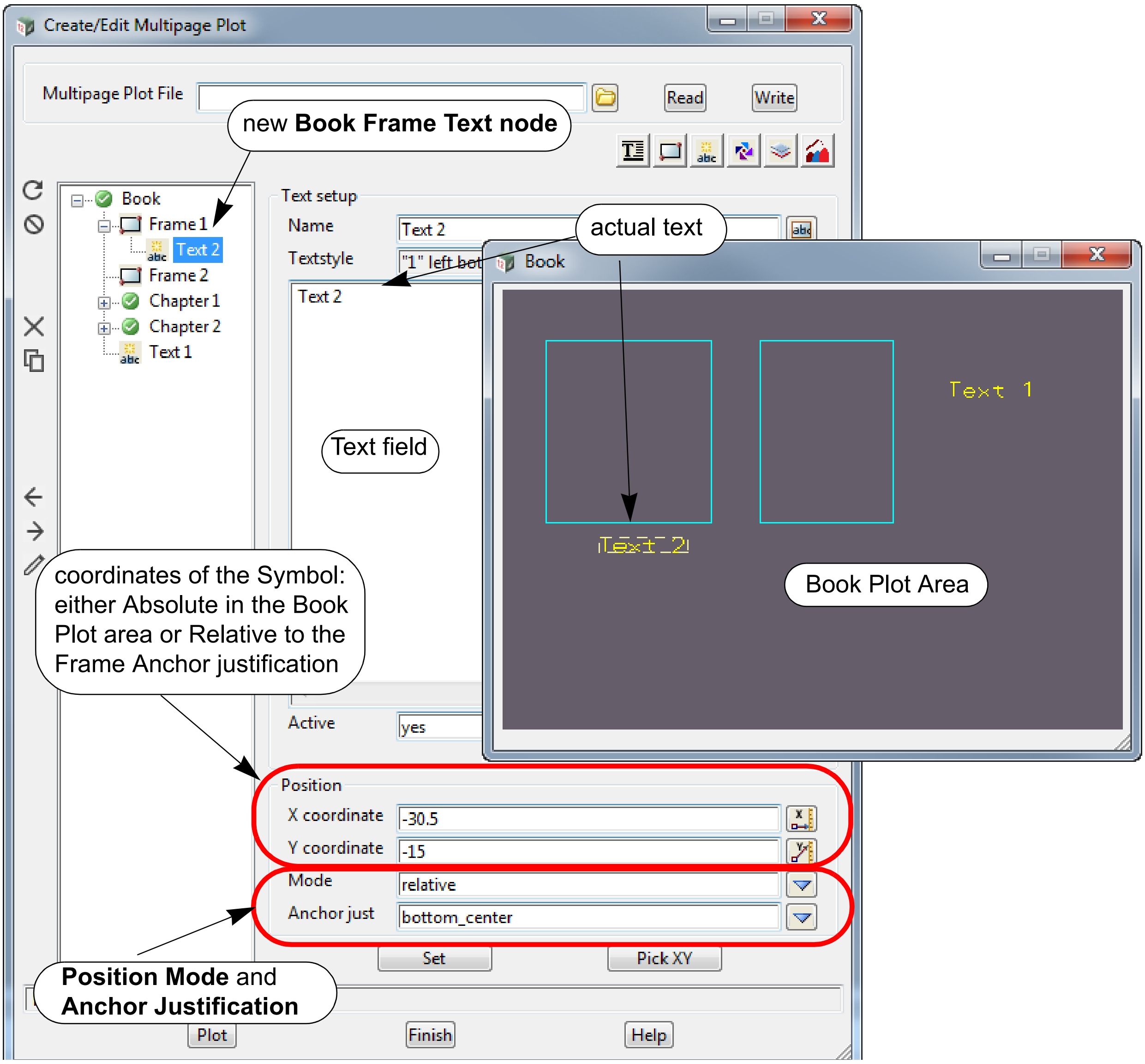


Once the text position is selected, a **Book Frame Text node** is automatically added at the bottom of the **Book Frame** with the default name **Text n** where **n** is the next integer that makes the **Book Frame Text node** name unique amongst all the **Book Text nodes** AND the **Book Frame Text nodes**.

Similarly the name of a **Chapter Frame Text node** must be unique amongst all the **Chapter Text**

nodes AND the **Chapter Frame Text nodes** for that **Chapter**. And the name of a **Page Frame Text node** must be unique amongst all the **Page Text nodes** AND the **Page Frame Text nodes** for that **Page**.

The default text "Text n" is added to the Text field and displayed in the **Book Plot Area**.



If ***Absolute*** was chosen from the **Text** menu:

> the **Position Mode** is set to ***Absolute*** and the values for **X coordinate** and **Y coordinate** are the position on the Book Plot area.

If ***Rel to Frame*** was chosen from the **Text** menu:

> the **Position Mode** is set to ***Relative***, and the **Anchor just** is set to the closest of the nine rustications positions for the Frame (bottom left, bottom centre, bottom right, middle left, middle centre, middle right, top left, top centre, top right). The values for **X coordinate** and **Y coordinate** are then relative to the Anchor justification point.

The values for **X coordinate, Y coordinate**, **Mode** and **Anchor just** can be changed at any time and the **Set** button pressed for them to take effect.

If **mode** is **Relative** and the Frame is moved, the Text also moves by the same amount.

If **mode** is **Relative** and the Frame is resized, the position of the Text relative to the **Anchor justification** is maintained.

For documentation on the fields and icons used for a **Frame Text**, see 20.3.4.8.4 Icons and Fields for Text and Frame Text Nodes.

20.3.4.8.2.2 Creating Frame Text by Picking a Frame from the Plot Area

Instead of having to click on a **Frame node** in the **Book** tree to create **Text**, a **Frame** can be **interactive selected** from either the **Book Plot Area**, **Chapter Plot Area** or **Page Plot Area**.

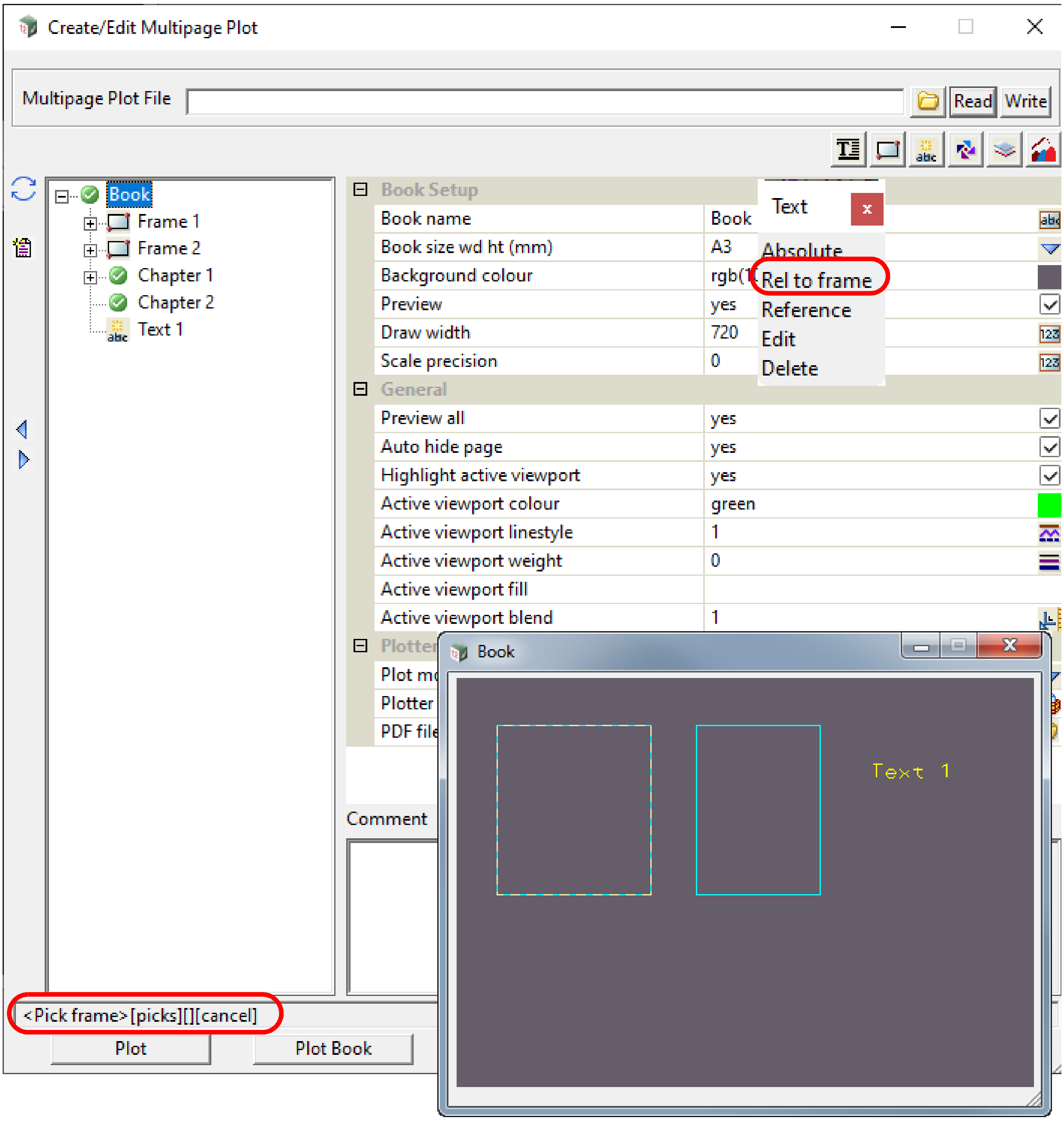
The process is similar to that for **Book**, **Chapter** or **Page Text** except **Rel to frame** must be selected from the **Text** menu.

(The steps are identical for a **Book**, **Chapter**, **Page** except that the word **Book** is replaced by **Chapter** or **Page** so the images will only show a **Book Frame**)

To create **Frame Text** by picking a **Frame** on the **Plot Area**, click on and highlight the **Book node**, **Chapter node** or **Page node** to display the **Plot Area**.

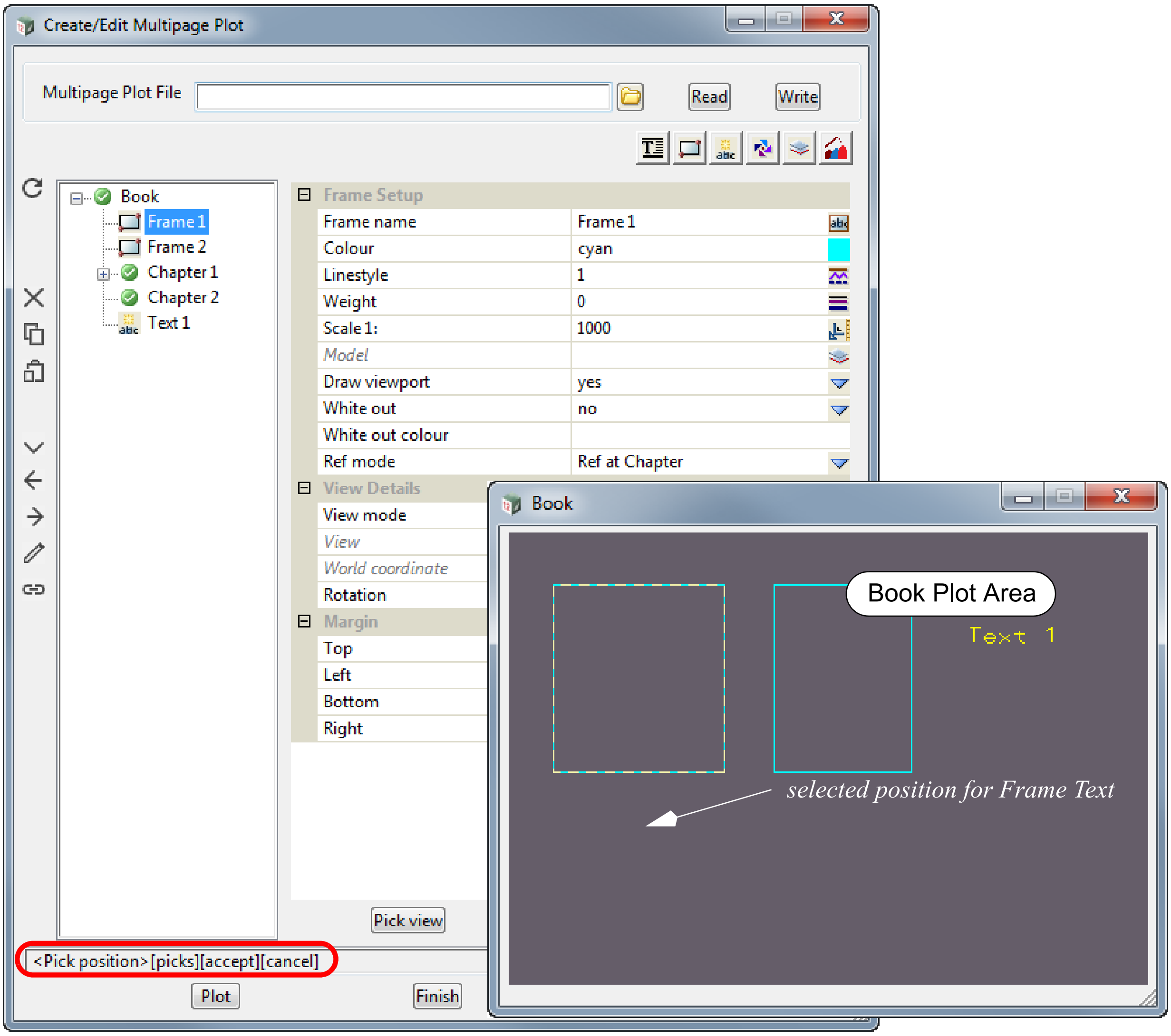
Next click on the **Text icon** at the top right to bring up the **Text** menu, and select ***Rel to frame*** from the **Text** menu.

The user is then asked to pick a **Frame** from the **Plot Area**.



When the **Frame** is **selected**, the **Frame** is highlighted in the **Plot Area** and the **Frame node** highlighted in the tree.

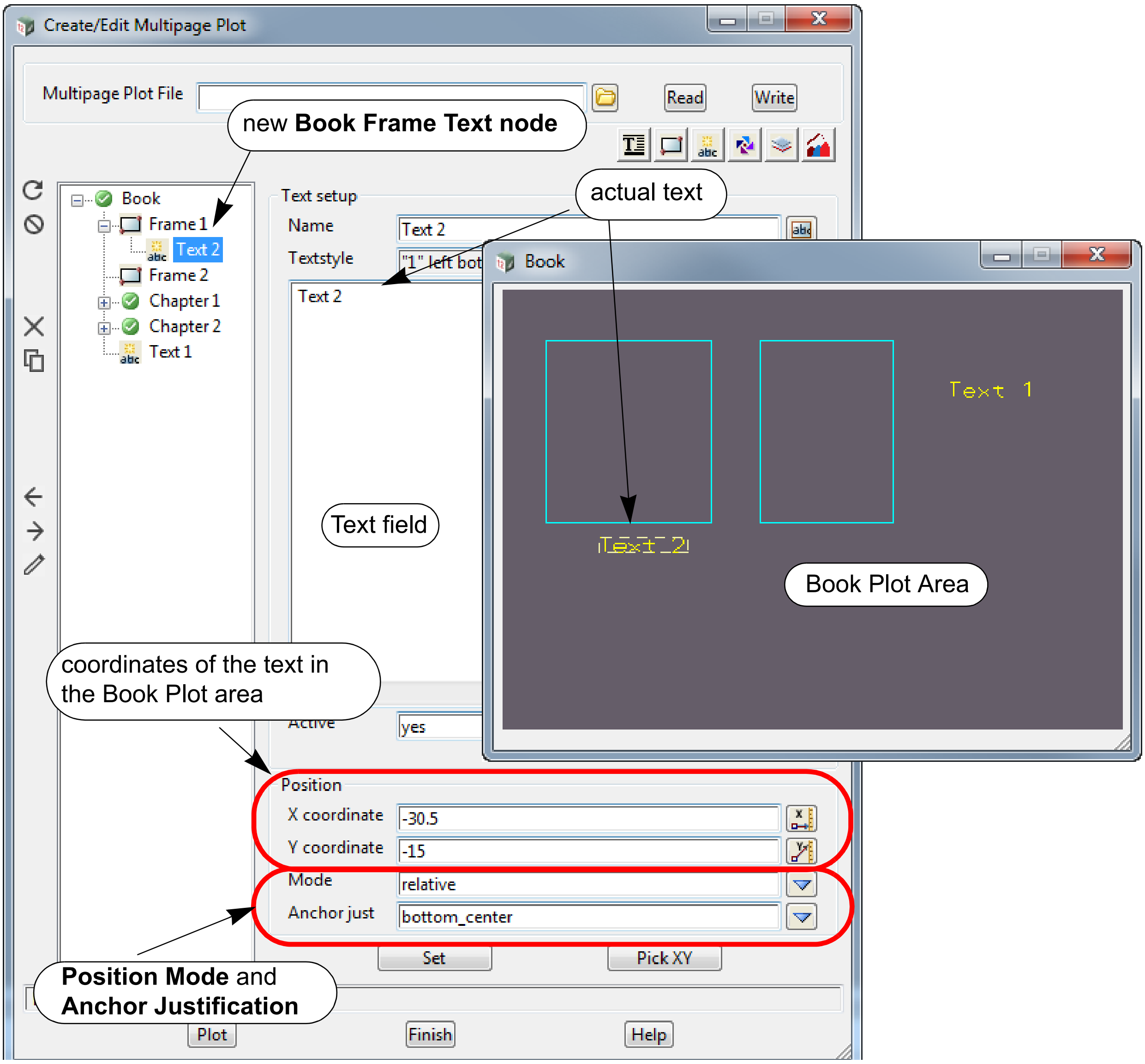
The position for the **Fame Text** is then selected in the **Plot Area**.



Once the text position is selected, a **Book Frame Text node** is automatically added at the bottom of the **Book Frame** with the default name **Text n** where **n** is the next integer that makes the **Book Frame Text node** name unique amongst all the **Book Text nodes** AND the **Book Frame Text nodes**.

Similarly the name of a **Chapter Frame Text node** must be unique amongst all the **Chapter Text nodes** AND the **Chapter Frame Text nodes** for that **Chapter**. And the name of a **Page Frame Text node** must be unique amongst all the **Page Text nodes** AND the **Page Frame Text nodes** for that **Page**.

The default text "Text n" is added to the Text field and displayed in the **Book Plot Area**.



If ***Absolute*** was chosen from the **Text** menu:

the **Position Mode** is set to ***Absolute*** and the values for **X coordinate** and **Y coordinate** are the position on the Book Plot area.

If ***Rel to Frame*** was chosen from the **Text** menu:

the **Position Mode** is set to ***Relative***, and the **Anchor just** is set to the closest of the nine justifications positions for the Frame (bottom left, bottom centre, bottom right, middle left, middle centre, middle right, top left, top centre, top right). The values for **X coordinate** and **Y coordinate** are then relative to the Anchor justification point.

The values for **X coordinate, Y coordinate**, **Mode** and **Anchor just** can be changed at any time and the **Set** button pressed for them to take effect.

If **mode** is **Relative** and the Frame is moved, the Text also moves by the same amount.

If **mode** is **Relative** and the Frame is resized, the position of the Text relative to the **Anchor justification** is maintained.

For documentation on the fields and icons used for **Frame Text**, see 20.3.4.8.4 Icons and Fields for Text and Frame Text Nodes.

20.3.4.8.3 Reference Text

Reference Text is not for creating a new **Text node** but creates a **Reference Text node** that **references** an existing **Text node** or **Reference Text node** at a higher level, and optionally replaces the values defining the new **Reference Text**.

That is, **Reference Text** at a **Chapter** level can only reference **Book Text** or **Book Frame Text**. And **Reference Text** at the **Page** level can only reference **Book Text**, **Book Frame Text, Chapter Text, Chapter Frame Text, Chapter Reference Text**, **Chapter Reference Frame Text** or **Chapter Reference Frame Reference Text.**

The **Reference Text** has as defaults all the values defined for the **Text** that is being referenced BUT any of those values can be modified for the **Reference Text**. In particular, the **Reference Text** can be made active/inactive independently of the original **Text**.

For example, if a **Book Text** was created then that text would by default be drawn exactly the same way on each **Page**. If a **Reference Text** was created on a **Page** and it referenced the **Book Text**, then the **Reference Text** would then specify how that **Book Text** was drawn on that **Page** and any of the Text values could be changed. For example, the actual text or its colour could be changed, or the **Reference Text** could be made inactive so that the **Text** is **no longer drawn** on that **Page**.

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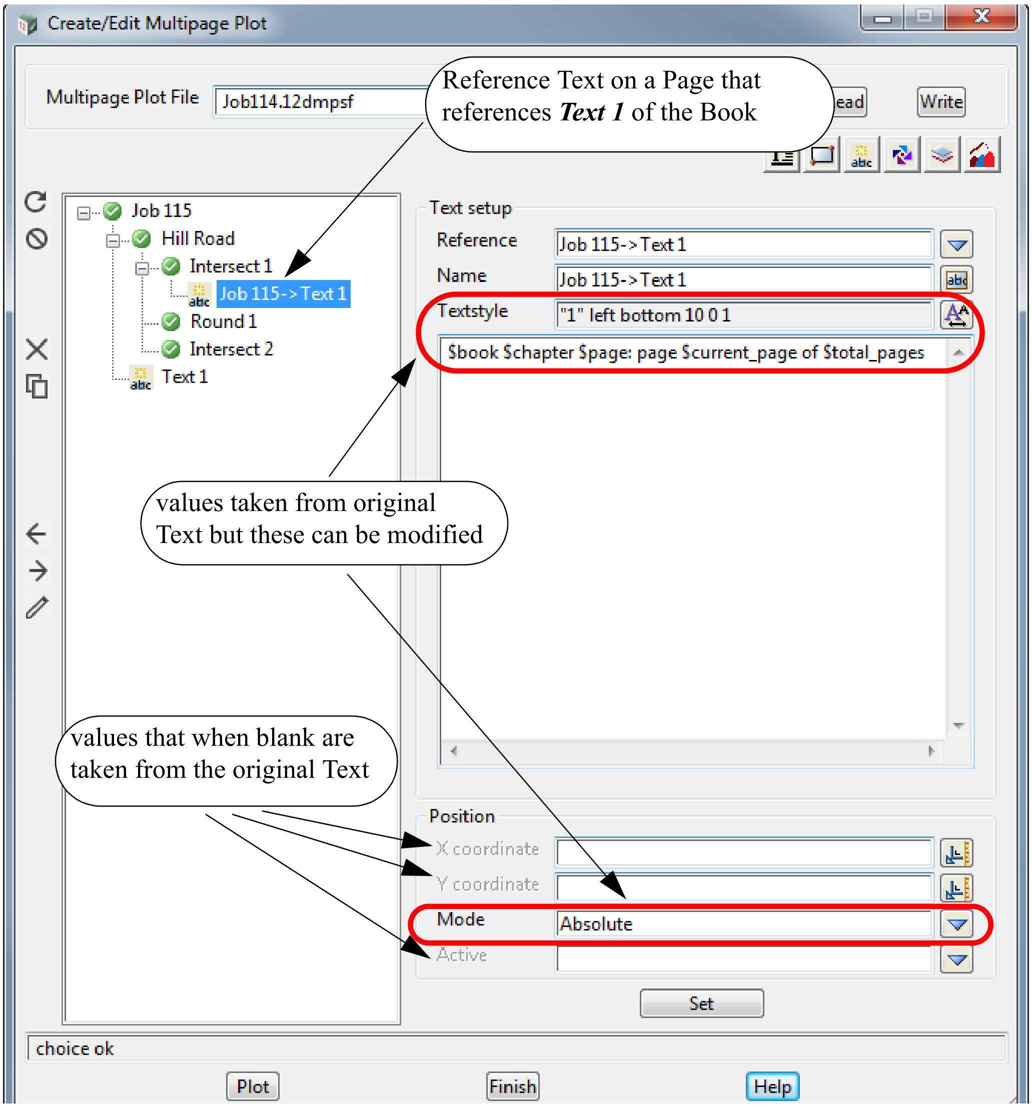


Reference Text can be created in six ways:

(a) **Chapter Reference Text.** *See* 20.3.4.8.3.1 Creating Chapter Reference Text

(b) **Chapter Frame Reference Text** *See* 20.3.4.8.3.2 Creating Chapter Frame Reference Text.

(c) **Chapter Reference Frame Reference Text** *See* 20.3.4.8.3.3 Creating Chapter Reference Frame Reference Text.

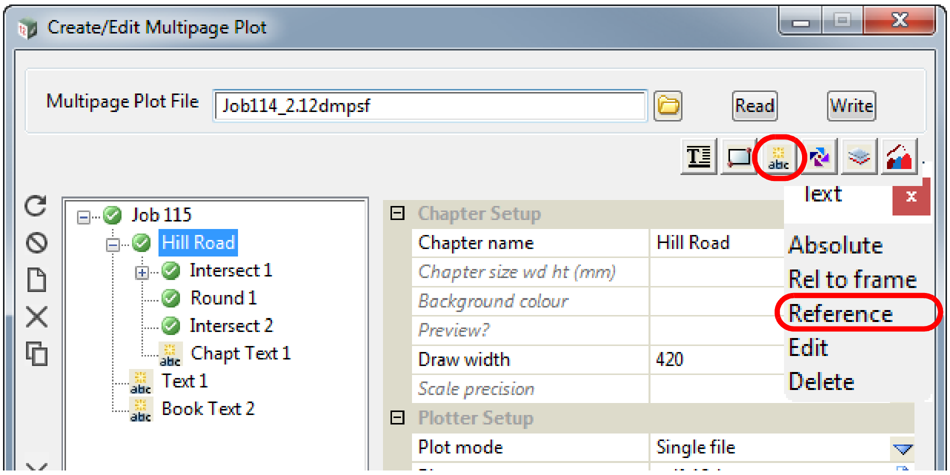
(d) **Page Reference Text.** *See* 20.3.4.8.3.4 Creating Page Reference Text.

(e) **Page Frame Reference Text.** *See* 20.3.4.8.3.5 Creating Page Frame Reference Text.

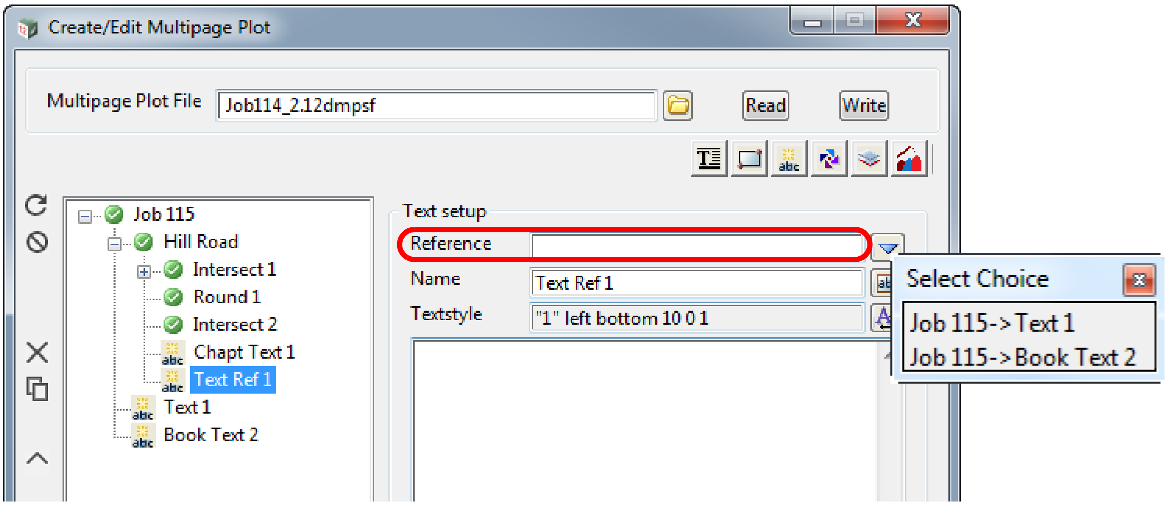
(f) **Page Reference Frame Reference Text.** *See* 20.3.4.8.3.6 Creating Page Reference Frame Reference Text.

20.3.4.8.3.1 Creating Chapter Reference Text

To create a **Chapter Reference Text** for a **Chapter**, click on the **Chapter node** and then click on the **Text** icon and select **Reference** from the **Text** menu.

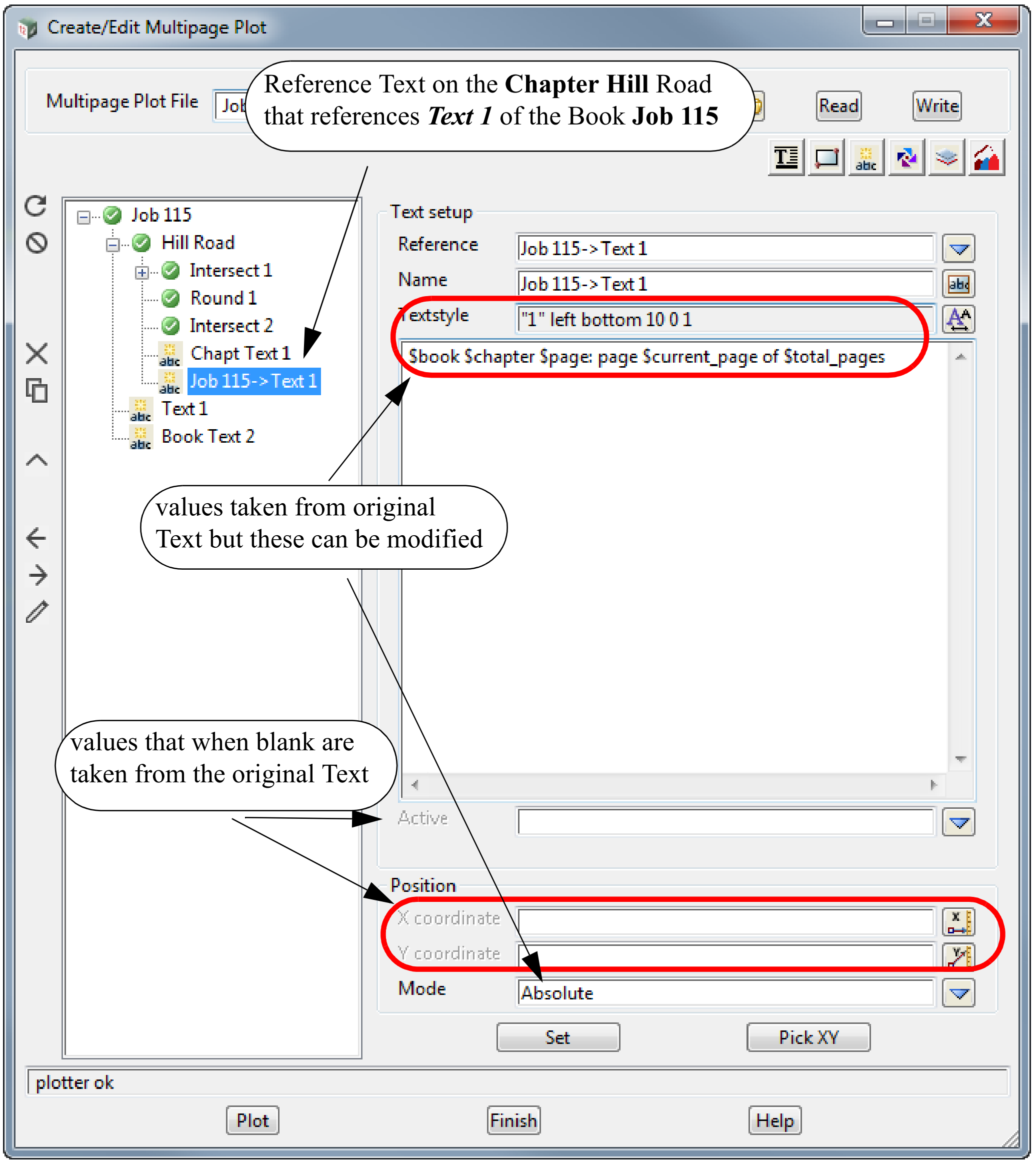


A new **Chapter Reference Text** is created but it has a blank **Reference** Field.



The Choice pop-up for the ***Reference field*** lists the existing **Book Texts** and **Book Frame Texts** that this **Reference Text** could reference.

Once a **Text** is selected, it is drawn in the **Chapter Plot Area** and the name of the **Reference Text** is changed to the full path name of the **Text** that it is referencing. If that name already exists then " **n**" is appended to the name where n is an integer starting with 1.



Most of the **Text Setup** values are blank as their values are taken from the **Book Text** being referenced but any of them can be changed and the changed values will be used for this **Chapter Reference Text**.

Important Note

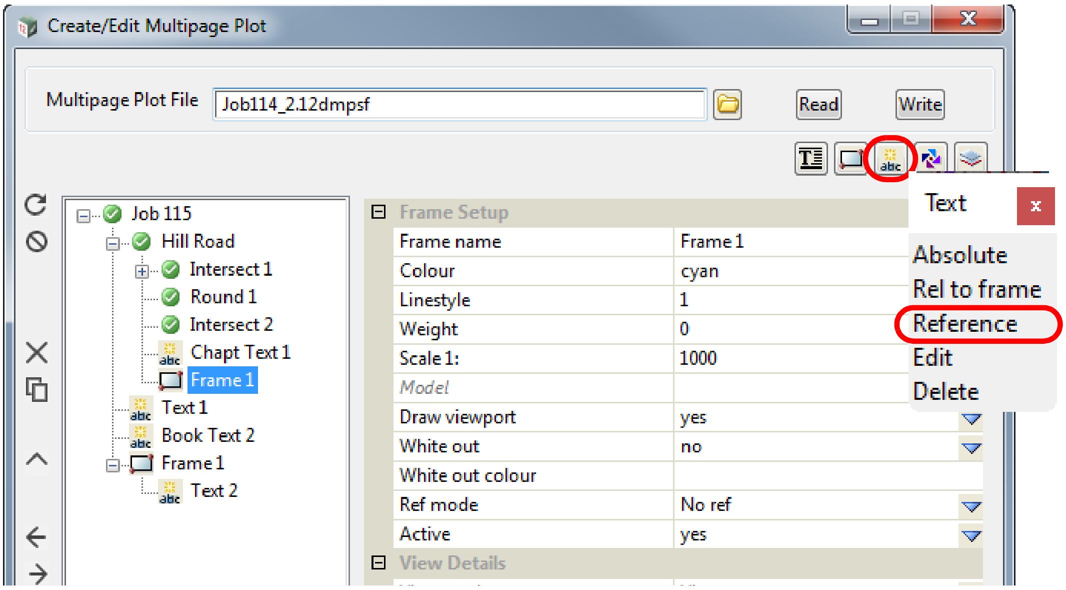
If you don't want to display **Book Text**, **Chapter Text** or **Chapter Reference Text** for a particular **Page**, then for that page, create a **Reference Text** that references the appropriate Book Text, Chapter Text or Chapter Reference Text, and set the ***Active*** field to **No**.

If you don't want to display **Book Text** for a particular chapter, then for that chapter, create a **Chapter Reference Text** which references the appropriate Book Text, and in the **Chapter Reference Text** fields, set the ***Active*** field to **No**.

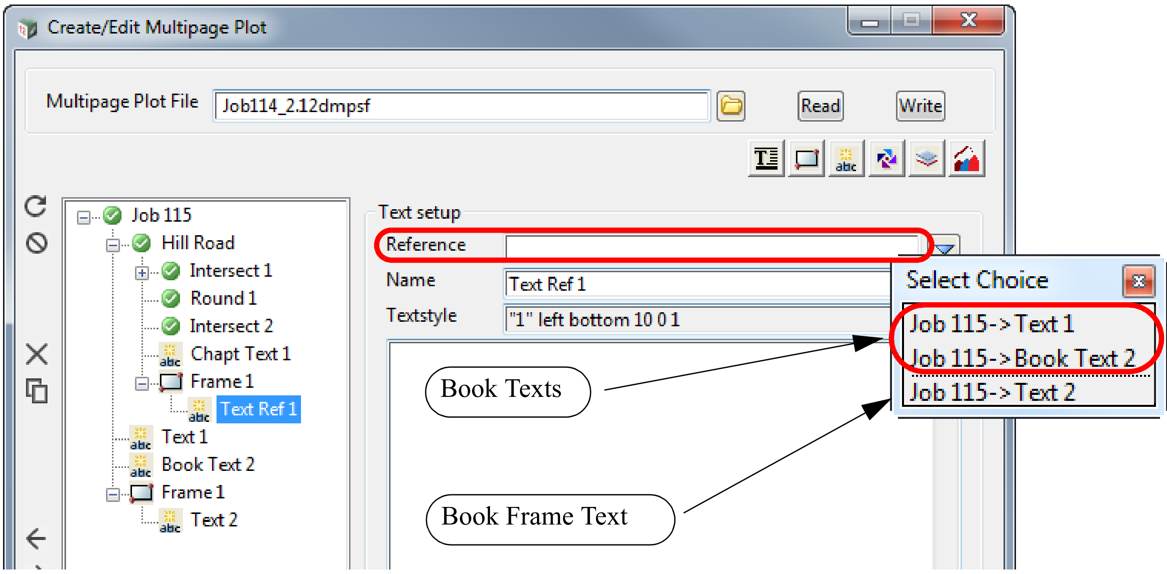
Similarly if a **Book Text** has been set to ***Inactive*** (i.e. OFF) then it can be displayed for a particular chapter by creating a **Chapter Reference Text** for that chapter and reference appropriate **Book Text**, and in the **Chapter Reference Text** fields, set the ***Active*** field to **Yes**.

20.3.4.8.3.2 Creating Chapter Frame Reference Text

To create a **Chapter Frame Reference Text** for a **Chapter Frame**, click on the **Chapter Frame node** and then click on the **Text** icon and select **Reference** from the **Text** menu.

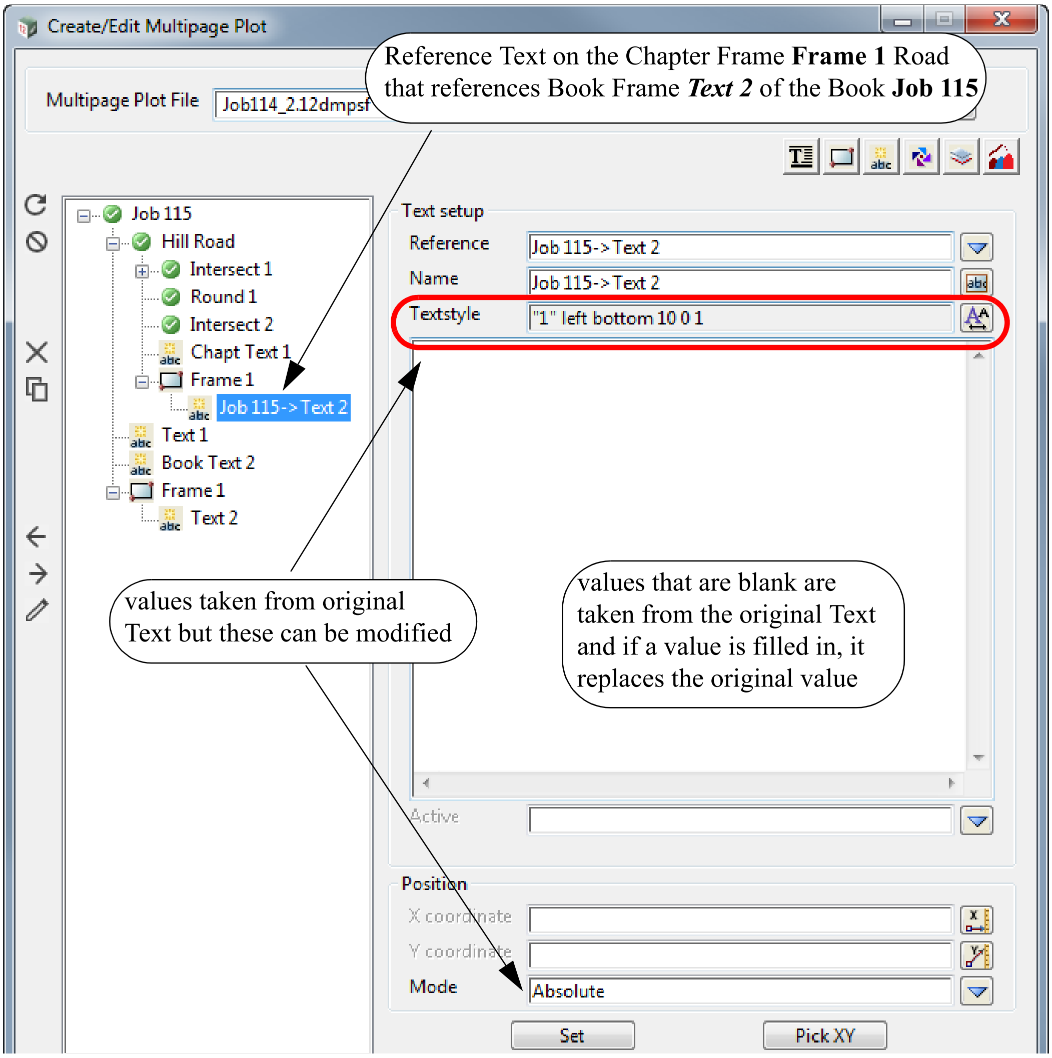


A new **Chapter Frame Reference Text** is created but it has a blank **Reference** Field.



The Choice pop-up for the ***Reference field*** lists the existing **Book Texts** and **Book Frame Texts** that this **Reference Text** could reference.

Once a **Text** is selected, it is drawn in the **Chapter Plot Area** and the name of the **Reference Text** is changed to the full path name of the **Text** that is referencing. If that name already exists then " **n**" is appended to the name where n is an integer starting with 1.



If the **Chapter Frame Reference Text** references a **Book Text** or **Book Frame Text,** any blank fields in the **Text Setup** take their values from the original **Text** being referenced. Any of the blank values can be changed and the changed values will be used for the **Chapter Frame Reference Text**.

Important Notes

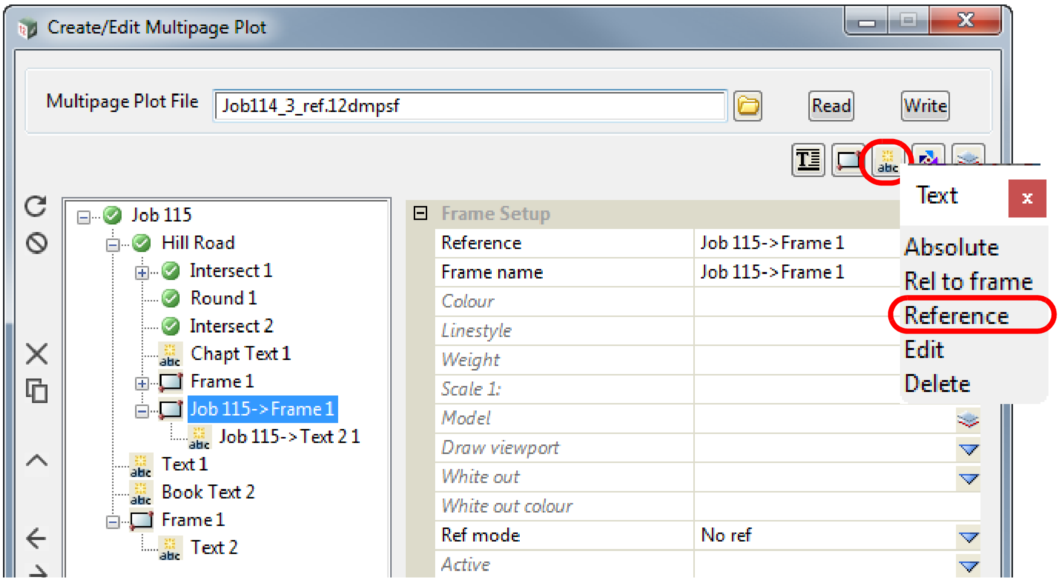
1. If you don't want to display **Book Text** for a particular chapter, then for that chapter, create a **Chapter Reference Text** which references the appropriate **Book Text**. And in the **Chapter Reference Text** fields, set the ***Active*** field to **No**.
2. If you don't want to display **Book Frame Text** for a particular chapter, then for that chapter, create a **Chapter Reference Frame** that references the **Book Frame** that contains the **Book Frame Text**. This new **Chapter Reference Frame** will also include a **Chapter Reference Frame Reference Text** that references the appropriate **Book Frame Text**. And in the **Chapter Reference Frame Reference Text** fields, set the ***Active*** field to **No**.
3. If a **Book Text** has been set to ***Inactive*** (i.e. OFF) then it can be **displayed** for a **particular** chapter by creating a **Chapter Reference Text** that references the appropriate **Book Text**. And in the **Chapter Reference Text** fields, set the ***Active*** field to **Yes**.
4. If a **Book Frame Text** has been set to ***Inactive*** (i.e. OFF) then it can be **displayed** for a **particular** chapter by creating a a **Chapter Reference Frame** that references the **Book Frame** that contains the **Book Frame Text**. This new **Chapter Reference Frame** will also include a **Chapter Reference Frame Reference Text** that references the appropriate **Book Frame Text**. And in the **Chapter Reference Frame Reference Text** fields, set the ***Active*** field to **Yes**.

20.3.4.8.3.3 Creating Chapter Reference Frame Reference Text

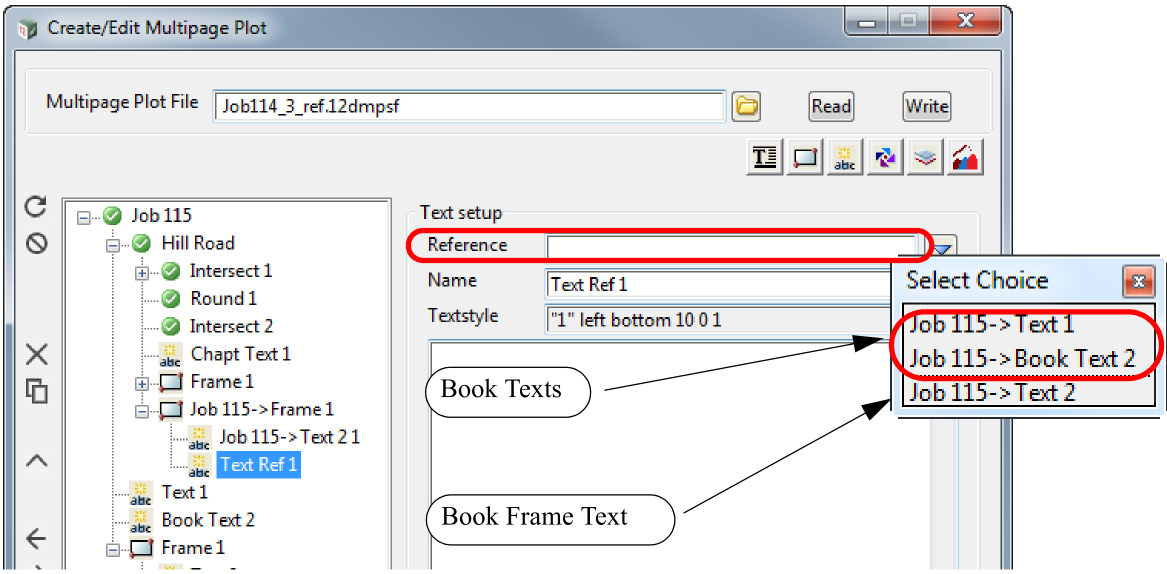
Important Note

Please note that the **Chapter Reference Frame Reference Text** and a **Chapter Frame Reference Text** are virtually identical and the only difference is that one is in a **Chapter Reference Frame** and the other in a **Chapter Frame**.

A **Chapter Reference Frame Reference Text** for a **Chapter Reference Frame** is created by clicking on the **Chapter Reference Frame node** and then clicking on the **Text** icon and selecting **Reference** from the **Text** menu.

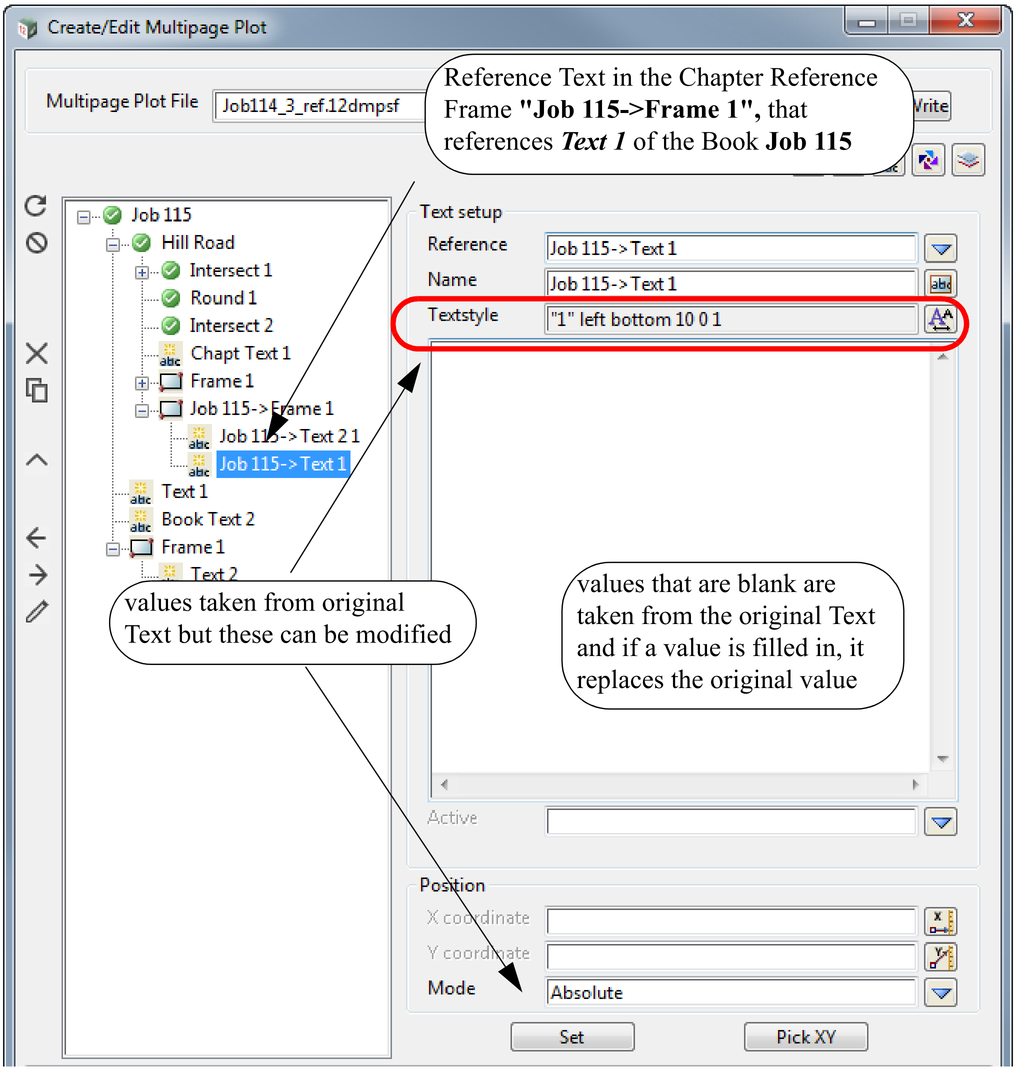


A new **Chapter Reference Frame Reference Text** is created but it has a blank **Reference** Field.



The Choice pop-up for the ***Reference field*** lists the existing **Book Texts** and **Book Frame Texts** that this **Reference Text** could reference.

Once a **Text** is selected, it is drawn in the **Chapter Plot Area** and the name of the **Reference Text** is changed to the full path name of the **Text** that is referencing. If that name already exists then " **n**" is appended to the name where n is an integer starting with 1.



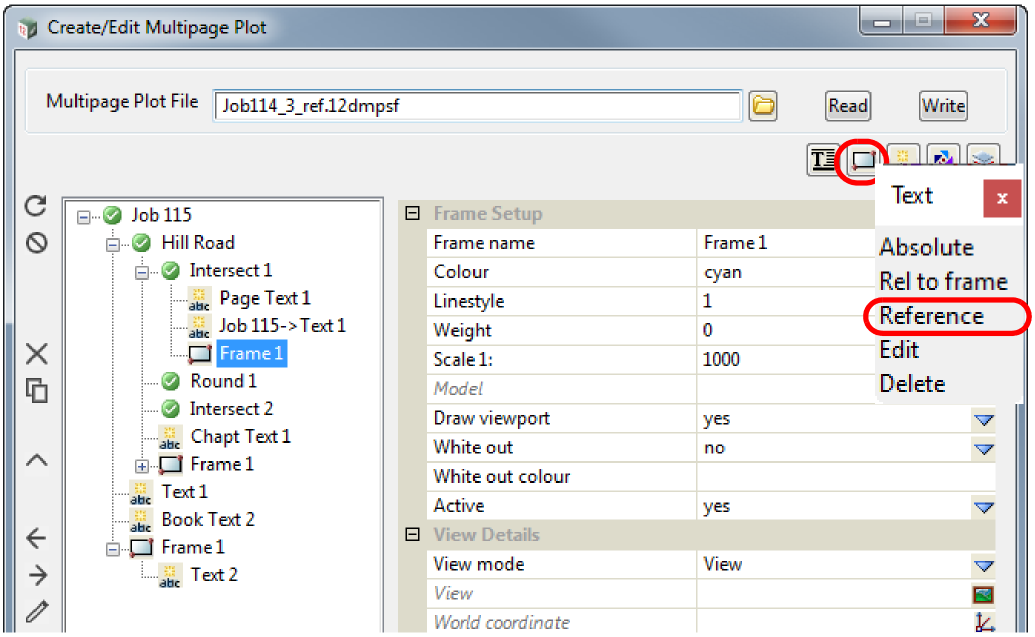
If the **Chapter Reference Frame Reference Text** references a **Book Text** or **Book Frame Text,** any blank fields in the **Text Setup** take their values from the original **Text** being referenced. Any of the blank values can be changed and the changed values will be used for the **Chapter Reference Frame Reference Text**.

Important Notes

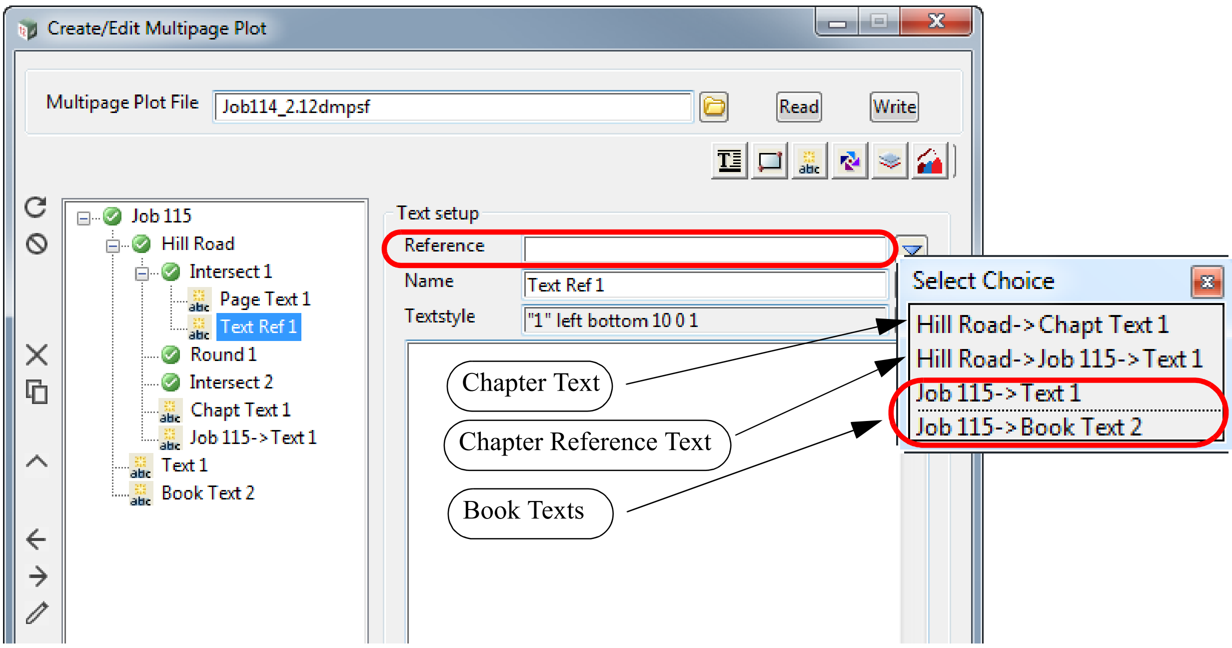
1. Please note that the **Chapter Reference Frame Reference Text** and the **Chapter Frame Reference Text** are virtually identical and the only difference is that one is in a **Chapter Reference Frame** and the other in a **Chapter Frame.**
2. The only way to tell if a **Text** references a **Book Text** or a **Book Frame Text** is that their names have to be unique at the **Book** level.

20.3.4.8.3.4 Creating Page Reference Text

To create a **Page Reference Text** for a **Page**, click on the **Page node** and then click on the **Text** icon and select **Reference** from the **Text** menu.

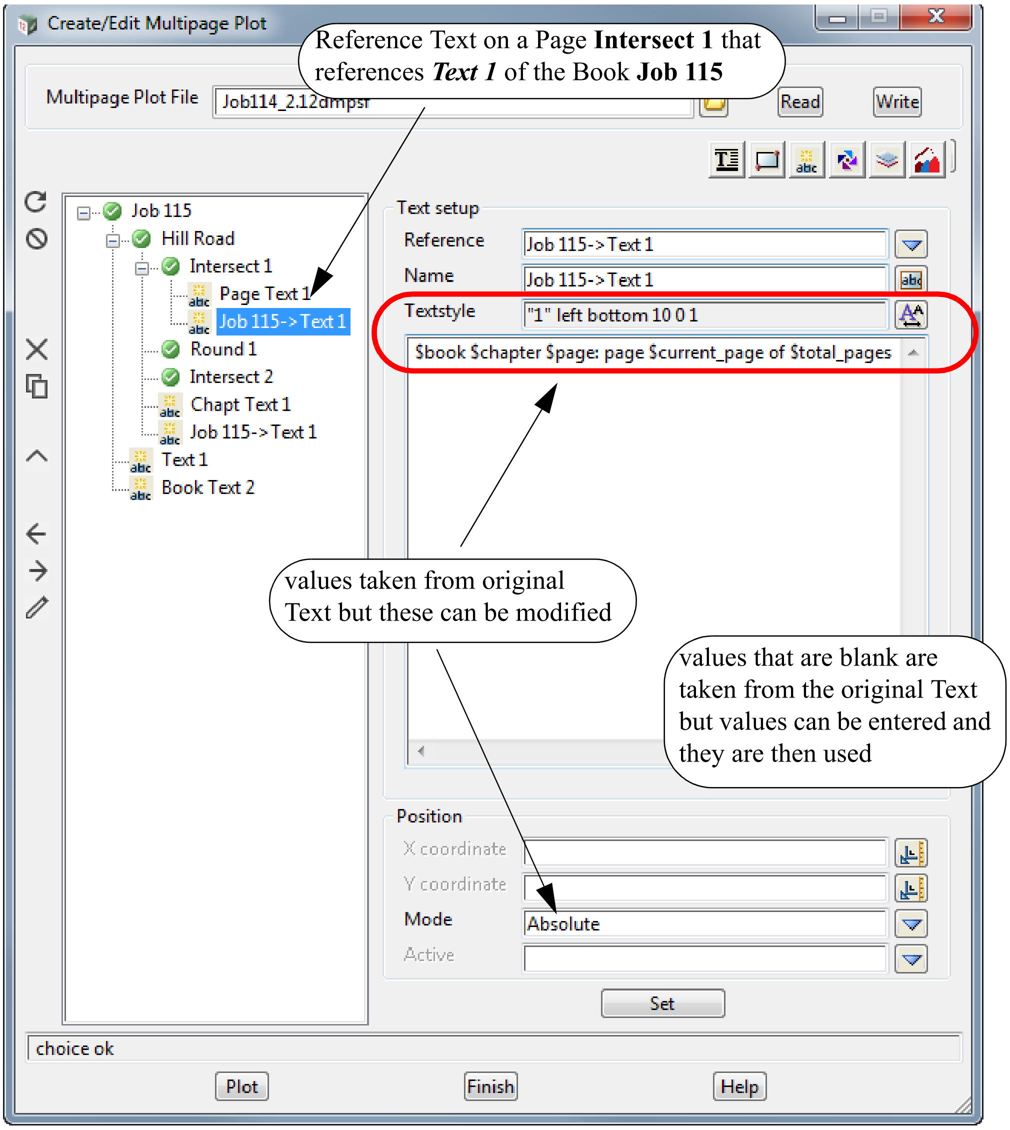


A new **Page Reference Text** is created but it has a blank **Reference** Field.



The Choice pop-up for the ***Reference field*** lists the existing **Book Texts**, **Book Frame Texts**, **Chapter Texts**, **Chapter Reference Texts**, **Chapter Frame Texts, Chapter Frame Reference Texts**, **Chapter Reference Frame Texts** and **Chapter Reference Frame Reference Texts** that this **Reference Text** could reference.

Once a **Text** is selected, it is drawn in the **Page Plot Area** and the name of the **Reference Text** is changed to the full path name of the **Text** that is referencing. If that name already exists then " **n**" is appended to the name where n is an integer starting with 1.



If the **Page Reference Text** references a **Book Text, Book Frame Text, Chapter Text** or **Chapter Frame Text**, any blank fields in the **Text Setup** take their values from the original **Text** being referenced. Any of the blank values can be changed and the changed values will be used for the **Page Reference Text**.

If the **Page Reference Text** references a **Chapter Reference Text**, a **Chapter Frame Reference Text,** or a **Chapter Reference Frame Reference Text** then the fields in the **Page Reference Text** override the fields in the **Chapter Reference Text** which in turn overrides the fields in the original **Book Text**.

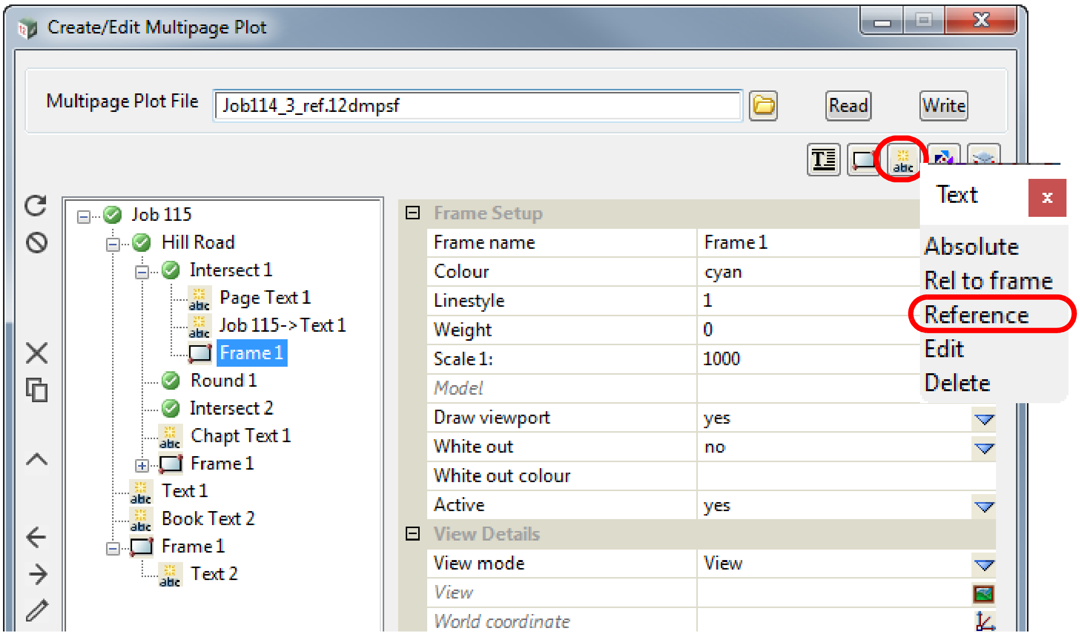
Important Notes

1. If you don't want to display **Book Text** for a particular page, then for that page, create a **Page Reference Text** which references the appropriate **Book Text**, and in the **Page Reference Text** fields, set the ***Active*** field to **No**.
2. If you don't want to display **Chapter Text** for a particular page, then for that page, create a **Page Reference Text** which references the appropriate **Chapter Text**, and in the **Page Reference Text** fields, set the ***Active*** field to **No**.
3. If you don't want to display **Chapter Reference Text** for a particular page, then for that page, create a **Page Reference Text** which references the appropriate **Chapter Reference Text**, and in the **Page Reference Text** fields, set the ***Active*** field to **No**.

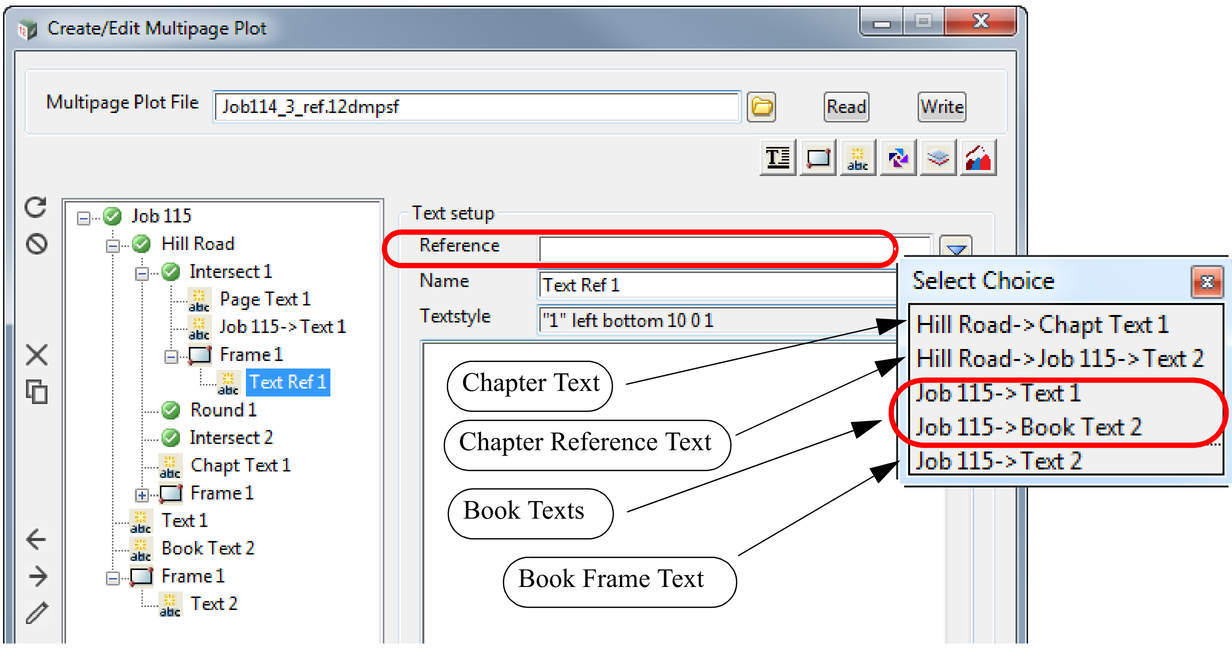
4. If a **Book Text** has been set to ***Inactive*** (i.e. OFF) then it can be **displayed** for a **particular** page by creating a **Page Reference Text** that references the appropriate **Book Text**. And in the **Page Reference Text** fields, set the ***Active*** field to **Yes**.
5. If a **Chapter Text** has been set to ***Inactive*** (i.e. OFF) then it can be **displayed** for a **particular** page by creating a **Page Reference Text** that references the appropriate **Chapter Text**. And in the **Page Reference Text** fields, set the ***Active*** field to **Yes**.
6. If a **Chapter Reference Text** has been set to ***Inactive*** (i.e. OFF) then it can be **displayed** for a **particular** page by creating a **Page Reference Text** that references the appropriate **Chapter Reference Text**. And in the **Page Reference Text** fields, set the ***Active*** field to **Yes**.

20.3.4.8.3.5 Creating Page Frame Reference Text

To create a **Page Frame Reference Text** for a **Page Frame**, click on the **Page Frame node** and then click on the **Text** icon and select **Reference** from the **Text** menu.

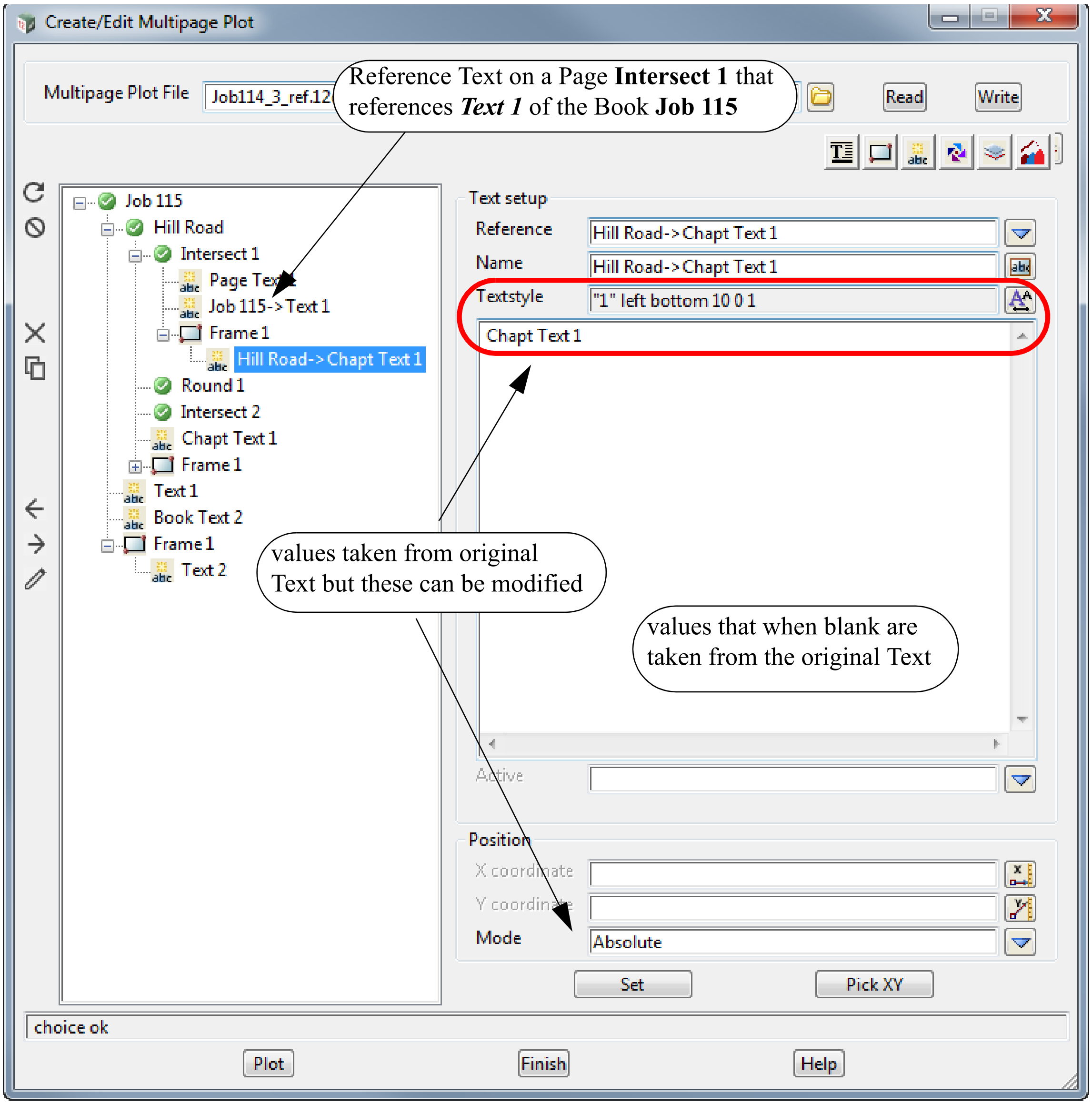


A new **Page Frame Reference Text** is created but it has a blank **Reference** Field.



The Choice pop-up for the ***Reference field*** lists the existing **Book Texts**, **Book Frame Texts**, **Chapter Texts**, **Chapter Reference Texts**, **Chapter Frame Texts, Chapter Frame Reference Texts**, **Chapter Reference Frame Texts** and **Chapter Reference Frame Reference Texts** that this **Reference Text** could reference.

Once a **Text** is selected, it is drawn in the **Page Plot Area** and the name of the **Reference Text** is changed to the full path name of the **Text** that is referencing. If that name already exists then " **n**" is appended to the name where n is an integer starting with 1.



If the **Page Frame Reference Text** references a **Book Text, Book Frame Text, Chapter Text** or **Chapter Frame Text**, any blank fields in the **Text Setup** take their values from the original **Text** being referenced. Any of the blank values can be changed and the changed values will be used for the **Page Reference Text**.

If the **Page Reference Text** references a **Chapter Reference Text** then the fields in the **Page Reference Text** override the fields in the **Chapter Reference Text** which in turn overrides the fields in the original **Book Text**.

Important Notes

1. If you don't want to display **Book Text** for a particular page, then for that page, create a **Page Reference Text** which references the appropriate **Book Text**, and in the **Page Reference Text** fields, set the ***Active*** field to **No**.
2. If you don't want to display **Chapter Text** for a particular page, then for that page, create a **Page Reference Text** which references the appropriate **Chapter Text**, and in the **Page Reference Text** fields, set the ***Active*** field to **No**.
3. If you don't want to display **Book Frame Text** for a particular page, then for that page, create a **Page Reference Frame** that references the **Book Frame** that contains the **Book Frame Text**. This new **Page Reference Frame** will also include a **Page Reference Frame Reference Text**

that references the appropriate **Book Frame Text**. And in the **Page Reference Frame Reference Text** fields, set the ***Active*** field to **No**.

4. If you don't want to display **Chapter Frame Text** for a particular page, then for that page, create a **Page Reference Frame** that references the **Chapter Frame** that contains the **Chapter Frame Text**. This new **Page Reference Frame** will also include a **Page Reference Frame Reference Text** that references the appropriate **Chapter Frame Text**. And in the **Page Reference Frame Reference Text** fields, set the ***Active*** field to **No**.

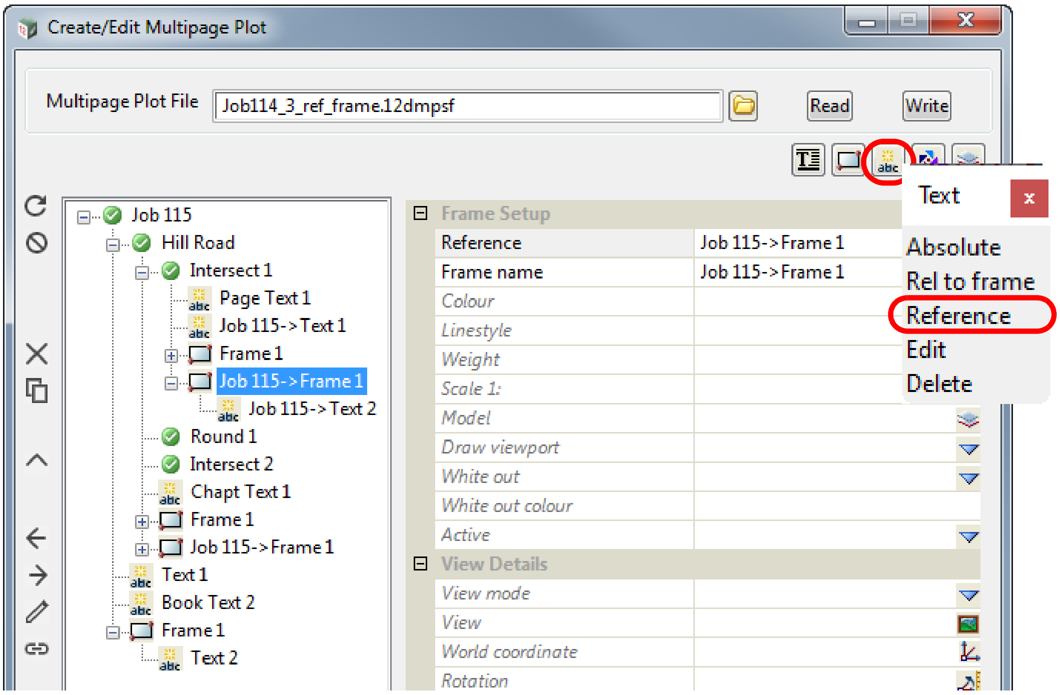
5. If a **Book Text** has been set to ***Inactive*** (i.e. OFF) then it can be **displayed** for a **particular** page by creating a **Page Reference Text** that references the appropriate **Book Text**. And in the **Page Reference Text** fields, set the ***Active*** field to **Yes**.
6. If a **Chapter Text** has been set to ***Inactive*** (i.e. OFF) then it can be **displayed** for a **particular** page by creating a **Page Reference Text** that references the appropriate **Chapter Text**. And in the **Page Reference Text** fields, set the ***Active*** field to **Yes.**
7. If a **Book Frame Text** has been set to ***Inactive*** (i.e. OFF) then it can be **displayed** for a **particular** page by creating a a **Page Reference Frame** that references the **Book Frame** that contains the **Book Frame Text**. This new **Page Reference Frame** will also include a **Page Reference Frame Reference Text** that references the appropriate **Book Frame Text**. And in the **Page Reference Frame Reference Text** fields, set the ***Active*** field to **Yes**.
8. If a **Chapter Frame Text** has been set to ***Inactive*** (i.e. OFF) then it can be **displayed** for a **particular** page by creating a a **Page Reference Frame** that references the **Chapter Frame** that contains the **Chapter Frame Text**. This new **Page Reference Frame** will also include a **Page Reference Frame Reference Text** that references the appropriate **Chapter Frame Text**. And in the **Page Reference Frame Reference Text** fields, set the ***Active*** field to **Yes**.
9. If a **Chapter Reference Frame Text** has been set to ***Inactive*** (i.e. OFF) then it can be **displayed** for a **particular** page by creating a a **Page Reference Frame** that references the **Chapter Reference Frame** that contains the **Chapter Reference Frame Text**. This new **Page Reference Frame** will also include a **Page Reference Frame Reference Text** that references the appropriate **Chapter Reference Frame Text**. And in the **Page Reference Frame Reference Text** fields, set the ***Active*** field to **Yes**.

20.3.4.8.3.6 Creating Page Reference Frame Reference Text

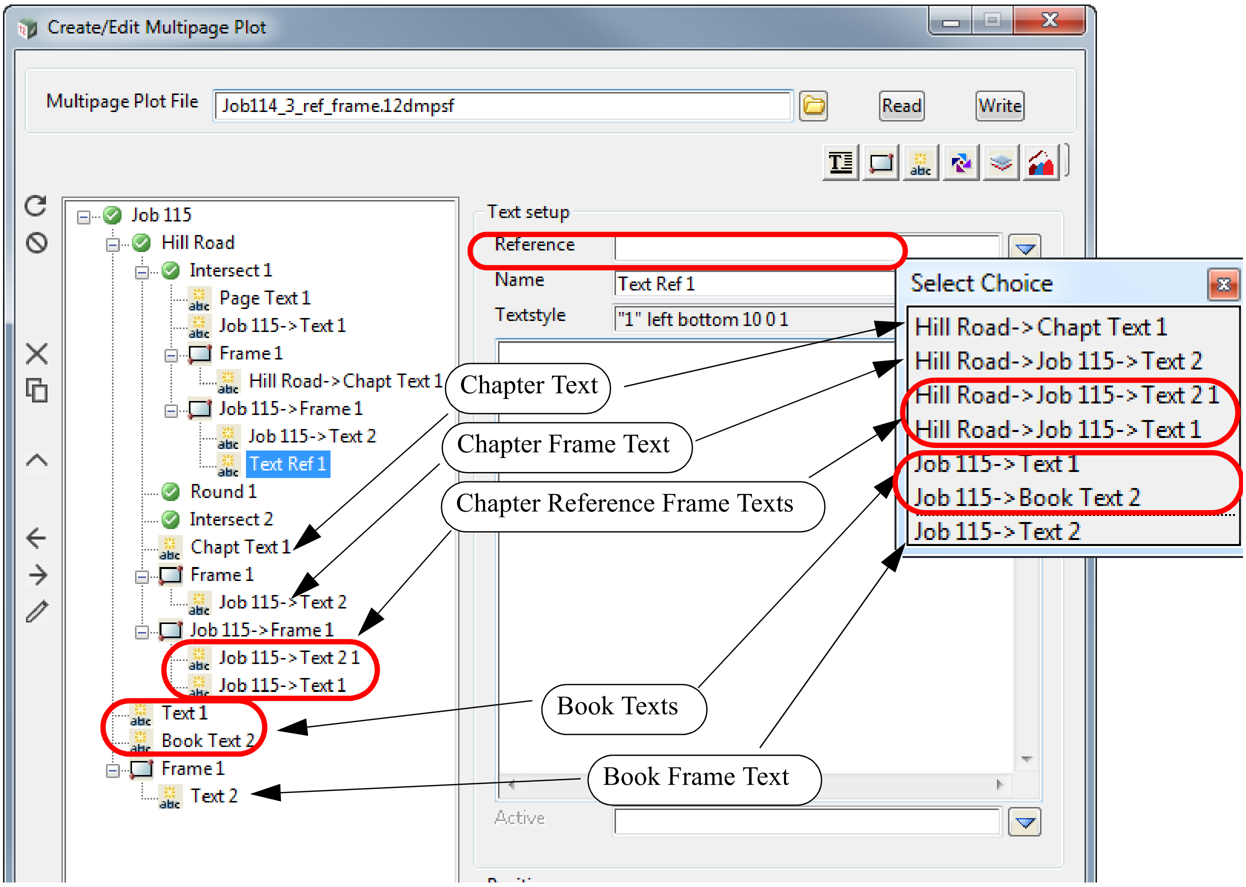
Important Note

Please note that the **Page Reference Frame Reference Text** and a **Page Frame Reference Text** are virtually identical and the only difference is that one is in a **Page Reference Frame** and the other in a **Page Frame**.

To create a **Page Reference Frame Reference Text** for a **Page Reference Frame**, click on the **Page Reference Frame node** and then click on the **Text** icon and select **Reference** from the **Text** menu.

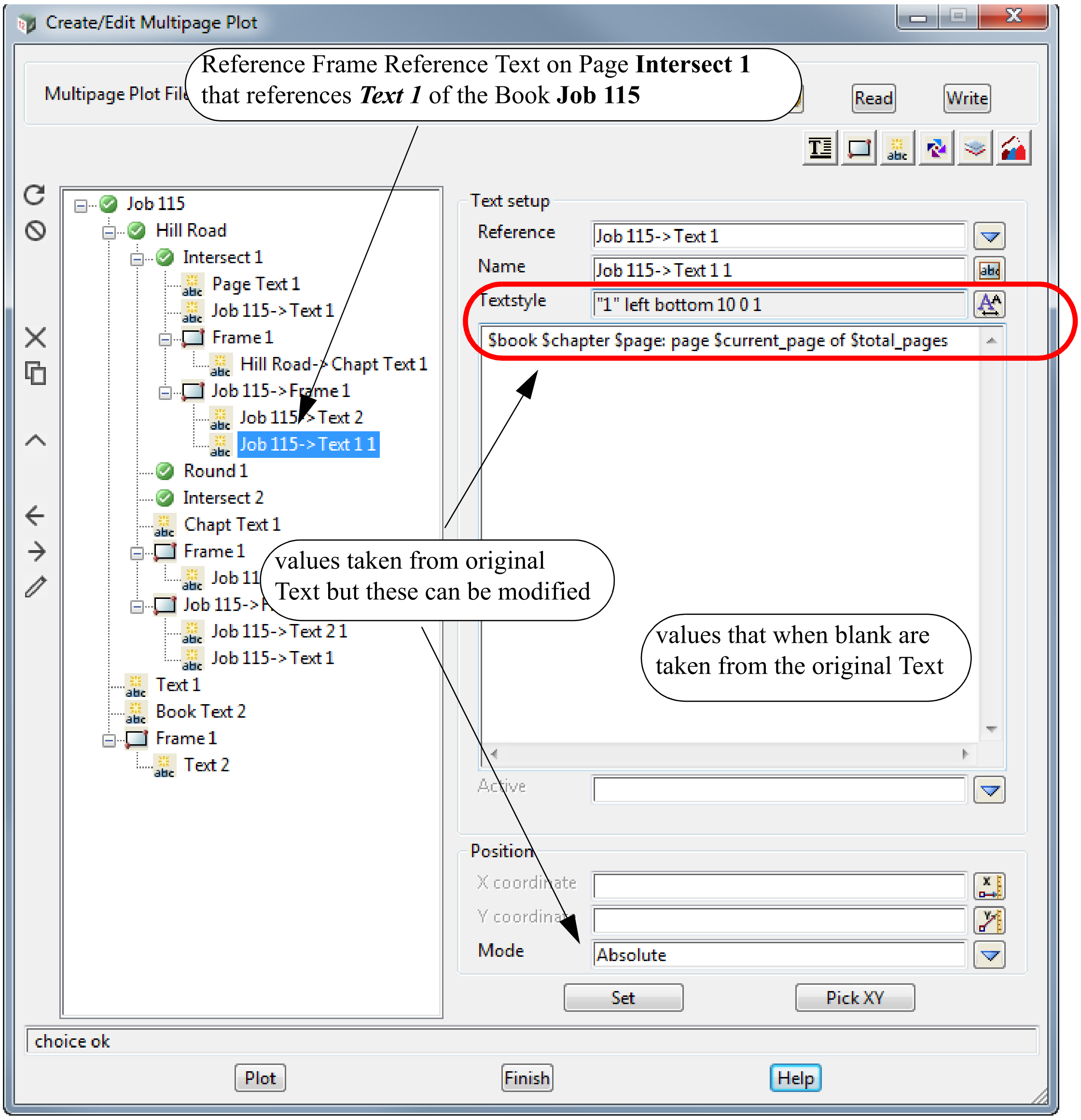


A new **Page Reference Frame Reference Text** is created but it has a blank **Reference** Field.



The Choice pop-up for the ***Reference field*** lists the existing **Book Texts**, **Book Frame Texts**, **Chapter Texts**, **Chapter Reference Texts**, **Chapter Frame Texts, Chapter Frame Reference Texts**, **Chapter Reference Frame Texts** and **Chapter Reference Frame Reference Texts** that this **Reference Text** could reference.

Once a **Text** is selected, it is drawn in the **Page Plot Area** and the name of the **Reference Text** is changed to the full path name of the **Text** that it is referencing. If that name already exists then " **n**" is appended to the name where n is an integer starting with 1.



If the **Page Reference Frame Reference Text** references a **Book Text, Book Frame Text, Chapter Text** or **Chapter Frame Text**, any blank fields in the **Text Setup** take their values from the original **Text** being referenced. Any of the blank values can be changed and the changed values will be used for the **Page Reference Frame Reference Text**.

If the **Page Reference Frame Reference Text** references a **Chapter Reference Text** /**Chapter Reference Frame Text** then the fields in the **Page Reference Frame Reference Text** override the fields in the **Chapter Reference Text/ Chapter Reference Frame Text** which in turn overrides the fields in the original **Book Text**.

Important Notes

1. Please note that the **Page Reference Frame Reference Text** and the **Page Frame Reference Text** are virtually identical and the only difference is that one is in a **Page Reference Frame** and the other in a **Page Frame**.
2. The only way to tell if a **Text** references a **Book Text** or a **Book Frame Text** is that their names have to be unique at the **Book** level.
3. The only way to tell if a **Text** references a **Chapter Text** or a **Chapter Frame Text** is that their names have to be unique at the **Chapter** level.

20.3.4.8.4 Icons and Fields for Text and Frame Text Nodes

The icons, fields and buttons used in the **Book Text, Chapter Text**, **Page Text, Book Frame Text, Chapter Frame Text** and **Page Frame Text** panels have the following functions.

Field Description Type Defaults Pop-Up

Icons on Left Side

The icons on the left side change depending on what is applicable for the highlighted node.

The action of the icons are described in 20.3.4.3 Icons on the Left Side.

Text Setup

Text name text box

name of the Text node.

Textstyle textdata box available textdata

the textstyle data to use for the text.

Text Area text area

area to type the required text into. The default value of Textn is entered so it is easy to see where the text is in the Plot Area. There are also special Text $variables that can be used in the Text Area (see 20.3.4.8.6 MPS Text $variables*).*

Note: if changes are made then the Set button must be pressed for the changes to take effect.

Active choice box Yes, No

*if **Yes**, the text is drawn.*
*If **No**, the text is not drawn.*
*For a Reference Text, the field can be left **blank** and then the value is taken from the referenced Text.*

Position

X/Y coordinate real box measures

the x/y coordinate (in millimetres) for the text.

*If **Mode** is **Absolute** then this is the position of the text in the Plot Area.*

*If **Mode** is **Relative** then this is the position of the text relative to the **Anchor justification** for the Frame.*

Mode choice box Absolute, Relative

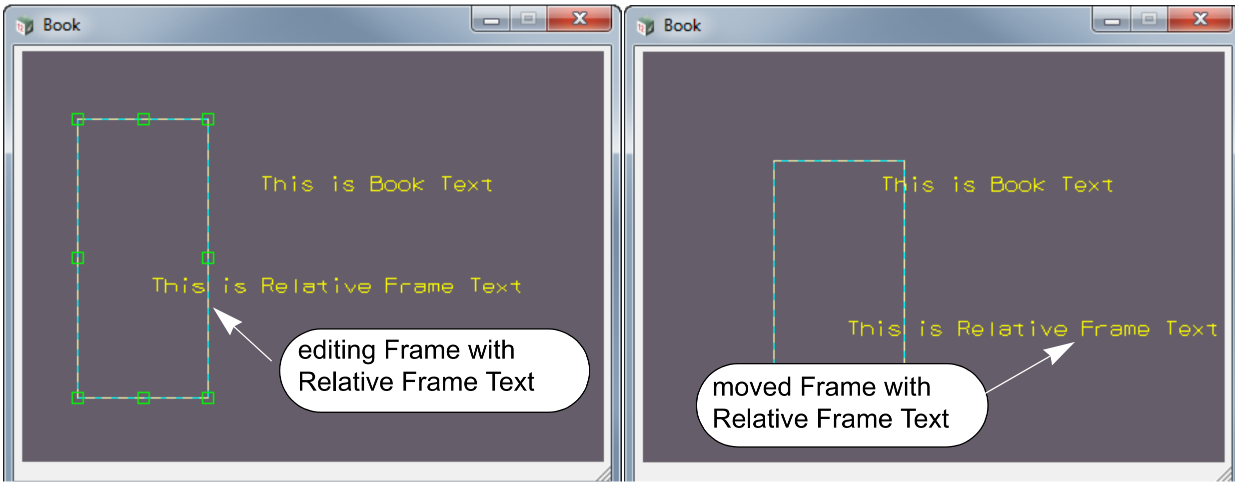
*if **Absolute**, the text is positioned in millimetre coordinates in the Plot Area.*

*If it is **Frame Text** and the Frame the Text is on is moved, the Text does not move with the Frame.*

*If **Relative**, the text is positioned in millimetre relative to the Frame **Anchor justification**.*

*If it is **Frame Text** and the Frame the Text is on is moved, the Text moves with the Frame.*

*If it is **Frame Text** and the Frame is resized, the position of the Text relative to the Frame **Anchor justification** is maintained.*



__Note__: For Book Text, Chapter Text and Page Text, Absolute and Relative are the same thing. __Relative__ is only different for __Frame Text.__

Anchor just	choice box	bottom left, bottom centre, bottom right middle left, middle centre, middle right top left, top centre, top right

If __mode__ is __Relative__ then the text is positioned relative to the selected Frame __Anchor justification__.

If __mode__ is __Absolute__ then __Anchor justification__ is ignored.

Set	button

the **Set** *button must be pressed for any new values in the panel to take effect.*

Pick XY	button

the **Pick XY** *button is used to select a position in the Plot Area and the values are piped into the* **X coordinate** *and* **Y coordinate fields**.

20.3.4.8.5 Plotting Order of Text Nodes

The order of the **Text node** in the tree is important because it determines the drawing order of the **Text** on each page of a plot.

All the **Book Text nodes** are plotted on each **Page**, but if the **Book Text node** is in the tree before a **Page** then the **Book Text** is plotted before the **Page** is plotted.

Similarly if the **Book Text node** is in the tree after a **Page** then the **Book Text** is plotted after the **Page** is plotted.

All the **Chapter Text nodes** are plotted on each **Page** in the **Chapter** but if the **Chapter Text node** appears in the tree before a **Page** in the **Chapter** then the **Chapter Text** is plotted before that **Page** is plotted.

Similarly if the **Chapter Text node** is in the tree after a **Page** in the **Chapter** then the **Chapter Text** is plotted after the **Page** is plotted.

Finally for a **Page node**, the order of the plotting is in the order of the items in the **Page** subtree.

20.3.4.8.6 MPS Text $variables

In the Text Area, there are special $variables that can be used.

(a) **$book** which at plot time is replaced by the **name** of the **Book**.

(b) **$chapter** which at plot time is replaced by the **name** of the **Chapter**.

(c) **$page** which at plot time is replaced by the **name** of the **Page**.

(d) **$frame** which at plot time is replaced by the **name** of the **Frame**.

(e) **$current_page** which at plot time is replaced by the **number** of the **Page**.

(f) **$total_pages** which at plot time is replaced by the **total number** of **pages** in the **Book**.

(g) **$chapter_current_page** which at plot time is replaced with the **number** of the **page** being plotted relative to its **Chapter**. Eg. if the **Chapter** has five pages in it and the page currently being plotted is the third page in that **Chapter** then the substituted value will be 3.

(h) **$chapter_total_pages** which at plot time is replaced by the **total number** of pages in the **Chapter** being plotted.

(i) **$chapter_start_page** which at plot time is replaced by the **number** of the **first page** of the **Chapter** being plotted.

(j) **$chapter_end_page** which at plot time is replaced by the **number** of the **last page** of the **Chapter** being plotted.

(k) **$if_next_page**<> which at plot time is replaced by the **value entered between the angled brackets**, if this page IS NOT the last page in the plot (ie. There is a next page). If this IS the last page in the plot (ie. There isn't a next page), then the whole variable will be removed. If there is a syntax error, then the variable will remain but the '$' sign will be removed. Supports nesting. Example - $if_next_page<CONTINUES ON NEXT PAGE> will be replaced by "CONTINUES ON NEXT PAGE" on all pages but the last page of the plot.

(l) **$if_previous_page**<> which at plot time is replaced by the **value entered between the angled brackets**, if this page IS NOT the first page in the plot (ie. There is a previous page). If this IS the first page in the plot (ie. There isn't a previous page), then the whole variable will be removed. If there is a syntax error, then the variable will remain but the '$' sign will be removed. Supports nesting. Example - $if_previous_page<CONTINUES ON PREVIOUS PAGE> will be replaced by "CONTINUES ON PREVIOUS PAGE" on all pages but the first page of the plot.

(m) **$node_name<page_number>** which at plot time is replaced by the **name of the node that produces the page of the specified page_number**. Where page_number is an integer value. If the **page_number** is out of range, then the whole variable will be removed. If there is a syntax error, then the variable will remain but the '$' sign will be removed. Supports some nesting. Example - $node_name<2> will be replaced by the name of the node that produces the second page. Nesting Example - $node_name<$current_page> will be replaced by the name of the node that produces each page.

(n) **$user** which at plot time is replaced by the user's login name.

(o) **$folder** which at plot time is replaced by the full path name of the working folder for the current project.

(p) **$project** which at plot time is replaced the name of the current project.

(q) **$time**<> which at plot time is replaced by the current local date and time. (eg. Wed Jun 12 11:21:52 2019). **$time**<> has an optional parameter **time_format** (usage: **$time<time_format>**) that enables complete customisation of the output time's format. Details concerning all the available **<time_format>** options are given in 27.2.7.2.6.1 Specifying the Format for $time - Time Format.

(r) **$project_attribute<project_attribute_path>** which at plot time is replaced with the **project_attribute** specified by **project_attribute_path**. More information about the usage of **$project_attribute<project_attribute_path>** can be found at 27.2.7.2.1.3 Project Attributes.

(s) **$synergy_attribute<synergy_attribute_path>** which at plot time is replaced with the

synergy_attribute specified by **synergy_attribute_path**. For example - Text Frame Text - "Job name: $synergy_attribute<Job_Number>" will be written out as the text "Job name: " followed by the text in the 12d Synergy attribute Job_Number.

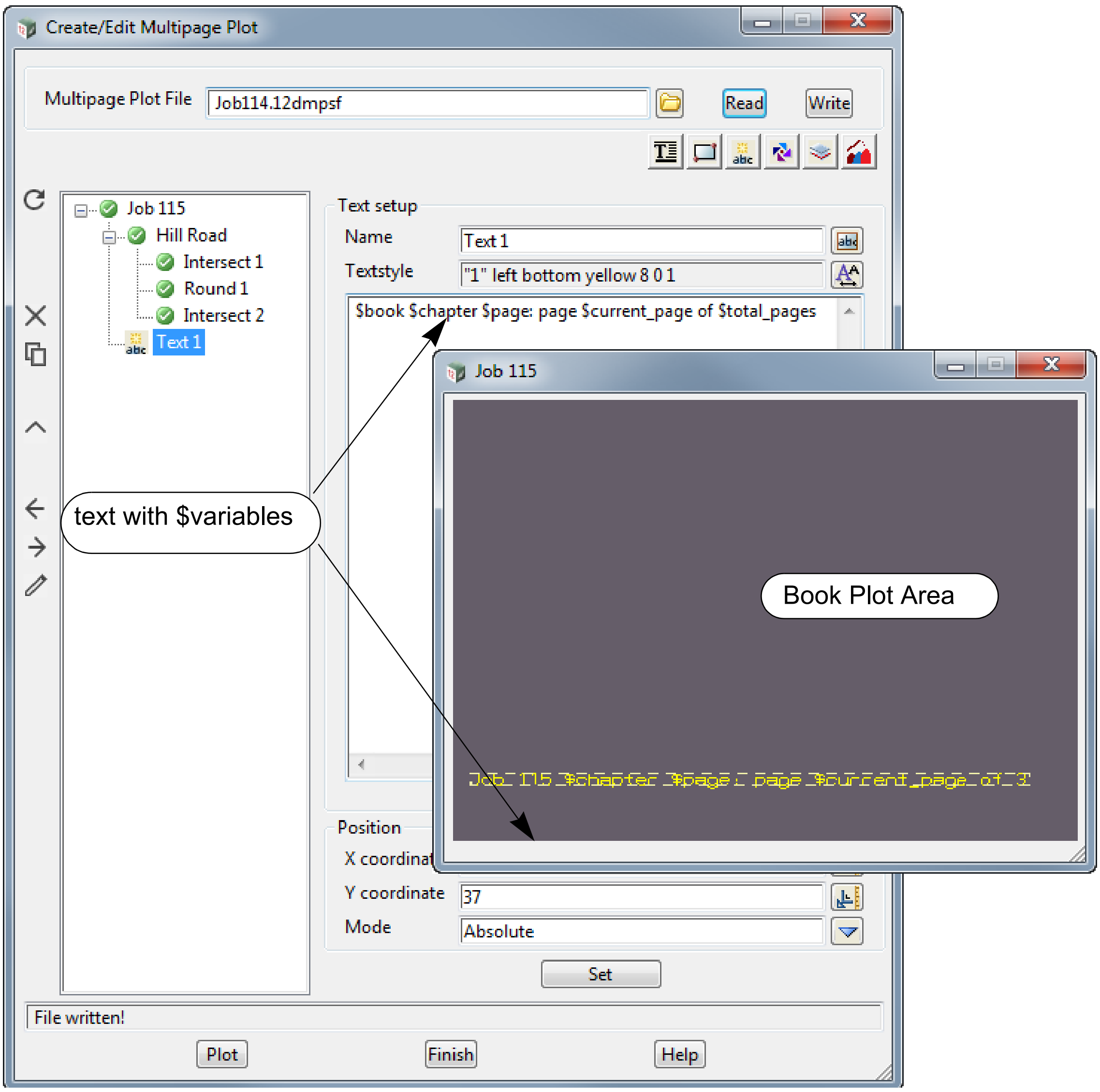
(t) **$project_details<project_details_path>** which at plot time is replaced with the **project_details_attribute** specified by **project_details_path**. The **project_details_path** can either be the name of the attribute group or a more specific path to a single attribute in a group. If the **project_details_path** is only to the group level, then the Value attribute in that group will be returned.For example - Text Frame Text - "Project Number: $project_details<ProjectNumber>" will be written out as the text "Project Number: " followed by the text from the ProjectDetails/ProjectNumber/Value attribute (if it exists).

And for **Frame Text** there are also some special $variables that at plot time, are substituted by values from the Frame. They are

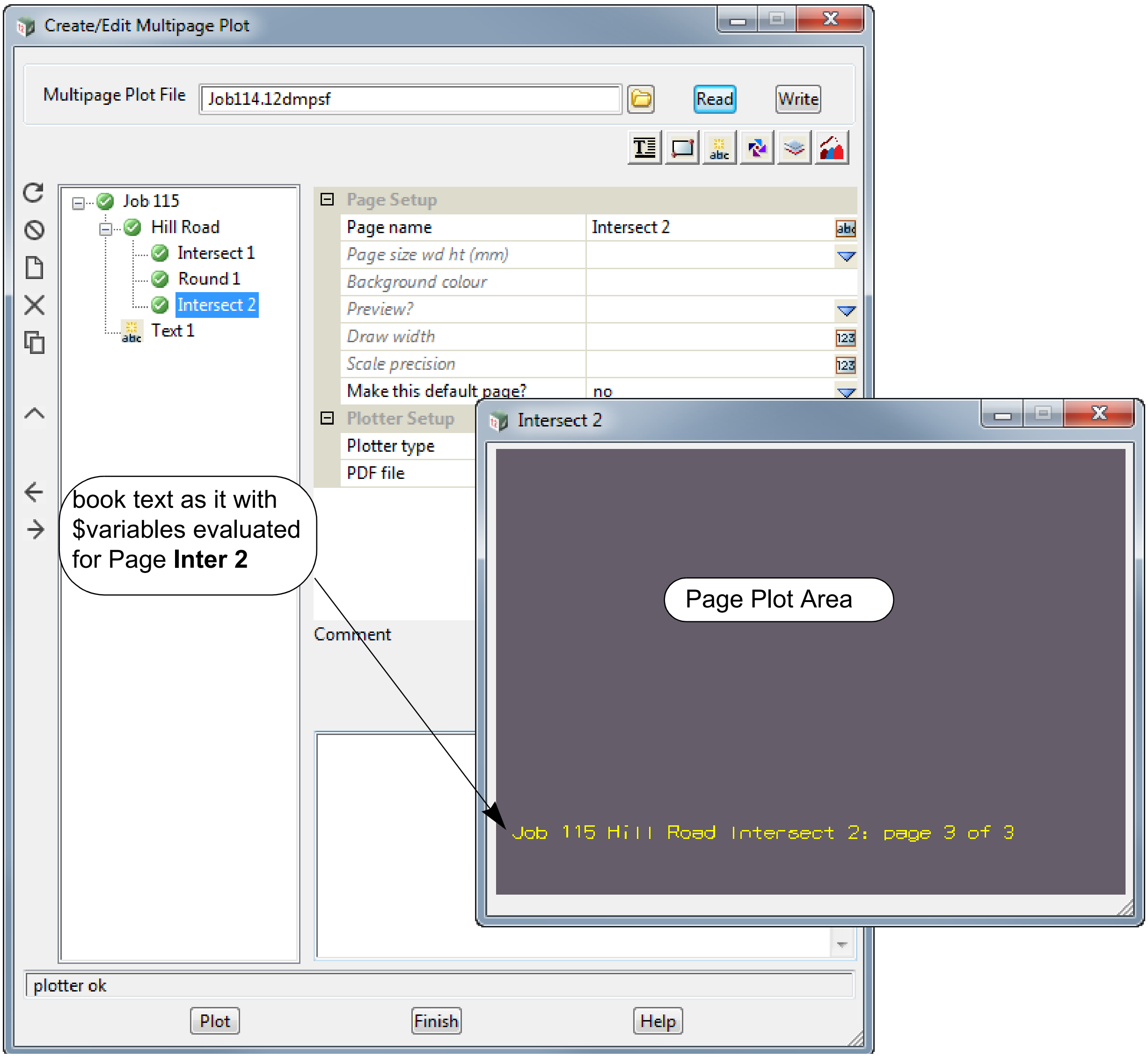
(u) **$scale** which at plot time is replaced by the **Horizontal scale** of the Frame.

(v) **$vertical_exaggeration** which at plot time is replaced by the vertical exaggeration of the Frame.

For Example, the **Book Text** with the text "$book $chapter $page: page $current_page of $total_pages".

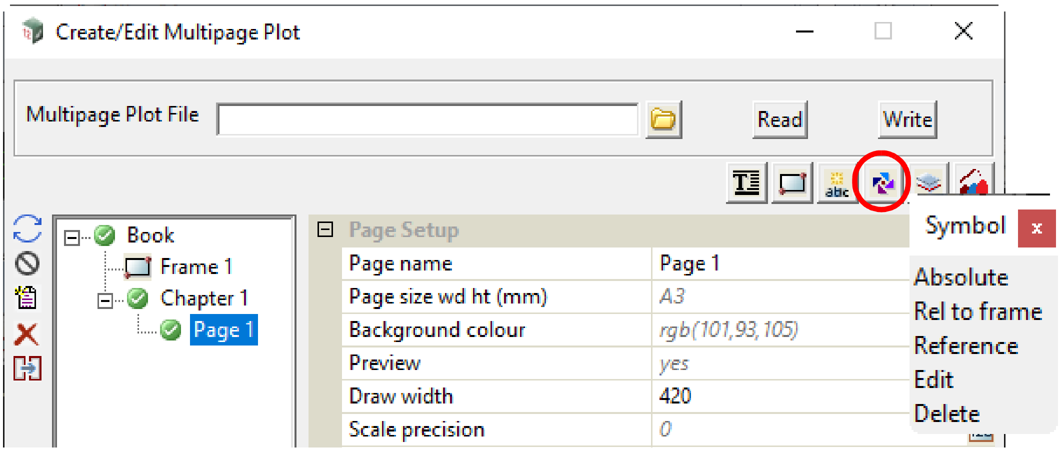


And on **Page** "Intersect 2", this would be evaluated as:


Create/Edit Multipage Plot
Multipage Plot File
Job114.12dmpsf
Read
Write
Job 115
Hill Road
Intersect 1
Round 1
Intersect 2
Text 1
Page Setup
Page name
Intersect 2
Page size wd ht (mm)
Background colour
Preview?
Draw width
Scale precision
Make this default page?
no
Plotter Setup
Plotter type
PDF file
Comment
book text as it with $variables evaluated for Page Inter 2
Intersect 2
Page Plot Area
Job 115 Hill Road Intersect 2: page 3 of 3
plotter ok
Plot
Finish
Help

20.3.4.9 Symbol Icon for Use on a Book, Chapter, Page or Frame Node

Symbols can be placed on a **Book**, **Chapter**, **Page** or **Frame** node using options on the **Symbol** menu which is brought up by clicking on the **Symbol** icon on the top right.



See

[Symbol - Absolute and Rel to Frame]
[Symbol - Reference]
[Symbol - Edit]
[Symbol - Delete]

Symbol - Edit

Edit: can be used to move or modify an existing Symbol on a **Plot Area** that the symbol was created on. For example, if the Symbol was created on a **Chapter Plot Area** then you need to highlight that **Chapter** and select the Symbol on that **Chapter Plot Area** to edit it.

To **move** a Symbol after clicking on **Edit**, pick the Symbol to move with LB **but don't accept it with MB.** The Symbol can then be moved.

If **MB** is clicked to accept the Symbol, the fields defining the Symbol are displayed in the right hand side of the **Create/Edit Multipage Plot** panel. These fields can then be modified.

Note that a Symbol can also be edited by highlighting the **Symbol node** in the tree and pressing **Edit** on the left hand side.

Symbol - Delete

Delete: can be used to delete a Symbol by picking it on a **Plot Area.**

To **delete** a Symbol after clicking on **Delete**, pick and accept the Symbol on a **Plot Area** that the Symbol was created on. For example, if the Symbol was created on a **Chapter Plot Area** then you need to highlight that **Chapter node** and select the Symbol on that **Chapter Plot Area** to delete it.

Note that a Symbol can also be deleted by highlighting the Symbol node in the tree and pressing **Delete** on the left hand side.

Symbol - Absolute and Rel to Frame

The options **Absolute** and **Rel to frame** are used when creating Symbols.

For the **Book**, **Book Symbol** can be created by:

Highlighting the **Book** node, clicking on the **Symbol** icon and selecting **Absolute** from the **Symbol** menu.

This will create a **Book Symbol**.

See [20.3.4.9.1 Creating a Symbol at the Book, Chapter or Page Level].

For the **Book**, a **Book Frame Symbol** can be created by either:

(a) highlighting a **Book Frame** node, clicking on the **Symbol** icon and selecting either **Absolute** or **Rel to frame** from the **Symbol** menu.

This will create a **Book Frame Symbol** for the highlighted **Book Frame** node.

See 20.3.4.9.2.1 Creating a Symbol by Highlighting the Frame Node.

(b) highlighting the **Book** node, clicking on the **Symbol** icon and selecting **Rel to frame** from the **Symbol** menu and then **picking** a **Book Frame** from the **Book Plot Area.**

This will create a **Book Frame Symbol** for the **picked Book Frame**.

See 20.3.4.9.2 Creating Frame Symbols.

For a **Chapter**, a **Chapter Symbol** can be created by:

Highlighting the **Chapter** node, clicking on the **Symbol** icon and selecting **Absolute** from the **Symbol** menu.

This will create a **Chapter Symbol**.

See 20.3.4.9.1 Creating a Symbol at the Book, Chapter or Page Level.

For a **Chapter**, a **Chapter Frame Symbol** can be created by either:

(a) highlighting a **Chapter Frame** node, clicking on the **Symbol** icon and selecting either **Absolute** or **Rel to frame** from the **Symbol** menu.

This will create a **Chapter Frame Symbol** for the highlighted **Chapter Frame** node.

See20.3.4.9.2.1 Creating a Symbol by Highlighting the Frame Node.

(b) highlighting a **Chapter** node, clicking on the **Symbol** icon and selecting **Rel to frame** from the **Symbol** menu and then **picking** a **Chapter Frame** from the **Chapter Plot Area.**

This will create a **Chapter Frame Symbol** for the **picked Chapter Frame**.

See 20.3.4.9.2 Creating Frame Symbols.

For a **Page**, a **Page Symbol** can be created by:

Highlighting the **Page** node, clicking on the **Symbol** icon and selecting **Absolute** from the **Symbol** menu.

This will create a **Page Symbol**.

See 20.3.4.9.1 Creating a Symbol at the Book, Chapter or Page Level.

For a **Page**, a **Page Frame Symbol** can be created by either:

(a) highlighting a **Page Frame** node, clicking on the **Symbol** icon and selecting either **Absolute** or **Rel to frame** from the **Symbol** menu.

This will create a **Page Frame Symbol** for the highlighted **Page Frame** node.

See 20.3.4.9.2.1 Creating a Symbol by Highlighting the Frame Node.

(b) highlighting a **Page** node, clicking on the **Symbol** icon and selecting **Rel to frame** from the **Symbol** menu and then **picking** a **Page Frame** from the **Page Plot Area.**

This will create a **Page Frame Symbol** for the **picked Page Frame**.

See 20.3.4.9.2 Creating Frame Symbols.

Symbol - Reference

The option **Reference** is not for creating a new symbol but creates a **Symbol** node that **references** an existing **Symbol** node. This means that the **Reference Symbol** node has as default, all the values defined for the **Symbol** node that is being referenced BUT any of those values can be modified for the **Reference Symbol** node.

See 20.3.4.10 Model Icon for Use on a Book, Chapter or Page.

Important Note:

The names of the **Book Symbol nodes** and **Book Frame Symbol nodes** must be unique amongst all the **Book Symbol nodes** AND the **Book Frame Symbol nodes.**

For a **Chapter**, the names of the **Chapter Symbol nodes** and the **Chapter Frame Symbol nodes** for **that Chapter** must be unique amongst all the **Chapter Symbol nodes** AND the **Chapter Frame Symbol nodes** for that **Chapter**.

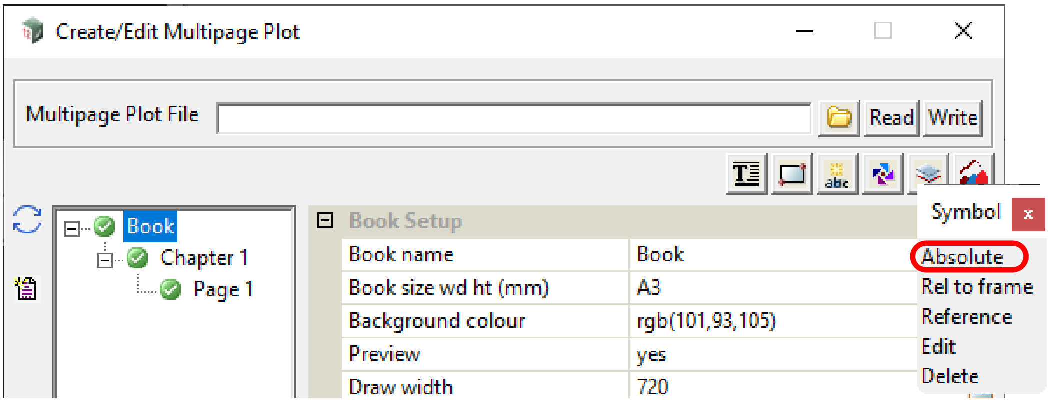
Similarly for a **Page**, the names of the **Page Symbol nodes** and the **Page Frame Symbol nodes** for **that Page** must be unique amongst all the **Page Symbol nodes** AND the **Page Frame Symbol nodes** for that **Page**.

20.3.4.9.1 Creating a Symbol at the Book, Chapter or Page Level

The process for creating **Book Symbol** will be described in detail but the steps are identical for **Chapter** and **Page** except that the word **Book** in the description is replace by **Chapter** or **Page**.

A Symbol is created at the **Book**, **Chapter** or **Page** level by first clicking on and highlighting either the **Book**, **Chapter** or **Page** node, then clicking on the **Symbol** icon on the top right to bring up the **Symbol** menu and finally selecting ***Absolute*** from the **Symbol** menu

.

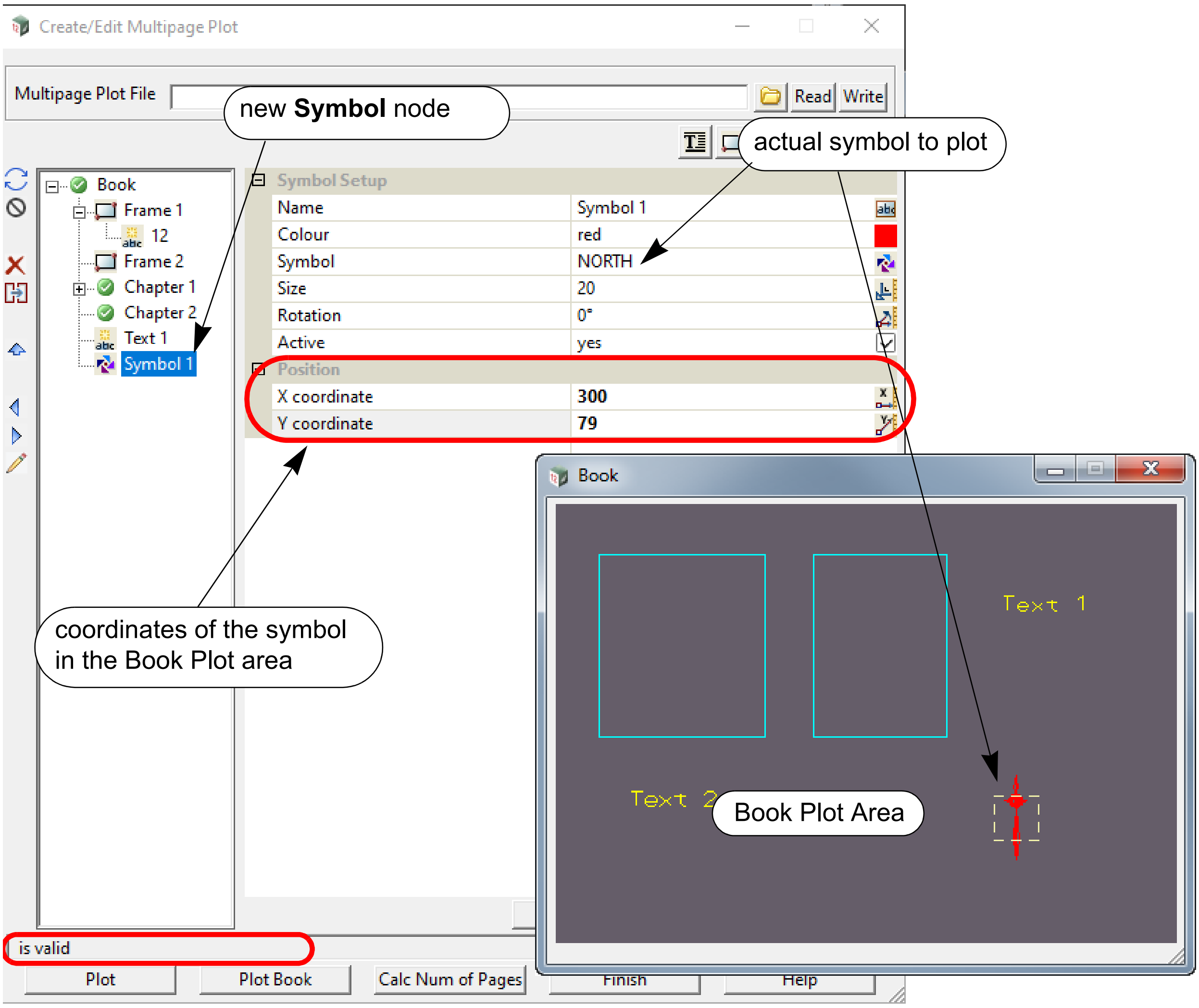


A position in the **Book Plot Area** for the symbol is then selected.

Once the Symbol position is selected, a **Book Symbol node** is automatically added at the bottom of the **Book** with the default name **Symbol n** where **n** is the next integer that makes the **Book Symbol node** name unique amongst all the **Book Symbol nodes** AND the **Book Frame Symbol nodes**.

Similarly the name of a **Chapter Symbol node** must be unique amongst all the **Chapter Symbol nodes** AND the **Chapter Frame Symbol nodes** for that **Chapter**. And the name of a **Page Symbol node** must be unique amongst all the **Page Symbol nodes** AND the **Page Frame Symbol nodes** for that **Page**.

The default Symbol "4dNorth" is added to the **Symbol** field and displayed in the **Book Plot Area**.



Notes

1. For **Book Symbol**, **Chapter Symbol** and **Page Symbol**, the values ***Relative*** and ***Absolute*** for **Rotation Mode** are both treated as an absolute rotation with respect to the **Book Plot Area**.
2. For **Book Symbol**, **Chapter Symbol** and **Page Symbol**, the values ***Relative*** and ***Absolute*** for **Position Mode** are both treated as an absolute position on the **Book Plot Area**.

For documentation on the fields and icons used for **Book Symbol**, **Chapter Symbol** and **Page Symbol**, see 20.3.4.9.4 Icons and Fields for Symbol and Frame Symbol Nodes.

20.3.4.9.2 Creating Frame Symbols

A **Symbol** can be **attached** to a **Frame** at either a **Book**, **Chapter** or **Page** level.

The main difference between a **Frame Symbol** and **a Book, Chapter** or **Page Symbol** is that a **Frame Symbol** can be placed **Absolutely on the Page Area** or **Relative to the Frame.**

If the **Frame Symbol** is **Absolute**, then the **Symbol** is placed at a fixed position on the **Plot Area** that the **Frame** is on and if the **Frame** is moved, the **Symbol does not** move.

If the **Frame Symbol** is **Relative**, its position is **Relative to the Frame** the Symbol is on, and if the Frame is **moved**, the **Frame Symbol moves with the Frame**.

There are two ways of selecting the **Frame** and then creating **Frame Symbol.**

1. Clicking on the **Frame node**.

   See 20.3.4.9.2.1 Creating a Symbol by Highlighting the Frame Node.

2. Picking a **Frame** from the **Plot Area**.

   See 20.3.4.9.2.2 Creating a Frame Symbol by Picking a Frame from a Plot Area.

20.3.4.9.2.1 Creating a Symbol by Highlighting the Frame Node

The process for creating **Book Frame Symbol** will be described in detail but the steps are identical for **Chapter** and **Page** except that in the description, the word **Book** is replace by **Chapter** or **Page**.

To create a **Frame Symbol** using the **Frame node**, click on and highlight the **Book Frame node**, **Chapter Frame node** or **Page Frame node** to add a **Frame Symbol** to.

The **Plot Area** for the **Book**, **Chapter** or **Page** of the **Frame node** is then displayed and the **Frame** highlighted on the **Plot Area**.

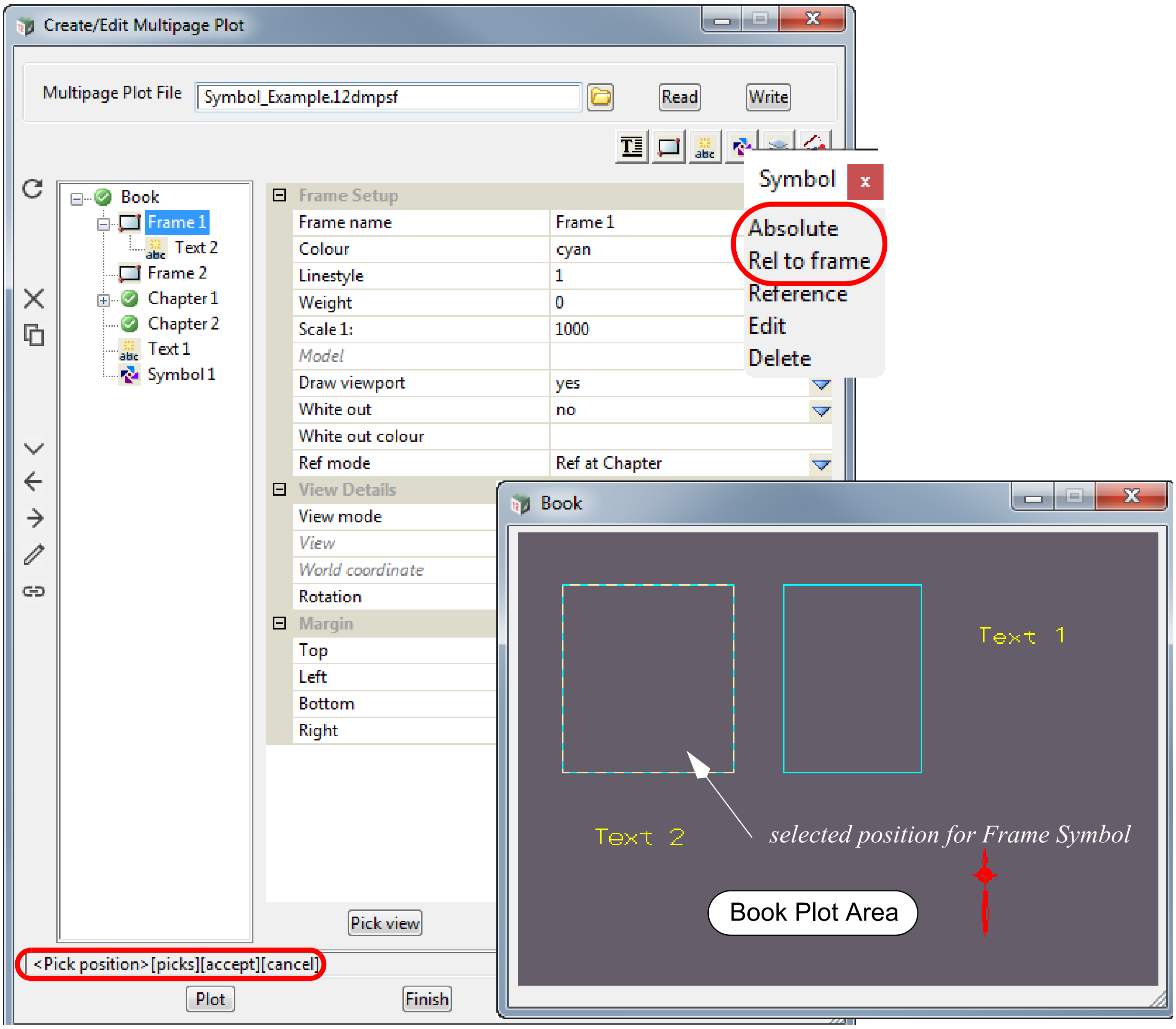
Next click on the **Symbol icon** at the top right to bring up the **Symbol** menu, and from the **Symbol** menu select:

(a) **Rel to frame** if you want the Symbol in the Plot Area to move with the **Frame**.

or

(b) **Absolute** if you want the Symbol to have a fixed position on the **Plot Area**. The Symbol does not move with the **Frame** but the Symbol will be deleted if the Frame is deleted.

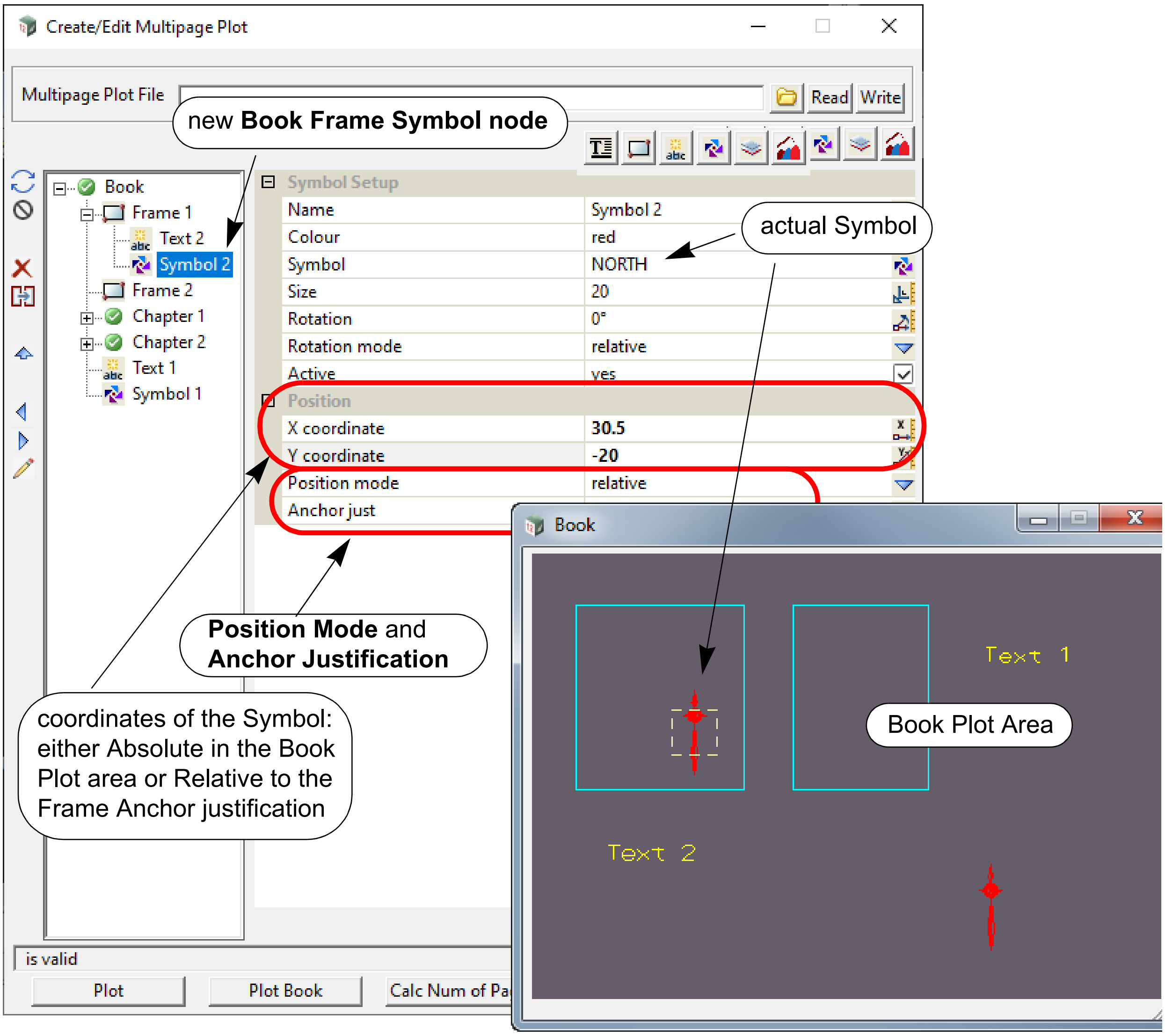
After picking **Rel to Frame** or **Absolute**, the position for the **Frame Symbol** is selected in the **Plot Area**.



Once the Symbol position is selected, a **Book Frame Symbol node** is automatically added at the bottom of the **Book Frame** with the default node name **Symbol n** where **n** is the next integer that makes the **Book Symbol node** name unique amongst all the **Book Symbol nodes** AND **Book Frame Symbol nodes**.

Similarly the name of a **Chapter Frame Symbol node** must be unique amongst all the **Chapter Symbol nodes** AND the **Chapter Frame Symbol nodes** for that **Chapter**. And the name of a **Page Frame Symbol node** must be unique amongst all the **Page Symbol nodes** AND the **Page Frame Symbol nodes** for that **Page**.

The default Symbol "4dNorth" is added to the **Symbol** field and displayed in the **Book Plot Area**.



If ***Absolute*** was chosen from the **Symbol** menu:

> the **Position Mode** is set to ***Absolute*** and the values for **X coordinate** and **Y coordinate** are the position on the Book Plot area.

If ***Rel to Frame*** was chosen from the **Symbol** menu:

> the **Position Mode** is set to ***Relative***, and the **Anchor just** is set to the closest of the nine justification positions for the Frame (bottom left, bottom centre, bottom right, middle left, middle centre, middle right, top left, top centre, top right). The values for **X coordinate** and **Y coordinate** are then relative to the Anchor justification point.

The values for **X coordinate, Y coordinate**, **Mode** and **Anchor just** can be changed at any time and the **Set** button pressed for them to take effect.

If **mode** is **Relative** and the Frame is moved, the Symbol also moves by the same amount.

If **mode** is **Relative** and the Frame is resized, the position of the Symbol relative to the **Anchor justification** is maintained.

For documentation on the fields and icons used for a **Frame Symbol**, see 20.3.4.9.4 Icons and Fields for Symbol and Frame Symbol Nodes.

20.3.4.9.2.2 Creating a Frame Symbol by Picking a Frame from a Plot Area

Instead of having to click on a **Frame node** in the **Book** tree to create a **Symbol**, a **Frame** can be **interactive selected** from either the **Book Plot Area**, **Chapter Plot Area** or **Page Plot Area**.

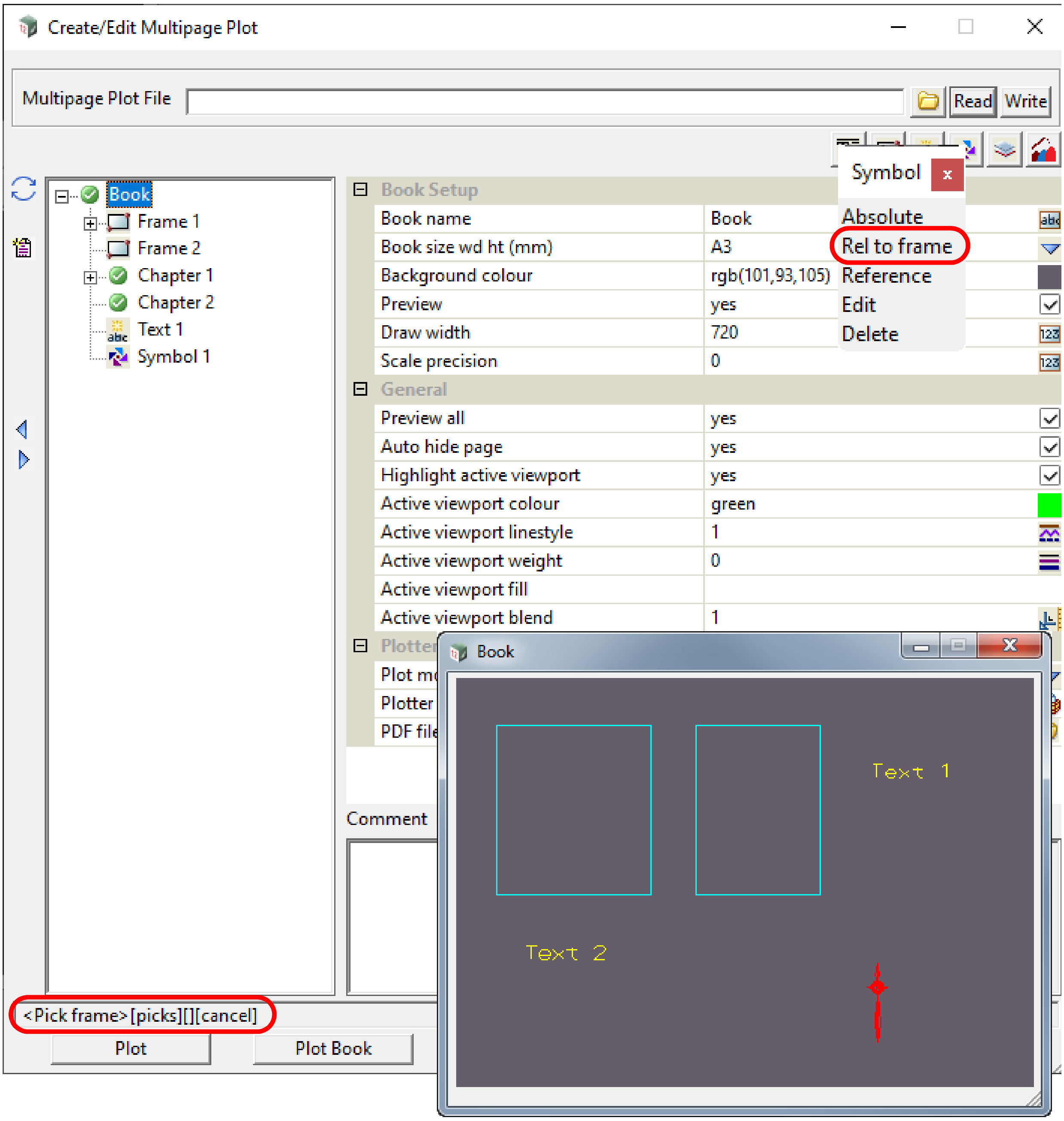
The process is similar to that for a **Book**, **Chapter** or **Page Symbol** except **Rel to frame** must be selected from the **Symbol** menu.

(The steps are identical for a **Book Frame**, **Chapter Frame** or **Page Frame** except that the word **Book** is replaced by **Chapter** or **Page** so the detailed discussion will only be for a **Book Frame**)

To create a **Frame Symbol** by picking a **Frame** on a **Plot Area**, click on and highlight the **Book node**, **Chapter node** or **Page node** to display the **Plot Area**.

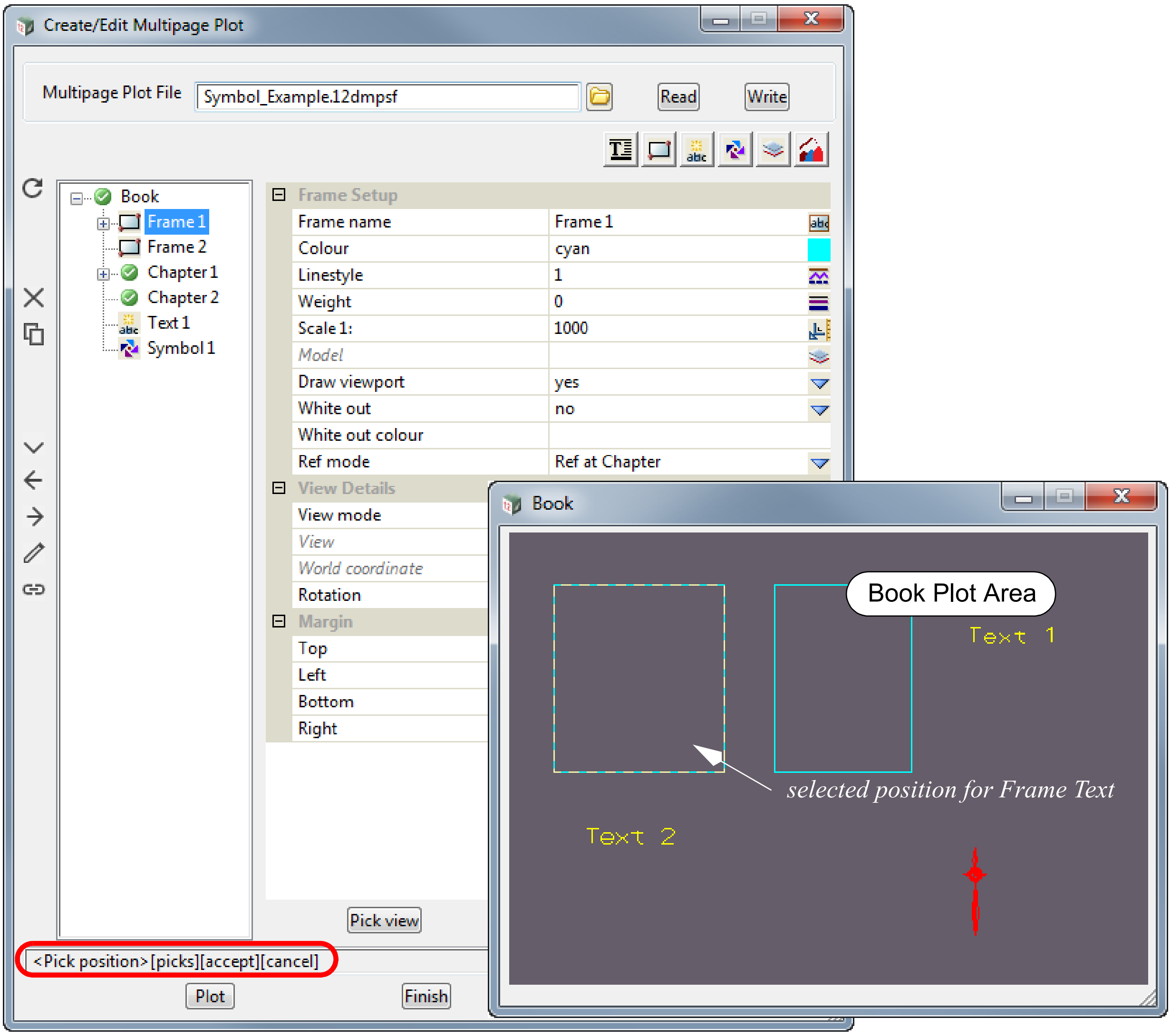
Next click on the **Symbol icon** at the top right to bring up the **Symbol** menu, and select ***Rel to frame*** from the **Symbol** menu.

The user is then asked to pick a **Frame** from the **Plot Area**.



When the **Frame** is **selected**, the **Frame** is highlighted in the **Plot Area** and the **Frame node** highlighted in the tree.

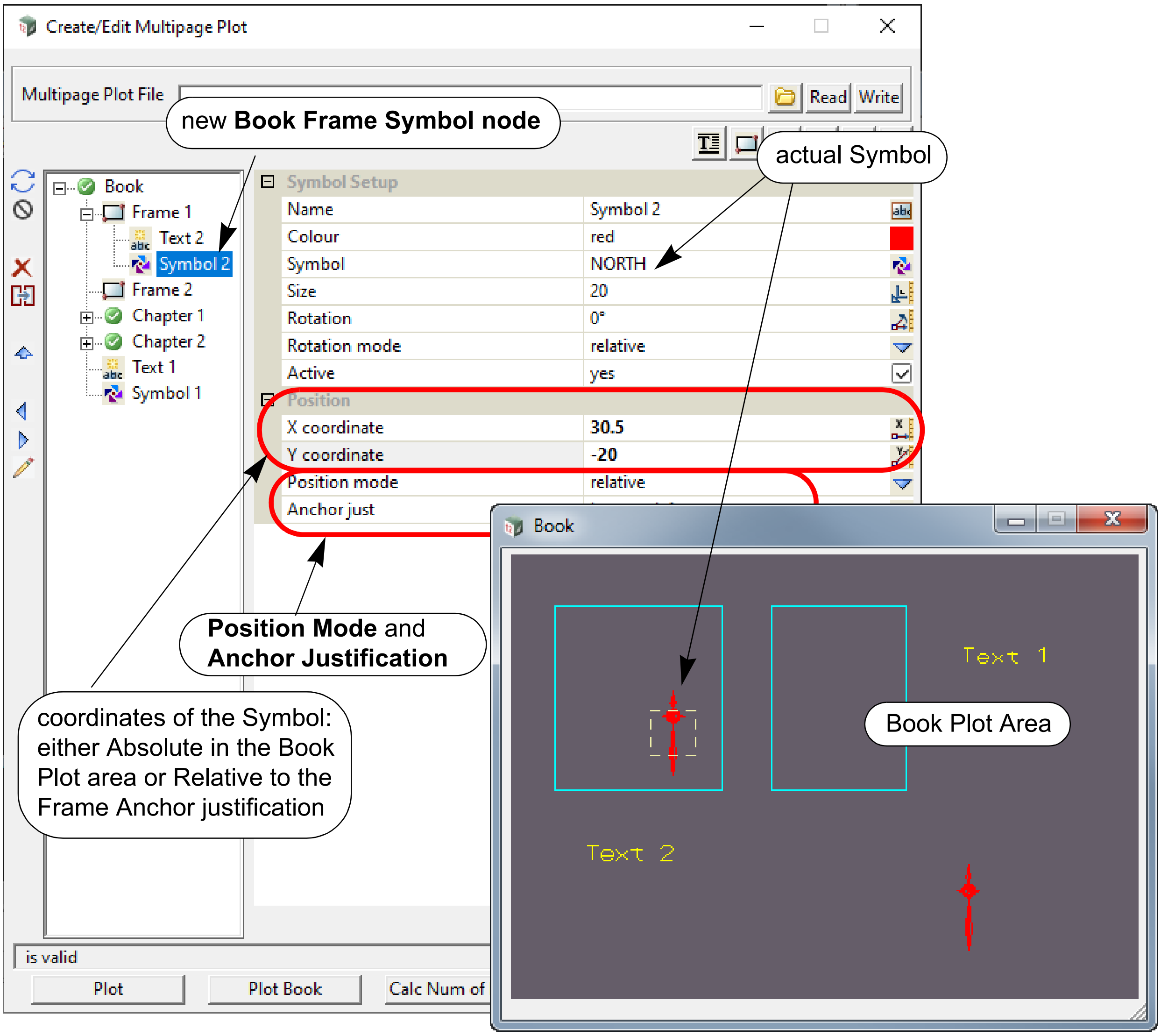
The position for the **Book Frame Symbol** is then selected in the **Plot Area**.



Once the Symbol position is selected, a **Book Frame Symbol node** is automatically added at the bottom of the **Book Frame** with the default name **Symbol n** where **n** is the next integer that makes the **Book Frame Symbol node** name unique amongst all the **Book Symbol nodes** AND **Book Frame Symbol nodes**.

Similarly the name of a **Chapter Frame Symbol node** must be unique amongst all the **Chapter Symbol nodes** AND the **Chapter Frame Symbol nodes** for that **Chapter**. And the name of a **Page Frame Symbol node** must be unique amongst all the **Page Symbol nodes** AND the **Page Frame Symbol nodes** for that **Page**.

The default Symbol "4dNorth" is added to the **Symbol** field and displayed in the **Book Plot Area**.



If ***Absolute*** was chosen from the **Symbol** menu:

> the **Position Mode** is set to ***Absolute*** and the values for **X coordinate** and **Y coordinate** are the position on the Book Plot area.

If ***Rel to Frame*** was chosen from the **Symbol** menu:

> the **Position Mode** is set to ***Relative***, and the **Anchor just** is set to the closest of the nine justification positions for the Frame (bottom left, bottom centre, bottom right, middle left, middle centre, middle right, top left, top centre, top right). The values for **X coordinate** and **Y coordinate** are then relative to the Anchor justification point.

The values for **X coordinate, Y coordinate**, **Mode** and **Anchor just** can be changed at any time and the **Set** button pressed for them to take effect.

If **mode** is **Relative** and the Frame is moved, the Symbol also moves by the same amount.

If **mode** is **Relative** and the Frame is resized, the position of the Symbol relative to the **Anchor justification** is maintained.

For documentation on the fields and icons used for **Frame Symbol**, see 20.3.4.9.4 Icons and Fields for Symbol and Frame Symbol Nodes.

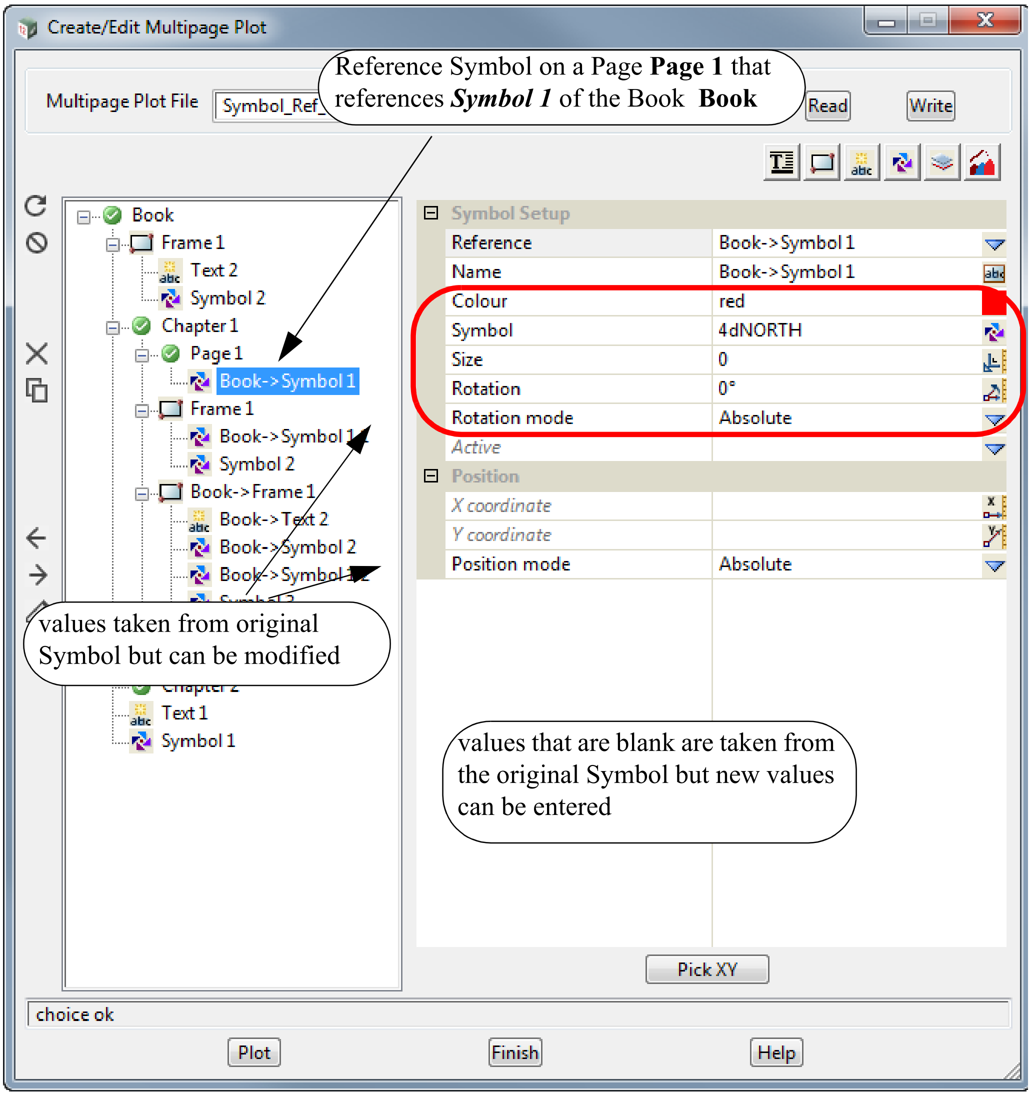
20.3.4.9.3 Reference Symbol

A **Relative Symbol** is not for creating a new **Symbol node** but creates a **Reference Symbol node that references** an existing **Symbol node** or **Reference Symbol node** at a higher level, and optionally replaces the values defining the new **Reference Symbol**.

That is, a **Reference Symbol** at a **Chapter** level can only reference a **Book Symbol** or a **Book Frame Symbol**. And a **Reference Symbol** at the **Page** level can only reference a **Book Symbol**, **Book Frame Symbol, Chapter Symbol, Chapter Frame Symbol, Chapter Reference Symbol**, **Chapter Reference Frame Symbol** or a **Chapter Reference Frame Reference Symbol.**

The **Reference Symbol** has as defaults all the values defined for the **Symbol** that is being referenced BUT any of those values can be modified for the **Reference Symbol**. In particular, the **Reference Symbol** can be made active/inactive independently of the original **Symbol**.

For example, if a **Book Symbol** was created then that symbol would by default be drawn exactly the same way on each **Page**. If a **Reference Symbol** was created on a **Page** and it referenced the **Book Symbol**, then the **Reference Symbol** would then specify how that **Book Symbol** was drawn on that **Page** and any of the Symbol values could be changed. For example, the actual symbol or its colour could be changed, or the **Reference Symbol** could be made inactive so that the **Symbol** is **no longer drawn** on that **Page**.



A **Reference Symbol** can be is created in six ways:

(a) **Chapter Reference Symbol.** *See* 20.3.4.9.3.1 Creating Chapter Reference Symbol.

(b) **Chapter Frame Reference Symbol** *See* 20.3.4.9.3.2 Creating Chapter Frame Reference Symbol.

(c) **Chapter Reference Frame Reference Symbol** *See* 20.3.4.9.3.3 Creating Chapter Reference Frame Reference Symbol.

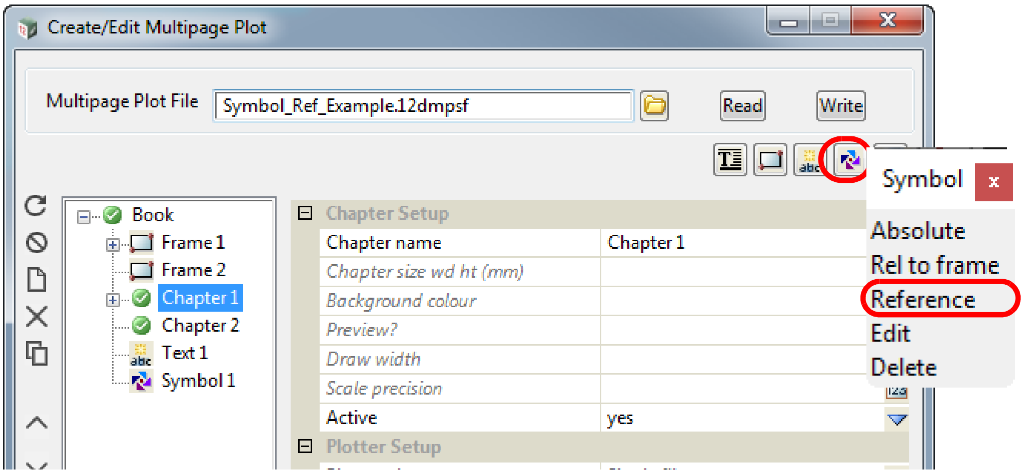
(d) **Page Reference Symbol.** *See* 20.3.4.9.3.4 Creating a Page Reference Symbol.

(e) **Page Frame Reference Symbol.** *See* 20.3.4.9.3.5 Creating Page Frame Reference Symbol.

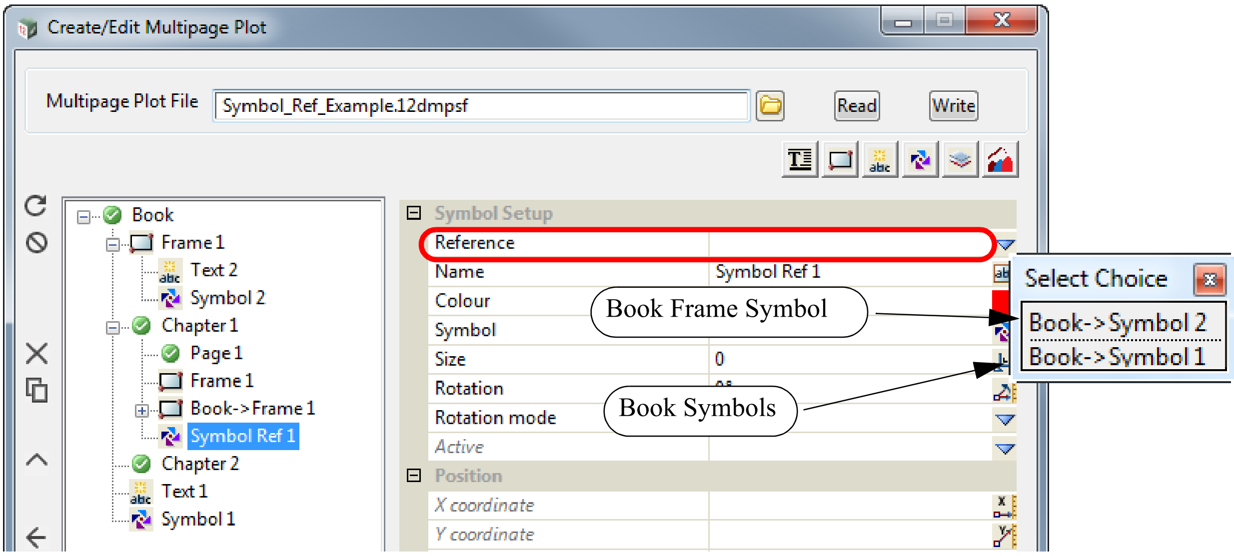
(f) **Page Reference Frame Reference Symbol.** *See* 20.3.4.9.3.6 Creating Page Reference Frame Reference Symbol.

20.3.4.9.3.1 Creating Chapter Reference Symbol

To create a **Chapter Reference Symbol** for a **Chapter**, click on the **Chapter node** and then click on the **Symbol** icon and select **Reference** from the **Symbol** menu.



A new **Chapter Reference Symbol** is created but it has a blank **Reference** Field.



The Choice pop-up for the ***Reference field*** lists the existing **Book Symbols** and **Book Frame Symbols** that this **Reference Symbol** could reference.

Once a **Symbol** is selected, it is drawn in the **Chapter Plot Area** and the name of the **Reference Symbol** is changed to the full path name of the **Symbol** that is referencing. If that name already exists then " **n**" is appended to the name where n is an integer starting with 1.

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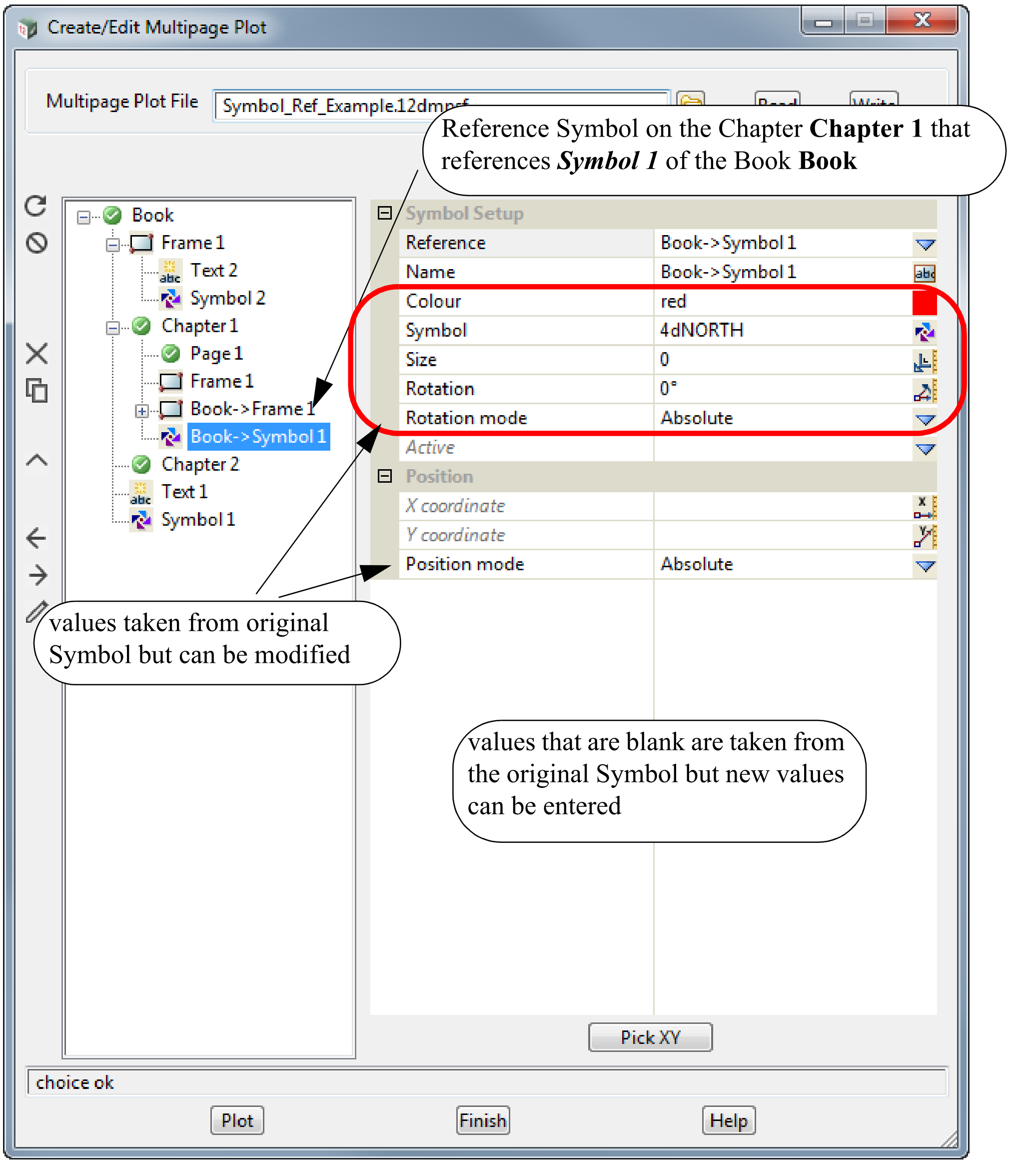


If the **Chapter Reference Symbol** references a **Book Symbol** or **Book Frame Symbol,** any blank fields in the **Symbol Setup** take their values from the original **Symbol** being referenced. Any of the blank values can be changed and the changed values will be used for the **Chapter Reference Symbol**.

Important Notes

1. If you don't want to display a **Book Symbol** for a particular chapter, then for that chapter, create a **Chapter Reference Symbol** which references the appropriate **Book Symbol**. And in the **Chapter Reference Symbol** fields, set the ***Active*** field to **No**.

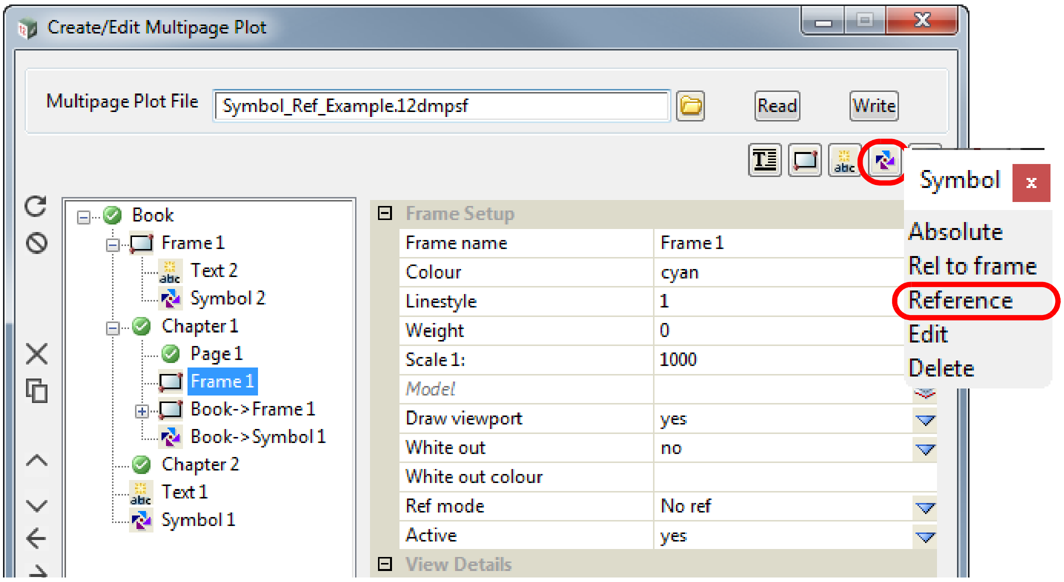
2. If you don't want to display **Book Frame Symbol** for a particular chapter, then for that chapter, create a **Chapter Reference Frame** that references the **Book Frame** that contains the **Book Frame Symbol**. This new **Chapter Reference Frame** will also include a **Chapter Reference Frame Reference Symbol** that references the appropriate **Book Frame Symbol**. And in the **Chapter Reference Frame Reference Symbol** fields, set the ***Active*** field to **No**.

3. If a **Book Symbol** has been set to ***Inactive*** (i.e. OFF) then it can be **displayed** for a **particular** chapter by creating a **Chapter Reference Symbol** that references the appropriate **Book Symbol**. And in the **Chapter Reference Symbol** fields, set the ***Active*** field to **Yes**.

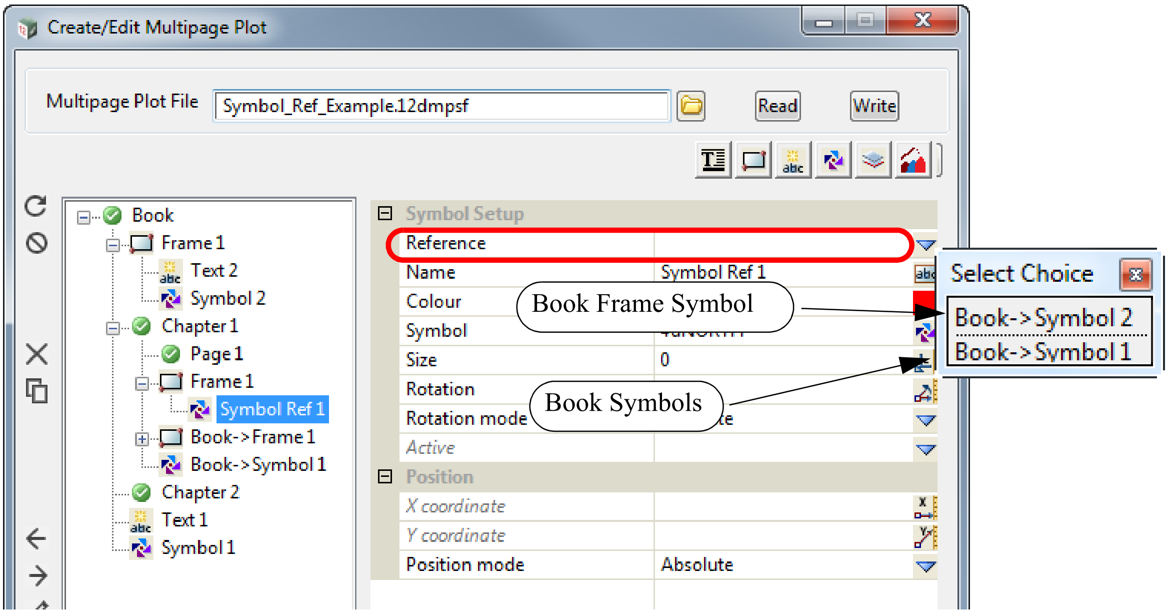
4. If a **Book Frame Symbol** has been set to ***Inactive*** (i.e. OFF) then it can be **displayed** for a **particular** chapter by creating a a **Chapter Reference Frame** that references the **Book Frame** that contains the **Book Frame Symbol**. This new **Chapter Reference Frame** will also include a **Chapter Reference Frame Reference Symbol** that references the appropriate **Book Frame Symbol**. And in the **Chapter Reference Frame Reference Symbol** fields, set the ***Active*** field to **Yes**.

20.3.4.9.3.2 Creating Chapter Frame Reference Symbol

To create a **Chapter Frame Reference Symbol** for a **Chapter Frame**, click on the **Chapter Frame node** and then click on the **Symbol** icon and select **Reference** from the **Symbol** menu.

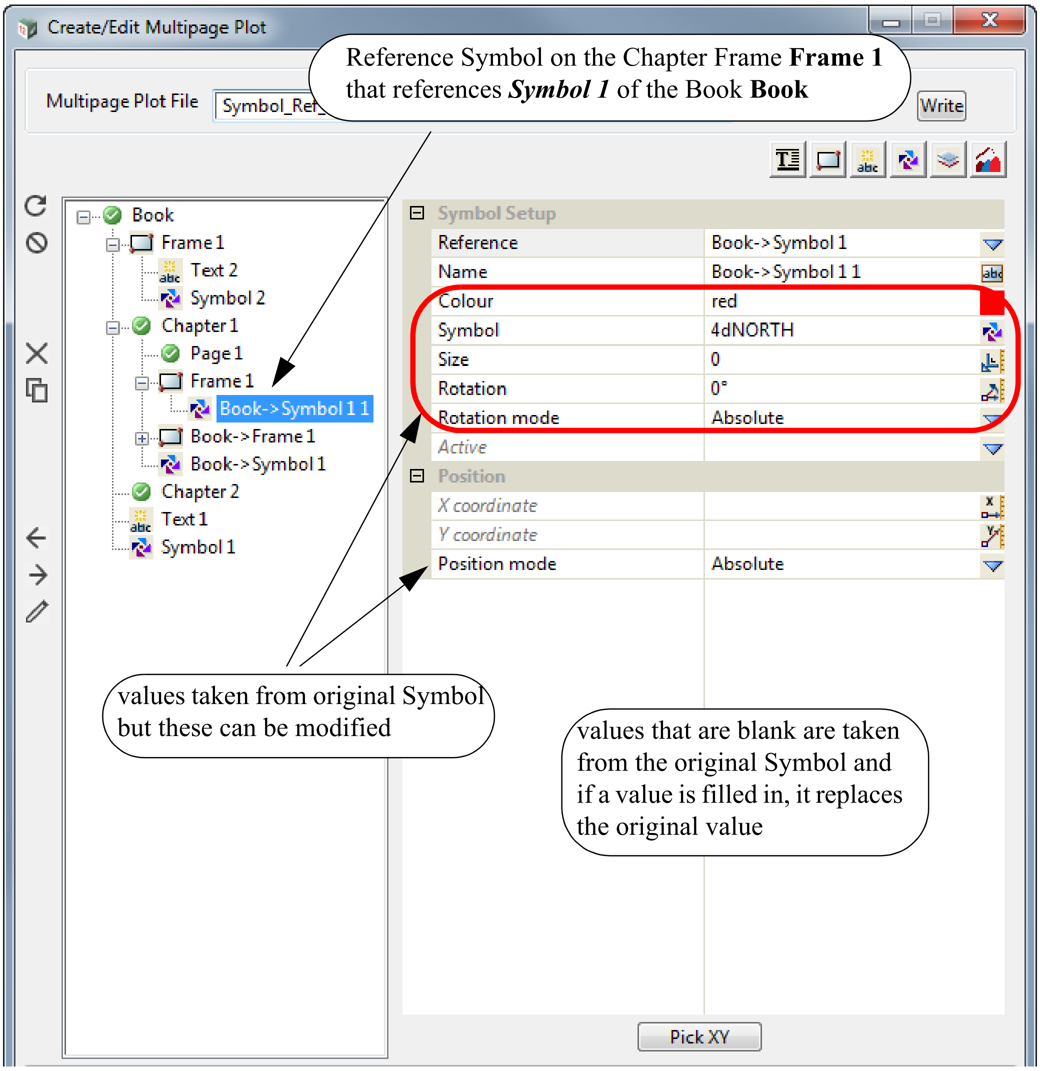


A new **Chapter Frame Reference Symbol** is created but it has a blank **Reference** Field.



The Choice pop-up for the ***Reference field*** lists the existing **Book Symbols** and **Book Frame Symbols** that this **Reference Symbol** could reference.

Once a **Symbol** is selected, it is drawn in the **Chapter Plot Area** and the name of the **Reference Symbol** is changed to the full path name of the **Symbol** that is referencing. If that name already exists then " **n**" is appended to the name where n is an integer starting with 1.



If the **Chapter Frame Reference Symbol** references a **Book Symbol** or **Book Frame Symbol,** any blank fields in the **Symbol Setup** take their values from the original **Symbol** being referenced. Any of the blank values can be changed and the changed values will be used for the **Chapter Frame Reference Symbol**.

Important Notes

1. If you don't want to display **Book Symbol** for a particular chapter, then for that chapter, create a **Chapter Reference Symbol** which references the appropriate **Book Symbol**. And in the **Chapter Reference Symbol** fields, set the ***Active*** field to **No**.
2. If you don't want to display **Book Frame Symbol** for a particular chapter, then for that chapter, create a **Chapter Reference Frame** that references the **Book Frame** that contains the **Book Frame Symbol**. This new **Chapter Reference Frame** will also include a **Chapter Reference Frame Reference Symbol** that references the appropriate **Book Frame Symbol**. And in the **Chapter Reference Frame Reference Symbol** fields, set the ***Active*** field to **No**.
3. If a **Book Symbol** has been set to ***Inactive*** (i.e. OFF) then it can be **displayed** for a **particular** chapter by creating a **Chapter Reference Symbol** that references the appropriate **Book Symbol**. And in the **Chapter Reference Symbol** fields, set the ***Active*** field to **Yes**.
4. If a **Book Frame Symbol** has been set to ***Inactive*** (i.e. OFF) then it can be **displayed** for a **particular** chapter by creating a a **Chapter Reference Frame** that references the **Book Frame** that contains the **Book Frame Symbol**. This new **Chapter Reference Frame** will also include a **Chapter Reference Frame Reference Symbol** that references the appropriate **Book Frame**

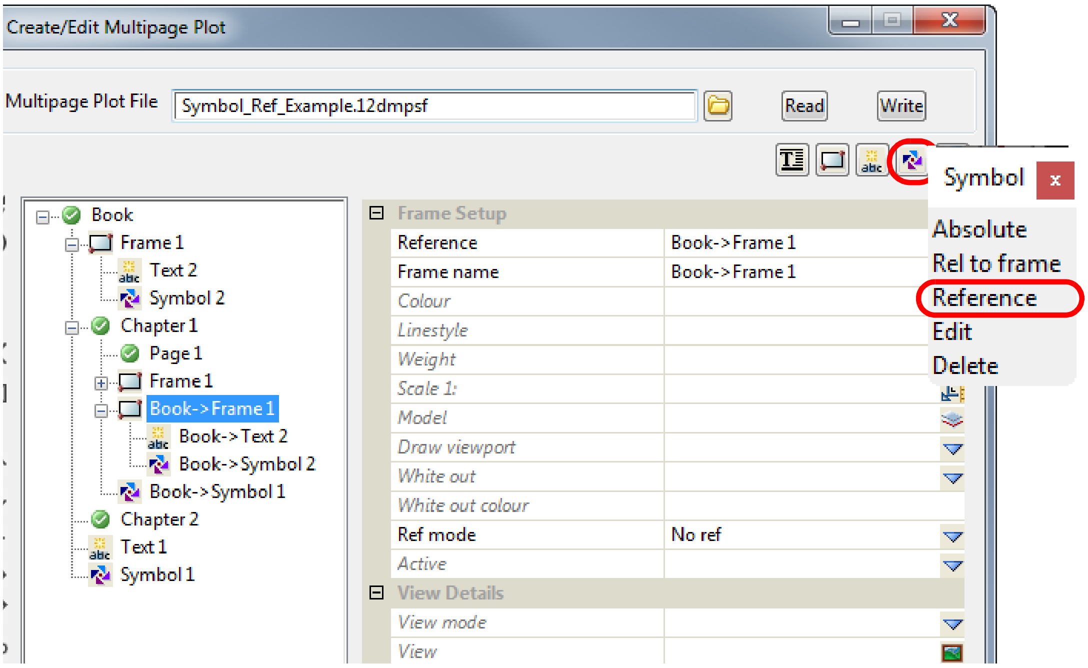
Symbol. And in the **Chapter Reference Frame Reference Symbol** fields, set the ***Active*** field to **Yes**.

20.3.4.9.3.3 Creating Chapter Reference Frame Reference Symbol

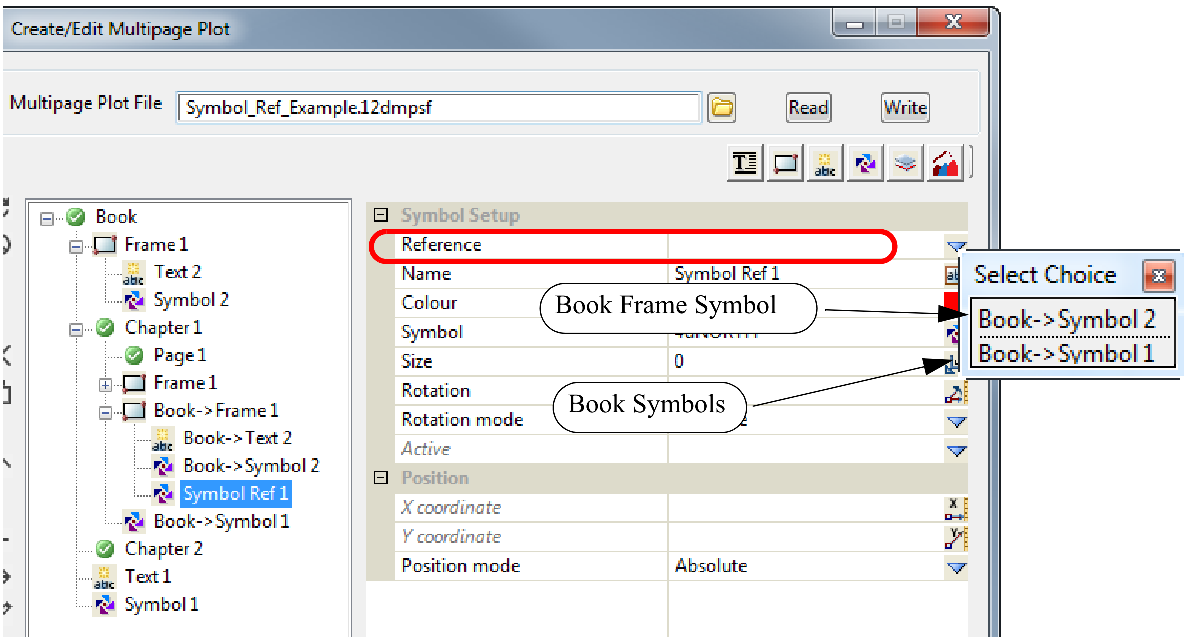
Important Note

Please note that the **Chapter Reference Frame Reference Symbol** and a **Chapter Frame Reference Symbol** are virtually identical and the only difference is that one is in a **Chapter Reference Frame** and the other in a **Chapter Frame**.

A **Chapter Reference Frame Reference Symbol** for a **Chapter Reference Frame** is created by clicking on the **Chapter Reference Frame node** and then clicking on the **Symbol** icon and selecting **Reference** from the **Symbol** menu.



A new **Chapter Reference Frame Reference Symbol** is created but it has a blank **Reference** Field.



The Choice pop-up for the ***Reference field*** lists the existing **Book Symbols** and **Book Frame Symbols** that this **Reference Symbol** could reference.

Once a **Symbol** is selected, it is drawn in the **Chapter Plot Area** and the name of the **Reference Symbol** is changed to the full path name of the **Symbol** that is referencing. If that name already exists then " **n**" is appended to the name where n is an integer starting with 1.

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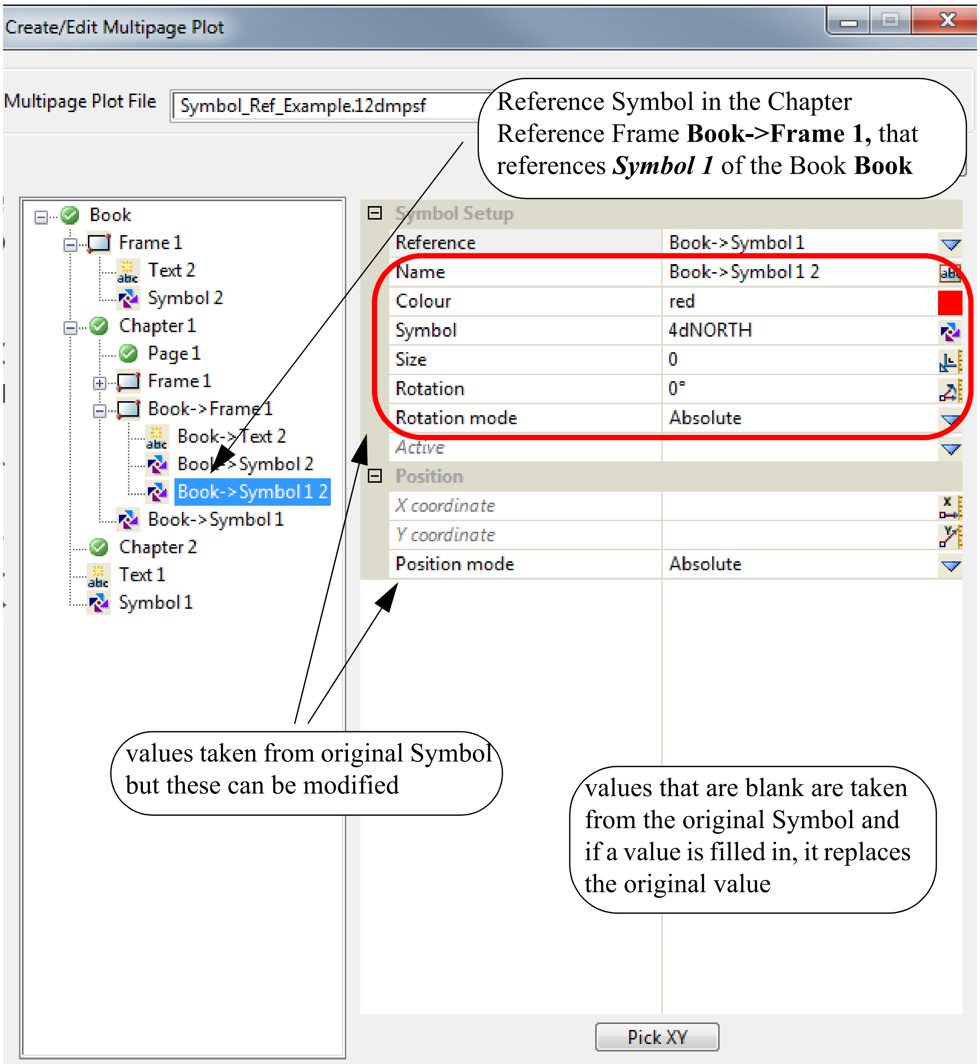


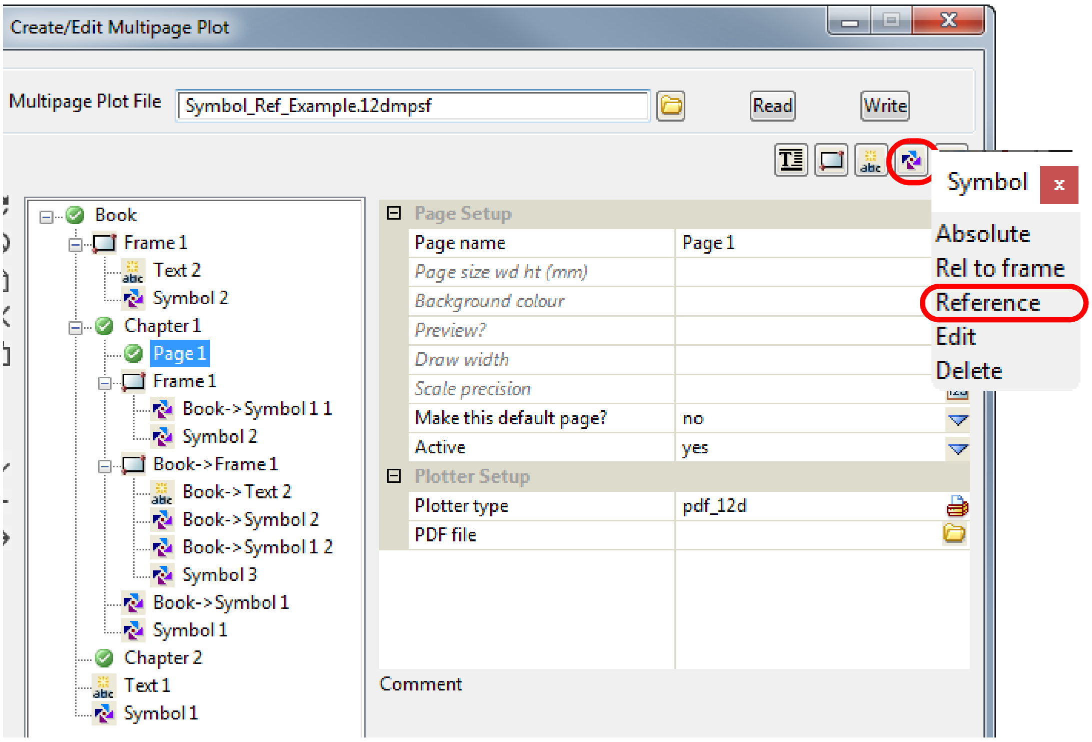
If the **Chapter Reference Frame Reference Symbol** references a **Book Symbol** or **Book Frame Symbol,** any blank fields in the **Symbol Setup** take their values from the original **Symbol** being referenced. Any of the blank values can be changed and the changed values will be used for the **Chapter Reference Frame Reference Symbol**.

Important Notes

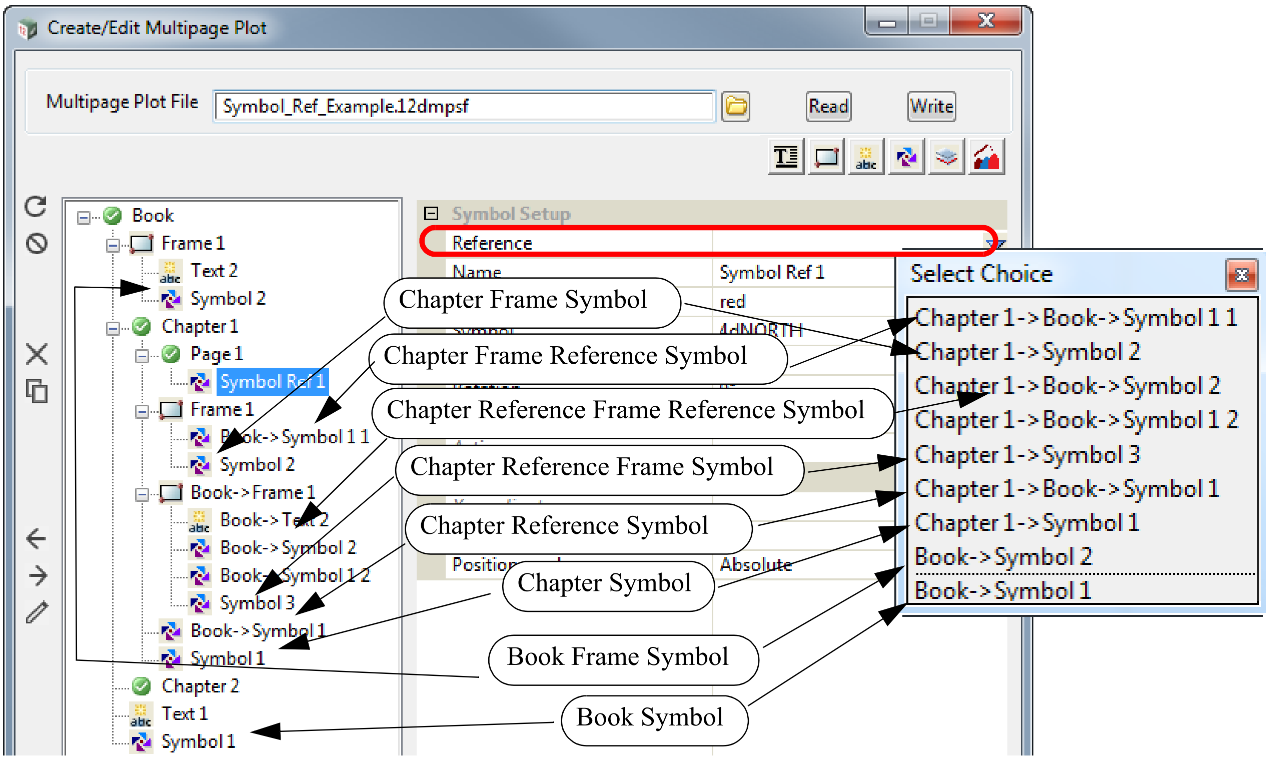
1. Please note that the **Chapter Reference Frame Reference Symbol** and the **Chapter Frame Reference Symbol** are virtually identical and the only difference is that one is in a **Chapter Reference Frame** and the other in a **Chapter Frame.**
2. The only way to tell if a **Symbol** references a **Book Symbol** or a **Book Frame Symbol** is that their names have to be unique at the **Book** level.

20.3.4.9.3.4 Creating a Page Reference Symbol

To create a **Page Reference Symbol** for a **Page**, click on the **Page node** and then click on the **Symbol** icon and select **Reference** from the **Symbol** menu.



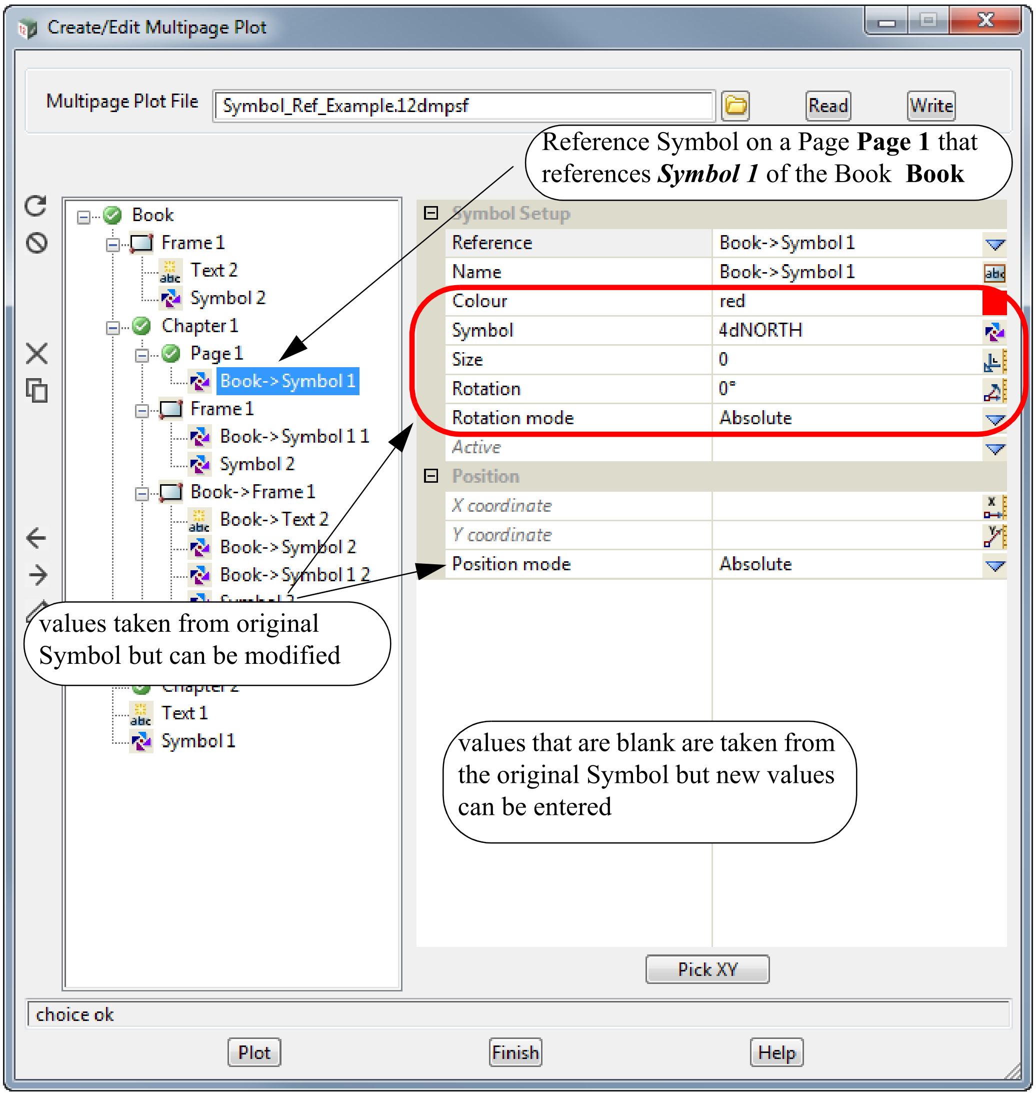
A new **Page Reference Symbol** is created but it has a blank **Reference** Field.



The Choice pop-up for the ***Reference field*** lists the existing **Book Symbols**, **Book Frame Symbols**, **Chapter Symbols, Chapter Reference Symbols**, **Chapter Frame Symbols**, **Chapter Frame Reference Symbols**, **Chapter Reference Frame Symbols** and **Chapter Reference Frame**

Reference Symbols that this **Reference Symbol** could reference.

Once a **Symbol** is selected, it is drawn in the **Page Plot Area** and the name of the **Reference Symbol** is changed to the full path name of the **Symbol** that is referencing. If that name already exists then " **n**" is appended to the name where n is an integer starting with 1.



If the **Page Reference Symbol** references a **Book Symbol, Book Frame Symbol, Chapter Symbol** or **Chapter Frame Symbol**, any blank fields in the **Symbol Setup** take their values from the original **Symbol** being referenced. Any of the blank values can be changed and the changed values will be used for the **Page Reference Symbol**.

If the **Page Reference Symbol** references a **Chapter Reference Symbol** or a **Chapter Frame Reference Symbol** or a **Chapter Reference Frame Reference Symbol** then the fields in the **Page Reference Symbol** override the fields in the **Chapter Reference Symbol** which in turn overrides the fields in the original **Book Symbol**.

Important Notes

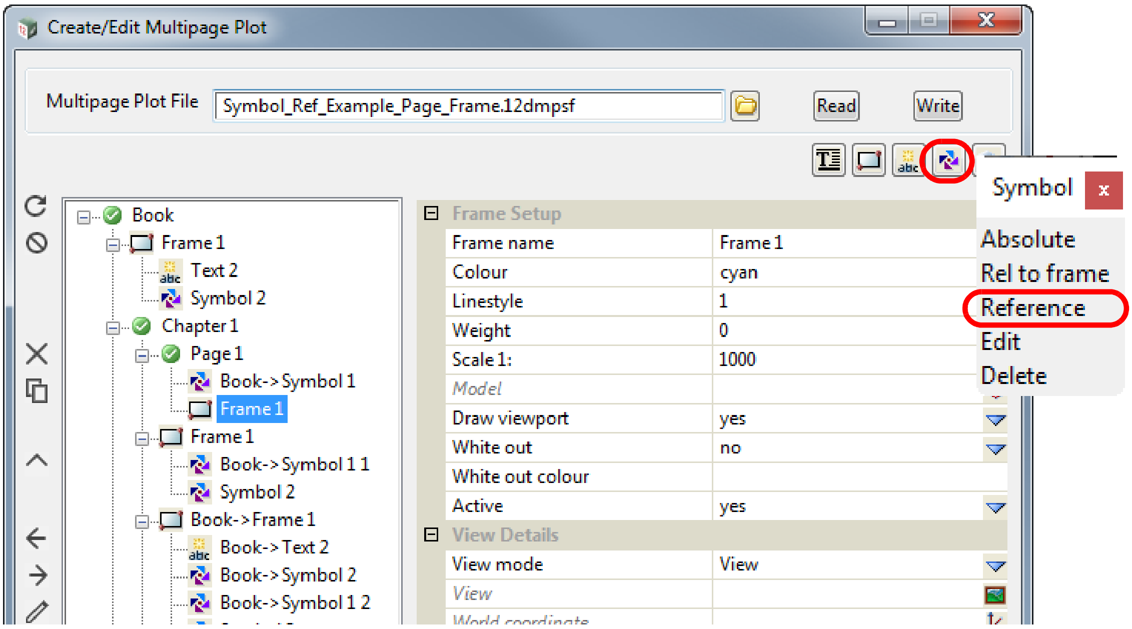
1. If you don't want to display **Book Symbol** for a particular page, then for that page, create a **Page Reference Symbol** which references the appropriate **Book Symbol**, and in the **Page Reference Symbol** fields, set the ***Active*** field to **No**.
2. If you don't want to display **Chapter Symbol** for a particular page, then for that page, create a **Page Reference Symbol** which references the appropriate **Chapter Symbol**, and in the **Page Reference Symbol** fields, set the ***Active*** field to **No**.

3. If you don't want to display **Chapter Reference Symbol** for a particular page, then for that page, create a **Page Reference Symbol** which references the appropriate **Chapter Reference Symbol**, and in the **Page Reference Symbol** fields, set the ***Active*** field to **No**.

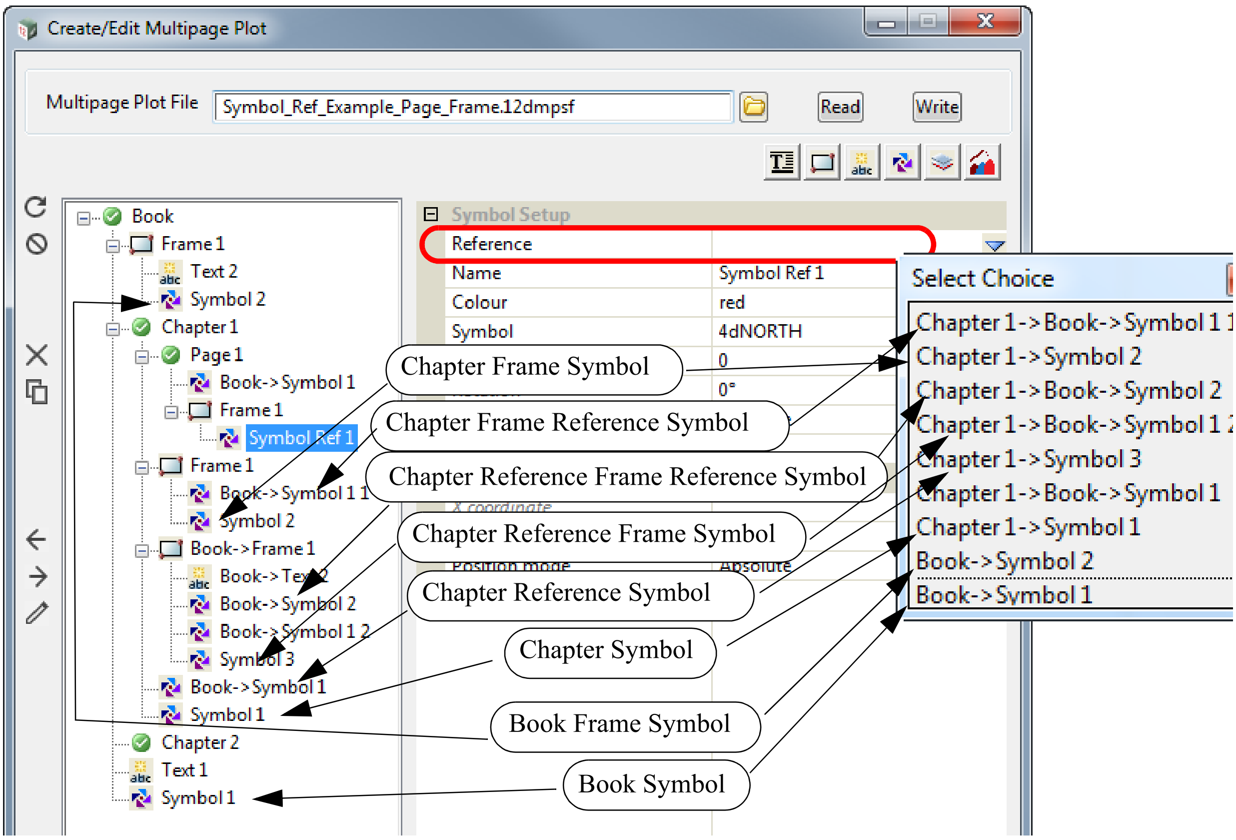
4. If a **Book Symbol** has been set to ***Inactive*** (i.e. OFF) then it can be **displayed** for a **particular** page by creating a **Page Reference Symbol** that references the appropriate **Book Symbol**. And in the **Page Reference Symbol** fields, set the ***Active*** field to **Yes**.
5. If a **Chapter Symbol** has been set to ***Inactive*** (i.e. OFF) then it can be **displayed** for a **particular** page by creating a **Page Reference Symbol** that references the appropriate **Chapter Symbol**. And in the **Page Reference Symbol** fields, set the ***Active*** field to **Yes**.
6. If a **Chapter Reference Symbol** has been set to ***Inactive*** (i.e. OFF) then it can be **displayed** for a **particular** page by creating a **Page Reference Symbol** that references the appropriate **Chapter Reference Symbol**. And in the **Page Reference Symbol** fields, set the ***Active*** field to **Yes**.

20.3.4.9.3.5 Creating Page Frame Reference Symbol

To create a **Page Frame Reference Symbol** for a **Page Frame**, click on the **Page Frame node** and then click on the **Symbol** icon and select **Reference** from the **Symbol** menu.

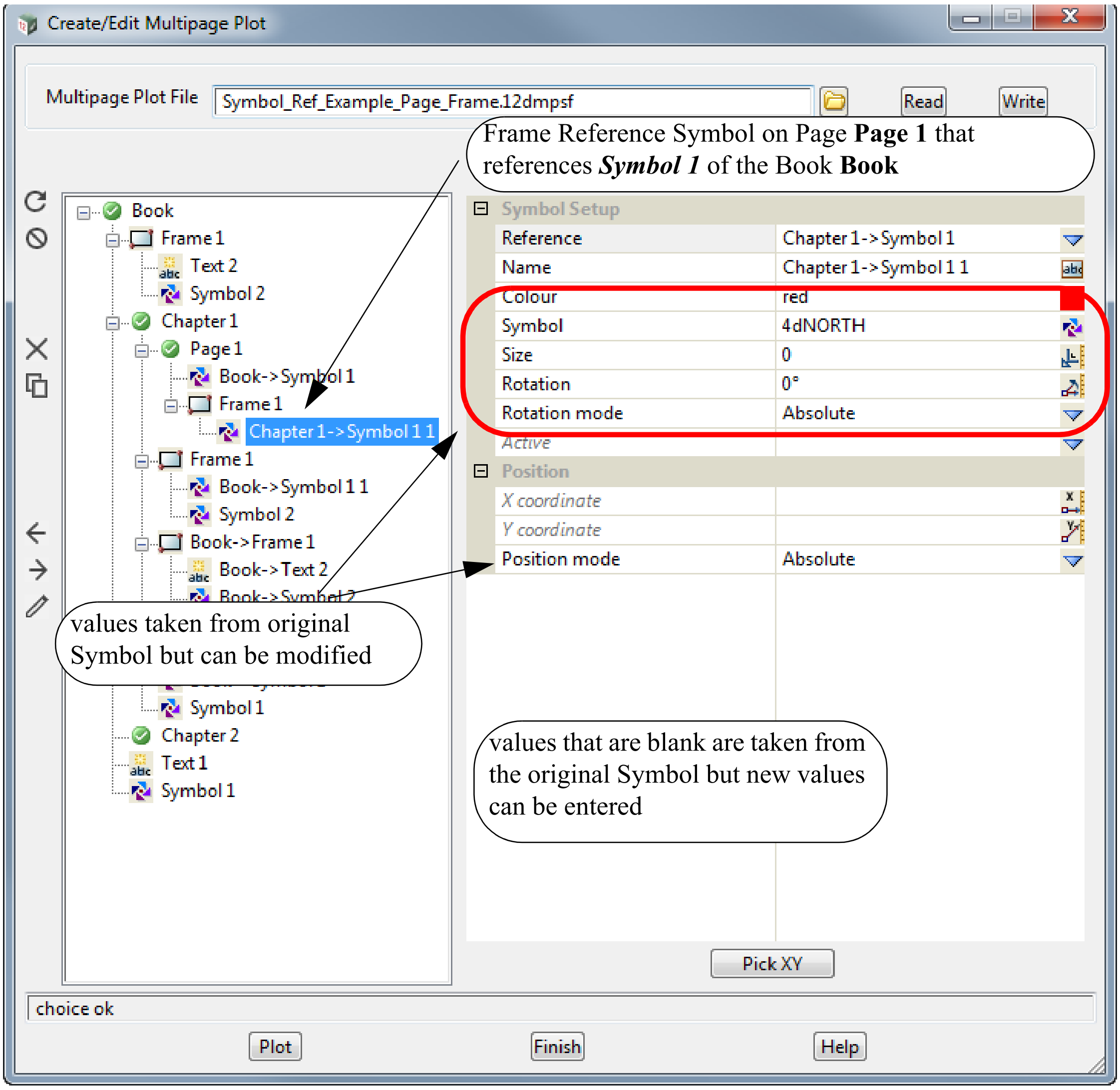


A new **Page Frame Reference Symbol** is created but it has a blank **Reference** Field.



The Choice pop-up for the ***Reference field*** lists the existing **Book Symbols**, **Book Frame Symbols**, **Chapter Symbols, Chapter Reference Symbols**, **Chapter Frame Symbols**, **Chapter Frame Reference Symbols**, **Chapter Reference Frame Symbols** and **Chapter Reference Frame Reference Symbols** that this **Reference Symbol** could reference.

Once a **Symbol** is selected, it is drawn in the **Page Plot Area** and the name of the **Reference Symbol** is changed to the full path name of the **Symbol** that is referencing. If that name already exists then " **n**" is appended to the name where n is an integer starting with 1.



If the **Page Frame Reference Symbol** references a **Book Symbol, Book Frame Symbol, Chapter Symbol** or **Chapter Frame Symbol**, any blank fields in the **Symbol Setup** take their values from the original **Symbol** being referenced. Any of the blank values can be changed and the changed values will be used for the **Page Fame Reference Symbol**.

If the **Page Frame Reference Symbol** references a **Chapter Reference Symbol** then the fields in the **Page Frame Reference Symbol** override the fields in the **Chapter Reference Symbol** which in turn overrides the fields in the original **Book Symbol**.

Important Notes

1. If you don't want to display **Book Symbol** for a particular page, then for that page, create a **Page Reference Symbol** which references the appropriate **Book Symbol**, and in the **Page Reference Symbol** fields, set the ***Active*** field to **No**.
2. If you don't want to display **Chapter Symbol** for a particular page, then for that page, create a **Page Reference Symbol** which references the appropriate **Chapter Symbol**, and in the **Page Reference Symbol** fields, set the ***Active*** field to **No**.
3. If you don't want to display **Book Frame Symbol** for a particular page, then for that page, create a **Page Reference Frame** that references the **Book Frame** that contains the **Book Frame Symbol**. This new **Page Reference Frame** will also include a **Page Reference Frame**

Reference Symbol that references the appropriate **Book Frame Symbol**. And in the **Page Reference Frame Reference Symbol** fields, set the ***Active*** field to **No**.

4. If you don't want to display **Chapter Frame Symbol** for a particular page, then for that page, create a **Page Reference Frame** that references the **Chapter Frame** that contains the **Chapter Frame Symbol**. This new **Page Reference Frame** will also include a **Page Reference Frame Reference Symbol** that references the appropriate **Chapter Frame Symbol**. And in the **Page Reference Frame Reference Symbol** fields, set the ***Active*** field to **No**.

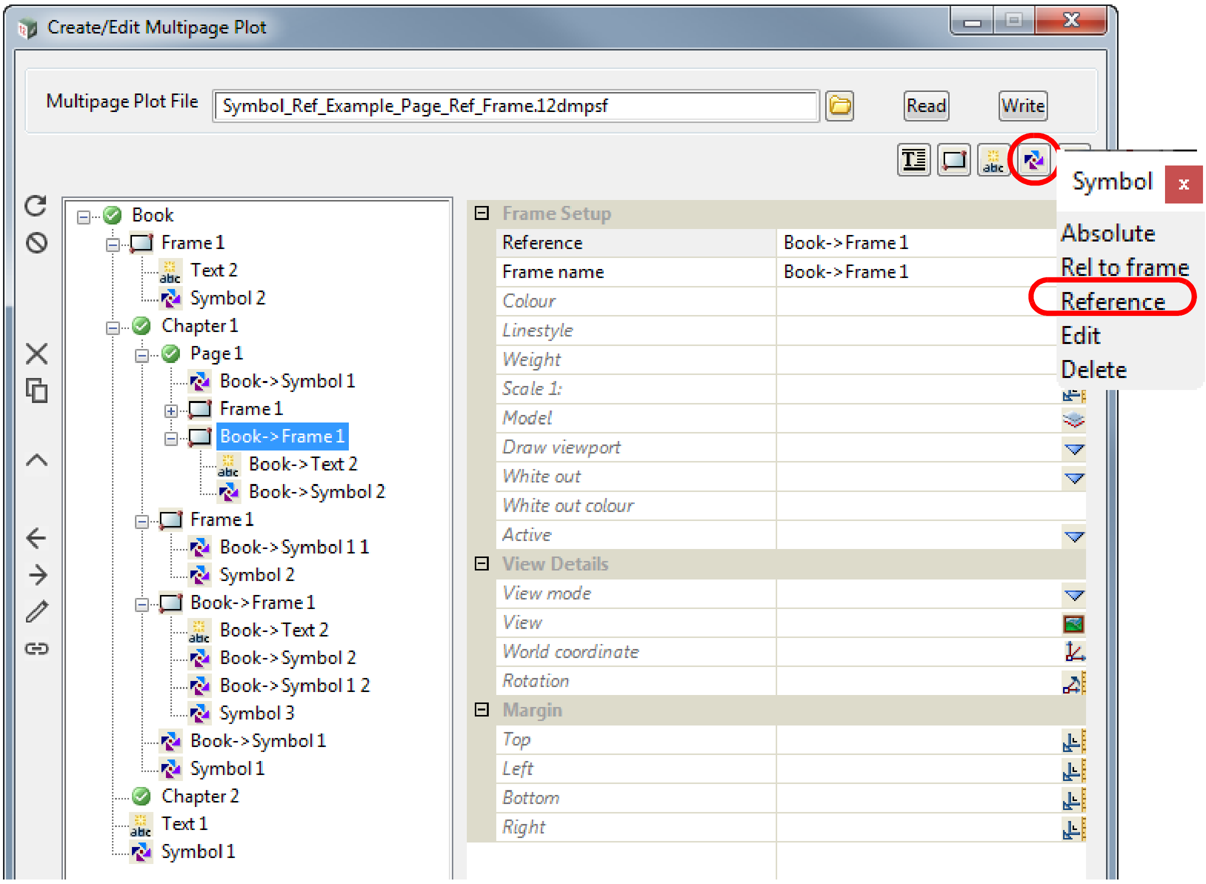
5. If a **Book Symbol** has been set to ***Inactive*** (i.e. OFF) then it can be **displayed** for a **particular** page by creating a **Page Reference Symbol** that references the appropriate **Book Symbol**. And in the **Page Reference Symbol** fields, set the ***Active*** field to **Yes**.
6. If a **Chapter Symbol** has been set to ***Inactive*** (i.e. OFF) then it can be **displayed** for a **particular** page by creating a **Page Reference Symbol** that references the appropriate **Chapter Symbol**. And in the **Page Reference Symbol** fields, set the ***Active*** field to **Yes**.
7. If a **Book Frame Symbol** has been set to ***Inactive*** (i.e. OFF) then it can be **displayed** for a **particular** page by creating a a **Page Reference Frame** that references the **Book Frame** that contains the **Book Frame Symbol**. This new **Page Reference Frame** will also include a **Page Reference Frame Reference Symbol** that references the appropriate **Book Frame Symbol**. And in the **Page Reference Frame Reference Symbol** fields, set the ***Active*** field to **Yes**.
8. If a **Chapter Frame Symbol** has been set to ***Inactive*** (i.e. OFF) then it can be **displayed** for a **particular** page by creating a a **Page Reference Frame** that references the **Chapter Frame** that contains the **Chapter Frame Symbol**. This new **Page Reference Frame** will also include a **Page Reference Frame Reference Symbol** that references the appropriate **Chapter Frame Symbol**. And in the **Page Reference Frame Reference Symbol** fields, set the ***Active*** field to **Yes**.
9. If a **Chapter Reference Frame Symbol** has been set to ***Inactive*** (i.e. OFF) then it can be **displayed** for a **particular** page by creating a a **Page Reference Frame** that references the **Chapter Reference Frame** that contains the **Chapter Reference Frame Symbol**. This new **Page Reference Frame** will also include a **Page Reference Frame Reference Symbol** that references the appropriate **Chapter Reference Frame Symbol**. And in the **Page Reference Frame Reference Symbol** fields, set the ***Active*** field to **Yes**.

20.3.4.9.3.6 Creating Page Reference Frame Reference Symbol

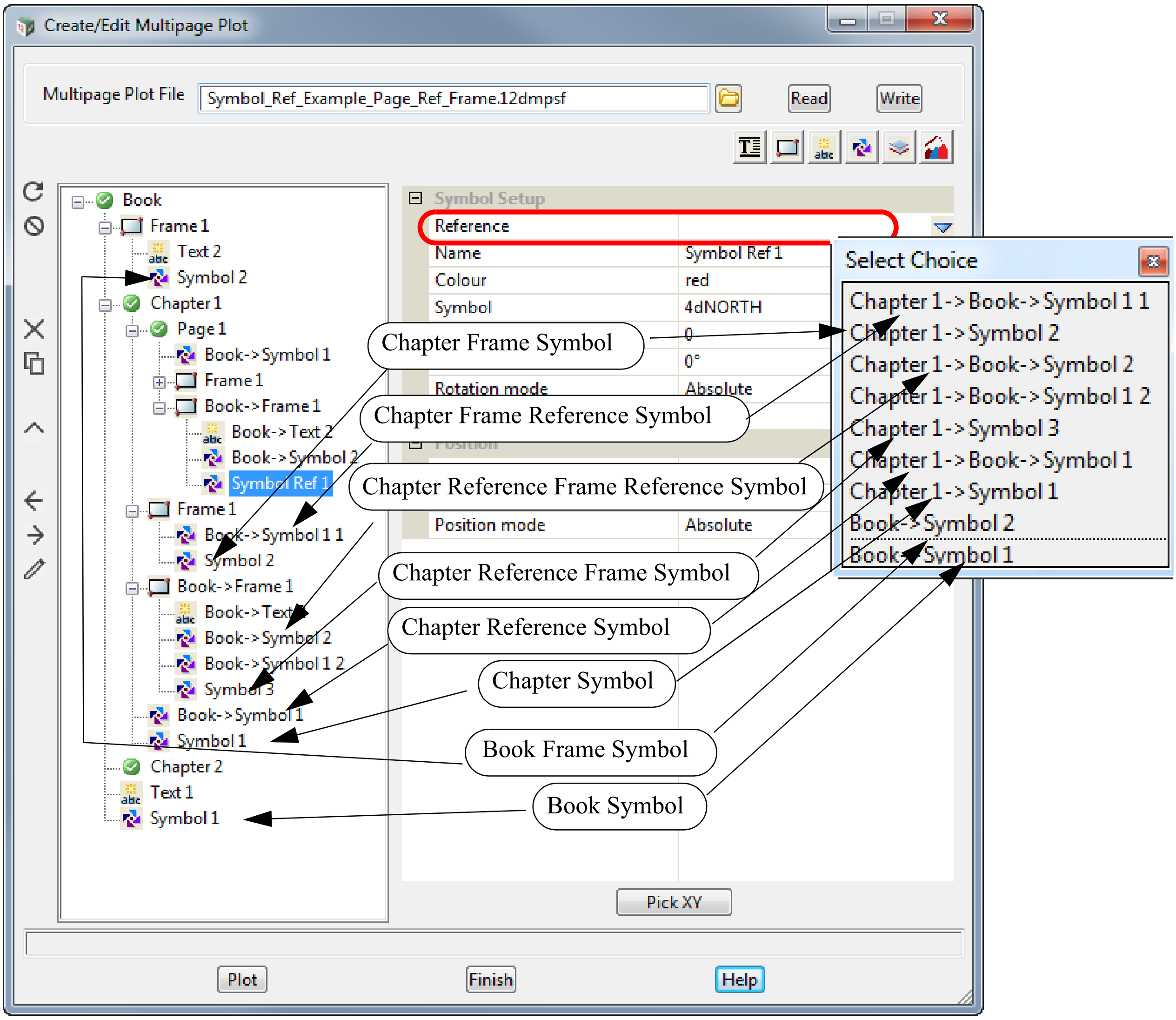
Important Note

Please note that the **Page Reference Frame Reference Symbol** and a **Page Frame Reference Symbol** are virtually identical and the only difference is that one is in a **Page Reference Frame** and the other in a **Page Frame**.

To create a **Page Reference Frame Reference Symbol** for a **Page Reference Frame**, click on the **Page Reference Frame node** and then click on the **Symbol** icon and select **Reference** from the **Symbol** menu.

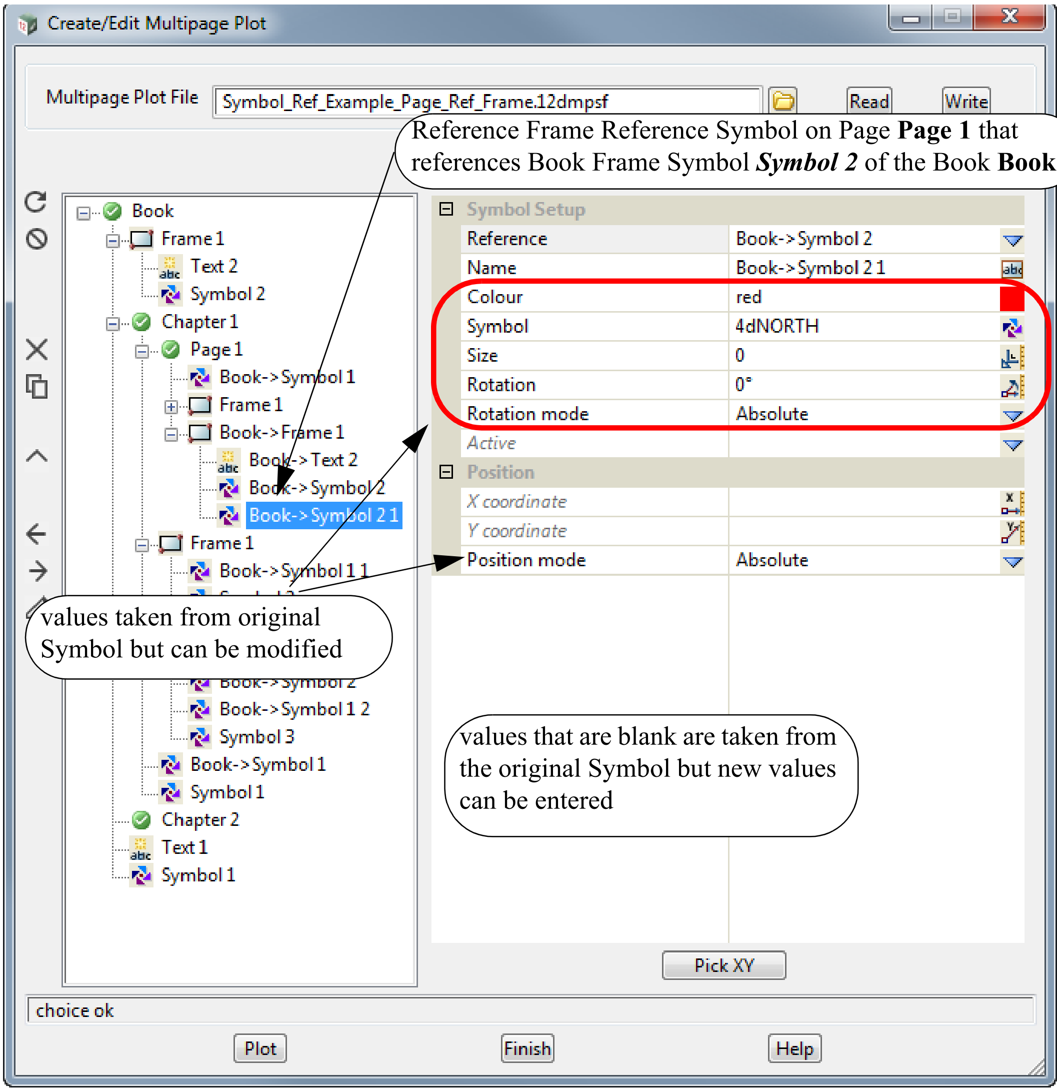


A new **Page Reference Frame Reference Symbol** is created but it has a blank **Reference** Field.



The Choice pop-up for the ***Reference field*** lists the existing **Book Symbols**, **Book Frame Symbols**, **Chapter Symbols, Chapter Reference Symbols**, **Chapter Frame Symbols**, **Chapter Frame Reference Symbols**, **Chapter Reference Frame Symbols** and **Chapter Reference Frame Reference Symbols** that this **Reference Symbol** could reference.

Once a **Symbol** is selected, it is drawn in the **Page Plot Area** and the name of the **Reference Symbol** is changed to the full path name of the **Symbol** that is referencing. If that name already exists then " **n**" is appended to the name where n is an integer starting with 1.



If the **Page Reference Frame Reference Symbol** references a **Book Symbol, Book Frame Symbol, Chapter Symbol** or **Chapter Frame Symbol**, any blank fields in the **Symbol Setup** take their values from the original **Symbol** being referenced. Any of the blank values can be changed and the changed values will be used for the **Page Reference Fame Reference Symbol**.

If the **Page Reference Frame Reference Symbol** references a **Chapter Reference Symbol** / **Chapter Reference Frame Symbol** then the fields in the **Page Reference Frame Reference Symbol** override the fields in the **Chapter Reference Symbol/ Chapter Reference Frame Symbol** which in turn overrides the fields in the original **Book Symbol**.

Important Notes

1. Please note that the **Page Reference Frame Reference Symbol** and the **Page Frame Reference Symbol** are virtually identical and the only difference is that one is in a **Page Reference Frame** and the other in a **Page Frame**.
2. The only way to tell if a **Symbol** references a **Book Symbol** or a **Book Frame Symbol** is that their names have to be unique at the **Book** level.
3. The only way to tell if a **Symbol** references a **Chapter Symbol** or a **Chapter Frame Symbol** is that their names have to be unique at the **Chapter** level.

20.3.4.9.4 Icons and Fields for Symbol and Frame Symbol Nodes

The icons, fields and buttons used in the **Book Symbol, Chapter Symbol**, **Page Symbol, Book Frame Symbol, Chapter Frame Symbol** and **Page Frame Symbol** panels have the following functions.

Field Description | Type | Defaults | Pop-Up

Icons on Left Side

The icons on the left side change depending on what is applicable for the highlighted node.

The action of the icons are described in 20.3.4.3 Icons on the Left Side.

Inherited Fields *

*Fields that support inheritance will be marked by a * symbol next to their **Field Description**.*

***Note**: Only **Reference Symbol** fields have inheritance support.*

*For more information on **Inherited Fields** see,* 20.3.4.5 Inherited Fields *.

Symbol Setup

Name | text box | Symbol n

*the name of this Symbol Node. The default is **Symbol n** where **n** is the first number (integer from zero) to make the Symbol **Name** unique amongst all Symbol Nodes in the tree.*

Colour* | colour box | red | available colours

the colour for the Symbol.

Symbol* | symbol box | NORTH | available symbols

Symbol to use.

Size* | real box | 20

the size of the Symbol.

Rotation* | angle box | 0

the rotation angle of the Symbol.

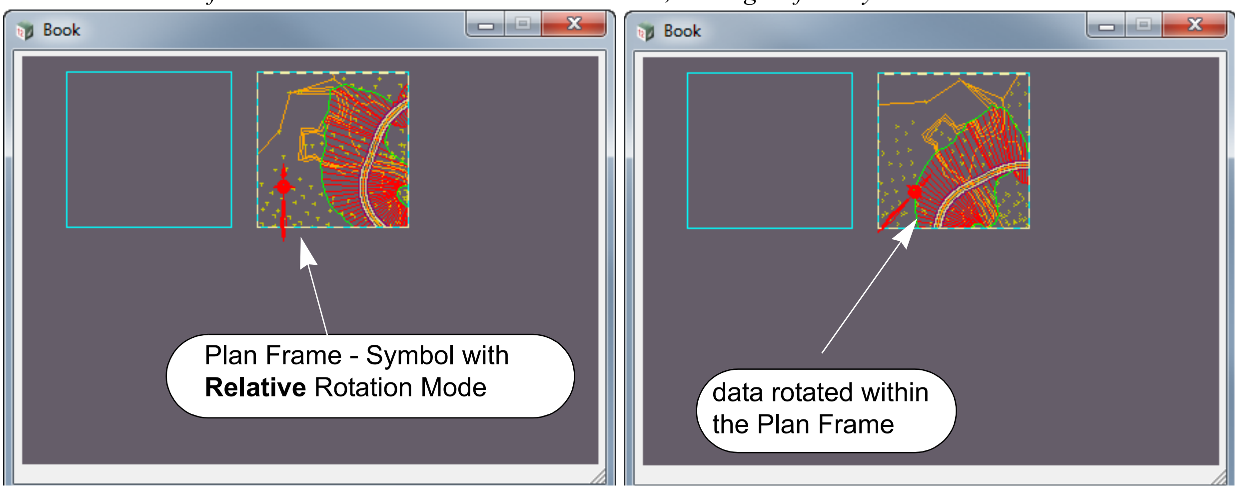
Rotation Mode* | choice box | absolute | absolute, relative

*If **absolute**, the rotation angle of the Symbol is fixed and is defined by the value of **Rotation**.*

*If **relative**, the rotation angle of the Symbol will match the rotation of the data within the parent Frame Node.*

***Note**: this field will only appear if the Symbol Node is a Subnode of a Frame Node.*

If the data within the Plan Frame is rotated, the angle of the Symbol rotates with the data.



Active | tick box | ticked

*if **ticked**, the currently selected Node is made active and will be used when plotting. The Node's active/inactive icon will be set to active.*
*if **not ticked**, the currently selected Node is made inactive and it will be ignored when plotting. The Node's active/inactive icon will be set to inactive.*
***Note**: this tick box is linked to the Node's active/inactive icon. Changing one also changes the other.*

Position

X coordinate* real box x coordinate of Symbol location

the x coordinate (in millimetres) for the Symbol.

Y coordinate* real box y coordinate of Symbol location

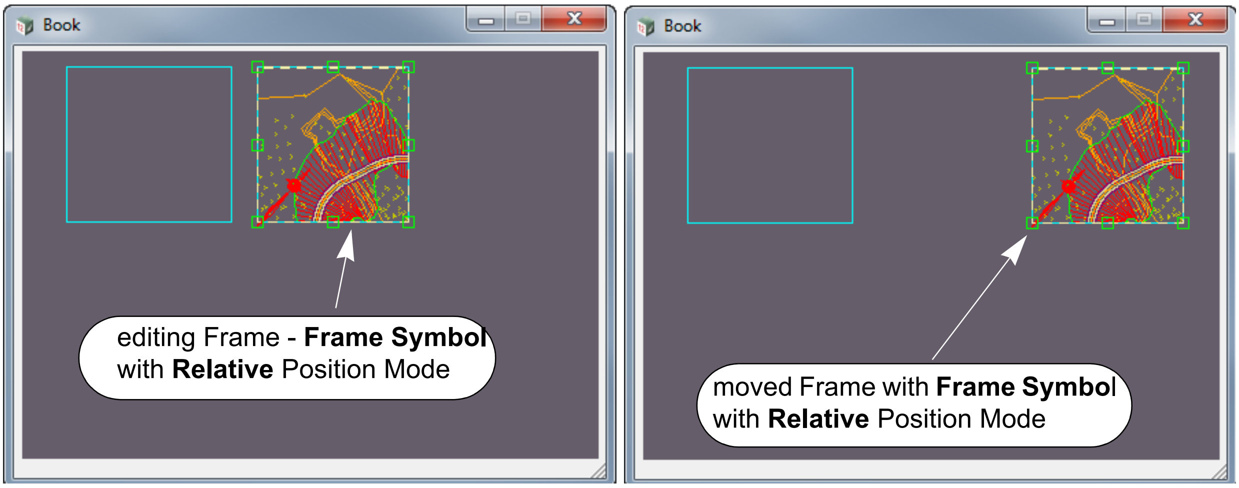
the y coordinate (in millimetres) for the Symbol.

Position Mode* choice box Absolute, Relative

*if **Absolute**, the Symbol is positioned in millimetre coordinates in the Plot Area.*
*If it is **Frame Symbol** and the Frame the Symbol is on is moved, the Symbol does not move with the Frame.*

*If **Relative**, the Symbol is positioned in millimetre relative to the Frame **Anchor justification**.*
*If it is a **Frame Symbol** and the Frame the Symbol is on is moved, the Symbol moves with the Frame.*

*If it is a **Frame Symbol** and the Frame is resized, the position of the Symbol relative to the Frame **Anchor justification** is maintained.*



Anchor just* choice box bottom left, bottom centre, bottom right
middle left, middle centre, middle right
top left, top centre, top right

*if **mode** is **Relative** then the Symbol is positioned relative to the selected Frame **Anchor justification**.*

*If **mode** is **Absolute** then **Anchor justification** is ignored.*

Set button

the **Set** *button must be pressed for any new values in the panel to take effect.*

Pick XY button

the **Pick XY** *button is used to select a position in the Plot Area and the values are piped into the* **X coordinate** *and* **Y coordinate fields**.

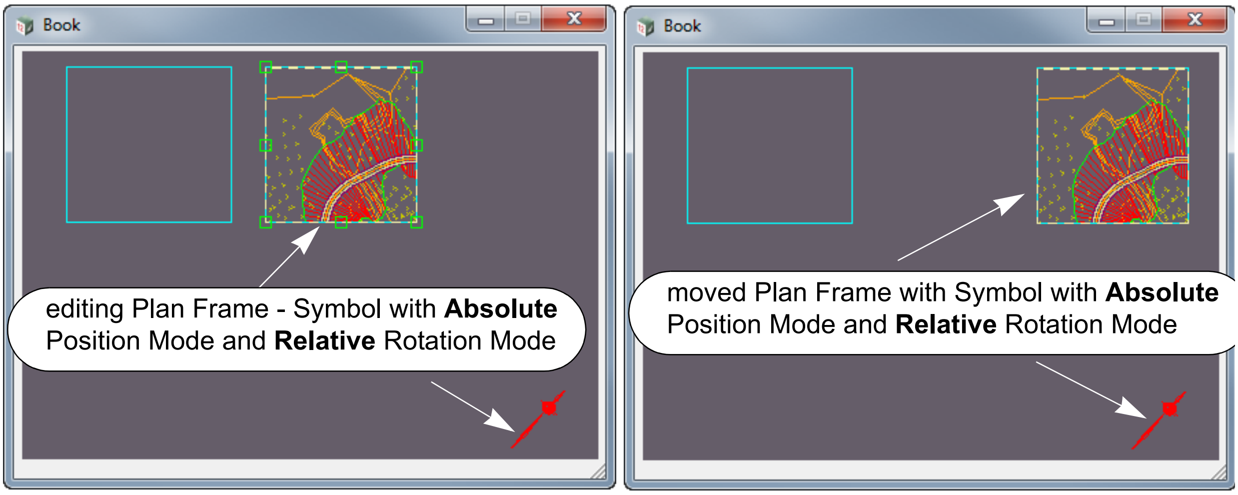
Important Notes

1. **Rotation Mode** and **Position Mode** are independent.

   That is, you can have a **Plan Frame Symbol** whose ***Rotation is relative*** to the data within the

Plan Frame but the **Plan Frame Symbol** is **placed absolutely** on the Page.

This means that a **Plan Frame Symbol** that rotates with the data can be placed in a fixed position on the Page so that its position doesn't move when the Plan Frame is moved.



2. For **Book Symbol**, **Chapter Symbol** and **Page Symbol**, the values ***Relative*** and ***Absolute*** for **Rotation Mode** are both treated as an absolute rotation with respect to the **Plot Area.**
3. For **Book Symbol**, **Chapter Symbol** and **Page Symbol**, the values ***Relative*** and ***Absolute*** for **Position Mode** are both treated as an absolute position on the **Plot Area.**

20.3.4.9.5 Plotting Order of Symbol Nodes

The order of the **Symbol node** in the tree is important because it determines the drawing order of the **Symbol** on each page of a plot.

All the **Book Symbols nodes** are plotted on each **Page**, but if the **Book Symbol node** is in the tree before a **Page** then the **Book Symbol** is plotted before the **Page** is plotted.

Similarly if the **Book Symbol node** is in the tree after a **Page** then the **Book Symbol** is plotted after the **Page** is plotted.

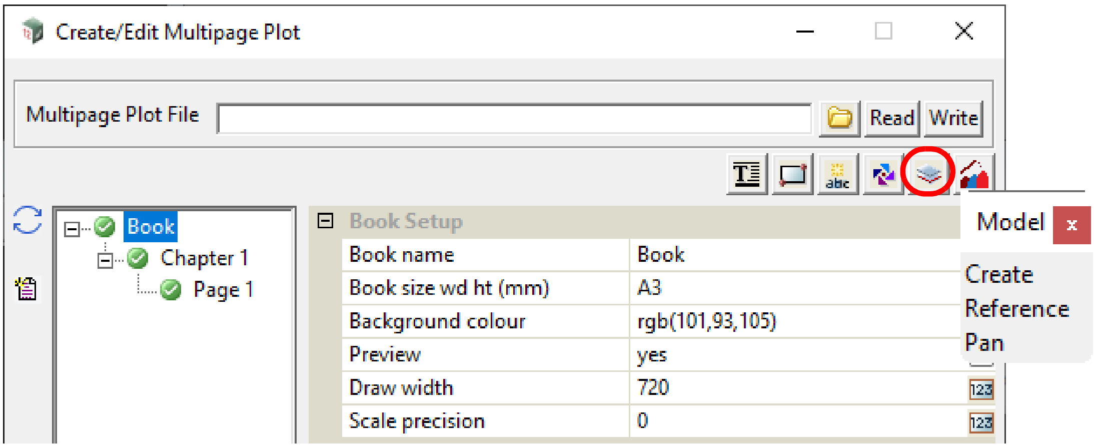
All the **Chapter Symbol nodes** are plotted on each **Page** in the **Chapter** but if the **Chapter Symbol node** appears in the tree before a **Page** in the **Chapter** then the **Chapter Symbol** is plotted before that **Page** is plotted.

Similarly if the **Chapter Symbol node** is in the tree after a **Page** in the **Chapter** then the **Chapter Symbol** is plotted after the **Page** is plotted.

Finally for a **Page node**, the order of the plotting is in the order of the items in the **Page** subtree.

20.3.4.10 Model Icon for Use on a Book, Chapter or Page

A **Model** of data can be placed on a **Book**, **Chapter** or **Page node** using options on the **Model** menu which is brought up by clicking on the **Model** icon on the top right.



The options are:

Create - create a **Model** node in the tree at either the **Book**, **Chapter** or **Page** level.

A **Model node** allows users to add all the data that is in a model to the plot.

The units for the data in the model are assumed to be in **millimetres** with (0,0) in the left hand corner so that the data in the model overlays the Plot Area. See 20.3.4.10.1 Creating a Model Node at the Book, Chapter or Page Level.

Pan: can be used to move the position of the Model data on a **Plot Area**.

Model - Reference

The option **Reference** is not for creating new model data but creates a **Model** node that **references** an existing **Model** node. This means that the **Reference Model** has as default, all the values defined for the **Model node** that is being referenced BUT any of those values can be modified for the **Reference Model**.

See 20.3.4.10.4 Reference Model.

Important Note:

The names of the **Book Model nodes** must be unique amongst all the **Book Model nodes.**

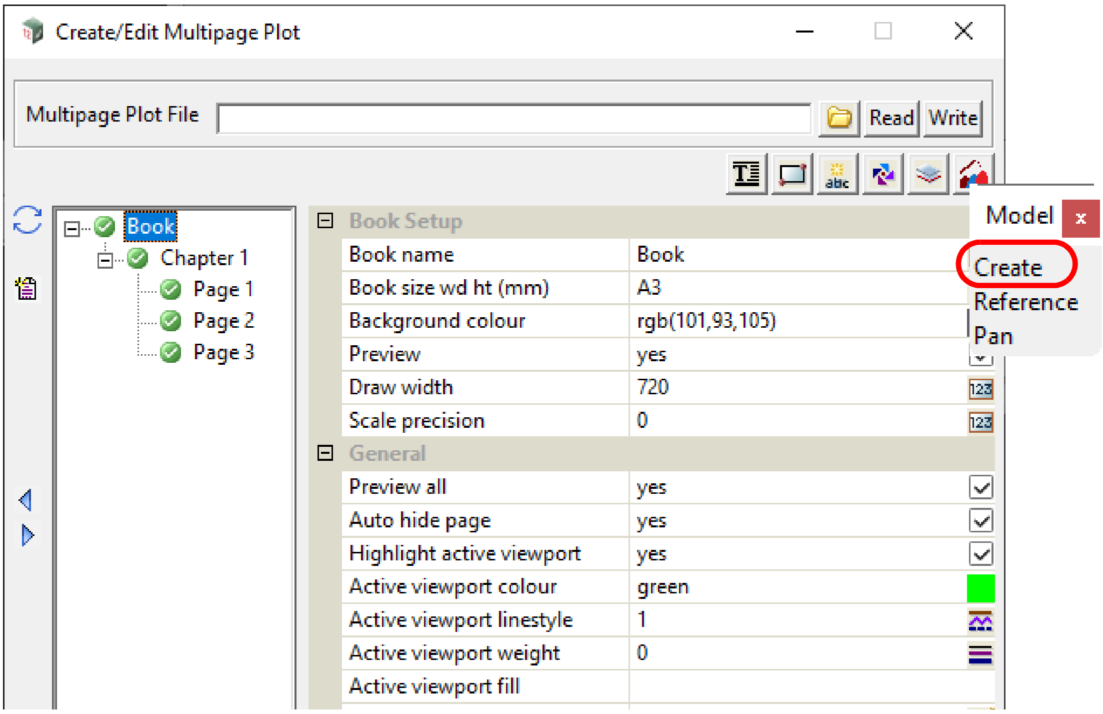
For a **Chapter**, the names of the **Chapter Model nodes** must be unique amongst all the **Chapter Model nodes** for that **Chapter**.

Similarly for a **Page**, the names of the **Page Model nodes** must be unique amongst all the **Page Model nodes** for that **Page**.

20.3.4.10.1 Creating a Model Node at the Book, Chapter or Page Level

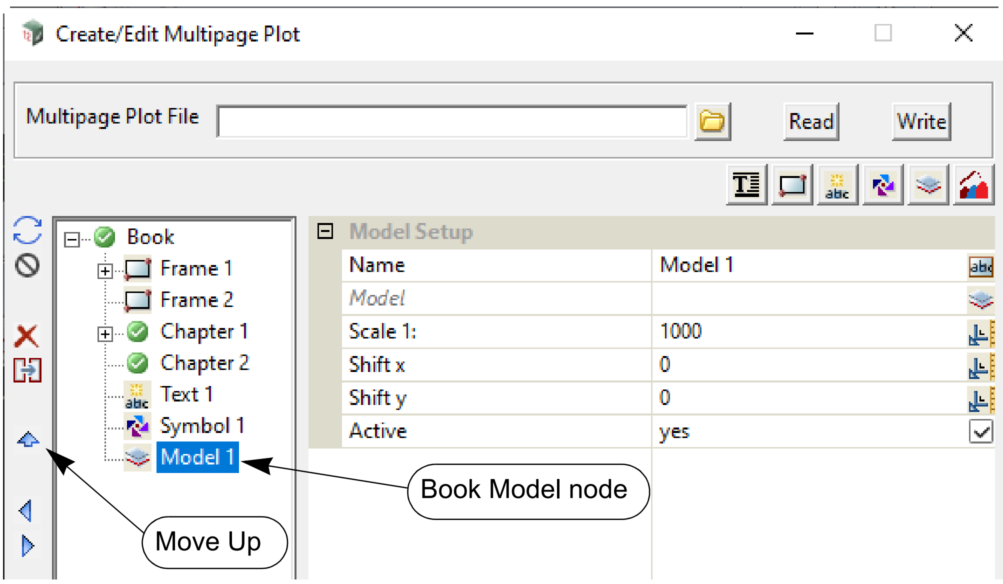
The process for creating a **Book Model** will be described in detail but the steps are identical for **Chapter** and **Page** except that the word **Book** in the description is replaced by **Chapter** or **Page**.

A **Model node** is created at the **Book**, **Chapter** or **Page** level by first clicking on and highlighting either the **Book**, **Chapter** or **Page** node, then clicking on the **Model** icon on the top right to bring up the **Model** menu and finally selecting ***Create*** from the **Model** menu.

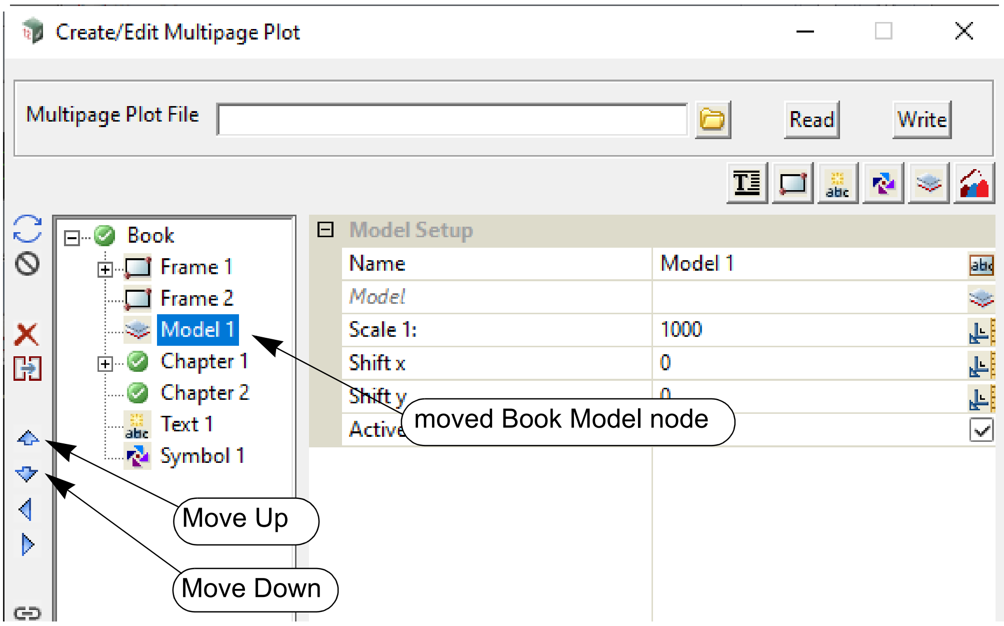


A **Book Model node** is automatically added at the bottom of the **Book** with the default name **Model n** where **n** is the next integer that makes the **Book Model node** name unique amongst all the **Book Model nodes**.

Similarly the name of a **Chapter Model node** must be unique amongst all the **Chapter Model nodes** for that **Chapter**, and the name of a **Page Model node** must be unique amongst all the **Page Model nodes** for that **Page**.

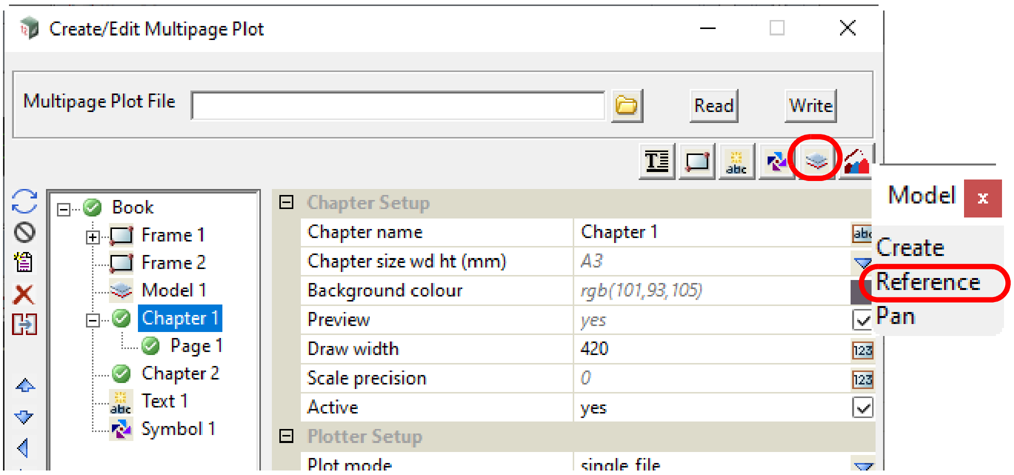


Once a **Model node** is created, it can be moved **Up** and **Down** at that level by using **Up** and **Down** on the left hand side.

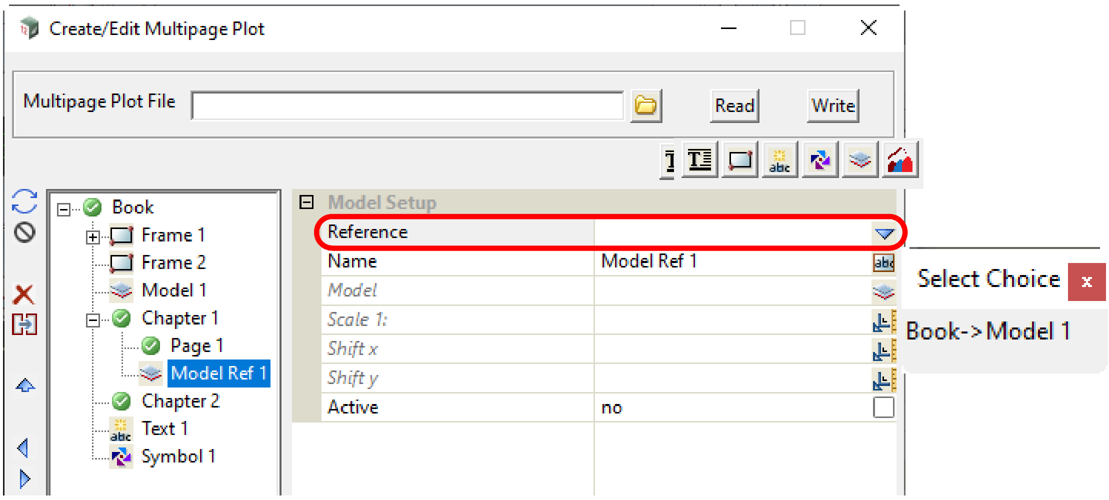


20.3.4.10.1.1 Chapter Reference Model

To create a **Chapter Reference Model** for a **Chapter**, click on the **Chapter node** and then click on the **Model** icon and select **Reference** from the **Model** menu.



A new **Chapter Reference Model** node is created but it has a blank **Reference** Field.



The Choice pop-up for the ***Reference field*** lists the existing **Book Models** that this **Reference Model** could reference.

Once a **Model** is selected, it is drawn in the **Chapter Plot Area** and the name of the **Reference Model** is changed to the full path name of the **Model** node that is referencing. If that name already exists then " **n**" is appended to the name where n is an integer starting with 1.

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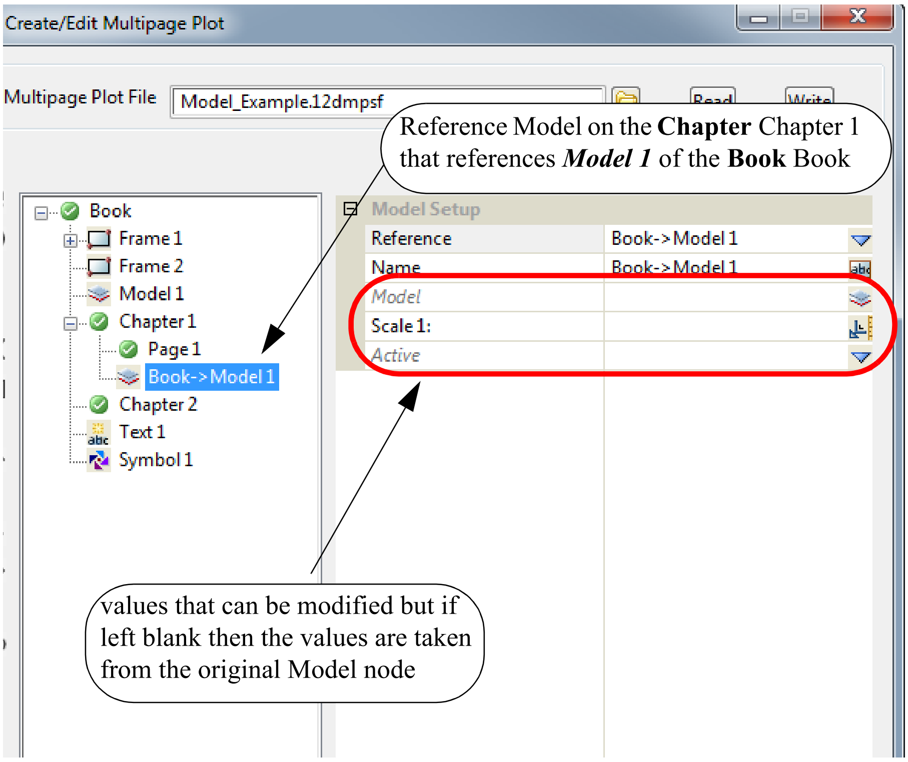


Most of the **Model Setup** fields are blank as their values are taken from the **Book Model** being referenced but any of them can be changed and the changed values will be used for this **Chapter Reference Model**.

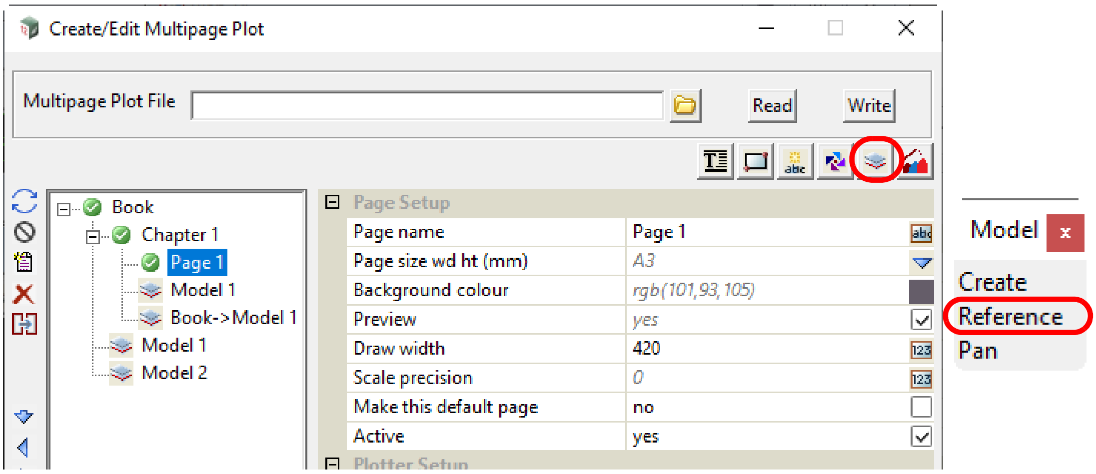
Important Note

If you don't want to display a **Book Model** for a particular chapter, then for that chapter, create a **Chapter Reference Model** which references the appropriate **Book Model**, and in the **Chapter Reference Model** fields, set the ***Active*** field to **No**.

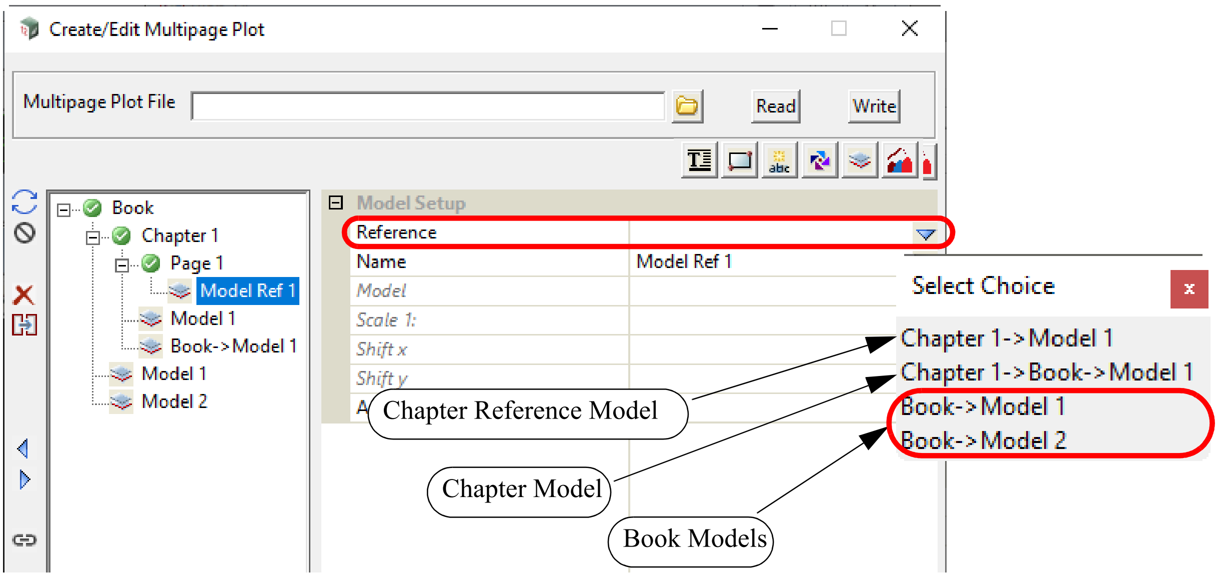
Similarly if a **Book Model** has been set to ***Inactive*** (i.e. OFF) then it can be displayed for a particular chapter by creating a **Chapter Reference Model** for that chapter and referencing the appropriate **Book Model**, and in the **Chapter Reference Model** fields, set the ***Active*** field to **Yes**.

20.3.4.10.1.2 Page Reference Model

To create a **Page Reference Model** for a **Page**, click on the **Page node** and then click on the **Model** icon and select **Reference** from the **Model** menu.

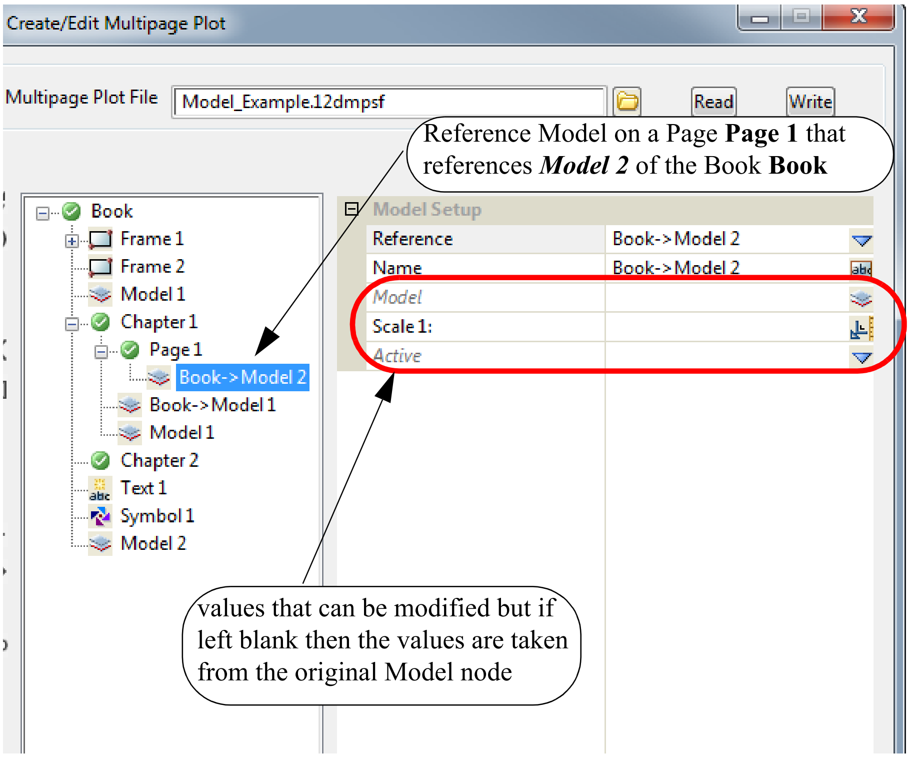


A new **Page Reference Model** is created but it has a blank **Reference** Field.



The Choice pop-up for the ***Reference field*** lists the existing **Book Models**, **Chapter Models** and **Chapter Reference Models** that this **Reference Model** could reference.

Once a **Model** is selected, it is drawn in the **Page Plot Area** and the name of the **Reference Model** is changed to the full path name of the **Model** that is referencing. If that name already exists then " **n**" is appended to the name where n is an integer starting with 1.



Most of the **Model Setup** fields are blank as their values are taken from the original **Model** being referenced but any of them can be changed and the changed values will be used for this **Page Reference Model**.

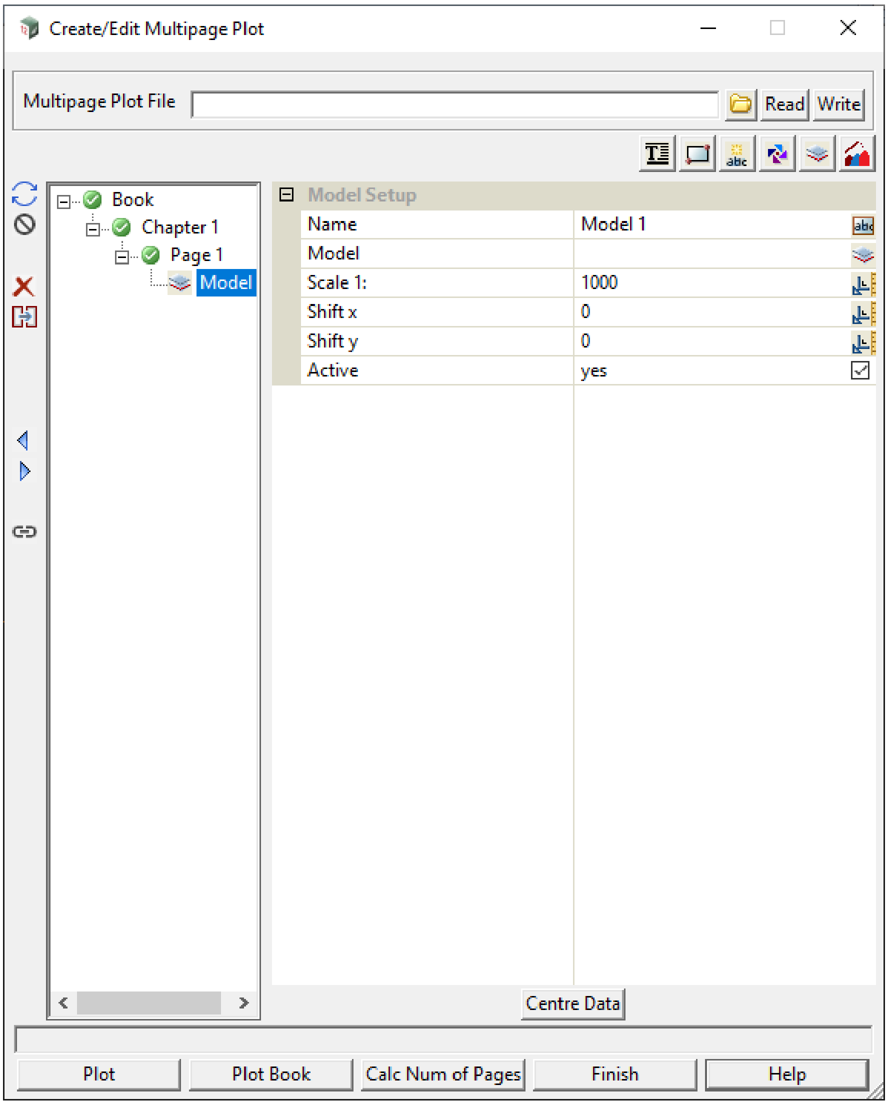
If the **Page Reference Model** references a **Chapter Reference Model** then the fields in the Page Reference Model override the fields in the **Chapter Reference Model** which in turn override the fields in the original **Book Model**.

Important Note

If you don’t want to display a **Book Model**, **Chapter Model** or **Chapter Reference Model** for a particular **Page**, then for that page, create a **Page Reference Model** that references the appropriate **Book Model**, **Chapter Model** or **Chapter Reference Model**, and in the **Page Reference Model** fields, set the ***Active*** field to **No**.

Similarly if a **Book Model**, **Chapter Model** or **Chapter Reference Model** has been set to ***Inactive*** (i.e. OFF) then it can be displayed for a particular page by creating a **Page Reference Model** which references the appropriate **Book Model**, **Chapter Model** or **Chapter Reference Model**, and in the **Page Reference Model** set the ***Active*** field to **Yes**.

20.3.4.10.2 Icons and Fields for Model Nodes



The icons, fields and buttons used in the panels for the **Book Model, Chapter Model** and **Page Model** nodes have the following functions:

Field Description Type Defaults Pop-Up

Icons on Left Side

The icons on the left side change depending on what is applicable for the highlighted node.

The action of the icons are described in 20.3.4.3 Icons on the Left Side.

Inherited Fields *

*Fields that support inheritance will be marked by a * symbol next to their **Field Description**.*

***Note**: Only **Reference Model** fields have inheritance support.*

*For more information on **Inherited Fields** see,* 20.3.4.5 Inherited Fields *.

Model Setup

Name text box

Name of the Model node.

Model* model box available models

The model to be plotted.

The coordinate for the data in the model are assumed to be in ***millimetres*** *with (0,0) in the left hand corner.*

Scale 1:* real box

By default the units for the data is assumed to be millimetres and have a scale of 1:1000.

By changing the scale, the units of the data will be scaled up or down.

For example, a scale of 1:500 will double the size of the data.

Shift x* real box measures

The shift, in millimetres, to the horizontal (x) coordinate of the data in the Model. Adjust so that the desired Model data appears in the Plotting Area.

Shift y* real box measures

The shift, in millimetres, to the vertical (y) coordinate of the data in the Model. Adjust so that the desired Model data appears in the Plotting Area.

Active choice box Yes, No

If ***Yes****, the Model is drawn.*
If ***No****, the Model is not drawn.*
For a Reference Model, the field can be left ***blank*** *and then the value is taken from the Model that is referenced (referenced Model).*

Buttons at the Bottom

Centre Data button

Centres the model data by updating the Shift x and Shift y values. The centre of the Model will appear in the centre of the Plotting Area. Extremely helpful for initial positioning.

20.3.4.10.3 Plotting Order of Model Nodes

The order of the **Model node** in the tree is important because it determines the plotting order of the **Model** on each page of a plot.

All the **Book Model nodes** are plotted on each **Page**, but if the **Book Model node** is in the tree before a **Page** then the **Book Model** is plotted before the **Page** is plotted.

Similarly if the **Book Model node** is in the tree after a **Page** then the **Book Model** is plotted after the **Page** is plotted. See 20.3.4.10.5 Examples of Model Nodes.

All the **Chapter Model nodes** are plotted on each **Page** in the **Chapter** but if the **Chapter Model node** appears in the tree before a **Page** in the **Chapter** then the **Chapter Model** is plotted before that **Page** is plotted.

Similarly if the **Chapter Model node** is in the tree after a **Page** in the **Chapter** then the **Chapter Model** is plotted after the **Page** is plotted. See 20.3.4.10.5 Examples of Model Nodes.

Finally for a **Page node**, the order of the plotting is in the order of the items in the **Page** subtree.

20.3.4.10.4 Reference Model

A **Relative Model** is not for creating new model data but creates a **Model** node that **references** an existing **Model node**. at a higher level, and replaces the existing **Model** fields at the level of the **Reference Model** with the values given for the **Reference Model**. That is, a **Reference Model** at a **Chapter** level can only reference a **Book Model,** and a **Reference Model** at the **Page** level can only reference a **Book Model**, a **Chapter Model** and a **Chapter Reference Model**.

The **Reference Model** node has as defaults all the values defined for the **Model** node that is being referenced BUT any of those values can be modified for the **Reference Model.** In particular, the **Reference Model** can be made ***active/inactive*** independently of the original **Model** node.

For example, if a **Book Model** was created then that **Model** would by default be drawn exactly the same way on each **Page**. If a **Reference Model** was created on a **Page** and it referenced the **Book Model**, then the **Reference Model** would then specify how that **Book Model** was drawn on that **Page** and any of the **Model** node's field values could be changed. For example, the actual model of data could be changed, or the **Reference Model** could be made inactive so that the **Model** is **no longer drawn** on that **Page**.

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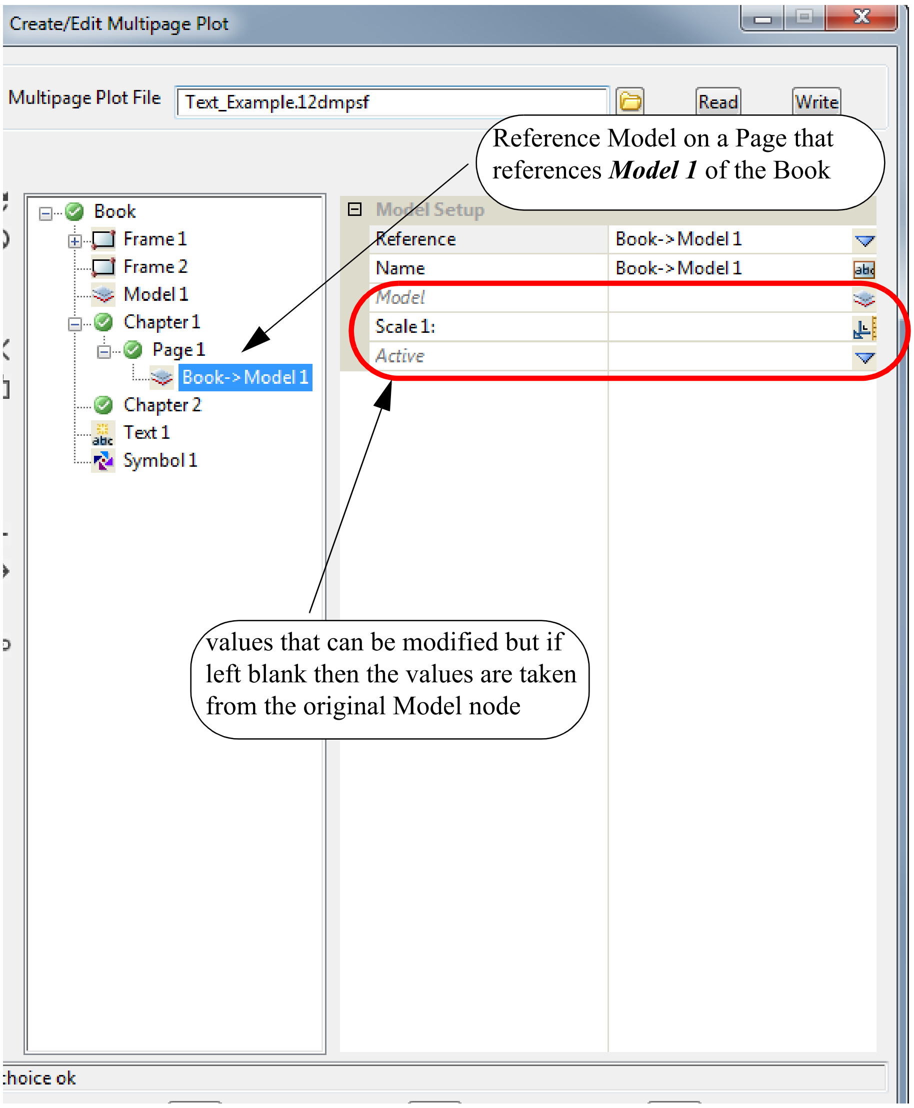


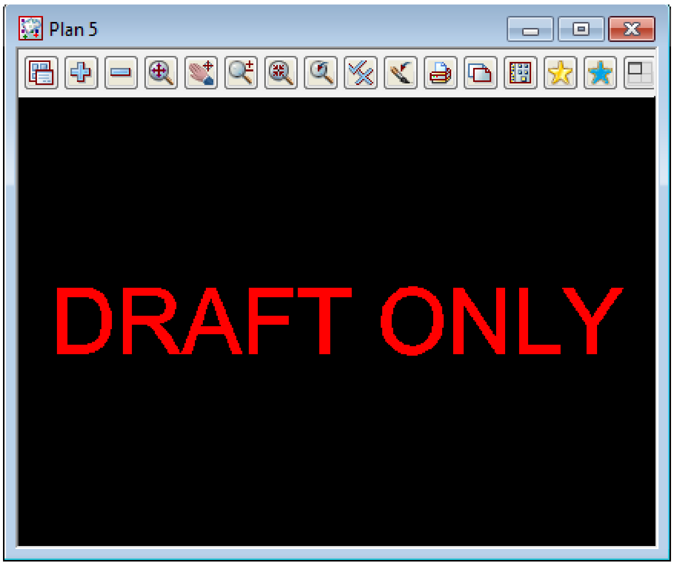
A **Reference Model** can be is created in two ways:

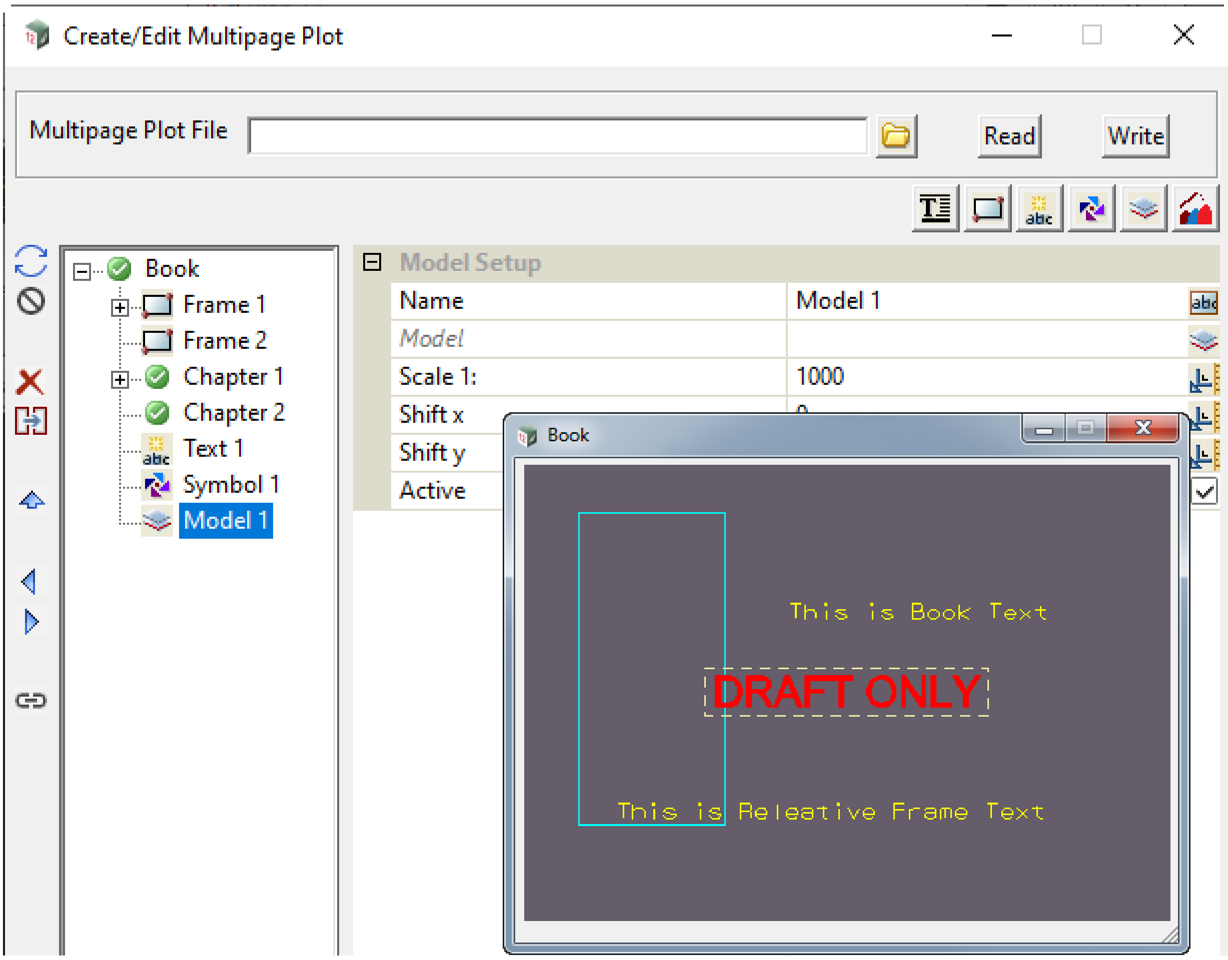
(a) **Chapter Reference Model.** *See* 20.3.4.10.1.1 Chapter Reference Model.

(b) **Page Reference Model.** *See* 20.3.4.10.1.2 Page Reference Model.

20.3.4.10.5 Examples of Model Nodes

As an example of **Model nodes**, if we have a ***12d Model*** with the words *Draft Only* in it, this can be added to every plot by simply adding a **Model node** at the Book level.



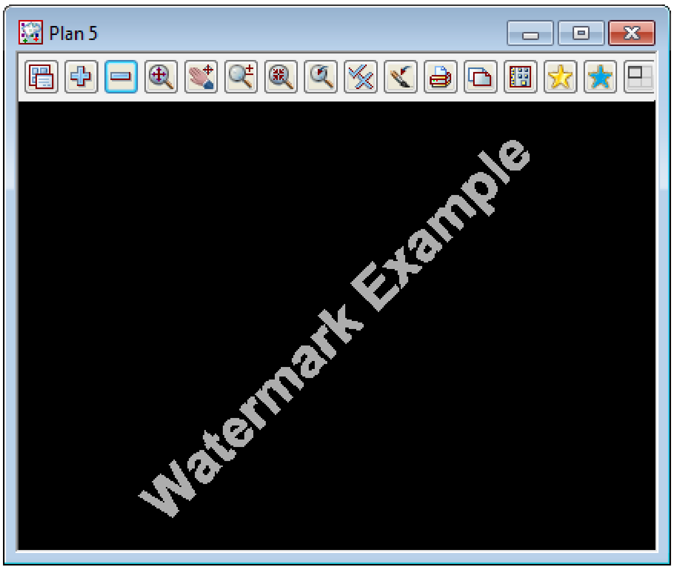


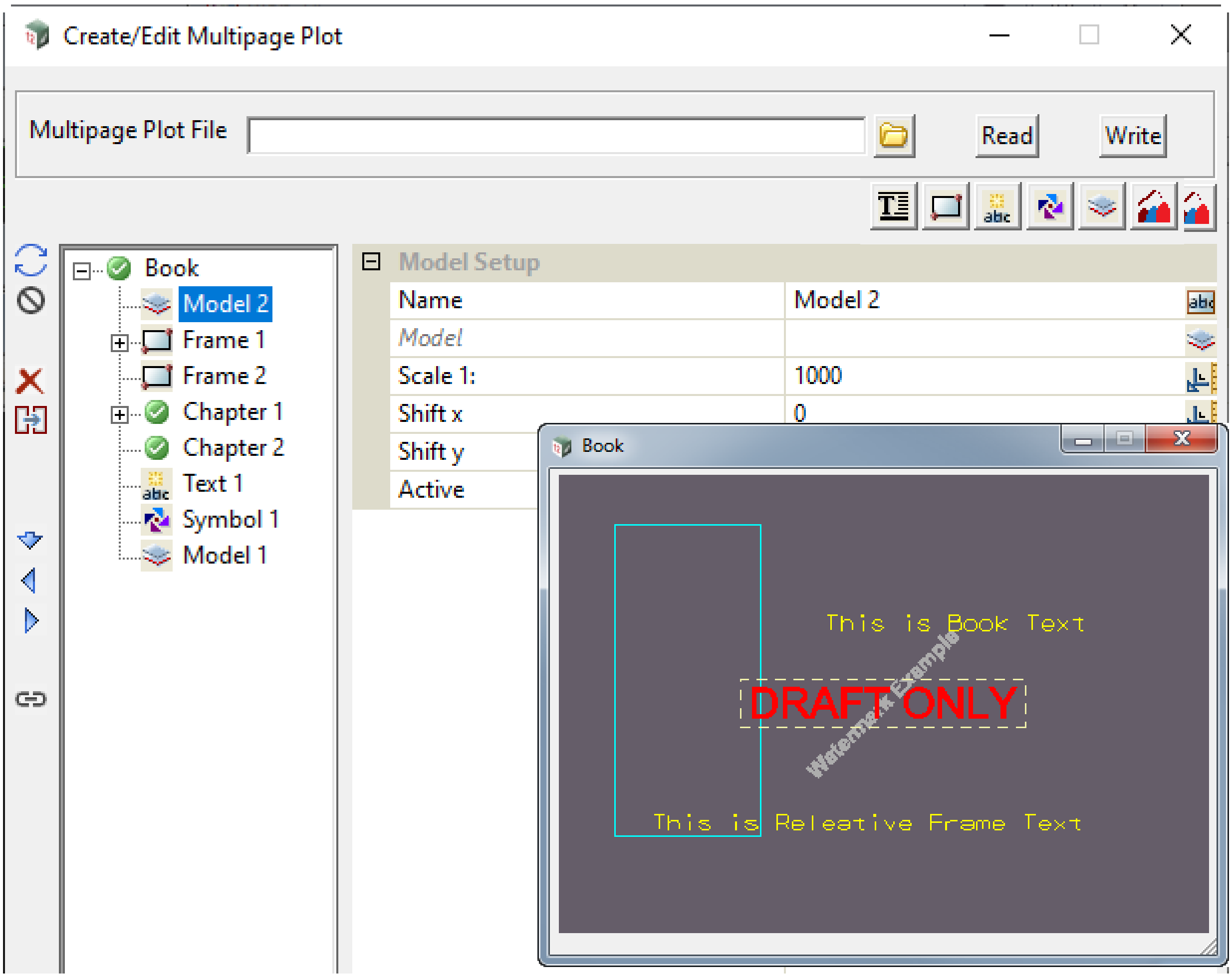
Although all the **Models** at **Book** level will be plotted on each **Page**, the order of the **Model node** in the tree is still very important.

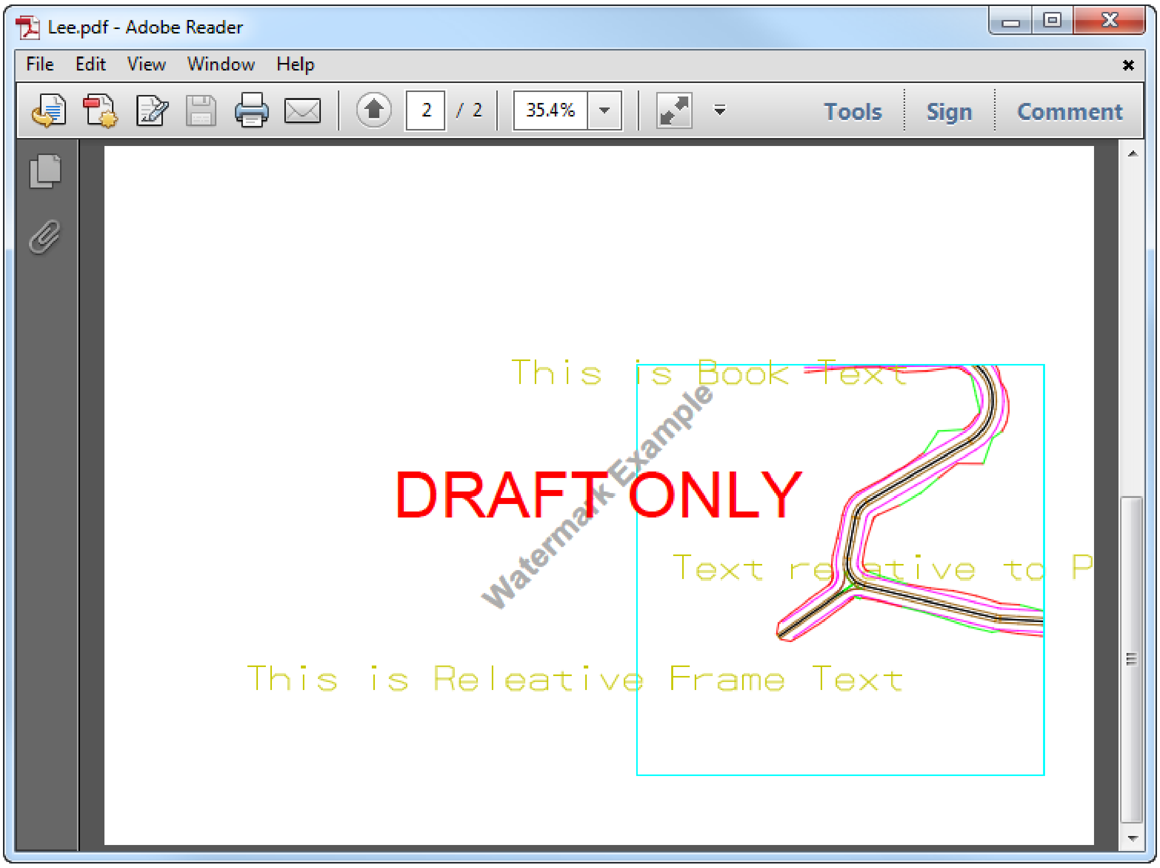
In the example just given, the **Model node** is at the bottom of the tree and so the words *Draft Only* are the last thing plotted on a **Page**.

If another **Model node** was added and moved to the top of the tree, it would be plotted first and then all the other information on a **Page** is plotted.

So if we added another **Model node** "Model 2" using the *12d Model Watermark*, and moved it to the top of the Book.







Lee.pdf - Adobe Reader
File Edit View Window Help
2 / 2
35.4%
Tools Sign Comment
This is Book Text
DRAFT ONLY
Watermark Example
Text relative to P
This is Releative Frame Text

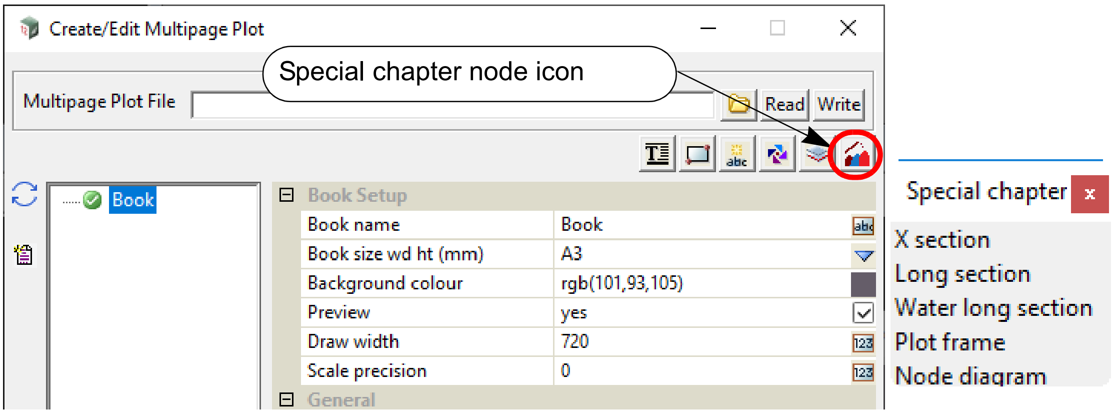
20.3.4.11 Special Chapter

Special Chapters are a Special kind of Chapter (hence the name) that allow the user to easily create multiple pages of plots by providing a single PPF file of a desired plot type. They don't allow Page Nodes as subnodes but do support most other Node types.

Not all plot types have Special Chapter support. The supported plot types are:

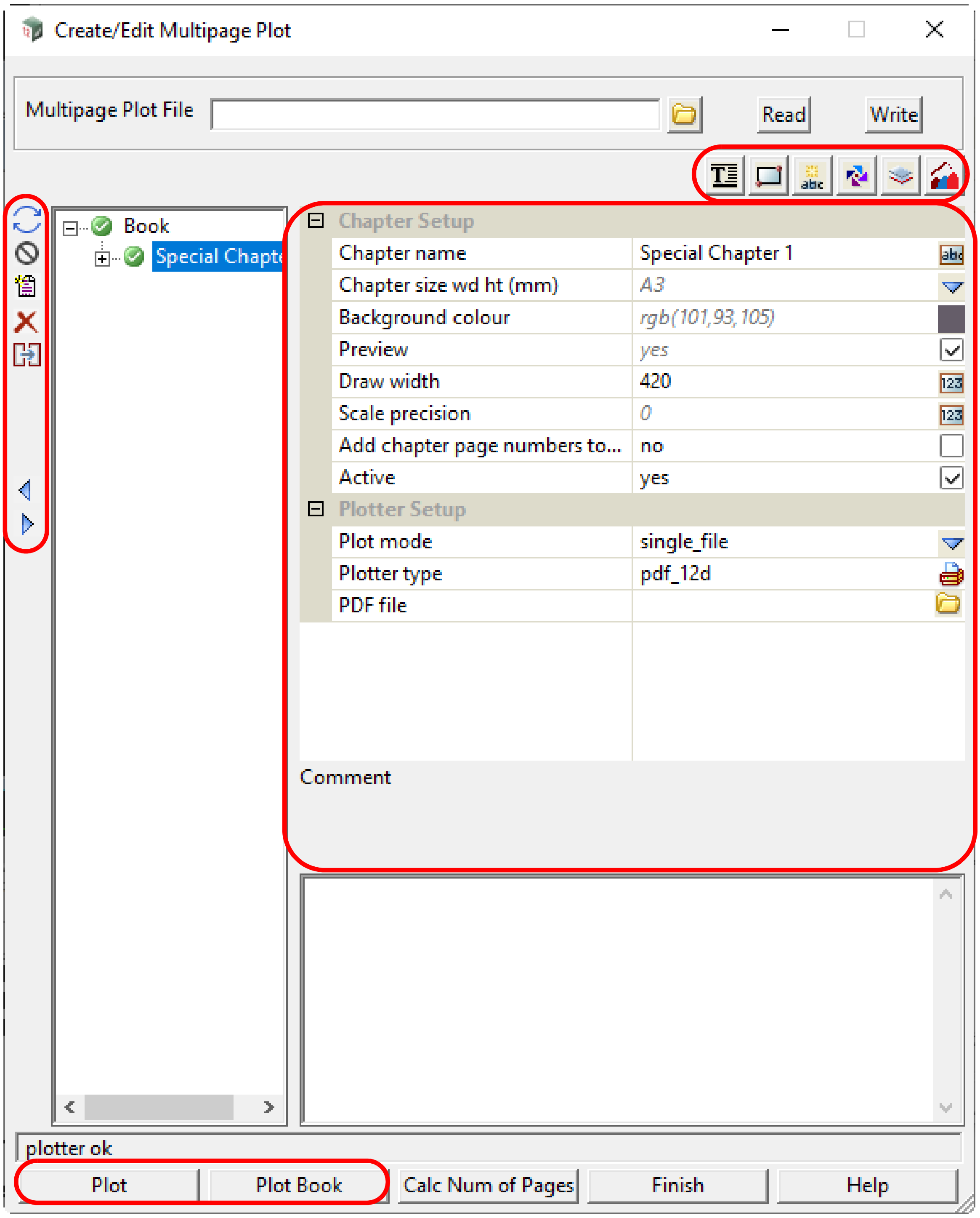
X-Section 20.3.4.11.2 X-Section Chapter
Long Section 20.3.4.11.3 Long Section Chapter
Water Long Section 20.3.4.11.4 Water Long Section Chapter
Plot Frame 20.3.4.11.5 Plot Frame Chapter
Water Node Diagram 20.3.4.11.6 Node Diagram Chapter

Special Chapters are created using the Special Chapter Node Icon.



When the Special Chapter Node Icon is clicked and a plot type is chosen two nodes are created. Firstly, a new Special Chapter Node is created as a subnode of the MPS Book. Secondly, a new Multi Node, of the plot type selected, is created as a subnode of the new Special Chapter Node.

20.3.4.11.1 Icons and Fields for a Special Chapter



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

Field Description Type Defaults Pop-Up

Icons on Left Side

The icons on the left side change depending on what is applicable for the currently selected node.

The icons common to most Nodes are described in 20.3.4.3 Icons on the Left Side.

The icon that is special for a Special Chapter is:

New Chapter icon

*create a new **Chapter** Node immediately after the **Special Chapter** in the tree. See* 20.3.4.1 Chapter.

Icons on Right Side

The icons are described in 20.3.4.4 Icons on the Top Right.

Inherited Fields *

*Fields that support inheritance will be marked by a * symbol next to their **Field Description**.*

*For more information on **Inherited Fields** see,* 20.3.4.5 Inherited Fields *.

Special Chapter Setup

Chapter name text box Special Chapter n

*name for this Special Chapter. The default is **Special Chapter n** where **n** is the first number to make the **Chapter name** unique amongst all the Special Chapters in the tree (the Multipage plot file).*

***Note**: the **Chapter name** can include **Project Attributes** as part of the name.*

For example:

Special chapter size wd ht (mm)* sheet box Book node value defined sheet sizes

*if **blank**, the Page size used for this Special Chapter is taken from the Book node.*

*if **not blank**, the Page size (in millimetres) to use for this Special Chapter.*

*The **Chapter page size** is given as **width** followed by one or more spaces and the height. Or clicking on the choice icon brings up the defined **Page sizes** and one can be selected from the pop-up list. Once a size has been typed in, or selected from the pop up, the **Special Chapter Plot Area** panel is drawn with an aspect ratio to match the selected page size.*

Background colour* colour box Book node value available colours

*if **blank**, the colour of the background for the **Special Chapter Plot** Area is taken from the Book node.*

*if **not blank**, the colour of the background for the **Special Chapter Plot** Area.*

Preview* tick box Book node value

*if **ticked**, the contents of the Frame and Title Block Nodes of this Special Chapter Node will be approximately drawn ("previewed") in the **Special Chapter Plot** Area.*

*if **not ticked**, the contents of the Frame and Title Block Nodes will not be drawn in the **Special Chapter Plot** Area.*

***Note**: Re-establishing an inheritance link cannot be done for this field since it only has two states and cannot be left 'blank' in the same way as other fields.*

Draw width* integer box Book node value

*if **blank**, the width in pixels of the **Special Chapter Plot** Area is taken from the Book node.*

*if **not blank**, the width in pixels of the **Special Chapter Plot** Area. This will change if the **Special Chapter Plot Area Panel** is resized. The height is then automatically determined by the aspect ratio of the **Chapter size wd ht**.*

Scale precision* integer box Book node value

*if **blank**, the Scale precision is taken from the Book node.*

*if **not blank**, the number of decimal places used in the $scale text variable when added to the **Special Chapter Plot Area** or a Frame in this Special Chapter.*

Add chapter page numbers to plot file tick box not ticked

The default value for the plot_file $variable for individual pages in a Special Chapter is the Special Chapter Node name.

*if **ticked**, then the plot_file $variable for the pages in this Special Chapter will have the internal Special Chapter page number appended to the end to allow for unique matching when using a Title Block Drawing Register.*
eg. If the Special Chapter has the name of "Cabbage" and has 8 pages in it then the individual pages will have the $plot_file values of "Cabbage 1", "Cabbage 2",..., "Cabbage 8".

*if **not ticked**, then the page number will not be appended to plot_file $variable (default behaviour).*

Active tick box ticked

*if **ticked**, the highlighted node is made active and will be used when plotting (if plotting from this node). The node's active/inactive icon will be set to active.*
*if **not ticked**, the highlighted node and all of its children will be ignored when plotting. The node's active/inactive icon will be set to inactive.*

***Note**: This tick box is linked to the node's active/inactive icon. Changing one also changes the other.*

Plotter Setup

*if the **Plot** button is pressed then the following fields define how the plotting for the Special Chapter occurs.*

Plot mode choice box single_file single_file
multiple_file

*if **single_file**, then the field **PDF file** is displayed and all the pages produced by this **Special Chapter** are plotted to separate pages of a single pdf file whose name is given in the field **PDF file**.*
*if **multiple_file**, then the fields **Prefix** and **Digits in plot file number** are displayed and each page produced by this Special Chapter is plotted to a different pdf file. The name of each pdf file is the **Prefix** followed by the **Special Chapter name** followed by the **plot file number** for that page in the Special Chapter.*

Plotter type* plotter box Book node value pdf plotters

*the **Plotter type** to use for plotting. Currently this can only be a pdf plotter. This is an inherited field.*

*if **blank**, the value from the equivalent **Book** Node field will be used.*

Pdf file file box *.pdf files

*if **not blank**, the name of the pdf file that will be produced by the Special Chapter.*
*if **blank**, the pdf file produced will use the Special Chapter name as its filename.*

*This option only appears when **Plot mode** is **single_file**.*

Prefix text box

*if **not blank**, the prefix to use for the filename of each pdf file produced by the Special Chapter.*
*if **blank**, then no prefix will be used for pdf filenames.*

*This option only appears when **Plot mode** is **multiple_file**.*

Digits in plot file number integer box 1

*the **plot file number** starts at 1 and is incremented for each page in the Special Chapter. This field will accept integer values between 1 and 10 (inclusive). Setting a value of 1 will result in the **plot file number** being used without any modification. Setting a value of 2 or more ensures that there will be at least that number of digits in the **plot file number.** Zero-padding is used to achieve this. Eg. if **Digits in plot file number** is 3 then plot number 7 will appear as 007.*

*This option only appears when **Plot mode** is **multiple_file**.*

Fields and Buttons at Bottom

Comment text box

user comment about this Special Chapter.

Plot button

*Triggers plotting from the currently highlighted node. If the highlighted node isn't a base node (Book, Chapter, Special Chapter or Page Node) then we recursively check parent nodes until a base node is found. The **Plotter Setup** from the highlighted node is used for the plot.*

Plot Book button

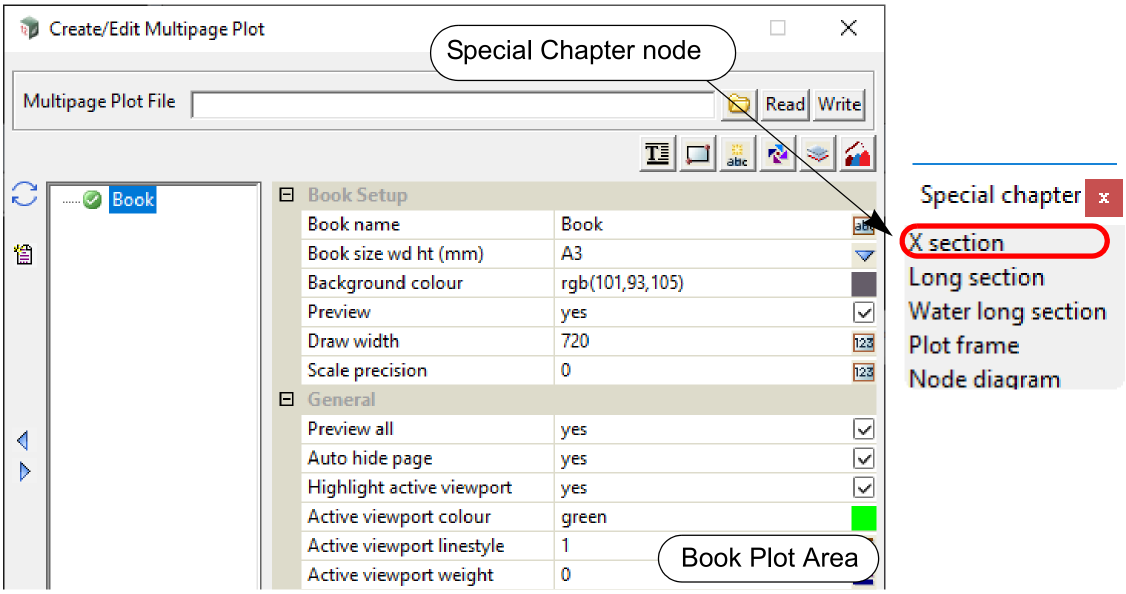
*Triggers plotting from the Book Node regardless of the currently highlighted node. The **Plotter Setup** from the Book Node is used for the plot.*

Important Notes

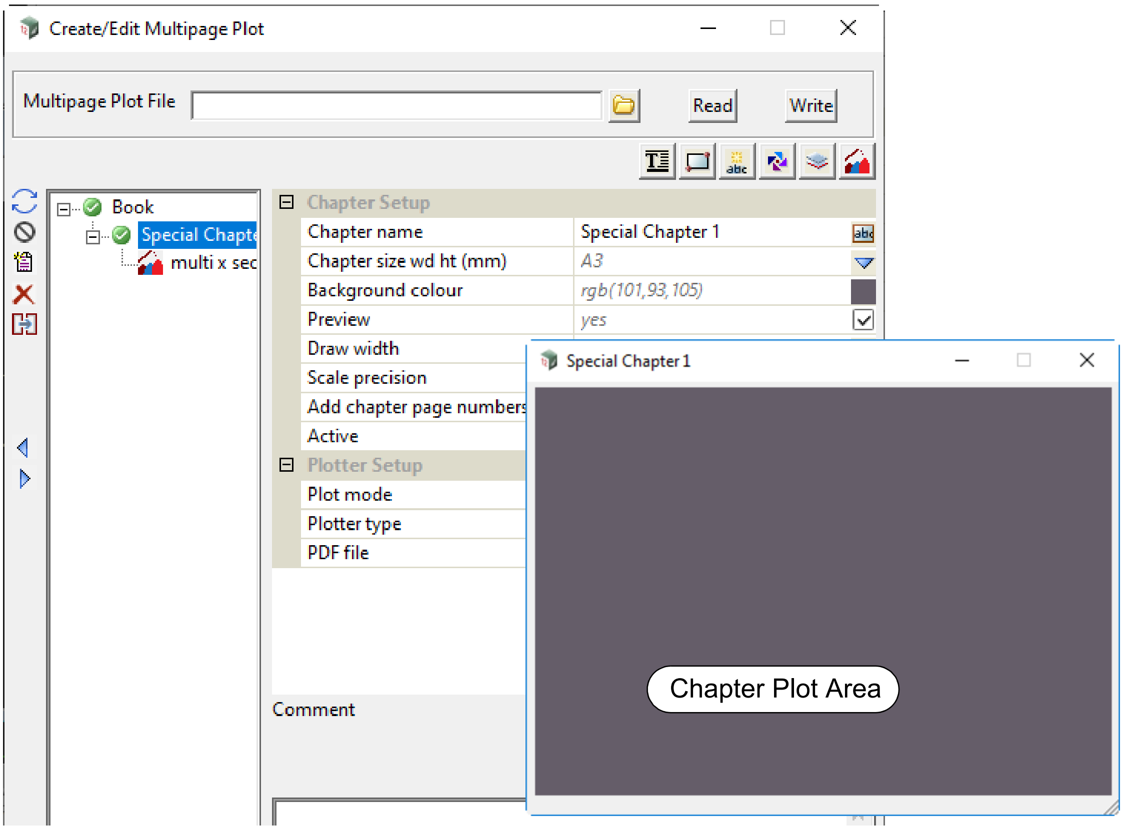
If the Special Chapter is inactive then nothing in the Special Chapter will plot.

The order of nodes in the tree is important because it determines the plotting order. However, for Special Chapters the Multi Node will always be plotted first regardless of order.

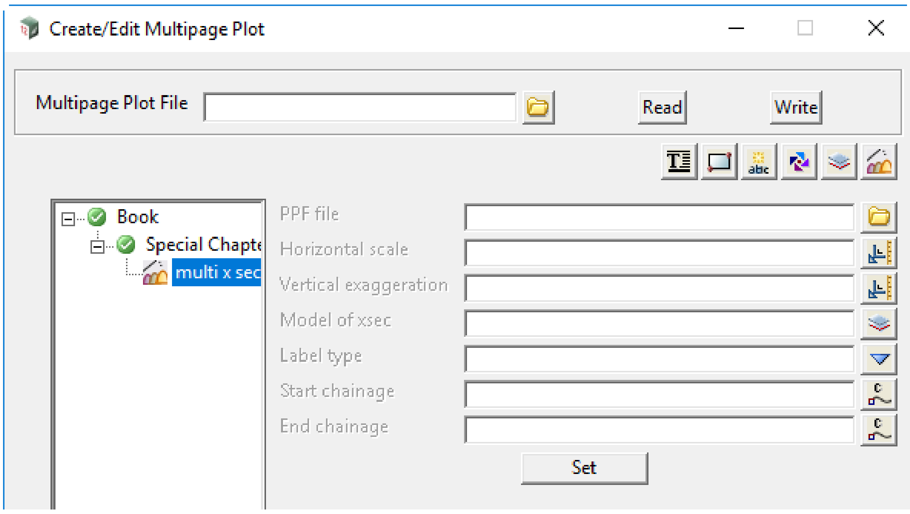
20.3.4.11.2 X-Section Chapter



Clicking on the **Special Chapter node >X-Section** option creates a X-sections Chapter with a subnode called **multi x-sections**.



Clicking on the **multi x-sections** node displays the information for controlling the pages generated by the X-Section Chapter.



PPF file X- section ppf box available x sec ppfs

the selected X-Section PPF file that contains all the information for drawing the pages of x-sections.

***Note**: the Title Block node in the PPF file is **NOT** used.*

Horizontal scale real box

*if **not blank**, this value will override the value in the* **Horizontal scale** *field in the X-Section Plot PPF file, and is used for the plot.*

*If **blank**, the value in the* **Horizontal scale** *field in the X-Section Plot PPF file is used for the plot.*

Vertical exaggeration real box

*if **not blank**, this value will override the value in the* **Vertical exaggeration** *field in the X-Section Plot PPF file, and is used for the plot.*

*If **blank**, the value in the* **Vertical exaggeration** *field in the X-Section Plot PPF file is used for the plot.*

Model of x sec model box available models

if a model is selected, this will override the **Model of xsect to plot** *field in the X-Section Plot PPF file, and this model will be used for the model of x-sections to plot.*

*If **blank**, the* **Model of xsect to plot** *field in the X-Section Plot PPF file is used for the model of x-sections to plot.*

Label type choice box centre line, boxes

if a Label type is selected, this will override the **Label type** *field in the X-Section Plot PPF file, and this Label type will be used for the x-sections plotted.*

*If **blank**, the* **Label type** *field in the X-Section Plot PPF file is used for x-sections plotted.*

Start/End chainage real box measures

*if Start chainage/End chainage is **not blank**, the value will override the value in the* **Start /End chainage** *field in the X- Section plot **PPF file**, and is used for the plots.*

*If **blank**, the value in the* **Start /End chainage** *field in the X- Section plot **PPF file** is used for the plots.*

*The Start and End chainage and other information in the X-Section **PPF file** will determine how many pages there will be in the X-Section Chapter.*

Set button

update and use the values in the fields.

Note that a **Write** *needs to be done to update the Multipage plots file.*

20.3.4.11.2.1 Notes on Using the X-Section Chapter

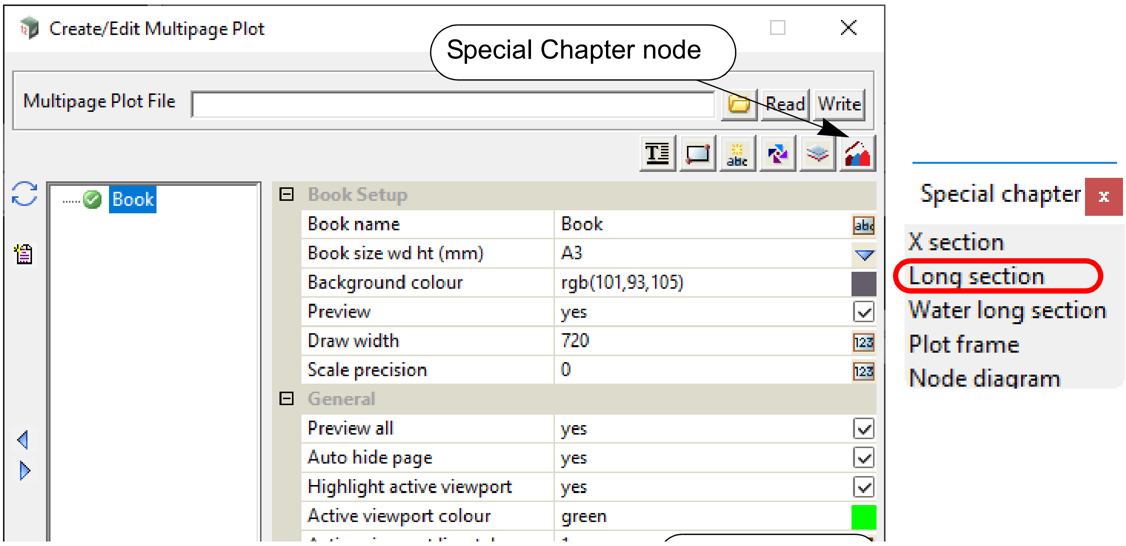
1. No other pages can be added to the X-Section Chapter and the drawing of the x-sections on each page is determined by the information in the X-Plot PPF file.
2. The *Title Block* in the X-Plot PPF is NOT used.
3. If they are not blank, the *Start and End Chainages* in the PPF are NOT used and are replaced by the values given in the **multi x-sections** node of the X-Section Chapter.

   If *Start chainage* in the multi-sections node is ***blank***, then the *Start chainage* in the PPF is used.

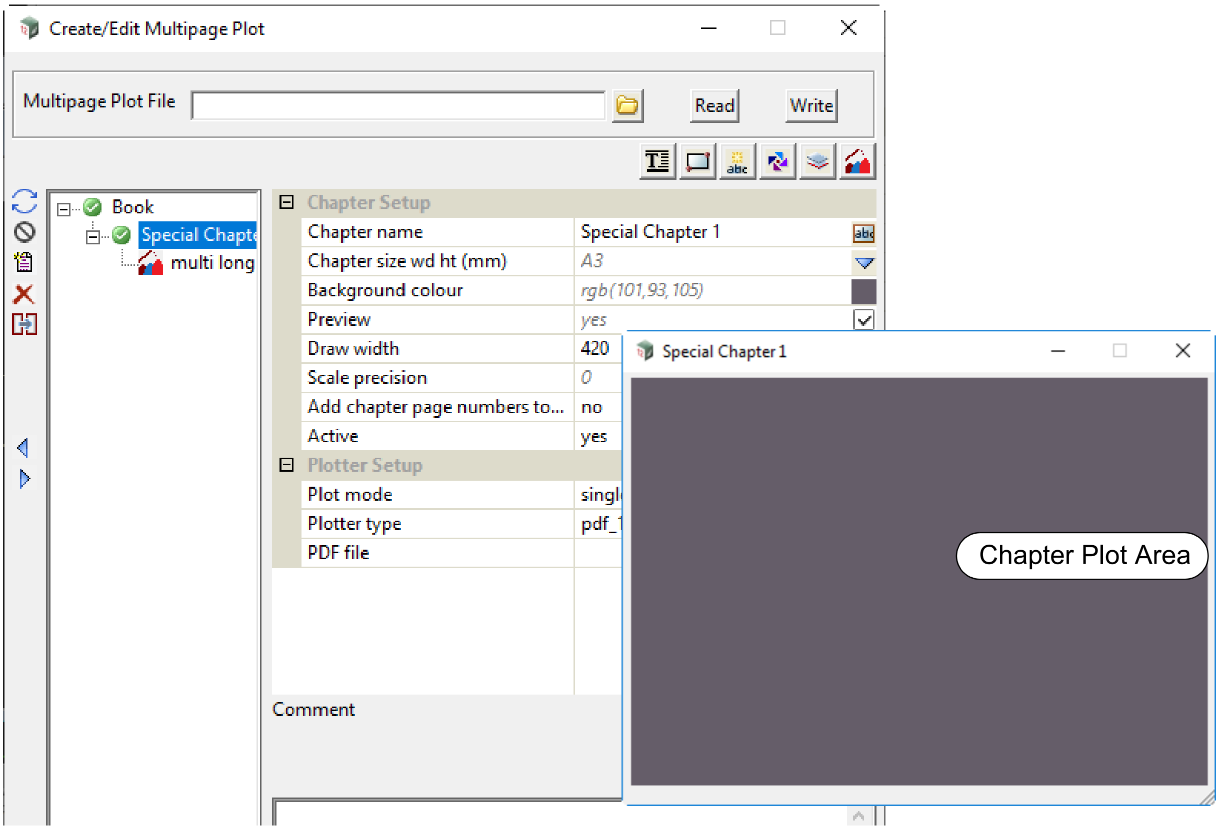
   If *End chainage* in the multi-sections node is ***blank***, then the *End chainage* in the PPF is used.
4. Title Blocks, Frames, Text, Symbols and Models can be added to the X-Section Chapter and they behave as they do for any other Chapter.
5. The number of pages created in the X-Section Chapter is included in the special text **$total_pages**.
6. If the special text **$current_page** is used in a X-Section Chapter, then it will be incremented correctly for each of the individual pages plotted in the X-Section Chapter.

For information on the special text $variables for MPS, see 20.3.4.8.6 MPS Text $variables.

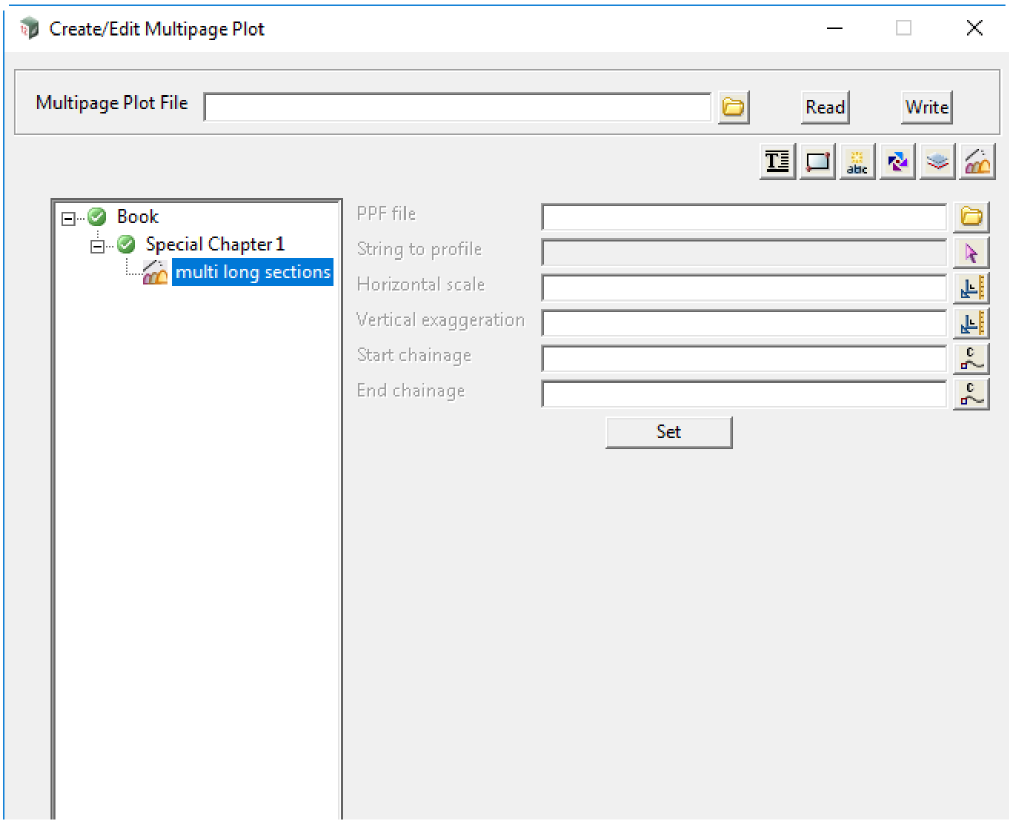
20.3.4.11.3 Long Section Chapter



Clicking on the **Special Chapter node >Long section** option creates a Long section Chapter with a subnode called **multi long sections**.



Clicking on the **multi long sections** node displays the information for controlling the pages generated by the Long Section Chapter.



Long Section Setup

Panel Field	Type	Pop-Up
PPF file	Long section ppf box	available long sec ppfs

the selected Long Section PPF file that contains all the information for drawing the pages of long sections.

***Note**: the Title Block node in the PPF file is **NOT** used.*

String to profile string select box

if a string is selected, this will override the **String to profile** *field in the Long Section Plot PPF file, and this string will be used as the primary string for the Long Section plot.*

*If **blank**, the* **String to profile** *field value in the Long Section Plot PPF file is used for the plot.*

Model of strings to profile Model box

*if a model is selected, this will override the **Model of strings to profile** field in the Long Section Plot PPF file, and a Long Section Plot will be produced for each string in this model.*

*If blank, the **Model of strings to profile** field value in the Long Section Plot PPF file is used for the plot.*

***Note**: When using this option the **Start chainage** and **End chainage** fields are ignored and the entire strings are plotted.*

Horizontal scale real box

if a scale is provided, this value will override the value in the **Horizontal scale** *field in the Long Section Plot PPF file, and this scale will be used for the Long Section Plot.*

*If **blank**, the* **Horizontal scale** *field value in the Long Section Plot PPF file is used for the plot.*

Vertical exaggeration real box

*if an exaggeration is provided**,** this value will override the value in the* **Vertical exaggeration** *field in the Long Section Plot PPF file, and this exaggeration will be used for the Long Section plot.*

*If **blank**, the* **Vertical exaggeration** *field value in the Long Section Plot PPF file is used for the plot.*

Start chainage real box

if a start chainage is provided, this value will override the value in the **Start chainage** *field in the Long Section plot* ***PPF file****, and this chainage will be used to restrict the primary string profile for the Long Section Plot.*

If ***blank****, the* **Start chainage** *field value in the Long Section plot* ***PPF file*** *is used for the plot.*

End chainage real box

if a start chainage is provided, this value will override the value in the ***Start chainage*** *field in the Long Section Plot* ***PPF file****, and this chainage will be used to restrict the primary string profile for the Long Section Plot.*

If ***blank****, the* ***Start chainage*** *field value in the Long Section Plot* ***PPF file*** *is used for the plot.*

Symbol Setup - only for plan plotting as part of long section plot

Allows for the creation of a symbol that will automatically set it's rotation value to match the plan produced when Plan Plotting.

Note*: these parameters ONLY apply when Plan Plotting options are enabled in the supplied* ***PPF file****.*

Symbol Symbol box available symbols

Symbol to use. Default value: NORTH.

Colour Colour Box

colour to use for the symbol. Default value: RED.

Scale mode Choice Box native, user and plot scale

scale mode to use for the symbol. Default value: native scale

native scale:

*user scale: allows the user to enter a custom scale (****User scale*** *field below) for the sizing of the symbol.*

plot scale: the ***Horizontal scale*** *field value in the* ***PPF file*** *will be used for the sizing of the symbol.*

User scale Real box 20

the value to be used to size the Symbol if the ***Scale mode*** *field is set to* ***user scale****.*

Default value: 20

Active Choice box yes, no

if ***yes*** *then a rotated symbol will be created using the parameters specified here.*

if ***no*** *then no creation will take place.*

Default value: no

Note: *Plan Plotting must be enabled and set up in the PPF file otherwise no symbol will be created.*

X coordinate Real box

the X coordinate (in mm) of the symbol on the sheet. Default value: 0

Y coordinate Real box

the Y coordinate (in mm) of the symbol on the sheet. Default value: 0

Buttons at Bottom

Set button

update and use the values in the fields.
Note that a **Write** *needs to be done to update the Multipage plots file.*

20.3.4.11.3.1 Notes on Using the Long Section Chapter

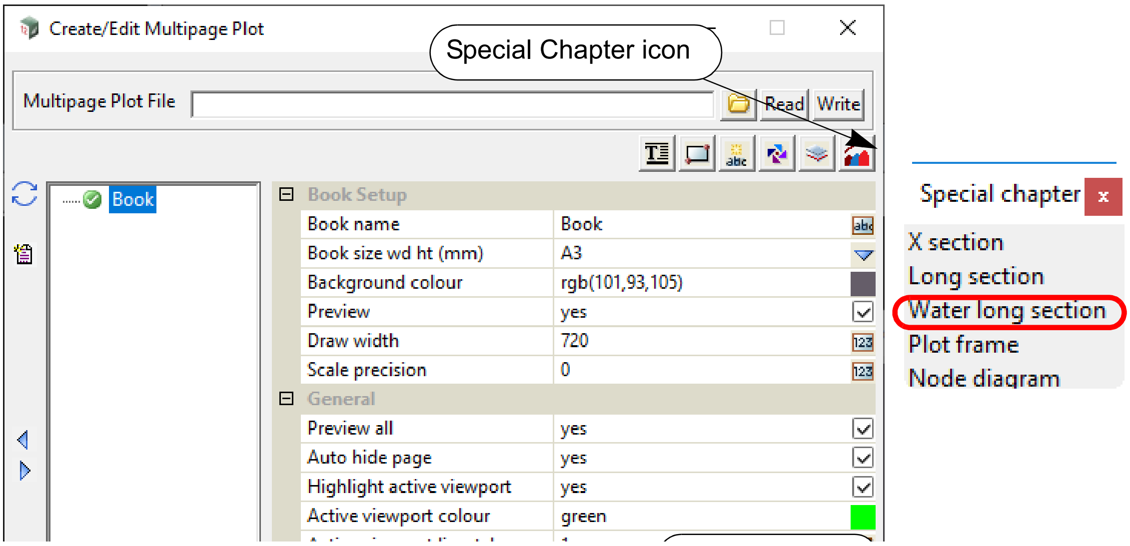
1. No other pages can be added to the Long Section Chapter and the drawing of the long section of the primary string on each page is determined by the information in the Long Plot PPF file.
2. The *Title Block* in the Long Plot PPF is NOT used.
3. If they are not blank, the *Start and End Chainages* in the PPF are NOT used and are replaced by the values given in the **multi- long sections** node of the Long Section Chapter.

   If *Start chainage* in the multi-sections node is ***blank***, then the *Start chainage* in the PPF is used.

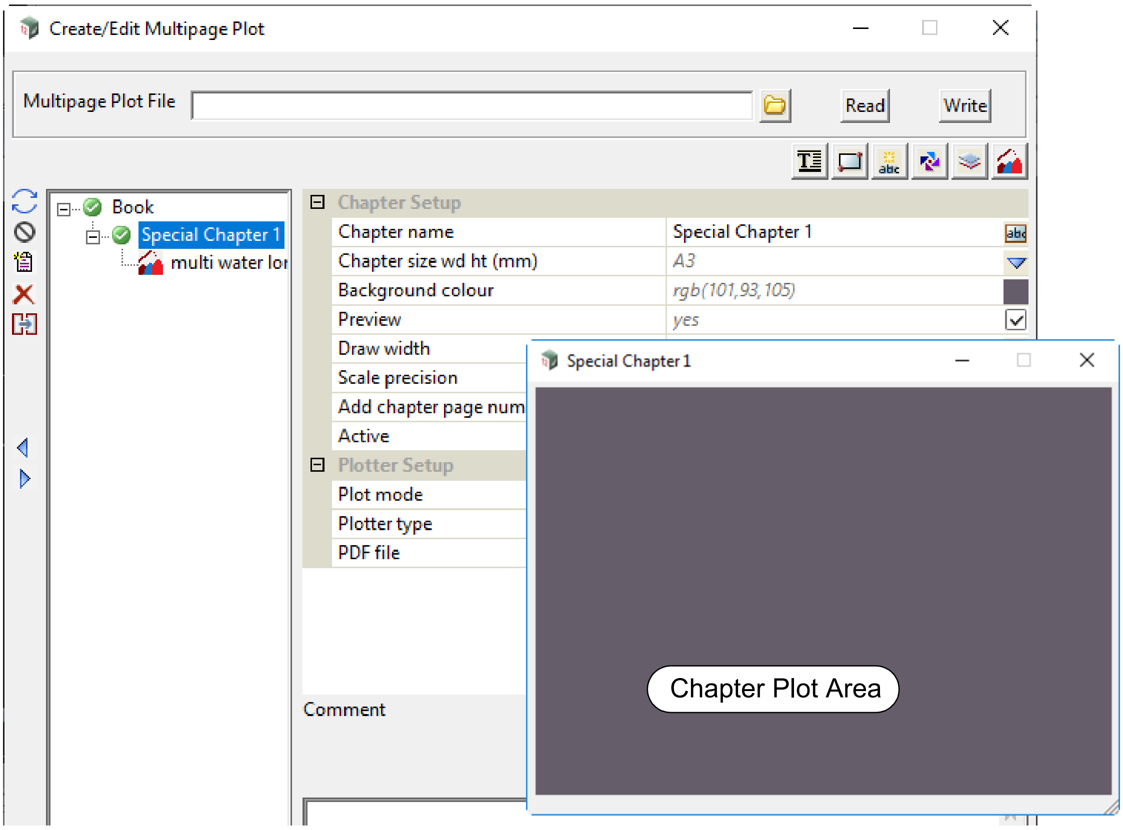
   If *End chainage* in the multi-sections node is ***blank***, then the *End chainage* in the PPF is used.
4. Title Blocks, Frames, Text, Symbols and Models can be added to the Long Section Chapter and they behave as they do for any other Chapter.
5. The number of pages created in the Long Section Chapter is included in the special text **$total_pages**.
6. If the special text **$current_page** is used in a Long Section Chapter, then it will be incremented correctly for each of the individual pages plotted in the Long Section Chapter.

For information on the special text $variables for MPS, see 20.3.4.8.6 MPS Text $variables.

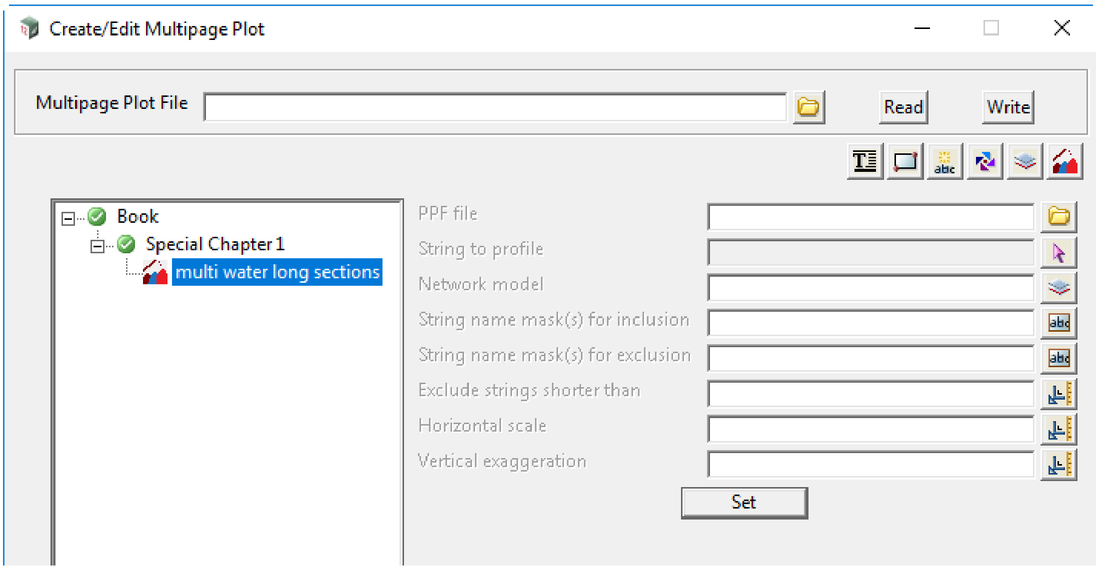
20.3.4.11.4 Water Long Section Chapter



Clicking on the **Special Chapter >Water long section** option creates a Water Long section Chapter with a subnode called **multi water long sections**.



Clicking on the **multi water long sections** node displays the information for controlling the pages generated by the Water Long Section Chapter.



PPF file Water Long section ppf box available water long sec ppfs

the selected Water Long Section PPF file that contains all the information for drawing the pages of water long sections.

***Note**: the Title Block node in the PPF is **NOT** used.*

String to profile string select box

if a string is selected, this will override the **Single string to plot** *field in the Water Long Section Plot PPF file, and this string will be the only string plotted in the Water Long Section plot.*

*If **blank**, the* **Single string to plot** *field in the Water Long Section Plot PPF file is used as the primary sting for the Water Long section plot.*

Network model model box available models

if a model is selected, this will override the **Network model** *field in the Water Long Section Plot PPF file, and this model will be used for the model of water strings to plot.*

*If **blank**, the* **Network model** *field in the Water Long Section Plot PPF file is used for the model of water strings to plot.*

String name mask(s) for inclusion text box

*if **not blank**, this value will override the value in the* **String name mask(s) for inclusion** *field in the Water Long Section Plot PPF file, and is used for the plot.*

*If **blank**, the value in the* **String name mask(s) for inclusion** *field in the Water Long Section Plot PPF file is used for the plot.*

String name mask(s) for exclusion text box

*if **not blank**, this value will override the value in the* **String name mask(s) for exclusion** *field in the Water Long Section Plot PPF file, and is used for the plot.*

*If **blank**, the value in the* **String name mask(s) for exclusion** *field in the Water Long Section Plot PPF file is used for the plot.*

Exclude strings shorter than real box

*if **not blank**, this value will override the value in the* **Exclude string shorter than** *field in the Water Long Section Plot PPF file, and is used for the plot.*

*If **blank**, the value in the* **Exclude string shorter than** *field in the Water Long Section Plot PPF file is used for the plot*

Horizontal scale real box

*if **not blank**, this value will override the value in the* **Horizontal scale** *field in the Water Long Section Plot PPF file, and is used for the plot.*

*If **blank**, the value in the* **Horizontal scale** *field in the Water Long Section Plot PPF file is used for the plot.*

Vertical exaggeration real box

*if **not blank**, this value will override the value in the* **Vertical exaggeration** *field in the Water Long Section Plot PPF file, and is used for the plot.*

*If **blank**, the value in the* **Vertical exaggeration** *field in the Water Long Section Plot PPF file is used for the plot.*

Set button

update and use the values in the fields.

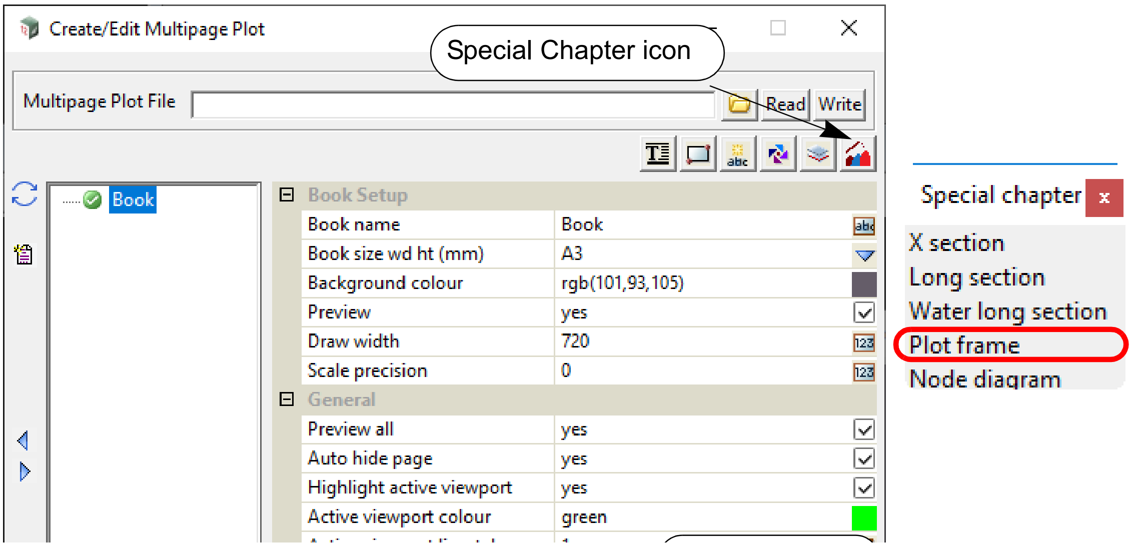
Note that a **Write** *needs to be done to update the Multipage plots file.*

20.3.4.11.4.1 Notes on Using the Water Long Section Chapter

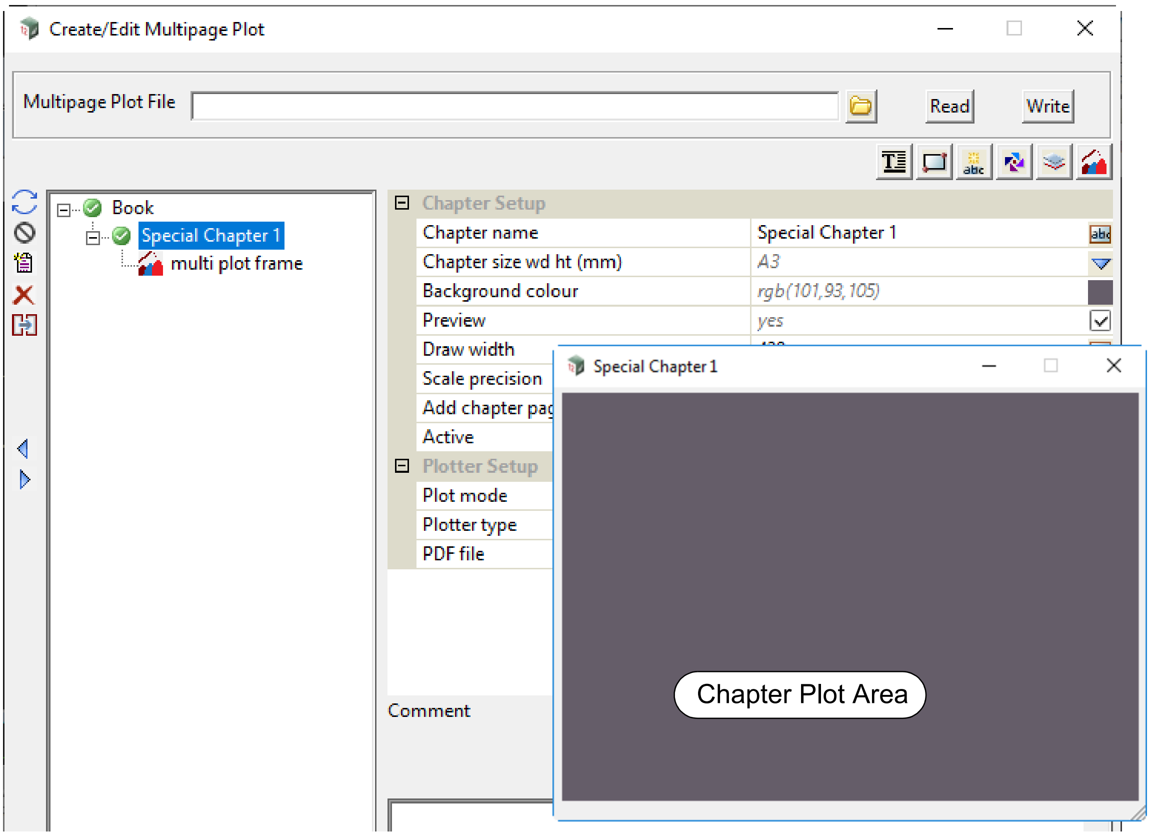
1. No other pages can be added to the Water Long Section Chapter and the drawing of the water long sections on each page is determined by the information in the Water Long Plot PPF file.
2. The *Title Block* in the Water Long Plot PPF is NOT used.
3. Title Blocks, Frames, Text, Symbols and Models can be added to the Water Long Section Chapter and they behave as they do for any other Chapter.
4. The number of pages created in the Water Long Section Chapter is included in the special text **$total_pages**.
5. If the special text **$current_page** is used in a Water Long Section Chapter, then it will be incremented correctly for each of the individual pages plotted in the Water Long Section Chapter.

For information on the special text $variables for MPS, see 20.3.4.8.6 MPS Text $variables.

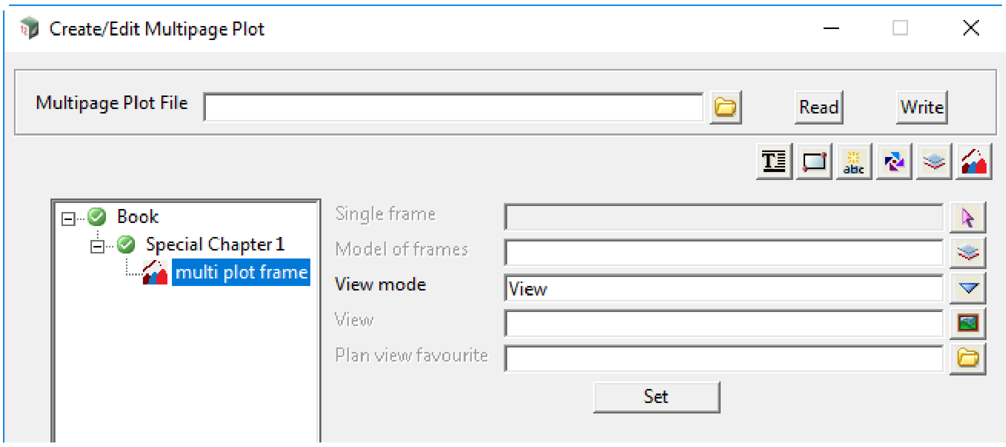
20.3.4.11.5 Plot Frame Chapter



Clicking on the **Special Chapter >Plot frame** option creates a Plot frame Chapter with a subnode called **multi plot frames**.



Clicking on the **multi plot frame** node displays the information for controlling the pages generated by the Plot Frame Chapter.



PPF file Plot Frames ppf box available plot frame ppfs

the selected Plot Frame PPF file that contains all the information for drawing the pages of a model of plot frames.

***Note**: the Title Block in the PPF is **NOT** used.*

Single frame Plot Frames select box

if a Plot Frame is selected, this will override the **Single frame** *field in the Plot Frame PPF file.*

*If **blank**, the* **Single frame** *field in the Plot Frame PPF file is used.*

Model of frames Model box available models

if a model is selected, this will override the **Model of frames** *field in the Plot Frame PPF file.*

*If **blank**, the* **Model of frames** *field in the Plot Frame PPF file is used.*

Set button

update and use the values in the fields.

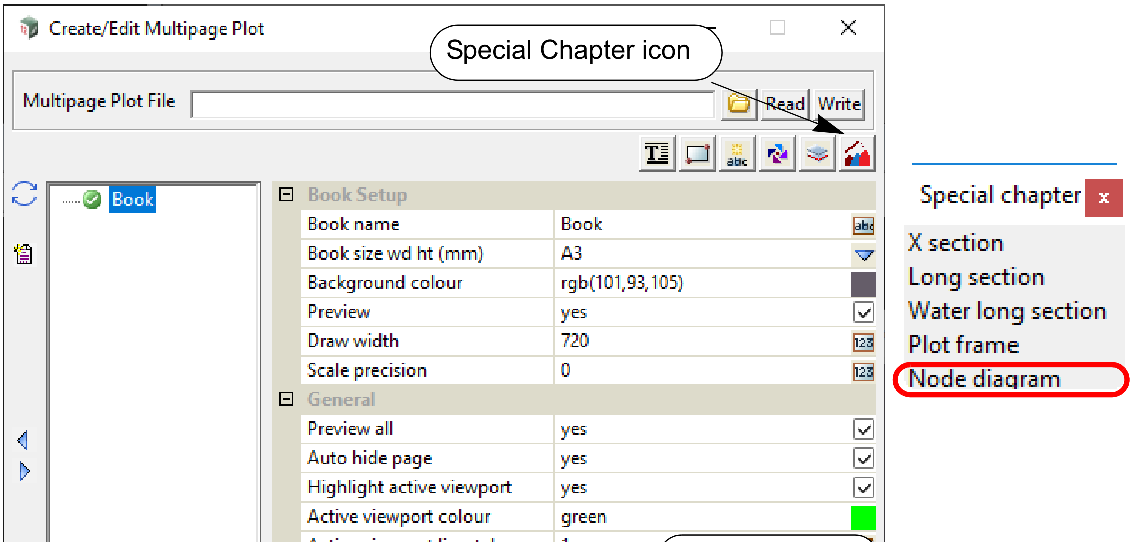
Note that a **Write** *needs to be done to update the Multipage plots file.*

20.3.4.11.5.1 Notes on Using the Plot Frames Chapter

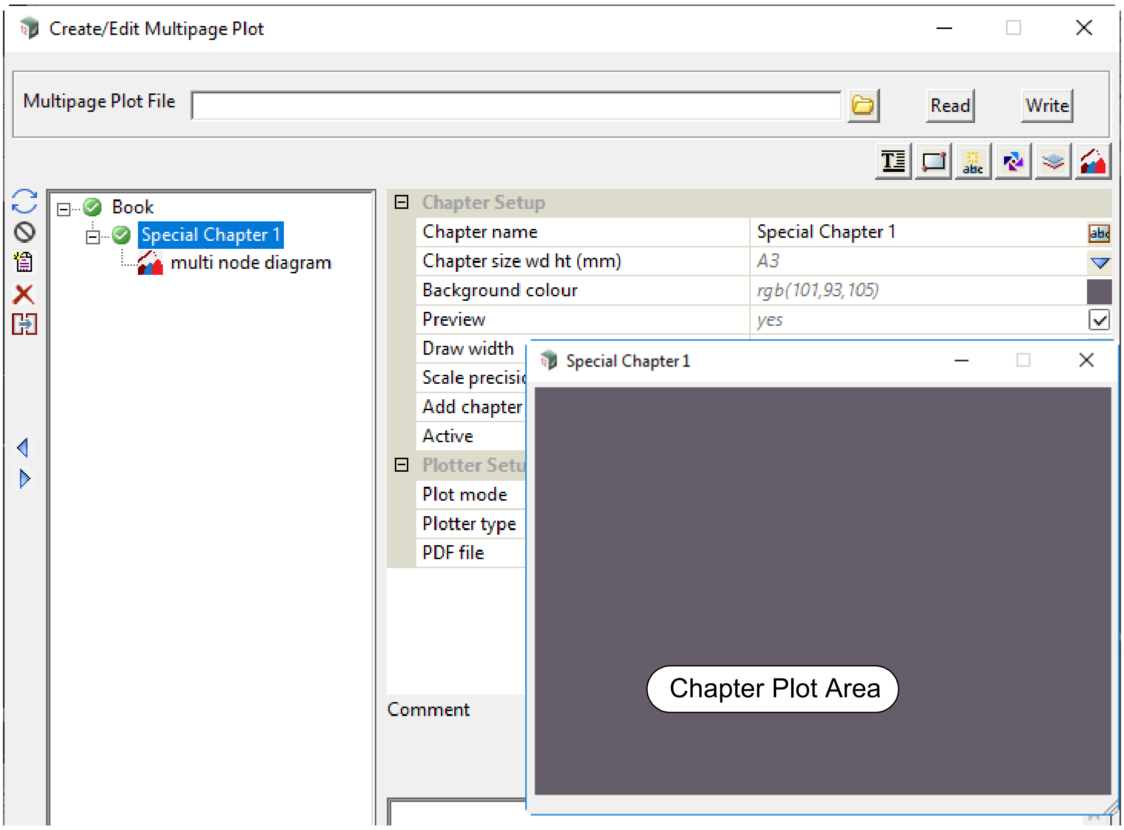
1. No other pages can be added to the Plot Frames Chapter and the drawing of the plot frame on each page is determined by the information in the Plot Frame PPF file.
2. The *Title Block* in the Plot Frame PPF is NOT used.
3. Title Blocks, Frames, Text, Symbols and Models can be added to the Plot Frame Chapter and they behave as they do for any other Chapter.
4. The number of pages created in the Plot Frame Chapter is included in the special text **$total_pages**.
5. If the special text **$current_page** is used in a Plot Frame Chapter, then it will be incremented correctly for each of the individual pages plotted in the Plot Frame Chapter.

For information on the special text $variables for MPS, see 20.3.4.8.6 MPS Text $variables.

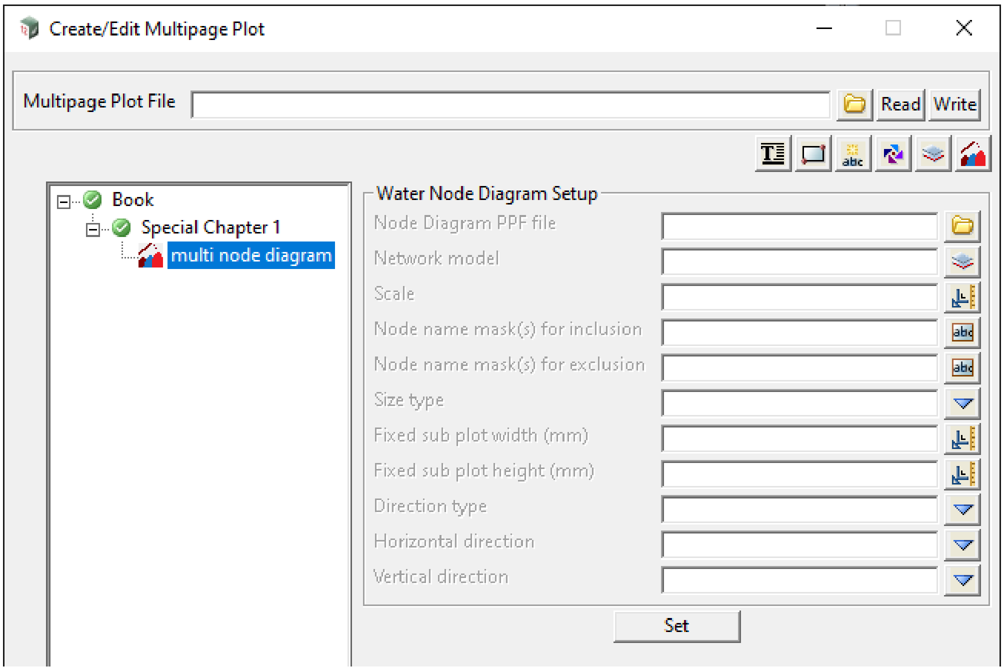
20.3.4.11.6 Node Diagram Chapter



Clicking on the **Special chapter >Node diagram** option creates a Plot frame Chapter with a subnode called **multi node diagram**.



Clicking on the **multi node diagram** node displays the information for controlling the pages generated by the Node Diagram Chapter.



Node Diagram PPF file Water Diagram ppf box available water diagram ppfs

the selected Node Diagram PPF file that contains all the information for drawing the pages of node diagrams.

***Note**: the Title Block in the PPF is **NOT** used.*

Network model Model box available models

the model containing the water string whose nodes are to be plotted.

*if **not blank**, this value will override the existing value of the **Network model** field in the **Node Diagram PPF file** when plotting.*

*if **blank**, no overriding will occur and the **Network model** field value specified in the **Node Diagram PPF file** will be used when plotting.*

Scale 1:

the scale to plot the node diagrams.

Node name mask(s) for inclusion inclusion_mask text box

*if **not blank** then only those nodes whose name matches one in the name mask are considered for plotting. See* A Note on Name masks.

*If **blank**, all nodes are considered for plotting. So blank acts like "*".*

Node name mask(s) for exclusion exclusion_mask text box

*if **not blank** then any node whose name matches one in the name mask is not plotted. See* A Note on Name masks.

*If **blank**, then no nodes are considered for excluding from plotting.*

Set sub plot size to choice box fixed size, diagram size

*if **fixed size**, each node diagram is drawn in a rectangle defined by **Sub plot width in mm** and **Sub plot height in mm**.*

*If **diagram size**, each node diagram is drawn in a rectangle of a size calculated to fit that particular node. So the size will be different for each node.*

Fixed plot width in mm real box

the width of the imaginary box to draw each node diagram in.

Sub plot height in mm real box

the height of the imaginary box to draw each node diagram in.

Sub plot direction choice box

*if **by column**, then the plotted node diagrams are arranged into columns.*

*if **by row**, then the plotted node diagrams are arranged into rows.*

Horizontal direction choice box

*if **left to right**, the node diagrams in a row start on the left and move to the right.*
*If **right to left**, the node diagrams in a row start on the right and move to the left.*

Vertical direction choice box

*if **top to bottom**, the node diagrams in a column start at the top and go down to the bottom.*
*If **bottom to top**, the node diagrams in a column start at the bottom and go up to the top.*

Set button

update and use the values in the fields.
Note that a **Write** *needs to be done to update the Multipage plots file.*

20.3.4.11.6.1 Notes on Using the Node Diagram Chapter

1. No other pages can be added to the Node Diagram Chapter and the drawing of the plot frame on each page is determined by the information in the Node Diagram PPF file.
2. The *Title Block* in the Node Diagram PPF is NOT used.
3. Title Blocks, Frames, Text, Symbols and Models can be added to the Node Diagram Chapter and they behave as they do for any other Chapter.
4. The number of pages created in the Node Diagram Chapter is included in the special text **$total_pages**.
5. If the special text **$current_page** is used in a Node Diagram Chapter, then it will be incremented correctly for each of the individual pages plotted in the Node Diagram Chapter.

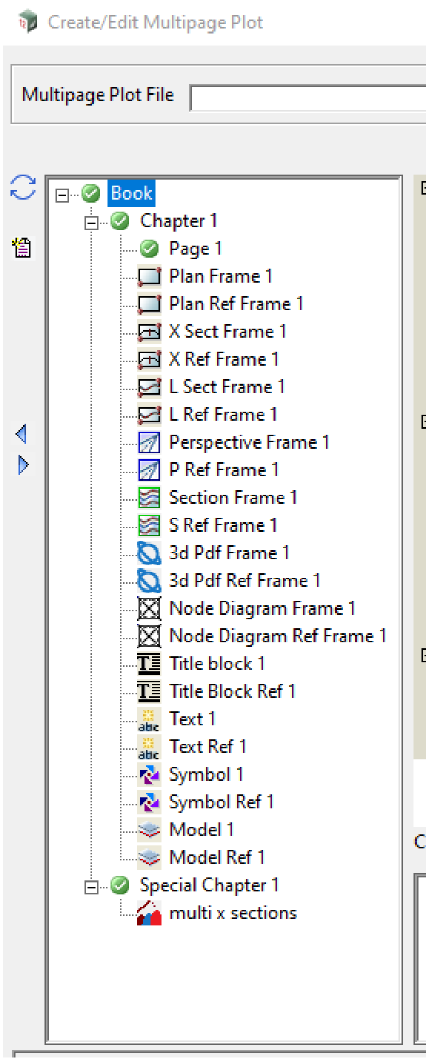
For information on the special text $variables for MPS, see 20.3.4.8.6 MPS Text $variables.

20.3.4.12 Node Insertion Order

When inserting new Nodes into the MPS tree there is an ordering that is used to determine the insertion position for the Node. The intention of the order is that Nodes be placed in a position that will hopefully require minimal manual repositioning from the user. The ordering also results in Nodes of the same type being grouped together in the MPS tree.

The insertion order is not enforced in any way after the insertion has occurred. The user is free to manually reposition the Nodes in the MPS tree to suite their preferences/requirements. However, the insertion order will only operate optimally when the MPS tree conforms to the order. So the more manual repositioning that occurs, the more the MPS tree will deviate from the order, which means it will be less likely that newly inserted Nodes will be in the correct position order wise.

The order was decided by taking into account the rules of MPS itself and by considering what users are using MPS to produce (predominately civil design and surveying drawings).



The **Node order** is as follows:

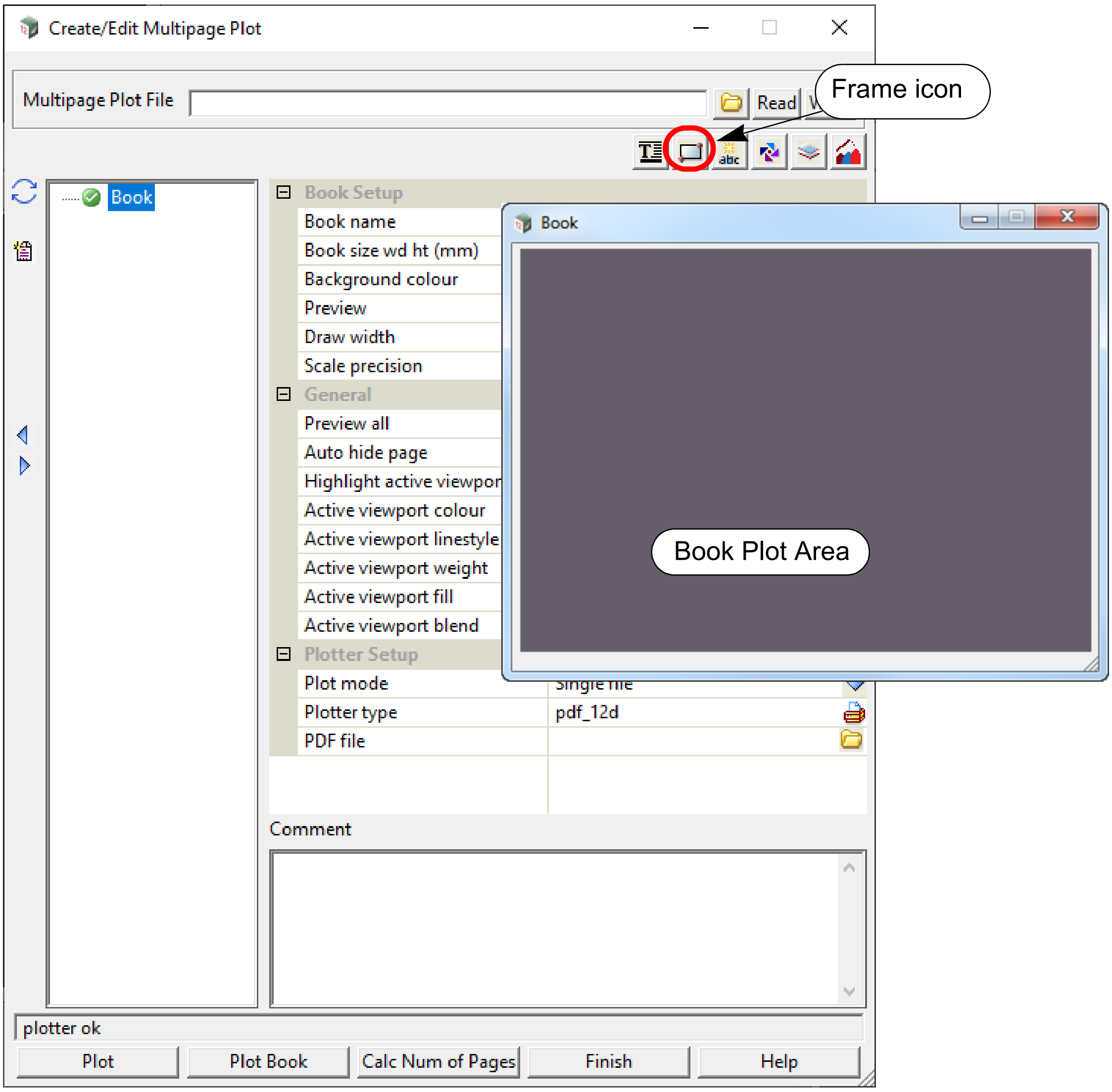
Book Node
Chapter Node
Special Chapter Node*
Page Node
Special Chapter Multi Node
Plan Frame Node
Plan Frame Reference Node
X Section Frame Node
X Section Frame Reference Node
Long Section Frame Node
Long Section Frame Reference Node
Perspective Frame Node
Perspective Frame Reference Node
Section Frame Node
Section Frame Reference Node
3D PDF Frame Node
3D PDF Frame Reference Node
Water Node Diagram Frame Node
Water Node Diagram Frame Reference Node
Title Block Node
Title Block Reference Node
Text Node
Text Reference Node
Symbol Node
Symbol Reference Node
Model Node
Model Reference Node

* **Special Chapters** only insert using the ordering if the Book Node is the currently selected node. Otherwise they insert directly underneath the Book level Subnode of the currently selected node.

20.3.5 Example Using Reference Frames

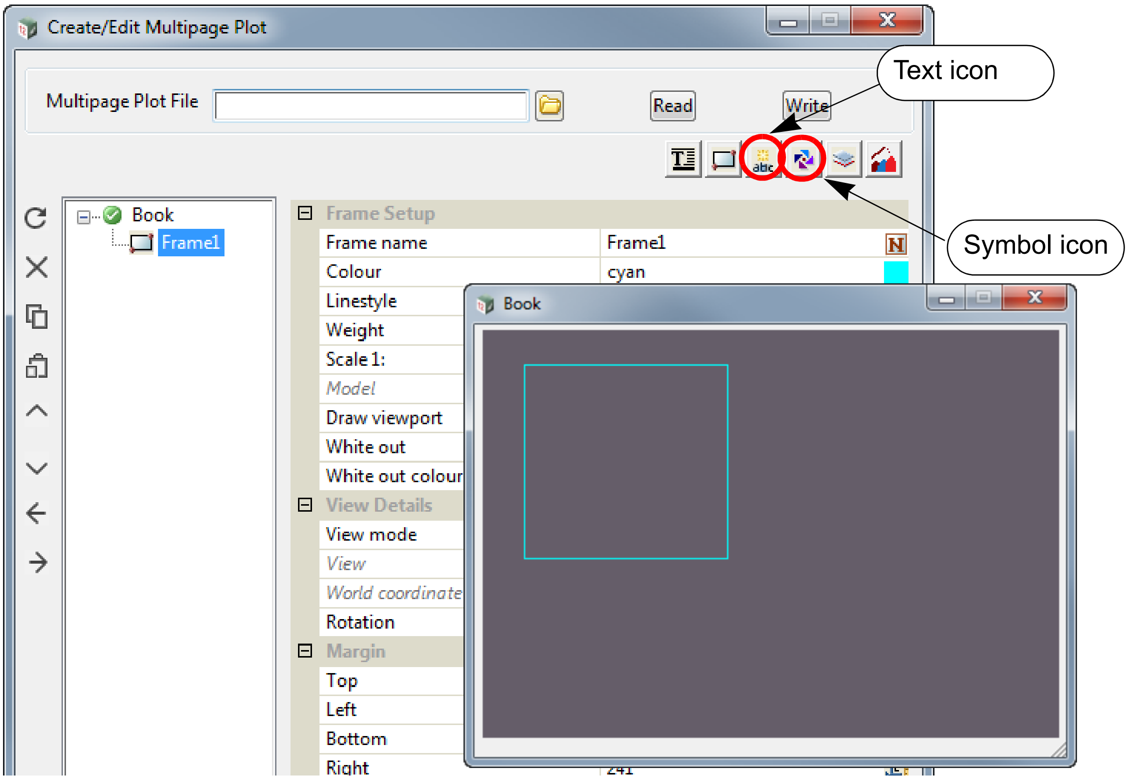
20.3.5.1 Creating Frames That Can Be Referenced

Click on the option ***Plots =>Multipage Plots =>Create*** to create a new **Multipage Plot Tree** with just the **Book node** and a **Book Plot Area**.



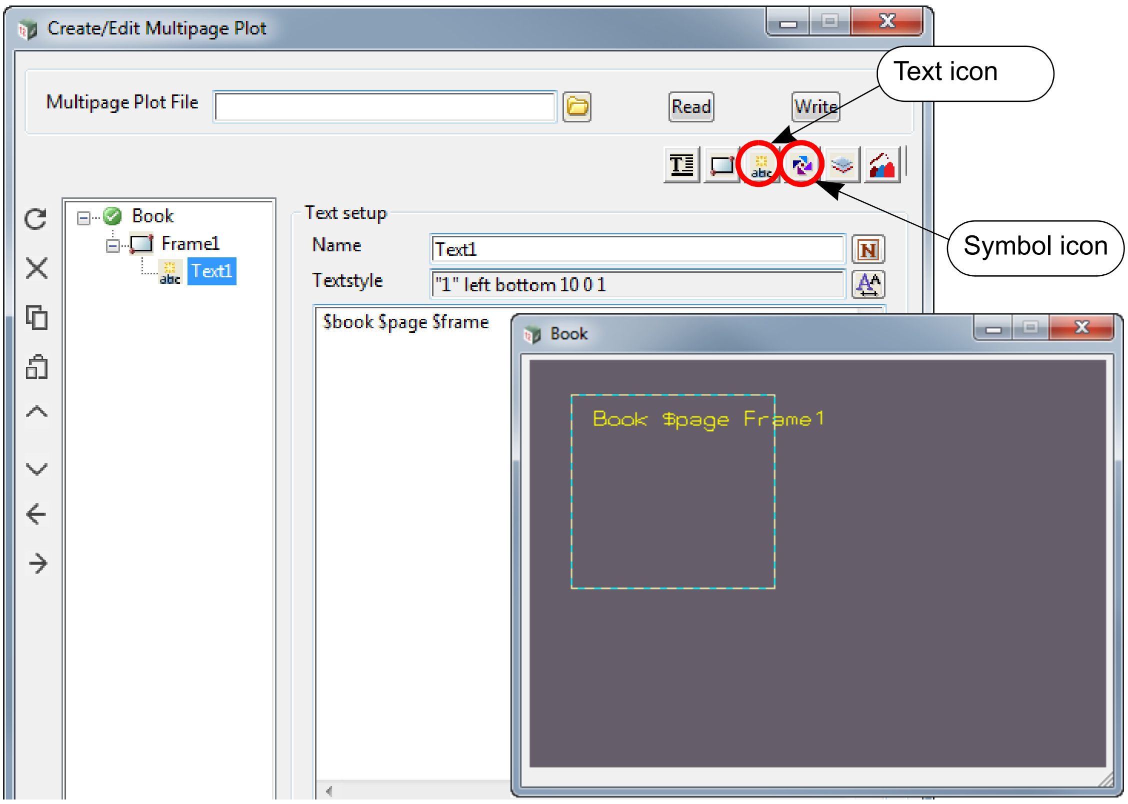
Click on the **Frame** icon and select **Plan** and then create a **Book Frame** on the left hand side of the **Book Plot Area**.

Say **Yes** to "Do you want to create reference frame(s) for Chapter(s)?"
Say **Yes** to "Do you want to create reference frame(s) for Pages(s)?"

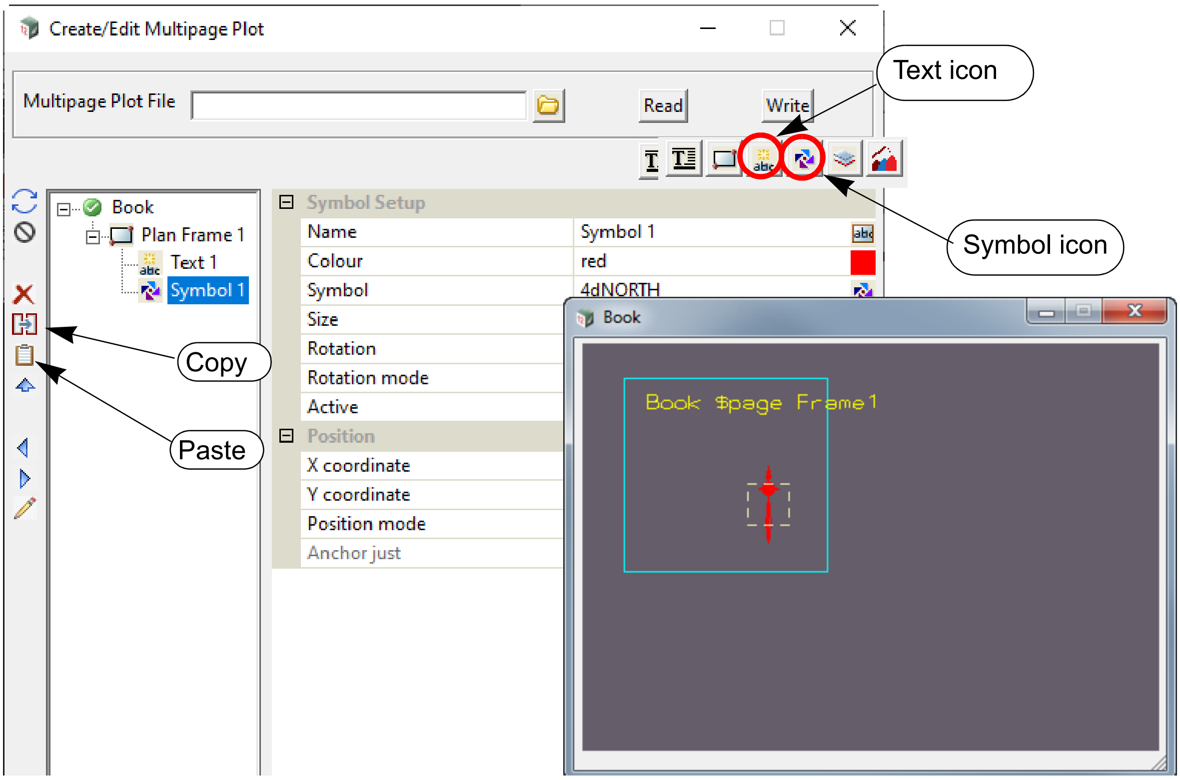


Highlight the *Frame 1* node and click on the **Text** icon, select **Rel to frame** and then place **Text** at the top of the **Book Frame** *Frame1*.

Click on the *Text 1* node and replace the text with "$book $page $frame" and click on the **Set** button.

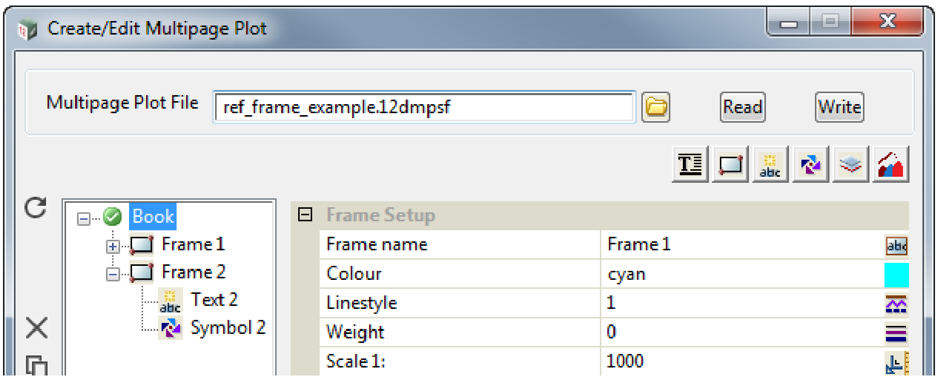


Highlight the *Frame 1* node and click on the **Symbol** icon, select **Rel to frame** and then place a Symbol at the bottom right of the **Book Frame** *Frame 1*.
A Symbol of name "Symbol 1" is created in *Book Frame 1*.



Before continuing, type **ref_frame_example** into the **Multipage Plot File** field and press **Write**.

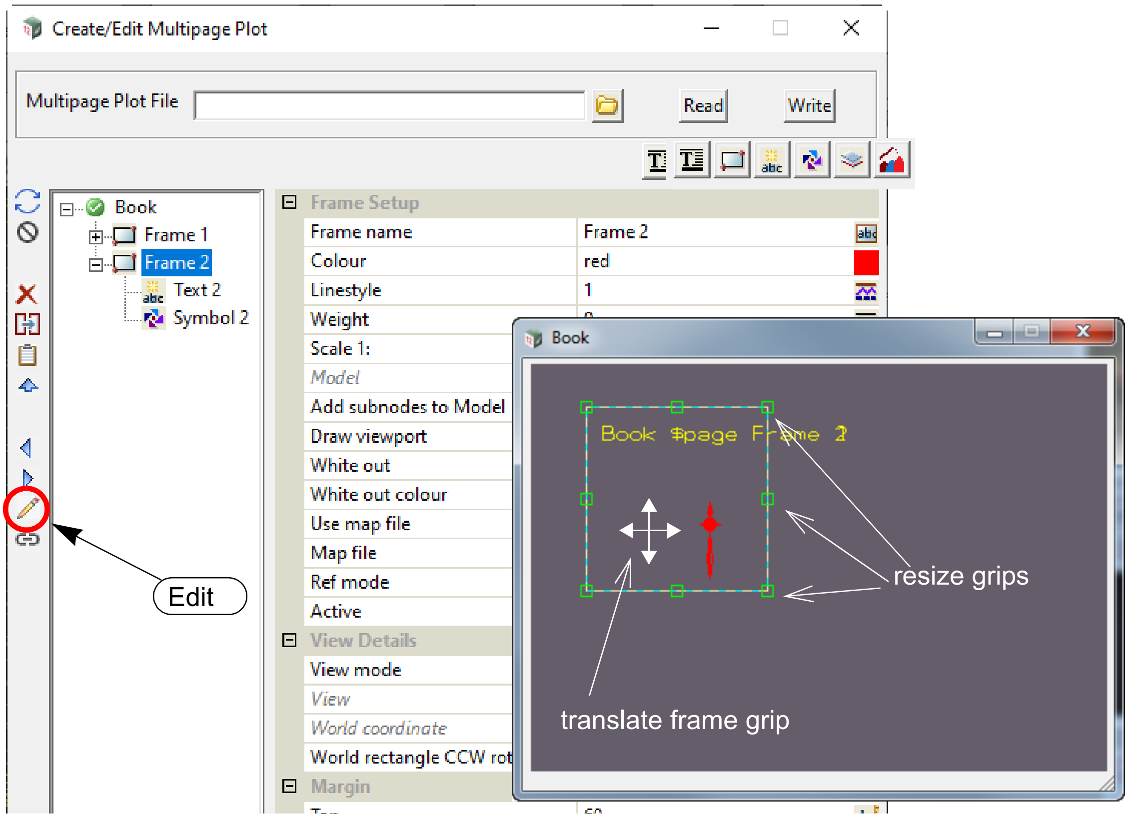
Now highlight the *Frame 1* node and click on the **Copy** icon and then the **Paste** icon. A new Frame is created at the bottom of the Books and the **Book** node is automatically highlighted.



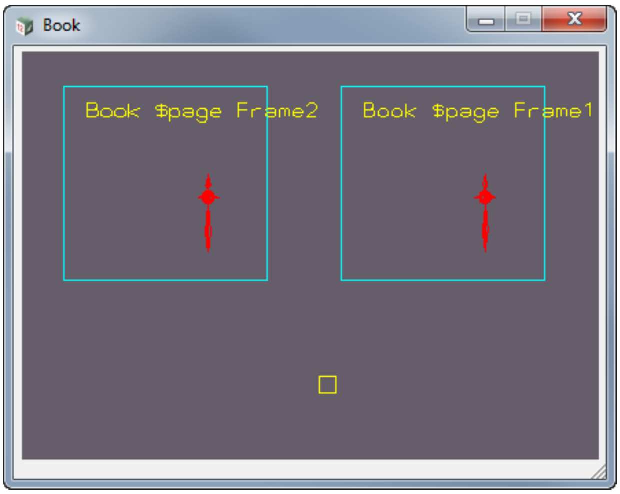
The copied frame is on top of the original frame so we will move one of the Frames by using the Frame Edit command which can be done in two ways:

(a) Highlight the **Frame** node to be edited and then click on the **Edit** icon on the left hand side.

The Frame will then highlight in the Book Plot Area and display nine resize grips and if you move your cursor inside the Frame, the translate frame grip is displayed.



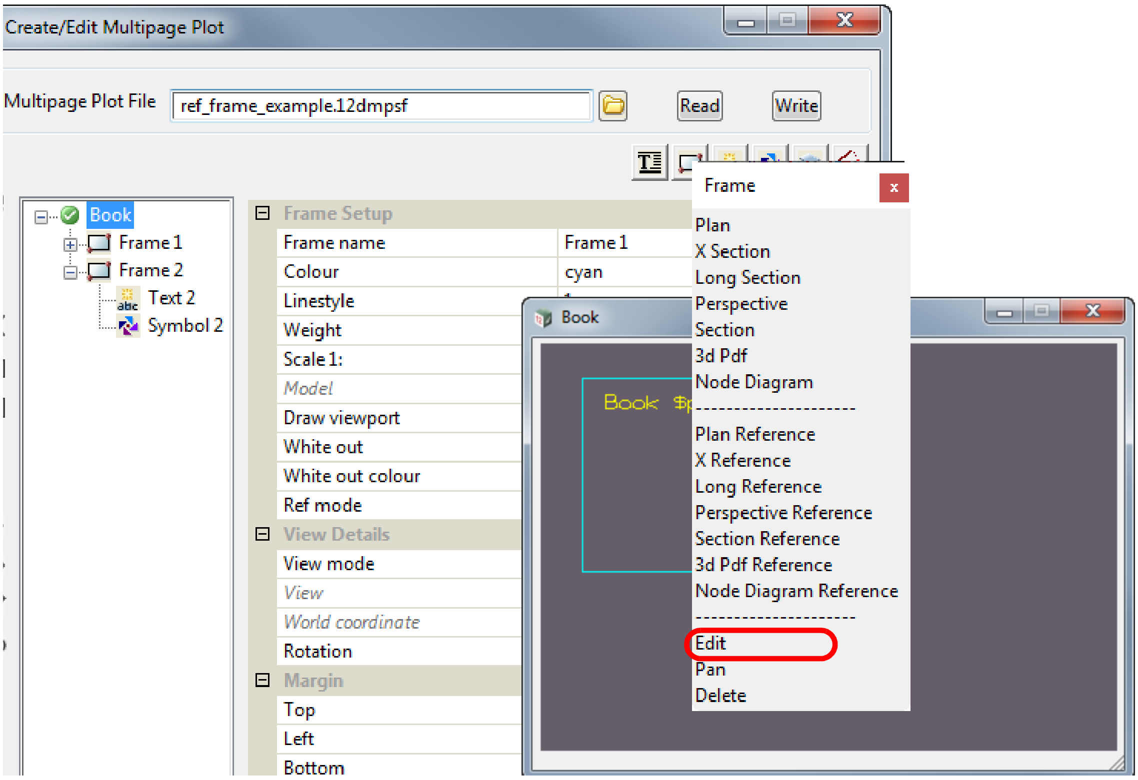
Hold down LB and move the Frame to the left.

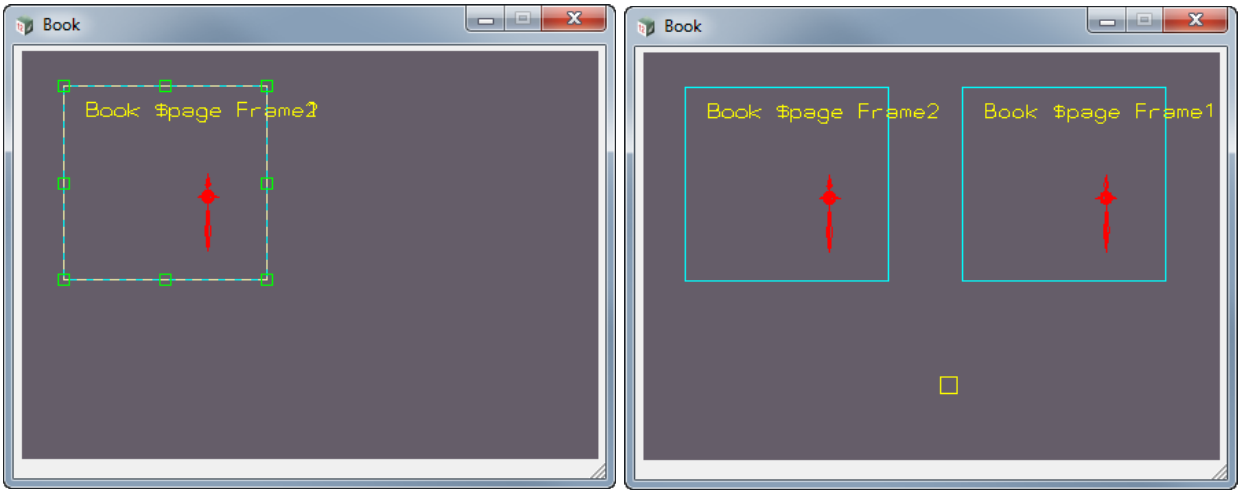


(b) Selecting the Frame from the Book Plot Area

With **Book** highlighted, click on the **Frame** icon and select **Edit** from the **Frame** menu.

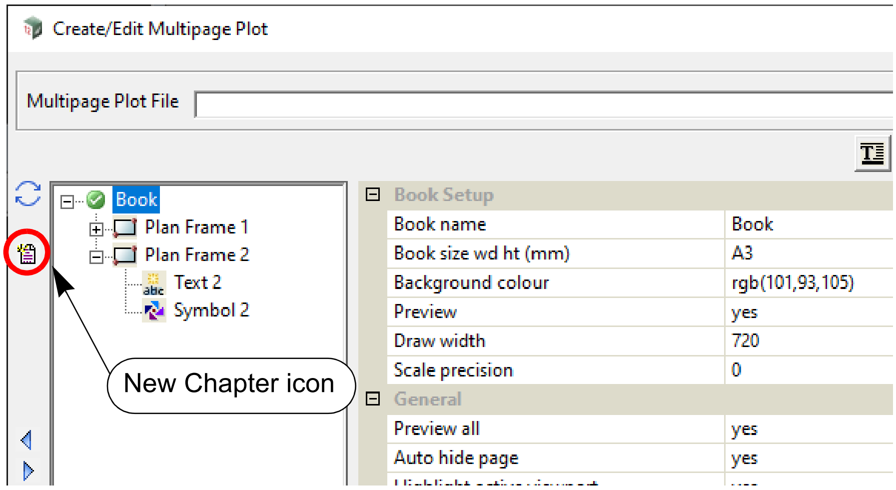
Then click LB only on one of the Frames in the **Book Plot Area** and then move it to the right hand side of the **Book Plot Area**.

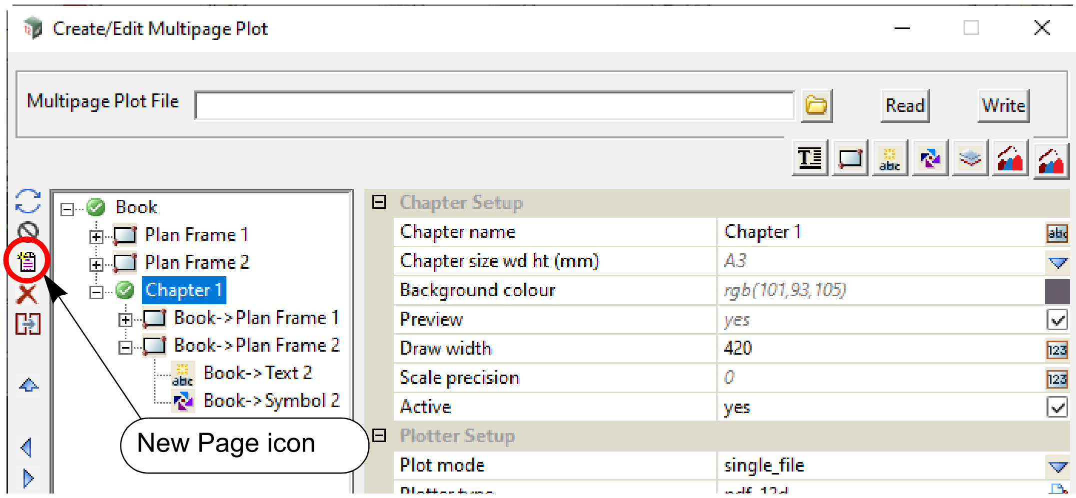

Create/Edit Multipage Plot
Multipage Plot File
ref_frame_example.12dmpsf
Read
Write
Book
Frame 1
Frame 2
Text 2
Symbol 2
Frame Setup
Frame name
Frame 1
Colour
cyan
Linestyle
Weight
Scale 1:
Model
Draw viewport
White out
White out colour
Ref mode
View Details
View mode
View
World coordinate
Rotation
Margin
Top
Left
Bottom
Frame
Plan
X Section
Long Section
Perspective
Section
3d Pdf
Node Diagram
Plan Reference
X Reference
Long Reference
Perspective Reference
Section Reference
3d Pdf Reference
Node Diagram Reference
Edit
Pan
Delete


Book
Book $page Frame2
Book
Book $page Frame2
Book $page Frame1

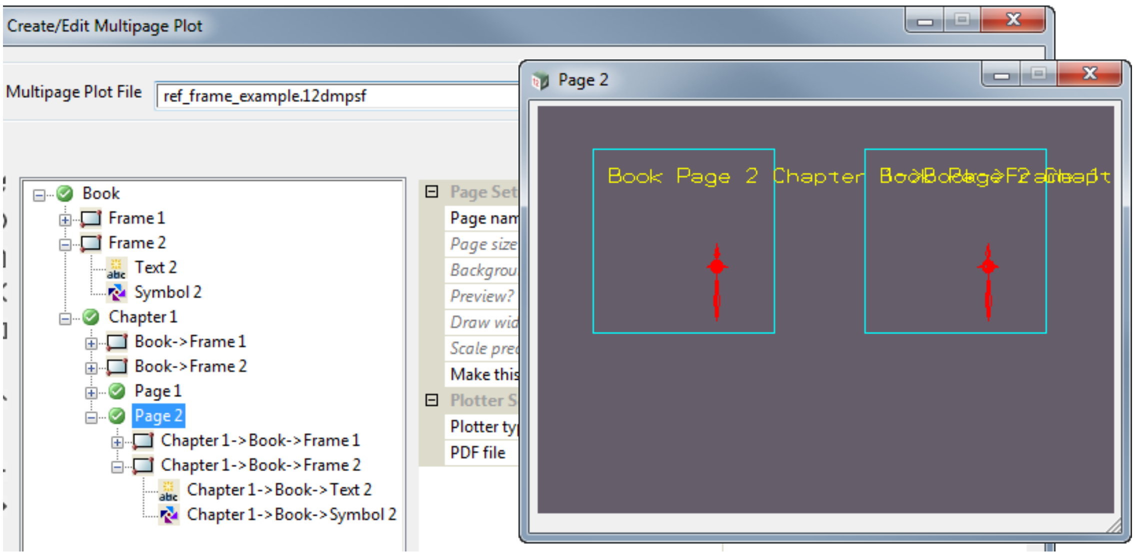
20.3.5.2 Automatic Reference Frame Creation

With the **Book** node highlighted, click on the **New Chapter** icon:





With the **Chapter** node highlighted, click on the **New page** icon twice to create two new pages in the **Chapter**:



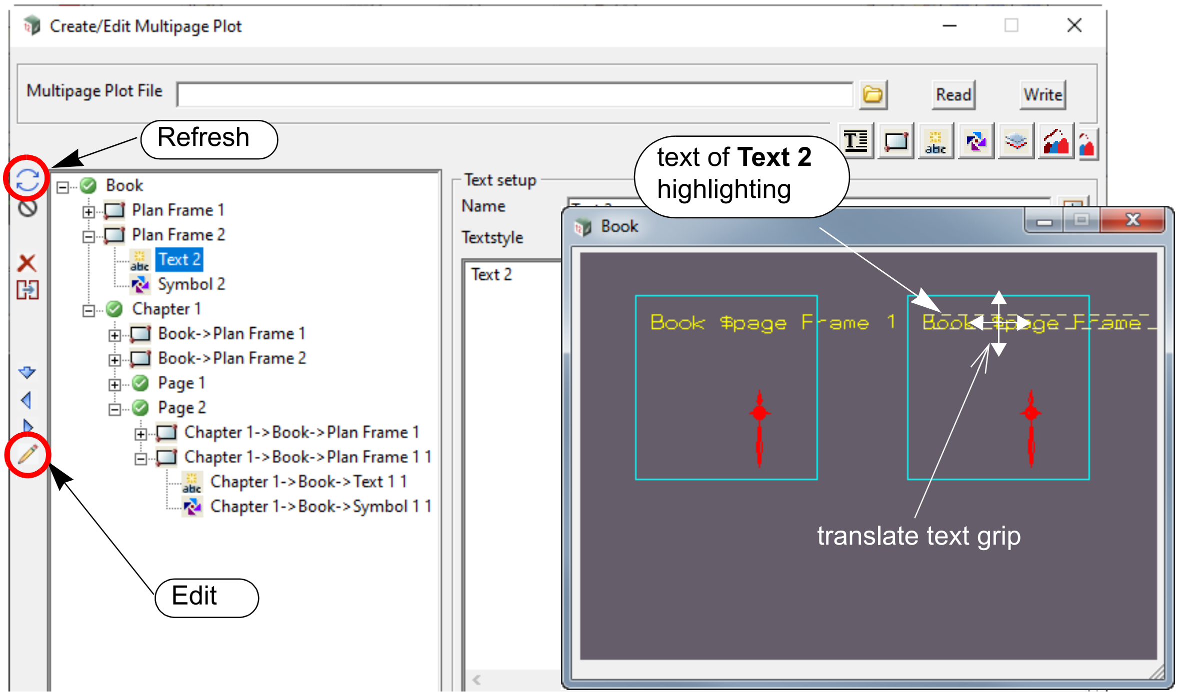
Click on the **Write** button to save the MPS file.

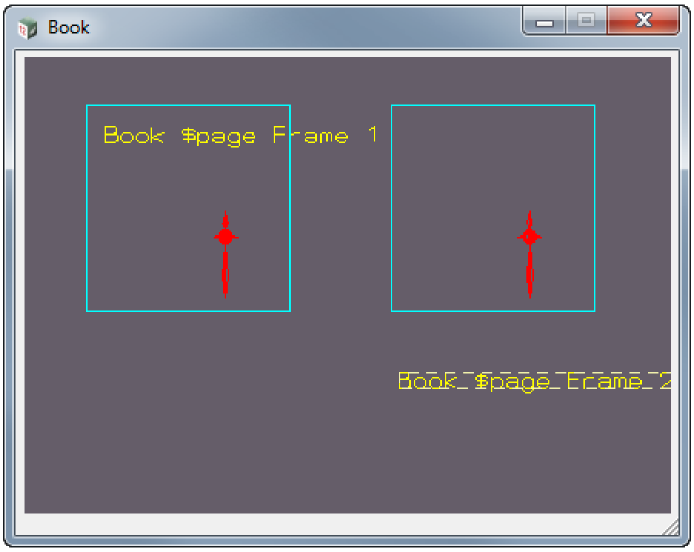
You'll notice the Text from the left hand frame is overwriting the Text in the right hand frame so we need to move it and we'll do that on the original **Book Frame** *Frame 2*.

To do so, click on the **Text 2 node** under **Book Frame 2**. The text for **Text 2** then highlights in the Page 2 Plot Area and if the cursor is moved over the highlight text then the translate text grip is displayed.

Hold down LB and move the text to the bottom of the right hand Frame.

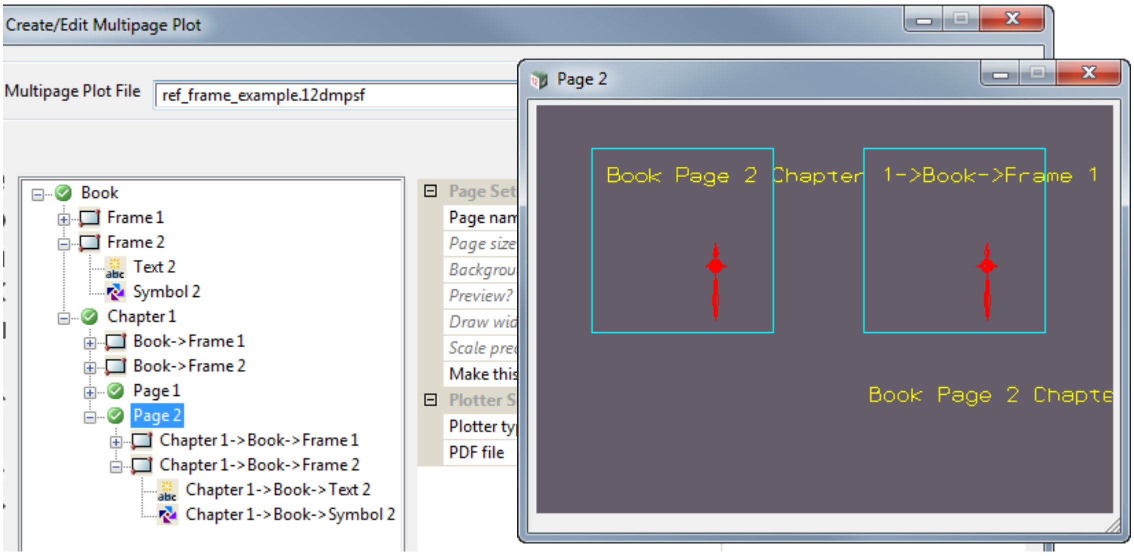
.





Click on the **Book** node again and then on Refresh to refresh all the Plot Areas for the Book.

Then click on the **Page2** node again.



Note

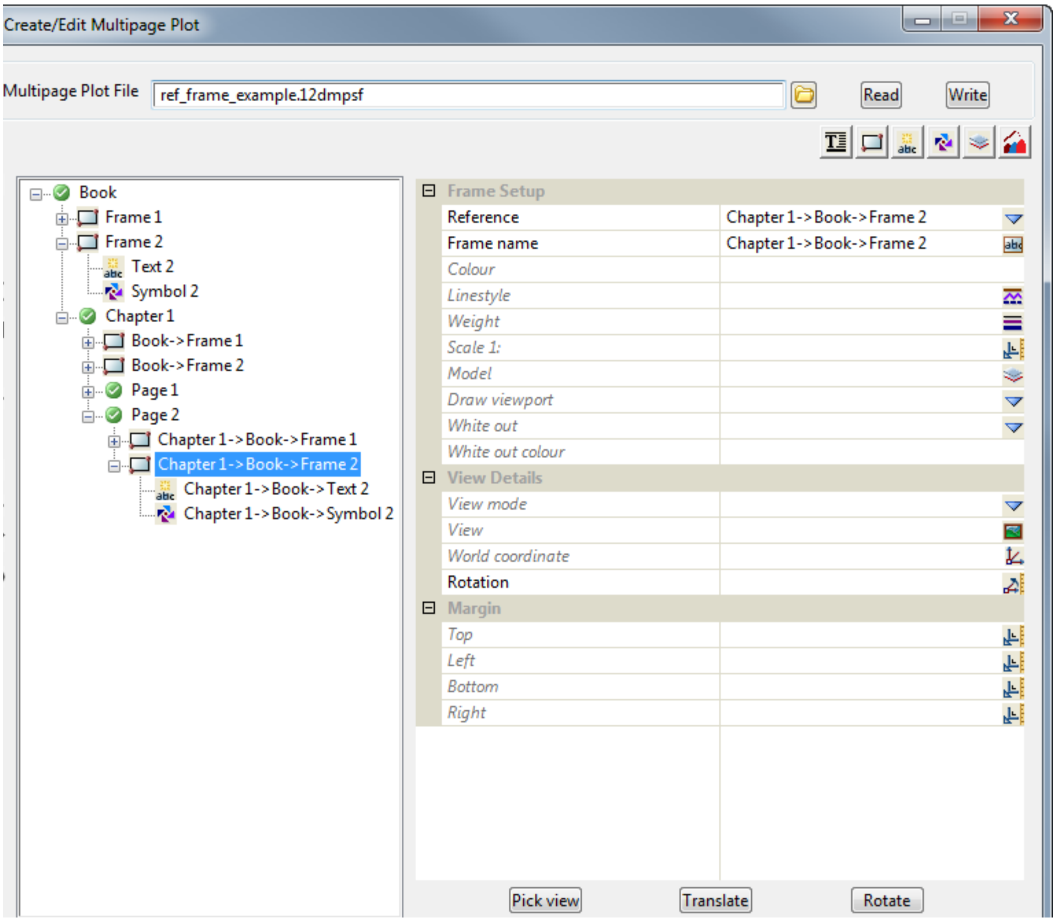
You can also edit the text by clicking on the **Book Frame** to show the **Book Plot Area** and then clicking on the **Text** icon on the top right and selecting **Edit.**
Next click LB down on the text to be moved to see the translate text grip and then move the text to the bottom of the right hand Frame and release LB.

20.3.5.3 Reference Frame Fields

We'll now work with these Reference Frames to give an idea of how Reference Frames can be used.

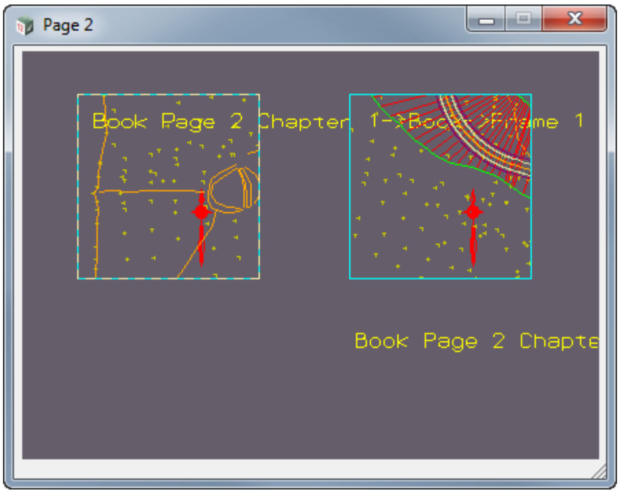
Highlight the **Reference Frame** *Chapter 1 ->Book ->Frame 2* under the **Page** node *Page 2.*

You will notice that most of the fields are blank which means that the values are taken from the Book Frame frame that is referenced (Book Frame *Book->Frame 2*) combined with those from the Chapter Frame that is also referenced (Chapter 1 Frame Book ->Frame 2) and we hadn't filled in any of these fields after creating the **Book Frame** or the **Reference Chapter Frame**.



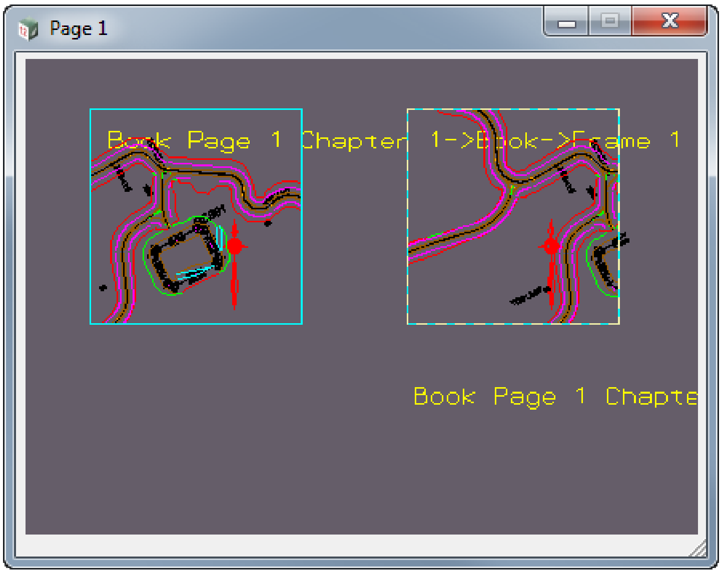
Click on **Pick View** and click in a view to get the data to draw in the Frame.

Similarly click on the **Reference Frame** *Chapter 1 ->Book ->Frame 1* under the **Page** node *Page2*, click on **Pick view** and then click in a view.



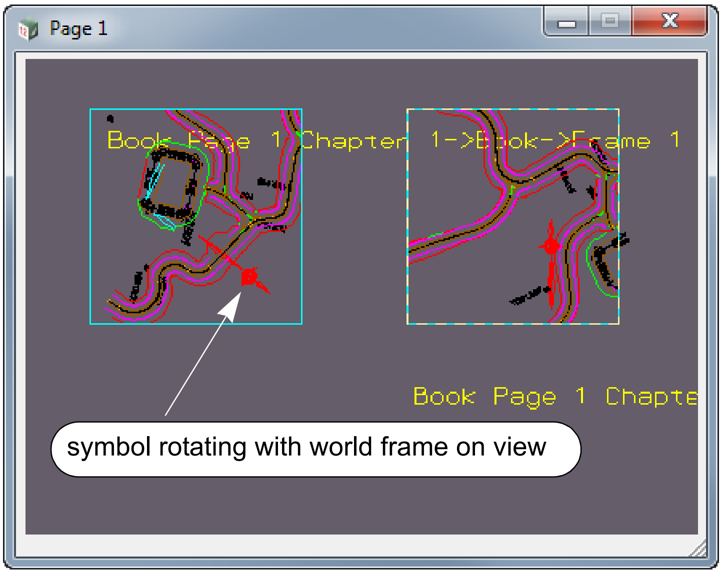
Now highlight the **Page Reference Frame** *Chapter 1 ->Book ->Frame 1* under the **Page** node *Page1* and again pick the *Pick view* button and select a View.

Do the same thing for the **Page Reference Frame** *Chapter 1 ->Book ->Frame 2* under the **Page** node *Page1.*



So the **Page Reference frame** *Chapter 1 ->Book ->Frame 1* on ***Page1*** and **Page Reference frame** *Chapter 1 ->Book ->Frame 1* on ***Page 2*** **both** used the **same Book Frame** *Frame 1* but have totally different values for some of their fields.

If you click on the node **Page Reference frame** *Chapter 1 ->Book ->Frame 1* on ***Page1***, and next the **Rotate** button and rotate the world frame on the View, then because the **Rotation mode** for the **Symbol** in the **original** Book Frame was **Relative**, the symbol will rotate in that one Frame.


Page 1
Book Page 1 Chapter 1->Book->Frame 1
Book Page 1 Chapte
symbol rotating with world frame on view

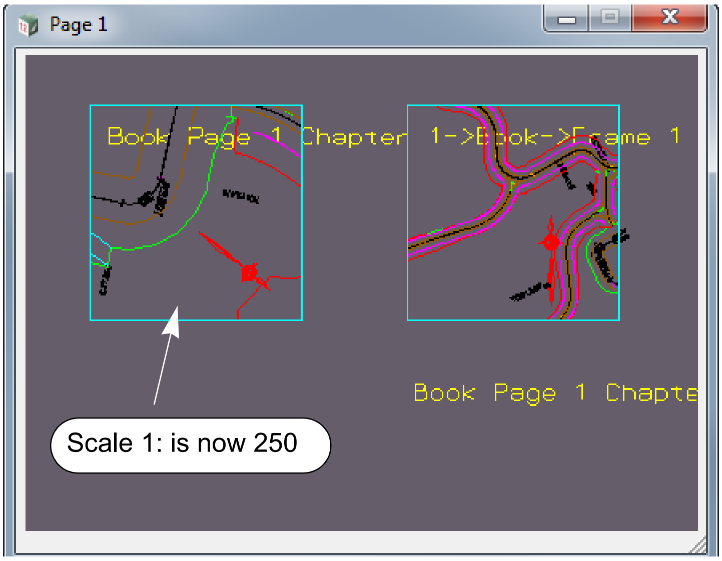
20.3.5.4 Changing Fields on the Original Frames

If you click on the **Frame 1** node at the **Book** level you will see that **Scale 1:** is *1000* and so it is for the frames on *Page 1* and *Page 2* that both reference **Book Frame1.**

Change **Scale 1:** to *250*, click on the **Book** node and then click on **Refresh** to update all the frames that reference Book Frame1 and update all the Plot Areas

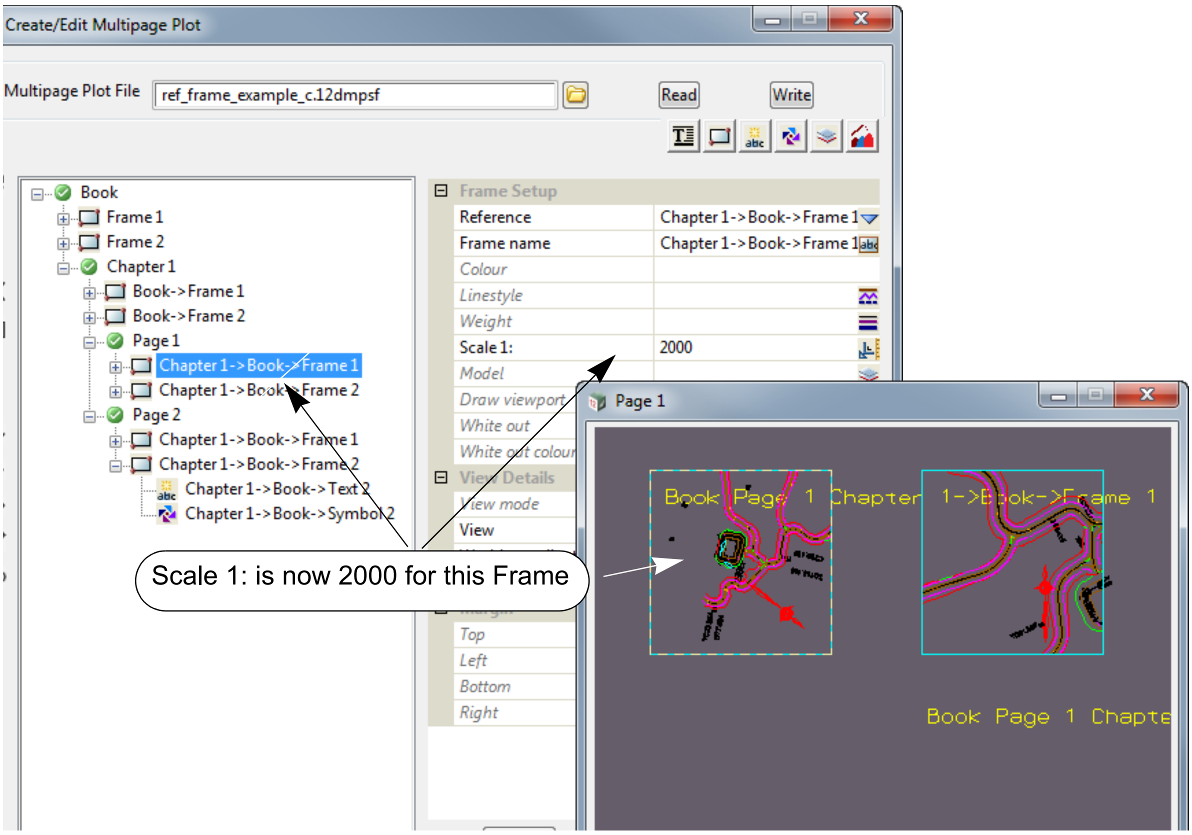
Click on the node Page 1 again and the scale has now changed on the Reference Frame that referenced Frame 1.

.



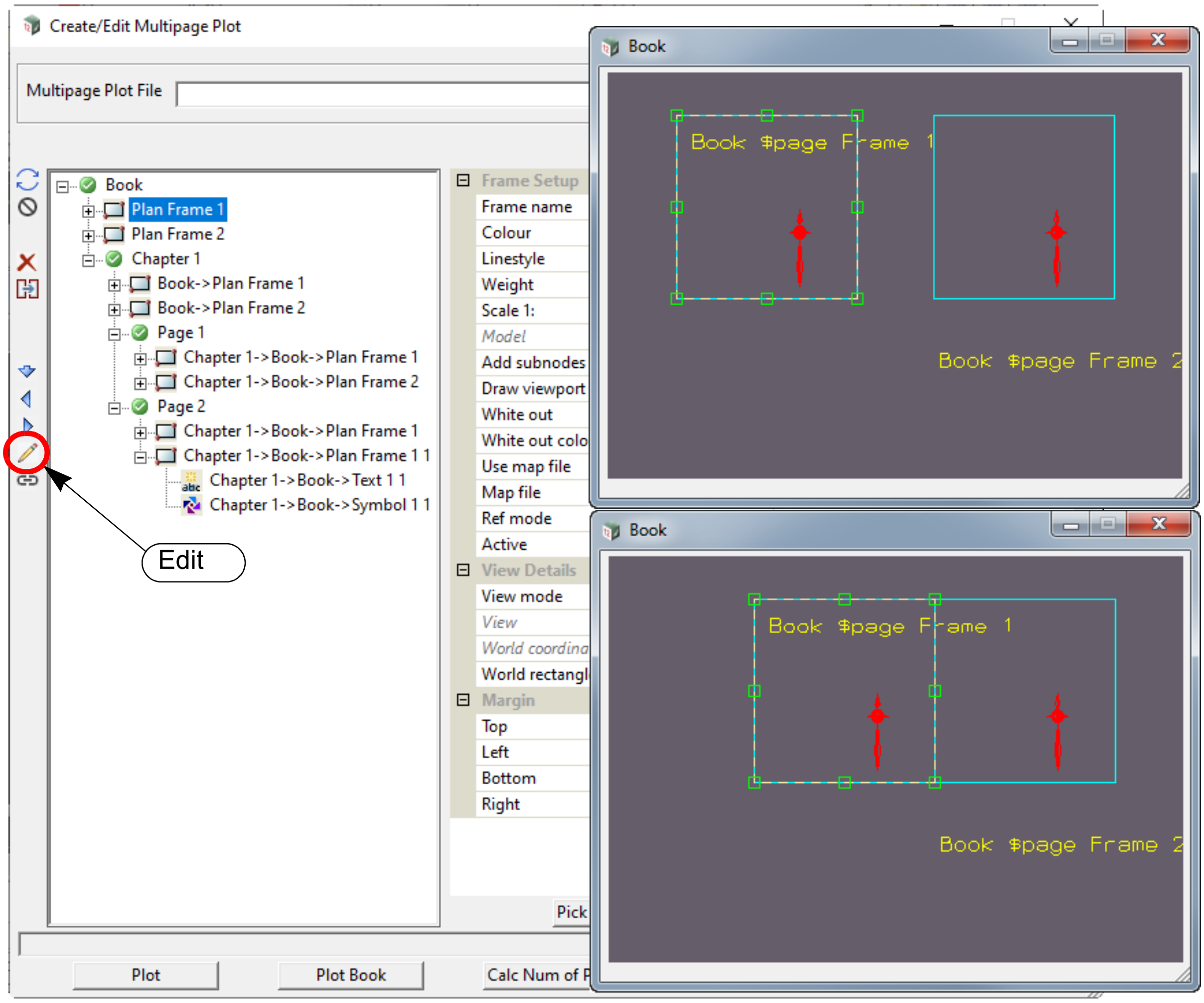
Even though ***Book Frame 1*** has **Scale 1:** to *250*, you can give a **Page Reference Frame** that references it a different scale by simply clicking that **Frame** node and where the field **Scale 1:** was blank, enter *2000*. Because the field is no longer blank, the scale for that particular Frame is no longer inherited from the original frame and will be *2000*.

.



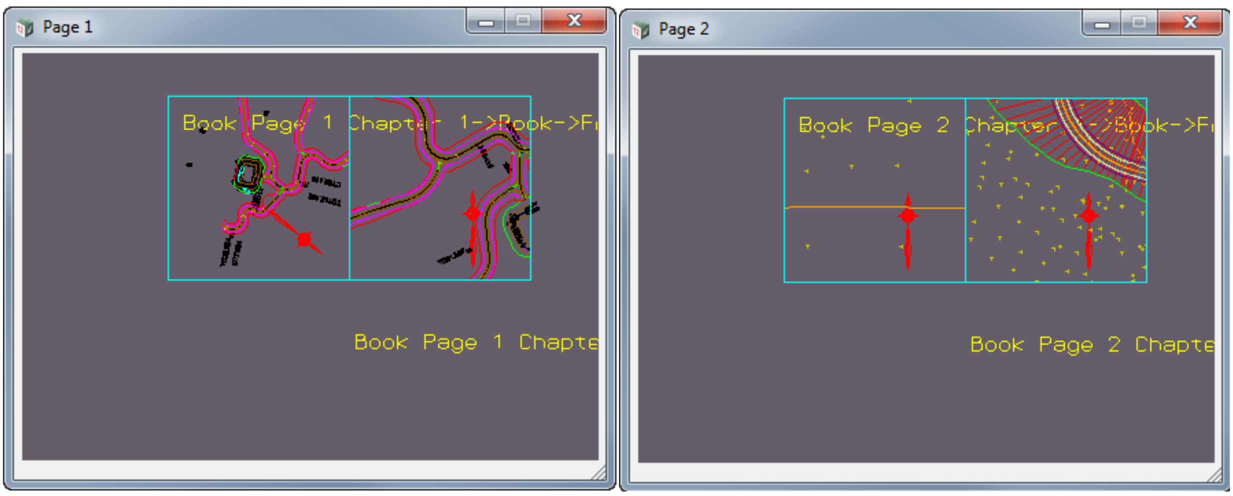
20.3.5.5 Moving an Original Frame

Now go back and highlight the **Book Frame** node *Frame 1*, click on **Edit** and then hold down LB on the Frame and move it so it touched the side of the right hand Frame.



Click on and highlight the Book node and click on **Refresh** to refresh all the **Plot Areas** for all the **Chapters** and **Pages** in the **Book**.

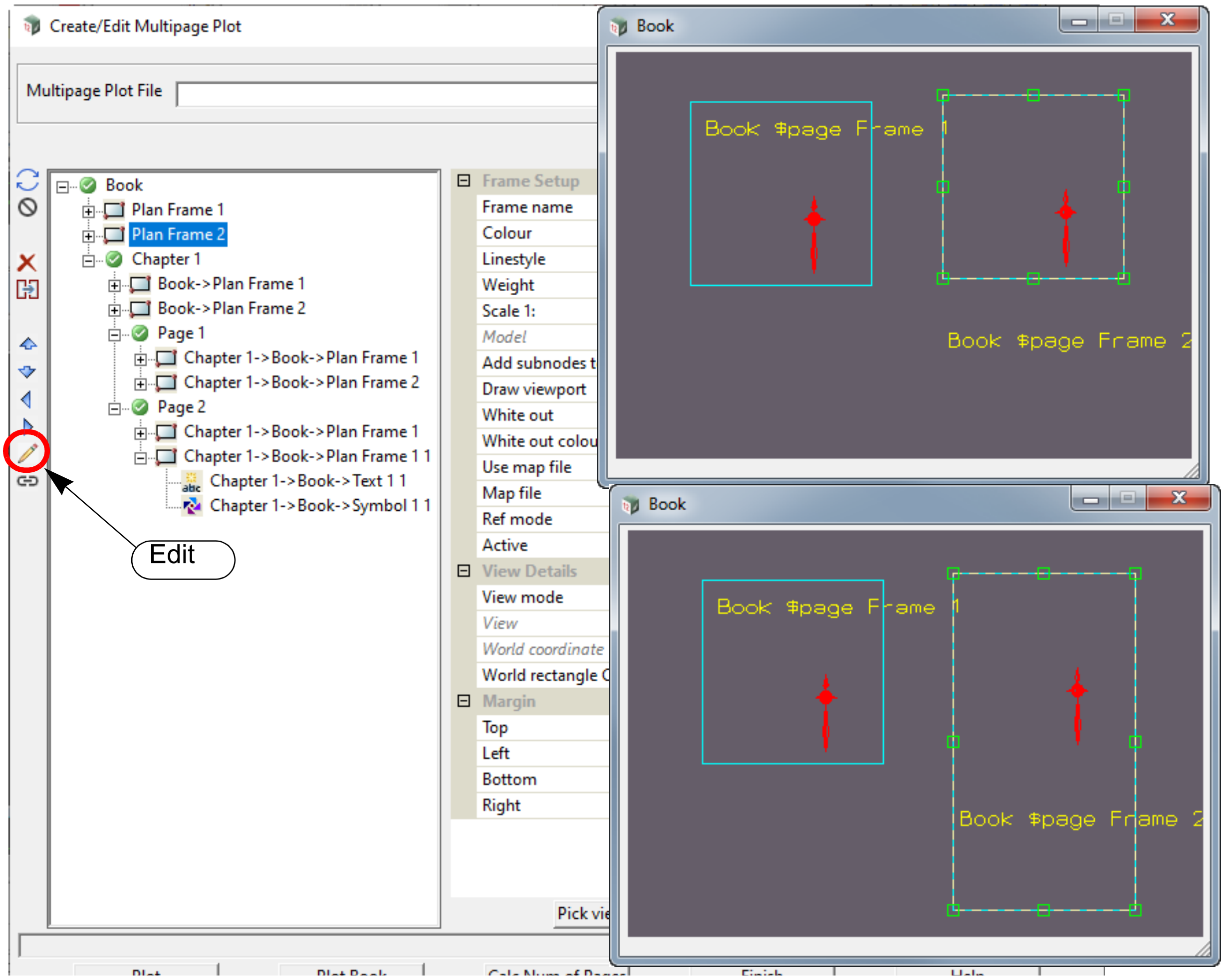
Then click on the **Page 1** and **Page 2** nodes again and you'll see that **all** the Reference Frames that reference **Book Frame 1** have moved.



Now move the **Book** Frame back to where it was, highlight **Book** and click on **Refresh**.

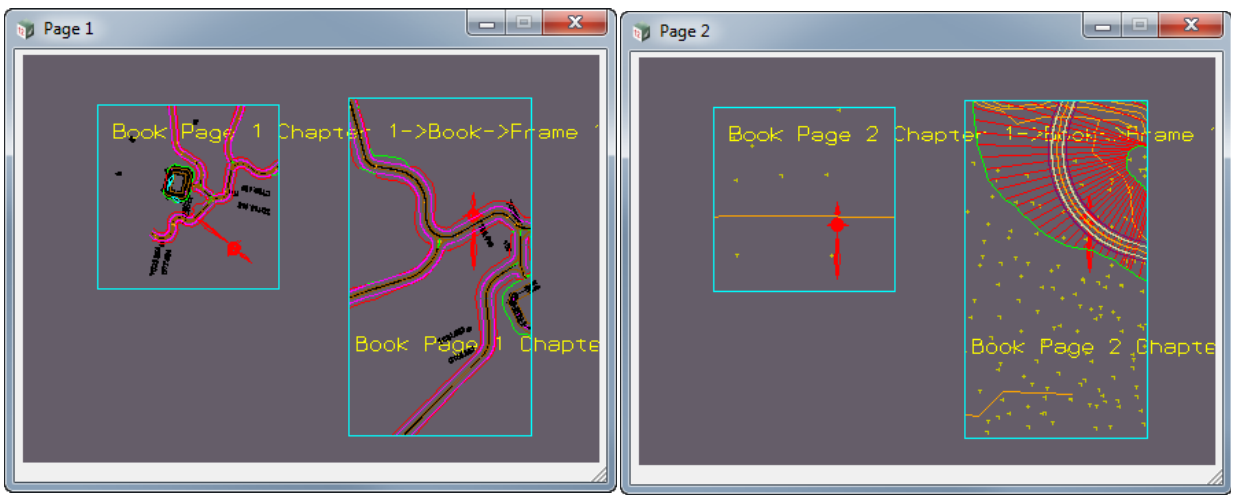
20.3.5.6 Resizing an Original Frame

Go back and highlight the **Book Frame** node **Frame 2**, click on **Edit** and then resize it *Frame 2*.



Click on and highlight the **Book** node and click on **Refresh** to refresh all the **Plot Areas** for all the **Chapters** and **Pages** in the **Book**.

Then click on the **Page 1** and **Page 2** nodes again and you'll see that **all** the Reference Frames that reference **Book Frame1** have resized.

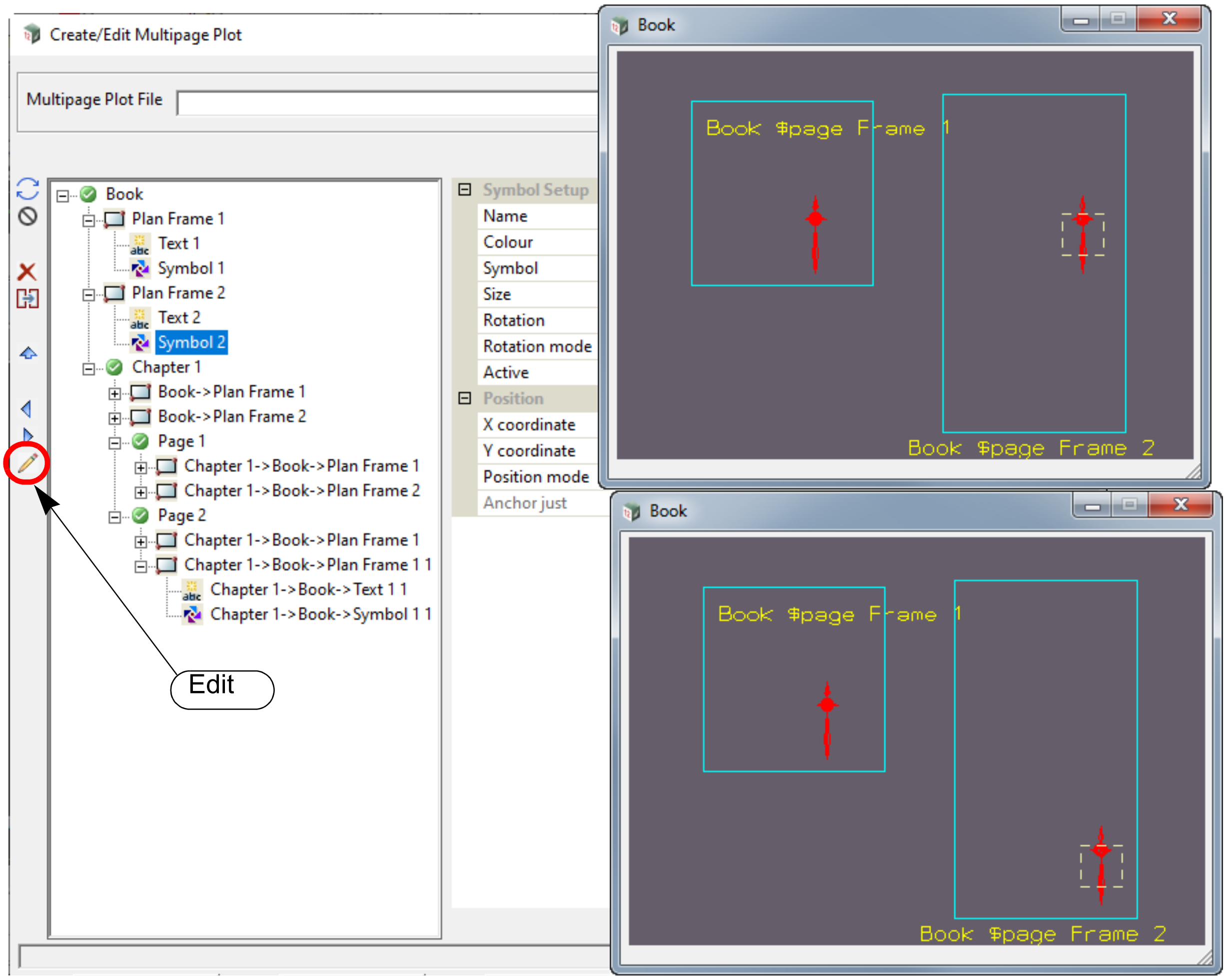


20.3.5.7 Moving an Original Text and Original Symbol

Go back and expand **Frame 2**, click on the **Text 2** node, then **Edit** and move the Text to the bottom of the Frame.

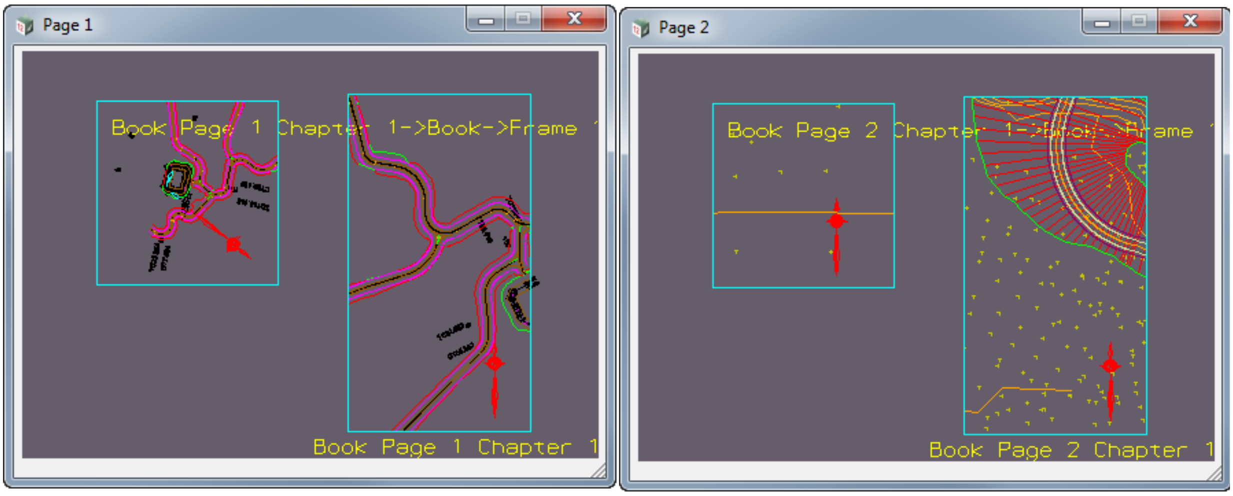
Or to do the same thing where the text is selected in the Book Page Area: Highlight the **Book** node, click on the **Text** icon, select **Edit** from the ***Text*** menu and then click LB down on the Text on the right hand side and move it to the bottom of the Frame.

Similarly, click on the **Symbol 2** node, then **Edit** and move the Symbol to the bottom of the Frame. Or highlight the **Book** node, click on the **Symbol** icon, select **Edit** from the ***Symbol*** menu and then click LB down on the Symbol on the right hand side and move it to the bottom of the Frame.



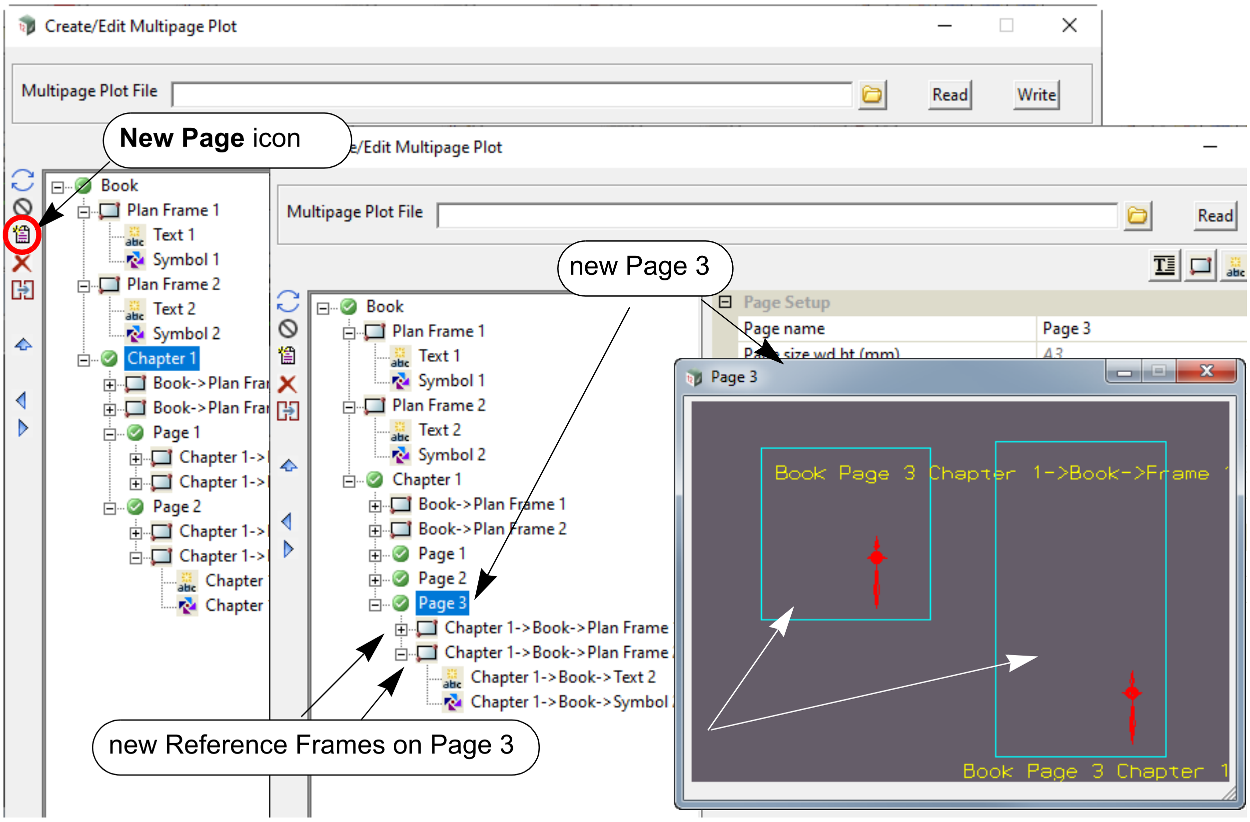
Click on and highlight the **Book** node and click on **Refresh** to refresh all the **Plot Areas** for all the **Chapters** and **Pages** in the **Book**.

Then click on the **Page1** and **Page2** nodes again and you'll see that **all** the Reference Frames that reference **Book Frame1** have the Text and Symbol moved.


Page 1
Book Page 1 Chapter 1->Book->Frame 1
Book Page 1 Chapter 1
Page 2
Book Page 2 Chapter 1->Book->Frame 1
Book Page 2 Chapter 1

20.3.5.8 Adding A Page When Ref on Chapter and Page is On

Highlight the **Chapter 1** node and then click on the **New Page** icon to create **Page** *Page3*.



The new node **Page** *Page3* is added to the bottom of **Chapter** *Chapter1* and for each **Book Frame** that has the field ***Ref mode*** set to **Ref on Chapter and Page** or **Ref on Page,** a **Reference Frame** is automatically added to **Page** *Page3*.

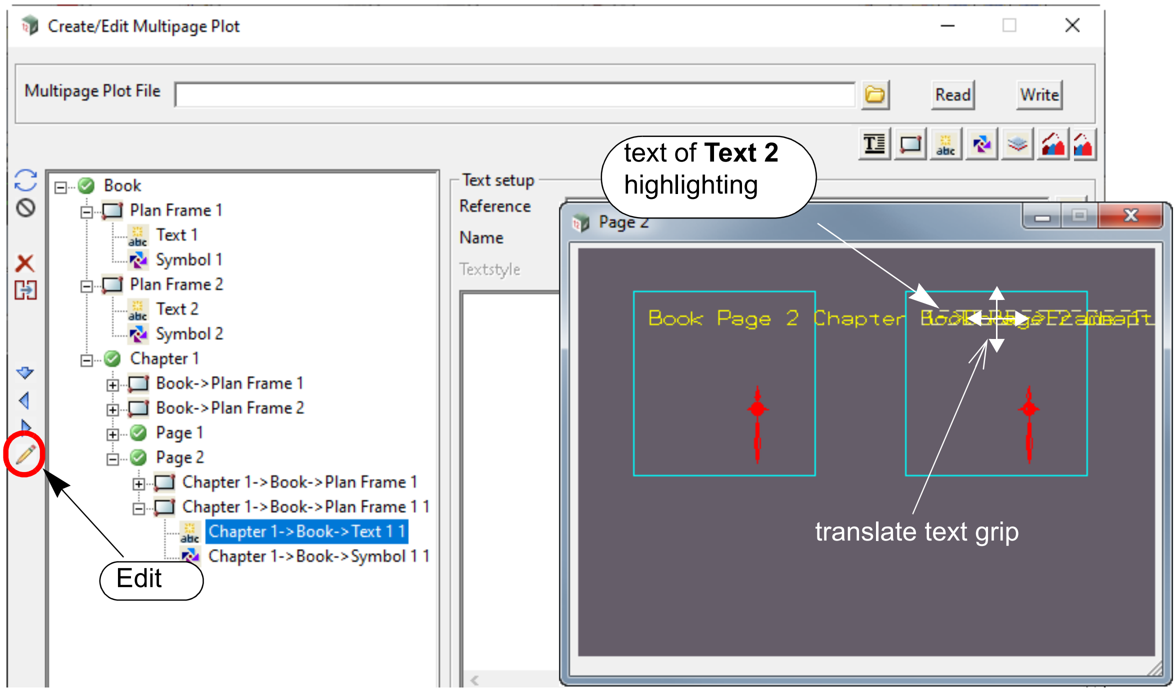
KEEP FOR A WHILE - MOVING TEXT ON A REFERENCE FRAME

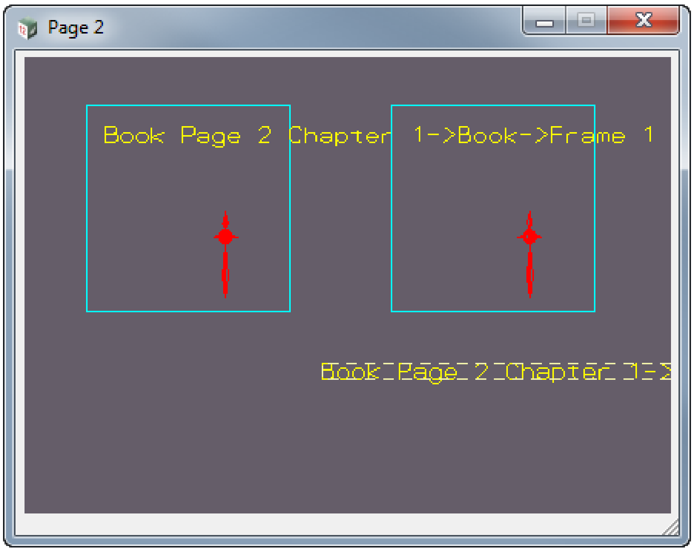
You'll notice the Text from the left hand frame is overwriting the Text in the right hand frame so we need to move it.

To do so, click on the **Text 2 node** under **Page 2**. The text for **Text 2** then highlights in the Page 2 Plot Area and if the cursor is moved over the highlight text then the translate text grip is displayed.

Hold down LB and move the text to the bottom of the right hand Frame.

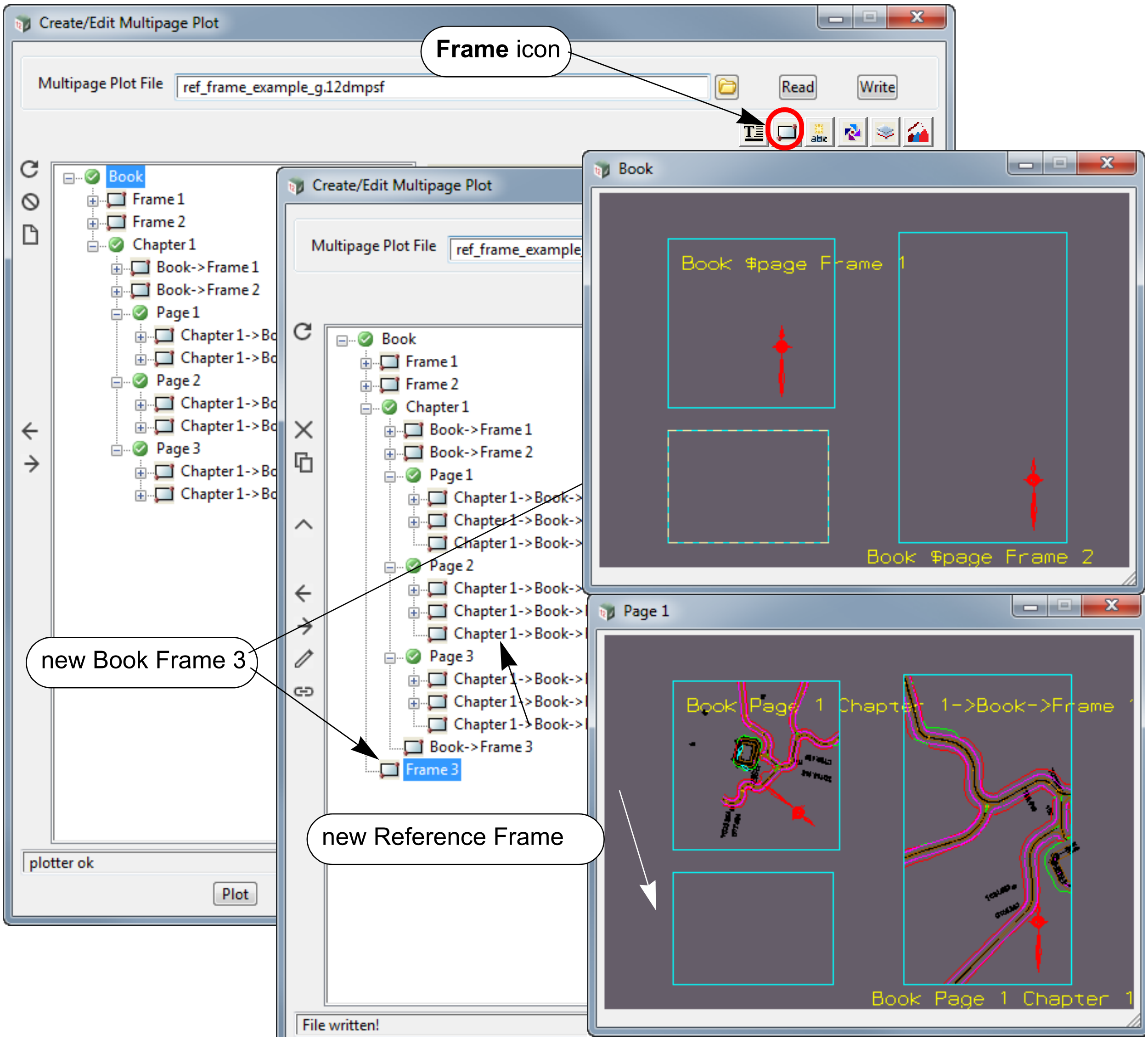
.


Create/Edit Multipage Plot
Multipage Plot File
Read
Write
Book
Plan Frame 1
Text 1
Symbol 1
Plan Frame 2
Text 2
Symbol 2
Chapter 1
Book->Plan Frame 1
Book->Plan Frame 2
Page 1
Page 2
Chapter 1->Book->Plan Frame 1
Chapter 1->Book->Plan Frame 1 1
Chapter 1->Book->Text 1 1
Chapter 1->Book->Symbol 1 1
Text setup
Reference
Name
Textstyle
text of Text 2 highlighting
Page 2
Book Page 2 Chapter
translate text grip
Edit


Page 2
Book Page 2 Chapter 1->Book->Frame 1

20.3.5.9 Adding a New Book Frame

Highlight the **Book** node, click on the **Frame** icon and select ***Plan*** and then create a new **Book Frame** on the left hand side of the **Book Plot Area** and say **Yes** to "Do you want to create reference frame(s) for Chapter(s)?" and "Do you want to create reference frame(s) for Pages(s)?".



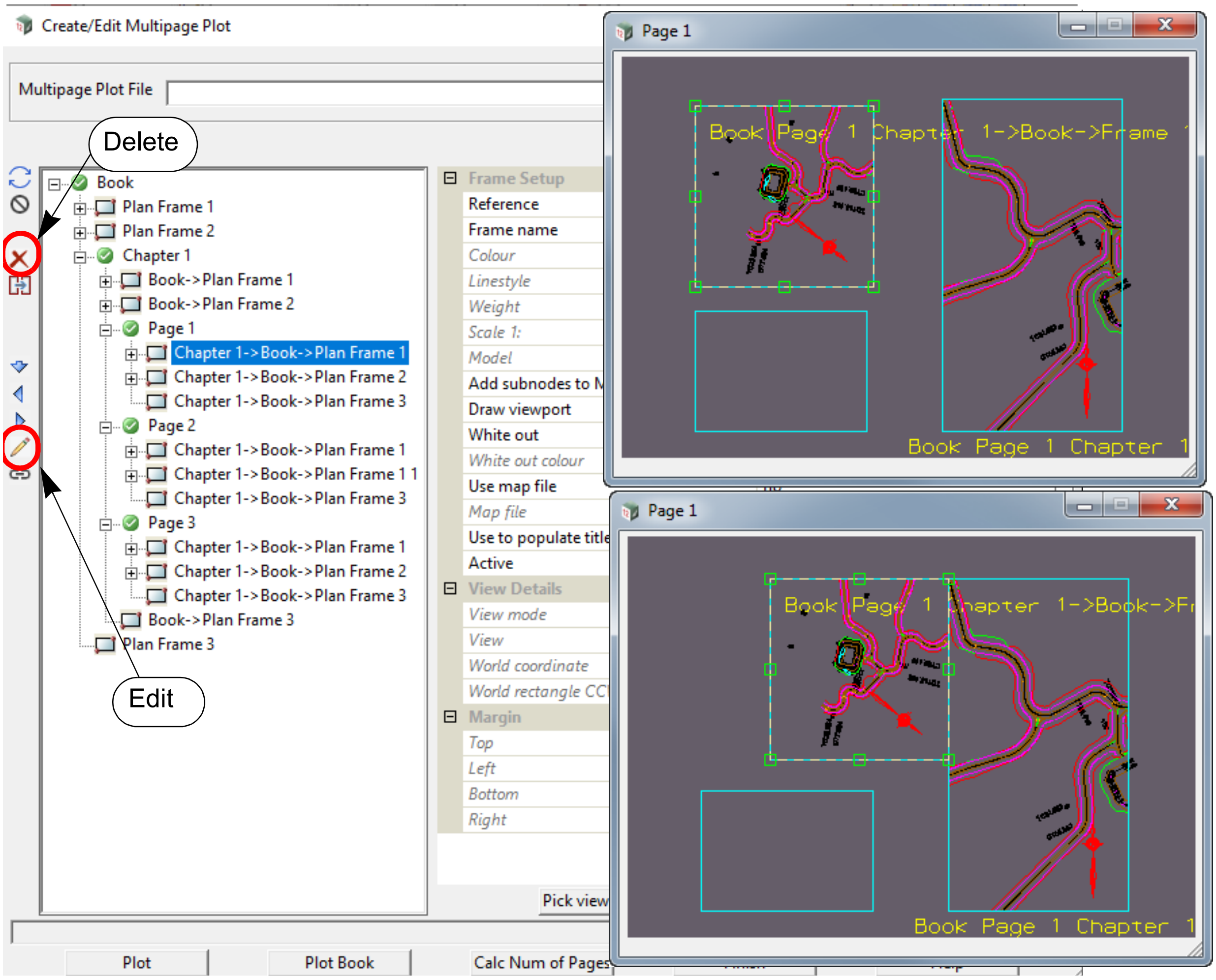
The new **Frame** node *Frame 3* is added to the bottom of the **Book** and because Yes was answered to the questions about creating reference frames for the Chapters and Pages, a **Reference Frame** is automatically added to each **Chapter** and each **Page** in the **Book**.

Notes

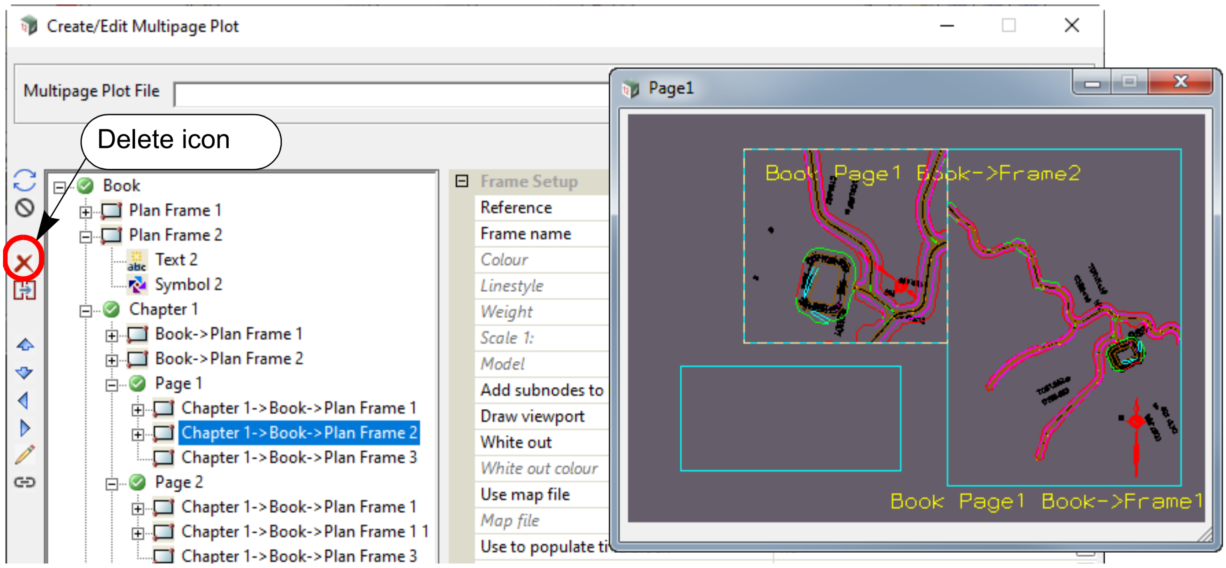
1. If when *Book Frame 3* was created, **Yes** was answered to "Do you want to create reference frame(s) for Chapter(s)?" and **No** to "Do you want to create reference frame(s) for Pages(s)?", then only the **Chapter Reference Frames** would be created.
2. If when *Book Frame 3* was created, **No** was answered to "Do you want to create reference frame(s) for Chapter(s)?" and **Yes** to "Do you want to create reference frame(s) for Pages(s)?", then only the **Page Reference Frames** would be created.
3. If when *Book Frame 3* was created, **No** was answered to "Do you want to create reference frame(s) for Chapter(s)?" and **No** to "Do you want to create reference frame(s) for Pages(s)?", then NO **Reference Frames** would have been created.

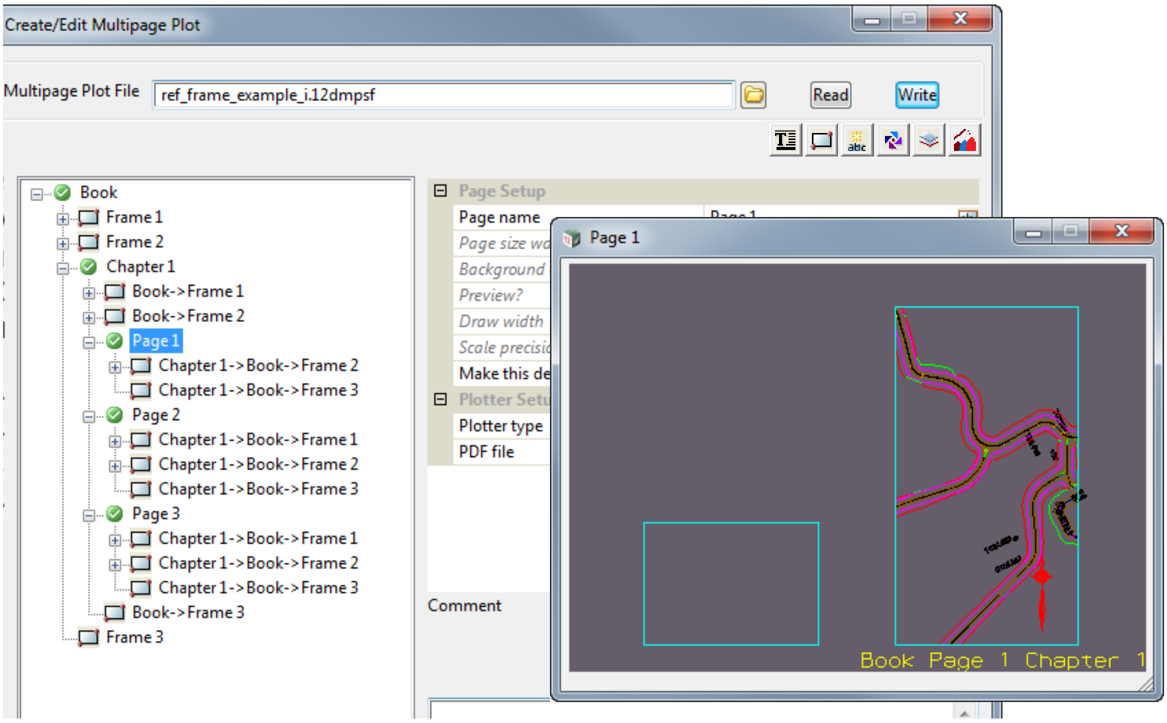
20.3.5.10 Working on an Individual Page

If you want the **Reference Frame** on one particular **Page** or **Chapter** to be in a different position to the Frame it references, click on the node for the **Reference Frame** to bring up the **Page or Chapter Plot Area** and highlight the Reference Frame on it, click **Edit** and then click LB down on the highlighted Frame and move it.



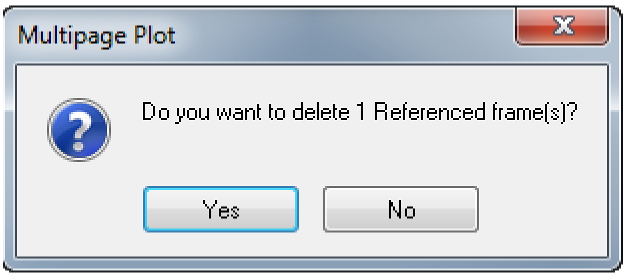
You can delete a **Reference Frame** by highlighting the **Reference Frame** node and clicking on the **Delete** on the left hand side.





Important Note:

If you delete an original Frame that has been referenced by other Frames, the Yes-No panel pops up.

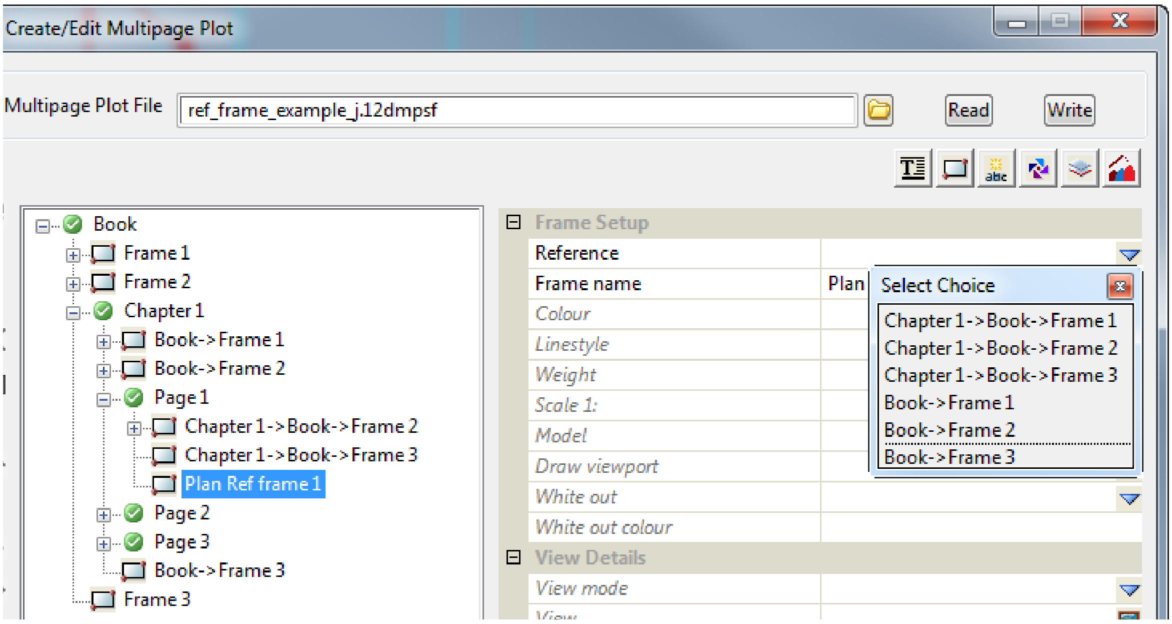


If you answer **Yes**, then the Frame and all the Frames that reference that Frame will be deleted.

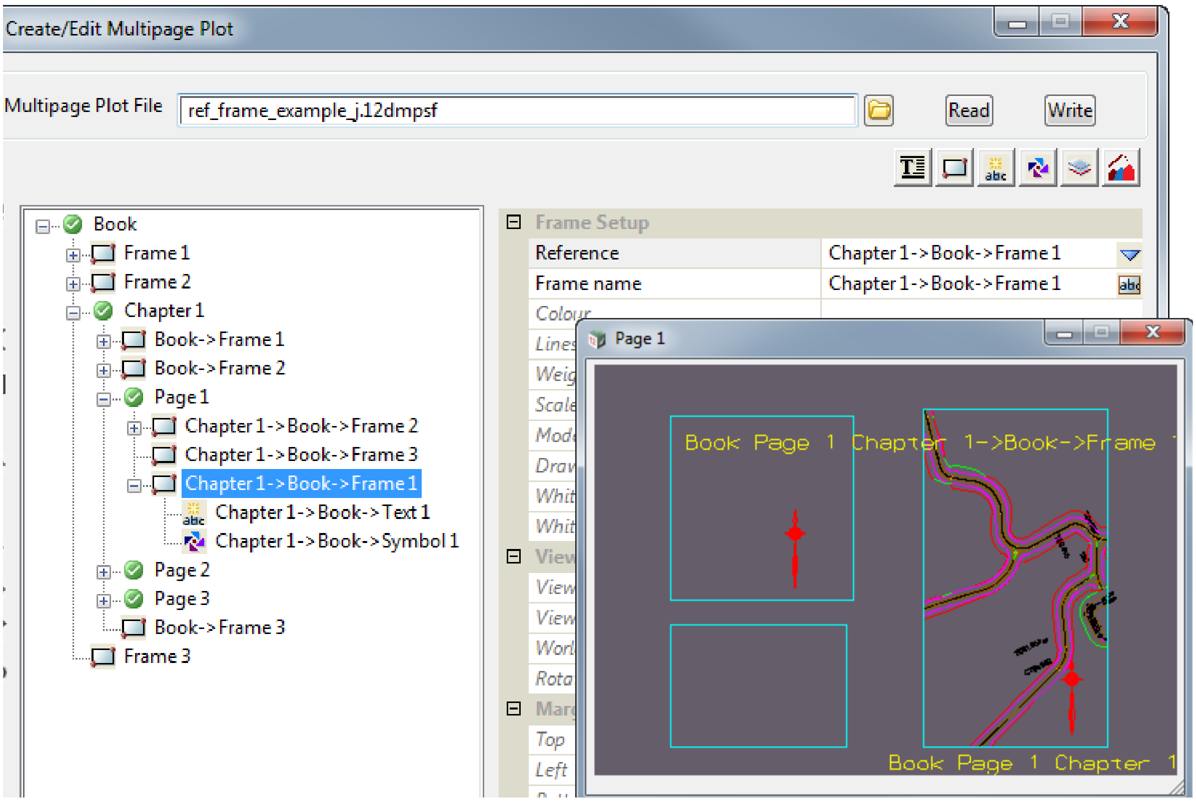
If you answer **No**, then the Frame is deleted and the Frames that reference it are left.

To add a Reference Frame to a Page, first click on the **Page** node, then the **Frame** icon and select **Plan Reference**, **X Reference** or **Long Reference**.

A **Reference Frame** node will be created at the bottom of the **Page** and the **Reference** field will be blank.



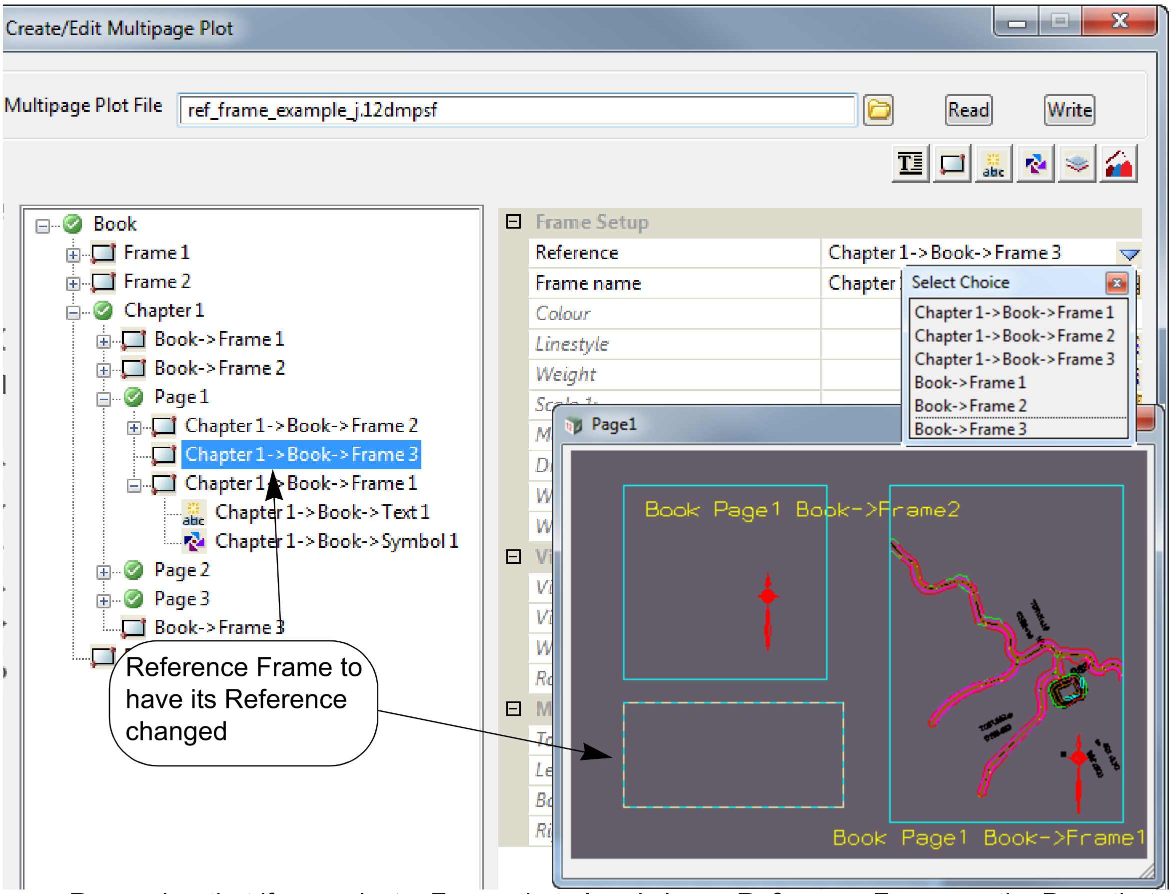
Click on the **Choice** icon for the **Reference** field and select the **Frame** you want to be the referenced from the list, and the referenced frame will appear on the **Plot Area** for the **Page**.



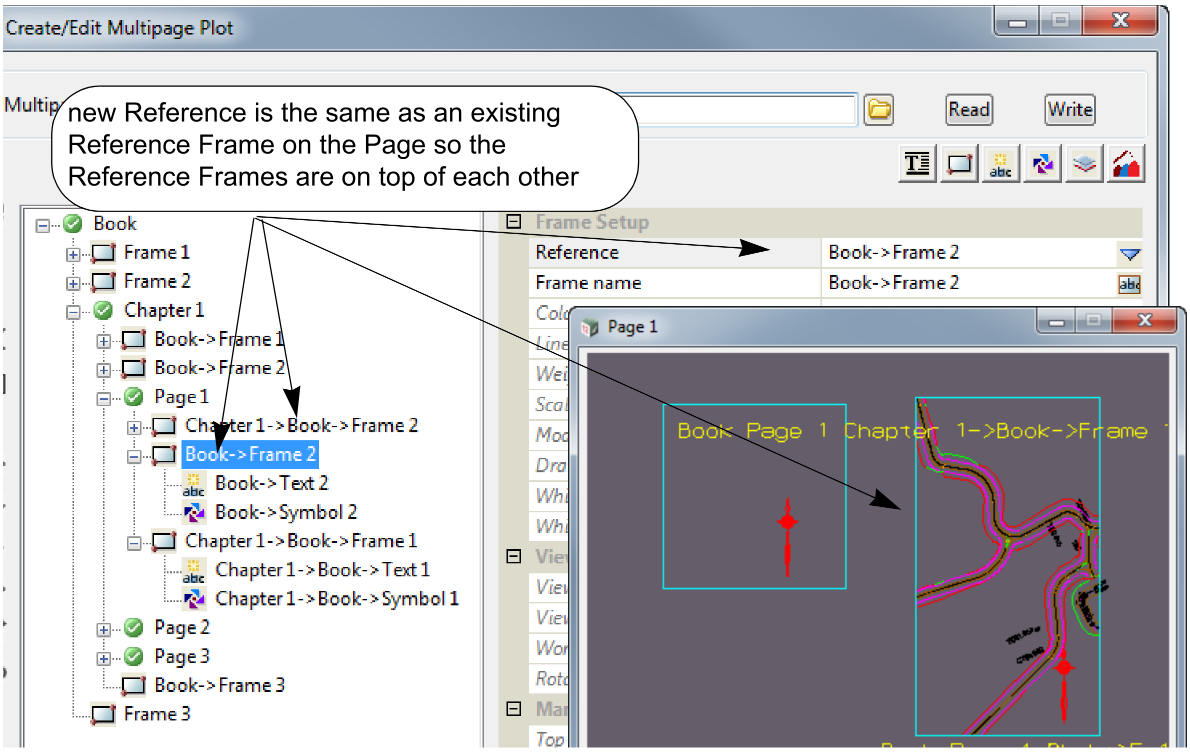
The ***Frame Setup***, ***View Details*** etc can then modified for the Reference Frame as required.

For more information on adding a **Reference Frame** to a **Chapter** or **Page**, see 20.3.4.7.2.2 Reference Frames for a Chapter or 20.3.4.7.3.2 Reference Frames for a Page.

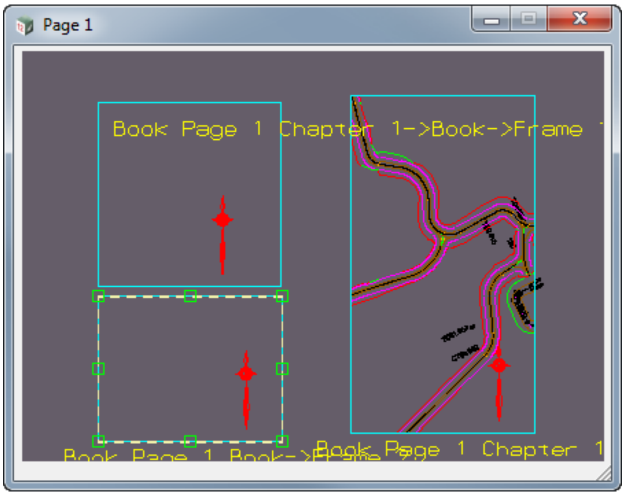
Finally the **Frame** that a **Reference Frame** references can be changed by clicking on the **Reference Frame** node and selecting another **Frame** in the **Reference** field.



Remember that if you select a **Frame** that already has a **Reference Frame** on the Page that references the same **Frame** then the new **Reference Frame** will probably be on top of the existing **Reference Frame** already on the **Page**.



One of the **Reference Frames** would then need to be moved and maybe resized on that **Page** so that you don't get over plotting.



Continue to 26.6 Plot Frames or return to 20.3 Multipage Plots (MPS).

21 PPF Editors

There has been changes to the **PPF Editors** chapter in the ***12d Model Reference manual***.

See 21.1 General Information on PPF Editors

See 21.2 Fields and Nodes Common to PPF Editors

See 21.3 Water Node Diagram PPF

See 21.4 Long Section Plot PPF Editor

See 21.5 Plot to Models - Long Section

21.1 General Information on PPF Editors

21.2 Fields and Nodes Common to PPF Editors

Now documented In the v15 reference manual

21.2.1 Title Blocks

21.2.1.1 Title Block Variables

21.2.1.1.1 Plot Details

21.2.1.1.1.1 X-Section Plots

$model_name variable has been added under X-Section Plots

$model_name // the name of the Model that the X-Sections are taken from for plotting

21.2.1.1.1.2 Water Node Diagrams

$horizontal_scale and **$model_name** variables has been added under Water Node Diagrams.

$horizontal_scale *// scale for the node diagram (1000/ppf scale)*

$model_name *// the name of the Network Model that the Nodes are taken from for plotting*

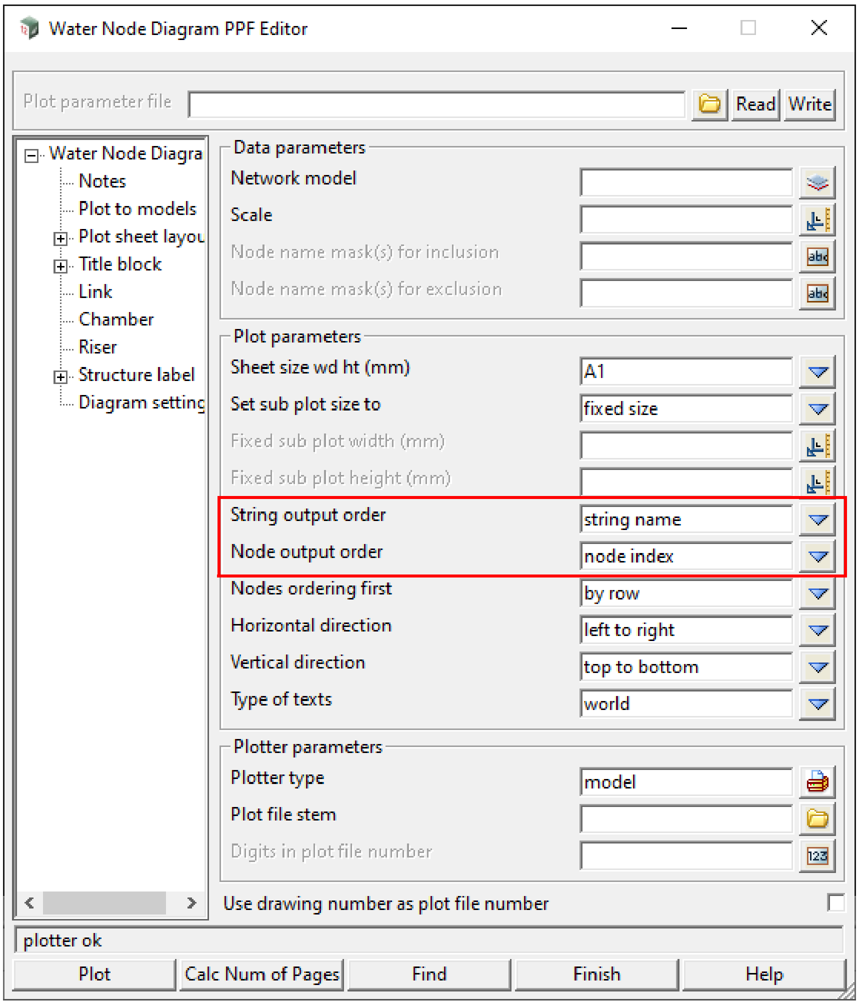
21.3 Water Node Diagram PPF

Position of option on menu: **Plot =>Plot and PPF Editors =>Water node diagram**

21.3.1 Water Node Diagram - Front Page

Now documented In the v15 reference manual

String output order and **Node output order** has been added to the *Water Node Diagram PPF Editor* panel.



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

Field Description	Type	Defaults	Pop-Up
String output order	choice box	string name	string name, upstream to downstream, downstream to upstream

*The order in which the water strings contained within the **Network model** are to be processed and plotted out.*

string name: *12d Model database string order.*

upstream to downstream: *most upstream branch line first. then repeatedly select the next most upstream branch line. trunk line last.*

downstream to upstream: *trunk line first. then repeatedly select the next most downstream branch line.*

Node output order	choice box	node index	node index, upstream to downstream, downstream to upstream

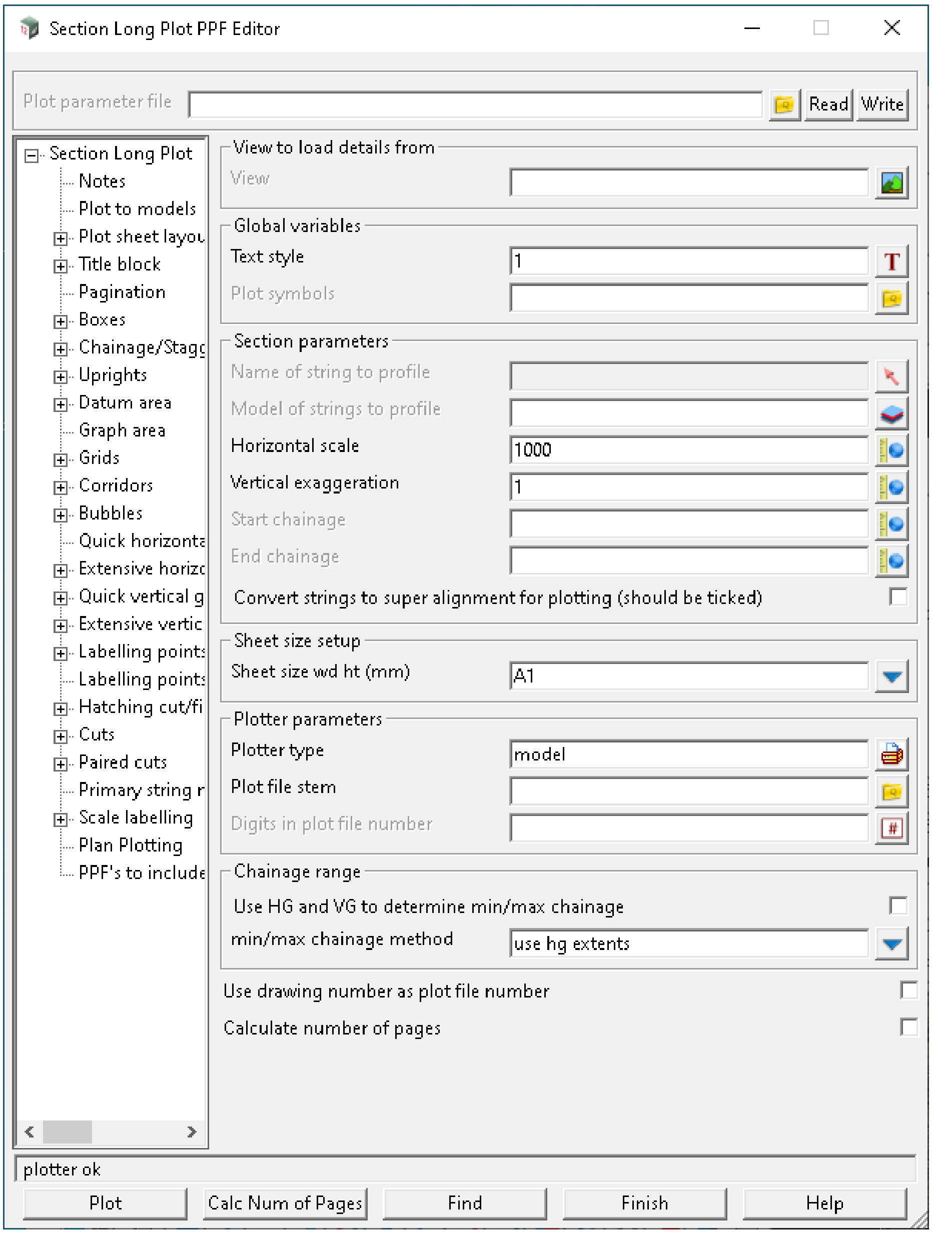
The order in which the nodes of each water string are to be processed and plotted out.

node index: *ascending order based on node index.*

upstream to downstream: *upstream end to downstream end of the water string.*

downstream to upstream: *downstream end to upstream end of the water string.*

21.4 Long Section Plot PPF Editor



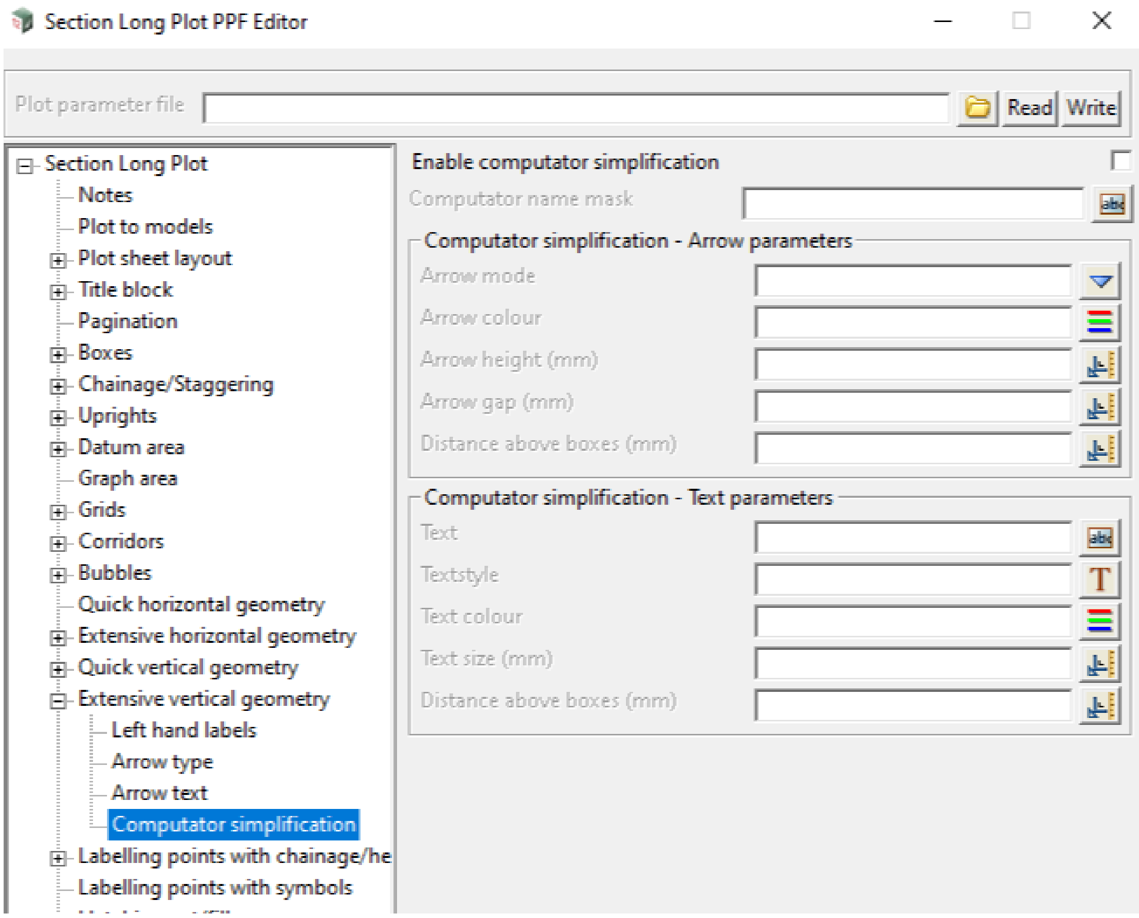
21.4.1 Extensive Vertical Geometry - Long Section

21.4.1.1 Extensive Vertical Geometry - Computator simplification

Now documented In the v15 reference manual

The extensive vertical geometry labelling can sometimes be too extensive when it comes to computators. The following options allow for the extensive vertical geometry of selected computators solved chainage range to be replaced by a simplified labelling scheme.

NOTE: Option may not perfectly handle complex cases of back-to-back computators where some are simplified and others are not.



Field Description	Type	Defaults	Pop-Up
Enable computator simplification	tick box	not ticked	

*If **ticked**, computator simplification will be performed.*

*if **not ticked**, then computator simplification will not be performed.*

Computator name mask text box

Identifies the computators to be simplified by matching the computator names against this mask.

supports partial matching. Does not support wildcards.

***NOTE**: if no mask is provided then all computators will be simplified.*

Computator simplification - Arrow parameters

The following options allow for customisation of the arrow that extends along the solved chainage range of the computator being simplified. If the computator straddles multiple Long Sections, then the arrow will reflect this.

Arrow mode choice box ticks ticks, arrows

*The style for the ends of the arrows. Either **ticks** or **arrows**.*

Arrow colour colour box GREEN_4D colour selection

The colour of the arrows.

Arrow height (mm) real box 1.5

The height of the ends of the arrows in millimetres.

Arrow gap (mm) real box 0

The length, in millimetres, of a desired gap in the arrows that extends outwards from the midpoint of the arrows range.

Distance above boxes (mm) real box -5

The distance above (or below) the top of the boxes that the arrows should be drawn. Can be positive or negative.

Computator simplification - Text parameters

The following options allow for customisation of the text that appears at the midpoint of the solved chainage range of the computator being simplified. If the computator straddles multiple Long Sections, then the text will appear at the midpoint of each arrow on each Long Section.

Text) text box

The text that will appear at the midpoint of the solved chainage range. If no text is specified, then no text will be drawn.

Textstyle textstyle box 1 text style selection

*The style of the **Text**.*

Text colour colour box WHITE_4D colour selection

*The colour of the **Text**.*

Text size (mm) real box 2.5

*The size of the **Text** in millimetres.*

Distance above boxes (mm) real box -5

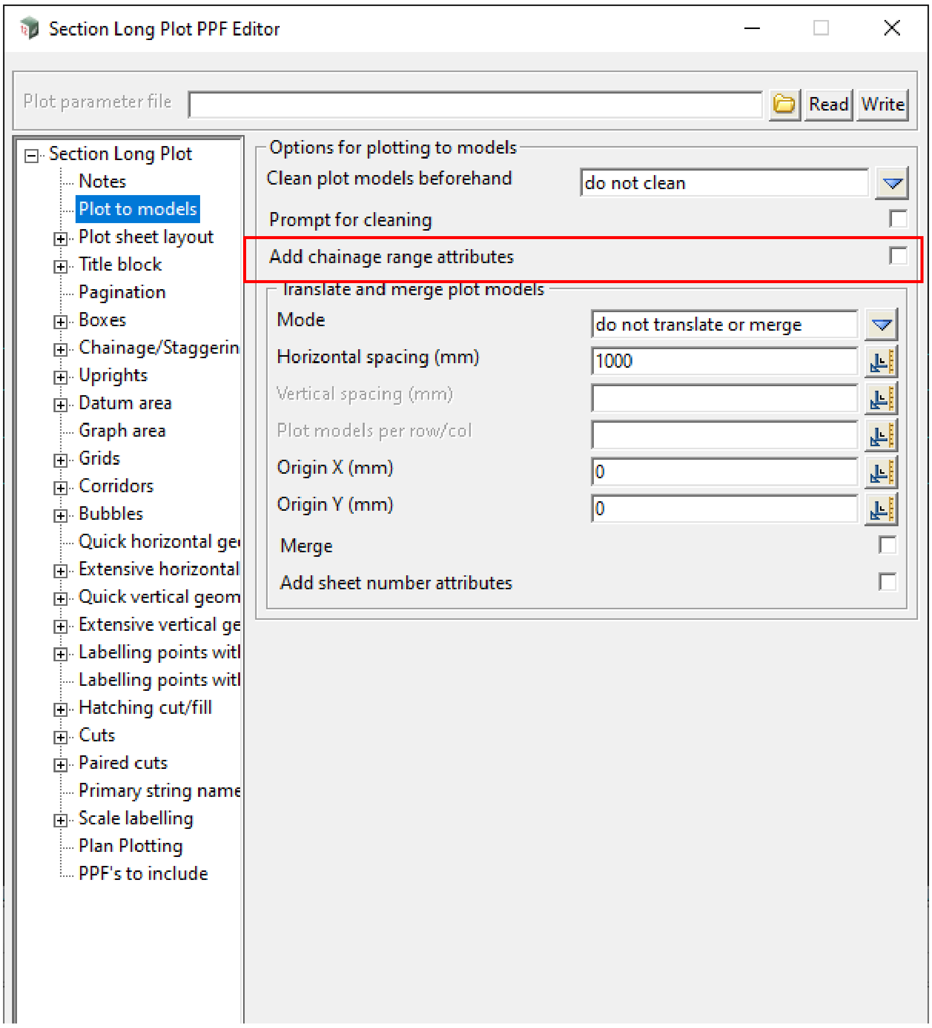
The distance above (or below) the top of the boxes that the Text should be drawn. Can be positive or negative.

21.5 Plot to Models - Long Section

Now documented In the v15 reference manual

This is documented for all the PPF Editors in **Plot to models.**

However, Long Section plots have an additional unique field in the Plot to Models node.



The columns for the fields documented in the sections are for.

Panel Field	Parameter name	Type	Pop-Up
Add chainage range attributes	chainage_range_attributes	tick box	

*If **ticked**, two **Real** attributes (**start_chainage** and **end_chainage**) will be added to every plot string in the produced plot models. Their values will be the start and end chainage of the section that is being plotted on each page.*

*if **not ticked**, the attributes will not be created.*

***Example**: plot strings on the first produced page that covers the chainage range of 0-400 will have the attribute values of start_chainage = 0.0 and end_chainage = 400.0. On the second produced page, that covers the 400-800 range, the string attributes will have the value of start_chainage = 400.0 and end_chainage = 800.0.*

22 Utilities

There has been changes to the **Utilities** chapter in the ***12d Model Reference manual***.

See

[22.1 Model from Attribute](#)
[22.2 Classify with Attributes](#)
[22.3 Change Super Strings Closed](#)

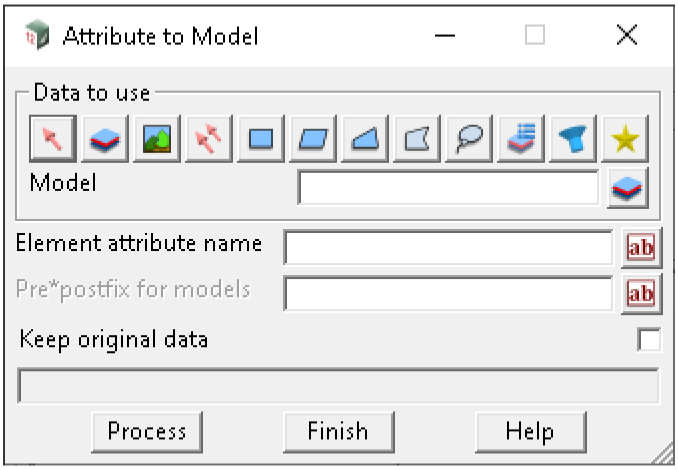
22.1 Model from Attribute

Position of option on menu: **Utilities =>Attributes =>Model from attribute**

Now documented In the v15 reference manual

Foir an element, this option uses the value of a attribute as the new model for the element.

Note that the attribute value may not be a valid model name. In that case, characters in the attribute value that can’t be part of a valid model name are replaced by spaces.



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

Field Description	Type	Defaults	Pop-Up
Data to translate	data source		

Data selection type.

Selected data source	input	Model	

Data source for data to have an attribute value used as a model name.

String attribute name	text box		

The name of the attribute whose value is to be used as the model for he element.

Pre*postfix for model	text box		

*The model name given by the attribute is pre*postfixed by this text.*

Keep original data	tick box		

*If **ticked**, the original data is kept in the original models and a copy of the data is placed in the new model.*

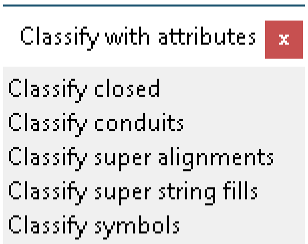
*If **not ticked**, the data is moved to the new model.*

Buttons at Bottom

Process	button		

When Process is pressed, the selected data is copied/moved to the model given by the attribute value.

22.2 Classify with Attributes



See

22.2.1 Set String Closed Attribute

22.2.2 Classify Super String Fills

22.2.1 Set String Closed Attribute

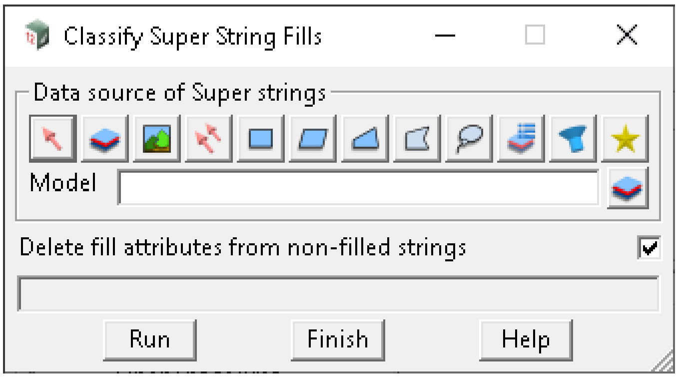
Position of option on menu: **Utilities =>A-G =>Classify with attributes =>Classify closed**

Position of option on menu: **Utilities =>Attributes =>Classify with attributes =>Classify closed**

Now documented In the v15 reference manual

This option sets the integer attribute **Closed** on Super strings, based on whether or not the string is closed. An integer value of 1 is set if the string is closed, otherwise 0.

On selecting the **Classify closed** option, the **Set String Closed Attribute** panel is displayed.



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

Field Description	Type	Defaults	Pop-Up
Data to Attribute	data source		
Data selection type.			
Selected data source	input	Model	
Source of data to be processed.			

Buttons at Bottom

Run	button		
Runs the option.			

22.2.2 Classify Super String Fills

Position of option on menu: **Utilities =>A-G =>Classify with attributes =>Classify super string fills**

Position of option on menu: **Utilities =>Attributes =>Classify with attributes =>Classify super string fills**

Now documented In the v15 reference manual

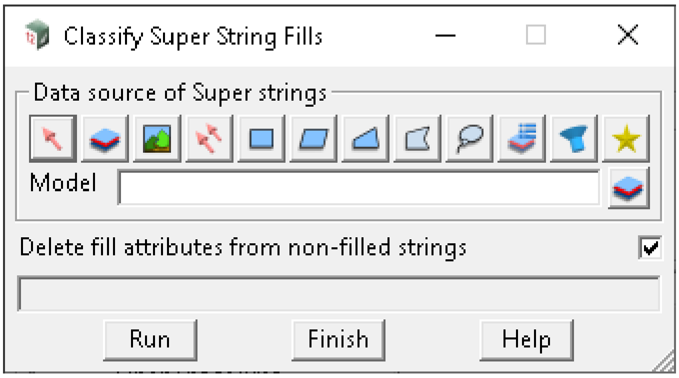
This option sets attributes on **Super** strings with solid fill.

String attributes set are:

solid fill colour (text) on all **Super** strings set with solid fill dimension.

solid fill blend (real) on all **Super** strings set with solid fill dimension.

On selecting the **Classify fills** option, the **Classify Super String Fills** panel is displayed.



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

Field Description Type Defaults Pop-Up

Data source of Super strings data source

Data selection type.

Selected data source input Model

Source of data to be processed

Delete fill attributes from non-filled strings tick box ticked

Whether to delete the above mentioned string attributes (if present) from strings without fill.

Buttons at Bottom

Run button

Runs the option.

22.3 Change Super Strings Closed

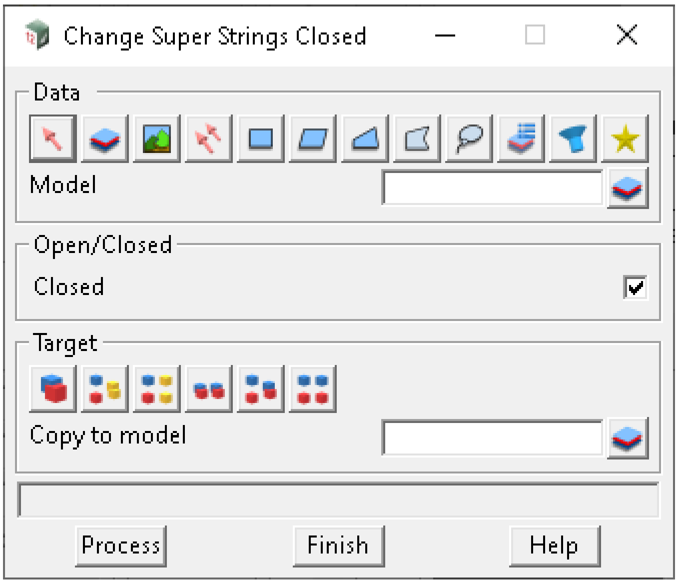
Position of option on menu: **Utilities =>Super strings =>Close/open super strings**

Position of option on menu: **Utilities =>A-G =>Close**

Now documented In the v15 reference manual

Open and close multiple super strings in one.

Selecting **Close** brings up the **Change Super Strings Closed** panel.



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

Field Description	Type	Defaults	Pop-Up
Data	data source		

Data selection type.

Selected data source	input	Model	

Source of data to be processed.

Closed	tick box	ticked	

Sts whether the strings will be closed or opened.

*If **ticked**, the strings will be closed.*

*If **not ticked**, the strings will be opened.*

Target type

Data target type.

Target info	input		

Eextra information required for the target.

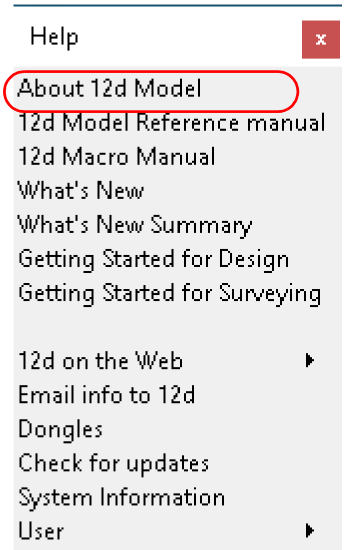
Buttons at Bottom

Process button

When pressed, the strings are processed to be opened/closed.

23 Help

There has been changes to the **Help** chapter in the ***12d Model Reference manual***.



See

23.1 About 12d Model

23.2 Check for updates

23.1 About 12d Model

Position of option on menu: **Help =>About 12d Model**

The menu item **About 12d Model** has been moved to the top of the **Help** menu.

23.2 Check for updates

Position of option on menu: **Help =>Check for updates**

The menu item **Check for Updates** has been added to the **Help** menu.

Clicking on the option will check if there is a new version available or not.

24 Setting Up

There has been changes to the **Setting Up** chapter in the ***12d Model Reference manual***.

24.1 Environment Variables

24.1.1 Alphabetical Environment Variables List

ALLOW_CONVERT_CHAINAGES_TO_DROPPED_XY_REF_4D

ALLOW_CONVERT_CHAINAGES_TO_DROPPED_XY_REF_4D value 0 or 1

if not zero, when using the template modifiers edit panel and RB on the row number column the option to convert the highlighted chainage/s to **Drop Point to Reference String** smart chainages will be added to the pop up "Edit row" menu .

CENTRELINE_ATTACH_APPLY_ATTRIBUTES_4D

CENTRELINE_ATTACH_APPLY_ATTRIBUTES_4D integer default 1

if **ticked**, standard apply details such as string lengths and polygon areas are added as an attribute group with the name of the MTF file, e.g. ROAD01.MTF to the apply reference string.

OPTIONS_LOGGING_FLUSH_COUNTER_4D

OPTIONS_LOGGING_FLUSH_COUNTER_4D integer 16

the logging file will be flushed every 16th line written.

So if you want to force a file flush after every line written, set OPTIONS_LOGGING_FLUSH_COUNTER_4D to 0

OPTIONS_LOGGING_FLUSH_INTERVAL_4D

OPTIONS_LOGGING_FLUSH_INTERVAL_4D integer 8

the logging file will be flushed to disk once 8 seconds has past since the last flush.

Note: this is only checked when attempting to write a line to the file.

REMEMBER_MTF_COLUMN_SIZE_4D

REMEMBER_MTF_COLUMN_SIZE_4D 0 or **1**

If ticked, and either REMEMBER_MTF_PANEL_SIZE_4D or REMEMBER_MTF_PANEL_SIZE_ON_OK_4D are set the width of the current columns are recorded and used when the panel is opened again.

Note: the panel positions are stored in the working directory file **mtf_panel_sizes.4d**

The default value is 0.

SHOW_SYNERGY_FILE_SYSTEM_EXECUTION_TIME_4D

SHOW_SYNERGY_FILE_SYSTEM_EXECUTION_TIME_4D 0/1

this will add lines to the current options.txt file as to the start and completion of each 12d Synergy call.

Very useful when diagnosing how long each call takes.

Note: the interaction with the following environment variables:

TOPMOST_BUTTON_LIST_4D

TOPMOST_BUTTON_LIST_4D text

A list of topmost most buttons to show in order of display and the text to display on screen for the button, the list is whitespace separated and contains pairs of the button id and screen text. It is an error if the list does not contain an even number of entries.

The available buttons ids are left_mouse_button, middle_mouse_button, right_mouse_button, enter_button, escape_button, typed_input_button, shift_next_mouse_button, control_next_mouse_button, middle_next_mouse_button right_next_mouse_button

For example, to display the right mouse button, enter and escape keys on screen as RMB, ENT & ESC the entry would be as such:

right_mouse_button RMB enter_button ENT escape_button ESC

25 12d Survey Guide

The information contained in this chapter outlines the general options, terminology, definitions and methods used by*12d* ***Model*** for the purpose of inputting survey data, and reducing the survey data to produce super strings and reports.

The guide covers the process using the ***12d Field Pickup*** option (***12d Pickup***) and also the background information required when ***12d Pickup*** is not being used to produce the survey data on a survey instrument.

For ***non-12d Pickup*** users, the chapter 41 12d and Survey Instruments contains the formation on how to pick up data on specific instruments so that the survey data can be used and reduced in ***12d Model***.

See

Continue to 25.2 Survey Reduction in 12d Model.

25.1 An Overview of Surveying and Reduction

See

25.1.1 Collecting Survey Data in the Field
25.1.2 What is Survey Reduction?

25.1.1 Collecting Survey Data in the Field

Total Stations (**TPS**) and **GNSS** (GPS, Glonass etc) instruments are used to collect information in the field.

See

25.1.1.1 Total Stations - TPS
25.1.1.2 GNSS (GPS, Glonass etc)

25.1.1.1 Total Stations - TPS

Total station instruments (TPS) are used to measure the **vertical angle**, **horizontal angle** and **slope distance** to a point.

But what exactly are these values?

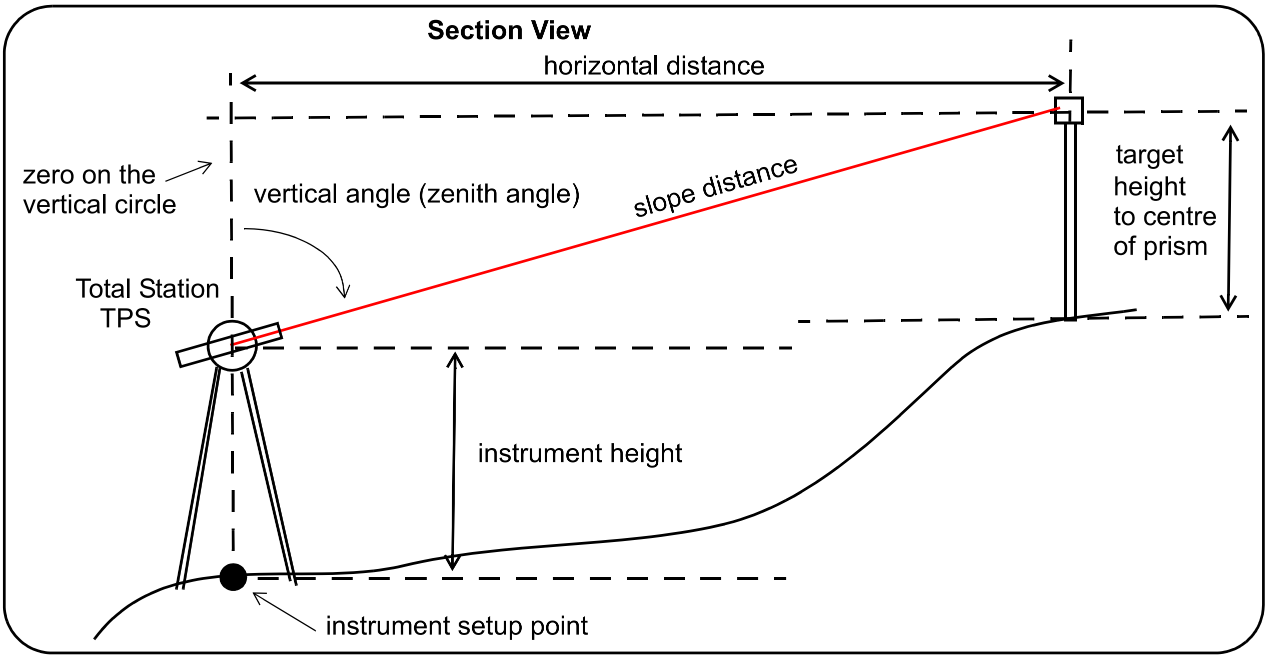
A TPS is set up over a point whose coordinates are known (or will be known) - the **instrument setup point**.

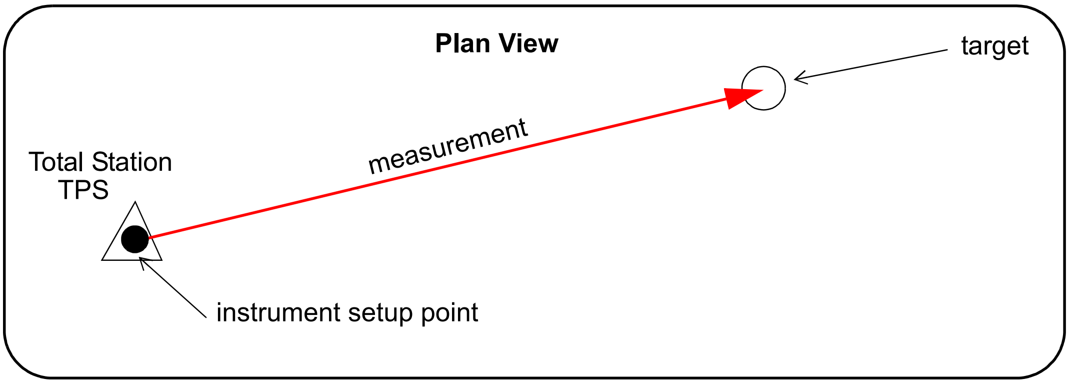
The TPS itself is mounted on plate that is levelled horizontally, and a plumb bob used so that the centre of the instrument is over the setup point. The distance form the centre of the instrument to the setup point is the ***instrument height***.

The TPS uses a laser to shoot to the centre of a prism that is mounted on a pole (pogo) that is kept vertical and the distance from the TPS to the centre of the prism on the pole is the **slope distance**.

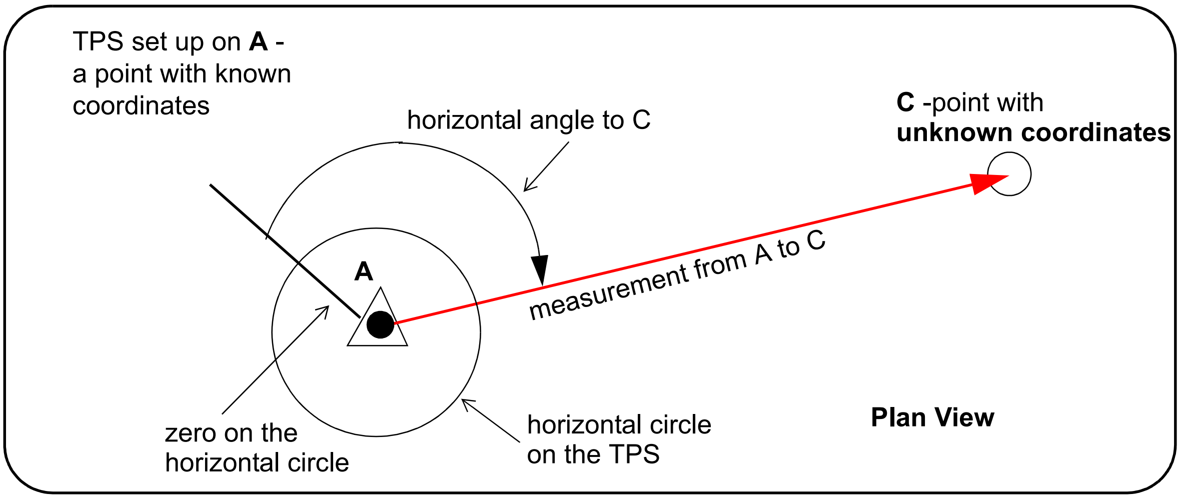
The distance from the centre of the prism to the ground is the **target height**.

The **vertical circle** is used for measuring the vertical angle and it is set up in the vertical plane so that the zero of the vertical circle is on the plumb line. The **vertical angle** is the angle measured from zero to the line of the measurement. This is also known as the **zenith angle**.





For the TPS, the **horizontal circle** is on the horizontal plate with a zero marked on it, and when the instrument is turned to measure to a point, then it is the angle turned through from zero that is the **horizontal angle** for the measurement.



Note that unlike the vertical circle, there is no natural zero for the horizontal circle and so the horizontal angles are only angles relative to where ever the zero was placed.

Hence TPS instruments measure slope distances, vertical angles and **relative horizontal angles** from the instrument.

So even though the coordinates of the setup point, A, are known and the horizontal angle, the vertical angle and the slope distance know, the coordinates of C can't be calculated. All you know is that C lies on the circle around A.

There are any number of ways you could get additional information to find where C lies on the circle. For example, you could observe C from three different instrument setups and C would be at the intersection of the three circles.

But the most common method used is much easier and only requires that from the same instrument set up, you can make a measurement to another point, **B**, whose (x,y) coordinates are known.

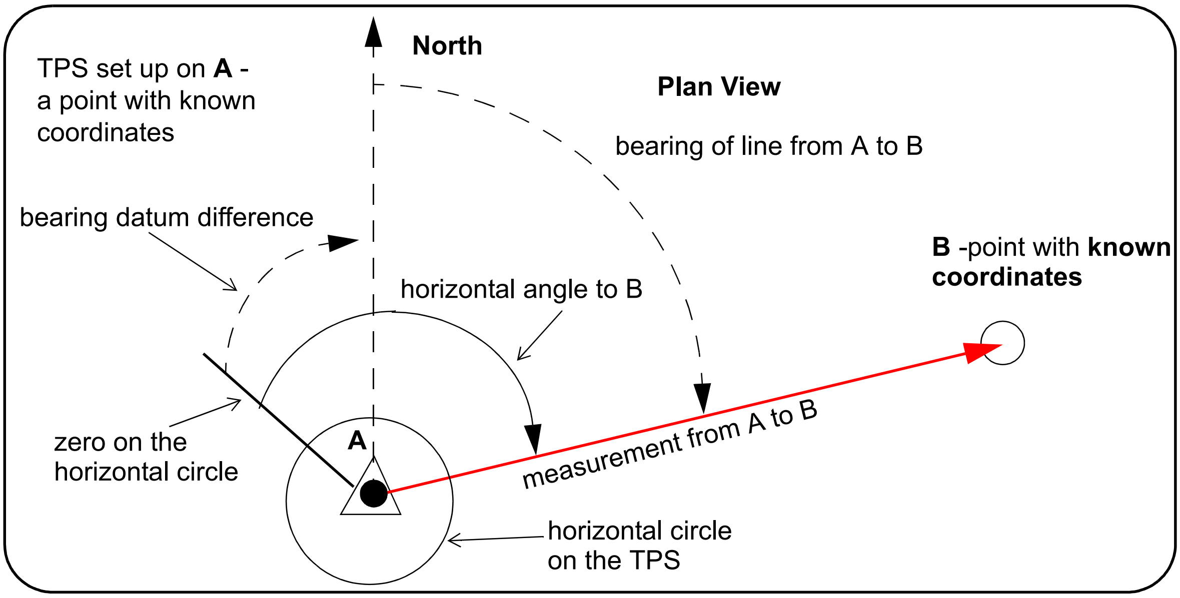
In fact, you only need the **horizontal angle to the known point B**.

This is called a **backsight**.

The theory is as follows:

Backsight - Bearing Datum Difference

.



Because you know the (x,y) coordinates of A and B, you can calculate the clockwise angle that the line AB makes from the Y-axis (North). This is called the **bearing** of the line from A to B.

You observe the point B from the setup point A and measure the horizontal angle to B.

The bearing datum difference is defined to be the difference between the bearing of the line from A to B, and the horizontal angle from A to B. That is,

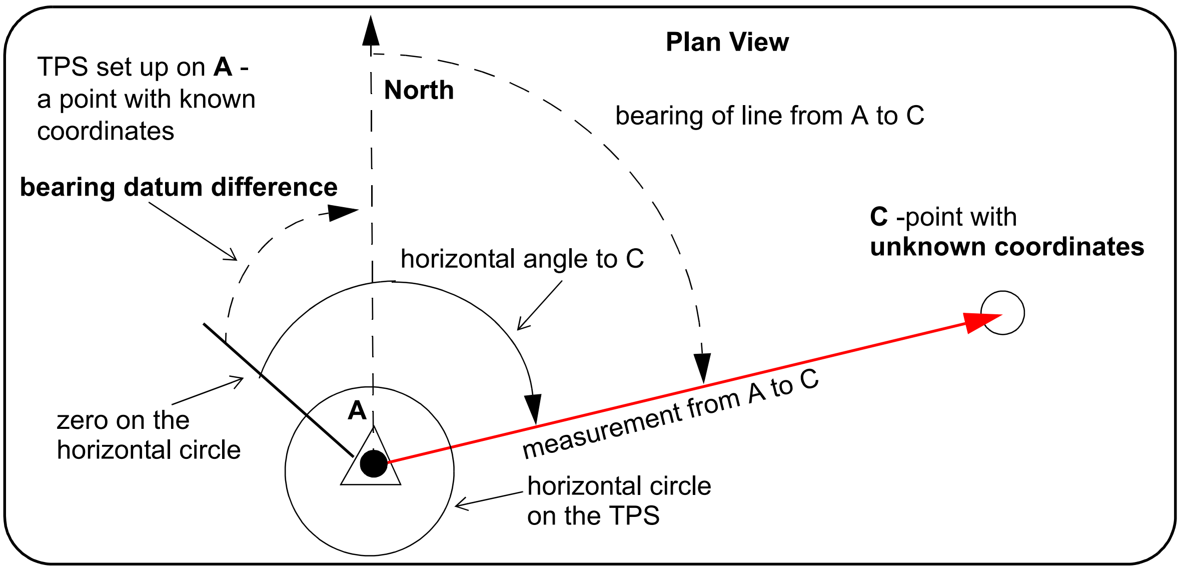
Bearing datum difference = **(horizontal angle of B observed from A) - (bearing of line AB)**

Because both the bearing of the line AB and the horizontal angle for B are both known quantities, the **bearing datum distance is a known value.**

How is the bearing dataum difference used?

If you now measure from the same setup at A, to a point C with unknown coordinates, you measure the horizontal angle from A to C. And using the known bearing datum difference, you can calculate the bearing of the line from A to C.

(bearing of line AC) = **(horizontal angle of C observed from A) - Bearing datum difference**



So using the **bearing data difference** for the instrument setup at A, you can turn the relative horizontal angle into an absolute bearing and use that to finalise the calculation of the position of the unknown point C.

So, in summary, TPS measure slope distances, vertical angles and relative horizontal angles from the instrument to points but do not produce (x,y,z) coordinates for the measurement points.

The (x,y,z) coordinates of the measurement points must be calculated from the measurements and other data such as the coordinates of known physical points (e.g. survey marks).

Important Notes

1. What is North?

Although North was mentioned in the above discussion, it glossed over the fact that to get an actual bearing, the coordinates for the known points need to be map coordinates, or at least truncated map coordinates.

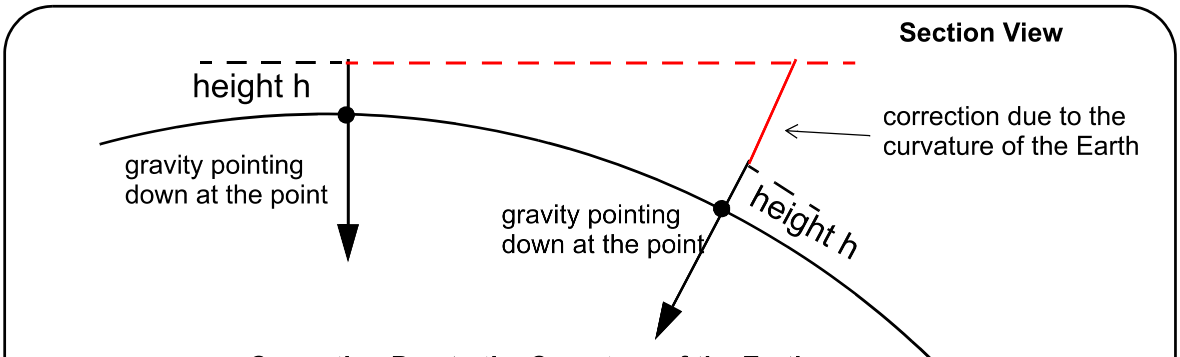
Then there is the fact that there are three Norths uses in Surveying. See 27.5.3 True North, Grid North and Magnetic North.

2. Curvature of the Earth

Another problem is that the laser of the TPS travels in a straight line but the Earth is not flat.

So when the laser is pointed out horizontally at a height of **h**, the laser will be higher than **h** the further the beam is from the setup point.

12d Model can make the curvature of the earth corrections.



Correction Due to the Curvature of the Earth

Continue to 25.1.1.2 GNSS (GPS, Glonass etc) or return to 25.1.1 Collecting Survey Data in the Field or 25.1 An Overview of Surveying and Reduction.

25.1.1.2 GNSS (GPS, Glonass etc)

A **GNSS** instrument measures the **longitude**, **latitude** and **ellipsoid height** at the position of the GNSS.

But the longitude, latitude and ellipsoid height are measured at a particular time (epoch) using a mass centred ellipsoid with zero longitude going through Greenwich.

However, due to continental drift, a point on the ground moves relative to Greenwich so calculations are needed on the longitude, latitude and ellipsoid heights from the GNSS to get the longitude, latitude and ellipsoid heights for the epoch that the project is using.

12d Model does not do any of this specialist processing and accepts the longitude, latitude and ellipsoid height produced by the GNSS which should be in the required epoch.

Once ***12d Model*** has the longitude and latitudes, ***12d Model*** can do the calculations to produces the coordinates needed for the project. For example, Eastings and Northings in a particular projection such as MGA2020.

Finally the heights measured by the GNSS are ellipsoid heights, which are never used in practice because with ellipsoid heights, water may not run down hill.

Instead of ellipsoid heights, the world uses **orthometric**, or **geoid heights**. That is, heights defined by the requirement that two points have the same height if water will not run between them. And the value of the orthometric height is the vertical distance it is above mean sea level.

The difference between the ellipsoid height at the orthometric height at a point is called the **N value**.

Unfortunately, because the density of the earth is not uniform, there is no formulae to calculate the orthometric height for a point - it must be determined from other points of known orthometric height.

Using N-values for a region surveyed, ***12d Model*** calculates the required orthometric heights.

So from a GNSS instrument, (x,y,z) coordinate can be obtained.

Note: Many GNSS units have N-values on board and can do all the calculations on board and produce the required (x,y,z) coordinates.

However the (x,y,z) coordinates produced are for where the GNSS instrument itself sits and so the actual ***instrument height*** must also be known to find the height on the ground.

For more information about the models of the Earth, longitude and latitude, N-values, continental drift and Map Projections, see 27 Geodetics Summary.

Continue to 25.1.2 What is Survey Reduction? or return to 25.1 An Overview of Surveying and Reduction or 25 12d Survey Guide.

25.1.2 What is Survey Reduction?

The process of using the measurements and the extra data, to create coordinates for all the measurements, is called ***survey reduction***, or just ***reduction***.

If the ***12d Field*** option ***Pickup*** (***12d Pickup***) is used for collecting the survey data, the instrument measurements and extra information are recorded in a ***Survey Data Reduction Function*** (***SDR Function***) as ***field data commands***, and the ***SDR Function*** reduces the data and displays it on the screen as each measurement is taken.This means the survey data can be immediately verified and any errors corrected or gaps in the survey spotted.

If ***12d Field*** is ***NOT*** being used in the field, then the measurements are being generated by the instrument and hopefully written to a raw file that is stored either on the instrument itself, or in a data recorder. For these cases, the raw data file needs to be converted to a ***12d Field File*** and then, in ***12d Model***, a ***SDR Function*** created using the ***12d Field File*** as its initial input.

So in both cases, it is a ***12d Model Survey Data Reduction Function*** (***SDR Function***) that does the survey reduction to produce strings. See 25.1.2 What is Survey Reduction?.

Important Note

The ***SRD Function*** stores the survey data as ***field data commands*** and in a ***12d Field FIle***, the survey data is stored as ***opcodes***.

However there is a one-to-one correspondence between the ***field data commands*** and the ***opcodes*** and they each contain the same information. See 25.5 Field Data Commands and 12d Field File Opcodes.

There are two steps in the reduction of a survey by a ***SDR Function.***

1. Calculate (x,y,z) coordinates for all the measured points

   The **first step of the reduction** takes the surveyor's measurements and produces (x,y,z) coordinates for each measurement.

   For this to be mathematically possible, the (x,y,z) coordinates of know physical points in the survey area are needed, and then used in the survey reduction.

   For example, the instrument can be set up over a known point, and the name of that known point recorded with the instrument set up. Or when a set up is done over an unknown point, measurements to known points can be made and these measurements used by resections, least squares etc to calculate the (x,y,z) coordinates of the unknown set up point.

   It is part of the surveyors skill to determine what known points and types of measurements are required so that the (x,y,z) coordinates can be calculated for all the measurement points in the survey.

   For redundancy, check measurements are regularly done to ensure that everything is still correct and no errors have crept in. Even if the instruments are measuring correctly, an incorrect instrument or target height may have been entered at some time. Or when a known point is being used, the wrong name may have been entered and hence the wrong (x,y,z) coordinate used for that point.

   The coordinates of known points are provided in **Control models** and **Network models**, or typed into ***12d Pickup*** or the ***SDR Function.***

   Also, during the survey, the surveyor can tag a measurement to a point as a **named measurement** and provide a unique name for the point (called a ***named point)*** and a list of named points is maintained by the ***SDR Function*** so that the named points can be referred to by other measurements in the survey.

Important Note

Named measurements are separate to other measurements which are know as standard measurements.

2. Creating strings, string properties and adding attributes

   Picking up points alone is almost useless (zero dimension and zero information) and surveyors are not just point gatherers.

   The surveyor’s skill is knowing the correct points to measure to represent the required features, and how to add additional information to the measurements.

   During the survey, the surveyor can record additional information such as ***feature codes***, ***string numbers***, ***point ids*** etc in ***field data commands*** (***commands***) to turn measurement points into more valuable information.

   For example, ***feature codes*** and ***string numbers*** are used to create strings from the points and give them identifiable names. For example, a string named "CK TOP " for the string of points along the top of the bank of a creek, a string named "RD EB" for the string of points along the edge of bitumen or a single point string "EL H" for a high voltage electricity power pole.

   Field data commands define how each measurement and the associated data is to be used. As examples, the field data commands:

   - *denote a measurement as a backsight measurement and hold the name of the point that it is a backsight to*
   - *are used to enter the coordinates and the names of known points*
   - *define where an instrument is instrument set up and hold the instrument height.*
   - *add additional information such as pipe diameters, culvert widths and heights, add string, vertex and segment attributes and create arcs through points etc.*

It is the **second step of the reduction** that turns a collection of points into much more valuable information.

Once the survey data is in a ***SDR Function***, the field data commands can be edited, both graphically or by selecting the commands and changing values, and additional commands added.

Continue to 25.2 Survey Reduction in 12d Model or return to 25 12d Survey Guide.

25.2 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**.

12d Model stores survey data in a ***Survey Data Reduction Function*** (***SDR Function***) and the ***SDR Function*** does the survey reduction to produce super strings.

There are three typical paths for creating the ***SDR Function:***

(a) The ***12d Field*** option ***Pickup*** (***12d Pickup***) creates a ***SDR Function*** that automatically reduces and displays the resulting strings as the data is being picked up.

For information on survey coding and field data commands used in ***12d Model***, see 25.3 Field Coding for 12d Model.

(b) a ***12d Field File*** exists without an associated ***SDR Function***

The ***12d Field File*** may have been created by another ***12d Model*** option without the ***SDR Function*** being created, or sent to you without the associated ***SDR Function***, or the ***12d Field File*** may have been created by another survey product.

In this case, a ***SDR Function*** can be easily created and the ***12d Field File*** reduced. See 25.2.1 12d Field File and No Survey Data Reduction Function.

(c) Another survey file format is received

In this case the file, often a raw file from the instrument or data collector, must first be converted to a ***12d Field File*** and then used as input data to create a ***SDR Function*** See 25.2.2 A Non 12d Field File is Received.

Important Note

The ***SRD Function*** stores the survey data as ***field data commands*** and in a ***12d Field FIle***, the survey data is stored as ***opcodes***.

However there is a one-to-one correspondence between the ***field data commands*** and the ***opcodes*** and they each contain the same information. See 25.5 Field Data Commands and 12d Field File Opcodes.

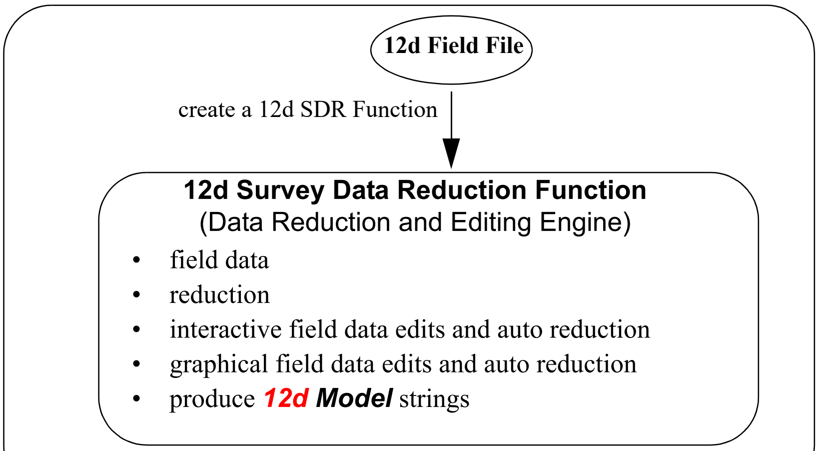
Continue to 25.2.1 12d Field File and No Survey Data Reduction Function or return to 25 12d Survey Guide.

25.2.1 12d Field File and No Survey Data Reduction Function

When only a ***12d Field File*** (extension ***.fld*** or ***.12dfield***) exists **without** an associated **SDR Function**, a **SDR Function** needs to be created for the ***12d Field File*** file so that the survey data can be reduced to produce strings. See 16.4.2 Create SDR Function from a 12d Field File.

If errors occur in the reduction, the ***SDR Function*** can then be interactively and/or graphically edited.

So when only a ***12d Field File*** exists with no associated **SDR Function***,* the data flow diagram for the survey reduction process is still fairly simple:



Data Flow for Survey Reduction with 12d Field File Only

Note

To understand survey coding in ***12d Field File***, the following information is required:

(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 25.3 Field Coding for 12d Model

(b) There are template field coding concepts used in ***12d Model*** that are common to all instruments. These are described in 25.3.10 Field Templates

(c) There are shape field coding concepts used in ***12d Model*** that are common to all instruments. These are described in 25.3.11 Shape Field Coding

(d) There are traverse field coding concepts used in ***12d Model*** that are common to all instruments. These are described in 25.3.12 Traverse Coding

Continue to 25.2.2 A Non 12d Field File is Received or return to 25.2 Survey Reduction in 12d Model or 25 12d Survey Guide.

25.2.2 A Non 12d Field File is Received

When the file produced or received is not a ***12d Field file*** then there are up to three steps involved:

1. ***12d Model*** downloads the raw data file from the data collector and stores it on the computer.
2. The raw data file is **converted** to a ***12d Field File***
3. The ***12d Field File*** is read into a ***SDR Function*** and reduced.

   The reduction produces ***12d Model*** super strings.

   If errors occur in the reduction, the ***SDR Function*** can be interactively and/or graphically edited within ***12d Model***.

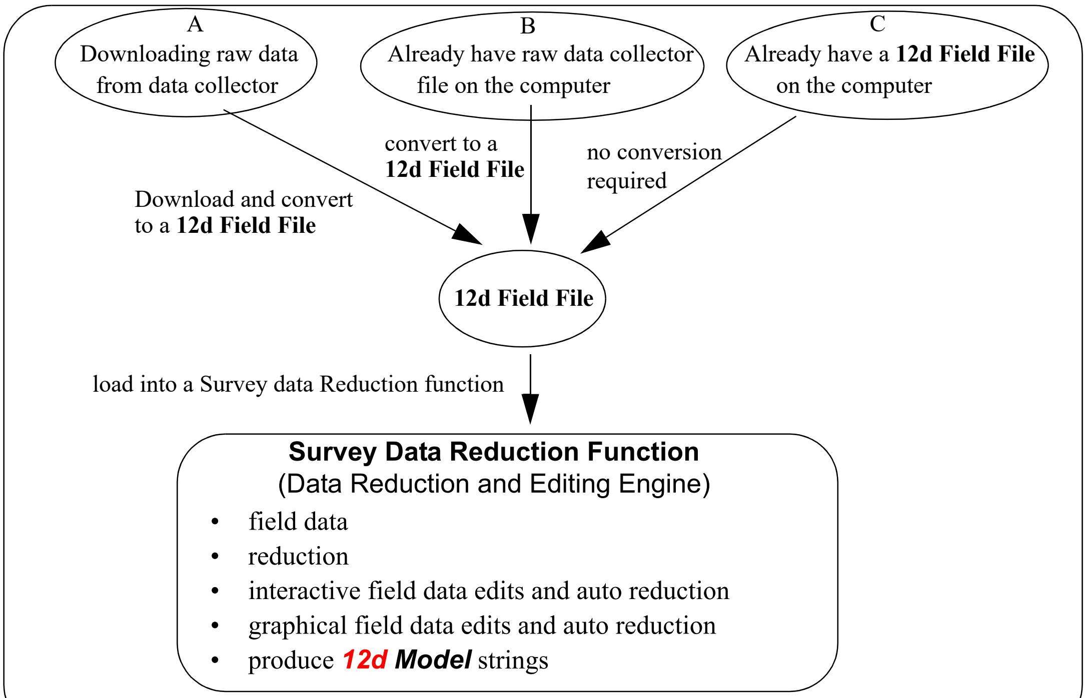
In some circumstances, not all steps are necessary.

For example, Step 1 is not necessary when the raw data file is already on the computer (and hence doesn't need downloading).

Steps 2 is not necessary when the survey data is already in the form of a ***12d Field File*** file.

This occurs when other software packages such as ***TP Setout*** produce a ***12d Field File*** directly, or if the ***12d Field File*** was created in a previous ***12d Model*** session, maybe even on a different computer.

The data flow diagram for the survey reduction process of a non-***12d Field File*** is:



Data Flow for Survey Reduction of non 12d Field File

Unfortunately, each brand of data collector has its own method of communicating with a computer and a software package, and different coding methods are needed on the different data collectors.

So in ***12d Model***, data collector definitions can be set up to work with each different data collector and the appropriate data collector definition used in the process of converting a raw data collector file to a ***12d Field File.***

For information on setting up a data collector definition, see 41.1 Data Collector Definitions.

Continue to 25.2.3 Using Data Collectors or return to 25.2 Survey Reduction in 12d Model or 25 12d Survey Guide.

25.2.3 Using Data Collectors

The process of converting raw files from data collector appears complicated 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, there is no industry standard and each brand of survey instrument has a totally different format for recording information. In fact, different instruments from the same survey instrument manufacturer can have different formats for recording data.

Secondly, many users are already familiar with another survey package and if possible, wan to continue field coding in the same way. Where possible, ***12d Model*** has tried to accommodate this.

12d Model has a method of field coding for each instrument to take advantage of features that are available in ***SDR Function***. For example, defining and using field templates and recording user-defined attributes on points and segments.

To understand survey coding in ***12d Model***, and how it is used for different data collectors, the following information is required:

(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 25.3 Field Coding for 12d Model

(b) This include template field coding concepts used in ***12d Model*** that are common to all instruments. These are described in 25.3.10 Field Templates

(c) Also shape field coding concepts used in ***12d Model*** that are common to all instruments. These are described in 25.3.11 Shape Field Coding

(d) And traverse field coding concepts used in ***12d Model*** that are common to all instruments. These are described in 25.3.12 Traverse Coding

(e) For Leica instruments, the coding methods are different from most other types. These are described in 41.3 Field Coding for Leica TPS Instruments

(f) For non-Leica instruments, the concepts used in coding are similar for each type. These are described in 41.2 Field Coding for Non Leica Instruments

Continue to 25.3 Field Coding for 12d Model or return to 25 12d Survey Guide.

25.3 Field Coding for 12d Model

TPS and GNSS equipment is used in the field to make readings of points.

However, rather than just collecting points, it is desirable to add extra information by coding the readings in a way that can be interpreted during the data reduction process to produce more valuable information.

In ***12d Model***, the extra information is included in one or more of

- *feature code*
- *string number*
- commands and information

How ***12d Pickup*** stores the ***feature codes***, ***string number*** **etc** as ***field data commands*** (**commands**) is well defined in 25.4 Field Data Commands but unfortunately there is no industry standard for doing so on other survey instruments and data collectors.

For **non-*12d Pickup*** users, ***12d Model*** needs to converts the raw data files from the different survey instruments and data recorders with different coding conventions, into a ***12d Field File*** before being loaded into a ***SDR Function*** and reduced.

So knowing how ***12d Model*** field data commands work is essential for any survey reductions done in ***12d Model***.

Some of the important concept used in ***12d Model*** field data commands will now be described:

See

25.3.1 Stringing in the Field.
25.3.2 Offsets.
25.3.3 Start New String.
25.3.4 Close String.
25.3.5 Squashed Rectangle - Parallelogram.
25.3.6 Rectangle by 2 Points.
25.3.7 Feature String.
25.3.8 Joining Strings
25.3.9 Arcs Through Points
25.3.10 Field Templates
25.3.11 Shape Field Coding
25.3.12 Traverse Coding

Continue to 25.3.1 Stringing in the Field or return to 25.3 Field Coding for 12d Model or 25 12d Survey Guide.

25.3.1 Stringing in the Field

To string data together, a feature coding convention is used and it is possible to string data when:

(a) *feature codes* and *string numbers* are used
or
(b) just *feature codes* and no string numbers are used.

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 reduction.

To control 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 ***feature code*** remains as the ***name*** of the **super string** and the ***string number*** is recorded as a string attribute called ***string_no.***

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 ***Map 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 j**ust *feature codes*** are used then a ***New String*** command is used to start a new super string rather than using string numbers.

During reduction, ***12d Model*** connects measurement points with the **same** *feature code* in the order they are measured 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 **Map File** to specify the name, model, colour, point-line type, linestyle, tinability and other details for the super string.

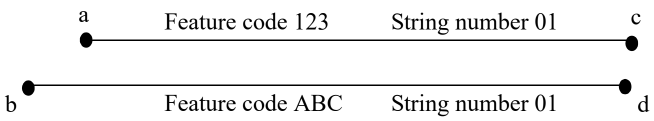
Note that the measurements of points with different feature codes can be intertwined. That is, *not* all the points in one super string need to be measured before the points in a different super string.

Important Note

Even in Case (a) when both feature codes and string number are used,.a ***New String*** command can be used to start a new string even though the string number has not changed.

An Example of Feature 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*.

As well as stringing data together, the ***SDR Function*** has field data commands to do other things with the strings such as:

25.3.2 Offsets
25.3.3 Start New String
25.3.4 Close String
25.3.5 Squashed Rectangle - Parallelogram
25.3.6 Rectangle by 2 Points
25.3.7 Feature String
25.3.4 Close String
25.3.8 Joining Strings
25.3.9 Arcs Through Points
25.3.10 Field Templates
25.3.11 Shape Field Coding
25.3.12 Traverse Coding

Continue to 25.3.2 Offsets or return to 25.3 Field Coding for 12d Model or 25 12d Survey Guide.

25.3.2 Offsets

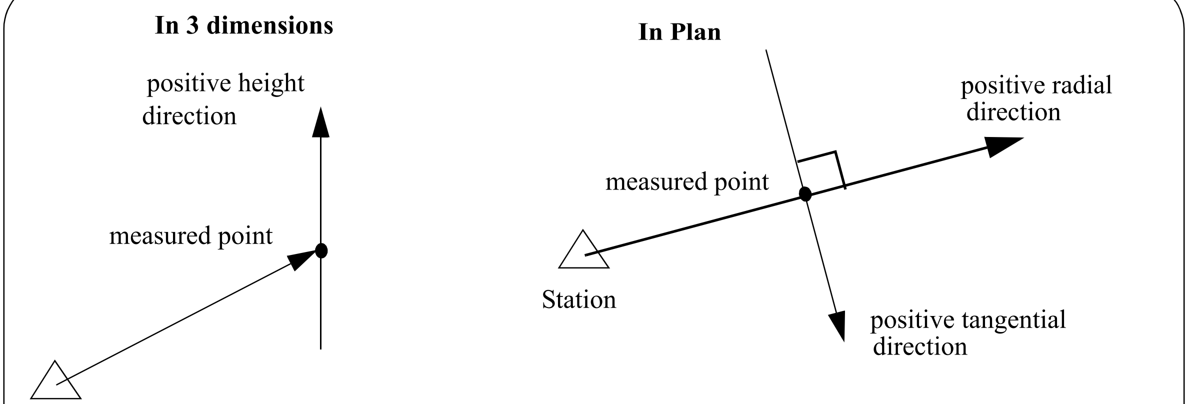
It is not always possible to measure a point directly but it may be possible to measure a point nearby and then measure an offset to adjust the measured point by and so produce the coordinates of the required point.

The three offsets that are allowed as field data commands:

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.



Offset Directions

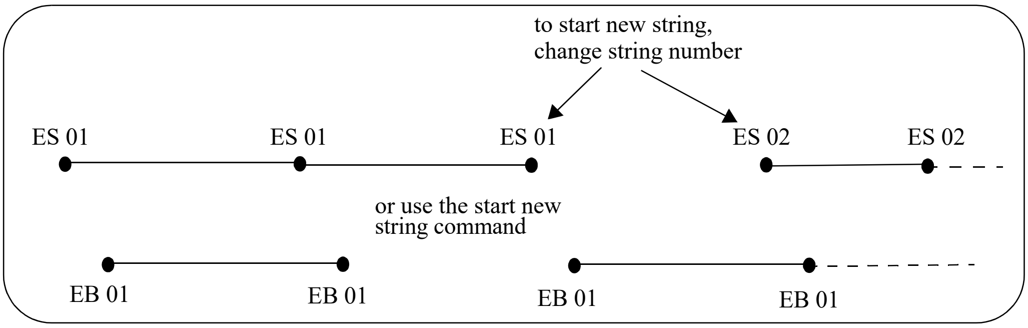
Continue to 25.3.3 Start New String or return to 25.3 Field Coding for 12d Model or 25 12d Survey Guide.

25.3.3 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 ***Start New String*** command is particularly useful for correcting the field error of forgetting to change the string number.

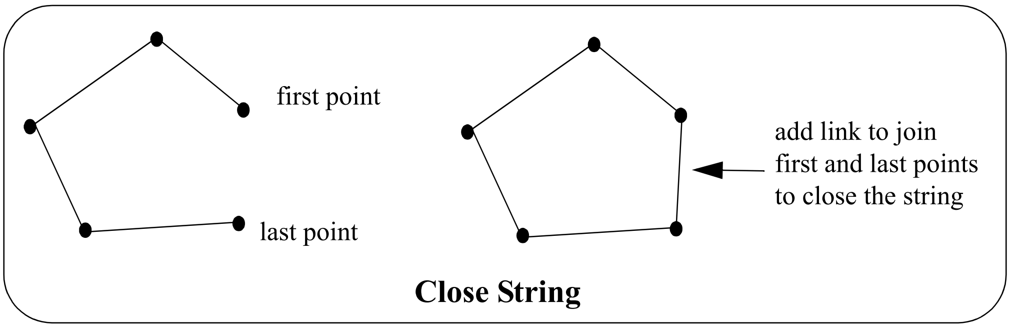


Continue to 25.3.4 Close String or return to 25.3 Field Coding for 12d Model or 25 12d Survey Guide.

25.3.4 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 close string command can be given at the recording of any point of the string, and the entire string is closed.

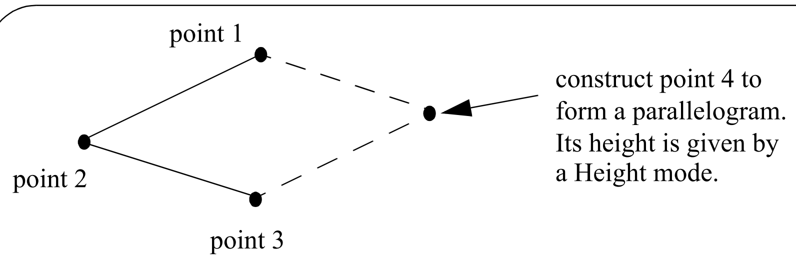


Continue to 25.3.5 Squashed Rectangle - Parallelogram or return to 25.3 Field Coding for 12d Model or 25 12d Survey Guide.

25.3.5 Squashed Rectangle - Parallelogram

The **rectangle** command acts on the 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 determined by a ***Height mode***.



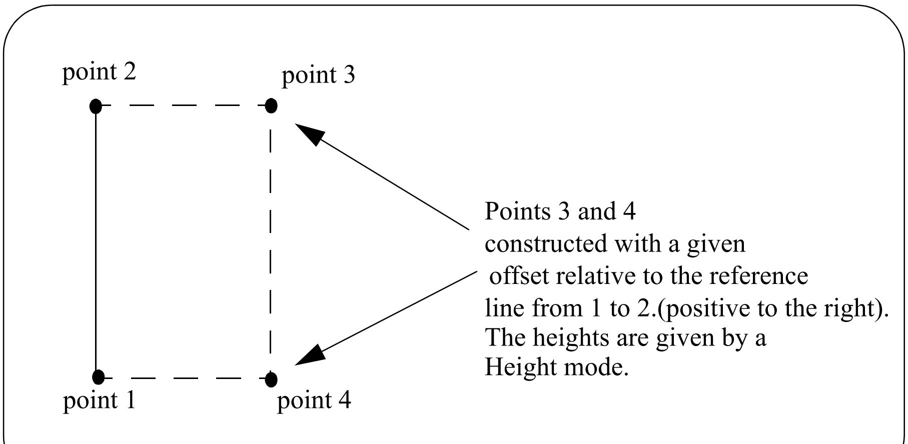
Form Parallelogram (Squashed Rectangle)

Continue to 25.3.6 Rectangle by 2 Points or return to 25.3 Field Coding for 12d Model or 25 12d Survey Guide.

25.3.6 Rectangle by 2 Points

The **rectangle by 2 pts command** acts on the 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 point is determined by a ***Height mode***.



Form Rectangle By 2 Points

Continue to 25.3.7 Feature String or return to 25.3 Field Coding for 12d Model or 25 12d Survey Guide.

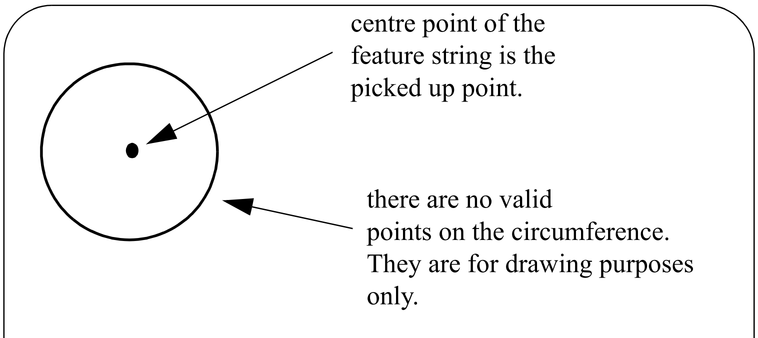
25.3.7 Feature String

A *feature string* is a 2D circle in the (x,y) plane 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.



Feature String

Continue to 25.3.8 Joining Strings or return to 25.3 Field Coding for 12d Model or 25 12d Survey Guide.

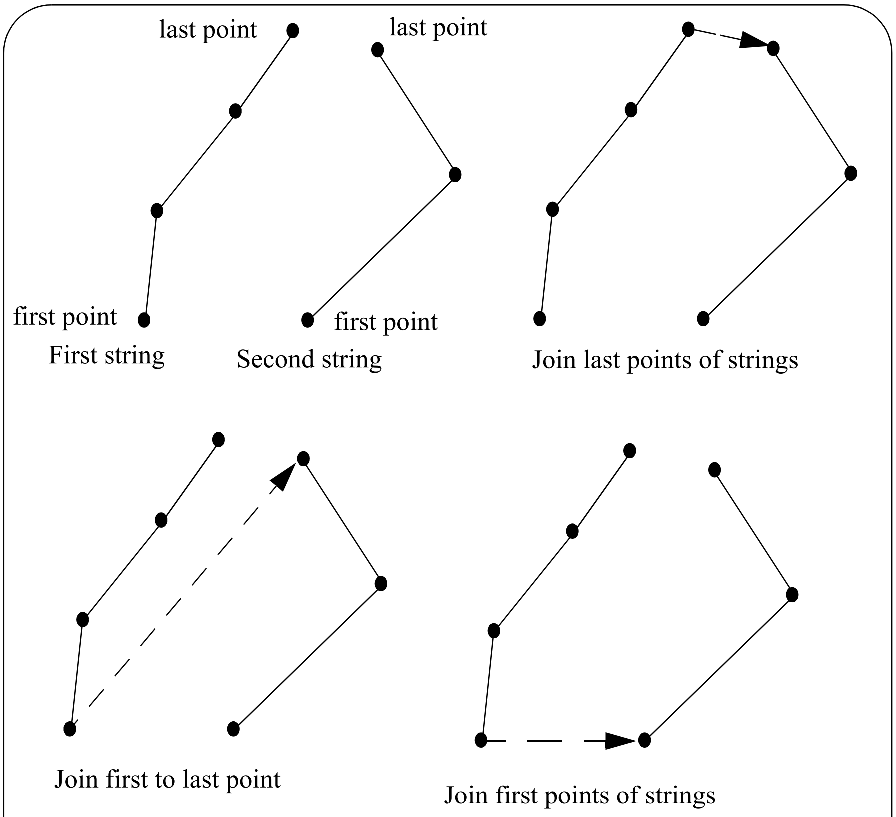
25.3.8 Joining Strings

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.



Join Strings

Continue to 25.3.9 Arcs Through Points or return to 25.3 Field Coding for 12d Model or 25 12d Survey Guide.

25.3.9 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 an 3d-arc in a plane not parallel to the x-y plane does **not** project onto an arc in the x-y plane.

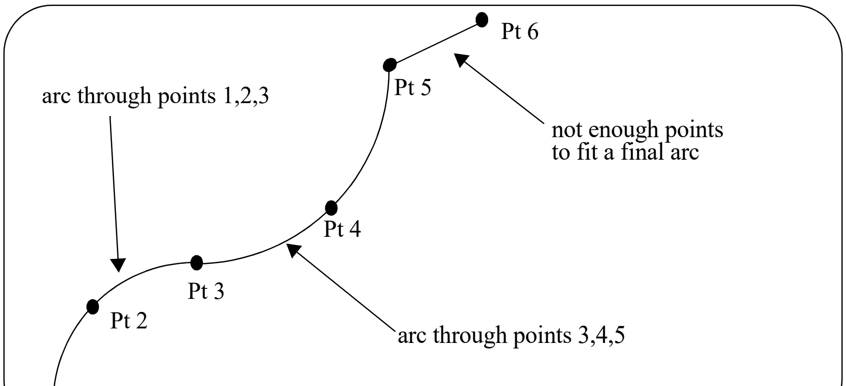
There are arc commands to

(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.



Arcs through Points

Continue to 25.3.10 Field Templates or return to 25.3 Field Coding for 12d Model or 25 12d Survey Guide.

25.3.10 Field Templates

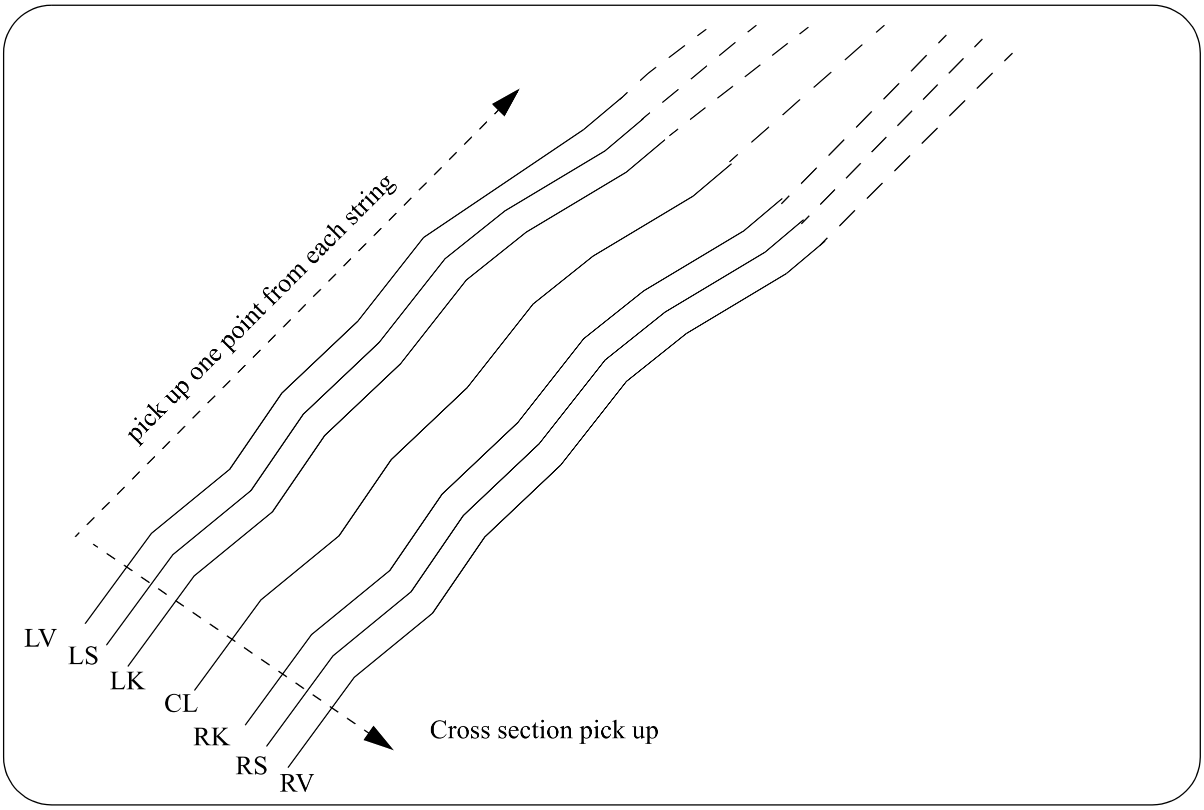
If a series of points are being picked up along the one string then the ***feature code*** and ***string number*** only need to be entered once since the **default** is for a measurement to use the **last *feature code* and *string number*** if no new ones are given.

However it is often much more efficient to pick up one point from a number of strings before moving onto the next point of each string (this is called a 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.

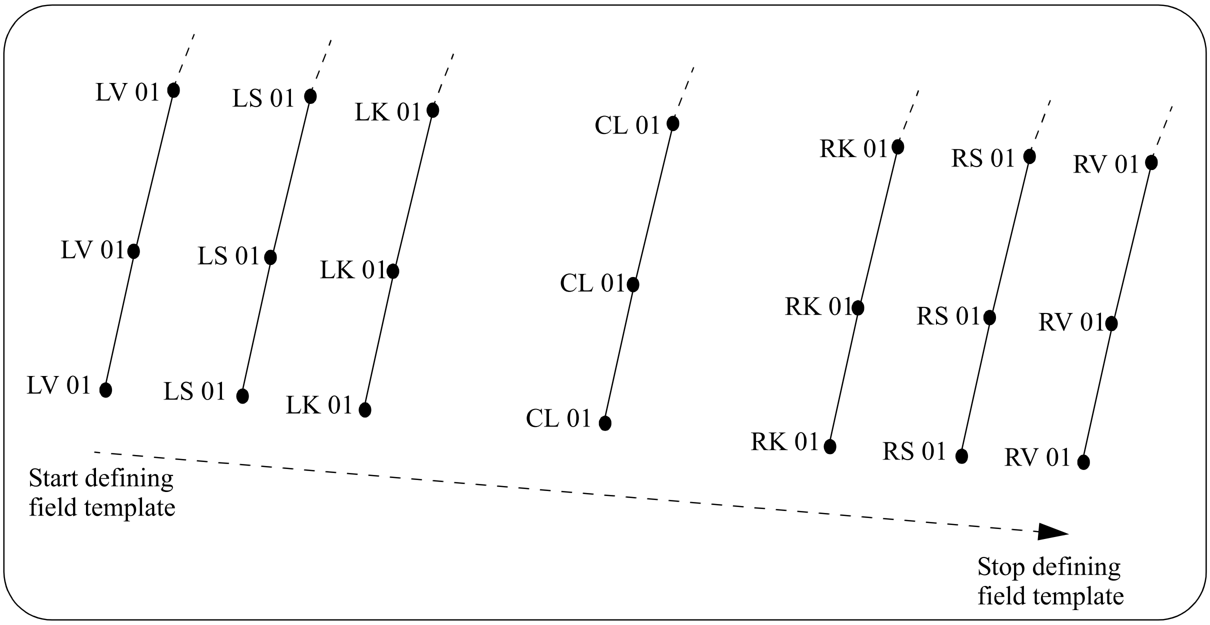
In the diagram below, this means picking up one point from each of the strings LV, LS, LK, CL, RK, RS, RV and then moving onto the next cross section rather than picking up all of LV and then all of LS and so on.

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 s*tring numbers* pairs 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 code*s 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 it is being used for picking up points.

When a field template is used, the feature code and string number from the field template can be used:

(a) in the same order as the codes are defined in the field template (forward direction).

(b) in the opposite order to how the codes are defined in the field template (reverse direction).

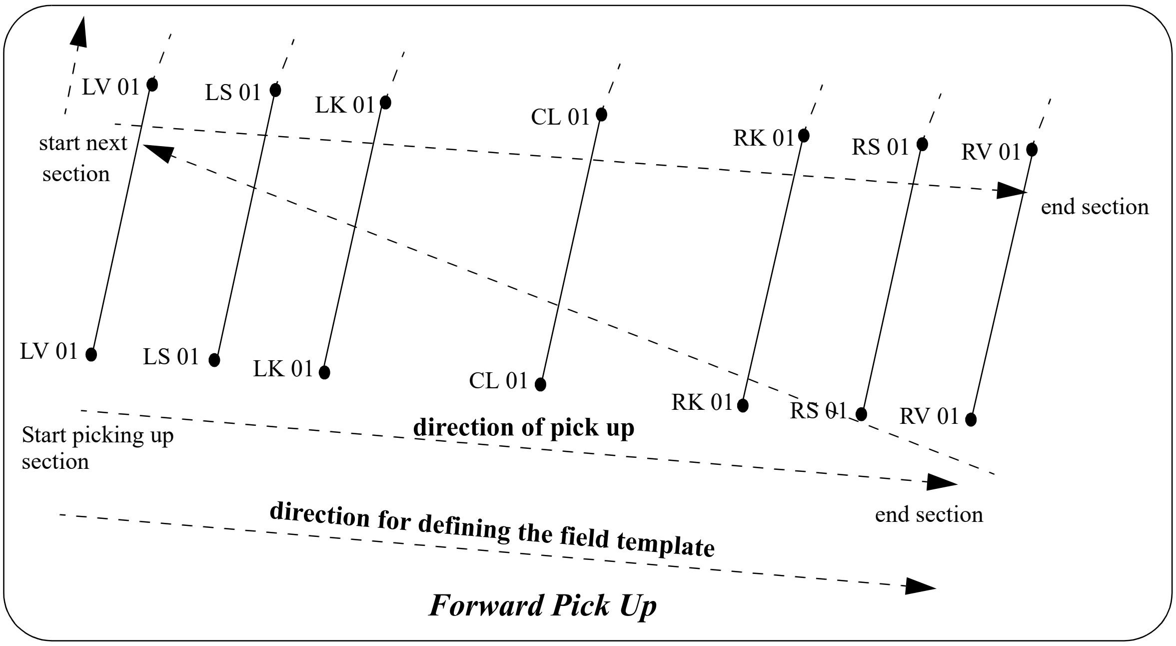
(c) in an alternating same and opposite order that the codes are defined in field template (zig-zag)

These three modes of usage of a field template will be described in the following sections.

Continue to 25.3.10.1 Forward Direction.

25.3.10.1 Forward Direction

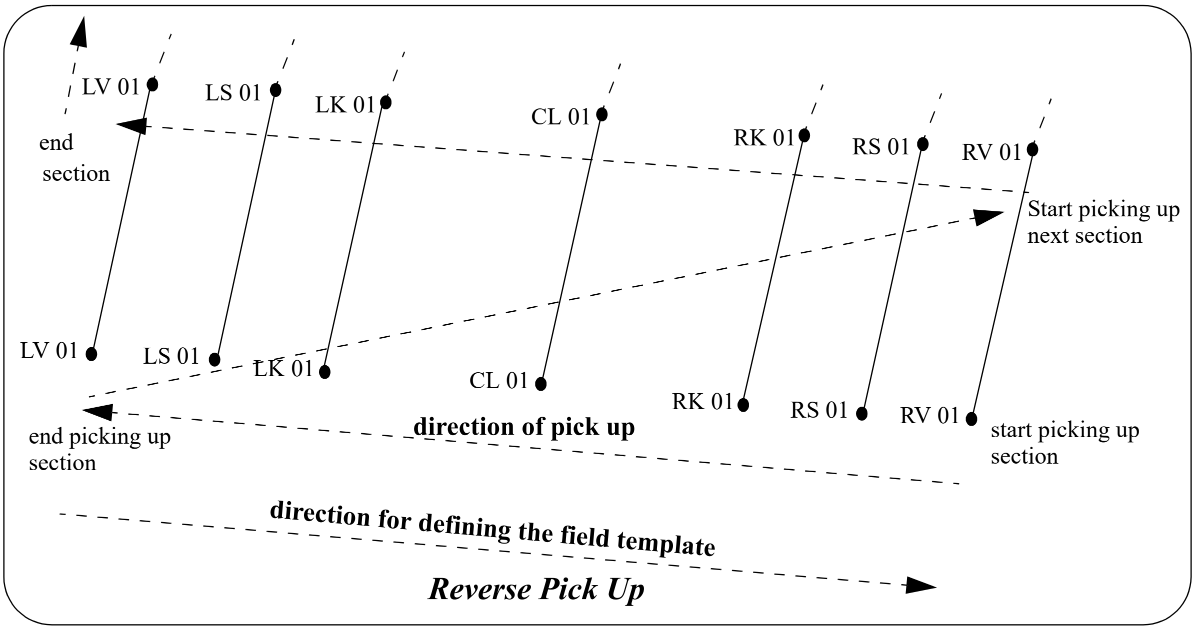
If the field template is used in the *forward* direction, then the feature codes and string numbers are used in the same order that they were defined to be in the field template. Once the end of the field template is reached, the feature codes and string numbers re-start at the beginning of the field template.



Continue to 25.3.10.2 Reverse Template Direction.

25.3.10.2 Reverse Template Direction

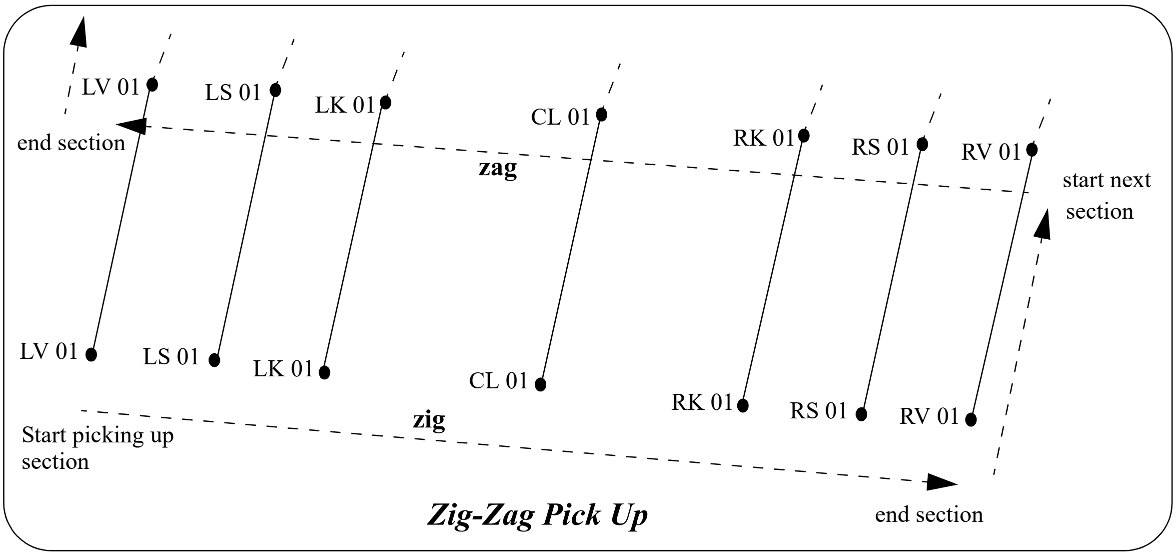
If the field template is used in the *reverse* direction, then the feature codes and string numbers are used in the reverse order to what they were defined to be in the field template. That is the feature codes and string numbers start at the *end* of the field template definition and are used in the 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.



Continue to 25.3.10.3 Zig-Zag.

25.3.10.3 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:

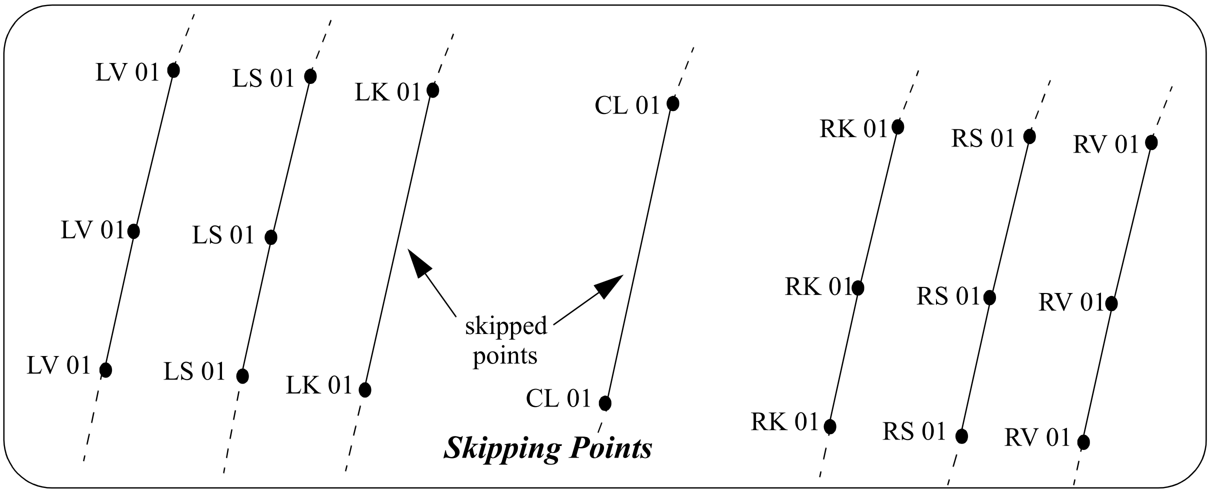
(a) a zig-zag field template starting on the zig

(b) a zig-zag field template starting on the zag.

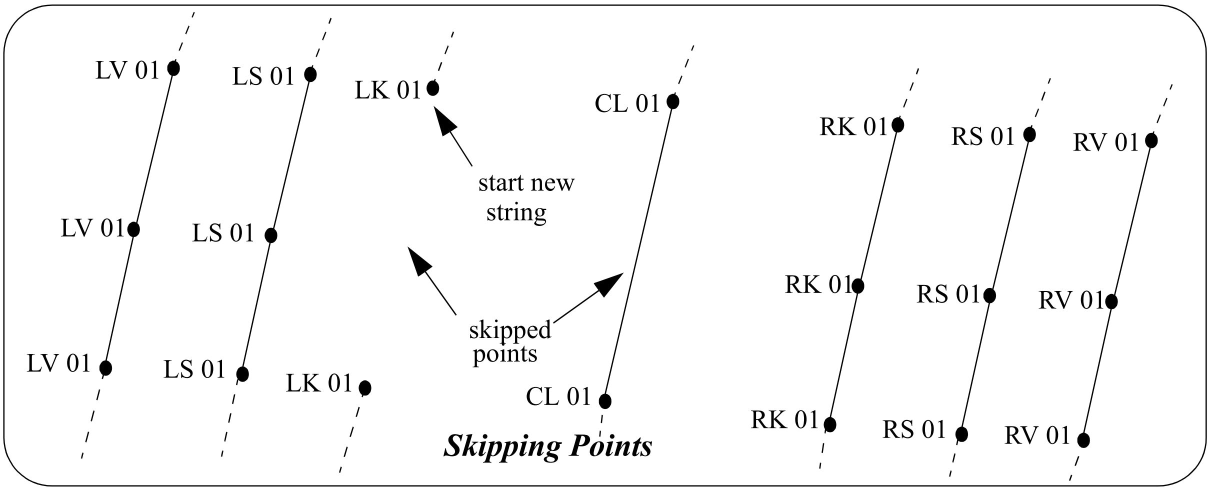
Continue to 25.3.10.4 Skipping Field Template Points.

25.3.10.4 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.



Continue to 25.3.10.5 Insert Template Points or Insert Multiple Codes.

25.3.10.5 Insert Template Points or Insert Multiple Codes

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 can be applied to specify which template pick-up the inserted point is to be added to. That is, add it to the last series of points or the next series. This flag is called the "insert special" flag.

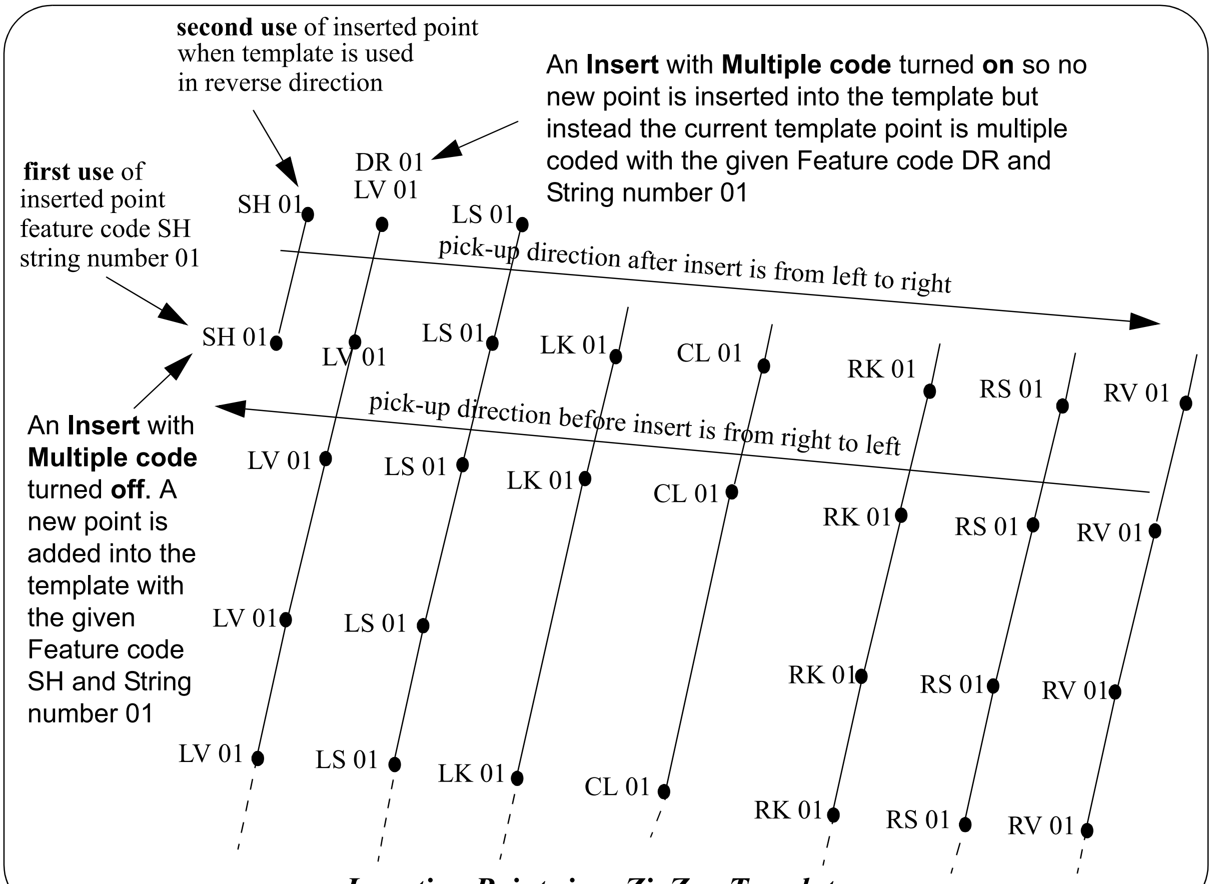
If ticked on in the insert panel, or if the flag given in the offset code is 1, the point will be added to the current series of points in the template being picked up.

In the case shown below where SH 01 is inserted, 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.

Note - in the example below, it is a zig-zag template so SH 01 is then used again straight away as the first point of the pickup when coming from left to right.

With the Insert, rather than insert new template points, it is also possible to give multiple codes to existing points in the template so that more than one code can be assigned to the one pick-up point (insert multiple codes).

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 so that the observed LV 01 string will also be coded DR 01.



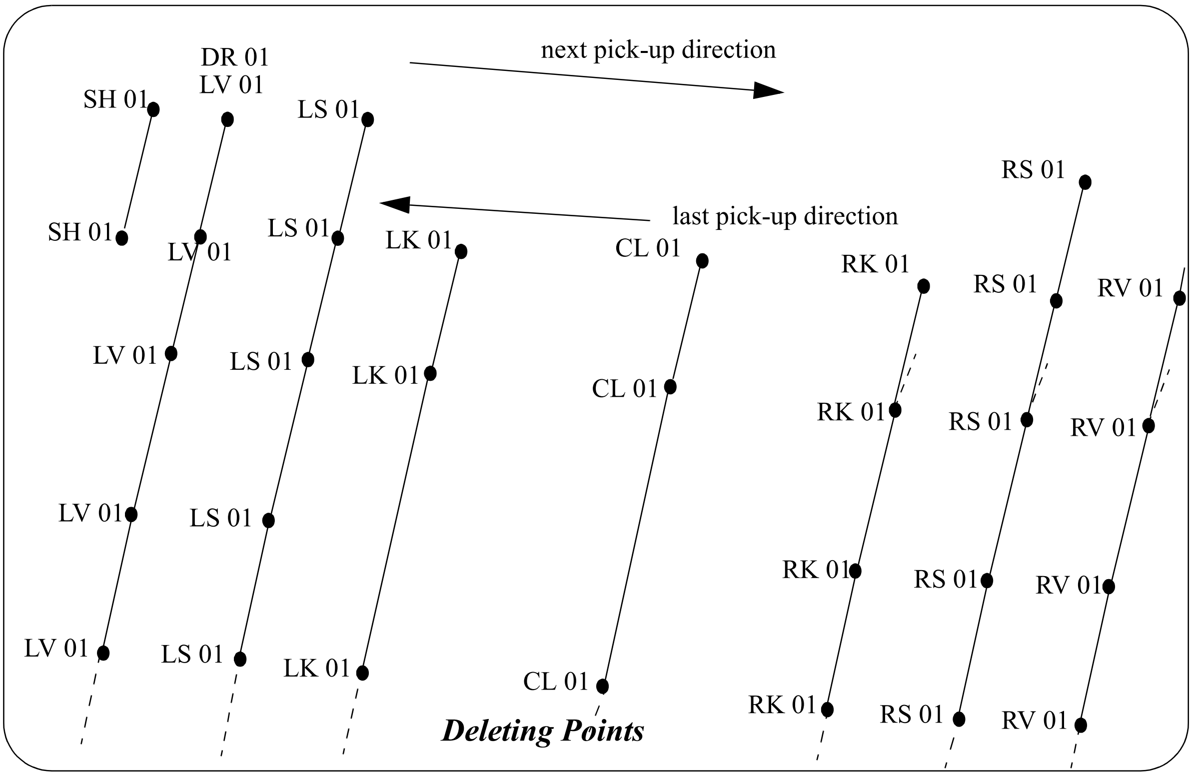
Inserting Points in a ZigZag Template

Continue to 25.3.10.6 Delete Template Points.

25.3.10.6 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.



Continue to 25.3.11 Shape Field Coding or return to 25.3 Field Coding for 12d Model or 25 12d Survey Guide.

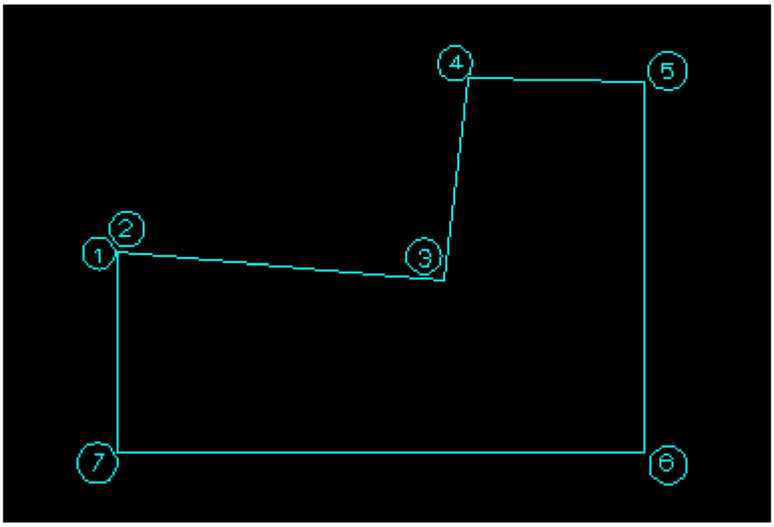
25.3.11 Shape Field Coding

If a an object of a standard section is to picked up such as a length of kerb, a shape can be defined and extruded/parallelled 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 Model*** 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.

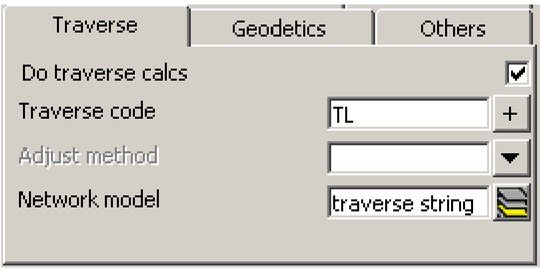
The next step is to pick up the entire length of the kerb at the reference string position using the same *feature code* and *string number* used for the reference string in the shape pick-up. In this example the lip of kerb.

Once completed, the shape can be extruded or parallelled 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.

Continue to 25.3.12 Traverse Coding or return to 25.3 Field Coding for 12d Model or 25 12d Survey Guide.

25.3.12 Traverse Coding

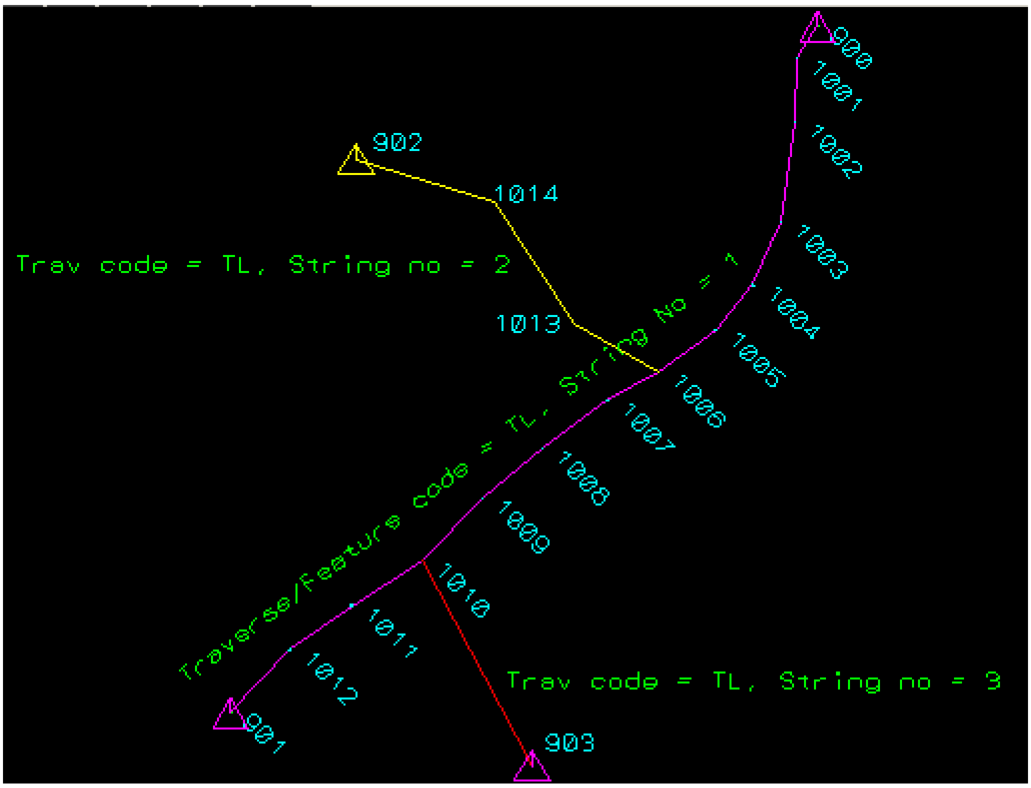
If a traverse is undertaken as part of a survey, a traverse code and string number can be coded so that ***12d Model*** can extract the traverse information. The specific traverse code can be supplied in the survey reduction panel under the traverse tab. An example is shown below:



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.

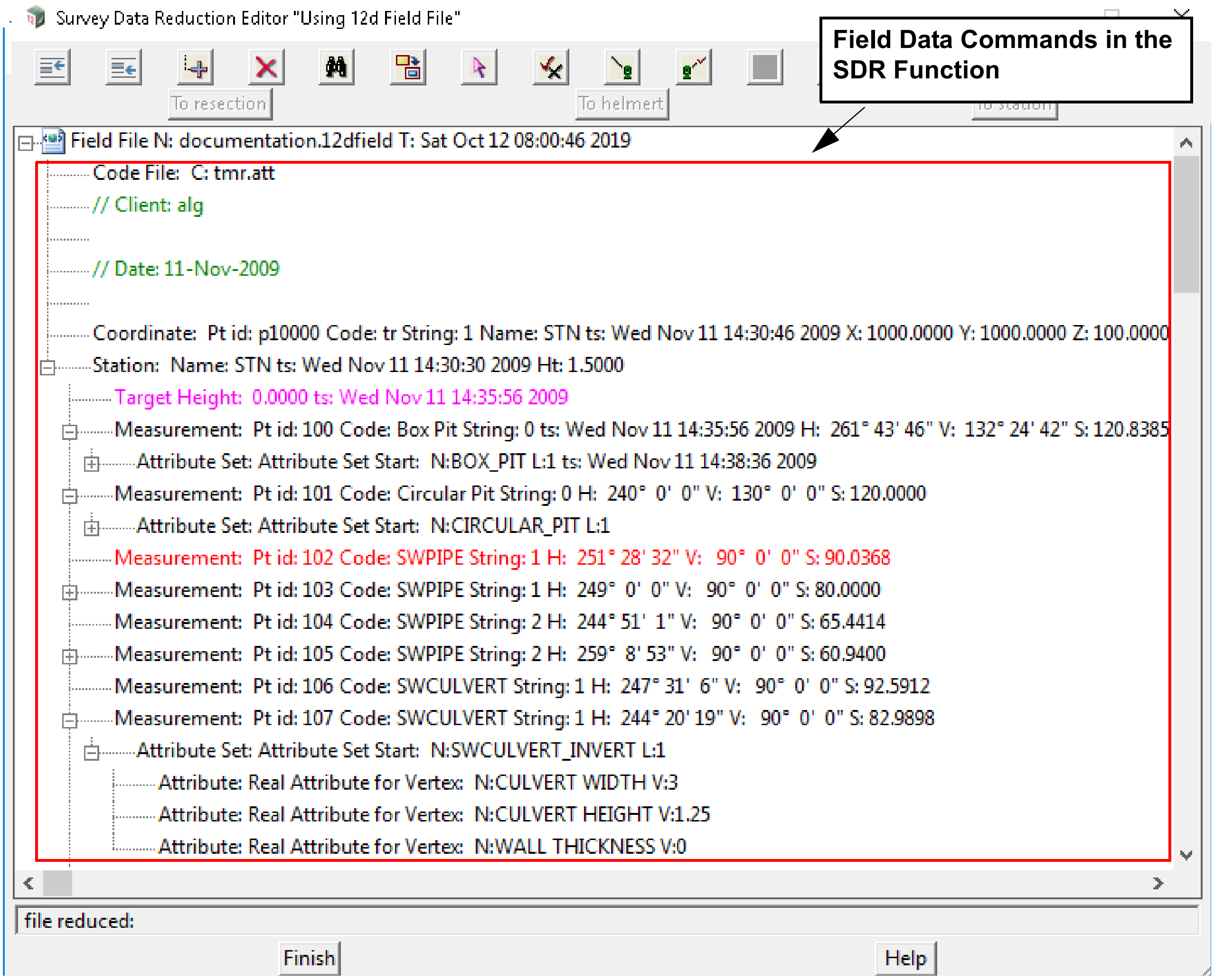


Continue to 25.4 Field Data Commands or return to 25.3 Field Coding for 12d Model or 25 12d Survey Guide.

25.4 Field Data Commands

The **Survey Data Reduction Editor** is used to interactively edit the field data of a ***SDR function***.

The **Survey Data Reduction Editor** panel displays the data loaded into the ***SDR Function***, either from ***12d Pickup*** or from a ***12d Field FIle***, as ***field data commands*** (***commands)***, and all the commands displayed in the **Survey Data Reduction Editor** panel can be modified, deleted, or new commands added.



The concepts used in the field data commands are described in 25.4.1 Common Information for Field Data Command Panels and the field data commands themselves in 25.4.2 List of Field Data Commands.

25.4.1 Common Information for Field Data Command Panels

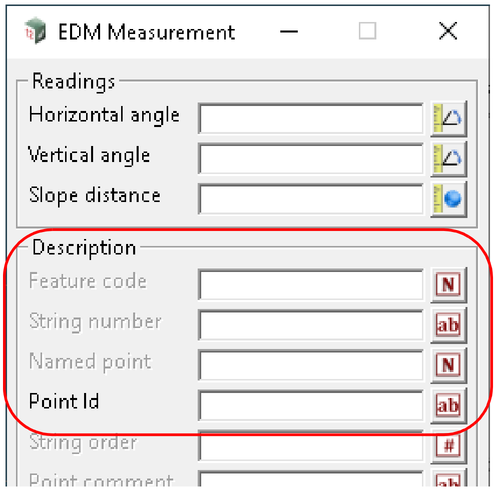
See

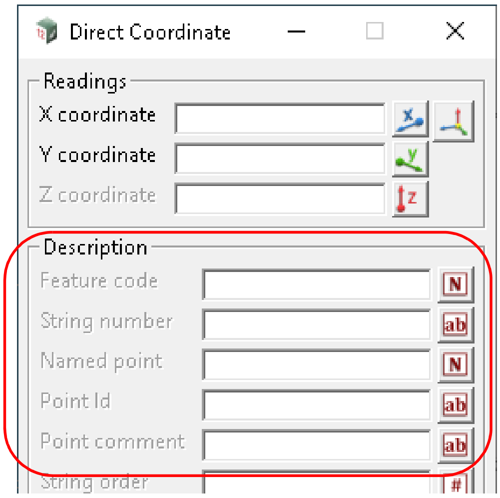
[25.4.1.1 Feature Code, String Number, Named Point, Point Id, Point Comment and String Order for a New Measured Point](#)
[25.4.1.2 Searching for Coordinates, Points and Strings](#)
[25.4.1.3 Time surveyed, Comment and Bottom Panel buttons](#)

25.4.1.1 Feature Code, String Number, Named Point, Point Id, Point Comment and String Order for a New Measured Point

When a new point is created by a measurement or a directly entered coordinate, reduction creates a vertex of a super string and the field data command supplies information for the new vertex.

This field data command information is displayed in the ***Description*** section of the panel for the field data command.





However there are two cases:

1. Standard measurement

   If the field ***Named point*** in the panel is ***blank***, or when working with a ***12d Field File*** and the ***point_name*** is ***blank***, then it is a ***standard measurement***.

   It this case, the measurement point becomes the vertex of a super string during the ***Feature code-String number*** processing.

   For details of the super sting vertex for a standard measurement, see [25.4.1.1.1 Standard Measurement](#)

2. Named measurement

   If the field ***Named point*** in the panel is ***not blank***, or when working with a 1***12d Field File*** and ***point_name*** is ***not blank***, then it is a ***named measurement***.

   In this case, a special one point super string is created and the ***Named name*** (***point_name***) added to the ***named measurement list*** for the SDR Function so that it can be referenced by following measurements and opcodes.

   However, if the field **Use named points as measurements** in the associated ***SDR Function*** is ***ticked***, a standard measurement is also created.

   For the details of the super string vertex created for a named measurement, and if required, the super string vertex for the associated standard measurement, see [25.4.1.1.2 Named Measurement](#)

25.4.1.1.1 Standard Measurement

If the **Named point** field in the panel is ***blank*** (or the ***point_name*** in the 12d Field File is ***blank***) then it is a ***standard measurement***.

When reduction occurs for a standard measure, the (x,y,z) coordinates are calculated for the measurement point and a **vertex** of a **super string** is created for that measurement point.

The name of the super string is ***Feature code*** (feature_code), and the ***String number*** (string_number) is recorded as the value of the string attribute, ***string_no***.

The ***Feature code*** and ***String number*** are processed to produce stringed data (see 25.3.1 Stringing in the Field).

Hence a ***standard measurement*** produces stringed data.

The ***Point number*** (***point_number***) is recorded as the ***point id*** for that vertex of the super string.

The ***Point comment*** (***point_comment***) is recorded as the ***vertex text*** for that vertex of the super string.

For the vertex, three attribute groups are created: *SDR Setup Details*, *SDR Measurement Details* and *SDR Measurement Geodetic Details*.

For ***SDR Setup Details***, the attribute names and values in the group are:

is_id	name of the station the measurement was taken from
is_x	x coordinate of the station
is_y	y coordinate of the station
is_z	z coordinate of the station
is_ht	height of the station
is_bearing_swing	the bearing swing in radians
is_setup_type	the type of setup (Station)

For ***SDR Measurement Details***, the attribute names and values are:

target_height	the height of the target
pu_hb_dms	horizontal angle in dms for the measurement
pu_va_dms	vertical angle in dms for the measurement
pu_sd	slope distance for the measurement

For ***SDR Geodetic Details***, the attribute names and values are:

So for a ***standard measurement***, the panel fields have the following use:

Feature code

feature_code

*For a standard measurement, then this is the **name of the super string** that this standard measurement point is part of.*

***Note:** for a standard measurement, the feature code and string number are used to string the data together and in the final strings, there is no actual feature code but its value is the **string name**.*

String number

string_number.

*If **not blank** and a standard measurement is being created, then this is the **string number** of the new standard measurement point.*

*The **string_number** is recorded as the value of a **string attribute** called **string_no, of the super string** that the new standard measurement point is part of.*

Named point

*this must be **blank** for a standard measurement.*

Point id

point_id.

*if **not blank** and a standard measurement is being created, then the **point_id** is recorded as the **vertex id** for the vertex of the super string that the new standard measurement point is part of. See*25.4.1.1.1 Standard Measurement.

Point comment

point_comment.

*if **not blank** and a standard measurement is being created, then the **point_comment** is recorded as the **vertex text** for the vertex of the super string that the new standard measurement point is part of. See*25.4.1.1.1 Standard Measurement.

String order

???

25.4.1.1.2 Named Measurement

If the **Named point** field in the panel is ***not blank*** (or the ***point_name*** in the 12d Field File is ***not blank***) then it is a ***named measurement***.

When reduction occurs for a named measure, the (x,y,z) coordinates are calculated for the measurement point and:

(a) a ***one vertex super string*** of name ***Feature code*** (***feature_code***) is created and mapped using the Map File

(b) the ***vertex text*** of the vertex is the ***station prefix*** followed by the ***Named point*** (***point_name)***.

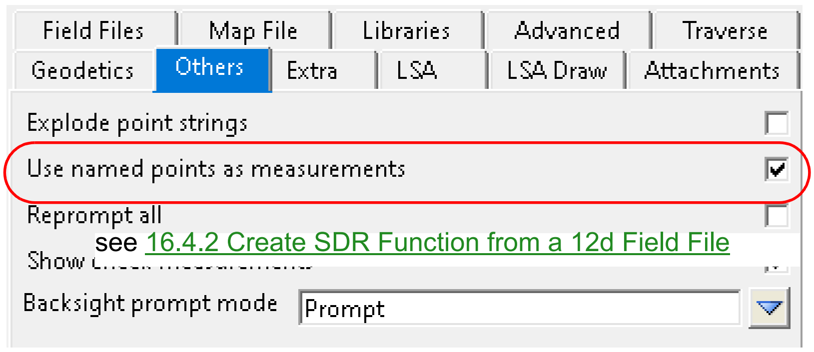
(c) the ***Named point*** (***point_name*** is added to the reduction functions internal list of ***named measurements list*** (***named points***) used in the reduction when searching for existing coordinates.

(d) the ***Point id*** of the one vertex of the super string is also set to ***Named name*** (***point_name***)

The one vertex super string is given a string attribute called ***Survey Control Station*** with the value 1.

So when creating a ***named measurement***, the ***String number*** (**string_number), *Point id* (*point_id***) and ***Point comment*** (***point_comment***), are **NOT** used when creating the special one vertex super string.

HOWEVER, for a named measurement, if **Use named points as measurements** is ticked **ON** in the **Others** tab for ***SDR Function*** being used.



see 16.4.2 Create SDR Function from a 12d Field File

then a **separate standard measurement** is **also created** using the fields ***Feature code*** (feature_code), ***String number*** (string_number), ***Point id*** (point_id), ***Point Comment*** (point_comment) and ***String order*** (string_order).

The ***Feature code*** and ***String number*** are for the separate standard measurement that can be processed to produce stringed data (see 25.3.1 Stringing in the Field).

So for a ***named measurement***, the panel fields can be used in two ways:

Feature code

feature_code.

*This is used as the **String name** of the named measurement and if a standard measurement is also being created, its **String name**. See* 25.4.1.1.1 Standard Measurement.

String number

string_number.

string_number is not used by the named measurement.

If a standard measurement is also being created, then this is its ***string number****. See*[25.4.1.1.1 Standard Measurement](#).

Named point

point_name.

If ***not blank,*** *then this is a* **named measurement**.

In this case, a one vertex super string with the string name ***point_name*** *is created. The named measurement can be used in the reduction to provide coordinates for stations, backsights etc.*

If a standard measurement is also being created, it does not use ***point_name****. See*[25.4.1.1.1 Standard Measurement](#).

Point id

point_id.

The point_id is not used in the **named measurement**.

If a standard measurement is also being created, then this is its ***point_id****. See*[25.4.1.1.1 Standard Measurement](#).

Point comment

point_comment.

For a named measurement, the point_comment is used as the vertex text of the super string.

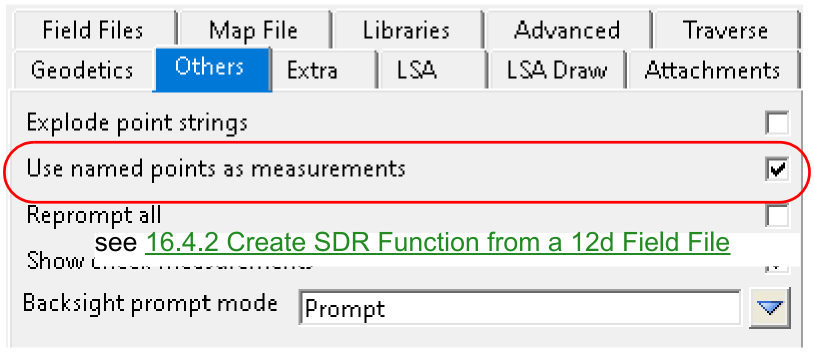
If a standard measurement is also being created, then the point_comment is the ***vertex text*** *of this super string. See*[25.4.1.1.1 Standard Measurement](#).

String order

???

Important Note - Named Measurement Also Producing a Standard Measurement

For a named measurement, the extra standard measurement is only created when **Use named points as measurements** is ticked ON in the **Others** tab for the ***SDR Function*** being used.



see 16.4.2 Create SDR Function from a 12d Field File

25.4.1.2 Searching for Coordinates, Points and Strings

When doing a survey there are two types of searches that are required.

(a) Searching for special known points critical to the reduction

Some field data commands such as ***Backsight***, ***New instrument*** and ***Check measurements***, allow the user to enter an **existing *Name***, and sometimes a ***known Point Id***, and they are used to search the Control model, the Network model and the list of ***Named Points*** created during the reduction, to find the special point and use its (x,y,z) coordinate and other details in the reduction.

See 25.4.1.2.1 Searching for the Coordinates of Special Points.

(b) Searching standard measurements for existing points or strings for stringing and attributing

Most field data commands are used for stringing, setting properties of the created super strings and string, vertex and segment attributes of the created super string.s

These options only use standard measurements.

See 25.4.1.2.2 Feature Code, String Number, Point Id for Finding Standard Points or Strings

25.4.1.2.1 Searching for the Coordinates of Special Points

For the field data commands ***Backsight***, ***New Instrument***, ***Check measurement*** and ***Check coordinate***, the values of the fields:

1. **Backsight point** field in the **Backsight** panel
2. **Named point** field in the **New Instrument** panel
3. **Check point** field in the **Check Measurement** panel
4. **Check point** field in the **Check Coordinate** panel

and sometimes also the value in the ***Point id*** field, are used **to *find a point*** whose coordinates are used in the reduction.

Note: in the ***12d Field File,*** these fields are all stored as the ***point_name*,** and the ***Point id*** field is store as the ***point_id***. See 25.5 Field Data Commands and 12d Field File Opcodes.

To save confusion, in this section we will use:

(a) ***Name*** for **Backsight point/Named point /Check point** in the field data command (***point_name*** in the ***12d Field File***).

and

(b) ***Id*** for the **Point Id** in the field data command (***point_id*** in the ***12d Field File***).

Given the ***Name*** and/or ***Id*** for the given field data commands, a point is found by searching in the following order:

First search the Control model (if it exists):

1. ***Name*** amongst **Vertex ids**

   A search is made of the **Control model** for a **vertex of a string** whose **point id** is the **same as *Name***. If a vertex is found its (x,y,z) coordinates and details are used.

2. ***Id*** amongst **Vertex ids**

   A search is made of the **Control model** for a **vertex of a string** whose **point id** is the **same as *Id***. If a vertex is found its (x,y,z) coordinates and details are used.

3. ***Name*** amongst **String names**

   A search is made of the **Control model** for a **string whose name** is the **same as *Name*.** If a string is found, the **first vertex of the string** is used for the (x,y,z) coordinates and details.

Next search the Network model (if it exists):

4. ***Name*** amongst **Vertex ids**

   A search is made of the **Network model** for a **vertex of a string** whose **point id** is the **same as *Name***. If a vertex is found its (x,y,z) coordinates and details are used.

5. ***Id*** amongst **Vertex ids**

   A search is made of the **Network model** for a **vertex of a string** whose **point id** is the **same as *Id***. If a vertex is found its (x,y,z) coordinates and details are used.

If *Use field coordinates* is ticked. next search the already entered Directly Entered Coordinates (DECs) in the SDR Function (12d Field File). Note that in the 12d Field file, a DEC has a point_name and point_id.

6. ***Name*** amongst **Named points (point_names)**

   A search is made of previously entered ***directly entered coordinates*** for a DEC whose ***Named point*** (***point_name***) is the **same as *Name***. If a DEC is found, its (x,y,z) coordinates are used.

7. ***Name*** amongst **Point ids**

A search is made of previously entered ***directly entered coordinates*** for a DEC whose ***Point id*** (***point_id***) is the same as ***Name***. If a DEC is found, its (x,y,z) coordinates are used.

8. ***Id*** amongst **Point ids** (**point_ids)**

   A search is made of previously entered ***directly entered coordinates*** for a DEC whose ***Point id*** (***point_id***) is the **same as** ***Id***. If a DEC is found, its (x,y,z) coordinates are used.

Next search the previous measurements in the SDR Function (12d Field File): Note that a measurement in the SDR Function has a Feature code which is stored as point_name in the 12d Field file, and a Point id which is stored as point_id in the 12d Field file.

9. ***Name*** amongst ***Feature code*** (**point_names**)

   A search is made of ***previous measurements*** for a measurement whose ***Feature code*** (**point_name**) is the **same as** ***Name***. If a measurement is found, its (x,y,z) coordinates are used.

10. ***Name*** amongst ***Point ids*** (**point_ids)**

    A search is made of **previous measurements** for a measurement whose ***Point id*** (***point_id)*** is the **same as** ***Name***. If a measurement is found, its (x,y,z) coordinates are used.

11. ***Id*** amongst ***Point ids*** (**point_ids**)

    A search is made of **previous measurements** for a measurement whose ***Point id*** (**point_id**) is the **same as** ***Id***. If a measurement is found, its (x,y,z) coordinates are used.

Finally

12. If **no match** is found, the user will be ***prompted for the details of the unfound point.***

    The user is asked to type in the (x,y,z) coordinates 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 **string name** ***Name*****,** and for the vertex text, the **Station label prefix** field value followed by ***Name.***

For a summary of the **12d Field File Opcodes**, see 26.8 12d Survey Opcode Summary

For the full description of the **12d Field File Opcodes**, see 26.7 Full Description of 12d Survey Opcodes.

Continue to 25.4.1.2.2 Feature Code, String Number, Point Id for Finding Standard Points or Strings or return to 25.4 Field Data Commands.

25.4.1.2.2 Feature Code, String Number, Point Id for Finding Standard Points or Strings

The ***Feature Code***, ***String number*** and ***Point Id*** are used to find measurement points or strings already created in the ***12d Field File***.

Feature code

feature code.

*if **not blank**, the feature code is used for searching.*

See Searching Using Feature Code, String Number and Point Id

String number

string number.

*If **not blank**, the string number is used for searching.*

See Searching Using Feature Code, String Number and Point Id

Point id

point id.

*if **not blank**, the point id is used for searching.*

See Searching Using Feature Code, String Number and Point Id

Searching Using Feature Code, String Number and Point Id

Although the searching is the same for most options, it can vary from option to option.

However, how the ***result*** of the search is used definitely depends on the particular option.

So the searching and the use of the search results is described in each option.

In most cases, the searching is as follows

If **no Feature code**, **String number** or **Point id** is given, then the current measurement point is used.

If the **Feature code and String number** are given, then last previous measurement points of the same feature code and string number are used to find points or strings.

If **only the Point id** is given, then the feature code and string number are taken from the previous measurement point **with that Point id** and the feature code and string number of that measure point are used to search for points or strings.

Continue to 25.4.1.3 Time surveyed, Comment and Bottom Panel buttons or return to 25.4 Field Data Commands.

25.4.1.3 Time surveyed, Comment and Bottom Panel buttons

The panel fields have the following use:

Time surveyed

time when the command (opcode) was created

Comment

comment to add with the command in the field file.

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

standard 12d buttons.

Continue to 25.4.2 List of Field Data Commands or return to 25.4 Field Data Commands.

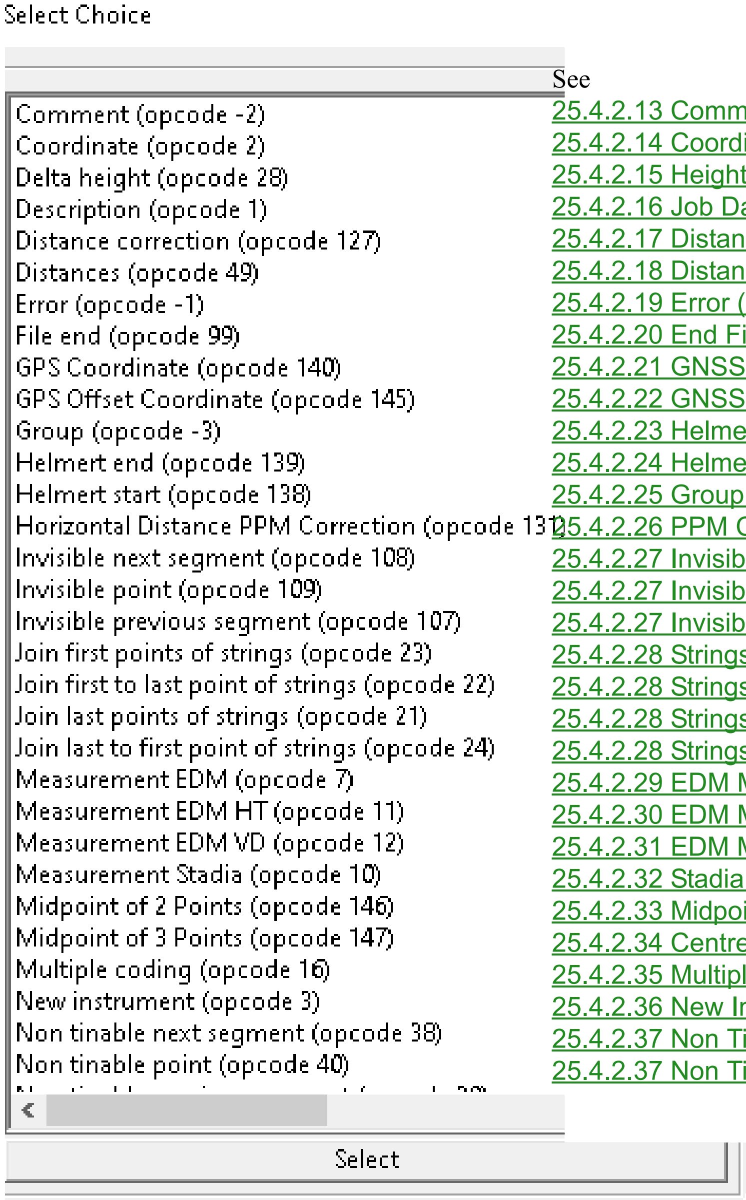
25.4.2 List of Field Data Commands

The list of Field Data Commands field commands in the pop-up from **Insert** or **Batch Add** are:

Select Choice

	See
Arc fitting end (opcode 62)	25.4.2.1 Arc Fitting (opcodes 17, 60, 61, 62)
Arc fitting start (opcode 61)	25.4.2.1 Arc Fitting (opcodes 17, 60, 61, 62)
Arc through last 3 points (opcode 17)	25.4.2.1 Arc Fitting (opcodes 17, 60, 61, 62)
Arc through next 3 points (opcode 60)	25.4.2.1 Arc Fitting (opcodes 17, 60, 61, 62)
Attachment (opcode 126)	25.4.2.2 Attachment (opcode 126)
Attribute for next segment (Measurement) (opcode 122)	25.4.2.3 Measurement Attributes (opcodes 120 to 123)
Attribute for next segment (integer) (opcode 74)	25.4.2.4 Attributes (opcodes 68 to79)
Attribute for next segment (real) (opcode 75)	25.4.2.4 Attributes (opcodes 68 to79)
Attribute for next segment (text) (opcode 76)	25.4.2.4 Attributes (opcodes 68 to79)
Attribute for previous segment (Measurement) (opcode 123)	25.4.2.3 Measurement Attributes (opcodes 120 to 123)
Attribute for previous segment (integer) (opcode 77)	25.4.2.4 Attributes (opcodes 68 to79)
Attribute for previous segment (real) (opcode 78)	25.4.2.4 Attributes (opcodes 68 to79)
Attribute for previous segment (text) (opcode 79)	25.4.2.4 Attributes (opcodes 68 to79)
Attribute for string (Measurement) (opcode 120)	25.4.2.3 Measurement Attributes (opcodes 120 to 123)
Attribute for string (integer) (opcode 68)	25.4.2.4 Attributes (opcodes 68 to79)
Attribute for string (real) (opcode 69)	25.4.2.4 Attributes (opcodes 68 to79)
Attribute for string (text) (opcode 70)	25.4.2.3 Measurement Attributes (opcodes 120 to 123)
Attribute for vertex (Measurement) (opcode 121)	25.4.2.4 Attributes (opcodes 68 to79)
Attribute for vertex (integer) (opcode 71)	25.4.2.4 Attributes (opcodes 68 to79)
Attribute for vertex (real) (opcode 72)	25.4.2.4 Attributes (opcodes 68 to79)
Attribute for vertex (text) (opcode 73)	25.4.2.4 Attributes (opcodes 68 to79)
Attribute set end (opcode 125)	25.4.2.5 Attribute Set (opcodes 124 and 125)
Attribute set start (opcode 124)	25.4.2.5 Attribute Set (opcodes 124 and 125)
Backsight (opcode 4)	25.4.2.6 Backsight (opcode 4)
Backsight reference (opcode 50)	25.4.2.7 Backsight Reference (opcode 50)
Building end (opcode 111)	25.4.2.8 Buildings (opcodes 110, 111)
Building start (opcode 110)	25.4.2.8 Buildings (opcodes 110, 111)
Check coordinate (opcode 14)	25.4.2.9 Check Coordinate (opcode 14)
Check measurment (opcode 6)	25.4.2.10 Check Measurement (opcode 6)
Circle feature (opcode 18)	25.4.2.11 Circle Feature (opcode 18)
Code file (opcode 119)	25.4.2.12 Code File (opcode 119)

Select



See
25.4.2.13 Comment (opcode -2)
25.4.2.14 Coordinate (opcode 2)
25.4.2.15 Height Or Depth Comment (opcode 28)
25.4.2.16 Job Data (opcode 1)
25.4.2.17 Distance correction (opcode 127)
25.4.2.18 Distances (opcode 49)
25.4.2.19 Error (opcode -1)
25.4.2.20 End File (opcode 99)
25.4.2.21 GNSS Coordinate (opcode 140)
25.4.2.22 GNSS Offset Correction (opcode 145)
25.4.2.23 Helmert Start (opcode 138)
25.4.2.24 Helmert End (opcode 139)
25.4.2.25 Group (opcode -3)
25.4.2.26 PPM Correction (opcode 131)
25.4.2.27 Invisibility (opcodes 107, 108, 109)
25.4.2.27 Invisibility (opcodes 107, 108, 109)
25.4.2.27 Invisibility (opcodes 107, 108, 109)
25.4.2.28 Strings Join (opcodes 21 to 24)
25.4.2.28 Strings Join (opcodes 21 to 24)
25.4.2.28 Strings Join (opcodes 21 to 24)
25.4.2.28 Strings Join (opcodes 21 to 24)
25.4.2.29 EDM Measurement (opcode 7)
25.4.2.30 EDM Measurement (HA,HD,HT) (opcode 11)
25.4.2.31 EDM Measurement (HA,HD,Diff HT) (opcode 12)
25.4.2.32 Stadia Measurement (opcode 10)
25.4.2.33 Midpoint of Two Points (opcode 146)
25.4.2.34 Centre of Arc Through Three Points (opcode 147)
25.4.2.35 Multiple Coding (opcode 16)
25.4.2.36 New Instrument Setup - Station (opcode 3)
25.4.2.37 Non Tinability (opcodes 38, 39, 40, 141)
25.4.2.37 Non Tinability (opcodes 38, 39, 40, 141)

Select Choice

	See
Non tinable previous segment (opcode 39)	25.4.2.37 Non Tinability (opcodes 38, 39, 40, 141)
Non tinable string (opcode 141)	25.4.2.37 Non Tinability (opcodes 38, 39, 40, 141)
Note (opcode 29)	25.4.2.38 Note (opcode 29)
Offset height (opcode 44)	25.4.2.39 Offset Measurement (opcodes 42, 43, 44)
Offset radial (opcode 42)	25.4.2.39 Offset Measurement (opcodes 42, 43, 44)
Offset tangential (opcode 43)	25.4.2.39 Offset Measurement (opcodes 42, 43, 44)
Order String Automatically (opcode 101)	25.4.2.40 Order String Automatically (opcode 101)
Pipe axial (opcode 81)	25.4.2.41 Pipe Justification (opcodes 80, 81, 82)
Pipe invert (opcode 80)	25.4.2.41 Pipe Justification (opcodes 80, 81, 82)
Pipe obvert (opcode 82)	25.4.2.41 Pipe Justification (opcodes 80, 81, 82)
Remove height (opcode 30)	25.4.2.42 Remove Height (opcode 30)
Remove point (opcode 31)	25.4.2.43 Remove (Delete) Point (opcode 31)
Remove string (opcode 144)	25.4.2.44 Remove (Delete) String (opcode 144)
Resection end (opcode 129)	25.4.2.46 Resection End (opcode 129)
Resection start (opcode 128)	25.4.2.45 Resection Start (opcode 128)
Shape end (opcode 84)	25.4.2.47 Shaping (opcodes 83 to 86)
Shape extrude (opcode 86)	25.4.2.47 Shaping (opcodes 83 to 86)
Shape parallel (opcode 85)	25.4.2.47 Shaping (opcodes 83 to 86)
Shape record (opcode 83)	25.4.2.47 Shaping (opcodes 83 to 86)
Slope Distance Scale factor (opcode 9)	25.4.2.48 Slope Distance Scale Factor (opcode 9)
String close (opcode 20)	25.4.2.49 String Close (opcode 20)
String end (opcode 48)	25.4.2.50 String End (opcode 48)
String rectangle (opcode 45)	25.4.2.51 String (Squashed) Rectangle (opcode 45)
String rectangle by 2 points (opcode 37)	25.4.2.52 String Rectangle by 2 Points (opcode 37)
String reverse (opcode 19)	25.4.2.53 String Reverse (opcode 19)
String start (opcode 47)	25.4.2.54 String Start (opcode 47)
String tinable (opcode 46)	25.4.2.55 String Tinable - Breakline String (opcode 46)
String type 2d (opcode 92)	25.4.2.56 String Type (opcodes 92, 93, 94)
String type 3d (opcode 93)	25.4.2.56 String Type (opcodes 92, 93, 94)
String type 4d (opcode 94)	25.4.2.56 String Type (opcodes 92, 93, 94)
String type culvert (opcode 96)	25.4.2.57 Culvert (opcode 96)

	See
String type pipe (opcode 95)	25.4.2.58 Pipe Diameter (opcode 95)
Target height (opcode 5)	25.4.2.59 Target Height (opcode 5)
Template change (opcode 59)	25.4.2.60 Templating (opcodes 51 to 59)
Template continue (opcode 54)	25.4.2.60 Templating (opcodes 51 to 59)
Template delete (opcode 57)	25.4.2.60 Templating (opcodes 51 to 59)
Template end (opcode 52)	25.4.2.60 Templating (opcodes 51 to 59)
Template insert (opcode 58)	25.4.2.60 Templating (opcodes 51 to 59)
Template pause (opcode 53)	25.4.2.60 Templating (opcodes 51 to 59)
Template record (opcode 55)	25.4.2.60 Templating (opcodes 51 to 59)
Template skip (opcode 56)	25.4.2.60 Templating (opcodes 51 to 59)
Template start (opcode 51)	25.4.2.60 Templating (opcodes 51 to 59)
Text (opcode 41)	25.4.2.61 Additional Text For Point (opcode 41)
Units (opcode 100)	25.4.2.62 Units (opcode 100)
Vertical circle correction (opcode 15)	25.4.2.63 Vertical Circle Correction (opcode 15)

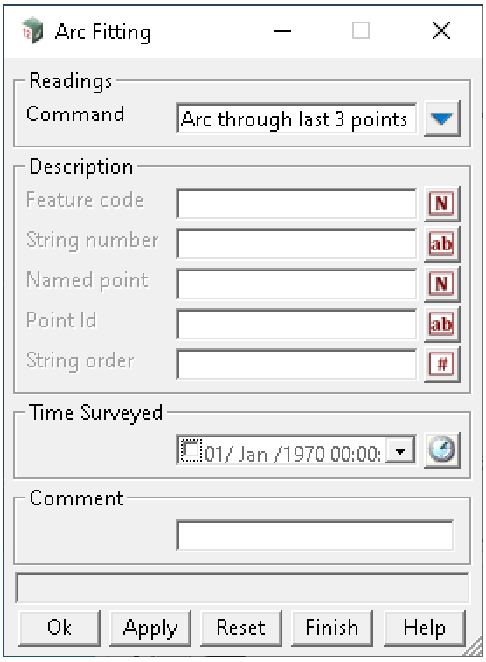
For a summary of the field file opcodes see the section 26.8 12d Survey Opcode Summary.

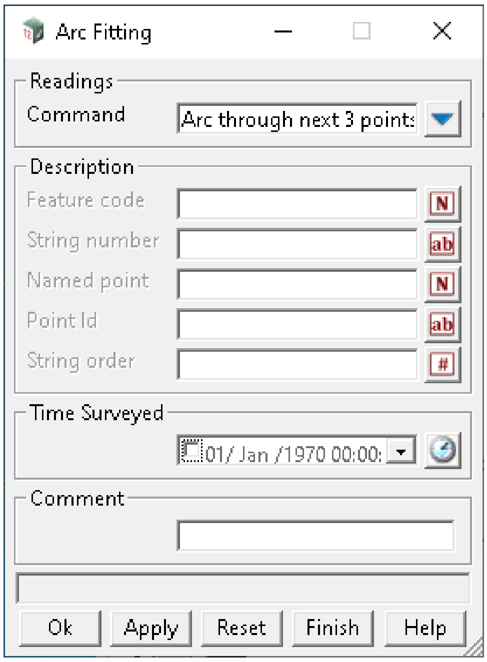
The documentation for each of the Field Data Commands in the pop-up list will now be given.

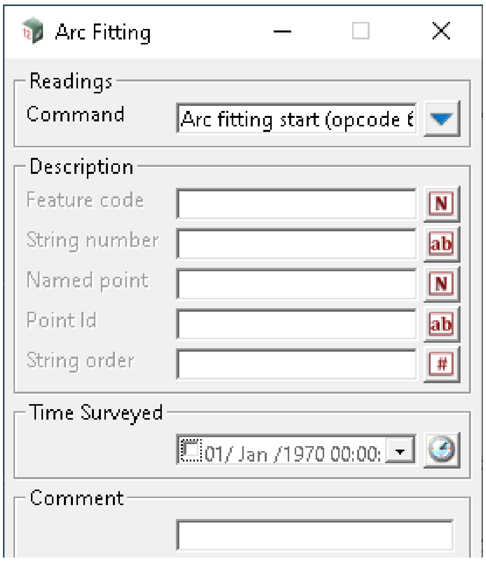
25.4.2.1 Arc Fitting (opcodes 17, 60, 61, 62)

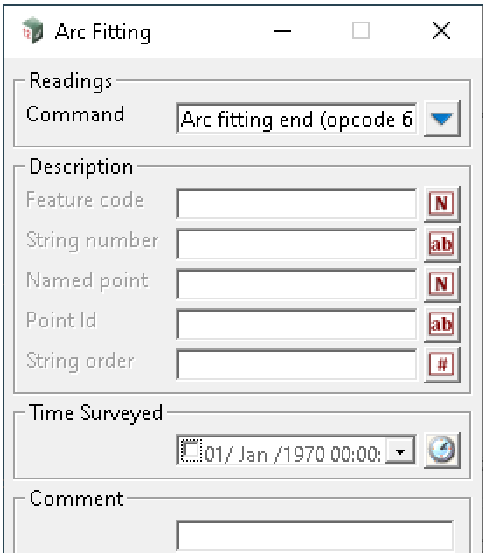
The **Arc Fitting** option fits arcs through existing or future measurements.

For a full description and diagrams, see 25.3.9 Arcs Through Points in 25 12d Survey Guide.









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

Field Description	Type	Defaults	Pop-Up
Readings			
Command	choice box		Arc through last 3 points (opcode 17) Arc through next 3 points (opcode 60) Arc fitting start (opcode 61) Arc fitting end (opcode 62)

for Arc through last 3 pts - uses standard measurements only

*the **Named point** field is not used.*

*If no **Feature code**, **String number** 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** are given, 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 **only the Point id** is given, 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 that have the same feature code and string number, are joined by an arc. If there is less than three points, no arc is fitted*

for Arc through next 3 pts - uses standard measurements only

*the **Named point** field is not used.*

*If no **Feature code**, **String number** 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** is given, then either the Feature code and/or String number and/or the Point id is used.*

*If the **Feature code** or **String number** is given, 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 **only the Point id** is given, 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*

for Start arc fitting - uses standard measurements only

*the **Named point** field is not used.*

*If no **Feature code**, **String number** 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** is given, 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. If the current point has that feature code and string number, then it is the first of the points.*

*If **only the Point id** is given, 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.*

for End arc fitting - uses standard measurements only

*the **Named point** field is not used.*

*If no **Feature code**, **String number** 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** are given, 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 **only the Point id** is given, 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.*

Description - used for finding existing standard points

Feature code, String number, Point id See 25.4.1.2.2 Feature Code, String Number, Point Id for Finding Standard Points or Strings

Named point

not used

String order

???

Rest of the Fields and Buttons

Time surveyed, Comment, OK, Apply, Reset, Finish, Help See 25.4.1.3 Time surveyed, Comment and Bottom Panel buttons.

For the description on how the field data command is stored in a ***12d Field File,*** see

17 arc_fitting_last_3_points Arc through previous three points.

60 arc_fitting_next_3_points Arc through next three points.

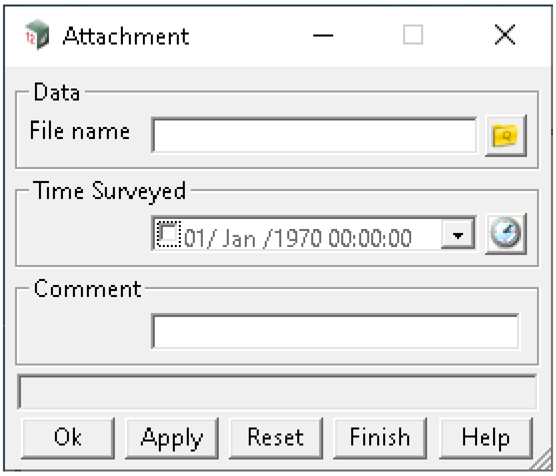
61 arc_fitting_start Start of arc through sets of three points until end of string, or a 62 occurs.

62 arc_fitting_end End the arcs begun by a 61 command.

Continue to 25.4.2.2 Attachment (opcode 126) or return to 25.4.2 List of Field Data Commands or 25 12d Survey Guide.

25.4.2.2 Attachment (opcode 126)

The **Attachment** option attaches a file to the current measurement.



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 current measurement.

Time surveyed, Comment, OK, Apply, Reset, Finish, Help See 25.4.1.3 Time surveyed, Comment and Bottom Panel buttons.

For the description on how the field data command is stored in a ***12d Field File,*** see 126 attachment Attach a file.

Continue to 25.4.2.3 Measurement Attributes (opcodes 120 to 123) or return to 25.4.2 List of Field Data Commands or 25 12d Survey Guide

25.4.2.3 Measurement Attributes (opcodes 120 to 123)

The **Measurement Attributes** option uses the given horizontal angle, vertical angle, slope distance and target height and calculates the coordinates of the point resulting from these values.

No point is created by this but the following information is stored as attributes (**measurement attributes**):

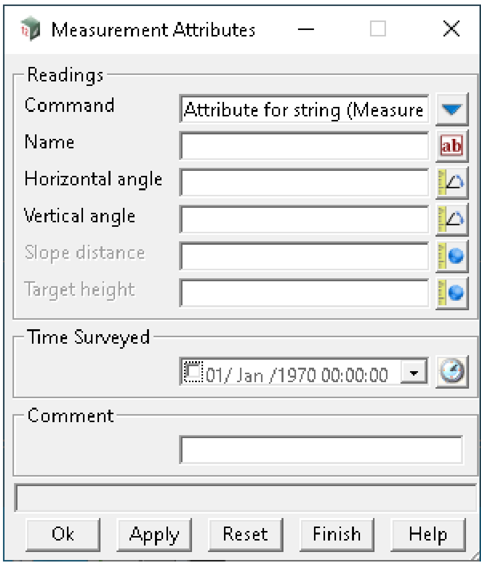
(a) x, y and z coordinates of the instrument

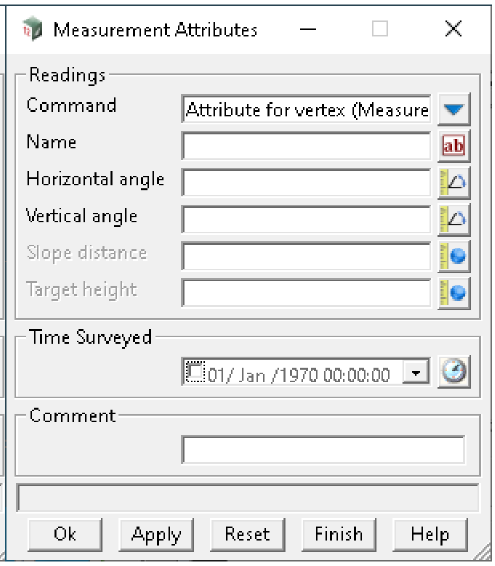
(b) instrument height

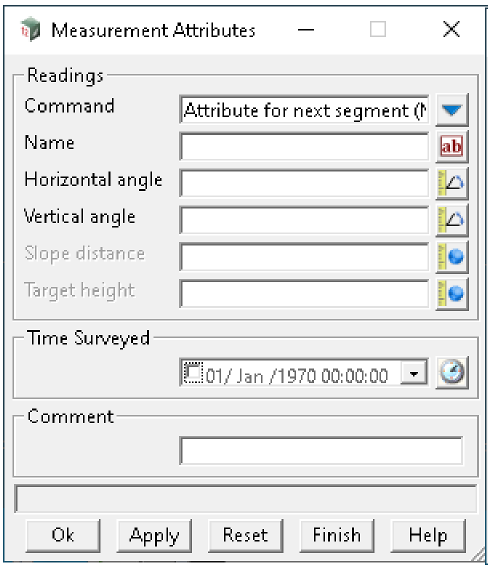
(c) x, y and z coordinates of the calculated point

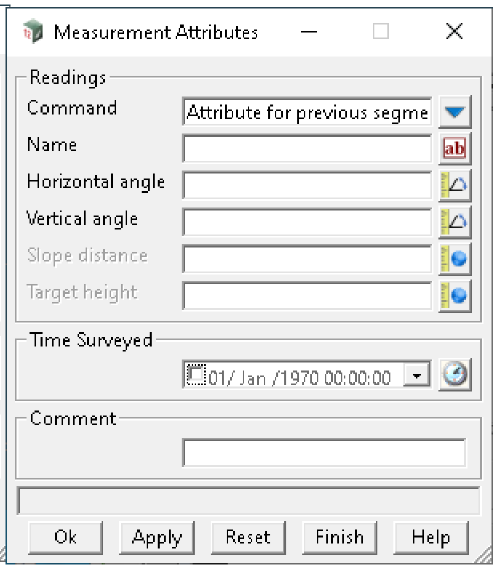
(d) horizontal angle, vertical angle, slope distance and target height.

These attributes can be used by macros and other ***12d Model*** options.









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

Field Description Type Defaults Pop-Up

Readings

Command choice box Attribute for string (Measurement) (opcode 120)
Attribute for vertex (Measurement) (opcode 121)
Attribute for next segment (Measurement) (opcode 122)
Attribute for previous segment (Measurement) (opcode 123)

for string (measurement)
add the measurement attributes to the current string.

for vertex (measurement)
add the measurement attributes to the current vertex (current measurement point).

for next segment (measurement)
add the measurement attributes to the next segment from the current measurement point.

for previous segment (measurement)
add the measurement attributes to the previous segment to the current measurement point.

Name

Name*, followed by a space " ", is used as a prefix for the names of the attributes used to store the values.*

Horizontal angle

the horizontal angle to use to calculate a point.

Vertical angle

the vertical angle to use to calculate a point.

Slope distance

the slope distance to use to calculate a point.

Target height

the target height to use to calculate a point.

Rest of the Fields and Buttons

Time surveyed, Comment, OK, Apply, Reset, Finish, Help See 25.4.1.3 Time surveyed, Comment and Bottom Panel buttons.

The actual attribute names and values stored for the measurement attributes are:

name_prefix ix	x coordinate of the instrument
name_prefix iy	y coordinate of the instrument
name_prefix iz	z coordinate of the instrument
name_prefix ih	instrument height
name_prefix tx	x coordinate of the target when using the values in the panel
name_prefix ty	y coordinate of the target when using the values in the panel
name_prefix tz	z coordinate of the target when using the values in the panel
name_prefix ha	**Horizontal angle** in radians
name_prefix va	**Vertical angle** in radians
name_prefix sd	**Slope distance** in radians
name_prefix t	**Target height**

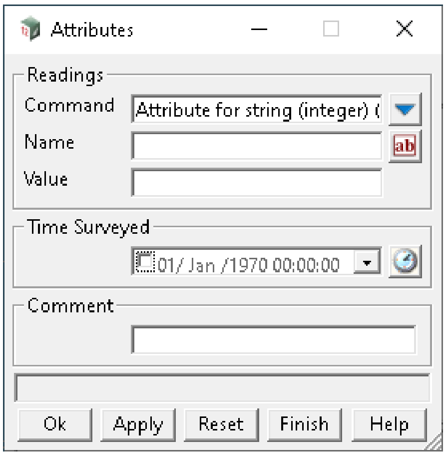
For the description on how the field data command is stored in a ***12d Field File,*** see
120 measure_attribute_string Attribute for string (measurement).

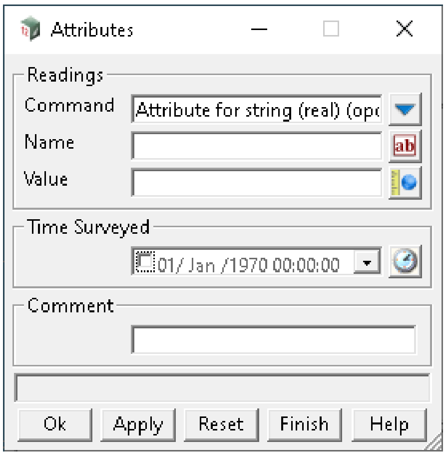
to

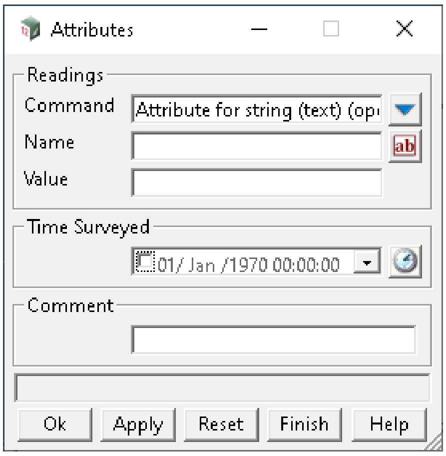
Continue to 25.4.2.4 Attributes (opcodes 68 to79) or return to 25.4.2 List of Field Data Commands or 25 12d Survey Guide.

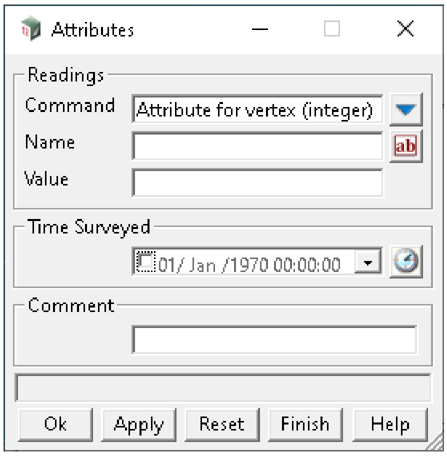
25.4.2.4 Attributes (opcodes 68 to79)

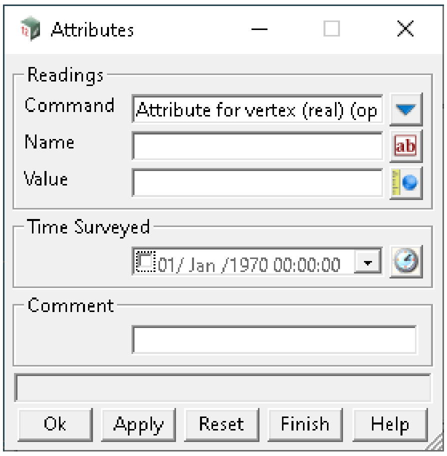
The ***Attributes*** option adds user named attributes and values of type integer, real or text to the current string, the current measurement point (vertex), and to the segment before and the segment after, the current measurement point.

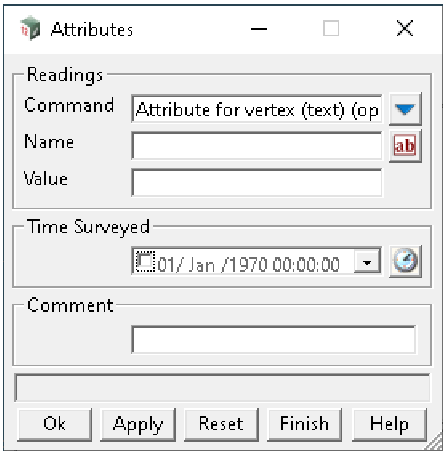


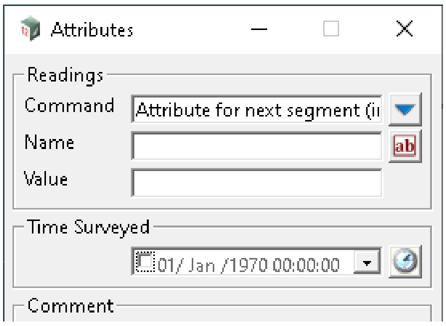


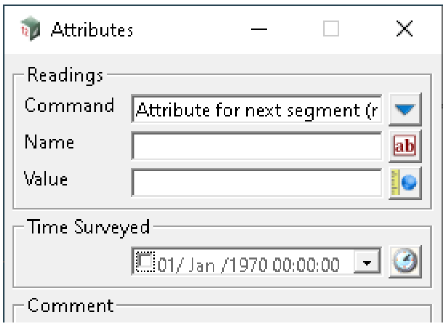


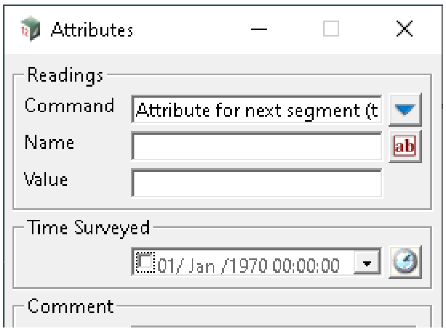


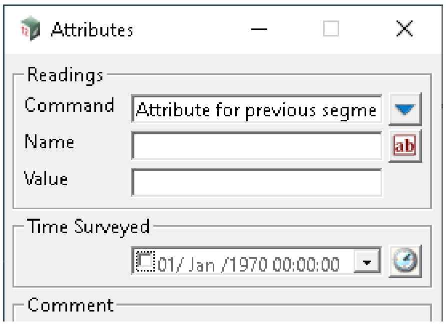


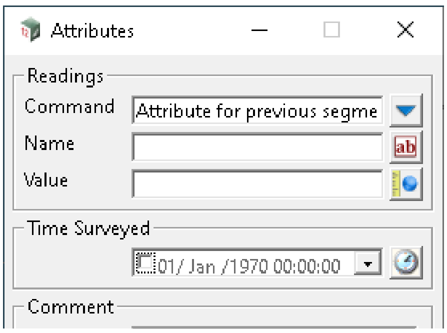


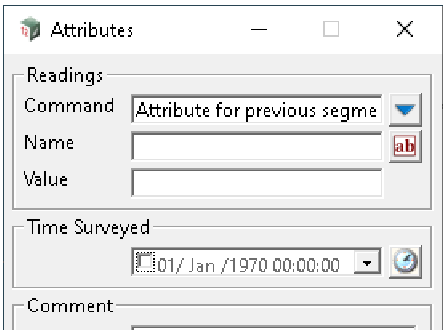












The fields and buttons used in this panel have the following functions.

Field Description	Type	Defaults	Pop-Up

Readings

Command	choice box	Attribute for string (integer) (opcode 68) Attribute for string (real) (opcode 69)	

Attribute for string (text) (opcode 70)
Attribute for vertex (integer) (opcode 71))
Attribute for vertex (real) (opcode 72))
Attribute for vertex (text) (opcode 73)
Attribute for next segment (integer) (opcode 74)
Attribute for next segment (real) (opcode 75))
Attribute for next segment (text) (opcode 76))
Attribute for previous segment (integer) (opcode 77))
Attribute for previous segment (real) (opcode 78)
Attribute for previous segment (text) (opcode 79)

for String (integer/real/text)

add user defined integer/real/text attribute to the current string.

for Vertex (integer/real/text)

add user defined integer/real/text attribute to the current measurement point.

for Next segment (integer/real/text)

add user defined integer /real/text attribute to the next segment from the current measurement point.

for Previous segment (integer/real/text)

add user defined integer/real/text attribute to the previous segment to the current measurement point.

Name

name of the attribute.

Value

attribute value in the form specified by the mode.

Rest of the Fields and Buttons

Time surveyed, Comment, OK, Apply, Reset, Finish, Help See 25.4.1.3 Time surveyed, Comment and Bottom Panel buttons.

For the description on how the field data command is stored in a ***12d Field File,*** see
68 integer_attribute_string Add a user defined integer attribute to the current string.

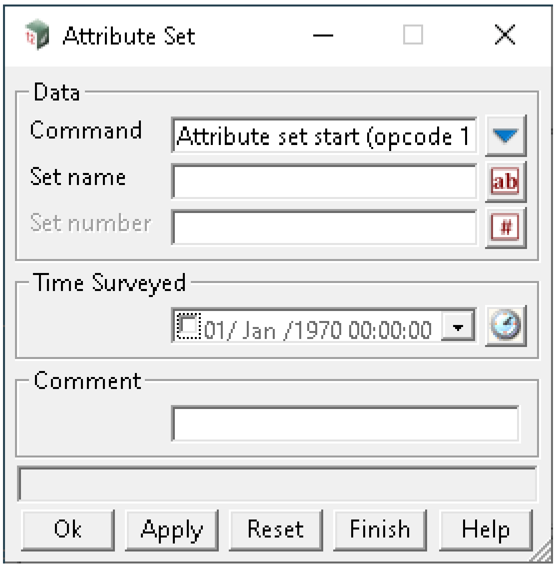
to

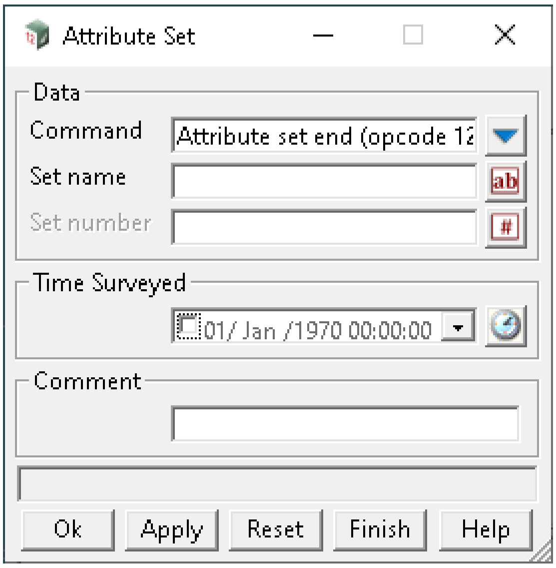
79 text_attribute_previous_segment Add a user defined text attribute to the previous segment.

Continue to 25.4.2.5 Attribute Set (opcodes 124 and 125) or return to 25.4.2 List of Field Data Commands or 25 12d Survey Guide.

25.4.2.5 Attribute Set (opcodes 124 and 125)

The option ***Attribute set start*** starts an attribute group of a given name and all attributes are added to this group until the next ***Attribute set end*** option.





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

Field Description	Type	Defaults	Pop-Up

Data

Command	choice box		Attribute set start (opcode 124) Attribute set end (opcode 125)

Attribute set start

*starts an attribute group called **Set name** and all attribute names are added to this group until an **Attribute set end** is done.*

Attribute set end

ends the current attribute group.

Set name

name of the attribute group.

Rest of the Fields and Buttons

Time surveyed, Comment, OK, Apply, Reset, Finish, Help See 25.4.1.3 Time surveyed, Comment and Bottom Panel buttons.

For the description on how the field data command is stored in a ***12d Field File,*** see

124 attribute_set Start an attribute group.

125 attribute_set_end End the current attribute group.

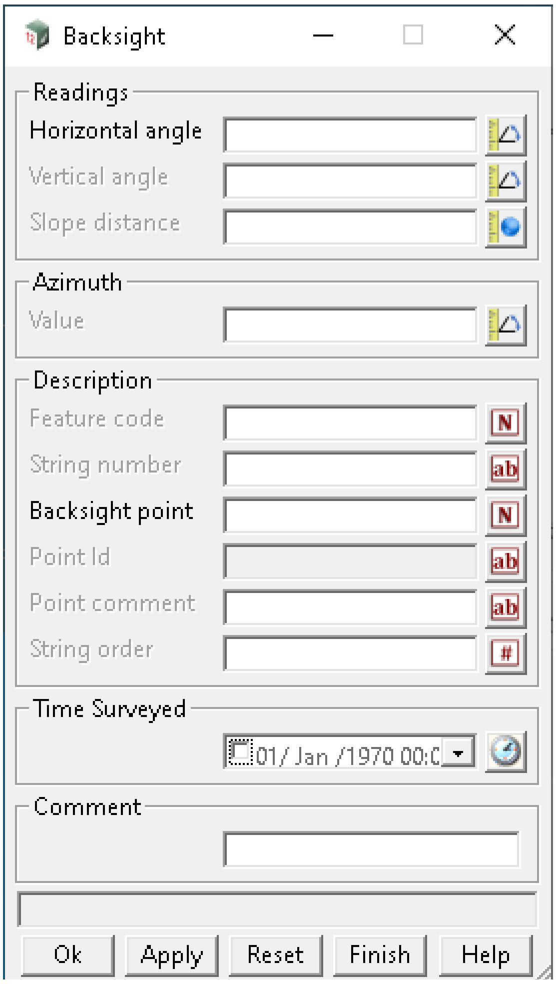
Continue to 25.4.2.6 Backsight (opcode 4) or return to 25.4.2 List of Field Data Commands or 25 12d Survey Guide.

25.4.2.6 Backsight (opcode 4)

The ***Backsight*** option tags the measurement as a backsight measurement.

Individual backsight measurements can be entered, or they can consist 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 **Backsight** panel each time.



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

Field Description Type Defaults Pop-Up

Readings

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 measurements in the range 180-360 degrees 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

*if **not blank**, the azimuth to the backsight in dd.mmss format.*

The azimuth_value may be specified when no coordinate for the backsight point exists.

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.

Description

Feature code

This is only used in the special case given in When Backsight Point is Not Found for a Backsight Command.

String number

Not used.

Backsight point

The point name of the backsight point.

For a description of how the reduction finds the appropriate point, see 25.4.1.2.1 Searching for the Coordinates of Special Points

Point id output

Point id of the backsight point.

If a new backsight entry is inserted into the 12d Field File, this field will be non-editable since only the backsight point is required.

Point comment

Not used.

Rest of the Fields and Buttons

Time surveyed, Comment, OK, Apply, Reset, Finish, Help See 25.4.1.3 Time surveyed, Comment and Bottom Panel buttons.

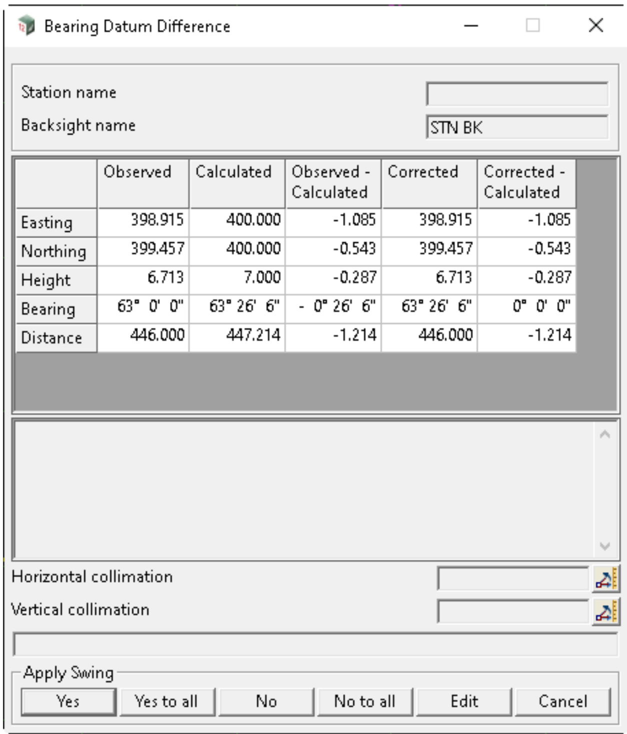
For the description on how the field data command is stored in a 1***2d Field File,*** see 4 backsight Measurement to backsight.

See

When Backsight Point is Found for a Backsight Command
When Backsight Point is Not Found for a Backsight Command

When Backsight Point is Found for a Backsight Command

If the **Backsight prompt mode** is set to **Prompt** in the ***SDR Function*** and the Backsight point is found, the **Bearing Datum Difference** panel is displayed:

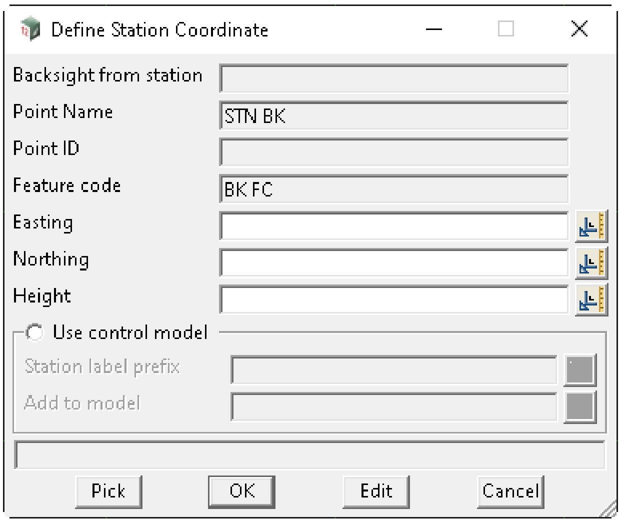


No point is created.

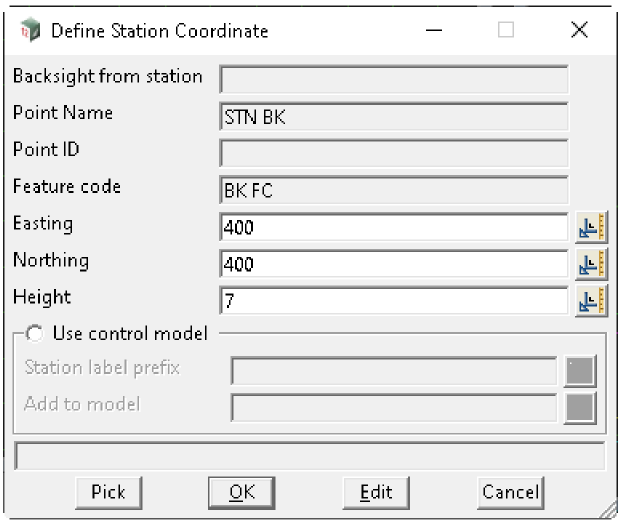
For information on the **Bearing Data Difference** panel, see 16.4.3.3 Bearing Datum Difference.

When Backsight Point is Not Found for a Backsight Command

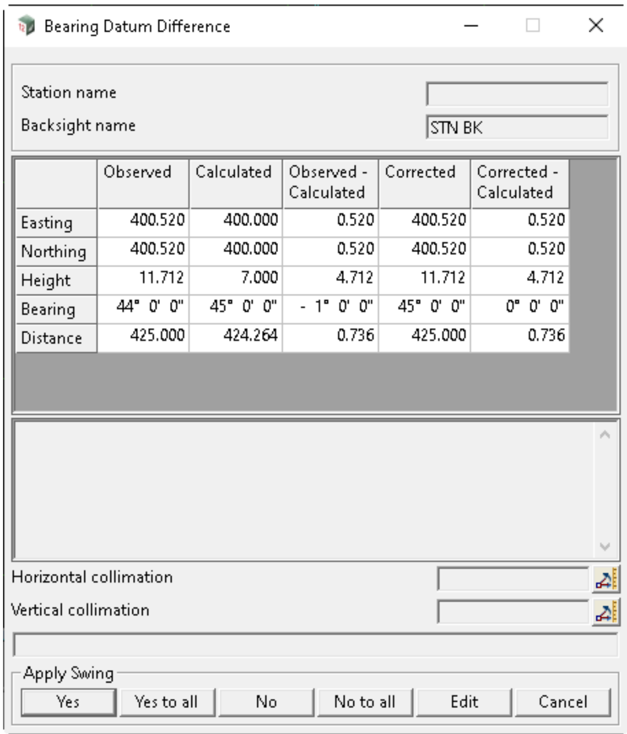
If the ***Backsight point*** can't be found, the **Define Station Coordinate** panel is displayed (see 16.4.3.1 Define Station Coordinate for Unknown Points):



Either **Pick** can be pressed and an existing vertex selected to fill in the **Easting**, **Northing** and **Height** fields, or values can be typed into the **Easting**, **Northing** and **Height** fields.



When **OK** is pressed, the **Bearing Datum Difference** panel is displayed (see 16.4.3.3 Bearing Datum Difference).



When **Yes, Yes to all, No**, or **No to all** is pressed, it is similar to a named measurement and one or two points are created.

1. a one vertex super string is created with:

   String name ***Feature code*** from the **Backsight** panel.

   Vertex id ***Backsight point*** from the **Backsight** panel.

   Vertex text ***Backsight point*** from the **Backsight** panel.

String attribute: ***Survey Control Station*** with the value ***1***

2. If **Used named points as measurements** is ***ticked*** in the **Others** tab in the **SDR Function**:

   a super string vertex is created with:

   String name ***Feature code*** from the **Backsight** panel.

   No string attribute ***string_no***.

   For the vertex, three attribute groups are created: ***SDR Setup Details***, ***SDR Measurement Details*** and ***SDR Measurement Geodetic Details***. See 25.4.2.64 Attributes for the Unknown Control Point Standard Measurement.

   This point is used in stringing.

Important Note:

A ***named Coordinate*** field data command (panel **Direct Coordinate**) is inserted **BEFORE** the ***Backsight*** field data command. The fields in the panel **Direct Coordinate** panel are:

X/Y/Z coordinate - ***Easting***, ***Northing*** and ***Height*** from the **Define Station Coordinate** panel.

Feature code - ***Feature code*** from the **Backsight** panel.

String number - blank.

Named point - ***Backsight point*** from the **Backsight** panel.

Point comment - blank.

The ***named Coordinate*** field data command may only be visible when the ***SDR Editor*** is restarted.

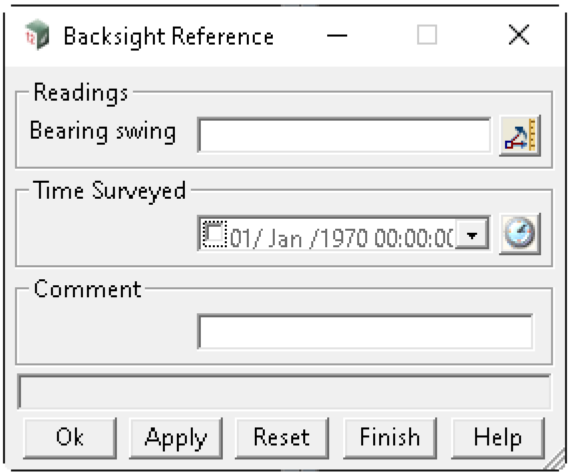
Continue to 25.4.2.7 Backsight Reference (opcode 50) or return to 25.4.2 List of Field Data Commandsor 25 12d Survey Guide.

25.4.2.7 Backsight Reference (opcode 50)

The ***Backsight Reference*** option specifies the bearing-datum-difference angle (**Bearing swing)** to use for the current instrument setup and it is used for all measurement from the current instrument setup that are after the Backsight reference command.

Hence the macerates from the current instrument that follow the Backsight Reference are rotated about the instrument setup point.

The ***Bearing swing*** angle is measured clockwise from North.



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 the measurements following the Backsight Reference command, about the current instrument setup point.

It is equivalent to the bearing datum difference.

Note: *this Bearing swing is only applicable to 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 from North.*

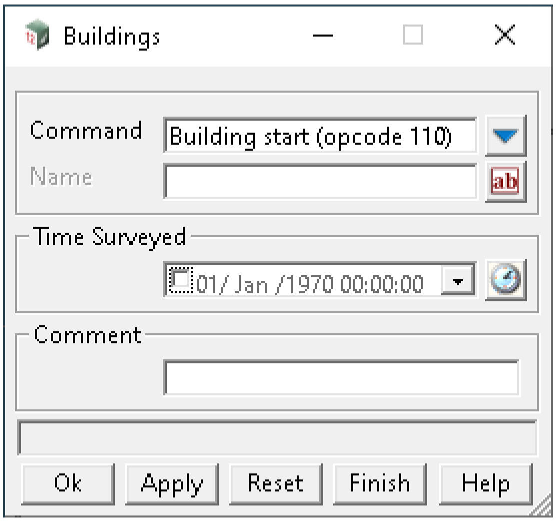
Time surveyed, Comment, OK, Apply, Reset, Finish, Help See 25.4.1.3 Time surveyed, Comment and Bottom Panel buttons.

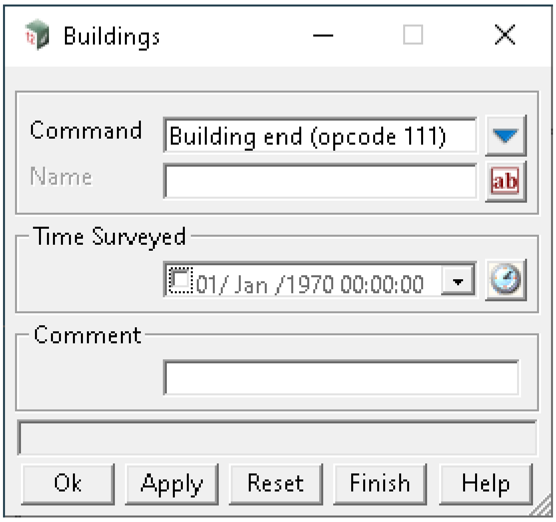
For the description on how the field data command is stored in a ***12d Field File,*** see 50 backsight_reference Specify bearing to correct for true north - used as bearing datum difference.

Continue to 25.4.2.8 Buildings (opcodes 110, 111) or return to 25.4.2 List of Field Data Commands or 25 12d Survey Guide.

25.4.2.8 Buildings (opcodes 110, 111)

The ***Buildings*** option creates a building face.





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

Field Description	Type	Defaults	Pop-Up
Command	choice box		Building end (opcode 111) Building start (opcode 110)

for Buildings start

*Start recording a building face with the given **Name**.*

*If **Name** is blank, then the default building face is defined by the feature code and string number.*

Any following measurements until a Building end (op code 111), are stored as the building face. There is no limit to the number of points in a building face.

for Building end

*If **Name** is blank, the current measurement point is added to the current building face observation set and the current building face observation set is then finished.*

*If **Name** is not blank, the building face observation set of that **Name** is finished.*

Name

Name has the meaning as outlined above in Building end/start definition.

Time surveyed, Comment, OK, Apply, Reset, Finish, Help See 25.4.1.3 Time surveyed, Comment and Bottom Panel buttons.

For the description on how the field data command is stored in a ***12d Field File,*** see

110 building_face Start recording buildings face observations - before the measurements.

111 building_face_end End recording building face observations.

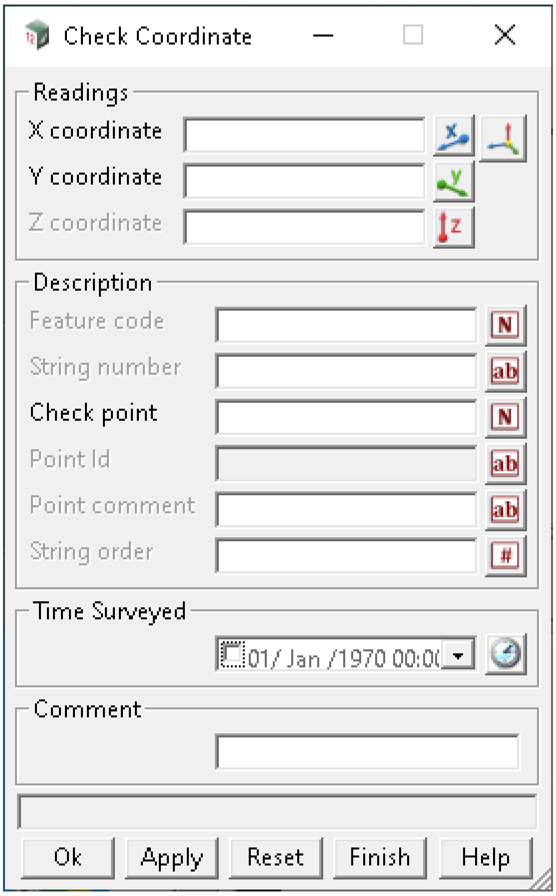
Continue to 25.4.2.9 Check Coordinate (opcode 14) or return to 25.4.2 List of Field Data Commands or 25 12d Survey Guide.

25.4.2.9 Check Coordinate (opcode 14)

The ***Check Coordinate*** option tags the measurement as a **check coordinate** measurement.

That it, it is a measurement to a known point and so the difference between the measurement point and the known point can be calculated and reported.

If the *Display panel for backsights* field in the **Survey Data Reduce** panel is **ticked**, then the **Survey Data Check Coordinate** panel shows the differences in the coordinates. A record is written to the report file.



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

Field Description Type Defaults Pop-Up

Readings

X/Y/Z coordinate

the X/Y/Z of the measurement to the check point.

Description

Feature code

This is only used in the special case given in When Check Point is Not Found for the Check Coordinate Command.

String number

Not used.

Check point

Point name of the point that the measurement is checking against.

For a description of how the reduction finds the appropriate point, see 25.4.1.2.1 Searching for the Coordinates of Special Points

Point id

Point id of the point that the measurement is checking against.

If a new Check point entry is inserted into the file, this field will be non-editable because only the check point is required.

Point comment

Not used.

String order

???.

Rest of the Fields and Buttons

Time surveyed, Comment, OK, Apply, Reset, Finish, Help See 25.4.1.3 Time surveyed, Comment and Bottom Panel buttons.

For the description on how the field data command is stored in a ***12d Field File,*** see 14 check_coordinate Check Coordinates.

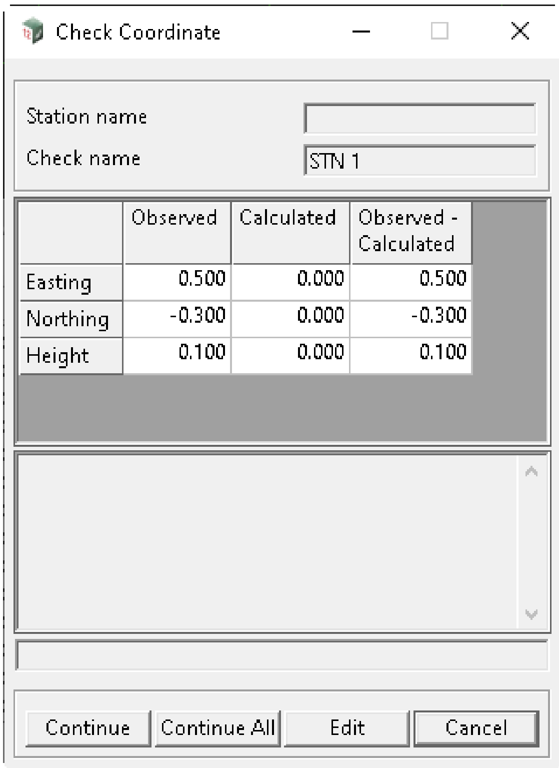
See

When Check Point is Found for the Check Coordinate Command

When Check Point is Not Found for the Check Coordinate Command

When Check Point is Found for the Check Coordinate Command

If **Show check measurements** is ***ticked*** in the ***SDR Function*** then for each check coordinate measurement, the **Check Coordinate Difference** panel is displayed:

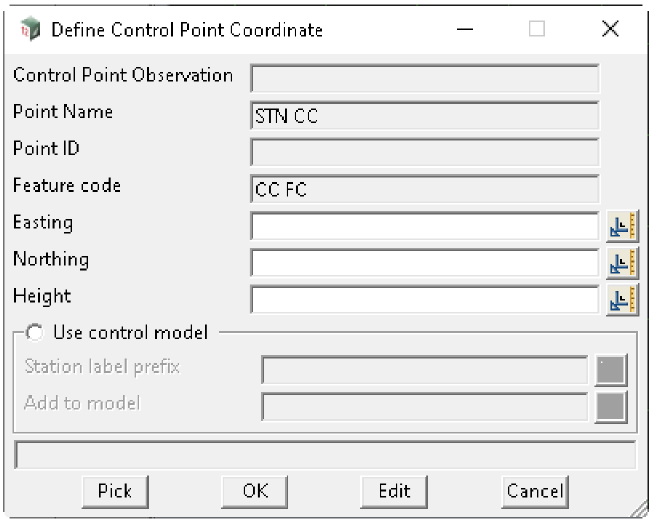


For information on the **Check Coordinate Difference** panel, see 16.4.3.5 Check Coordinate Difference.

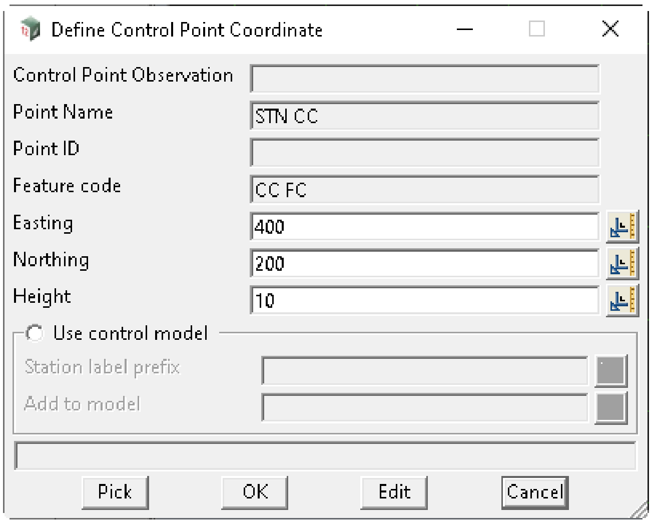
No point is created.

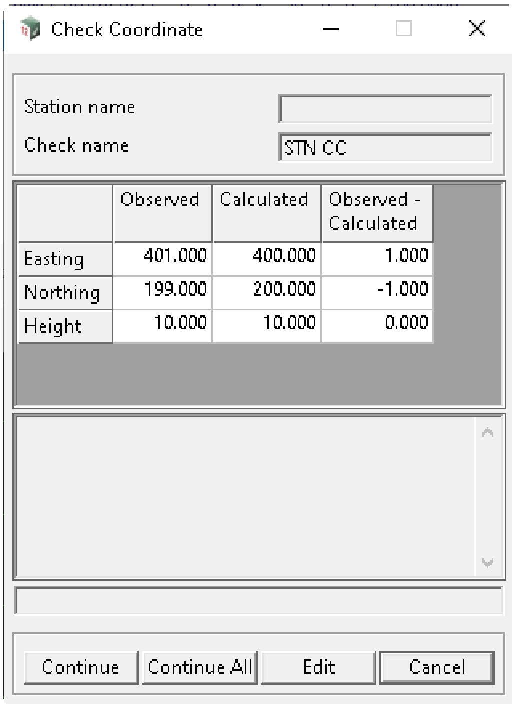
When Check Point is Not Found for the Check Coordinate Command

If the ***Check point*** can't be found, the **Define Control Point Coordinate** panel is displayed (see 16.4.3.2 Define Control Point Coordinate for Unknown Point):



Either **Pick** can be pressed and an existing vertex selected to fill in the **Easting**, **Northing** and **Height** fields, or values can be typed into the **Easting**, **Northing** and **Height** fields.





When **OK** is pressed, the **Check Coordinate Difference** panel is displayed (see 16.4.3.4 Check Measurement Difference).

When **Continue** or **Continue All** is pressed, it is similar to a named measurement and one or two points are created.

1. a one vertex super string is created with:

   String name ***Feature code*** from the **Check Coordinate** panel.

   Vertex id ***Check point*** from the **Check Coordinate** panel.

   Vertex text ***Check point*** from the **Check Coordinate** panel.

   String attribute: ***Survey Control Station*** with the value ***1***

2. If **Used named points as measurements** is ***ticked*** in the **Others** tab in the **SDR Function**:

   a super string vertex is created with:

   String name ***Feature code*** from the **Check Coordinate** panel.

   No string attribute ***string_no***.

   For the vertex, three attribute groups are created: ***SDR Setup Details***, ***SDR Measurement Details*** and ***SDR Measurement Geodetic Details***. See 25.4.2.64 Attributes for the Unknown Control Point Standard Measurement.

   This point is used in stringing.

Important Note:

A ***named Coordinate*** field data command (panel **Direct Coordinate**) is inserted **BEFORE** the ***Check Coordinate*** field data command. The fields in the panel **Direct Coordinate** panel are:

X/Y/Z coordinate - *Easting*, *Northing* and *Height* from the **Define Control Point Coordinate** panel.
Feature code - *Feature code* from the **Check Coordinate** panel.
String number - blank.
Named point - *Check point* from the **Check Coordinate** panel.
Point comment - blank.

The ***named Coordinate*** field data command may only be visible when the ***SDR Editor*** is restarted.

Continue to 25.4.2.10 Check Measurement (opcode 6) or return to 25.4.2 List of Field Data Commands or 25 12d Survey Guide.

25.4.2.10 Check Measurement (opcode 6)

The ***Check Measurement*** option tags the measurement as a **check measurement.**

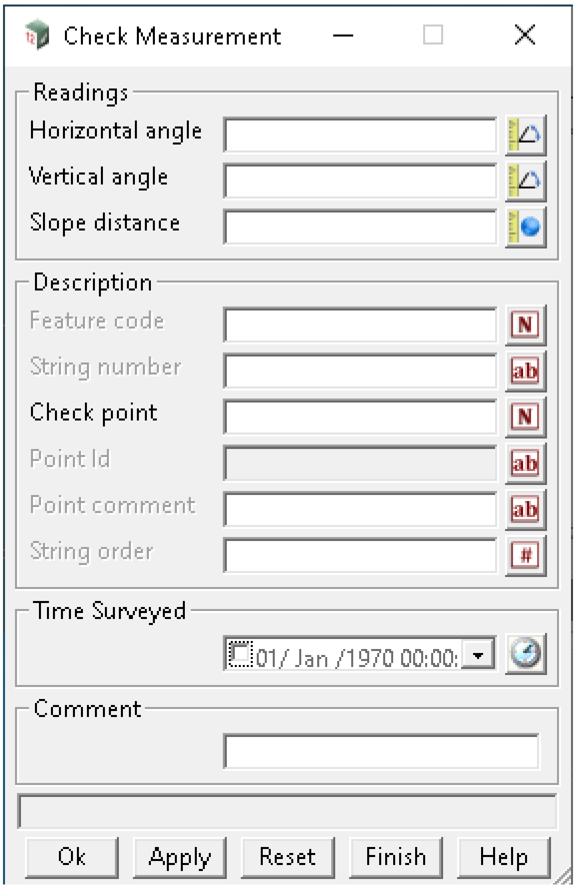
That it, it is a measurement to a known point and so the difference between the measurement point and the known point can be calculated and reported.

A two point super string (with string name ***Check point***) from the instrument point to the measured point is created and added to the model for the Check measurements (given by the **Check model** field on the **Advanced** tab of the ***SDR Function*** - see 16.4.2 Create SDR Function from a 12d Field File).

The instrument point name, the station name and the differences between the measurement point and coordinates and the station coordinates are written as text along the super string. The differences between the measurement and the known point is also written to the report file.

Individual check measurements can be entered, or they can consist 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

Readings

Horizontal angle

The horizontal angle of the measurement to the check point in dd.mmss format.

Vertical angle

the vertical angle of the measurement 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 of 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.

Description

Feature code

This is only used in the special case given in When Check Point in Not Found for the Check Measurement Command.

String number

Not used.

Check point

Point name of the point that the measurement is checking against.

For a description of how the reduction finds the appropriate point, see 25.4.1.2.1 Searching for the Coordinates of Special Points

Point id output

Point id of the point that the measurement is checking against.

If a new Check point entry is inserted into the file, this field will be non-editable because only the check point is required.

Point comment

Not used.

String order

???.

Rest of the Fields and Buttons

Time surveyed, Comment, OK, Apply, Reset, Finish, Help See 25.4.1.3 Time surveyed, Comment and Bottom Panel buttons.

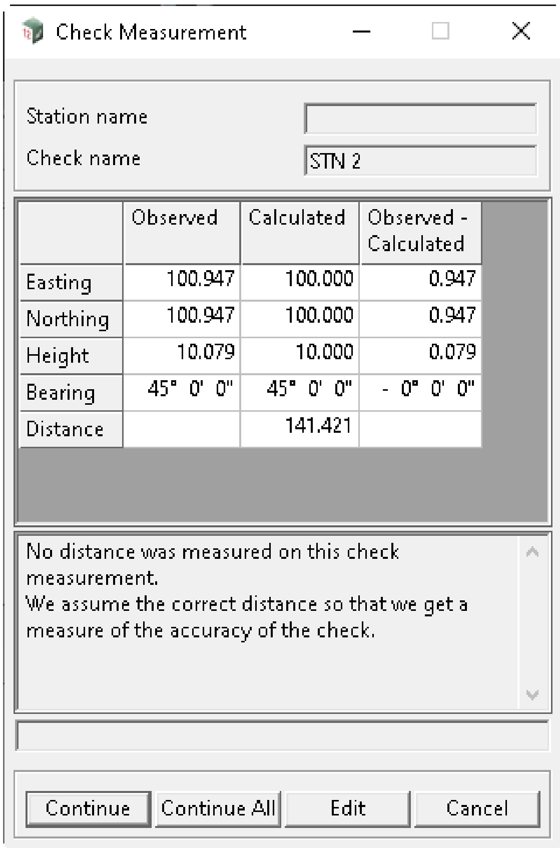
For the description on how the field data command is stored in a ***12d Field File,*** see 6 check_measurement Check measurement.

See

When Check Point is Found for the Check Measurement Command
When Check Point in Not Found for the Check Measurement Command

When Check Point is Found for the Check Measurement Command

If **Show check measurements** is ***ticked*** in the ***SDR Function*** then for each check measurement, the **Check Measurement Difference** panel is displayed:



For information on the **Check Measurement Difference** panel, see 16.4.3.4 Check Measurement Difference.

A one vertex super string is created in the ***Check model*** with values:

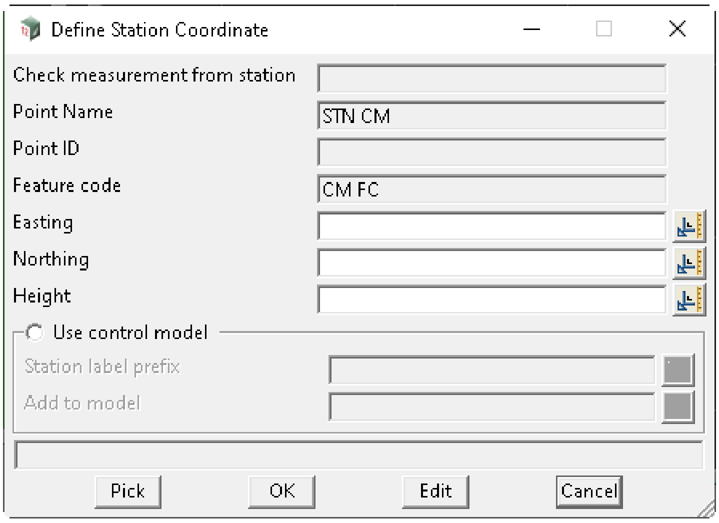
String name ***Check point***

Vertex text ***Check point***

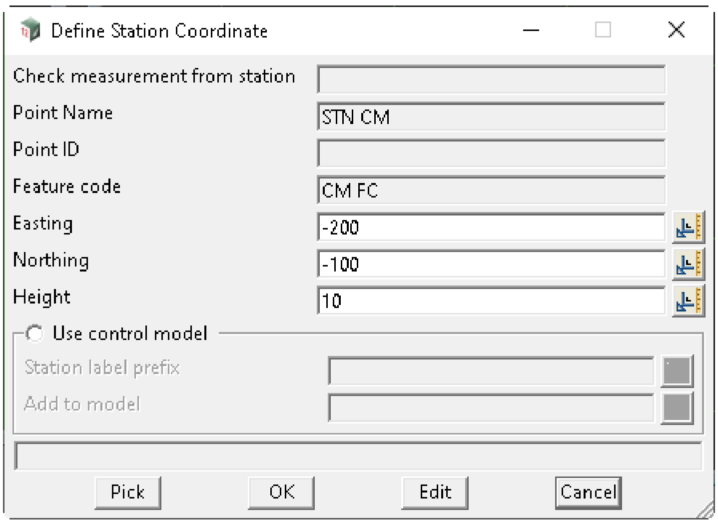
No string or vertex attributes are created.

When Check Point in Not Found for the Check Measurement Command

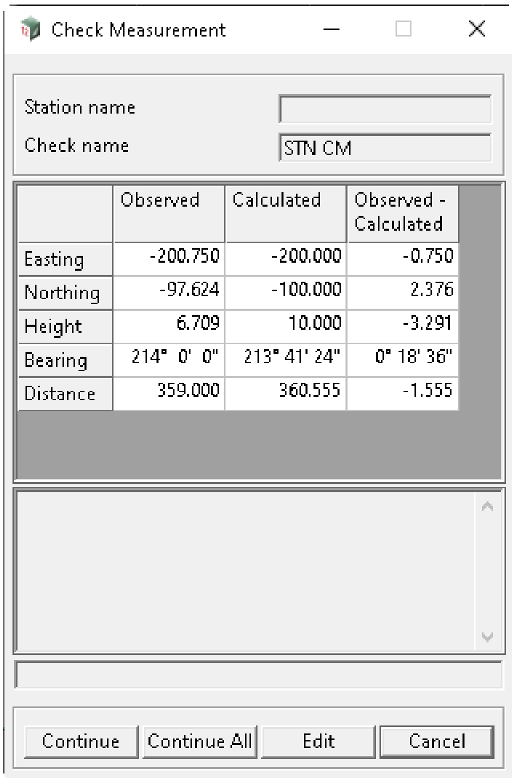
If the ***Check point*** can’t be found, the **Define Station Coordinate** panel is displayed (see 16.4.3.1 Define Station Coordinate for Unknown Points):



Either **Pick** can be pressed and an existing vertex selected to fill in the **Easting**, **Northing** and **Height** fields, or values can be typed into the **Easting**, **Northing** and **Height** fields.



When **OK** is pressed, the **Check Measurement Difference** panel is displayed (see 16.4.3.4 Check Measurement Difference).



When **Continue** or **Continue All** is pressed, it is similar to a named measurement and one or two points are created.

1. a one vertex super string is created with:

   String name   ***Feature code*** from the **Check Measurement** panel.

   Vertex id   ***Check point*** from the **Check Measurement** panel.

Vertex text   ***Check point*** from the **Check Measurement** panel.

String attribute: ***Survey Control Station*** with the value ***1***

2. If **Used named points as measurements** is ***ticked*** in the **Others** tab in the **SDR Function**:

   a super string vertex is created with:

   String name   ***Feature code*** from the **Check Measurement** panel.

   No string attribute ***string_no***.

   For the vertex, three attribute groups are created: ***SDR Setup Details***, ***SDR Measurement Details*** and ***SDR Measurement Geodetic Details***. See 25.4.2.64 Attributes for the Unknown Control Point Standard Measurement.

   This point is used in stringing.

Important Note:

A ***named Coordinate*** field data command (panel **Direct Coordinate**) is inserted **BEFORE** the ***Check Measurement*** field data command. The fields in the panel **Direct Coordinate** panel are:

X/Y/Z coordinate - ***Easting***, ***Northing*** and ***Height*** from the **Define Station Coordinate** panel.
Feature code - ***Feature code*** from the **Check Measurement** panel.
String number - blank.
Named point - ***Check point*** from the **Check Measurement** panel.
Point comment - blank.

The ***named Coordinate*** field data command may only be visible when the ***SDR Editor*** is restarted.

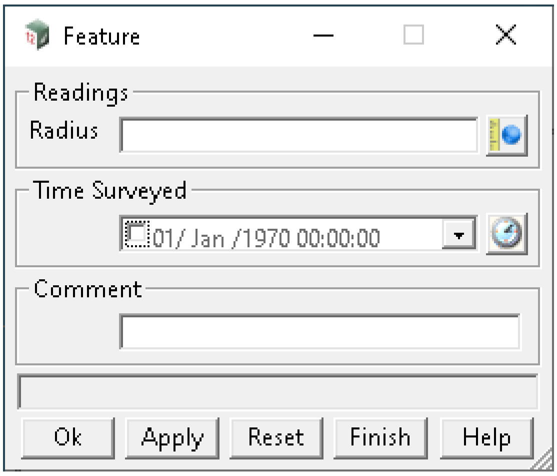
Continue to 25.4.2.11 Circle Feature (opcode 18) or return to 25.4.2 List of Field Data Commandsor 25 12d Survey Guide.

25.4.2.11 Circle Feature (opcode 18)

The ***Feature*** option create a feature string of the given ***Radius*** and centred in the current measurement point and with the height of the current measurement point.See 25.3.7 Feature String.

That is, the current measurement point is the centre of the feature string.

See 25.3.7 Feature String in 25 12d Survey Guide.



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 in the (x,y) plane around the current measurement point.

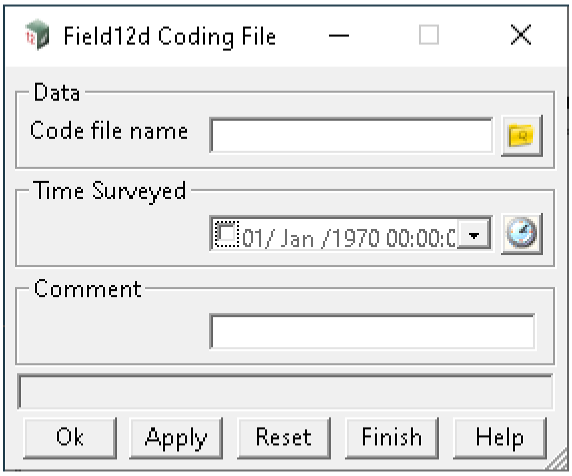
Time surveyed, Comment, OK, Apply, Reset, Finish, Help See 25.4.1.3 Time surveyed, Comment and Bottom Panel buttons.

For the description on how the field data command is stored in a ***12d Field File,*** see 18 feature Circle Feature.

Continue to 25.4.2.12 Code File (opcode 119) or return to 25.4.2 List of Field Data Commandsor 25.4 Field Data Commands or 25 12d Survey Guide.

25.4.2.12 Code File (opcode 119)

The option ***Field12d Coding File*** records the name of the ***12d Field File***.



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

Field Description	Type	Defaults	Pop-Up

Code file name

the name of he 12d Field File.

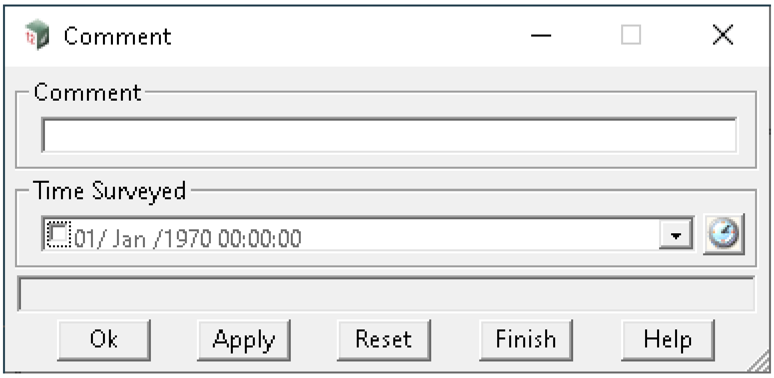
Time surveyed, Comment, OK, Apply, Reset, Finish, Help See 25.4.1.3 Time surveyed, Comment and Bottom Panel buttons.

For the description on how the field data command is stored in a ***12d Field File,*** see 119 code_file Name of this 12d Field File.

Continue to 25.4.2.13 Comment (opcode -2) or return to 25.4.2 List of Field Data Commandsor 25.4 Field Data Commands or 25 12d Survey Guide.

25.4.2.13 Comment (opcode -2)

The ***Comment*** option inserts a comment into the field file.



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

Field Description	Type	Defaults	Pop-Up

Comment

*if **not blank**, the text in the* **Comment** *filed is added as a comment in the 12d Field File.*

Time surveyed, Comment, OK, Apply, Reset, Finish, Help See 25.4.1.3 Time surveyed, Comment and Bottom Panel buttons.

For the description on how the field data command is stored in a ***12d Field File,*** see
-2 comment Insert a comment.

Continue to 25.4.2.14 Coordinate (opcode 2) or return to 25.4.2 List of Field Data Commandsor 25.4 Field Data Commands or 25 12d Survey Guide.

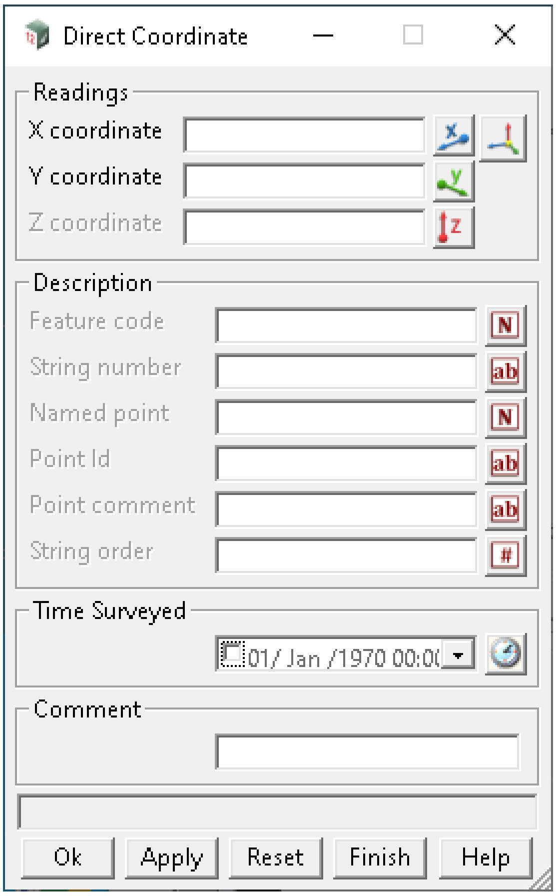
25.4.2.14 Coordinate (opcode 2)

The ***Coordinate*** opcode is for creating a point by typing in the points x, y and z coordinates. This is also referred to as a ***directly entered coordinate*** or ***DEC***.

Although no measurement by an instrument is required, the point is still referred to as a measurement point.

Because the (x,y,z) coordinates are given an so know, no reduction is needed to calculate them.

Selecting **Coordinate** brings up the **Direct Coordinate** panel:



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

Field Description Type Defaults Pop-Up

Readings

X coordinate double box

the x coordinate for the point.

Y coordinate double box

the y coordinate for the point.

Z coordinate double box

the z coordinate for the point.

Description - used for the new point or points

Feature code, String number, Named point, Point id, Point comment and String order are used to define values for the new point. See 25.4.1.1 Feature Code, String Number, Named Point,

Point Id, Point Comment and String Order for a New Measured Point.

Rest of the Fields and Buttons

Time surveyed, Comment, OK, Apply, Reset, Finish, Help See 25.4.1.3 Time surveyed, Comment and Bottom Panel buttons.

For the description on how the field data command is stored in a ***12d Field File,*** see 2 coordinate Directly entered coordinate measurement.

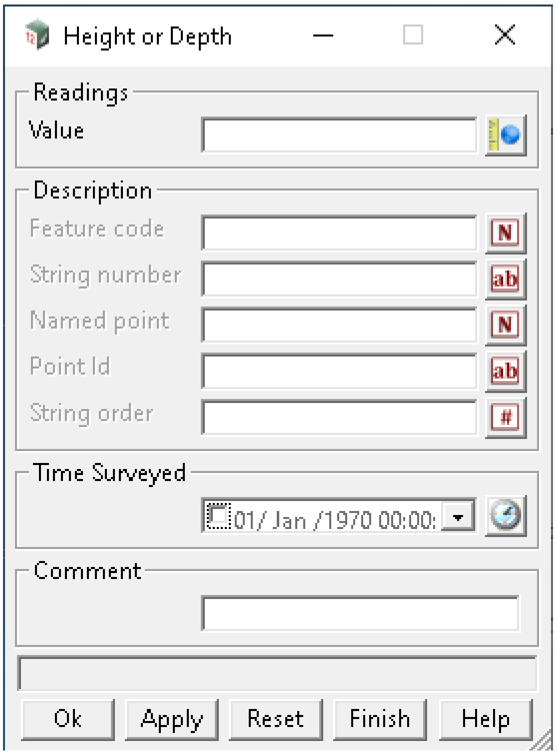
Continue to 25.4.2.15 Height Or Depth Comment (opcode 28) or return to 25.4.2 List of Field Data Commands or 25 12d Survey Guide.

25.4.2.15 Height Or Depth Comment (opcode 28)

[/Dest /height_or_depth /DEST pdfmark

The ***Height or Depth*** option creates text consisting of a space (" ") followed by a real number converted to text, and the resulting text is appended to the selected string names.

Note - this option ***does not alter heights***.



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

Field Description	Type	Defaults	Pop-Up
Value	real box		

*if **not blank**, text is created consisting of a space (" ") followed by **Value** converted to text.*
*The resulting text is appended to the string names as selected by the values in the **Description** fields.*

Description - used for finding strings

Feature code, String number, Named point, Point id

*the **Named point** field is not used.*

*If **no Feature code**, **String number** or **Point id** is given, the text is appended to all string names with the same feature code and string number **as the current measurement**. This applies to the entire field file.*

*If the **Feature code** and **String number** are given, then the text is appended to all string names with the same feature code and string number. This applies to the entire field file.*

*If **only the Point id** is given, then the text is appended to all string names with the same feature code and string number as the point defined by the **Point id**. This applies to the entire field file.*

Feature code, String number, Point id See 25.4.1.2.2 Feature Code, String Number, Point Id for Finding Standard Points or Strings

Named point

not used

String order

???

Rest of the Fields and Buttons

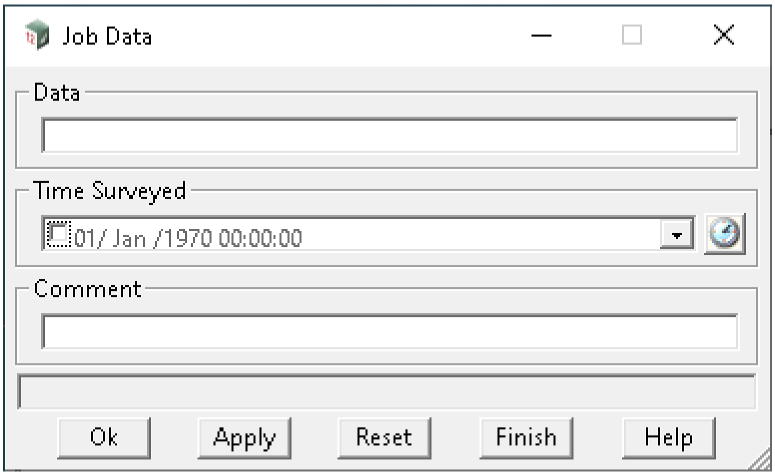
Time surveyed, Comment, OK, Apply, Reset, Finish, Help See 25.4.1.3 Time surveyed, Comment and Bottom Panel buttons.

For the description on how the field data command is stored in a ***12d Field File,*** see 28 height_or_depth Add text to the string name - for delta height.

Continue to 25.4.2.16 Job Data (opcode 1) or return to 25.4.2 List of Field Data Commands 25 12d Survey Guide.

25.4.2.16 Job Data (opcode 1)

The ***Job Data*** option adds given text as header information in the ***12d Field File***.



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

Field Description	Type	Defaults	Pop-Up

Data

text to be added as header information in the 12d Field File.

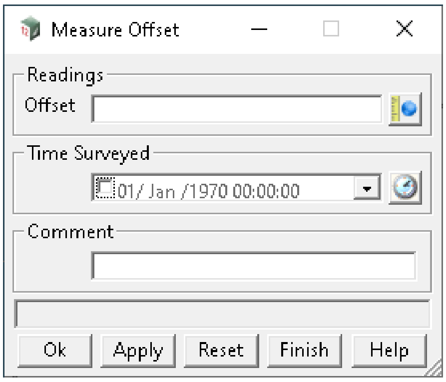
Time surveyed, Comment, OK, Apply, Reset, Finish, Help See 25.4.1.3 Time surveyed, Comment and Bottom Panel buttons.

For the description on how the field data command is stored in a ***12d Field File,*** see 1 job_data Job Information.

Continue to 25.4.2.17 Distance correction (opcode 127) or return to 25.4.2 List of Field Data Commands or 25 12d Survey Guide.

25.4.2.17 Distance correction (opcode 127)

This section of documentation is a work in progress and will be updated in subsequent releases.



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

Field Description	Type	Defaults	Pop-Up
Offset			

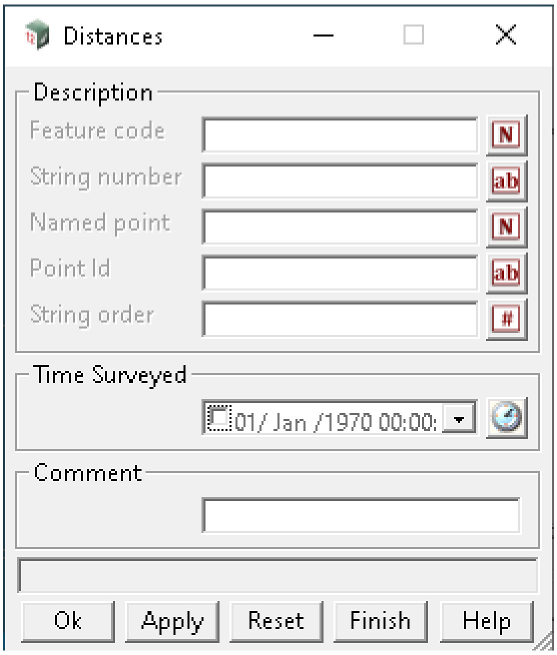
Time surveyed, Comment, OK, Apply, Reset, Finish, Help See 25.4.1.3 Time surveyed, Comment and Bottom Panel buttons.

For the description on how the field data command is stored in a ***12d Field File,*** see 127 measurement_offset Distance correction.

Continue to 25.4.2.18 Distances (opcode 49) or return to 25.4.2 List of Field Data Commands or 25 12d Survey Guide.

25.4.2.18 Distances (opcode 49)

This section of documentation is a work in progress and will be updated in subsequent releases.



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

Field Description Type Defaults Pop-Up

Description

Feature 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 25.4.1.2.1 Searching for the Coordinates of Special Points

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 25.4.1.2.1 Searching for the Coordinates of Special Points*. If a new check point entry is inserted into the file, this field will be non-editable since only the check point is required.*

String order

????

Rest of the Fields and Buttons

Time surveyed, Comment, OK, Apply, Reset, Finish, Help See 25.4.1.3 Time surveyed, Comment and Bottom Panel buttons.

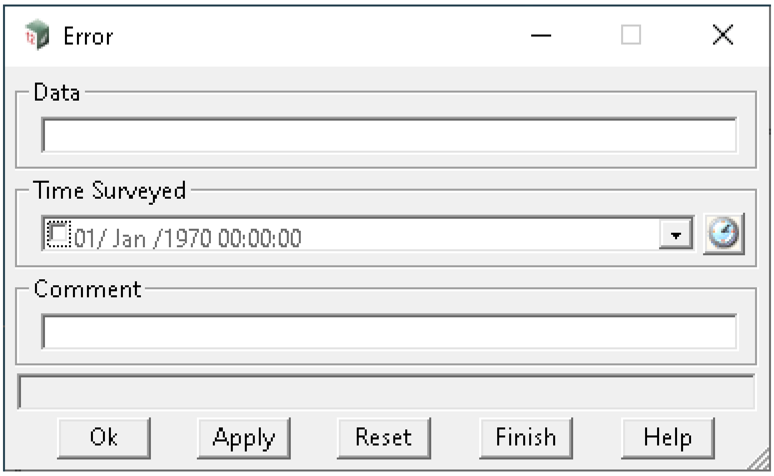
For the description on how the field data command is stored in a ***12d Field File,*** see 49 distances Distances.

Continue to 25.4.2.19 Error (opcode -1) or return to 25.4.2 List of Field Data Commandsor 25 12d Survey Guide.

25.4.2.19 Error (opcode -1)

If the ***12d Field FIle*** was produced from a raw data collector file, any records that can't be parsed correctly will be made into an Error comment.

The ***Error*** option appends extra text to the Error comment.



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

Field Description Type Defaults Pop-Up

Data

extra text to be added to Error comment.

If the 12d Field File was produced from a raw data collector file, any records that can't be parsed correctly will have an Error comment.

Time surveyed, Comment, OK, Apply, Reset, Finish, Help See 25.4.1.3 Time surveyed, Comment and Bottom Panel buttons.

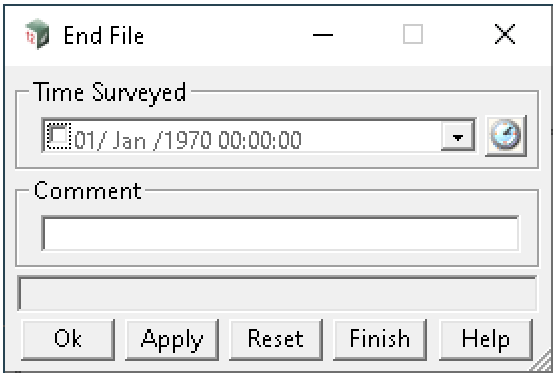
For the description on how the field data command is stored in a ***12d Field File,*** see -1 error Add text to information for an error.

Continue to 25.4.2.20 End File (opcode 99) or return to 25.4.2 List of Field Data Commands or 25 12d Survey Guide

25.4.2.20 End File (opcode 99)

The ***End File*** option stops the processing of the ***12d Field File*** at this line.

This is useful for debugging errors.



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

Field Description Type Defaults Pop-Up

Time surveyed, Comment, OK, Apply, Reset, Finish, Help See 25.4.1.3 Time surveyed, Comment and Bottom Panel buttons.

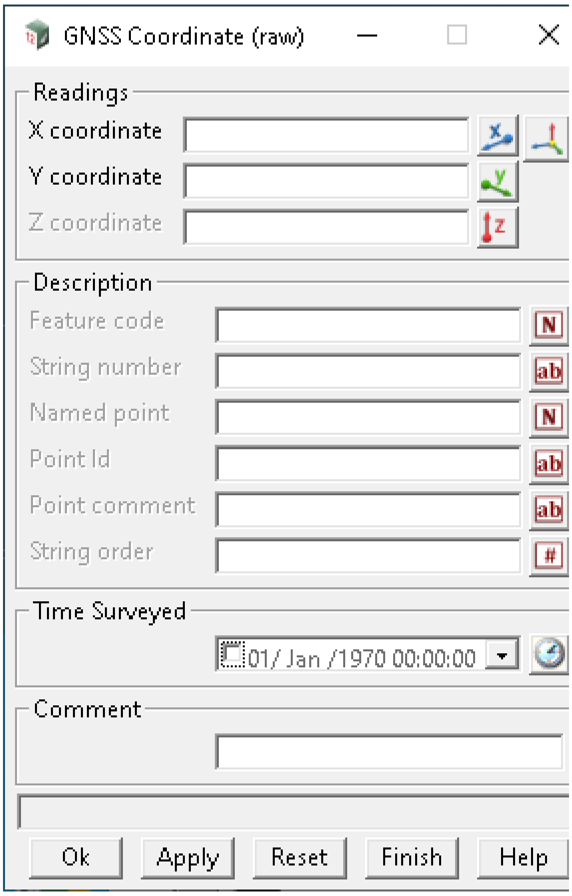
For the description on how the field data command is stored in a ***12d Field File,*** see 99 file_end Terminate processing.

Continue to 25.4.2.21 GNSS Coordinate (opcode 140) or return to 25.4.2 List of Field Data Commands or 25 12d Survey Guide.

25.4.2.21 GNSS Coordinate (opcode 140)

The ***GNSS Coordinate*** options creates a point with the specified GNSS coordinates.

Also note. The GNSS coordinate is shifted by any current **GNSS Offset Correction** (see 25.4.2.22 GNSS Offset Correction (opcode 145))



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

Field Description Type Defaults Pop-Up

Readings

X coordinate double box

the x coordinate value of the nominated point.

Y coordinate double box

the y coordinate value of the nominated point.

Z coordinate double box

the z coordinate value of the nominated point.
The antenna height is not subtracted.
The reduced Z coordinate is calculated by subtracting the current target height.

Description - used for the new point

Feature code, String number, Named point, Point id, Point comment and String order are used to define values for the new point created by the measurement. See 25.4.1.1 Feature Code, String Number, Named Point, Point Id, Point Comment and String Order for a New Measured Point.

Rest of the Fields and Buttons

Time surveyed, Comment, OK, Apply, Reset, Finish, Help See 25.4.1.3 Time surveyed, Comment and Bottom Panel buttons.

For the description on how the field data command is stored in a ***12d Field File,*** see 140 gps_coordinate GNSS coordinate measurement.

Continue to 25.4.2.22 GNSS Offset Correction (opcode 145) or return to 25.4.2 List of Field Data Commands or25 12d Survey Guide.

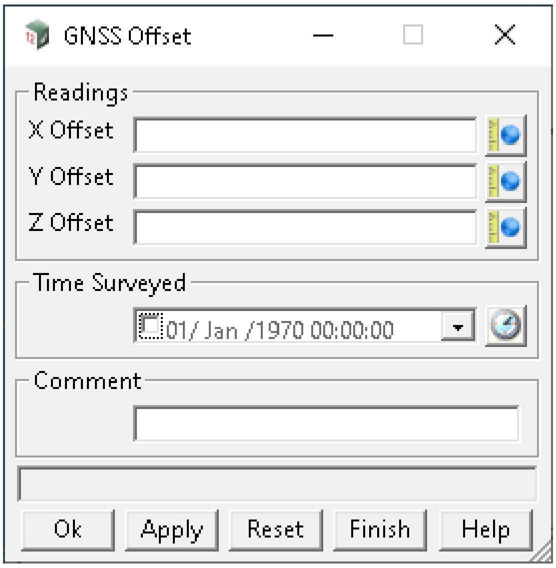
25.4.2.22 GNSS Offset Correction (opcode 145)

The ***GNSS Offset*** option applies corrections to subsequent GNSS coordinate measurements **until another opcode 145 is encountered**.

The X Offset, Y Offset, Z Offset is added to GNSS (x, y, z) coordinates in the following140 opcodes.

Using X Offset, Y Offset, Z Offset values of **0 0 0** in opcode 145 stops the effect of GNSS Offset.

Target height (Opcode 5) is applied after this correction to subtract the antenna pole height.



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

Field Description	Type	Defaults	Pop-Up
X Offset	double box		

the x offset value is applied to subsequent GPS coordinate measurements until another 145 is encountered.

Y Offset	double box		

the y offset value is applied to subsequent GPS coordinate measurements until another 145 is encountered.

Z Offset	double box		

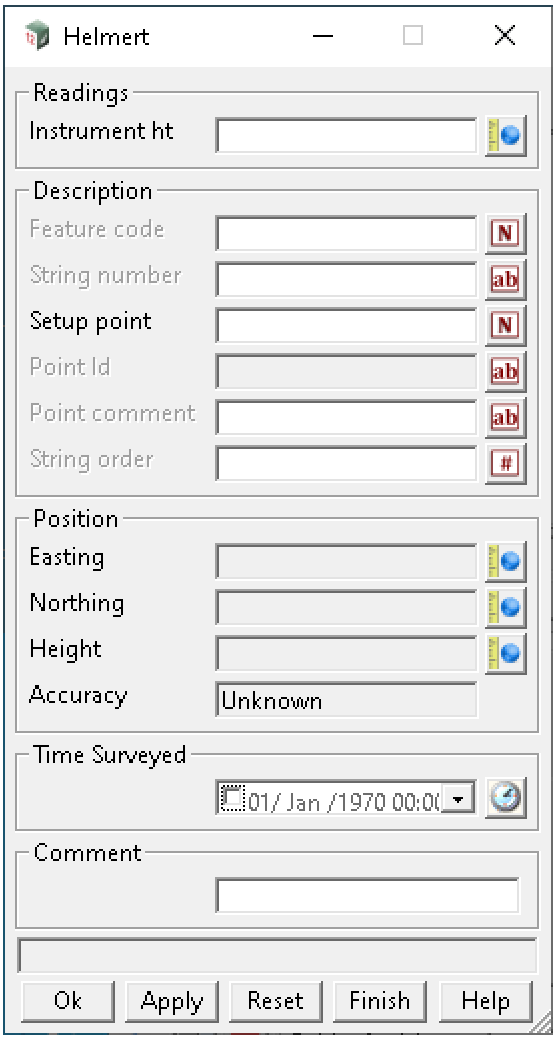
the z offset value is applied to subsequent GPS coordinate measurements until another 145 is encountered.

Time surveyed, Comment, OK, Apply, Reset, Finish, Help See 25.4.1.3 Time surveyed, Comment and Bottom Panel buttons.

Continue to 25.4.2.23 Helmert Start (opcode 138) or return to 25.4.2 List of Field Data Commands or 25 12d Survey Guide.

25.4.2.23 Helmert Start (opcode 138)

This option is under development.



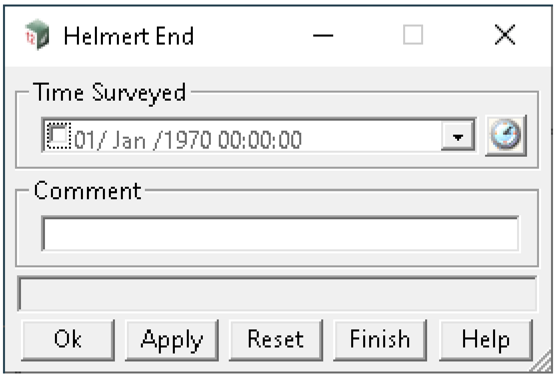
OK, Apply, Reset, Finish, Help See the description for the panel buttons in the section 25.4.1.3 Time surveyed, Comment and Bottom Panel buttons

For the description on how the field data command is stored in a ***12d Field File,*** see 138 helmert Helmert start.

Continue to 25.4.2.24 Helmert End (opcode 139) or return to 25.4.2 List of Field Data Commands or 25 12d Survey Guide.

25.4.2.24 Helmert End (opcode 139)

This option is under development.



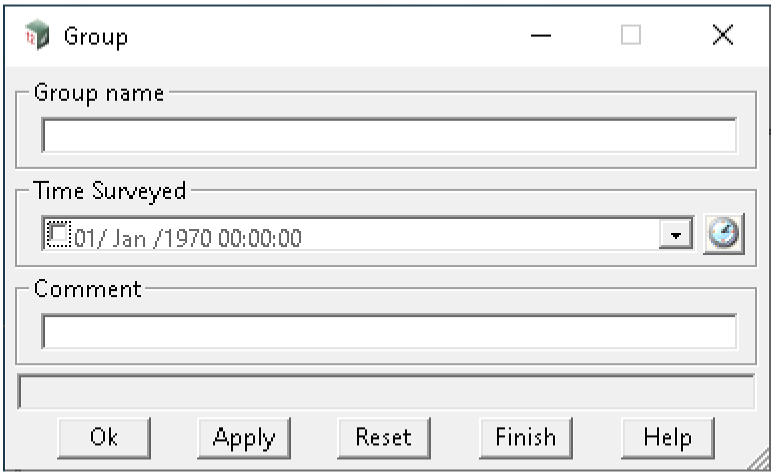
OK, Apply, Reset, Finish, Help See the description for the panel buttons in the section 25.4.1.3 Time surveyed, Comment and Bottom Panel buttons

For the description on how the field data command is stored in a ***12d Field File,*** see 139 helmert_end End the Helmert.

Continue to 25.4.2.25 Group (opcode -3) or return to 25.4.2 List of Field Data Commandsor 25 12d Survey Guide.

25.4.2.25 Group (opcode -3)

This section of documentation is a work in progress and will be updated in subsequent releases.



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

Field Description Type Defaults Pop-Up

Group name

???

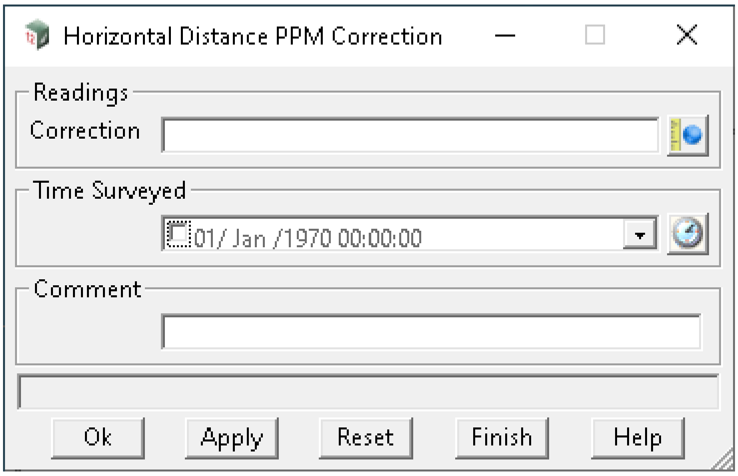
Time surveyed, Comment, OK, Apply, Reset, Finish, Help See 25.4.1.3 Time surveyed, Comment and Bottom Panel buttons.

For the description on how the field data command is stored in a ***12d Field File,*** see -3 group Group.

Continue to 25.4.2.26 PPM Correction (opcode 131) or return to 25.4.2 List of Field Data Commands or 25 12d Survey Guide.

25.4.2.26 PPM Correction (opcode 131)

This section of documentation is a work in progress and will be updated in subsequent releases.



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

Field Description	Type	Defaults	Pop-Up
Correction	real box		

???

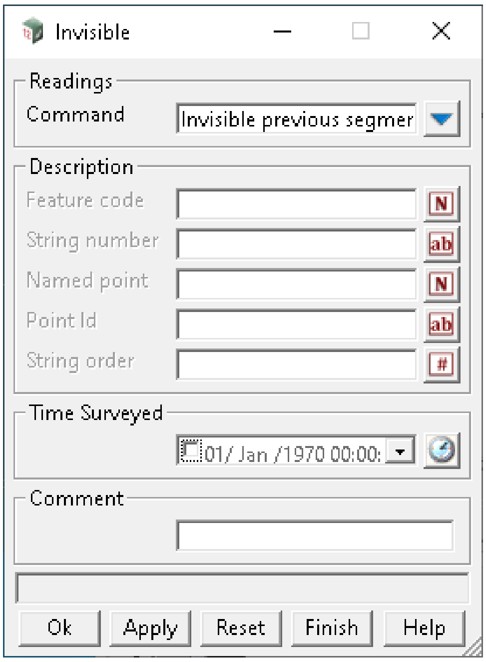
Time surveyed, Comment, OK, Apply, Reset, Finish, Help See 25.4.1.3 Time surveyed, Comment and Bottom Panel buttons.

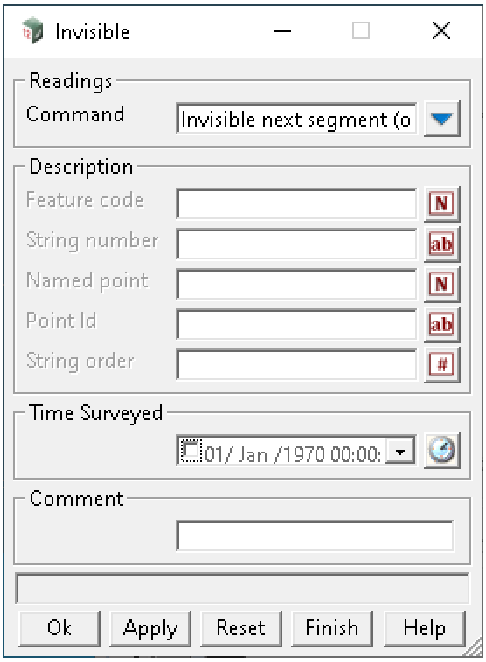
For the description on how the field data command is stored in a ***12d Field File,*** see 131 ppm_correction PPM correction.

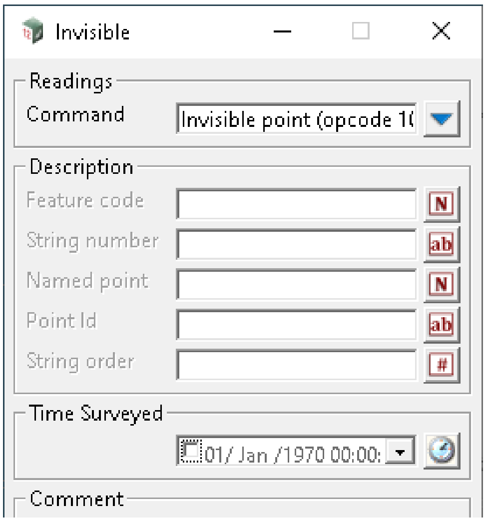
Continue to 25.4.2.27 Invisibility (opcodes 107, 108, 109) or return to 25.4.2 List of Field Data Commands or 25 12d Survey Guide.

25.4.2.27 Invisibility (opcodes 107, 108, 109)

The ***Invisibility*** option make segments or vertices invisible.







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

Field Description	Type	Defaults	Pop-Up
Readings			
Command	choice box		Invisible previous segment (opcode 107) Invisible next segment (opcode 108) Invisible point (opcode 109)

for Invisible previous segment

*the **Named point** field is not used.*

*If **no Feature code**, **String number** or **Point id** is given, 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 **only the Point id** exists, then the segment containing the point with that point id as an end point, is set to invisible.*

for Invisible next segment

*If **no Feature code**, **String number** or **Point id** is given, 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 next segment with the current measurement point as a starting point, and with the same feature code and string number, is set to invisible.*

*If **only the Point id** exists, then the segment containing the point with that point id as a starting point, is set to invisible.*

for invisible point

*If **no Feature code**, **String number** or **Point id** is given, the current measurement point is set to invisible.*

*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 **only the Point id** exists, then the point with that point id is set to invisible.*

Description - used for finding an existing point

Feature code, String number, Point id See 25.4.1.2.2 Feature Code, String Number, Point Id for Finding Standard Points or Strings

Named point

???

String order

???

Rest of the Fields and Buttons

Time surveyed, Comment, OK, Apply, Reset, Finish, Help See 25.4.1.3 Time surveyed, Comment and Bottom Panel buttons.

For the description on how the field data command is stored in a ***12d Field File,*** see

107 invisible_previous_segmet Make the previous segment invisible - after the measurement.

108 invisible_next_segment Make next segment invisible - after measurement for first point of segment.

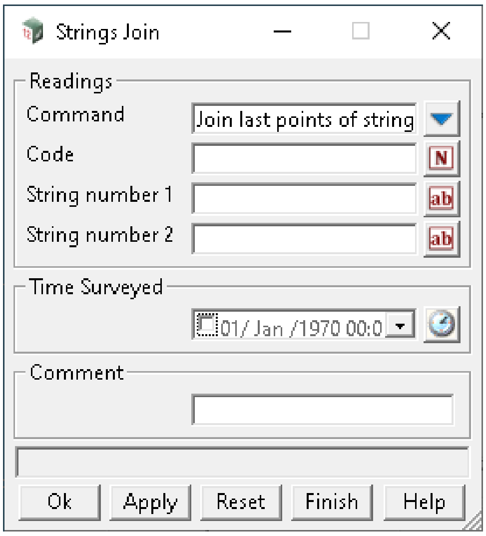
109 invisible_vertex Make a point invisible - after the measurement.

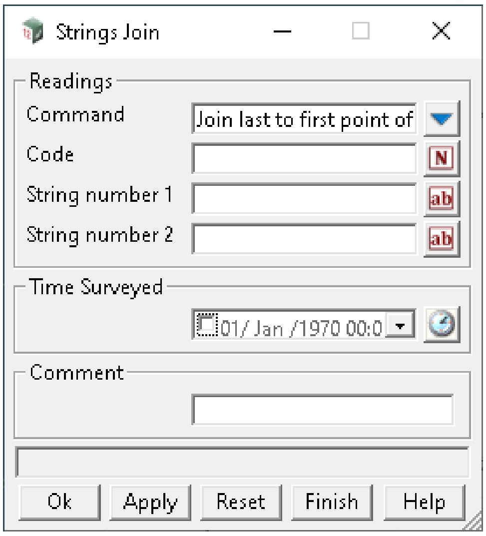
Continue to 25.4.2.28 Strings Join (opcodes 21 to 24) or return to 25.4.2 List of Field Data Commands or 25 12d Survey Guide.

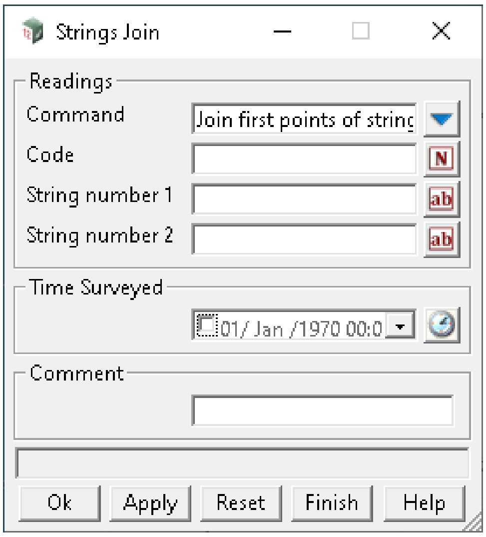
25.4.2.28 Strings Join (opcodes 21 to 24)

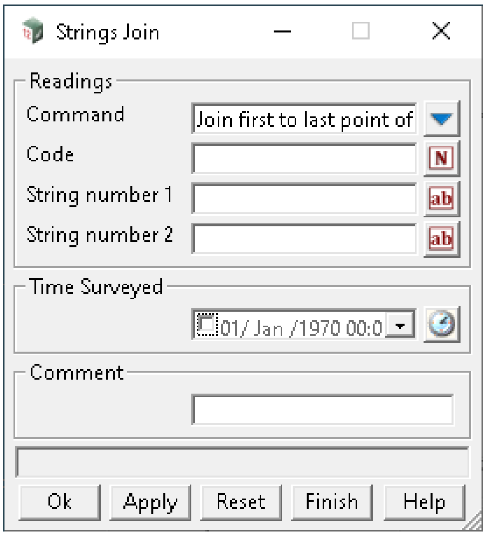
The ***Join String*** option joins two selected strings together by connecting the ends of the strings to form one string.

For a full description and diagrams, see 25.3.8 Joining Strings in Appendix 25 12d Survey Guide.









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

Field Description	Type	Defaults	Pop-Up

Readings

Command	choice box		Join last points of strings (opcode 21) Join first to last point of strings (opcode 22) Join first points of strings (opcode 23) Join last to first point of strings (opcode 24)

for 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**.*

for 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**.*

for 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**.*

for 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**.*

Feature 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

Rest of the Fields and Buttons

Time surveyed, Comment, OK, Apply, Reset, Finish, Help See 25.4.1.3 Time surveyed, Comment and Bottom Panel buttons.

Note: The created string has the given **Feature code.** No string number is needed since it is the final phase of the reduction where the string numbers are dropped.

For the description on how the field data command is stored in a ***12d Field File,*** see

21 join_strings_last_to_last Join last points of strings.

22 join_strings_first_to_last Join first to last point of strings.

23 join_strings_first_to_first Join first points of strings.

24 join_strings_last_to_first Join last to first point of strings.

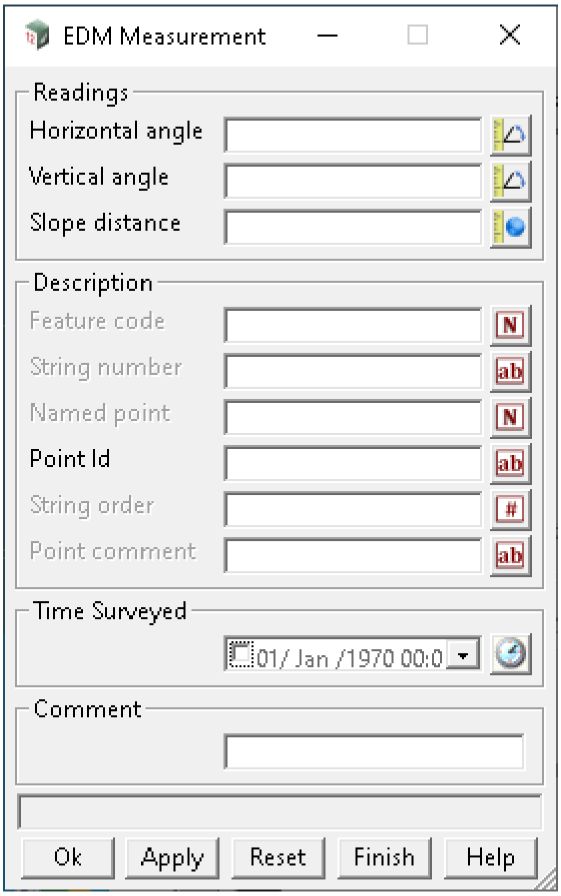
Continue to 25.4.2.29 EDM Measurement (opcode 7) or return to 25.4.2 List of Field Data Commands or 25 12d Survey Guide.

25.4.2.29 EDM Measurement (opcode 7)

The ***EDM Measurement*** option stores a point from a measurement that is given by a horizontal angle, a vertical angle and slope distance.

Individual measurements can be entered or they can consist 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

Readings

Horizontal angle

the horizontal angle to the measured point in dd.mmss format.

Vertical angle

the vertical angle to the measured 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 measured point.

If a pair of face1/face2 measurements exist, the mean value of the slope distance is used for reduction purposes.

Description - used for the new point

Feature code, String number, Named point, Point id, Point comment and String order are used to define values for the new point created by the measurement. See 25.4.1.1 Feature Code, String Number, Named Point, Point Id, Point Comment and String Order for a New Measured Point.

Rest of the Fields and Buttons

Time surveyed, Comment, OK, Apply, Reset, Finish, Help See 25.4.1.3 Time surveyed, Comment and Bottom Panel buttons.

For the description on how the field data command is stored in a ***12d Field File,*** see 7 edm_tachy_measurement Measurement - HA, VA, SD.

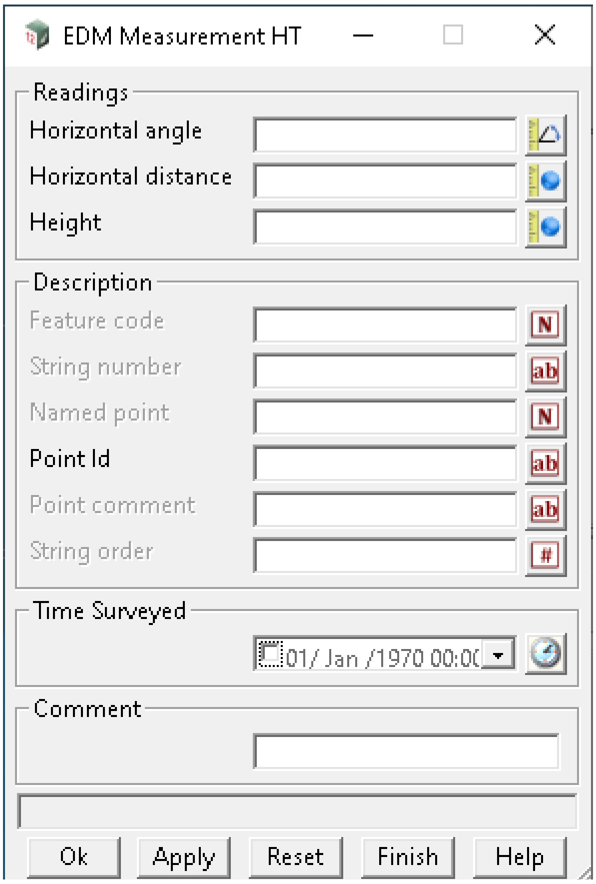
Continue to 25.4.2.30 EDM Measurement (HA,HD,HT) (opcode 11) or return to 25.4.2 List of Field Data Commands or 25 12d Survey Guide

25.4.2.30 EDM Measurement (HA,HD,HT) (opcode 11)

The ***EDM Measurement HT*** option stores a point from a measurement that is given by a horizontal angle, a horizontal distance and a height.

Individual measurements can be entered or they can consist 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

Readings

Horizontal angle

the horizontal angle to the measured point in dd.mmss format.

Horizontal distance

the reduced horizontal distance to the measured point.

Height

the height of the measured point.

Description - used for the new point

Feature code, String number, Named point, Point id, Point comment and String order are used to define values for the new point created by the measurement. See 25.4.1.1 Feature Code, String Number, Named Point, Point Id, Point Comment and String Order for a New Measured Point.

Rest of the Fields and Buttons

Time surveyed, Comment, OK, Apply, Reset, Finish, Help See 25.4.1.3 Time surveyed, Comment and Bottom Panel buttons.

For the description on how the field data command is stored in a ***12d Field File,*** see
 11 edm_tachy_measurement_ht Measurement - HA, HD, Height.

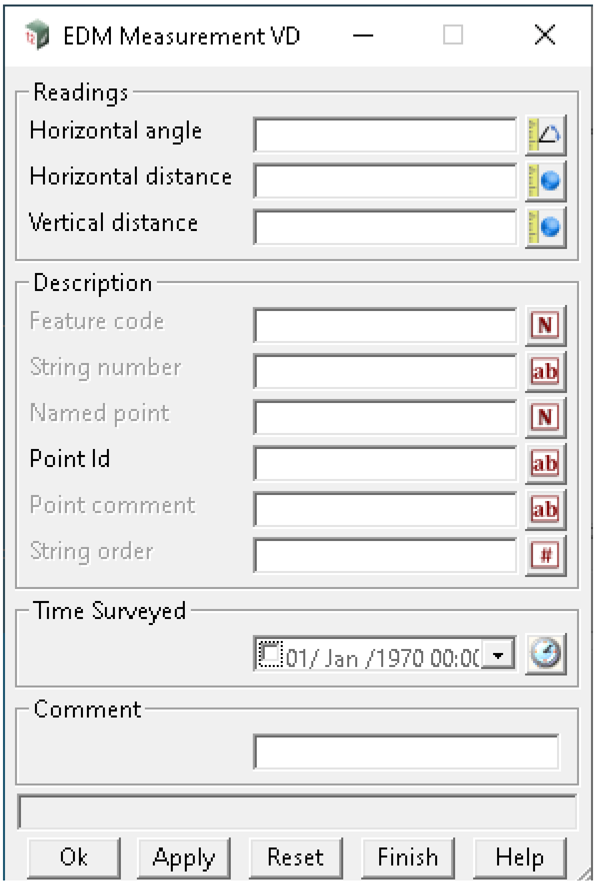
Continue to 25.4.2.31 EDM Measurement (HA,HD,Diff HT) (opcode 12) or return to 25.4.2 List of Field Data Commands or 25 12d Survey Guide.

25.4.2.31 EDM Measurement (HA,HD,Diff HT) (opcode 12)

The ***EDM Measurement VD*** option stores a point from a measurement that is given by a horizontal angle, a horizontal distance and a vertical distance.

Individual measurements can be entered or they can consist 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

Readings

Horizontal angle

the horizontal angle to the measured point in dd.mmss format.

Horizontal distance

the reduced horizontal distance to the measured point.

Vertical distance

the change in height as measured from the collimation height of the instrument to the target point (usually centre of target).

Description - used for the new point

Feature code, String number, Named point, Point id, Point comment and String order are used to define values for the new point created by the measurement. See 25.4.1.1 Feature Code,

String Number, Named Point, Point Id, Point Comment and String Order for a New Measured Point.

Rest of the Fields and Buttons

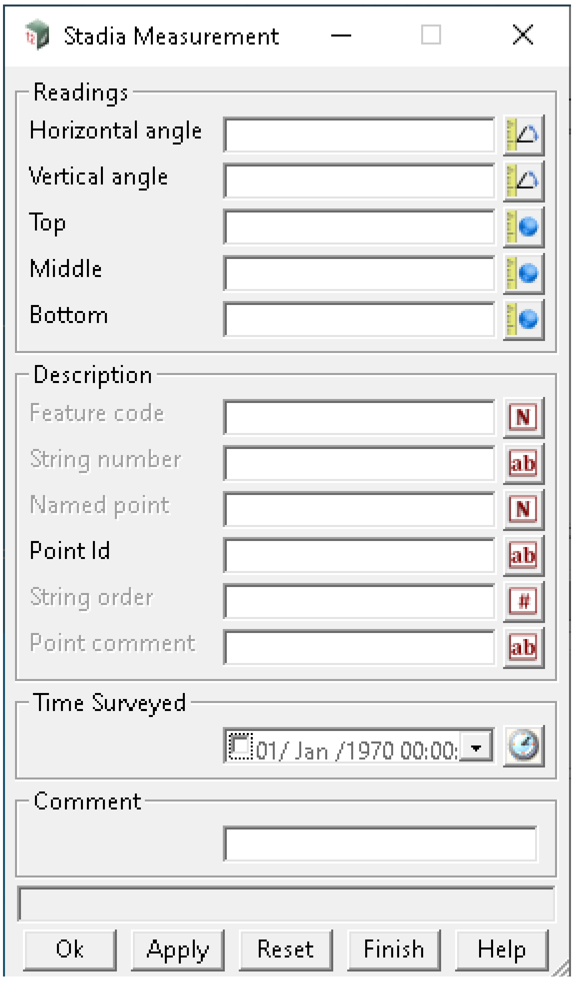
Time surveyed, Comment, OK, Apply, Reset, Finish, Help See 25.4.1.3 Time surveyed, Comment and Bottom Panel buttons.

For the description on how the field data command is stored in a ***12d Field File,*** see 11 edm_tachy_measurement_ht Measurement - HA, HD, Height.

Continue to 25.4.2.32 Stadia Measurement (opcode 10) or return to 25.4.2 List of Field Data Commands or 25 12d Survey Guide.

25.4.2.32 Stadia Measurement (opcode 10)

The ***Stadia Measurement*** option stores a point from a measurement that is given by a horizontal angle, a vertical angle and the Top, Middle and Bottom hair readings.



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

Field Description Type Defaults Pop-Up

Readings

Horizontal angle

the horizontal angle to the measured point in dd.mmss format.

Vertical angle

the vertical angle to the measured point in dd.mmss format.

Top

the top hair reading.

Middle

the middle hair reading.

Bottom

the bottom hair reading.

Description - used for the new point

Feature code, String number, Named point, Point id, Point comment and String order are used to define values for the new point created by the measurement. See 25.4.1.1 Feature Code, String Number, Named Point, Point Id, Point Comment and String Order for a New Measured Point.

Rest of the Fields and Buttons

Time surveyed, Comment, OK, Apply, Reset, Finish, Help See 25.4.1.3 Time surveyed, Comment and Bottom Panel buttons.

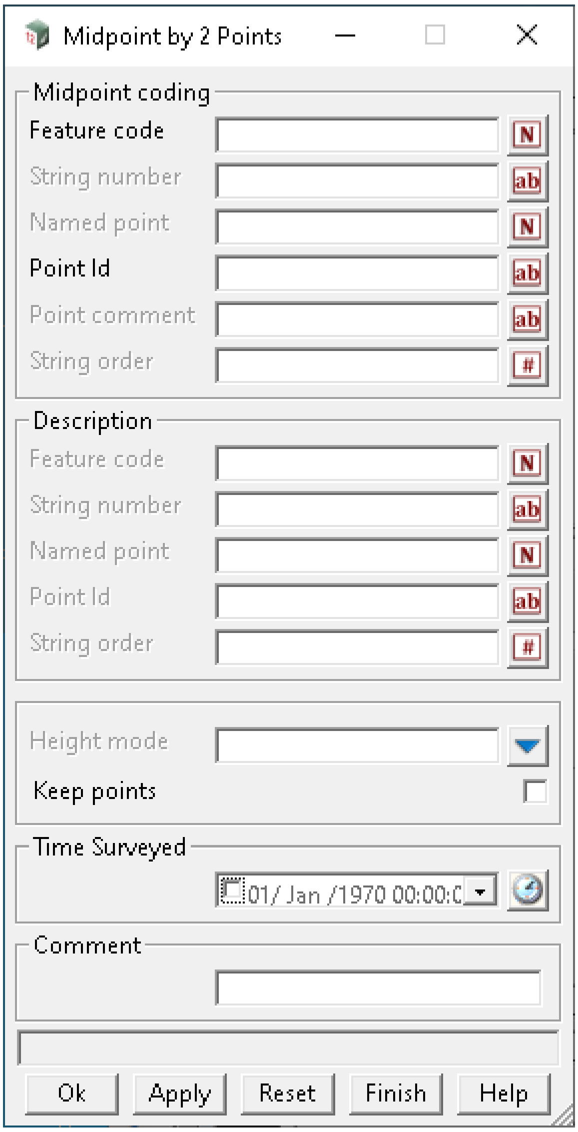
For the description on how the field data command is stored in a ***12d Field File,*** see 10 stadia_measurement Three hair stadia measurement.

Continue to 25.4.2.33 Midpoint of Two Points (opcode 146) or return to 25.4.2 List of Field Data Commands or 25 12d Survey Guide.

25.4.2.33 Midpoint of Two Points (opcode 146)

The ***Midpoint by 2 Points*** option creates a new point which is the midpoint of the previous two measurement points.

The two points used to calculate the midpoint can also be deleted.



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

Field Description Type Defaults Pop-Up

Midpoint coding - used for the new point

Feature code, String number, Named point, Point id, Point comment and String order are used to define values for the new point created by the measurement. See 25.4.1.1 Feature Code, String Number, Named Point, Point Id, Point Comment and String Order for a New Measured Point.

Named point

???

String order

???

Description - used for finding two existing points

*If **no Feature code**, **String number** or **Point id** is given, the current measurement point and one previous point from the current string are used. If found, the two points are used to create the midpoint of the two points. The height of the new point is determine by **Height mode** and the new point is given the coding values from the* **Midpoint Coding** *section.*

*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, the two points are used to create the midpoint of the two points. The height of the new point is determine by **Height mode** and the new point is given the coding values from the* **Midpoint Coding** *section.*

*If **only 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, the two points are used to create the midpoint of the two points. The height of the new point is determine by **Height mode** and the new point is given the coding values from the* **Midpoint Coding** *section.*

In each case, if there is less than two points then no midpoint can be created.

Feature code, String number, Point id See 25.4.1.2.2 Feature Code, String Number, Point Id for Finding Standard Points or Strings

Named point

???

String order

???

Rest of the Fields and Buttons

Height mode choice box null, non_tinable, interpolate

*if **null**, the created point has a null z-value.*

*If **interpolate**, the created point has a z-value which is the average of the z-values of the two points.*

*If **non_tinable**, the created point has a z-value which is the average of the z-values of the two points but the vertex is not tinable.*

Keep points tick box

*if **not ticked**, the two points used are deleted during the reduction.*

*If **ticked**, the two points are kept.*

Time surveyed, Comment, OK, Apply, Reset, Finish, Help See 25.4.1.3 Time surveyed, Comment and Bottom Panel buttons.

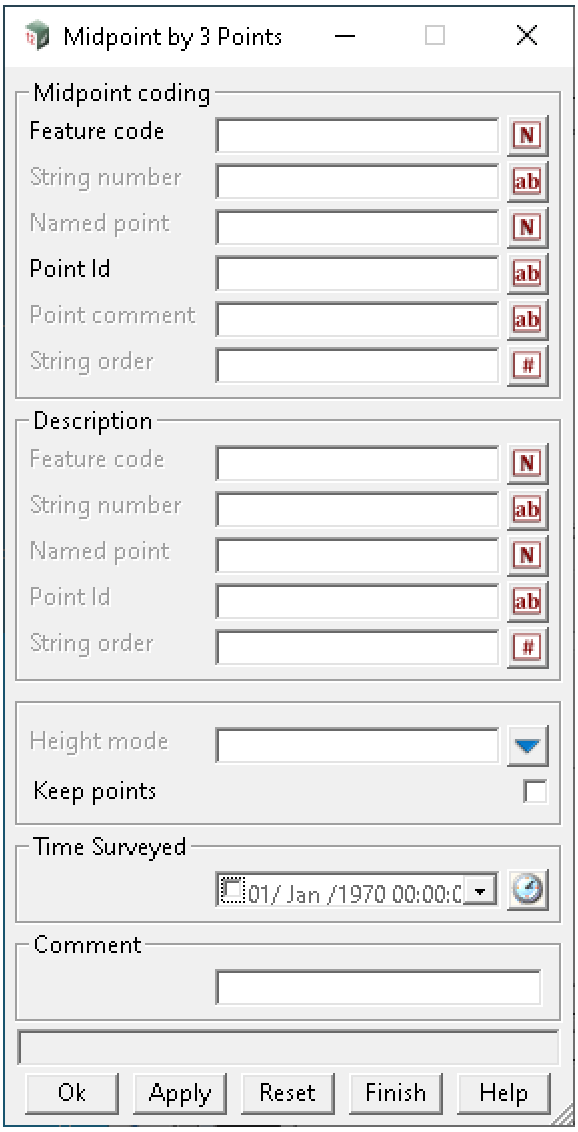
For the description on how the field data command is stored in a ***12d Field File,*** see 146 midpoint_2 Create midpoint of two points.

Continue to 25.4.2.34 Centre of Arc Through Three Points (opcode 147) or return to 25.4.2 List of Field Data Commands or 25 12d Survey Guide.

25.4.2.34 Centre of Arc Through Three Points (opcode 147)

The ***Midpoint by 3 Points*** option creates a new point that is the centre of the arc that passes through three previous measurement points.

The three points used to calculate the arc centre can also be deleted. by the option.



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

Field Description Type Defaults Pop-Up

Midpoint coding - used for the new point

Feature code, String number, Named point, Point id, Point comment and String order are used to define values for the new point created by the measurement. See 25.4.1.1 Feature Code, String Number, Named Point, Point Id, Point Comment and String Order for a New Measured Point.

Named point

???

String order

???

Description - used for finding three existing points

*If **no Feature code**, **String number** or **Point id** is given, the current measurement point and the two previous points from the current string are used, and a new point is created which is the centre of the arc through the three points. The height of the new point is determine by **Height mode** and the new point is given the coding values from the* **Midpoint Coding** *section.*

*If the **Feature code** and **String number** exist, the last three points with that feature code and string number are used and a new point is created which is the centre of the arc through the three points. The height of the new point is determine by **Height mode** and the new point is given the coding values from the* **Midpoint Coding** *section.*

*If **only 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.*

*If **only the Point id** is given, 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 that have the same feature code and string number, are used and a new point is created which is the centre of the arc through the three points. The height of the new point is determine by **Height mode** and the new point is given the coding values from the* **Midpoint Coding** *section.*

In each case, if there is less than three points then no arc can be fitted and no new point created.

Feature code, String number, Point id See 25.4.1.2.2 Feature Code, String Number, Point Id for Finding Standard Points or Strings

Named point

???

String order

???

Rest of the Fields and Buttons

Height mode choice box null, non_tinable, interpolate

*if **null**, the created point has a null z-value.*

*If **interpolate**, the created point has a z-value which is the average of the z-values of the three points.*

*If **non_tinable**, the created point has a z-value which is the average of the z-values of the three points but the vertex is not tinable.*

Keep points tick box

*if **not ticked**, the three points used are deleted during the reduction.*

*If **ticked**, the two points are kept.*

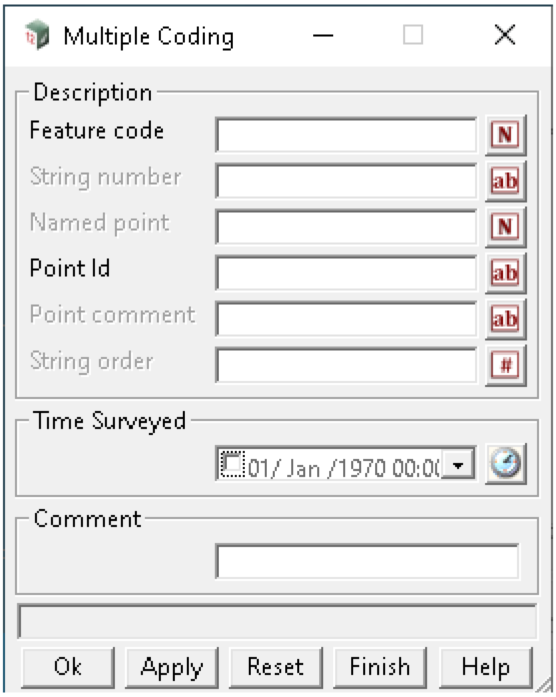
Time surveyed, Comment, OK, Apply, Reset, Finish, Help See 25.4.1.3 Time surveyed, Comment and Bottom Panel buttons.

For the description on how the field data command is stored in a ***12d Field File,*** see
147 midpoint_3 Create centre of arc that goes through three points.

Continue to 25.4.2.35 Multiple Coding (opcode 16) or return to 25.4.2 List of Field Data Commands or 25 12d Survey Guide.

25.4.2.35 Multiple Coding (opcode 16)

The ***Multiple Coding*** option records a new point at the same position as the current measurement point but with possibly a different ***feature code*** and ***string number***.



A new point is created at the same position as the current measurement point but with the specified *Feature code* and *String number*.

The *Point id* and *Point comment* are recorded as the point id and vertex text for that vertex of the super string.

If a *Named point* exists, then its value is the ***point name*** and it is a ***named measurement***. A 4d point string of name *point name* is created and mapped using the Map 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 coordinates.

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

Field Description	Type	Defaults	Pop-Up

Description - used for the new point

Feature code, String number, Named point, Point id, Point comment and String order are used to define values for the new point created by the measurement. See 25.4.1.1 Feature Code, String Number, Named Point, Point Id, Point Comment and String Order for a New Measured Point.

Rest of the Fields and Buttons

Time surveyed, Comment, OK, Apply, Reset, Finish, Help See 25.4.1.3 Time surveyed, Comment and Bottom Panel buttons.

For the description on how the field data command is stored in a ***12d Field File,*** see
16 multiple_coding Multiply coded point.

Continue to 25.4.2.36 New Instrument Setup - Station (opcode 3) or return to 25.4.2 List of Field Data Commands or 25 12d Survey Guide.

25.4.2.36 New Instrument Setup - Station (opcode 3)

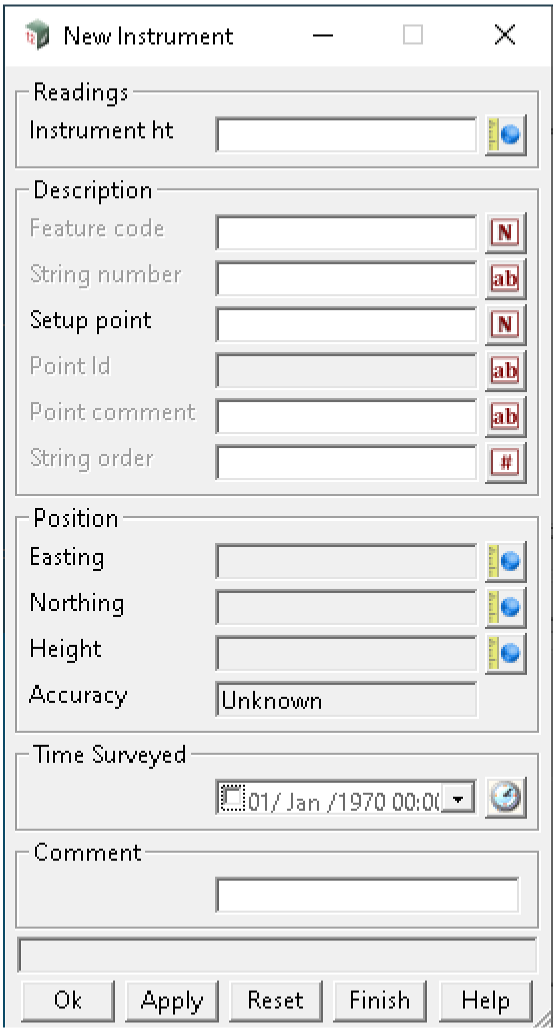
The ***New Instrument*** option defines a new instrument setup at an existing point.

That is, it is setting up an instrument at the point with name given in the **Setup point** field.

The (x,y,z) coordinates for **Setup point** are found by first searching the Control model, then the list of previously ***named points*** in the reduction, the ***point ids*** of previous measurements and finally if **Setup point** is still not found, the user is asked to type in the (x,y,z) coordinates.

See 26.6 Searching for Special Coordinates.

A record is written to the report file.



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

Field Description Type Defaults Pop-Up

Readings

Instrument ht

the height of the instrument setup.

Description - for find the point to set up on

Feature code

This is only used in the special case given in When Setup Point is Not Found for the New Instrument

Setup Command.

String number

Not used.

Setup point

Point name of the point that the instrument is being set up on.

For a description of how the reduction finds the appropriate point, see 25.4.1.2.1 Searching for the Coordinates of Special Points

Point id

Point id.

*if **not blank**, the point id is used for searching.*

Point comment

Not used.

String order

??

Rest of the Fields and Buttons

Position

Easting output

this field is non-editable and is populated if a valid coordinate exists for the nominated setup point.

Northing output

this field is non-editable and is populated if a valid coordinate exists for the nominated setup point.

Height output

this field is non-editable and is populated if a valid coordinate exists for the nominated setup point.

Time surveyed, Comment, OK, Apply, Reset, Finish, Help See 25.4.1.3 Time surveyed, Comment and Bottom Panel buttons.

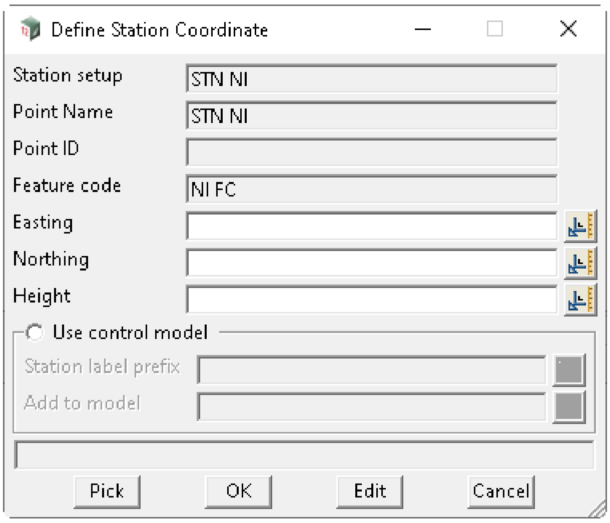
For the description on how the field data command is stored in a ***12d Field File,*** see 3 station New instrument setup on a point.

If the **Setup point** is found then no point is created by the New Instrument command.

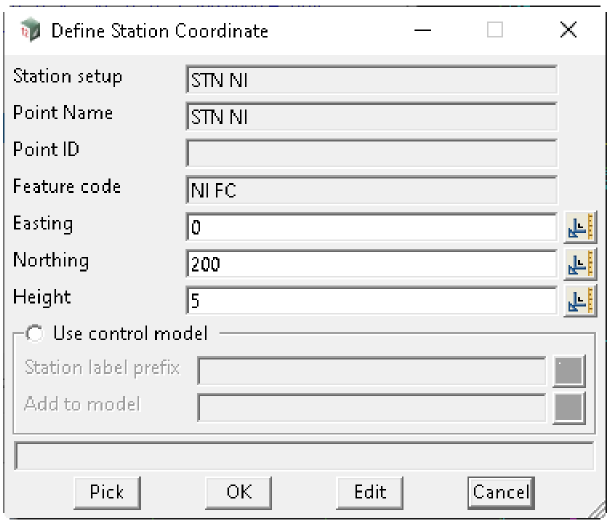
If the **Setup point** is not found then one or to new points can be created. See When Setup Point is Not Found for the New Instrument Setup Command'

When Setup Point is Not Found for the New Instrument Setup Command

If the ***Setup point*** can't be found, the **Define Station Coordinate** panel is displayed (see 16.4.3.1 Define Station Coordinate for Unknown Points):



Either **Pick** can be pressed and an existing vertex selected to fill in the **Easting**, **Northing** and **Height** fields, or values can be typed into the **Easting**, **Northing** and **Height** fields.



When **OK** is pressed, it is similar to a named measurement and one or two points are created.

1. a one vertex super string is created with:

   String name ***Feature code*** from the **New Instrument** panel.

   Vertex id ***Setup point*** from the **New Instrument** panel.

   Vertex text ***Setup point*** from the **New Instrument** panel.

   String attribute: ***Survey Control Station*** with the value ***1***

2. If **Used named points as measurements** is ***ticked*** in the **Others** tab in the **SDR Function**:

   a super string vertex is created with:

   String name ***Feature code*** from the **New Instrument** panel.

   No string attribute ***string_no***.

   For the vertex, three attribute groups are created: ***SDR Setup Details***, ***SDR Measurement***

Details and ***SDR Measurement Geodetic Details***. See 25.4.2.64 Attributes for the Unknown Control Point Standard Measurement.

This point is used in stringing.

Important Note:

A ***named Coordinate*** field data command (panel **Direct Coordinate**) is inserted **BEFORE** the ***New Instrument*** field data command. The fields in the panel **Direct Coordinate** panel are:

X/Y/Z coordinate - ***Easting***, ***Northing*** and ***Height*** from the **Define Station Coordinate** panel.

Feature code - ***Feature code*** from the **New Instrument** panel.

String number - blank.

Named point - ***Setup point*** from the **New Instrument** panel.

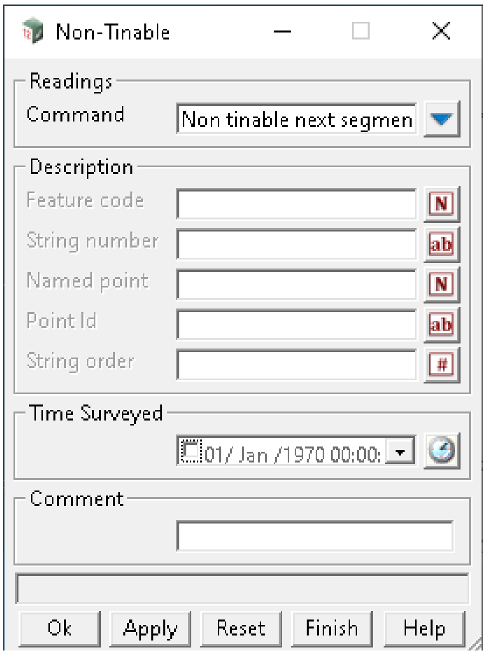
Point comment - blank.

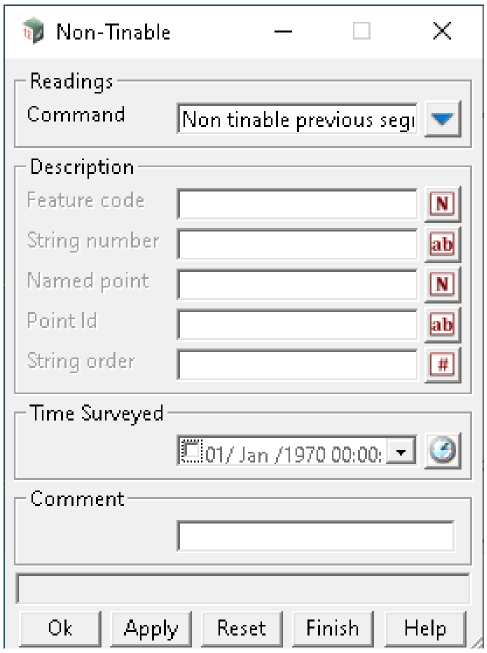
The ***named Coordinate*** field data command may only be visible when the ***SDR Editor*** is restarted.

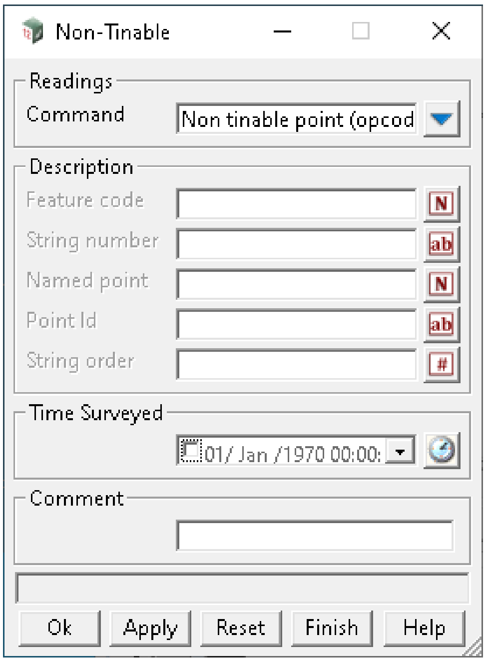
Continue to 25.4.2.37 Non Tinability (opcodes 38, 39, 40, 141) or return to 25.4.2 List of Field Data Commands or 25 12d Survey Guide.

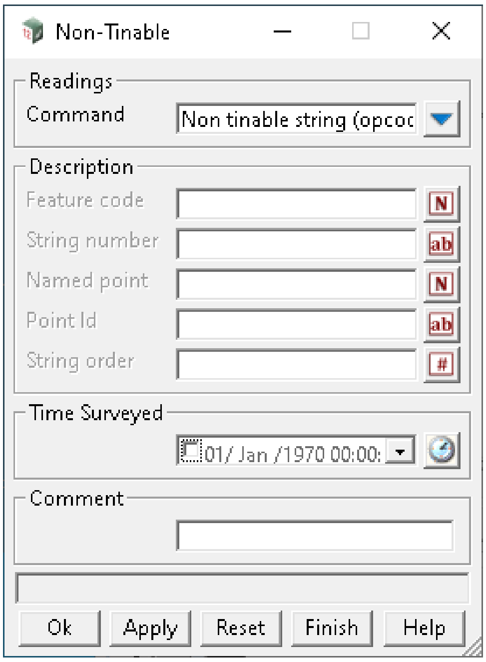
25.4.2.37 Non Tinability (opcodes 38, 39, 40, 141)

The ***Non-Tinable*** option sets selected vertices and/or segments to be non-tinable (not tinable).









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

Field Description	Type	Defaults	Pop-Up
Readings			
Command	choice box		Non tinable previous segment (opcode 39) Non tinable next segment (opcode 38) Non tinable point (opcode 40)

for Non tinable previous segment

*the **Named point** field is not used.*

*If **no Feature code**, **String number** or **Point id** 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 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. That is, it will not be treated as a breakline in triangulations.*

*If **only the Point id** exists, then the segment containing the point with that point id as an end point, is set to non-tinable. That is, it will not be treated as a breakline in triangulations.*

for Non tinable next segment

*If **no Feature code**, **String number** or **Point id** 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 the **Feature code** and **String number** exist, then the next segment with the current measurement point as a starting point, and with the same feature code and string number, is set to non-tinable. That is, it will not be treated as a breakline in triangulations*

*If **only the Point id** exists, then the segment containing the point with that point id as a starting point, is set to non-tinable. That is, it will not be treated as a breakline in triangulations.*

for Non tinable point

*If **no Feature code**, **String number** or **Point id** is given, the current measurement point is set to non-tinable. That is, it will not be used in triangulations.*

*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. That is, it will not be used in triangulations.*

*If **only the Point id** exists, then the point with that point id is set to non-tinable. That is, it will not be used in triangulations.*

Description - used for finding an existing point or string

Feature code, String number, Point id See 25.4.1.2.2 Feature Code, String Number, Point Id for Finding Standard Points or Strings

Named point

???

String order

???

Rest of the Fields and Buttons

Time surveyed, Comment, OK, Apply, Reset, Finish, Help See 25.4.1.3 Time surveyed, Comment and Bottom Panel buttons.

For the description on how the field data command is stored in a ***12d Field File,*** see

38 non_tinable_next_segment Make the next segment non-tinable.

39 non_tinable_previous_segment Make the previous segment non-tinable.

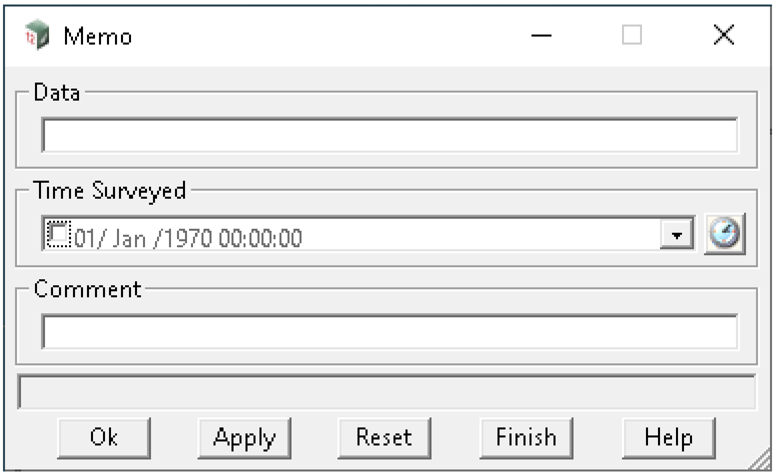
40 non_tinable_vertex Make a point non-tinable.

141 non_tinable_string Make a string non-tinable.

Continue to 25.4.2.38 Note (opcode 29) or return to 25.4.2 List of Field Data Commands or 25 12d Survey Guide.

25.4.2.38 Note (opcode 29)

The ***Memo*** option gives text to be added as information in the ***12d Field File***.



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, Comment, OK, Apply, Reset, Finish, Help See 25.4.1.3 Time surveyed, Comment and Bottom Panel buttons.

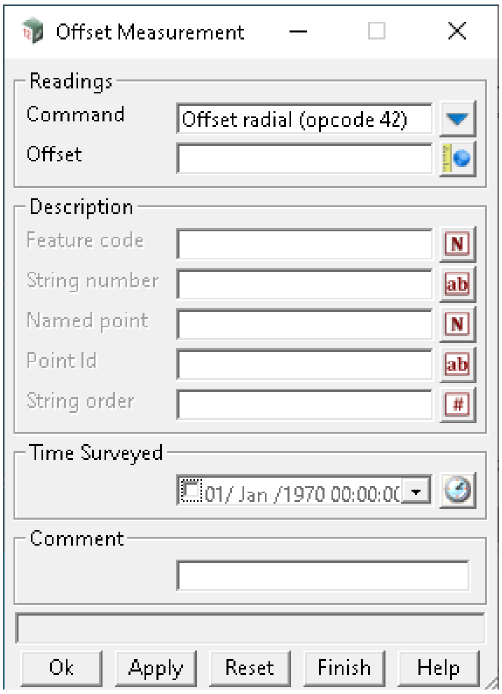
For the description on how the field data command is stored in a ***12d Field File,*** see 29 memo Note or memo.

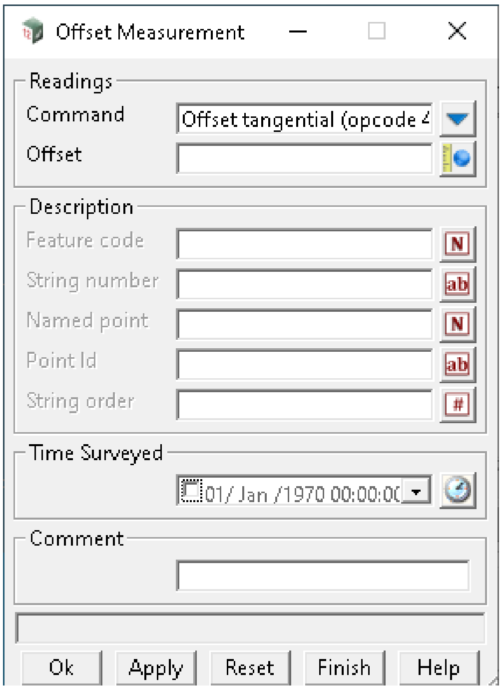
Continue to 25.4.2.39 Offset Measurement (opcodes 42, 43, 44) or return to 25.4.2 List of Field Data Commands or 25 12d Survey Guide

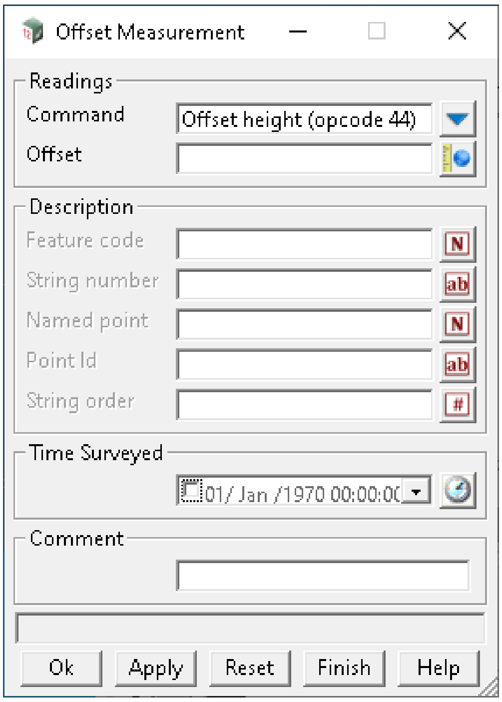
25.4.2.39 Offset Measurement (opcodes 42, 43, 44)

It is not always possible to measure a point directly but it may be possible to measure a point nearby and then measure offsets to adjust the measured point by to produce the coordinates of the required point.

For a full description and diagrams, see 25.3.2 Offsets in Appendix 25 12d Survey Guide.







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

Field Description	Type	Defaults	Pop-Up

Readings

Command	choice box	Offset radial (opcode 42) Offset tangential (opcode 43) Offset height (opcode 44)

for 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. For more information, see 25.3.2 Offsets

for 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). For more information, see 25.3.2 Offsets

for 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.For more information, see 25.3.2 Offsets

Description - used for finding an existing point

*the **Named point** field is not used in searching.*

*If **no Feature code**, **String number** or **Point id** is given, the offset is used to adjust the position of the current measured point.*

*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 **only the Point id** exists, then point with that **Point id** is adjusted.*

Feature code, String number, Point id See 25.4.1.2.2 Feature Code, String Number, Point Id for Finding Standard Points or Strings

Named point

???.

String order

???

Rest of the Fields and Buttons

Time surveyed, Comment, OK, Apply, Reset, Finish, Help See 25.4.1.3 Time surveyed, Comment and Bottom Panel buttons.

For the description on how the field data command is stored in a ***12d Field File,*** see

42 offset_measurement_radial Add a radial offset.

43 offset_measurement_tangential Add a tangential offset.

44 offset_measurement_height Add a height offset.

Continue to 25.4.2.40 Order String Automatically (opcode 101) or return to 25.4.2 List of Field Data Commands or 25 12d Survey Guide.

25.4.2.40 Order String Automatically (opcode 101)

The ***Order string automatically*** option does not bring up a panel and straight away creates an Order record.

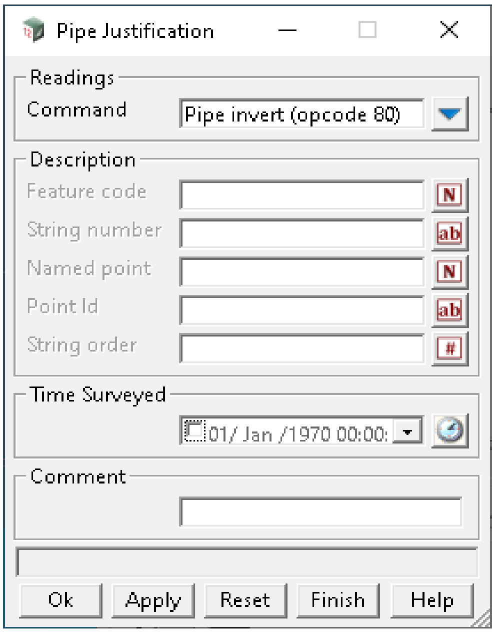
For the description on how the field data command is stored in a ***12d Field File,*** see 101 auto_order Order strings automatically.

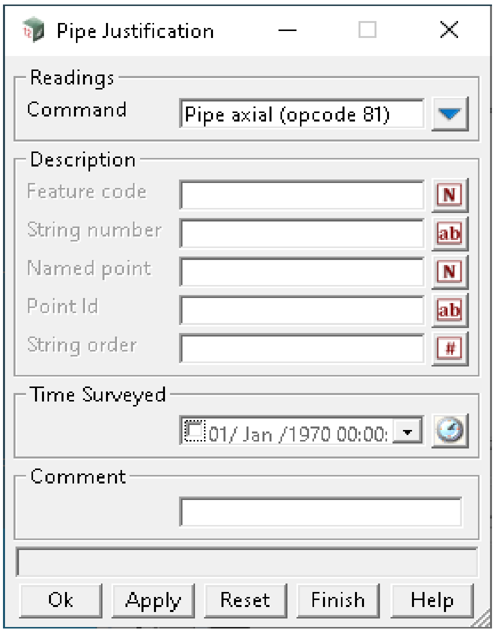
Continue to 25.4.2.41 Pipe Justification (opcodes 80, 81, 82) or return to 25.4.2 List of Field Data Commands or 25 12d Survey Guide.

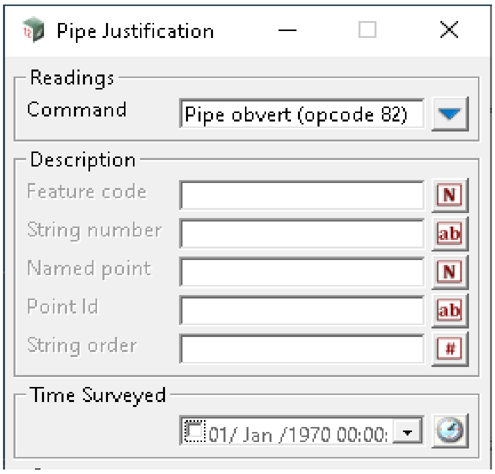
25.4.2.41 Pipe Justification (opcodes 80, 81, 82)

The ***Pipe Justification*** option sets the pipe justification type for a selected point.

If the selected point is not part of a pipe string then the command is ignored.







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

Field Description	Type	Defaults	Pop-Up
Readings			
Command	choice box		Pipe invert (opcode 80) Pipe axial (opcode 81) Pipe obvert (opcode 82)

for Pipe invert (opcode 80)

*If **no Feature code**, **String number** or **Point id** 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, then the last point of the previous string with that 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 **only 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.*

for Pipe axial (opcode 81)

*If **no Feature code**, **String number** or **Point id** 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, then the last point of the previous string with that 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 **only 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.*

for Pipe obvert (opcode 82)

*If **no Feature code**, **String number** or **Point id** 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, then the last point of the previous string with that 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 **only 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.*

Description - used for finding an existing point

Feature code, String number, Point id See 25.4.1.2.2 Feature Code, String Number, Point Id for Finding Standard Points or Strings

Named point

???

String order

???

Rest of the Fields and Buttons

Time surveyed, Comment, OK, Apply, Reset, Finish, Help See 25.4.1.3 Time surveyed, Comment and Bottom Panel buttons.

For the description on how the field data command is stored in a ***12d Field File,*** see

80 pipe_justification_invert Pipe or culvert invert point (bottom of the pipe or culvert).

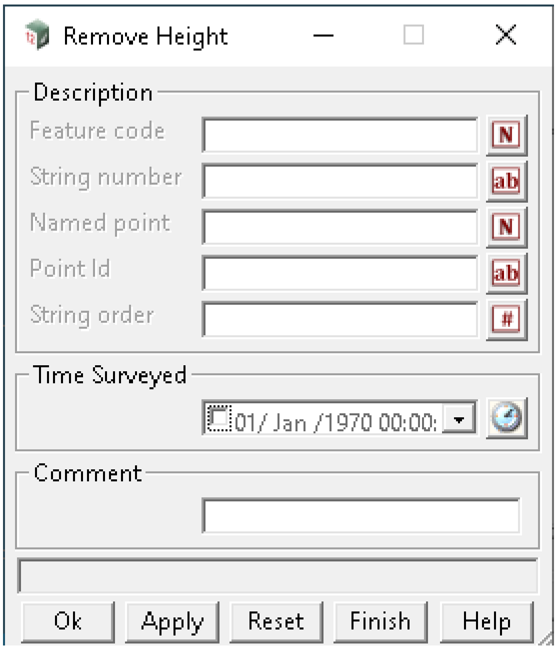
81 pipe_justification_axial Pipe or culvert axial point (centre of the pipe or culvert).

82 pipe_justification_obvert Pipe or culvert obvert point (top of the pipe or culvert).

Continue to 25.4.2.42 Remove Height (opcode 30) or return to 25.4.2 List of Field Data Commands or 25 12d Survey Guide.

25.4.2.42 Remove Height (opcode 30)

The ***Remove Height*** option sets the height of a selected point (vertex) to null.



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

Field Description Type Defaults Pop-Up

Description - used for finding an existing point

*If **no Feature code**, **String number** or **Point id** 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 **only the Point id** exists, then the height of the point with that point id is set to null.*

Feature code, String number, Point id See 25.4.1.2.2 Feature Code, String Number, Point Id for Finding Standard Points or Strings

Named point

???

String order

???

Rest of the Fields and Buttons

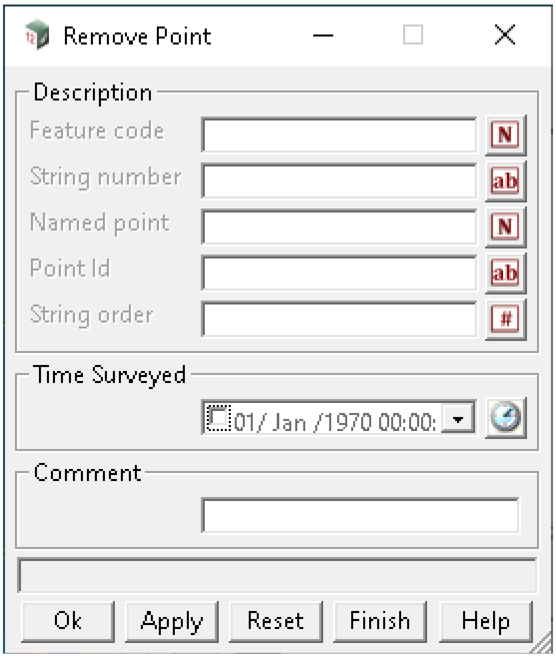
Time surveyed, Comment, OK, Apply, Reset, Finish, Help See 25.4.1.3 Time surveyed, Comment and Bottom Panel buttons.

For the description on how the field data command is stored in a ***12d Field File,*** see 30 remove_height Remove height from a point - that is make it a null height.

Continue to 25.4.2.43 Remove (Delete) Point (opcode 31) or return to 25.4.2 List of Field Data Commands or 25 12d Survey Guide.

25.4.2.43 Remove (Delete) Point (opcode 31)

The ***Remove Point*** option deletes a selected point (vertex).



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

Field Description   Type   Defaults   Pop-Up

Description - used for finding an existing point

*If **no Feature code**, **String number** or **Point id** is given, the current measurement point is deleted.*

*If the **Feature code** and **String number** exist, then the last point of the previous string with that feature code and string number is deleted.*

*If **only the Point id** exists, then the point with that point id is deleted.*

Feature code, String number, Point id   See 25.4.1.2.2 Feature Code, String Number, Point Id for Finding Standard Points or Strings

Named point

Not used.

String order

???

Rest of the Fields and Buttons

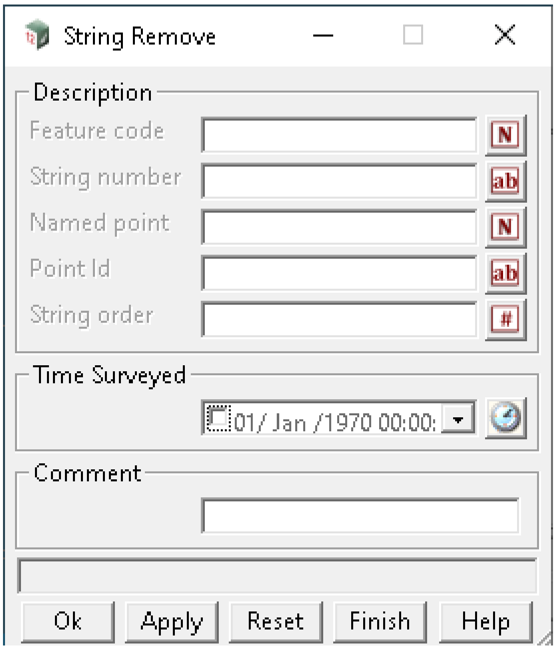
Time surveyed, Comment, OK, Apply, Reset, Finish, Help   See 25.4.1.3 Time surveyed, Comment and Bottom Panel buttons.

For the description on how the field data command is stored in a ***12d Field File,*** see 31 remove_point Delete point.

Continue to 25.4.2.44 Remove (Delete) String (opcode 144) or return to 25.4.2 List of Field Data Commands or 25 12d Survey Guide.

25.4.2.44 Remove (Delete) String (opcode 144)

The ***String Remove*** option deletes a string.



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

Field Description Type Defaults Pop-Up

Description - used for finding an existing string

*If **no Feature code**, **String number** or **Point id** is given, the string of the current measurement point is deleted.*

*If the **Feature code** and **String number** exist, then the last previous string with that feature code and string number is deleted.*

*If **only the Point id** exists, then the string containing the point with that point id, is deleted.*

Feature code, String number, Point id See 25.4.1.2.2 Feature Code, String Number, Point Id for Finding Standard Points or Strings

Named point

???

String order

???

Rest of the Fields and Buttons

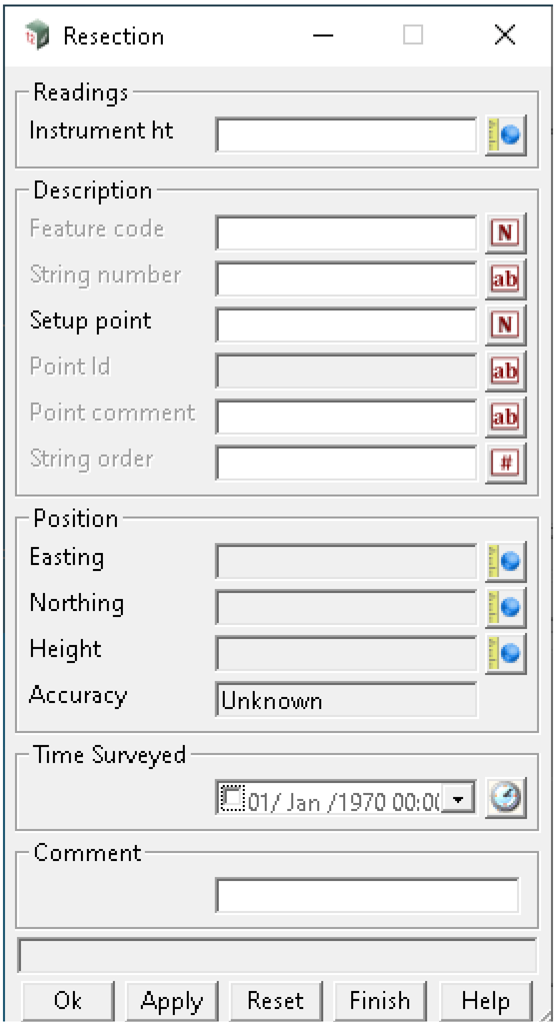
Time surveyed, Comment, OK, Apply, Reset, Finish, Help See 25.4.1.3 Time surveyed, Comment and Bottom Panel buttons.

For the description on how the field data command is stored in a ***12d Field File,*** see 144 remove_string Delete a string.

Continue to 25.4.2.45 Resection Start (opcode 128) or return to 25.4.2 List of Field Data Commands or 25 12d Survey Guide.

25.4.2.45 Resection Start (opcode 128)

The ***Resection*** option is under development.



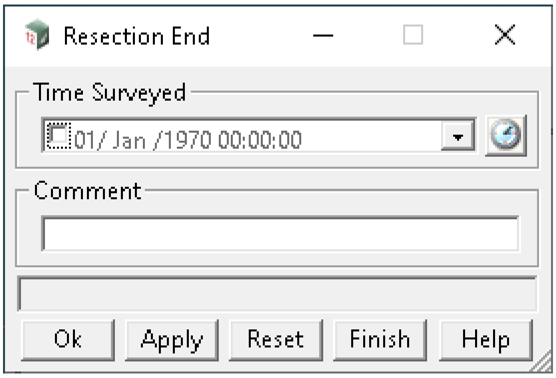
OK, Apply, Reset, Finish, Help See the description for the panel buttons in the section 25.4.1.3 Time surveyed, Comment and Bottom Panel buttons

For the description on how the field data command is stored in a ***12d Field File,*** see 128 resection Start a resection.

Continue to 25.4.2.46 Resection End (opcode 129) or return to 25.4.2 List of Field Data Commands or 25 12d Survey Guide.

25.4.2.46 Resection End (opcode 129)

The ***Resection End*** option is under development.



OK, Apply, Reset, Finish, Help See the description for the panel buttons in the section 25.4.1.3 Time surveyed, Comment and Bottom Panel buttons

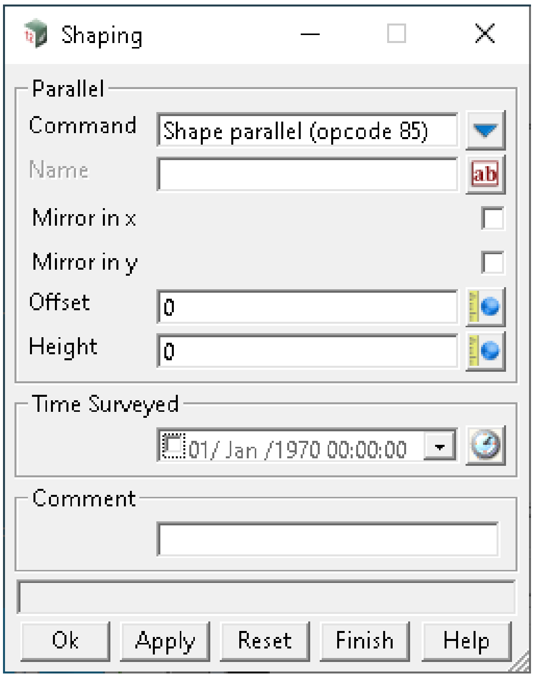
For the description on how the field data command is stored in a ***12d Field File,*** see 129 resection_end End the resection.

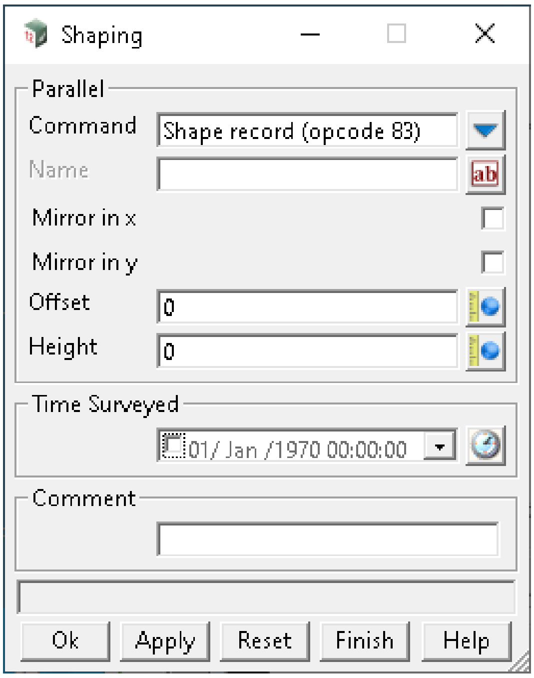
Continue to 25.4.2.47 Shaping (opcodes 83 to 86) or return to 25.4.2 List of Field Data Commands or 25 12d Survey Guide.

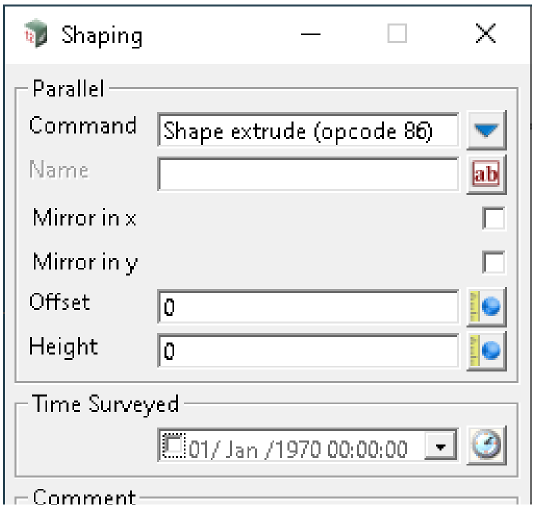
25.4.2.47 Shaping (opcodes 83 to 86)

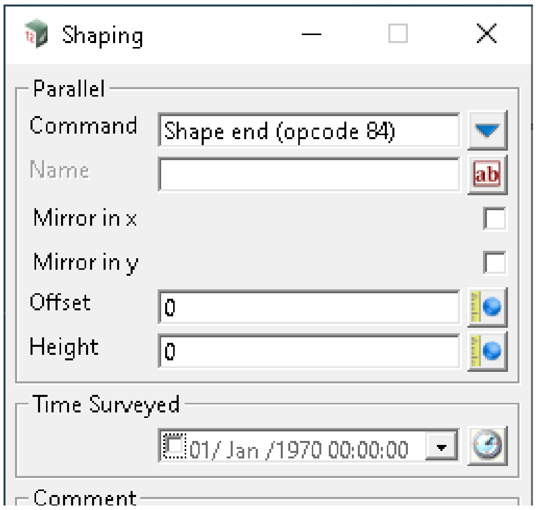
The ***Shaping*** option defines a shape and extrudes it down a string.

For a full description and diagrams, see 25.3.11 Shape Field Coding in chapter 25 12d Survey Guide









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

Field Description	Type	Defaults	Pop-Up
Parallel			
Command	choice box		Shape end (opcode 84) Shape record (opcode 83) Shape extrude (opcode 86) Shape parallel (opcode 85)

for Shape end

Stops using the current shape or stops recording a shape.

for Shape record

Start recording a shape with the shape name. If Shape_name is not blank, then the default field Shape is defined by the feature_code and string_number of the following measurements until a shape end command. There is no limit to the number of points in a shape.

for Shape extrude

extrude the current shape along the specified super string.

for 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.

Mirror in x

Mirror in y

Offset

Height

Rest of the Fields and Buttons

Time surveyed, Comment, OK, Apply, Reset, Finish, Help See 25.4.1.3 Time surveyed, Comment and Bottom Panel buttons.

For the description on how the field data command is stored in a ***12d Field File,*** see

83 shape_record Start recording a shape - before the measurement.

84 shape_end Finish using a shape definition or finish recording a shape - after the measurement.

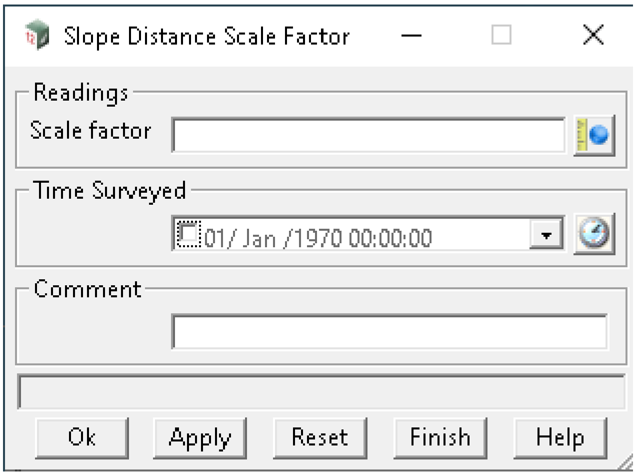
85 shape_parallel Parallel an existing shape.

86 shape_extrude Extrude an existing shape.

Continue to 25.4.2.48 Slope Distance Scale Factor (opcode 9) or return to 25.4.2 List of Field Data Commands or 25 12d Survey Guide.

25.4.2.48 Slope Distance Scale Factor (opcode 9)

THe ***Slope Distance Scale Factor*** option specifies the slope distance scale factor to use for subsequent measurements.



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

Field Description Type Defaults Pop-Up

Scale factor

*the scale factor to be applied to subsequent slope distance measurements. It is applied by multiplying raw slope distances by the **Scale factor** to give the corrected distance.*

Time surveyed, Comment, OK, Apply, Reset, Finish, Help See 25.4.1.3 Time surveyed, Comment and Bottom Panel buttons.

For the description on how the field data command is stored in a ***12d Field File,*** see

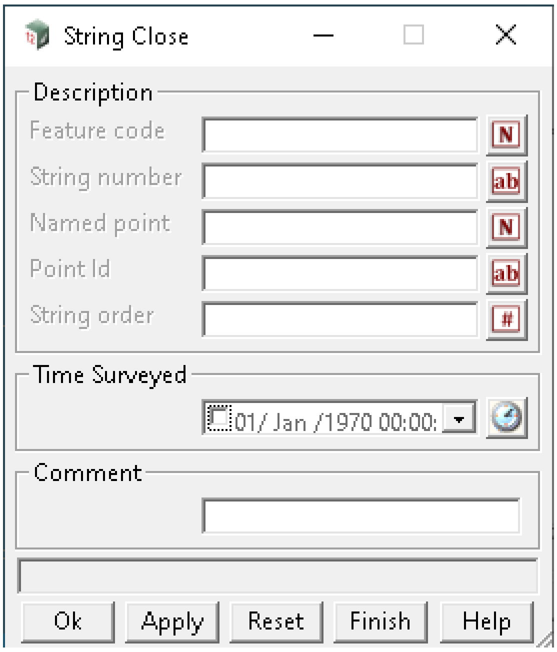
9 scale_factor Slope distance scale factor for subsequent distances.

Continue to 25.4.2.49 String Close (opcode 20) or return to 25.4.2 List of Field Data Commands or 25 12d Survey Guide.

25.4.2.49 String Close (opcode 20)

The ***String Close*** option closes the selected string.

For a full description and diagrams, see 25.3.4 Close String in 25 12d Survey Guide.



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

Field Description Type Defaults Pop-Up

Description - used for finding an existing string

*If **no Feature code**, **String number** or **Point id** is given, the string of the current measurement point is closed.*

*If the **Feature code** and **String number** exist, then the last previous string with that feature code and string number is closed.*

*If **only the Point id** exists, then the string containing the point with that point id, is closed.*

Feature code, String number, Point id See 25.4.1.2.2 Feature Code, String Number, Point Id for Finding Standard Points or Strings

Named point

???

String order

???

Rest of the Fields and Buttons

Time surveyed, Comment, OK, Apply, Reset, Finish, Help See 25.4.1.3 Time surveyed, Comment and Bottom Panel buttons.

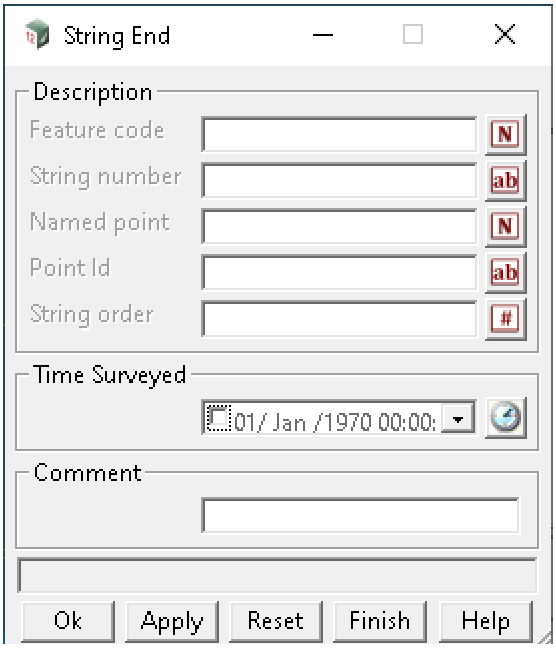
For the description on how the field data command is stored in a ***12d Field File,*** see 20 close_string Close string.

Continue to 25.4.2.50 String End (opcode 48) or return to 25.4.2 List of Field Data Commands or 25 12d Survey Guide.

25.4.2.50 String End (opcode 48)

The ***String End*** option ends (stops) a string at a selected vertex of an existing string. Any vertices after the selected vertex form a new string. So the selected vertex will be the end of the first string.

Note that the selected vertex is NOT joined to the points in the string that followed it that form the new string. So there will be a gap between the two strings.



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

Field Description Type Defaults Pop-Up

Description - used for finding an existing point

*If **no Feature code**, **String number** or **Point id** is given, the string of the current measurement point is the last point of that string. That is, the string is terminated.*

*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 last point of that string. That is, that string is terminated.*

*If **only the Point id** exists, then the previous string containing the point with that point id, is terminated after the point with the point id. So the point with the point id is the last point of the string.*

Feature code, String number, Point id See 25.4.1.2.2 Feature Code, String Number, Point Id for Finding Standard Points or Strings

Named point

???

String order

???

Rest of the Fields and Buttons

Time surveyed, Comment, OK, Apply, Reset, Finish, Help See 25.4.1.3 Time surveyed, Comment and Bottom Panel buttons.

For the description on how the field data command is stored in a ***12d Field File,*** see 48 end_string End a string.

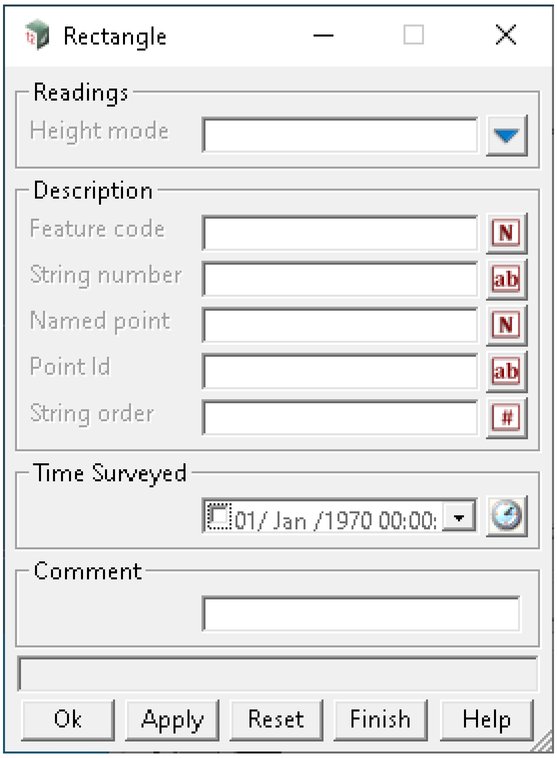
Continue to 25.4.2.51 String (Squashed) Rectangle (opcode 45) or return to 25.4.2 List of Field Data Commands or 25 12d Survey Guide.

25.4.2.51 String (Squashed) Rectangle (opcode 45)

The ***Rectangle*** option selects three measurement points in the same string (i.e. the three points have the same ***Feature code*** and ***String number****)*, and creates an extra vertex in the string to form a parallelogram (squashed rectangle).

The created vertex does not have any of the vertex attributes SDR Setup Details, SDR Measurement Details or SDR Measurement as it is not created by a measurement.

For a full description and diagrams, see 25.3.5 Squashed Rectangle - Parallelogram in 25 12d Survey Guide.



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

Field Description	Type	Defaults	Pop-Up

Readings

Height mode	choice box		null, non_tinable, interpolate

*if **null**, the created point has a null z-value.*

*If **interpolate**, the created point has a z-value which is the average of the z-values of the three points.*

*If **non_tinable**, the created point has a z-value which is the average of the z-values of the three points but the vertex is not tinable.*

Description - used for finding three existing points

*If **no Feature code**, **String number** or **Point id** 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 given by **Height mode**.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 given by **Height mode**. The string is then closed.*

*If **only 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.*

*If **only the Point id** is given, 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 that have the same 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 given by **Height mode**. The string is then closed. Note that the point with the point id is not necessarily used.*

In each case, if there is less than three points then a squashed rectangle can not be created and no new point created.

Feature code, String number, Point id See 25.4.1.2.2 Feature Code, String Number, Point Id for Finding Standard Points or Strings

Named point

???

String order

???

Rest of the Fields and Buttons

Time surveyed, Comment, OK, Apply, Reset, Finish, Help See 25.4.1.3 Time surveyed, Comment and Bottom Panel buttons.

For the description on how the field data command is stored in a ***12d Field File,*** see 45 rectangle Make a parallelogram from the last three measurement points.

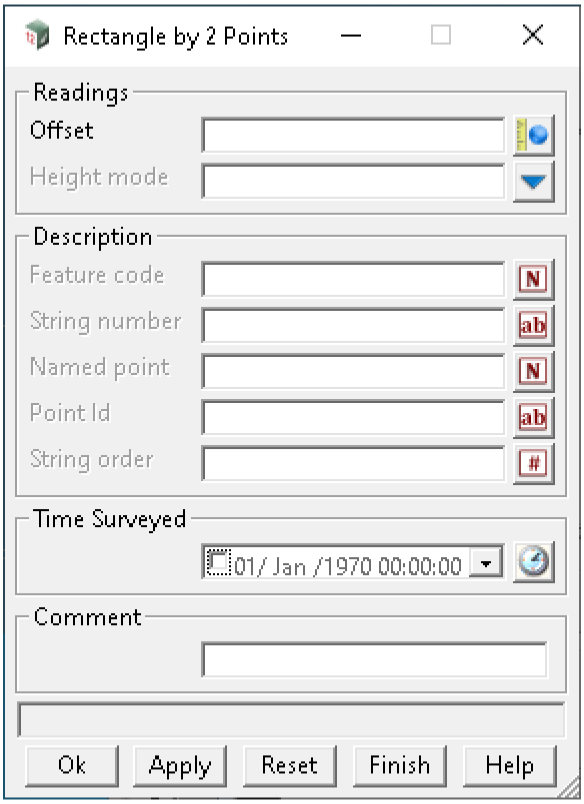
Continue to 25.4.2.52 String Rectangle by 2 Points (opcode 37) or return to 25.4.2 List of Field Data Commands or 25 12d Survey Guide

25.4.2.52 String Rectangle by 2 Points (opcode 37)

The ***Rectangle by 2 Points*** option selects two measurement points in the same string (the two points have the same ***Feature code*** and ***String number****),* and uses the given ***Offset*** value to create two extra vertices in the string to form a rectangle.

The created vertices do not have any of the vertex attributes SDR Setup Details, SDR Measurement Details or SDR Measurement as they are not created by a measurement.

For a full description and diagrams, see 25.3.6 Rectangle by 2 Points in 25 12d Survey Guide.



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

Field Description	Type	Defaults	Pop-Up

Readings

Offset real box

Offset value.

*The rectangle is defined by two points (reference side) and an **Offset value.***

*If a positive **Offset value** is given, two new points will be created to the right of the reference side.*

*If a negative **Offset value** is given, two new points will be created to the left of the reference side.*

Height mode choice box null, non_tinable, interpolate

*if **null**, the created point has a null z-value.*

*If **interpolate**, the created point has a z-value which is the average of the z-values of the two points.*

*If **non_tinable**, the created point has a z-value which is the average of the z-values of the two points but the vertex is not tinable.*

Description - used for finding two existing points

*If **no Feature code**, **String number** or **Point id** is given, the current measurement point and one previous point from the current string are used. If found, the two points are used to define the reference side of the* *rectangle and two new points created using the given **Offset value**. The heights of the third and fourth points are given by **Height mode**. The string is then closed.*

*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, these points are used to define the reference side of the rectangle and two new points created using the given **Offset value**. The heights of the third and fourth points are given by **Height mode**. The string is then closed.*

*If **only 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 and two new points created using the given **Offset value**. The heights of the third and fourth points are given by **Height mode**. The string is then closed.*

In each case, if there is less than two points then a rectangle can not be created and no new points created.

Feature code, String number, Point id See 25.4.1.2.2 Feature Code, String Number, Point Id for Finding Standard Points or Strings

Named point

???

String order

???

Rest of the Fields and Buttons

Time surveyed, Comment, OK, Apply, Reset, Finish, Help See 25.4.1.3 Time surveyed, Comment and Bottom Panel buttons.

Important Note

Two consecutive rectangles are unable to be defined side by side.

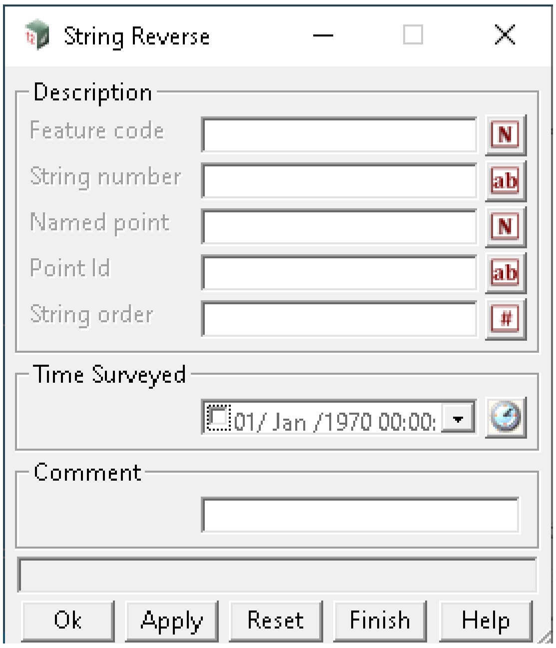
In other words if the two points given are part of string of greater than two vertices, the command will only work for sets of two points that are exclusively defined. That is, *f*or a 5 point string, a rectangle can be defined by points 1 and 2, and 4 and 5.

For the description on how the field data command is stored in a ***12d Field File,*** see 37 rectangle_2 Rectangle by two points.

Continue to 25.4.2.53 String Reverse (opcode 19) or return to 25.4.2 List of Field Data Commands or 25 12d Survey Guide.

25.4.2.53 String Reverse (opcode 19)

The ***String Reverse*** option reverses the direction of the selected string.



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

Field Description Type Defaults Pop-Up

Description - used for finding an existing string

*If **no Feature code**, **String number** or **Point id** is given, the string of the current measurement point is reversed.*

*If the **Feature code** and **String number** exist, then the last previous string with that feature code and string number is reversed.*

*If **only the Point id** exists, then the string containing the point with that point id, is reversed.*

Feature code, String number, Point id See 25.4.1.2.2 Feature Code, String Number, Point Id for Finding Standard Points or Strings

Named point

???

String order

???

Rest of the Fields and Buttons

Time surveyed, Comment, OK, Apply, Reset, Finish, Help See 25.4.1.3 Time surveyed, Comment and Bottom Panel buttons.

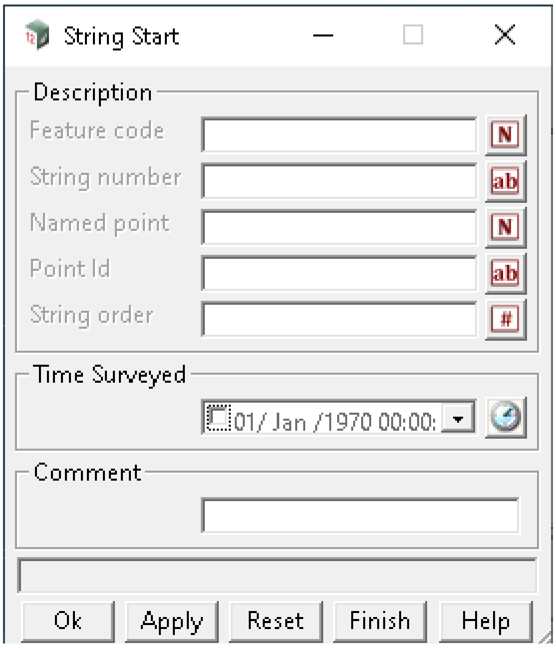
For the description on how the field data command is stored in a ***12d Field File,*** see 19 reverse_string Reverse string.

Continue to 25.4.2.54 String Start (opcode 47) or return to 25.4.2 List of Field Data Commands or 25 12d Survey Guide.

25.4.2.54 String Start (opcode 47)

The ***String Start*** option starts a new string at the selected vertex of an existing string.

For a full description and diagrams, see 25.3.3 Start New String in 25 12d Survey Guide.



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

Field Description Type Defaults Pop-Up

Description - used for finding an existing string

*If **no Feature code**, **String number** or **Point id** 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 **only 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.*

Feature code, String number, Point id See 25.4.1.2.2 Feature Code, String Number, Point Id for Finding Standard Points or Strings

Named point

???

String order

???

Rest of the Fields and Buttons

Time surveyed, Comment, OK, Apply, Reset, Finish, Help See 25.4.1.3 Time surveyed, Comment and Bottom Panel buttons.

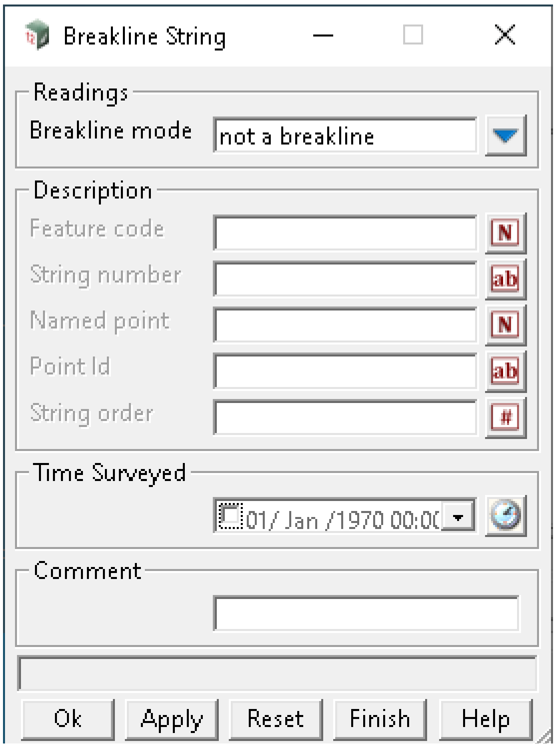
For the description on how the field data command is stored in a ***12d Field File,*** see 47 new_string Start a new string.

Continue to 25.4.2.55 String Tinable - Breakline String (opcode 46) or return to 25.4.2 List of Field Data Commands or 25 12d Survey Guide

25.4.2.55 String Tinable - Breakline String (opcode 46)

The ***Breakline Start*** option sets the breakline type for a selected string.

That is, it makes the selected a breakline (*i.e.* all vertices and segments are tinable) or not a breakline (*i.e.* all vertices and segments are not tinable).



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

Field Description	Type	Defaults	Pop-Up
Readings			
Breakline mode	choice box		not a breakline breakline

for Not a breakline

the selected string is set to a point string and hence is not a breakline (however the points are tinable).

for Breakline

the selected string is set to a line string (all vertices and segments are tinable) and is therefore a breakline.

Description - used for finding an existing string

*If **no Feature code**, **String number** or **Point id** is given, the string of the current measurement point is selected and **Breakline mode** used to define the string as a breakline or not.*

*If the **Feature code** and **String number** exist, then the last previous string with that feature code and string number is selected and **Breakline mode** used to define the string as a breakline or not.*

*If **only the Point id** exists, then the string containing the point with that point id, is selected and **Breakline mode** used to define the string as a breakline or not.*

Feature code, String number, Point id See 25.4.1.2.2 Feature Code, String Number, Point Id for Finding Standard Points or Strings

Named point

???

String order

???

Rest of the Fields and Buttons

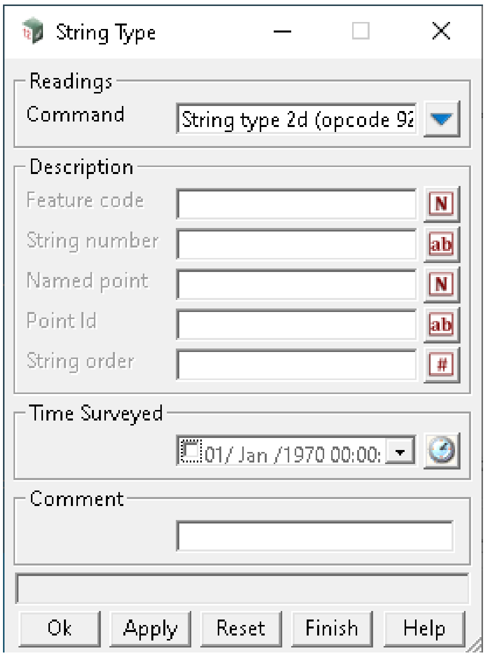
Time surveyed, Comment, OK, Apply, Reset, Finish, Help   See 25.4.1.3 Time surveyed, Comment and Bottom Panel buttons.

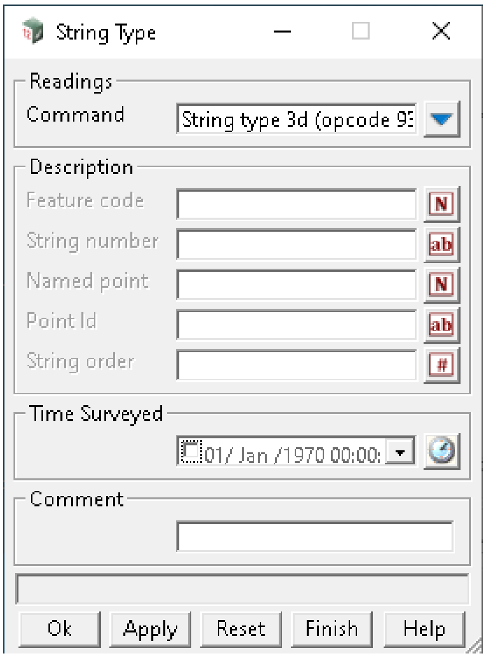
For the description on how the field data command is stored in a ***12d Field File,*** see 46 breakline Make the string a breakline or not.

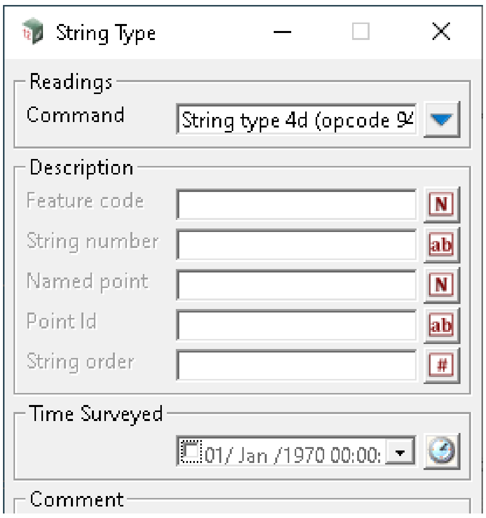
Continue to 25.4.2.56 String Type (opcodes 92, 93, 94) or return to 25.4.2 List of Field Data Commands or25 12d Survey Guide.

25.4.2.56 String Type (opcodes 92, 93, 94)

The ***String Type*** option sets whether a selected string is a 2d, 3d or 4d super string.







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

Field Description	Type	Defaults	Pop-Up
Readings			
Command	choice box	String type 2d	String type 2d (opcode 92) String type 3d (opcode 93) String type 4d (opcode 94)

*if **2d** - the string has null height for the entire string*
*if **3d** - the string can have different heights at each vertex*
*if **4d** - the string can have different heights and text at each vertex*

Description - used for finding an existing string

*If no **Feature code**, **String number** or **Point id** is given, the string of the current measurement point is* *selected and depending on the Opcode, is defined to be a 2d, 3d or 4d super string.*

*If the **Feature code** and **String number** exist, then the last previous string with that feature code and string number is selected and depending on the Opcode, is defined to be a 2d, 3d or 4d super string.*

*If **only the Point id** exists, then the string containing the point with that point id, is selected and depending on the Opcode, is defined to be a 2d, 3d or 4d super string.*

Feature code, String number, Point id See 25.4.1.2.2 Feature Code, String Number, Point Id for Finding Standard Points or Strings

Named point

???

String order

???

Rest of the Fields and Buttons

Time surveyed, Comment, OK, Apply, Reset, Finish, Help See 25.4.1.3 Time surveyed, Comment and Bottom Panel buttons.

For the description on how the field data command is stored in a ***12d Field File,*** see

92 string_type_2d Remove all z-values for a string (i.e. make all z-values null).

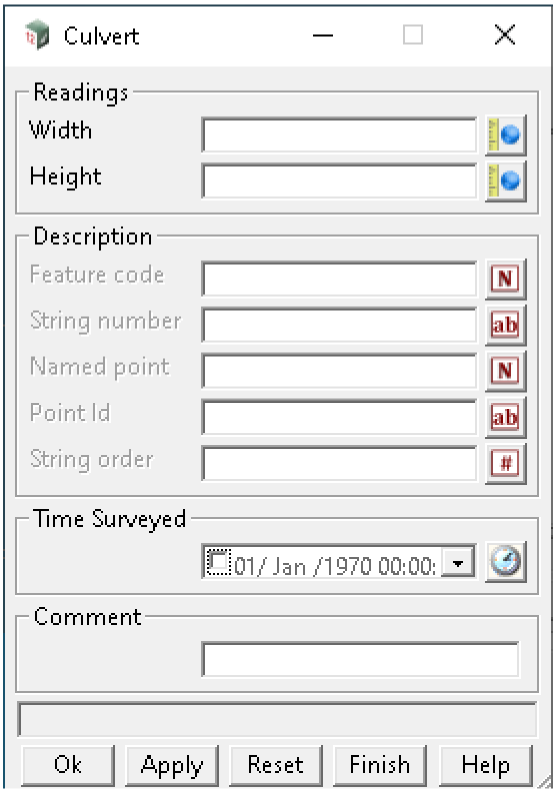
93 string_type_3d The string can have different z-values for each vertex.

94 string_type_4d Use name library file/ Map File for vertex text on the string - name mapping.

Continue to 25.4.2.57 Culvert (opcode 96) or return to 25.4.2 List of Field Data Commands or 25 12d Survey Guide.

25.4.2.57 Culvert (opcode 96)

The ***Culvert*** option sets a string to be a culvert super string with a given culvert width and height.



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

Field Description Type Defaults Pop-Up

Readings

Width

the width of the culvert

Height

the height of the culvert

Description - used for finding an existing string

*If **no Feature code**, **String number** or **Point id** is given, the string of the current measurement point is selected and created as a culvert string with the given width and height.*

*If the **Feature code** and **String number** exist, then the last previous string with that feature code and string number is selected and is created as a culvert with the given width and height.*

*If **only the Point id** exists, then the string containing the point with that point id, is selected and is created as a culvert with the given width and height.*

Feature code, String number, Point id See 25.4.1.2.2 Feature Code, String Number, Point Id for Finding Standard Points or Strings

Named point

???

String order

???

Rest of the Fields and Buttons

Time surveyed, Comment, OK, Apply, Reset, Finish, Help See 25.4.1.3 Time surveyed, Comment and Bottom Panel buttons.

Important Note

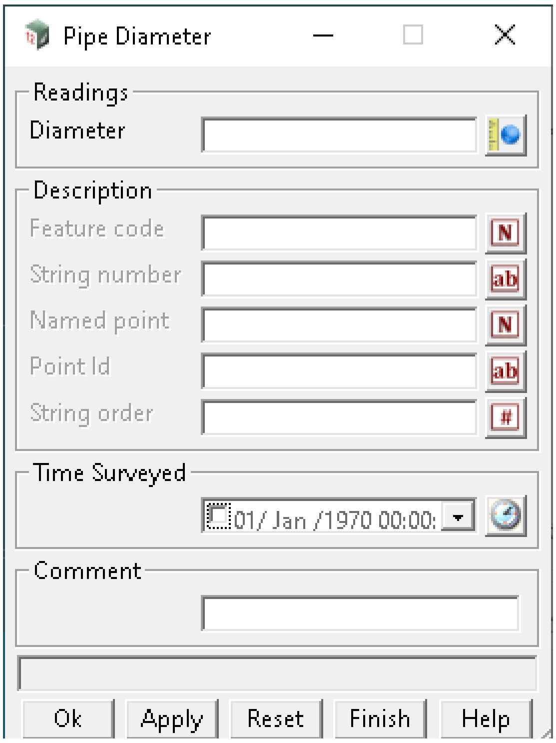
Culvert strings are always **line strings** and are stored with the justification of the majority of the string points. Individual culvert points are picked up by either top (obvert), centre (axial) or bottom (invert) of the culvert using opcodes 80, 81 and 82.

For the description on how the field data command is stored in a ***12d Field File,*** see 96 culvert width and height for a culvert super string.

Continue to 25.4.2.58 Pipe Diameter (opcode 95) or return to 25.4.2 List of Field Data Commands or 25 12d Survey Guide.

25.4.2.58 Pipe Diameter (opcode 95)

The ***Pipe Diameter*** option sets a string to be a pipe super string with a given pipe diameter.



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

Field Description Type Defaults Pop-Up

Readings

Diameter

the diameter of the pipe.

Description - used for finding an existing string

*If **no Feature code**, **String number** or **Point id** is given, the string of the current measurement point is selected and created as a pipe string with the given diameter.*

*If the **Feature code** and **String number** exist, then the last previous string with that feature code and string number is selected and is created as a pipe string with the given diameter.*

*If **only the Point id** exists, then the string containing the point with that point id, is selected and is created as a pipe string with the given diameter.*

Feature code, String number, Point id See 25.4.1.2.2 Feature Code, String Number, Point Id for Finding Standard Points or Strings

Named point

???

String order

???

Rest of the Fields and Buttons

Time surveyed, Comment, OK, Apply, Reset, Finish, Help See 25.4.1.3 Time surveyed, Comment and Bottom Panel buttons.

Important Note

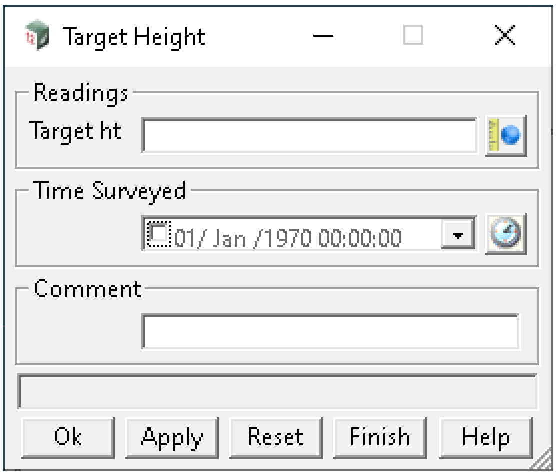
pipe strings are always **line strings** and are stored with the justification of the majority of the string points. Individual culvert points are picked up by either top (obvert), centre (axial) or bottom (invert) of the pipe using opcodes 80, 81 and 82.

For the description on how the field data command is stored in a ***12d Field File,*** see
95 pipe_diameter Diameter for a super string pipe.

Continue to 25.4.2.59 Target Height (opcode 5) or return to 25.4.2 List of Field Data Commands or 25 12d Survey Guide.

25.4.2.59 Target Height (opcode 5)

The ***Target Height*** option defines the target height to be used for the following measurements.



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

Field Description	Type	Defaults	Pop-Up

Target height

target height of following measurements.

Time surveyed, Comment, OK, Apply, Reset, Finish, Help See 25.4.1.3 Time surveyed, Comment and Bottom Panel buttons.

For the description on how the field data command is stored in a ***12d Field File,*** see 5 target_height New target height.

Continue to 25.4.2.60 Templating (opcodes 51 to 59) or return to 25.4.2 List of Field Data Commands or 25 12d Survey Guide.

25.4.2.60 Templating (opcodes 51 to 59)

The ***Templating*** option records and uses field templates when picking up strings.

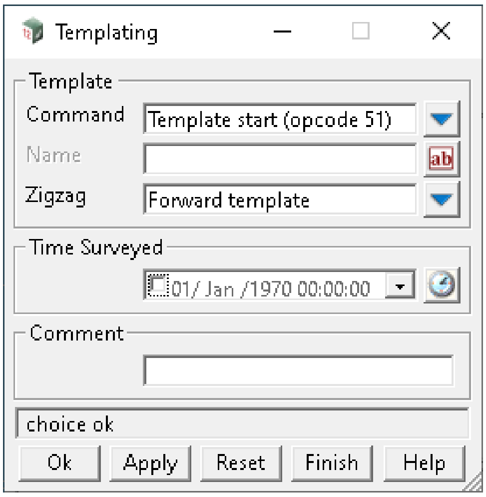
For a full description and diagrams, see 25.3.10 Field Templates in 25 12d Survey Guide.

For *Template start (opcode 51)*,go to	Template start
Template end (opcode 52)	Template end
Template pause (opcode 53)	Template pause
Template continue (opcode 54)	Template continue
Template record (opcode 55)	Template record
Template skip (opcode 56)	Template skip
Template insert (opcode 58)	Template insert
Template delete (opcode 57)	Template delete
Template change (opcode 59)	Template change

Template start

Selecting *Template start (opcode 51)* brings up the **Templating** panel with the *Command* field set to *Template start (opcode 51)*

Template start starts using the field template given in the field ***Name***.



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

Field Description	Type	Defaults	Pop-Up
Command		Template start	Template start (opcode 51) Template end (opcode 52) Template pause (opcode 53) Template continue (opcode 54) Template record (opcode 55)
Name	Text box		

Name of the field template to use.
If *Name* is blank, the default field template is used.

Zigzag	choice box	Forward template	Forward template Reverse template Start on zig of zigzag Start of zag of zigzag

If *zigzag* is ***forward template***, then the field template is used as a *forward* template.*See* 25.3.10.1 Forward Direction *in Appendix* 25 12d Survey Guide

reverse template, then the field template is used as a *reverse* template.*See* 25.3.10.2 Reverse Template Direction *in Appendix* 25 12d Survey Guide

start on 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). *See* 25.3.10.3 Zig-Zag *in Appendix* 25 12d Survey Guide.

start on 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).*See* 25.3.10.3 Zig-Zag *in Appendix* 25 12d Survey Guide.

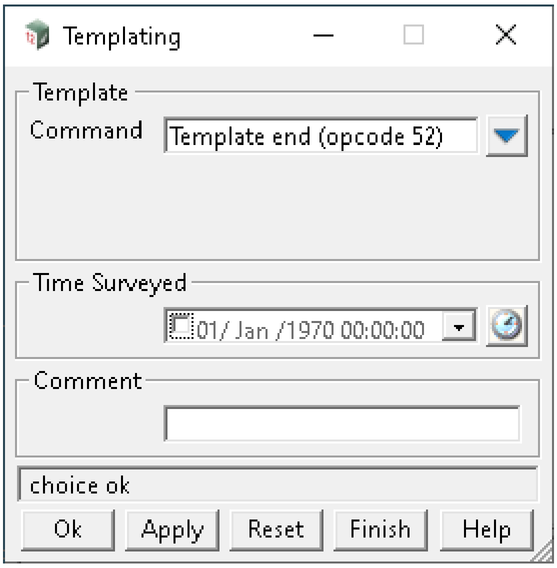
If *zigzag* is ***blank***, or anything other than ***forward***, ***reverse***, or ***start on zag*** then the field template is used as a zig-zag template starting on a ***zig***.

Time surveyed, Comment, OK, Apply, Reset, Finish, Help See 25.4.1.3 Time surveyed, Comment and Bottom Panel buttons.

Template end

Selecting *Template end (opcode 52)* brings up the **Templating** panel with the *Command* field set to **Template end**

Template end stops using the current field template, or stops recording a field template.



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

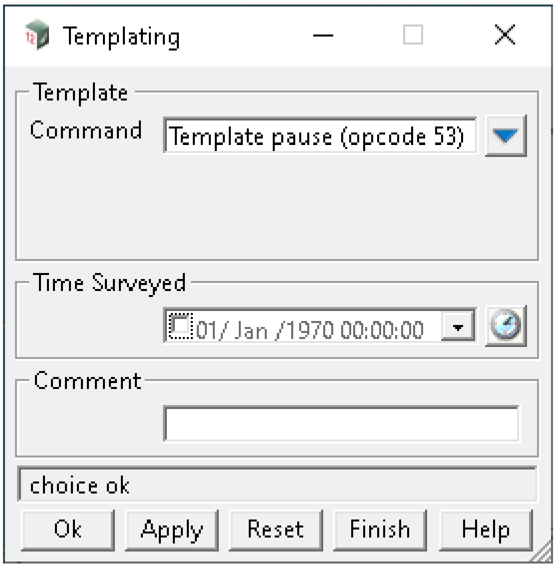
Field Description	Type	Defaults	Pop-Up
Command		Template end	Template start (opcode 51) Template end (opcode 52) Template pause (opcode 53) Template continue (opcode 54) Template record (opcode 55)

Time surveyed, Comment, OK, Apply, Reset, Finish, Help See 25.4.1.3 Time surveyed, Comment and Bottom Panel buttons.

Template pause

Selecting *Template pause (opcode 53)* brings up the **Templating** panel with the *Command* field set to **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.



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

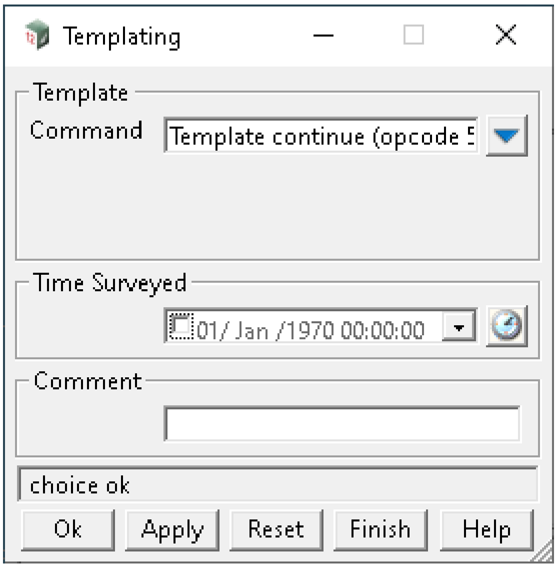
Field Description	Type	Defaults	Pop-Up
Command		Template pause	Template start (opcode 51) Template end (opcode 52) Template pause (opcode 53) Template continue (opcode 54) Template record (opcode 55)

Time surveyed, Comment, OK, Apply, Reset, Finish, Help See 25.4.1.3 Time surveyed, Comment and Bottom Panel buttons.

Template continue

Selecting *Template continue (opcode 54)* brings up the **Templating** panel with the *Command* field set to **Template continue**

Continue using or defining the current field template, which has been stopped by a *Template pause (opcode 53*). The *Continue* command only needs to be given once and applies to all following measurements until another *Pause* or *Finish* command is given.



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

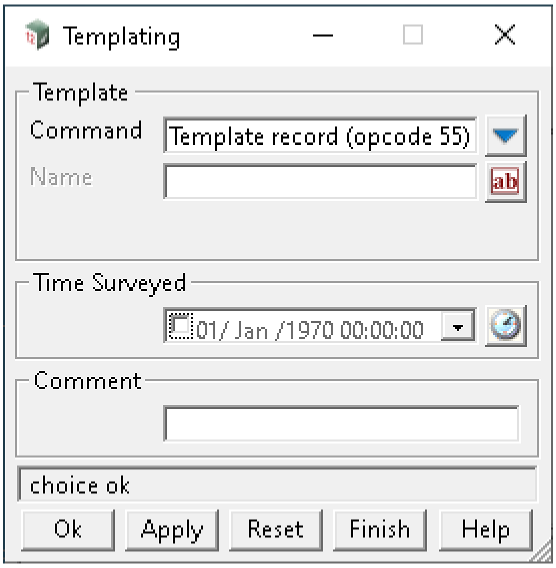
Field Description	Type	Defaults	Pop-Up
Command		Template continue	Template start (opcode 51) Template end (opcode 52) Template pause (opcode 53) Template continue (opcode 54) Template record (opcode 55)

Time surveyed, Comment, OK, Apply, Reset, Finish, Help See 25.4.1.3 Time surveyed, Comment and Bottom Panel buttons.

Template record

Selecting *Template record (opcode 55)* brings up the **Templating** panel with the Command field set to **Template record**

Template record stores the *feature code* and *string number* of the following measurements as a field template until a *Finish* code (52) is given.



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

Field Description	Type	Defaults	Pop-Up
Command		Template record	Template start (opcode 51) Template end (opcode 52) Template pause (opcode 53) Template continue (opcode 54) Template record (opcode 55)

Name

name of the template being created

Start recording a field template with the name **Name**. *If* **Name** *is blank, then it is the default field template that is defined.*

The feature code and string number of the following measurements are stored as the field template until a Finish code (52) is given. There is no limit to the number of feature code and string number pairs that can be stored in a field template.

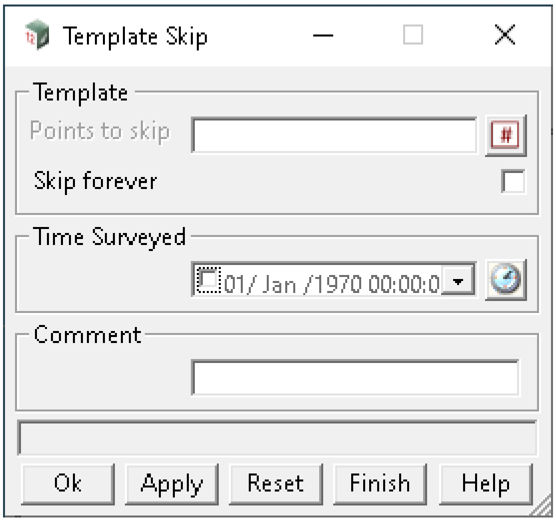
Time surveyed, Comment, OK, Apply, Reset, Finish, Help See 25.4.1.3 Time surveyed, Comment and Bottom Panel buttons.

Template skip

Selecting *Template skip (opcode 56)* brings up the **Template Skip** panel.

This panel allows the user to skip picking up one or more points (feature code and string number pairs) from the field template currently being used. The next measurement takes the *feature code* and *string number* from the next point after the skipped points, from the field template definition.

See 25.3.10.4 Skipping Field Template Points in Appendix 25 12d Survey Guide



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

Field Description Type Defaults Pop-Up

Points to skip

the number of points (feature code and string number pairs) of the template to skip.
If **Points to skip** *is blank or zero, then only one point is skipped otherwise* **Points to skip** *points are skipped.*

Skip forever tick box

if ticked, the given number of feature code and string number pairs are not used from then on.
If not ticked, only skip for this one used of the template.

Time surveyed, Comment, OK, Apply, Reset, Finish, Help See 25.4.1.3 Time surveyed, Comment and Bottom Panel buttons.

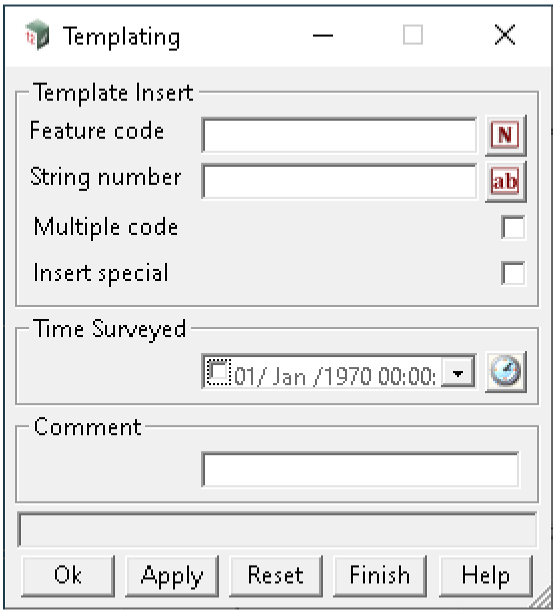
Template insert

Selecting *Template insert (opcode 58)* brings up the **Templating** panel.

This option allows the user to insert new point definitions into the template.

These may be **new points** or to **add a multiple code** to an **existing point** in the template.

See 25.3.10.5 Insert Template Points or Insert Multiple Codes in Appendix 25 12d Survey Guide



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

Field Description Type Defaults Pop-Up

Feature code

feature code to be inserted (as a new point or a multiple code) with the string number, into the template

String number

string number to be inserted (as a new point or a multiple code) with the feature code, into the template

Multiple code tick box

If ticked off (the default), a new point is inserted into the template with the Feature code and String number given in the panel.

If ticked on, no new point is inserted but the current template point will be made a multiple coded point with the Feature code and String number given in the panel. The multiple coding will be used each time the template point is used.

Insert special tick box

If ticked on, the point will be added to the current template being picked up (that is, to the end of the template).
If not ticked, the point will be added to the next template being picked up (that is, to the beginning of the template).

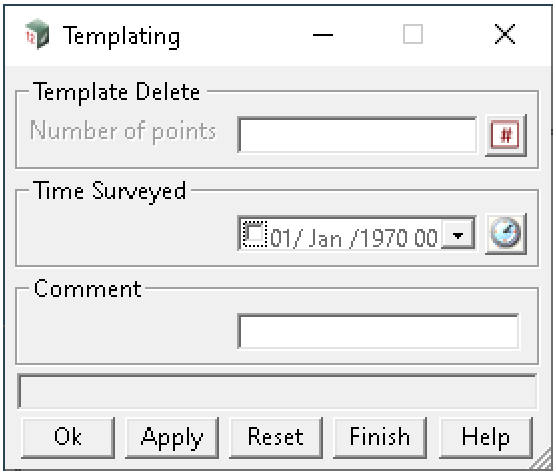
Time surveyed, Comment, OK, Apply, Reset, Finish, Help See 25.4.1.3 Time surveyed, Comment and Bottom Panel buttons.

Template delete

Selecting *Template delete (opcode 57)* brings up the **Templating** panel.

Allows the user to delete one or more points on the template. Picking up will use the updated template definition.

See 25.3.10.6 Delete Template Points in Appendix 25 12d Survey Guide



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

Field Description Type Defaults Pop-Up

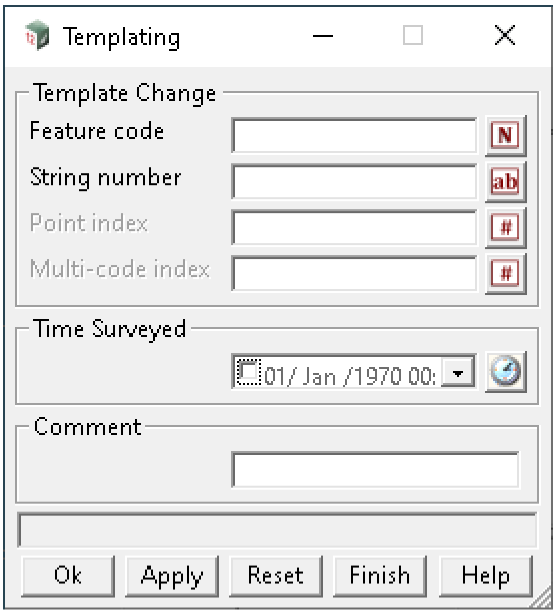
Number of points

number of points to delete from the template. Any further use of the template will used the updated template definition.

Time surveyed, Comment, OK, Apply, Reset, Finish, Help See 25.4.1.3 Time surveyed, Comment and Bottom Panel buttons.

Template change

Selecting *Template change (opcode 59)* brings up the **Templating** panel.



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

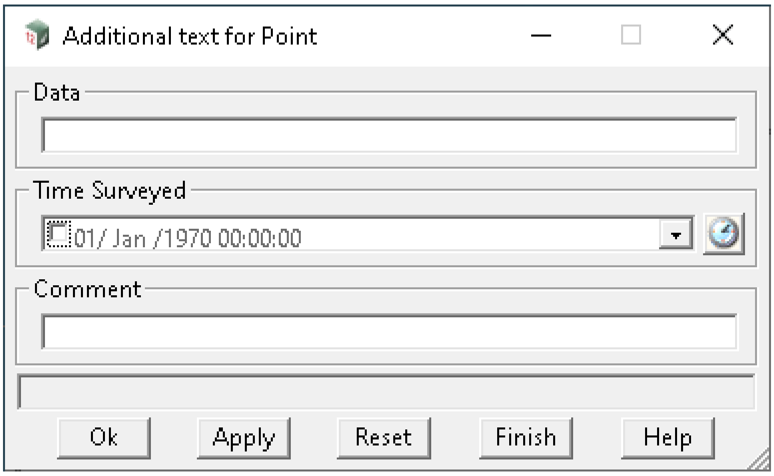
Field Description Type Defaults Pop-Up

Time surveyed, Comment, OK, Apply, Reset, Finish, Help See 25.4.1.3 Time surveyed, Comment and Bottom Panel buttons.

Continue to 25.4.2.61 Additional Text For Point (opcode 41) or return to 25.4.2 List of Field Data Commands or 25 12d Survey Guide.

25.4.2.61 Additional Text For Point (opcode 41)

The ***Additional Text for Point*** option appends extra text to any vertex text of the current measurement.



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

Field Description Type Defaults Pop-Up

Data

the text in **Data** *is appended to the vertex text of the current measurement point.*

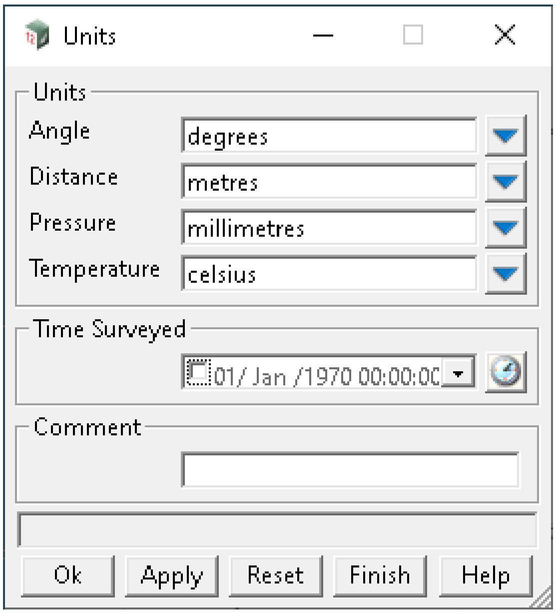
Time surveyed, Comment, OK, Apply, Reset, Finish, Help See 25.4.1.3 Time surveyed, Comment and Bottom Panel buttons.

For the description on how the field data command is stored in a ***12d Field File,*** see 41 additional_text Add additional text to the current measurement point.

Continue to 25.4.2.62 Units (opcode 100) or return to 25.4.2 List of Field Data Commands or25 12d Survey Guide.

25.4.2.62 Units (opcode 100)

The ***Units*** option sets the units used in the ***12d Field File.***



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

Field Description	Type	Defaults	Pop-Up
Angle	choice box		degrees, gons, mills

*if **degrees**, angles are given in **decimal degrees**.*

***Warning**: **gons** and **mils** are **not** implemented and even through chosen, **decimal degrees is still used**.*

Field Description	Type	Defaults	Pop-Up
Distance	choice box		metres, feet

*if **metres**, distance is given in metres.*

***Warning**: **feet** is **not** implemented and even through chosen, **metres is still used**.*

Field Description	Type	Defaults	Pop-Up
Pressure	choice box		millimetres, inches, millibars

*if **millimetres**, pressure is given in millimetres.*

***Warning**: **inches** and **millibars** are **not** implemented and even through chosen, **millimetres is still used**.*

Field Description	Type	Defaults	Pop-Up
Temperature	choice box		celsius, fahrenheit

*if **celsius**, temperatures are given in celsius.*

***Warning**: **fahrenheit** is **not** implemented and even through chosen, **celsius is still used**.*

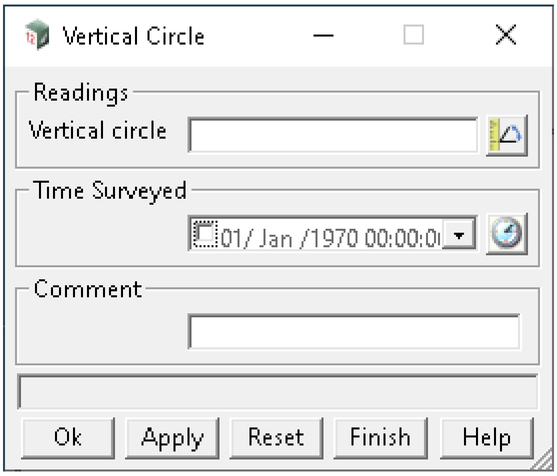
Time surveyed, Comment, OK, Apply, Reset, Finish, Help See 25.4.1.3 Time surveyed, Comment and Bottom Panel buttons.

For the description on how the field data command is stored in a ***12d Field File,*** see 100 units Units used in the 12d Field File.

Continue to 25.4.2.63 Vertical Circle Correction (opcode 15) or return to 25.4.2 List of Field Data Commands or 25 12d Survey Guide.

25.4.2.63 Vertical Circle Correction (opcode 15)

The ***Vertical Circle*** option subtracts a given value (in decimal degrees) from the vertical circle value in subsequent measurements.



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 following measurements*

Time surveyed, Comment, OK, Apply, Reset, Finish, Help See 25.4.1.3 Time surveyed, Comment and Bottom Panel buttons.

For the description on how the field data command is stored in a ***12d Field File,*** see 15 vertical_circle Vertical circle correction.

Continue to 26 12d Field File Format or return to 25.4.2 List of Field Data Commands or 25 12d Survey Guide.

25.4.2.64 Attributes for the Unknown Control Point Standard Measurement

For the string, the string attribute ***string_no*** is **NOT** created.

For the vertex, three attribute groups are created: ***SDR Setup Details***, ***SDR Measurement Details*** and ***SDR Measurement Geodetic Details***.

For ***SDR Setup Details***, the attribute names and values in the group are:

is_id	name of the Instrument setup that the measurement was taken from
is_x	x coordinate of the station
is_y	y coordinate of the station
is_z	z coordinate of the station
is_ht	height of the station
is_bearing_swing	the bearing swing in radians
is_setup_type	the type of setup (Station)

For ***SDR Measurement Details***, the attribute names and values are:

target_height	0.0

For ***SDR Geodetic Details***, the attribute names and values are:

25.5 Field Data Commands and 12d Field File Opcodes

When picking up data in the field, ***12d Pickup*** creates ***field data commands*** in the ***SDR Function.***

However at any time, the field data in the ***SDR Function*** can be written out as a ***12d Field File*** where the information is stored as ***opcodes*** and the opcode's associated data.

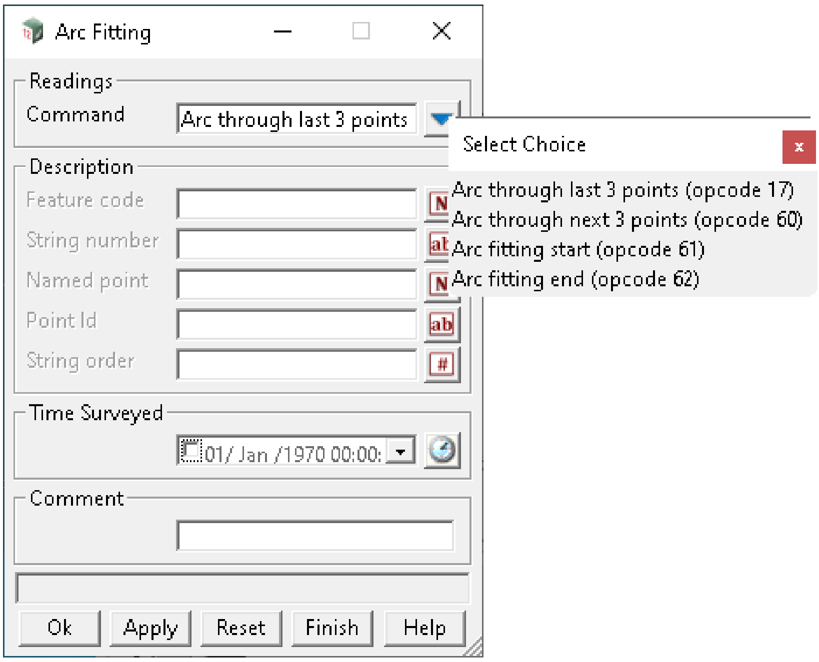
So to make this work effectively, there is a one-to-one relationship between the ***field data commands*** and the ***opcodes***. That is, for each ***field data command*** there is one ***opcode***, and vice-versa.

This relationship can be seen in the pop-up for the list of field data commands where each choice has its equivalent ***opcode number*** as part of the text.

Select Choice	See
Arc fitting end (opcode 62)	25.4.2.1 Arc Fitting (opcodes 17, 60, 61, 62)
Arc fitting start (opcode 61)	25.4.2.1 Arc Fitting (opcodes 17, 60, 61, 62)
Arc through last 3 points (opcode 17)	25.4.2.1 Arc Fitting (opcodes 17, 60, 61, 62)
Arc through next 3 points (opcode 60)	25.4.2.1 Arc Fitting (opcodes 17, 60, 61, 62)
Attachment (opcode 126)	25.4.2.2 Attachment (opcode 126)
Attribute for next segment (Measurement) (opcode 12	25.4.2.3 Measurement Attributes (opcodes 120 to 123)
Attribute for next segment (integer) (opcode 74)	25.4.2.4 Attributes (opcodes 68 to79)
Attribute for next segment (real) (opcode 75)	25.4.2.4 Attributes (opcodes 68 to79)
Attribute for next segment (text) (opcode 76)	25.4.2.4 Attributes (opcodes 68 to79)

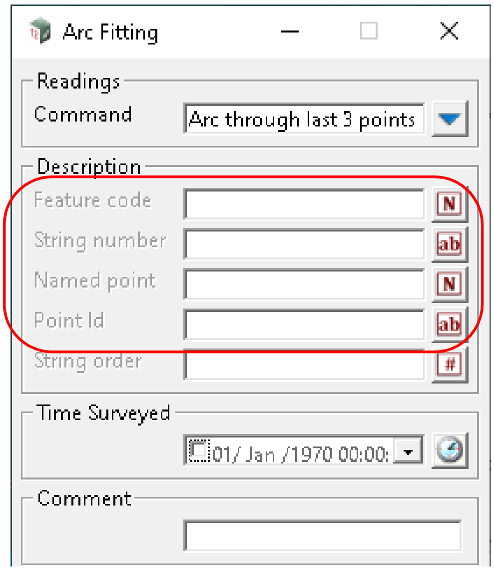
However, many of the opcodes can be grouped together and this fact is used in the panels in the ***SDR Editor.***

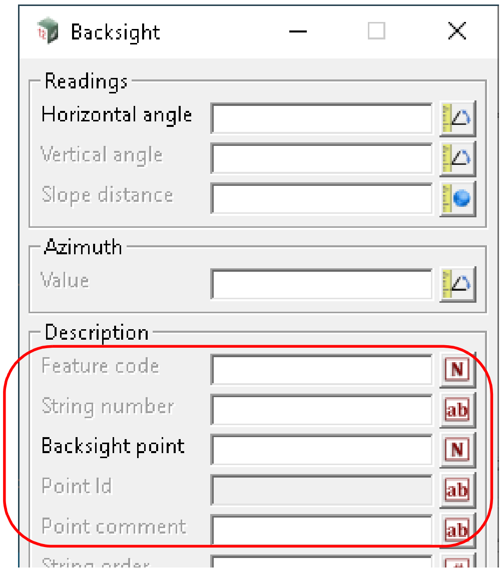
For example, although there are four different opcodes and field data commands for **Arc Fitting,** in the ***SDR Editor*** they all bring up the same panel, **Arc Fitting**, and the pop-up of choices for the **Command** field is restricted to the opcodes for arc fitting.



Another major difference between the display of field data commands and opcode is that the fields on the panel can have different text describing them but in the structure of the opcode record, the names of the fields are fixed and how they are used is determined by the opcode itself.

For example, in the ***Arc Fitting*** panel, there are the fields **Feature code**, **String number, Named point** and **Point id** and in the **Backsight** panel, there are the fields **Feature code**, **String number, Backsight point, Point id** and **Point comment.**





In the ***12d Field File***, these fields are collective referred as the ***point description*** and in the documentation are given the names:

feature_code
string_number
point_id
point_name
point_comment

Depending on the field data command/opcode, some of fields may be compulsory and others can be blank or not used at all.

In the ***field data command*** panel, the field ***Feature code*** is written out to the opcode field ***feature_code***, ***String number*** to ***string_number***, ***Point id*** to ***point_id*** and ***Point comment*** to ***point_comment***.

However the name of the field that is written out to ***point_name*** will vary.

For example, in the panel **Arc Fitting**, **Named point** is written out to ***point_id*** but in the **Backsight** panel, it is **Backsight point.**

25.6 stuff yet to use or remove

To Use

Important Note:

When examining an ***SDR function*** with the ***SDR Editor,*** the data is the ***SDR Function*** displayed using the ***Field Data Commands*** where the panel fields are given appropriate names.

For example, ***Setup point*** in the field data command panel, ***New Instrument***, for the name of the point to set up the instrument. Or ***Backsight point*** in the field data command panel, ***Backsight*** for the name for the name of the backsight that the backsight macerate is being made to.

However, when the data is stored as ***opcodes*** in the ***12d Field File***, some of the panel fields in the field data command panels are stored in a fixed ***point description*** structure (***point_description)*** consisting of ***feature_code***, ***string_number***, ***point_id***, ***point_name*** and ***point_comment*** in the ***12d Field File***.

And which panel fields go into which part of the point description structure in an ***opcode*** in the ***12d Field File*** will depend on the particular field data command. And how each of the part of the point description of an opcode is used in the reduction to produce super strings, depends on opcode.

For example, for a directly entered coordinate which has the field data command panel ***Direct Coordinate,*** the panel field ***Feature code*** is stored as ***feature_code***, ***String number*** as ***string_number, Named point*** as ***point_name***, which in this case is optional, ***Point id*** as ***point_id*** and ***Point comment*** as ***point_comment***.

And when the reduction takes place, two super string vertices are created:

1. one vertex super string which can be part of a many vertex super string with:

   String name of Feature code (feature_code)

   Vertex id of Named point (point_name)

   Vertex text of Point comment (point_comment).

   The String number (string_number) is stored as an attribute of the super string

   The Named point (point_name) is not used.

2. if ***Named point*** (point_name) is ***not blank***, then an extra ***one vertex super string*** is created with:

   String name of Feature code (feature_code)

   Vertex id of Point id (point_id)

   Vertex text of Point comment (point_comment).

   The String number (string_number) and Point id (point id) are not used.

To Use

The difference between ***point names*** and ***point ids*** is that:

point names are usually given by the user and should be a unique identifier for an easily recognised ***physical point*** that may be reused by other measurements.

whilst for that **same physical point,** a number of measurements may be made to that physical point and each measurement will be assigned a different ***point ids***, by ***12d Field*** or the data collector.

For example, measurements to control stations where the measurements are made to a fixed control point identified by its control point name, but each measurement to the control station point is given a different ***point id*** by ***12d Field*** or the data collector.

In most instances, each measurement to the same point has a different ***point id*** and ***12d Model*** automatically gives the measurement the same ***point name*** as it is rare to measure a non-control point more than once, However 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:

-to be moved

The measurements themselves, and the extra information, is written out as operation codes (***opcodes***) which consists of a unique identifier such as a number or some text, and the required data that goes with that opcode.

Important Note - put somewhere

Most ***survey data commands*** only work with standard measurements and ignore any named measurements.

Old Section:

Some commands such as ***Backsight***, ***New instrument*** and ***Check*** allow the user to enter **existing *point names*** (*i.e.* Backsight point, Setup point and Check point), or in the case of measurements from ***12d Field*** or a data collector, **both *point name*** and ***point ids*.**

The difference between ***point names*** and ***point ids*** is:

(a) ***point names*** are usually specified by the user and should be a unique identifier for a known physical point

(b) for each measurement, a different ***point id*** is generated by ***12d Field*** or by the software on the survey instrument or data collector, hence when a number of measurements are taken to the same physical point, each measurement will have a different ***point id***. Point ids should be unique in the one a 12d Field File.

For example, when taking measurements to a control station with a given point name, more than one measurement can be made to the control station (**point name**) but **each measurement** is given a **different point id**.

In most instances, a **measurement to a known point** has a **point id** and ***12d Model*** automatically gives it the **same point name** as it is rare to measure to a non-control point more than once. However the ***point name*** can be over ridden by the user.

The use of ***point names*** and ***point ids*** means that the reduction routine can ***search for the details of a special point*** (e.g. coordinates) and these are used for producing the coordinates of other measurements in the reduction.

Given a ***search_point_name*** and/or a ***search_point_id,*** the order for searching to find a match is:

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 *search_point_name*. If a string is found, the first point of the string is used for the (x,y,z) coordinates.
2. A search is made of the control model for a vertex of a string whose point id is the same as the *search_point_name*. If a vertex is found its (x,y,z) coordinates are used.

3. If only a *search_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 *search_point_id*. If a vertex is found its (x,y,z) coordinates are used.

Next search the already entered directly entered coordinates (DEC) in the field file:

4. A search is made of previously entered directly entered coordinates in the field file for a directly entered coordinate whose *point name* is the same as the specified *search_point_name*. If a DEC is found, its (x,y,z) coordinates are used.
5. A search is made of previously entered directly entered coordinates in the field file for a directly entered coordinate whose *point id* is the same as the *search_point_name*. If a DEC is found, its (x,y,z) coordinates are used.
6. A search is made of previously entered directly entered coordinates in the field file for a directly entered coordinate whose *point id* is the same as the specified *search_point_id*. If a DEC is found, its (x,y,z) coordinates 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 *search_point_name*. If a measurement is found, its (x,y,z) coordinates 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 *search_point_name*. If a measurement is found, its (x,y,z) coordinates 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 *search_point_id*. If a measurement is found, its (x,y,z) coordinates 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) coordinates 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 string name as *search_point_name*, and as the vertex text for the one point super string point, the **Station label prefix** field value followed by *search_point_name.*

26 12d Field File Format

The detailed definition of the ***12dfield*** and ***fld*** files will now be given.

The ***fld*** file is the original ***12d Solutions*** text field file format and many raw files from survey instruments or data collector are converted to a ***fld*** file before reduced by ***12d Model***.

However, the limitations in the structure of the ***fld*** file made it incapable of supporting all the functionality required for ***12d Field*** and consequently a new, and more easily extendable, field file format was required. The new file format is the ***12dfield*** file and it is an XML file.

This documentation consists of some definitions used in describing the two file formats, followed by the complete description of the ***12dfield****. and* ***fld*** file formats.

Note:

Unless a distinction is required, both ***12dfield*** or ***fld*** files will be referred to as ***12d Field Files***.

See

26.1 Structure of the 12dfield File

26.2 Structure of the fld File

26.3 Point Description

26.4 Keyword Blocks in the 12dfield File

26.5 Measurements and Named Measurements

26.6 Searching for Special Coordinates

26.7 Full Description of 12d Survey Opcodes

26.8 12d Survey Opcode Summary

26.1 Structure of the 12dfield File

The ***12dfield*** file is an XML file and is made up of **blocks** that can extend over many lines but the information within each block has identifiable starts and ends.

Having identifiable starts and ends has the advantage that XML readers can jump over information they do not understand and can keep reading data the XML file.

Square brackets **[ ]** around an item means that the item is optional.

Most ***12dfield*** files consist of the data for one visit to the field, but to allow for larger jobs that may take many days and/or involve a number of surveyors, the ***SDR Function*** can reduce any number of separate ***12dfield*** files as the one job. Hence a ***12dfield*** file can be written out from the ***SDR Function*** that maintains the integrity of each individual ***12dfield*** file that is included in the ***SDR Function***.

So there are two possibilities for the structure of the ***12dfield*** file:

(a) the ***12dfield*** file - all the data is in the one file (26.1.1 One 12dfield file)

or

(b) internally the ***12d field*** file consists of a number of separate ***12d field*** files (26.1.2 More Than One 12dfield File).

26.1.1 One *12dfield* file

The structure of the ***12dfield*** file is:

<?xml version= *xml_version_number***>**

<xml12d xmlns = ...>

[<meta_data_block>]

<field12>

[<version> *12dfield_file_version_number* **</version>]**

<opcode_text_block>

<opcode_text_block>

...

....

...

<opcode_text_block>

</field12d>

</xml12d>

26.1.2 More Than One *12dfield* File

When the ***12dfield*** file is an amalgamation of more than one ***12dfield*** file, the data for each separate ***12dfield*** file is enclosed in a ***<field file block>.***

The structure of the ***12dfield*** file is:

<?xml version= *xml_version_number***>**

<xml12d xmlns = ...>

[<meta_data_block>]

<field12>

[<version> *12dfield_file_version_number* **</version>]**

<field_file_block>

<field_file_block>

...

....

...

<field_file_block>

</field12d>

</xml12d>

Continue to 26.3 Point Description.

26.2 Structure of the fld File

Each line in the ***fld*** file is called a record and consists of a **numeric *operation code*** (or ***opcode*** for short) followed by zero or more tabs and pieces of information.

What actually follows the ***opcode*** depends on the *opcode*.

Hence the ***fld*** file record is:

opcode
99

or

opcode	tab	value	...	tab	value
02		abcS			fred

Continue to 26.3 Point Description.

26.3 Point Description

Feature codes and ***string numbers*** are entered by the surveyor whilst surveying in the field and entered by the surveyor into ***12d Pickup***, or if ***12d Pickup*** is not being used, the instrument or a separate data collector external to the instrument.

For convenience, ***data collector*** will be used to refer to data stored on the instrument itself, or in an data collector that is external to the instrument.

The ***point ids*** are usually automatically created by ***12d Pickup***, or the data collector, but sometimes will be entered by the surveyor.

Other information can also be entered by the surveyor but the extra information must end up in the ***12d Field File*** for it to be used by ***12d Model***.

For **non-*12d Pickup*** users, how any of the information is entered in the field depends on the data recorder and the coding convention used and the user can set up a ***Data Collector Definition*** in ***12d Model*** for the information to be converted correctly into a ***12d Field File***. In the in the ***12d Model Reference Manual***, see 41.1 Data Collector Definitions.

In most records of a ***12d Field File***, a ***feature code***, ***string number***, ***point id, point name*** and ***point comment*** (also called ***point text***) are present and stored together, either as sequential lines in the ***12dfield*** file, or on the same line separated by tabs in the ***fld*** file.

(a) The **feature code** and **string number** are for stringing points together, described in the ***12d Model Reference Manual*** in 25.3.1 Stringing in the Field.

(b) The **point id** is the EDM tacheometry measurement point id which is not normally entered by the user but is written into the ***12d Field File*** either by ***12d Field***, or in the raw data file, by the data collector. The ***point id*** can be ***alphanumeric***.

During reduction, the **point id** is stored as the ***point id*** for the vertex of the super string that the measurement point is part of.

(c) The **point name** is used to store the name of a ***station*** or ***special named point***, and is supplied by the surveyor with certain opcodes. It is also used by some opcodes to created a ***named point*** that can be searched for by other opcodes. See 26.5 Measurements and Named Measurements.

(d) The **point comment** or **point text** is stored as **vertex text** for that vertex of the super string.

For simplicity in describing the ***12d Field File***, the ***feature code***, ***string number***, ***point id, point name*** and ***point comment*** are grouped together and called the **point description**.

Hence the **point description** consists of the following pieces of information:

- feature code (string name)
- string number
- point id
- point name
- point comment or point text

In the ***12dfield*** file, the ***point description*** is denoted by **<point_description>** and is actually five separate lines of information:

<feature_code>abc</feature_code>

<string_number>01</string_number>

<point_id>1002</point_id>

<point_name>STN 4</point_name>

<point_comment>freddie</point_comment>

The order of the five items in <point_description> file is not important as each item is easily identified.

In the ***fld*** file, the ***feature code***, ***string number***, ***point id***, ***point name*** and ***point text*** must be given in this order and the values are separated by tabs. Each value can be up to sixty-three characters in length. If a value is missing then a tab is still needed so there may be two or more sequential tabs.

In the ***.fld*** file, the ***point description*** will be five items of information separated by tabs.:

feature code	string number	point id	point name	point comment
abc	01	1002	STN 4	freddie

The order of the five items in the ***fld*** file record is **critical** and each is separated by a <Tab>.

So, in summary, the ***point description*** is shorthand for **five** pieces of information

26.4 Keyword Blocks in the *12dfield* File

There are many regularly used blocks of information in ***12dfield*** that will be identified and documented by keywords.

The keyword and its block consist of a starting **<keyword>**, followed by the information in the keyword block, and ending in **</keyword>**

That is

<keyword> information in the keyword block **</keyword>**

Square brackets **[ ]** around an item means that the item is optional.

The keyword blocks used in the ***.12dfield*** file are:

<meta_data_block>

<units_block>

<application_block>

<field_file_block>

<opcode_text_block>

<time_created>

<time_updated>

<time_surveyed>

<id>

<comment>

<State>

<original>

and the format for time, time_text.

Finally there are <point_description>and [<op_code_properties>] which are not actual keyword blocks but are shorthand for a group of keyword blocks

<meta_data_block>

This is optional header data for the ***12dfield file***.

The format of the **meta_data_block** keyword block is:

<meta_data>

<units_block>
<application_block>

</meta_data>

<units_block>

This is the units used in the ***12dfield*** file.

Import note: the ***12dfield file*** currently only supports the one set of units as given below.

The units_block is currently optional as only one set of units is currently used.

The format of the **units_block** keyword block is:

<units>

<linear> *metres* </linear>

<area> *square metres* </area>

<volume> *cubic metres* </volume>

<temperature> *celsius* </temperature>

<pressure> *millibars* </pressure>

<angular> *decimal degrees* </angular>

<direction> *decimal degrees* </direction>

</units>

<application_block>

This is an option block containing information about the application (software) that created the 12dfield file, plus some information about the ***12d Model*** setups used.

The application_block is optional.

The format of the **application_block** keyword block is:

<application>

<name> *name of software creating the 12dfield file* </name>

<manufacturer> *name of company creating the software* </manufacturer>

<manufacturer_url> *url of the manufacturer* </manufacturer_url>

<application> *full name including version of the software* </application>

<application_build> *build number of the software* </application_build>

<application_path> *path to the software* </application_path>

<application_date_gmt> time_text (*gmt time when was application created)*
</application_date_gmt>

<application_date> time_text (*local time when application was created)*
</application_date>

<project_name> *12d Model project that created the 12dfield file* </project_name>

<project_guid> *guid 12d Model project that created the 12dfield file* </project_guid>

<project_folder> *folder the 12d Model project is in* </project_folder>

<client> *name of client using 12d Model* </client>

<dongle> *hardware lock being used for 12d Model* </dongle>

<maintenance> *maintenance_status* </maintenance>

<environment/

<env4d> *path of the env file being used by 12d Model* </env4d>

<user> *computer name of the user using 12d Model* </user>

<export_file_name> *name of the 12dfield file* </export_file_name>

<export_date_gmt> time_text (*gmt time when file was created)* </export_date_gmt>

<export_date> / time_text (*local time when file was created)* </export_date>

</application>

<field_file_block>

This contains the opcodes for a field file within the ***12dfield file***.

The format of the **field_file_block** keyword block is:

<field_file>

<name>*field_file_name***</name>**

<time> time_text**</time>**

<time_created> time_text **</time_created>**

<time_updated> time_text **</time_updated>**

<id>

<comment>

<state>*state_text* **</state**

<children>

<opcode_text_block>

<opcode_text_block>

...

...

...

<opcode_text_block>

</children>

</field_file>

<opcode_text_block>

The ***<opcode_text_block>*** block consists of the ***opcode_text*** for the particular opcode as the header and footer of the block which enclose the zero or more lines of information that is required for the particular opcode.

<opcode_text>

...

...

...

</opcode_text>

What follows the ***<opcode_text***> depends on the particular ***opcode***.

For the list of opcode_texts, see 26.7 Full Description of 12d Survey Opcodes.

For those familiar with the ***fld*** format which uses ***numeric opcodes***, when ***12d Model*** writes out an ***12dfield*** opcode record, it often precedes the record by a comment that gives the equivalent numeric opcode. But it is only a comment and is not required in the ***12dfield*** file.

As an example, for the ***opcode_text*** *arc_fitting_next_3_points*, the ***opcode_text_block*** is

```
<!-- opcode number 60 -->
 <arc_fitting_next_3_points>
   <feature_code/>
   <string_number/>
   <point_id/>
   <point_name/>
   <point_comment/>
     <time_created>2021-12-27T06:14:59Z</time_created>
     <time_updated>2021-12-27T06:14:59Z</time_updated>
     <id>516</id>
   <comment/>
   <state>Unknown</state>
 </arc_fitting_next_3_points>
```

time_text

time_text is a string of characters in the W3C time format.

*YYYY***-***MM***-***DD***T***hh***:***mm***:***ss***Z** *see* 1.3.8 W3C Time Format.

For example, 2015-09-28T06:42:45Z

<time_created>

This is the time that the opcode was first created.

The format of the **time_created** keyword block is:

<time_created> time_text</time_created>

Note that the time format for 12da is different from the one of 12dxml.

<time_updated>

This is the time that the opcode was last modified.

The format of the **time_updated** keyword block is:

<time_updated> time_text</time_updated>

Note that the time format for 12da is different from the one of 12dxml.

<time_surveyed>

The format of the **time_surveyed** keyword block is:

<time_surveyed> time_text</time_surveyed>

Note that the time format for 12da is different from the one of 12dxml.

<id>

The id is an internal session identifier.

The format of the **id** keyword block is:

<id>*id_value*</id>

<comment>

A comment can be included with an opcode.

The format of the **id** keyword block is:

<comment>*comment_text*</comment>

where ***comment_text*** is a string of characters.

<State>

The format of the **state** keyword block is:

<state>*state_value*</state>

where ***state_value*** is one of:

Unknown

Field

Deleted

Changed

Added

Auto added

Change deleted

Add deleted

<original>

Some ***12d Model*** options can edit the **opcodes** and when such edits occur, an **<original>** block is created inside the <opcode> block, and the original information inside the ***<op_code>*** block is copied to the **<original>** block.

Important Note
if subsequent edits occur to the opcode block, only the final data and the original data is maintained and none of the in between edits.

As an example of an <original> block, if a <coordinate> opcode was edited, the entry in the ***12dfield*** file would be:

```
<coordinate>
    <x>100</x>
    <y>100</y>
    <z>100</z>
    <feature_code/>
     <string_number/>
     <point_id/>
     <point_name/>
     <point_comment/>
        <time_created>2021-12-27T06:14:59Z</time_created>
        <time_updated>2021-12-27T06:14:59Z</time_updated>
        <id>468</id>
       <comment/>
```

```
        <state>Changed</state>
        <original>
          <x>-42.0</x>
          <y>42.0</y>
          <z>4.24242</z>
            <feature_code>OC</feature_code>
            <string_number/>
            <point_id/>
            <point_name/>
            <point_comment/>
              <time_created>2021-12-27T06:14:59Z</time_created>
              <time_updated>2021-12-27T06:14:59Z</time_updated>
              <id>468</id>
              <comment/>
              <state>Field</state>
         </original>
      </coordinate>
```

<point_description>

<point_description> has been previously documented and is shorthand for five pieces of information. See 26.3 Point Description.

This is:

<feature_code>*feature_code_value***</feature_code>**

<string_number>*string_number_value***</string_number>**

<point_id>*point_id_value***</point_id>**

<point_name>*point_name_value* **</point_name>**

<point_comment>*point_comment_value***</point_comment>**

<XYZ>

The **XYZ** block is shorthand for a number of properties that go with most opcodes.

That is, <XYZ> is shorthand for the three items:

<x>*x_value***</x>**

<y>*y_value***</y>**

<z>*z_value***</z>**

[<op_code_properties>]

The op_code_properties block is shorthand for a number of properties that go with most opcodes.

That is, <op_code_properties> is shorthand for the six items:

<time_created>

<time_updated>

<time_surveyed>

<id>

<comment>

<State>

Continue to 26.5 Measurements and Named Measurements.

26.5 Measurements and Named Measurements

The ***12d Field File*** allows for six types of measurements or entered coordinates, that create points (vertices) in super strings. They are

(a) EDM measurement (HA,VA,SD, + point_description)

(b) EDM measurement VD (HA,HD,VD + point_description)

(c) EDM measurement HT (HA,HD,HT, + point_description)

(d) three hair stadia measurement

(e) directly entered coordinate

(f) GNSS coordinate

For convenience, the six types will all be referred to as measurements.

Each of the above measurements creates a new point which in the reduction, is appended to previous points with the same *feature code* and *string number*.

When collecting the data, the measurement that is currently being done is referred to as the ***current measurement point*** or ***current point***, and the string it is appended to as the ***current string*.**

If a ***point_name*** **exists** in the ***point description*** for any of the measurements, then it is called a ***named measurement*** and a one point super string of name ***point_name*** is created and if it is used, mapped using the Map 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 coordinates.

For a ***named measurement,*** an ordinary measurement point can also be created but whether this occurs depends on a tick in a field in the ***12d Model SDR Function***.

Continue to 26.6 Searching for Special Coordinates.

26.6 Searching for Special Coordinates

When setting up the instrument on a point, measuring to a backsight, doing a check measurement or manually entering a bearing to use as the bearing datum difference, a ***point_name*** and/or ***point_id*** in the ***point description*** of the opcode record is used to find a point whose coordinates are used for the reduction of further measurements.

To save confusion in this section, ***Name*** and ***Id*** are used for values of ***point_name*** and ***point_id*** that are being searched for.

Given the ***Name*** and/or ***Id***, a point is found by searching in the following order:

First search the Control model (if it exists) in 12d Model:

1. ***Name*** amongst **Vertex ids**

   A search in ***12d Model*** is made of the ***Control model*** for a **vertex of a string** whose **point id** is the **same as *Name***. If a vertex is found its (x,y,z) coordinates and details are used.

2. ***Id*** amongst **Vertex ids**

   A search in ***12d Model*** is made of the ***Control model for*** a **vertex of a string** whose **point id** is the **same as *Id***. If a vertex is found its (x,y,z) coordinates and details are used.

3. ***Name*** amongst **String names**

   A search in ***12d Model*** is made of the ***Control model*** for a **string whose name** is the **same as *Name*.** If a string is found, the **first vertex of the string** is used for the (x,y,z) coordinates and details.

Next search the Network model (if it exists) in 12d Model:

4. ***Name*** amongst **Vertex ids**

   A search in ***12d Model*** is made of the ***Network model*** for a **vertex of a string** whose **point id** is the **same as *Name***. If a vertex is found its (x,y,z) coordinates and details are used.

5. ***Id*** amongst **Vertex ids**

   A search in***12d Model*** is made of the ***Network model*** for a **vertex of a string** whose **point id** is the **same as *Id***. If a vertex is found its (x,y,z) coordinates and details are used.

If *Use field coordinates* is ticked in the SDR Function in *12d Model*, next search the already entered Directly Entered Coordinates (DECs) in the 12d Field File. A DEC has a point_name and point_id

6. ***Name*** amongst **point_names**

   A search is made of previously entered ***directly entered coordinates*** in the field file for a DEC ***point_name*** is the **same as *Name***. If a DEC is found, its (x,y,z) coordinates are used.

7. ***Name*** amongst **point_ids**

   A search is made of previously entered ***directly entered coordinates*** in the field file for a DEC whose ***point_id*** is the same as ***Name***. If a DEC is found, its (x,y,z) coordinates are used.

8. ***Id*** amongst **point_ids**

   A search is made of previously entered ***directly entered coordinates*** in the field file for a DEC whose point_id is the **same as *Id***. If a DEC is found, its (x,y,z) coordinates are used.

Next search the previous measurements in the field file: a measurement has a point_name and point_id

9. ***Name*** amongst **point_names**

   A search is made of ***previous measurements*** in the field file for a measurement whose **point_name** is the **same as *Name***. If a measurement is found, its (x,y,z) coordinates are used.

10. ***Name*** amongst **point_ids**

A search is made of **previous measurements** in the field file for a measurement whose ***point id*** is the **same as** ***Name***. If a measurement is found, its (x,y,z) coordinates are used.

11. ***Id*** amongst **point_ids**

    A search is made of **previous measurements** in the field file for a measurement whose **point_id** is the **same as** ***Id***. If a measurement is found, its (x,y,z) coordinates are used.

Finally

12. If **no match** is found, then in ***12d Model***, the user will be ***prompted for the details of the unfound point.***

    The user is asked to type in the (x,y,z) coordinates 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 **string name** ***Name*****,** and for the vertex text, the **Station label prefix** field value followed by ***Name.***

For a summary of the **12d Field File Opcodes**, see 26.8 12d Survey Opcode Summary

For the full description of the **12d Field File Opcodes**, see 26.7 Full Description of 12d Survey Opcodes.

Note

The difference between ***point names*** and ***point ids*** is that:

point names are usually given by the user and should be a unique identifier for an easily recognised ***physical point*** that may be reused by other measurements.

Whilst for that **same physical point,** a number of measurements may be made to that physical point and each measurement will be assigned a different ***point id***, by ***12d Pickup*** or the data collector.

For example, measurements to control stations are made to a fixed control point identified by its control point name, but each measurement to the control station point is given a different ***point id***.

In most instances, each measurement to the same point has a different ***point id*** and ***12d Model*** automatically gives the measurement the same ***point name*** as it is rare to measure a non-control point more than once, However the ***point name*** can be over ridden by the user.

26.7 Full Description of 12d Survey Opcodes

The record for each *opcode* will now be described in detail for both versions of the ***12d Field Files***,***12dfield*** and ***fld***.

For each ***opcode*** record, the following information is given:

- The first line consists of the ***numeric opcode***, the **text opcode** and a **short description** of the opcode.
- The next block gives the **full syntax** for the opcode in the ***12dfield*** file.
- The next line gives the **full syntax** for the opcode in the ***fld*** file.
- The next paragraph gives a **detailed description** of the opcode record.
- If it exists, the final line gives a link to the ***12d Model Reference Manual*** to the panel for the field data command for the opcode.

Optional information is enclosed in square brackets **[ ]**.

The ***op_code_properties*** block only exists in the ***12dfield*** file and is ***optional***.

All **angles** in the ***12d Field File*** are given in ***decimal* degrees**.

For a summary of the **12d Field File Opcodes**, see 26.8 12d Survey Opcode Summary.

Numeric Opcode	Text Opcode	Short Description of Opcode

-3 **group** **Group**

<group>

<name>*Group_name*</name>

[<op_code_properties>]

</group>

-3 Group_name

-2 **comment** **Insert a comment**

<comment>

<data>*Comment_text*</data>

[<op_code_properties>]

</comment>

-2 Comment_text

-1 **error** **Add text to information for an error**

<error>

<data>*Error_value*</data>

[<op_code_properties>]

</error>

-1 Error_value

1 **job_data** **Job Information**

<job_data>

<description>*description_text*</description>

[<op_code_properties>]

</job_data>

01 block1 block2 block3 block4 where each block can be up to 10 characters.

Job header information.

The field data command panel in the SDR Editor is documented in 25.4.2.16 Job Data (opcode 1)

2 **coordinate** **Directly entered coordinate measurement**

<coordinate>

<XYZ>

<point_description>

[<op_code_properties>]

</coordinate>

02 Point_description X Y Z

A *measurement* point is created with the f*eature code* and *string number* from the *point_description* and given (x, y,z) coordinates. No reduction is needed.

The *point_number* and *point_comment* from the *point_description* are recorded as the point id and vertex 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 (or feature_code LJG)* is created and mapped using the Map 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 coordinates.

The field data command panel in the SDR Editor is documented in 25.4.2.14 Coordinate (opcode 2)

3 **station** **New instrument setup on a point**

<station>

<height>*instrument_height*</height>

<point_description>

[<op_code_properties>]

</station>

03 Point_description instrument_height

Setting up an instrument at the point with name given in the *point_name* section of the *point_description*. The (x,y,z) coordinates for *point_name* are found by first searching the control model, then the list of previously named points in the reduction, point ids of previous measurements and finally if *point_name* is still not found, the user is asked to type in the (x,y,z) coordinates. A record is written to the report file.

The field data command panel in the SDR Editor is documented in 25.4.2.36 New Instrument Setup - Station (opcode 3)

4 **backsight** **Measurement to backsight**

<backsight>

<horizontal_angle>*horizontal_circle*</horizontal_angle>

<vertical_angle><*vertical_circle*</vertical_angle>

<slope_distance><*splope_distance_value*</slope_distance>

<azimuth><*azimuth_value*</azimuth>

<point_description>

[<op_code_properties>]

</backsight>

04 Point_description horizontal_circle vertical_circle slope_distance_value azimuth_value

Measurement to a backsight whose name is given in the *point_name* section of the *point_description.*

If the *Display panel for backsights* field in the **Survey Data Reduction Function** panel is **ticked**, then the **Survey Data Bearing Datum Difference** panel shows the *bearing datum difference* and the *horizontal distance difference*. A record is written to the report file.

The units for *horizontal_circle* and *vertical_circle* are decimal degrees.

The *azimuth_value*, in decimal degrees, may be specified when no coordinate for the backsight point exists.

The field data command panel in the SDR Editor is documented in 25.4.2.6 Backsight (opcode 4)

5 target_height New target height

<target_height>

<height>*Target_height*</height>

<point_description>

[<op_code_properties>]

</target_height>

05 Target_height

Set a new target height. This applies to the Opcodes 4, 6, 7 and 140.

The field data command panel in the SDR Editor is documented in 25.4.2.59 Target Height (opcode 5)

6 check_measurement Check measurement

<check_measurement>

<horizontal_angle>*horizontal_circle*</horizontal_angle>

<vertical_angle><*vertical_circle*</vertical_angle>

<splope_distance><*splope_distance_value*</splope_distance>

<azimuth><*azimuth_value*</azimuth>

<point_description>

[<op_code_properties>]

</check_measurement>

06 Point_description horizontal_circle vertical_circle slope_distance_value

A check measurement is made to the station given in the *point_name* section of the *point_description*. A one point super string (with name *point_name*) at 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 coordinates and the station coordinates are written to the report file as well as the differences between the measurement and the known point.

The units for *horizontal_circle* and *vertical_circle* are decimal degrees.

The field data command panel in the SDR Editor is documented in 25.4.2.10 Check Measurement (opcode 6)

7 edm_tachy_measurement Measurement - HA, VA, SD

<edm_tachy_measurement>

<horizontal_angle>*horizontal_circle*</horizontal_angle>

<vertical_angle><*vertical_circle*</vertical_angle>

<splope_distance><*splope_distance_value*</splope_distance>

<point_description>

[<op_code_properties>]

</edm_tachy_measurement>

07 Point_description horizontal_circle vertical_circle slope_distance_value

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 id 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 Map 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 coordinates.

The field data command panel in the SDR Editor is documented in 25.4.2.29 EDM Measurement (opcode 7)

8 not yet used

9 scale_factor **Slope distance scale factor for subsequent distances**

<scale_factor>

<factor>*Scale_factor*</factor>

[<op_code_properties>]

</scale_factor>

09 Scale_factor

Scale factor to apply to subsequent slope distances.

The field data command panel in the SDR Editor is documented in 25.4.2.48 Slope Distance Scale Factor (opcode 9)

10 stadia_measurement **Three hair stadia measurement**

<stadia_measurement>

<horizontal_angle>*horizontal_circle*</horizontal_angle>

<vertical_angle><*vertical_circle*</vertical_angle>

<bottom><*bottom_value*</bottom>

<middle><*middle_value*</middle>

<top><*top_value*</top>

<point_description>

[<op_code_properties>]

</stadia_measurement>

10 Point_description horizontal_circle vertical_circle bottom_value bottom_value top_value

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 id 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 Map 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 coordinates.

The field data command panel in the SDR Editor is documented in 25.4.2.32 Stadia Measurement (opcode 10)

11 edm_tachy_measurement_ht **Measurement - HA, HD, Height**

<edm_tachy_measurement_ht>

<horizontal_angle>*horizontal_circle*</horizontal_angle>

<horizontal_distance>*horizontal_distance_value*</horizontal_distance>

<height><*height_value*</height>

<point_description>

[<op_code_properties>]

</edm_tachy_measurement_ht>

11 Point_description horizontal_circle horizontal_distance_value height_value

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 id 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 Map 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 coordinates.

The field data command panel in the SDR Editor is documented in 25.4.2.30 EDM Measurement (HA,HD,HT) (opcode 11)

12 edm_tachy_measurement_vd **Measurement - HA, HD, Height difference (VD)**

<edm_tachy_measurement_vd>

<horizontal_angle>*horizontal_angle_value*</horizontal_angle>

<horizontal_distance>*horizontal_distance_value*</horizontal_distance>

<vertial_distance>*height_difference*</vertical_distance>

<point_description>

[<op_code_properties>]

</edm_tachy_measurement_vd>

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 id 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 Map 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 coordinates.

The field data command panel in the SDR Editor is documented in 25.4.2.31 EDM Measurement (HA,HD,Diff HT) (opcode 12).

13 not yet used

14 check_coordinate **Check Coordinates**

<check_coordinate>

<XYZ>

<point_description>

[<op_code_properties>]

</check_coordinate>

14 Point_description X Y Z

Measurement to a coordinate whose name is given in the *point_name* section of the *point_description.*

If the *Display panel for backsights* field in the **Survey Data Reduce** panel is **ticked**, then the **Survey Data Check Coordinate** panel shows the differences in the coordinates. A record is written to the report file.

The field data command panel in the SDR Editor is documented in 25.4.2.9 Check Coordinate (opcode 14)

15 vertical_circle **Vertical circle correction**

<vertical_circle>

<correction>*vertical_circle_in_decimal_degrees*</correction>

[<op_code_properties>]

</vertical_circle>

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.

The field data command panel in the SDR Editor is documented in 25.4.2.63 Vertical Circle Correction (opcode 15)

16 multiple_coding Multiply coded point

<multiple_coding>

<point_description>

[<op_code_properties>]

</multiple_coding>

16 Point_description

Additional coding for the current measurement point created by opcodes 02, 07, 10, 11, 12, or 140.

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 opcode.

The *point_number* and *text* from the *point_description* are recorded as the point id 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 Map 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 coordinates.

The field data command panel in the SDR Editor is documented in 25.4.2.35 Multiple Coding (opcode 16)

17 arc_fitting_last_3_points Arc through previous three points

<arc_fitting_last_3_points>

[<point_description>**]**

[<op_code_properties>]

</arc_fitting_last_3_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 id* 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 id. 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

See 25.3.9 Arcs Through Points.

The field data command panel in the SDR Editor is documented in 25.4.2.1 Arc Fitting (opcodes 17, 60, 61, 62)

18 feature Circle Feature

<feature>

<radius>*Radius_value*</radius>

[<op_code_properties>]

</feature>

18 Radius_value

Creates a feature string with the given *Radius_value* and centred on the current measurement point.

See 25.3.7 Feature String

The field data command panel in the SDR Editor is documented in 25.4.2.11 Circle Feature (opcode 18)

19 reverse_string **Reverse string**

<reverse_string>

[<point_description>**]**

[<op_code_properties>]

</reverse_string>

19 [Point_description]

If no *point_description* is given, the current string is reversed.

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* 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 field data command panel in the SDR Editor is documented in 25.4.2.53 String Reverse (opcode 19)

20 close_string **Close string**

<close_string>

[<point_description>**]**

[<op_code_properties>]

</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 id* 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 id* from the *point_description* exists, then the string containing that point id will be closed.

See 25.3.4 Close String

The field data command panel in the SDR Editor is documented in 25.4.2.49 String Close (opcode 20)

21 join_strings_last_to_last **Join last points of strings**

<join_strings_last_to_last>

<feature_code>*feature_code_value*</feature_code>

<string_number_1>*string_number_value*</string_number_1>

<string_number_2>*string_number_value*</string_number_2>

[<op_code_properties>]

</join_strings_last_to_last>

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).

See 25.3.8 Joining Strings

The field data command panel in the SDR Editor is documented in 25.4.2.28 Strings Join (opcodes 21 to 24)

22 join_strings_first_to_last **Join first to last point of strings**

<join_strings_first_to_last>

<feature_code>*feature_code_value*</feature_code>

<string_number_1>*string_number_value*</string_number_1>

<string_number_2>*string_number_value*</string_number_2>

[<op_code_properties>]

</join_strings_first_to_last>

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).

See 25.3.8 Joining Strings

The field data command panel in the SDR Editor is documented in 25.4.2.28 Strings Join (opcodes 21 to 24)

23 join_strings_first_to_first **Join first points of strings**

<join_strings_first_to_first>

<feature_code>*feature_code_value*</feature_code>

<string_number_1>*string_number_value*</string_number_1>

<string_number_2>*string_number_value*</string_number_2>

[<op_code_properties>]

</join_strings_first_to_first>

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).

See 25.3.8 Joining Strings

The field data command panel in the SDR Editor is documented in 25.4.2.28 Strings Join (opcodes 21 to 24)

24 join_strings_last_to_first **Join last to first point of strings**

<join_strings_last_to_first>

<feature_code>*feature_code_value*</feature_code>

<string_number_1>*string_number_value*</string_number_1>

<string_number_2>*string_number_value*</string_number_2>

[<op_code_properties>]

</join_strings_last_to_first>

24 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 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 25.3.8 Joining Strings

The field data command panel in the SDR Editor is documented in 25.4.2.28 Strings Join (opcodes 21 to 24)

25 not yet used

26 not yet used

27 not yet used

28 height_or_depth **Add text to the string name - for delta height**

<height_or_depth>

<value>*Text*</value>

[<point_description>**]**

[<op_code_properties>]

</height_or_depth>

28 [Point_description] Text

A space (" ") followed by 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 id* 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 id* exists*,* then the string containing that point id has *Text* appended to the string name.

The field data command panel in the SDR Editor is documented in 25.4.2.15 Height Or Depth Comment (opcode 28)

29 memo **Note or memo**

<memo>

<data>*Text*</data>

[<op_code_properties>]

</memo>

29 Text

Any Text may be entered and will be added to the check measurements model at the position of the current measurement point.

The field data command panel in the SDR Editor is documented in 25.4.2.38 Note (opcode 29)

30 remove_height **Remove height from a point - that is make it a null height**

<remove_height>

[<point_description>**]**

[<op_code_properties>]

</remove_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 id* 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 id* exists, then the height of the point with that point id is set to null.

The field data command panel in the SDR Editor is documented in 25.4.2.42 Remove Height (opcode 30)

31 remove_point **Delete point**

<remove_point>

[<point_description>**]**

[<op_code_properties>]

</remove_point>

30 [Point_description]

The field data command panel in the SDR Editor is documented in 25.4.2.43 Remove (Delete) Point (opcode 31).

32 not yet used

33 not yet used

34 not yet used

35 not yet used

36 not yet used

37 rectangle_2 **Rectangle by two points**

<rectangle_2>

<offset>*offset_in_metres*</offset>

[<point_description>**]**

[<op_code_properties>]

</rectangle_2>

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 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.

See 25.3.6 Rectangle by 2 Points

The field data command panel in the SDR Editor is documented in 25.4.2.52 String Rectangle by 2 Points (opcode 37)

38 non_tinable_next_segment **Make the next segment non-tinable**

<non_tinable_next_segment>

[<point_description>**]**

[<op_code_properties>]

</non_tinable_next_segment>

38 [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 id* 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 id* exists, then the segment containing the point with that point id as a start point, is set to non-tinable.

The field data command panel in the SDR Editor is documented in 25.4.2.37 Non Tinability (opcodes 38, 39, 40, 141)

39 non_tinable_previous_segment Make the previous segment non-tinable

<non_tinable_previous_segment>

[<point_description>**]**

[<op_code_properties>]

</non_tinable_previous_segment>

39 [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 id* 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 id* exists, then the segment containing the point with that point id as an end point, is set to non-tinable.

The field data command panel in the SDR Editor is documented in 25.4.2.37 Non Tinability (opcodes 38, 39, 40, 141)

40 non_tinable_vertex Make a point non-tinable

<non_tinable_vertex>

[<point_description>**]**

[<op_code_properties>]

</non_tinable_vertex>

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 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 set to non-tinable.

If the *point id* exists, then the point with that point id is set to non-tinable.

The field data command panel in the SDR Editor is documented in 25.4.2.37 Non Tinability (opcodes 38, 39, 40, 141)

41 **additional_text** **Add additional text to the current measurement point**

<additional_text>

<text>*Text*</text>

<point_description>

[<op_code_properties>]

</additional_text>

41 Text

The given *Text* is appended to the vertex text for the current measurement point.

In the ***fld*** file, any spaces from column four onwards will be part of the text.

The field data command panel in the SDR Editor is documented in 25.4.2.61 Additional Text For Point (opcode 41)

42 **offset_measurement_radial** **Add a radial offset**

<offset_measurement_radial>

<offset>*Radial_offset_in_metres*</offset>

[<point_description>**]**

[<op_code_properties>]

</offset_measurement_radial>

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 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.

See 25.3.2 Offsets

The field data command panel in the SDR Editor is documented in 25.4.2.39 Offset Measurement (opcodes 42, 43, 44)

43 **offset_measurement_tangential** **Add a tangential offset**

<offset_measurement_tangential>

<offset>*Tangential_offset_in_metres*</offset>

[<point_description>**]**

[<op_code_properties>]

</offset_measurement_tangential>

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 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.

See 25.3.2 Offsets

The field data command panel in the SDR Editor is documented in 25.4.2.39 Offset Measurement (opcodes 42, 43, 44)

44 offset_measurement_height Add a height offset

<offset_measurement_height>

<offset>*Height_offset_in_metres*</offset>

[<point_description>**]**

[<op_code_properties>]

</offset_measurement_height>

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 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.

See 25.3.2 Offsets

The field data command panel in the SDR Editor is documented in 25.4.2.39 Offset Measurement (opcodes 42, 43, 44)

45 rectangle Make a parallelogram from the last three measurement points

<rectangle>

[<point_description>**]**

[<op_code_properties>]

</rectangle>

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 id* 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 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.

See 25.3.5 Squashed Rectangle - Parallelogram

The field data command panel in the SDR Editor is documented in 25.4.2.51 String (Squashed) Rectangle (opcode 45)

46 breakline **Make the string a breakline or not**

<breakline>

[<mode>*mode_value*</mode>]

[<point_description>]

[<op_code_properties>]

</breakline>

46 [Point_description] [mode_value]

The *point_description* is used to select a string and the *mode_value* 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 id* 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 id* exists*,* then the string containing the point with that point id is selected.

***mode*_value:**

If no *mode_value* is given, the selected string is set as a point string (that is, not a breakline).

If *mode_value* is given, then

if *mode_value* is 0, the selected string is set to a point string and hence is not a breakline.

if *mode_value* is 1, the selected string is set to a *line* string and is therefore a breakline

The field data command panel in the SDR Editor is documented in 25.4.2.55 String Tinable - Breakline String (opcode 46)

47 new_string **Start a new string**

<new_string>

[<point_description>]

[<op_code_properties>]

</new_string>

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 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 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.*

See 25.3.3 Start New String

The field data command panel in the SDR Editor is documented in 25.4.2.54 String Start (opcode 47)

48 end_string **End a string**

<end_string>

[<point_description>]

[<op_code_properties>]

</end_string>

48 [Point_description]

If no *Point_description exist*s, the current string is terminated (the terminated string includes 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 id is terminated *after* the point id point

The field data command panel in the SDR Editor is documented in 25.4.2.50 String End (opcode 48)

49 distances Distances

<distances>

<data>*distance_value*</data>

<point_description>

[<op_code_properties>]

</distances>

49 ?????

The field data command panel in the SDR Editor is documented in 25.4.2.18 Distances (opcode 49)

50 backsight_reference Specify bearing to correct for true north - used as bearing datum difference

<backsight_reference>

<angle_difference>*bearing_in_decimal_degrees*</angle_difference>

<point_description>

[<op_code_properties>]

</backsight_reference>

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 for all measurements from the current instrument set up that follow the Backsight Reference record.

The *point_name* in the *point_description* and the *bearing_in_decimal_degrees* are written to the report file.

The field data command panel in the SDR Editor is documented in 25.4.2.7 Backsight Reference (opcode 50)

51 template_start Start using an existing field template

<template_start>

<name>*Template_name*</name>

<zigzag_mode>*zig_zag_mode*</zigzag_mode>

[<op_code_properties>]

</template_start>

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*.

See 25.3.10 Field Templates

The field data command panel in the SDR Editor is documented in 25.4.2.60 Templating (opcodes 51 to 59)

52 template_end **Finish using a field template or finish recording a field template**

<template_end>

[<op_code_properties>]

</template_end>

52

Stops using the current field template or stops recording a field template.

See 25.3.10 Field Templates

The field data command panel in the SDR Editor is documented in 25.4.2.60 Templating (opcodes 51 to 59)

53 template_pause **Pause the current field template until opcode 54 or finish template 52**

<template_pause>

[<op_code_properties>]

</template_pause>

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.

See 25.3.10 Field Templates

The field data command panel in the SDR Editor is documented in 25.4.2.60 Templating (opcodes 51 to 59)

54 template_continue **Continue the current field template**

<template_continue>

[<op_code_properties>]

</template_continue>

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.

See 25.3.10 Field Templates

The field data command panel in the SDR Editor is documented in 25.4.2.60 Templating (opcodes 51 to 59)

55 template_record **Start recording a field template**

<template_record>

[<name>*Template_name*</name>**]**

[<op_code_properties>]

</template_record>

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.

See 25.3.10 Field Templates

The field data command panel in the SDR Editor is documented in 25.4.2.60 Templating (opcodes 51 to 59)

56 template_skip **Skip picking up one or more points from a field template**

<template_skip>

[<point_count>*num_skipped_points*</point_count>]

[<op_code_properties>]

</template_skip>

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.*

See 25.3.10.4 Skipping Field Template Points

The field data command panel in the SDR Editor is documented in 25.4.2.60 Templating (opcodes 51 to 59)

57 template_delete **Delete points from a field template - after the measurement of last point**

<template_delete>

[<point_count>*num_points_to_delete*</point_count>]

[<op_code_properties>]

</template_delete>

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.

See 25.3.10 Field Templates

The field data command panel in the SDR Editor is documented in 25.4.2.60 Templating (opcodes 51 to 59)

58 template_insert **Insert points when using a field template - after the measurement of last point**

<template_insert>

<feature_code>*Feature_code*</feature_code>

<string_number>*String_number*</string_number>

<multiple_code>*Multiple_code_flag*</multiple_code>

<insert_special>*Insert_special_flag*</insert_special>

[<op_code_properties>]

</template_insert>

58 Feature_code String_number Multiple_code_flag Insert_special_flag

Allows the user to insert points into the field template currently being used, or give an existing point a multiple code.

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.*

The *next measurement* takes the *feature_code* and *string_number* from the next point of the field template definition.

See 25.3.10.5 Insert Template Points or Insert Multiple Codes

The field data command panel in the SDR Editor is documented in 25.4.2.60 Templating (opcodes 51 to 59)

59 template_change **Change points in a field template**

<template_change

[<feature_code>*Feature_code*</feature_code>]
[<string_number>*String_number*</string_number>]
<point>*Point_value*</point>
<count>*Count_value*</count>
[<op_code_properties>]
</template_change>

59 [Point_description] String_number Point_value Count_value

The field data command panel in the SDR Editor is documented in 25.4.2.60 Templating (opcodes 51 to 59)

60 arc_fitting_next_3_points Arc through next three points

<arc_fitting_next_3_points>
[<point_description>]
[<op_code_properties>]
</arc_fitting_next_3_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 id* 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 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

See 25.3.9 Arcs Through Points

The field data command panel in the SDR Editor is documented in 25.4.2.1 Arc Fitting (opcodes 17, 60, 61, 62)

61 arc_fitting_start Start of arc through sets of three points until end of string, or a 62 occurs

<arc_fitting_start>
[<point_description>]
[<op_code_properties>]
</arc_fitting_start>

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 id* 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 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*.

See 25.3.9 Arcs Through Points

The field data command panel in the SDR Editor is documented in 25.4.2.1 Arc Fitting (opcodes 17, 60, 61, 62)

62 arc_fitting_end **End the arcs begun by a 61 command**

<arc_fitting_end>

[<point_description>**]**

[<op_code_properties>]

</arc_fitting_end>

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 id* 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 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.

See 25.3.9 Arcs Through Points

The field data command panel in the SDR Editor is documented in 25.4.2.1 Arc Fitting (opcodes 17, 60, 61, 62)

63 not yet used

64 not yet used

65 not yet used

66 not yet used

67 not yet used

There are opcodes 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 integer_attribute_string **Add a user defined integer attribute to the current string**

<integer_attribute_string>

<name>*Name*</name>

<value>*Integer*</value>

[<op_code_properties>]

</integer_attribute_string>

68 Name Integer

Add an user defined integer attribute to the current string.

The field data command panel in the SDR Editor is documented in 25.4.2.4 Attributes (opcodes 68 to79)

69 real_attribute_string **Add a user defined real attribute to the current string**

<real_attribute_string>

<name>*Name*</name>

<value>*Real*</value>

[<op_code_properties>]

</real_attribute_string>

69 Name Real

Add a real user defined attribute to the current string.

The field data command panel in the SDR Editor is documented in 25.4.2.4 Attributes (opcodes 68 to79)

70 text_attribute_string **Add a user defined text attribute to the current string**

<text_attribute_string>

<name>*Name*</name>

<value>*Text*</value>

[<op_code_properties>]

</text_attribute_string>

70 Name Text

Add a text user defined attribute to the current string.

The field data command panel in the SDR Editor is documented in 25.4.2.4 Attributes (opcodes 68 to79)

71 integer_attribute_vertex **Add a user defined integer attribute to the current point**

<integer_attribute_vertex>

<name>*Name*</name>

<value>*Integer*</value>

[<op_code_properties>]

</integer_attribute_vertex>

71 Name Integer

Add an integer user defined attribute to the current measurement point.

The field data command panel in the SDR Editor is documented in 25.4.2.4 Attributes (opcodes 68 to79)

72 real_attribute_vertex **Add a user defined real attribute to the current point**

<real_attribute_vertex>

<name>*Name*</name>
<value>*Real*</value>
[<op_code_properties>]
</real_attribute_vertex>

72 Name Real

Add a real (floating point) user defined attribute to the current measurement point.

The field data command panel in the SDR Editor is documented in 25.4.2.4 Attributes (opcodes 68 to79)

73 text_attribute_vertex Add a user defined text attribute to the current point

<text_attribute_vertex>
<name>*Name*</name>
<value>*Text*</value>
[<op_code_properties>]
</text_attribute_vertex>

73 Name Text

Add a text user defined attribute to the current measurement point.

The field data command panel in the SDR Editor is documented in 25.4.2.4 Attributes (opcodes 68 to79)

74 integer_attribute_next_segment Add a user defined integer attribute to the next segment

<integer_attribute_next_segment>
<name>*Name*</name>
<value>*Integer*</value>
[<op_code_properties>]
</integer_attribute_next_segment>

74 Name Integer

Add an integer user defined attribute to the next segment from the current measurement point.

The field data command panel in the SDR Editor is documented in 25.4.2.4 Attributes (opcodes 68 to79)

75 real_attribute_next_segment Add a user defined real attribute to the next segment

<real_attribute_next_segment>
<name>*Name*</name>
<value>*Real*</value>
[<op_code_properties>]
</real_attribute_next_segment>

75 Name Real

Add a real (floating point) user defined attribute to the next segment from the current measurement point.

The field data command panel in the SDR Editor is documented in 25.4.2.4 Attributes (opcodes 68 to79)

76 text_attribute_next_segment Add a user defined text attribute to the next segment

<text_attribute_next_segment>
<name>*Name*</name>
<value>*Text*</value>
[<op_code_properties>]
</text_attribute_next_segment>

76 Name Text

Add a text user defined attribute to the next segment from the current measurement point.

The field data command panel in the SDR Editor is documented in 25.4.2.4 Attributes (opcodes 68 to79)

77 integer_attribute_previous_segment Add a user defined integer attribute to the previous segment

<integer_attribute_previous_segment>

<name>*Name*</name>

<value>*Integer*</value>

[<op_code_properties>]

</integer_attribute_previous_segment>

77 Name Integer

Add an integer user defined attribute to the previous segment for the current measurement point.

The field data command panel in the SDR Editor is documented in 25.4.2.4 Attributes (opcodes 68 to79)

78 real_attribute_previous_segment Add a user defined real attribute for the previous segment

<real_attribute_previous_segment>

<name>*Name*</name>

<value>*Real*</value>

[<op_code_properties>]

</real_attribute_previous_segment>

78 Name Real

Add a real (floating point) user defined attribute to the previous segment for the current measurement point.

The field data command panel in the SDR Editor is documented in 25.4.2.4 Attributes (opcodes 68 to79)

79 text_attribute_previous_segment Add a user defined text attribute to the previous segment

<text_attribute_previous_segment>

<name>*Name*</name>

<value>*Text*</value>

[<op_code_properties>]

</text_attribute_previous_segment>

79 Name Text

Add a text user defined attribute to the previous segment for the current measurement point.

The field data command panel in the SDR Editor is documented in 25.4.2.4 Attributes (opcodes 68 to79)

In addition, extra codes allow ***12d Model*** super pipe strings to be coded in the field

80 pipe_justification_invert Pipe or culvert invert point (bottom of the pipe or culvert)

<pipe_justification_invert>

[<point_description>**]**

[<op_code_properties>]

</pipe_justification_invert>

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 id* 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 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.

The field data command panel in the SDR Editor is documented in 25.4.2.41 Pipe Justification (opcodes 80, 81, 82)

81 pipe_justification_axial **Pipe or culvert axial point (centre of the pipe or culvert)**

<pipe_justification_axial>

[<point_description>**]**

[<op_code_properties>]

</pipe_justification_axial>

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 id* 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 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.

The field data command panel in the SDR Editor is documented in 25.4.2.41 Pipe Justification (opcodes 80, 81, 82)

82 pipe_justification_obvert **Pipe or culvert obvert point (top of the pipe or culvert)**

<pipe_justification_obvert>

[<point_description>**]**

[<op_code_properties>]

</pipe_justification_obvert>

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 id* 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 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.

The field data command panel in the SDR Editor is documented in 25.4.2.41 Pipe Justification (opcodes 80, 81, 82)

83 shape_record **Start recording a shape - before the measurement**

<shape_record>

[<name>*Shape_name*</name>**]**

<mirror_x>*Mirror_x_status*</mirror_x>

<mirror_y>*Mirror_y_status*</mirror_y>

<offset>*Offset_value*</offset>

<height>*Height_value*</height>

[<op_code_properties>]

</shape_record>

83 [Shape_name] Mirror_x_status Mirror_y_status Offset_value Height_value

Start recording a shape with the name *Shape_name*. If *Shape_name* is not 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 25.3.11 Shape Field Coding

The field data command panel in the SDR Editor is documented in 25.4.2.47 Shaping (opcodes 83 to 86)

84 shape_end Finish using a shape definition or finish recording a shape - after the measurement

<shape_end>

[<name>*Shape_name*</name>**]**

<mirror_x>*Mirror_x_status*</mirror_x>

<mirror_y>*Mirror_y_status*</mirror_y>

<offset>*Offset_value*</offset>

<height>*Height_value*</height>

[<op_code_properties>]

</shape_end>

84 [Shape_name] Mirror_x_status Mirror_y_status Offset_value Height_value

Stops using the current shape or stops recording a shape.

See 25.3.11 Shape Field Coding

The field data command panel in the SDR Editor is documented in 25.4.2.47 Shaping (opcodes 83 to 86)

85 shape_parallel Parallel an existing shape

<shape_parallel>

[<name>*Shape_name*</name>**]**

<mirror_x>*Mirror_x_status*</mirror_x>

<mirror_y>*Mirror_y_status*</mirror_y>

<offset>*Offset_value*</offset>

<height>*Height_value*</height>

[<op_code_properties>]

</shape_parallel>

85 [Shape_name] Mirror_x_status Mirror_y_status Offset_value Height_value

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 id has the shape applied to the entire length of the string.

See 25.3.11 Shape Field Coding

The field data command panel in the SDR Editor is documented in 25.4.2.47 Shaping (opcodes 83 to 86)

86 shape_extrude Extrude an existing shape

<shape_extrude>

[<name>*Shape_name*</name>**]**
<mirror_x>*Mirror_x_status*</mirror_x>
<mirror_y>*Mirror_y_status*</mirror_y>
<offset>*Offset_value*</offset>
<height>*Height_value*</height>
[<op_code_properties>]
</shape_extrude>

86 [Shape_name] Mirror_x_status Mirror_y_status Offset_value Height_value

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 id has the shape applied to the entire length of the string.

See 25.3.11 Shape Field Coding

The field data command panel in the SDR Editor is documented in 25.4.2.47 Shaping (opcodes 83 to 86)

87 shape_parallel_start not yet documented

88 shape_extrude_start not yet documented

89 not yet used

90 not yet used

91 not yet used

92 string_type_2d Remove all z-values for a string (*i.e.* make all z-values null)

<string_type_2d>
[<point_description>**]**
[<op_code_properties>]
</string_type_2d>

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 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* 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 Map File.

The field data command panel in the SDR Editor is documented in 25.4.2.56 String Type (opcodes 92, 93, 94)

93 string_type_3d The string can have different z-values for each vertex

<string_type_3d>
[<point_description>**]**
[<op_code_properties>]
</string_type_3d>

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 id* 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 id* exists, then the point-line type is set for the string containing that point id.

The point-line type may be overridden by the Map File.

The field data command panel in the SDR Editor is documented in 25.4.2.56 String Type (opcodes 92, 93, 94)

94 string_type_4d Use name library file/ Map File for vertex text on the string - name mapping

<string_type_4d>

<point_description>

[<op_code_properties>]

</string_type_4d>

94 [Point_description]

If this opcode 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 opcode 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 id* 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 id* from the *point_description* exists, then name mapping is applied to the string containing that point id.

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.

The field data command panel in the SDR Editor is documented in 25.4.2.56 String Type (opcodes 92, 93, 94)

95 pipe_diameter Diameter for a super string pipe

<pipe_diameter>

<diameter>*pipe_diameter*</diameter>

[<point_description>**]**

[<op_code_properties>]

</pipe_diameter>

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 opcodes 80, 81 and 82.

If no *point_description* is given, the current string is created as a pipe string with the given *pipe_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 *pipe_diameter*.

If the *point id* exists, then the string containing that point id is created as a pipe string with the given *pipe_diameter*.

The field data command panel in the SDR Editor is documented in 25.4.2.58 Pipe Diameter (opcode 95)

96 culvert **width and height for a culvert super string**

<culvert>

<width>*culvert_width*</width>

<height>*culvert_height*</height>

<point_description>

[<op_code_properties>]

</culvert>

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 opcodes 80, 81 and 82.

If no *point_description* is given, the current string is created as a culvert string with the given *culvert_width* and *culvert_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 *culvert_width* and *culvert_height*.

If the *point id* exists, then the string containing that point id is created as a culvert string with the given *culvert_width* and *culvert_height*.

The field data command panel in the SDR Editor is documented in 25.4.2.57 Culvert (opcode 96)

97 not yet used

98 not yet used

99 file_end **Terminate processing**

<file_end>

[<op_code_properties>]

</file_end>

99

Stop processing the ***12d Field File*** at this line. Useful for debugging errors.

The field data command panel in the SDR Editor is documented in 25.4.2.20 End File (opcode 99)

100 units **Units used in the *12d Field File***

<units>

<angle>*angle_unit*</angle>

<distance>*metres*</distance>

<pressure>*millimetres*</pressure>

<temperature>*celcius*</temperature>

[<op_code_properties>]

</units>

100 angle_unit distance_unit pressure_unit temperature_unit

The units being used in the ***12d Field File***.

Currently there is only one choice for each unit and the choice for each unit is:

angle_unit is **degrees** which is ***decimal degrees***.

distance_unit is **metres**

pressure_unit is **millimetres**

temperature_unit is **celsius**

The field data command panel in the SDR Editor is documented in 25.4.2.62 Units (opcode 100)

101 auto_order **Order strings automatically**

<auto_order>

[<point_description>**]**

[<op_code_properties>]

</auto_order>

101 [Point_description]

The field data command panel in the SDR Editor is documented in????

102 not yet used

103 not yet used

104 not yet used

105 not yet used

106 not yet used

107 invisible_previous_segmet **Make the previous segment invisible - after the measurement**

<invisible_previous_segment>

[<point_description>**]**

[<op_code_properties>]

</invisible_previous_segment>

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 id as an end point, is set to invisible.

The field data command panel in the SDR Editor is documented in 25.4.2.27 Invisibility (opcodes 107, 108, 109)

108 invisible_next_segment **Make next segment invisible - after measurement for first point of segment**

<invisible_next_segment>

[<point_description>**]**

[<op_code_properties>]

</invisible_next_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 id as a start point, is set to invisible.

The field data command panel in the SDR Editor is documented in 25.4.2.27 Invisibility (opcodes 107, 108, 109)

109 invisible_vertex **Make a point invisible - after the measurement**

<invisible_vertex>

[<point_description>**]**

[<op_code_properties>]

</invisible_vertex>

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 id is set to invisible.

The field data command panel in the SDR Editor is documented in 25.4.2.27 Invisibility (opcodes 107, 108, 109)

110 building_face **Start recording buildings face observations - before the measurements**

<building_face>

[<name>*Building_name*</name>**]**

[<op_code_properties>]

</building_face>

110 [Building_name]

Start recording a field template with the name *Building_name*.

If *Building_name* is not 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.

The field data command panel in the SDR Editor is documented in 25.4.2.8 Buildings (opcodes 110, 111)

111 building_face_end **End recording building face observations**

<building_face_end>

[<name>*Building_name*</name>**]**

[<op_code_properties>]

</building_face_end>

111 [Building_name]

If no *Building_name exist*s, the current building face observation set is finished (including the current measurement point).

The field data command panel in the SDR Editor is documented in 25.4.2.8 Buildings (opcodes 110, 111)

112 set_collection **Start set collection observations - before the measurements**

<set_collection>

[<op_code_properties>]

</set_collection>

112

The field data command panel in the SDR Editor is documented in???

113 set_collection_end **End set collection observations**

<set_collection_end>

[<op_code_properties>]

</set_collection_end>

113

The field data command panel in the SDR Editor is documented in???

114 not yet used

115 not yet used

116 not yet used

117 not yet used

118 not yet used

119 code_file **Name of this *12d Field File***

<code_file>

<name>*file_name*</name>

[<op_code_properties>]

</code_file>

119 file_name

file_name is the name of this ***12d Field File***.

The field data command panel in the SDR Editor is documented in 25.4.2.12 Code File (opcode 119)

120 measure_attribute_string **Attribute for string (measurement)**

<measure_attribute_string>

<name>*Attribute_name*>

<horizontal_angle>*horizontal_angle_value*</horizontal_angle>

<vertical_angle><*vertical_angle_value*</vertical_angle>

<slope_distance><*splope_distance_value*</slope_distance>

<target_height><*splope_distance_value*</target_height>

[<op_code_properties>]

</measure_attribute_string>

*This opcode does not exist in the **fld** file.*

The measure_attribute_string opcode uses the given horizontal angle, vertical angle, slope distance and target height and calculates the coordinates of the point resulting from these values.

No point is created by this but the following information is stored as attributes of the current string.

x, y and z coordinates of the instrument
instrument height
x, y and z coordinates of the calculated point
horizontal angle, vertical angle, slope distance and target height.

The *Attribute_ name* plus a space (" ") is used to prefix the names for each of the attributes.

For the panel in the Insert command and the names for each of the attributes, see 25.4.2.3 Measurement Attributes (opcodes 120 to 123)

121 measure_attribute_vertex Attribute for vertex (measurement)

<measure_attribute_vertex>

<name>*Attribute_name*>

<horizontal_angle>*horizontal_angle_value*</horizontal_angle>

<vertical_angle><*vertical_angle_value*</vertical_angle>

<slope_distance><*splope_distance_value*</slope_distance>

<target_height><*splope_distance_value*</target_height>

[<op_code_properties>]

</measure_attribute_vertex>

*This opcode does not exist in the **fld** file.*

The measure_attribute_vertex opcode uses the given horizontal angle, vertical angle, slope distance and target height and calculates the coordinates of the point resulting from these values.

No point is created by this but the following information is stored as attributes of the current measurement.

x, y and z coordinates of the instrument
instrument height
x, y and z coordinates of the calculated point
horizontal angle, vertical angle, slope distance and target height.

The *Attribute_ name* plus a space (" ") is used to prefix the names for each of the attributes.

For the panel in the Insert command and the names for each of the attributes, see 25.4.2.3 Measurement Attributes (opcodes 120 to 123)

122 measure_attribute_next_segment Attribute for next segment (measurement)

<measure_attribute_next_segment>

<name>*Attribute_name*>

<horizontal_angle>*horizontal_angle_value*</horizontal_angle>

<vertical_angle><*vertical_angle_value*</vertical_angle>

<slope_distance><*splope_distance_value*</slope_distance>

<target_height><*splope_distance_value*</target_height>

[<op_code_properties>]

</measure_attribute_next_segment>

*This opcode does not exist in the **fld** file.*

The measure_attribute_vertex opcode uses the given horizontal angle, vertical angle, slope distance and target height and calculates the coordinates of the point resulting from these values.

No point is created by this but the following information is stored as attributes of the next segment from the current measurement point.

x, y and z coordinates of the instrument
instrument height
x, y and z coordinates of the calculated point
horizontal angle, vertical angle, slope distance and target height.

The *Attribute_ name* plus a space (" ") is used to prefix the names for each of the attributes.

For the panel in the Insert command and the names for each of the attributes, see 25.4.2.3 Measurement Attributes (opcodes 120 to 123)

123 measure_attribute_previous_segment Attribute for previous segment (measurement)

<measure_attribute_previous_segment>

<name>*Attribute_name*>

<horizontal_angle>*horizontal_angle_value*</horizontal_angle>

<vertical_angle><*vertical_angle_value*</vertical_angle>

<slope_distance><*splope_distance_value*</slope_distance>

<target_height><*splope_distance_value*</target_height>

[<op_code_properties>]

</measure_attribute_previous_segment>

*This opcode does not exist in the **fld** file.*

The measure_attribute_vertex opcode uses the given horizontal angle, vertical angle, slope distance and target height and calculates the coordinates of the point resulting from these values.

No point is created by this but the following information is stored as attributes of the previous segment to the current measurement point.

x, y and z coordinates of the instrument
instrument height
x, y and z coordinates of the calculated point
horizontal angle, vertical angle, slope distance and target height.

The *Attribute_ name* plus a space (" ") is used to prefix the names for each of the attributes.

For the panel in the Insert command and the names for each of the attributes, see 25.4.2.3 Measurement Attributes (opcodes 120 to 123)

124 attribute_set Start an attribute group

<attribute_set>

<name>*Attribute_group_name*</name>

<level>*Attribute_group_level*</level>

[<op_code_properties>]

</attribute_set>

*This opcode does not exist in the **fld** file.*

Starts an attribute group with the name Attribute_group_name.

All the following attributes are then under the Attribute_group_name unit and attribute_set_end (125).

The field data command panel in the SDR Editor is documented in 25.4.2.5 Attribute Set (opcodes 124 and 125)

125 attribute_set_end End the current attribute group

<attribute_set_end>

[<op_code_properties>]

</attribute_set_end>

*This opcode does not exist in the **fld** file.*

End the current attribute group.

The field data command panel in the SDR Editor is documented in 25.4.2.5 Attribute Set (opcodes 124 and 125)

126 attachment Attach a file

<attachment>

<name>*file_name*</name>

[<op_code_properties>]

</attachment>

126 file_name

The file *file_name* is attached to the current measurement point.

The field data command panel in the SDR Editor is documented in 25.4.2.2 Attachment (opcode 126)

127 measurement_offset **Distance correction**

<measurement_offset>

<correction>*correction_vaue*</correction>

[<op_code_properties>]

</measurement_offset>

127 correction_vaue

The field data command panel in the SDR Editor is documented in 25.4.2.17 Distance correction (opcode 127)

128 resection **Start a resection**

<resection>

<height>*height_value*</height>

<point_description>

[<op_code_properties>]

</resection>

128 height_value

The field data command panel in the SDR Editor is documented in 25.4.2.45 Resection Start (opcode 128)

129 resection_end **End the resection**

<resection_end>

[<op_code_properties>]

</resection_end>

129

The field data command panel in the SDR Editor is documented in 25.4.2.46 Resection End (opcode 129)

130 field_file **12d Model internal use only**

<field_file>

<name>*file_name*</name>

[<op_code_properties>]

</field_file>

This opcode does not exist in the ***fld*** *file.*

file_name is the name of an internal ***12d Field File***.

This option is for ***12d Model*** internal use only.

131 ppm_correction **PPM correction**

<ppm_correction>

<value>*PPM_correction*</value>

[<op_code_properties>]

</ppm_correction>

131 PPM_correction

The field data command panel in the SDR Editor is documented in 25.4.2.26 PPM Correction (opcode 131)

132 not yet used

133 not yet used

134 not yet used

135 not yet used

136 not yet used

137 not yet used

138 helmert **Helmert start**

<helmert>

<height>*height_value*</height>

<point_description>

[<op_code_properties>]

</helmert>

138 height_value

The field data command panel in the SDR Editor is documented in 25.4.2.23 Helmert Start (opcode 138)

139 helmert_end **End the Helmert**

<helmert_end>

[<op_code_properties>]

</helmert_end>

139 ?????

The field data command panel in the SDR Editor is documented in 25.4.2.24 Helmert End (opcode 139)

140 gps_coordinate **GNSS coordinate measurement**

<gps_coordinate>

<XYZ>

<point_description>

[<op_code_properties>]

</gps_coordinate>

*This opcode does not exist in the **fld** file.*

A *measurement* point is created with the f*eature code* and *string number* from the *point_description* and given GNSS (x, y,z) coordinates. The reduced X,Y,Z is affected by any current GNSS Offset Correction opcode, and the current target height.

So the entered GNSS Z coordinate does not have the antenna height subtracted!

The *point_number* and *point_comment* from the *point_description* are recorded as the point id 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 Map 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 coordinates.

The field data command panel in the SDR Editor is documented in 25.4.2.21 GNSS Coordinate (opcode 140)

141 non_tinable_string **Make a string non-tinable**

<non_tinable_string>

<point_description>

[<op_code_properties>]

</non_tinable_string>

*This opcode does not exist in the **fld** file.*

If no *point_description* is given, the current string is made non-tinable.

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* from the *point_description* exist*,* the last previous string with that *feature code* and *string number* is made non-tinable.

If the *point id* from the *point_description* exists*,* then the string containing that point id will be made non-tinable.

The field data command panel in the SDR Editor is documented in 25.4.2.37 Non Tinability (opcodes 38, 39, 40, 141).

142 offset_measurement_next_segment not yet implemented

143 offset_measurement_previous_segment not yet implemented

144 remove_string Delete a string

<remove_string>

<point_description>

[<op_code_properties>]

</remove_string>

*This opcode does not exist in the **fld** file.*

If no *point_description* is given, the current string is deleted.

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* from the *point_description* exist*,* the last previous string with that *feature code* and *string number* is deleted.

If the *point id* from the *point_description* exists*,* then the string containing that point id is deleted.

The field data command panel in the SDR Editor is documented in 25.4.2.44 Remove (Delete) String (opcode 144)

145 gps_offset GNSS Offset correction

<gps_offset>

<xofffset>*Xoffset_vaue*</xofffset>

<yofffset>*Yoffset_vaue*</yofffset>

<zofffset>*Zoffset_vaue*</zofffset>

<point_description>

[<op_code_properties>]

</gps_offset>

*This opcode does not exist in the **fld** file.*

The *Xoffset_vaue*,*Yoffset_vaue*,*Zoffset_vaue* is **added** to GNSS (x, y,z) coordinate in the following140 opcodes.

This applies to subsequent GNSS coordinate measurements until another 145 is encountered.

A 145 0 0 0 is used to **stop** the effect of GNSS Offsets.

Opcode 5 is applied after this correction to subtract the antenna pole height.

The field data command panel in the SDR Editor is documented in 25.4.2.22 GNSS Offset Correction (opcode 145)

146 midpoint_2 Create midpoint of two points

<midpoint_2>

<keep_points>*keep_point_value*</keep_points>

<coding>

<point_description>

</coding>

<point_description>

[<op_code_properties>]

</midpoint_2>

*This opcode does not exist in the **fld** file.*

The field data command panel in the SDR Editor is documented in 25.4.2.33 Midpoint of Two Points (opcode 146)

147 midpoint_3 Create centre of arc that goes through three points

<midpoint_3>

<keep_points>*keep_point_value*</keep_points>

<coding>

<point_description>

</coding>

<point_description>

[<op_code_properties>]

</midpoint_3>

*This opcode does not exist in the **fld** file.*

The field data command panel in the SDR Editor is documented in 25.4.2.34 Centre of Arc Through Three Points (opcode 147)

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 opcodes, the *point name* section of the *point description* is used to hold other information. See <point_description>

For a summary of the **12d Field File Opcodes**, go to the section 26.8 12d Survey Opcode Summary

26.8 12d Survey Opcode Summary

When ***12d Field*** is run and a ***12dfield*** file created, or a raw data collector file is converted into a ***12dfield*** or ***fld*** file, the survey information is recorded as a series of **opcodes**.

In the ***12dfield*** file, the **opcodes** are **text opcodes** and in the ***fld*** file, the opcodes are **numeric opcodes**.

Typed entry can also be used in the ***Survey Data Editor*** and for typed entry, the numeric opcodes are used to call up the survey data Insert panels.

The ***12d survey opcodes*** *are:*

Line 1: Numeric Opcode Text Opcode Description of Opcode

Line 2: Link to Insert panel that creates the opcode

Numeric Opcode	Text Opcode	Description of Opcode	Link
-3	group	Group	25.4.2.25 Group (opcode -3)
-2	comment	Insert a comment	25.4.2.13 Comment (opcode -2)
-1	error	Add text to information for an error	25.4.2.19 Error (opcode -1)
1	job_data	Job Information	25.4.2.16 Job Data (opcode 1)
2	coordinate	Directly entered coordinate measurement	25.4.2.14 Coordinate (opcode 2)
3	station	New instrument setup on a point	25.4.2.36 New Instrument Setup - Station (opcode 3)
4	backsight	Measurement to backsight	25.4.2.6 Backsight (opcode 4)
5	target_height	New target height	25.4.2.59 Target Height (opcode 5)
6	check_measurement	Check measurement	25.4.2.59 Target Height (opcode 5)
7	edm_tachy_measurement	Measurement - HA, VA, SD	25.4.2.58 Pipe Diameter (opcode 95)
8	not yet used		
9	scale_factor	Slope distance scale factor for subsequent distances	25.4.2.48 Slope Distance Scale Factor (opcode 9)
10	stadia_measurement	Three hair stadia measurement	25.4.2.32 Stadia Measurement (opcode 10)
11	edm_tachy_measurement_ht	Measurement - HA, HD, Height	25.4.2.30 EDM Measurement (HA,HD,HT) (opcode 11)
12	edm_tachy_measurement_vd	Measurement - HA, HD, Height difference (VD)	25.4.2.31 EDM Measurement (HA,HD,Diff HT) (opcode 12)
13	not yet used		
14	check_coordinate	Check Coordinates	25.4.2.9 Check Coordinate (opcode 14)
15	vertical_circle	Vertical circle correction	25.4.2.63 Vertical Circle Correction (opcode 15)
16	multiple_coding	Multiply coded point	25.4.2.35 Multiple Coding (opcode 16)
17	arc_fitting_last_3_points	Arc through previous three points	25.4.2.1 Arc Fitting (opcodes 17, 60, 61, 62)
18	feature	Circle Feature	25.4.2.11 Circle Feature (opcode 18)
19	reverse_string	Reverse string	

			25.4.2.53 String Reverse (opcode 19)
20	close_string	Close string	25.4.2.28 Strings Join (opcodes 21 to 24)
21	join_strings_last_to_last	Join last points of strings	25.4.2.28 Strings Join (opcodes 21 to 24)
22	join_strings_first_to_last	Join first to last point of strings	25.4.2.28 Strings Join (opcodes 21 to 24)
23	join_strings_first_to_first	Join first points of strings	25.4.2.28 Strings Join (opcodes 21 to 24)
24	join_strings_last_to_first	Join last to first point of strings	25.4.2.28 Strings Join (opcodes 21 to 24)
25	not yet used		
26	not yet used		
25	not yet used		
28	height_or_depth	Add text to the string name - for delta height	25.4.2.15 Height Or Depth Comment (opcode 28)
29	memo	Note or memo	25.4.2.38 Note (opcode 29)
30	remove_height	Remove height from a point - that is make it a null height	25.4.2.42 Remove Height (opcode 30)
31	remove_point	Delete point	25.4.2.43 Remove (Delete) Point (opcode 31)
32	not yet used		
33	not yet used		
34	not yet used		
35	not yet used		
36	not yet used		
37	rectangle_2	Rectangle by two points	25.4.2.52 String Rectangle by 2 Points (opcode 37)
38	non_tinable_next_segment	Make the next segment non-tinable	25.4.2.37 Non Tinability (opcodes 38, 39, 40, 141)
39	non_tinable_previous_segment	Make the previous segment non-tinable	25.4.2.37 Non Tinability (opcodes 38, 39, 40, 141)
40	non_tinable_vertex	Make a point non-tinable	25.4.2.37 Non Tinability (opcodes 38, 39, 40, 141)
41	additional_text	Add additional text to the current measurement point	25.4.2.61 Additional Text For Point (opcode 41)
42	offset_measurement_radial	Add a radial offset	25.4.2.39 Offset Measurement (opcodes 42, 43, 44)
43	offset_measurement_tangential	Add a tangential offset	25.4.2.39 Offset Measurement (opcodes 42, 43, 44)
44	offset_measurement_height	Add a height offset	25.4.2.39 Offset Measurement (opcodes 42, 43, 44)
45	rectangle	Make a parallelogram from the last three measurement points	25.4.2.51 String (Squashed) Rectangle (opcode 45)
46	breakline	Make the string a breakline or not	25.4.2.55 String Tinable - Breakline String (opcode 46)
47	new_string	Start a new string	25.4.2.54 String Start (opcode 47)
48	end_string	End a string	25.4.2.50 String End (opcode 48)
49	distances	Distances	25.4.2.18 Distances (opcode 49)
50	backsight_reference	Specify bearing to correct for true north - used as bearing datum difference	25.4.2.7 Backsight Reference (opcode 50)
51	template_start	Start using an existing field template	25.4.2.60 Templating (opcodes 51 to 59)
52	template_end	Finish using a field template or finish recording a field template	

84 shape_end Finish using a shape definition or finish recording a shape - after the measurement
25.4.2.47 Shaping (opcodes 83 to 86)
85 shape_parallel Parallel an existing shape
25.4.2.47 Shaping (opcodes 83 to 86)
86 shape_extrude Extrude an existing shape
25.4.2.47 Shaping (opcodes 83 to 86)
87 shape_parallel_start not yet documented
88 shape_extrude_start not yet documented
89 not yet used
90 not yet used
91 not yet used
92 string_type_2d Remove all z-values for a string (i.e. make all z-values null)
25.4.2.56 String Type (opcodes 92, 93, 94)
93 string_type_3d The string can have different z-values for each vertex
25.4.2.56 String Type (opcodes 92, 93, 94)
94 string_type_4d Use name library file/ Map File for vertex text on the string - name mapping
25.4.2.56 String Type (opcodes 92, 93, 94)
95 pipe_diameter Diameter for a super string pipe
25.4.2.58 Pipe Diameter (opcode 95)
96 culvert width and height for a culvert super string
25.4.2.57 Culvert (opcode 96)
97 not yet used
98 not yet used
99 file_end Terminate processing
25.4.2.20 End File (opcode 99)
100 units Units used in the 12d Field File
25.4.2.62 Units (opcode 100)
101 auto_order Order strings automatically
25.4.2.40 Order String Automatically (opcode 101)
102 not yet used
103 not yet used
104 not yet used
105 not yet used
106 not yet used
107 invisible_previous_segmet Make the previous segment invisible - after the measurement
25.4.2.27 Invisibility (opcodes 107, 108, 109)
108 invisible_next_segment Make next segment invisible - after measurement for first point of segment
25.4.2.27 Invisibility (opcodes 107, 108, 109)
109 invisible_vertex Make a point invisible - after the measurement
25.4.2.27 Invisibility (opcodes 107, 108, 109)
110 building_face Start recording buildings face observations - before the measurements
25.4.2.8 Buildings (opcodes 110, 111)
111 building_face_end End recording building face observations
25.4.2.8 Buildings (opcodes 110, 111)
112 set_collection Start set collection observations - before the measurements

113 set_collection_end End set collection observations

114 not yet used
115 not yet used
116 not yet used
117 not yet used
118 not yet used
119 code_file Name of this 12d Field File
25.4.2.12 Code File (opcode 119)
120 measure_attribute_string Attribute for string (measurement)
25.4.2.3 Measurement Attributes (opcodes 120 to 123)
121 measure_attribute_vertex Attribute for vertex (measurement)

For the full description of the **12d Field File Opcodes**, see 26.7 Full Description of 12d Survey Opcodes

TO BE MOVED

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 41.2 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 41.2.4 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.

27 Geodetics Summary

Various options in ***12d Model*** use geodetic calculations to present and change data. These options use terminology that are common to the field of geodetics and will be defined here.

Most of the terminology in ***12d Model*** follows definitions given in the Australian **GDA Technical Manual** which is published by the **Intergovernmental Committee on Surveying and Mapping** (ICSM), although the alternate name of Grid Azimuth will be used instead of Grid Bearing because of the differences in definitions in different parts of the world.

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 https://www.icsm.gov.au/gda2020-and-gda94-technical-manuals

See

27.1 Shape Of The Earth
27.2 Coordinates and Datums for the Earth
27.4 Distances
27.5 Norths, Azimuths and Bearings
27.6 Coordinate Conversions and Transformations

27.1 Shape Of The Earth

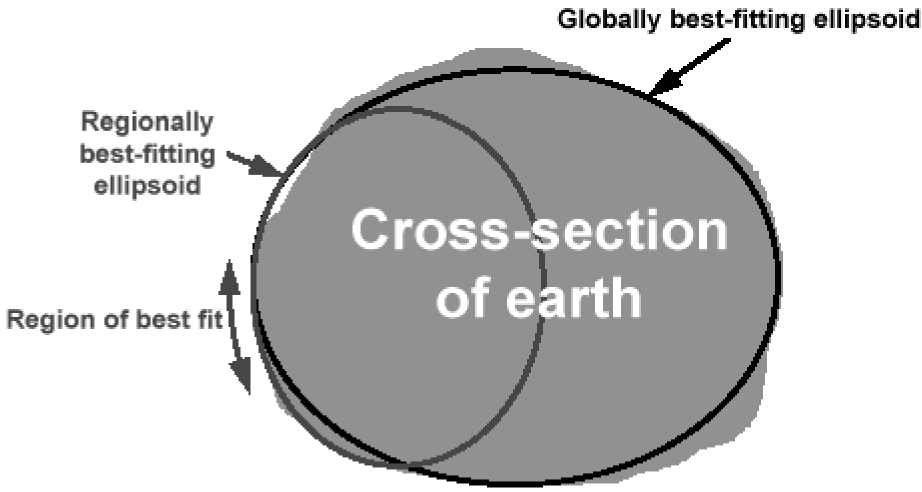
The determination of the Earth's shape is a science known as **Geodesy**.

What is meant by "shape of the Earth" needs to be exactly defined and for computational purposes, a mathematical model of the Earth is required.

Today, it is widely accepted that the Earth's shape is best approximated by an **ellipsoid** revolved around the **Earth's polar axis**. That is, the shape is a sphere that has been squashed at the north and south poles. The non-spherical shape is due to gravity.

Glossing over where is the north and south poles a number of ellipsoids have been calculated to best approximate the Earth's shape at local locations and others that best approximation to the Earth as a whole.

Traditionally the best fit is concerned with matching the geoid to a geometric ellipsoid shape. As such, there a wide number of definitions. See 27.1.1 Ellipsoid.



When thinking about the shape of the Earth, most people think about **heights**.

The **height** at two points is usually considered to be the **same** if **water** will **not flow between them**, and one height is **greater** than the other if **water flows** from the **higher point to the lower point**.

Gravity is what determines how water flows so the definition of equal heights is defined by gravity (**orthometric** height). Unfortunately the gravitational field of the Earth is not uniform and varies because density varies throughout the planet.

The **Geoid** is defined as the shape of the Earth that the ocean surface would take under the influence of the gravity and rotation of the Earth alone. The geoid is best approximated by Mean Sea Level. See 27.1.2 Geoid.

However due to the undulations of the earths density and surface, an exact mathematical model of the geoid is not currently available.

So to understand how the shape of the Earth is mathematically modelled, one must know how an ellipsoid is defined for the Earth, and then the relationship between the defined ellipsoid and the geoid.

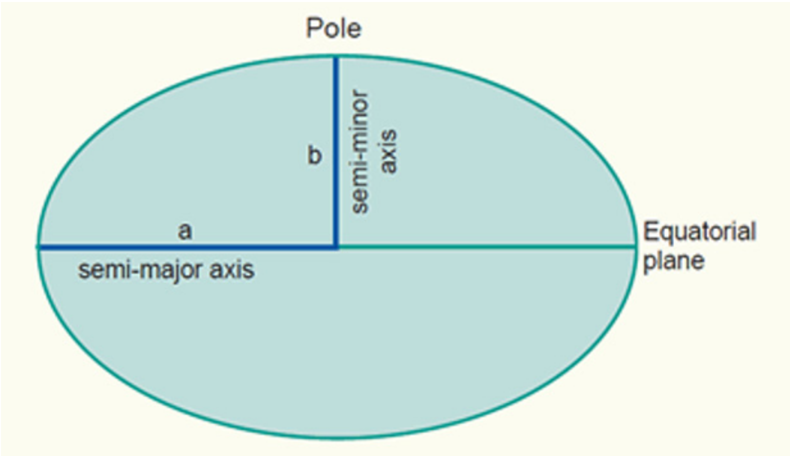
See

27.1.1 Ellipsoid
27.1.2 Geoid

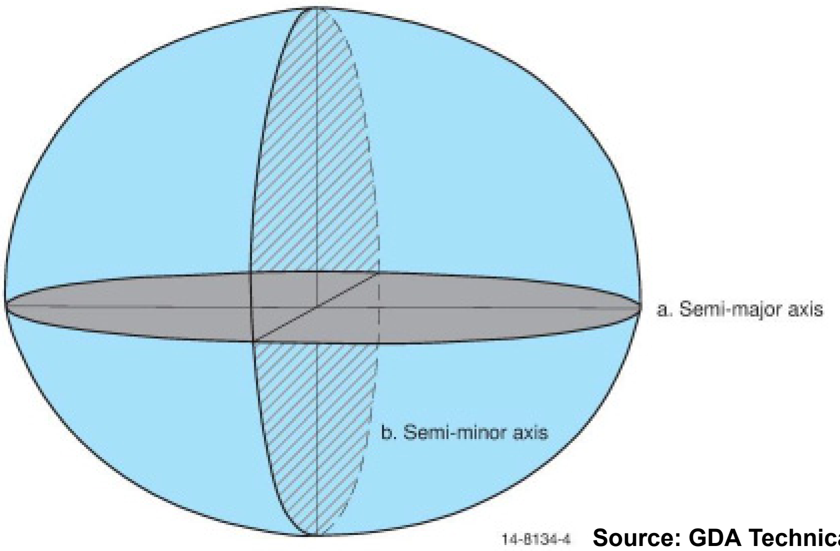
27.1.1 Ellipsoid

The Earth is not a round sphere but one that is squashed at the north and south poles and with a bulge at the equator. So the Earth is closer to being an ellipsoid than a sphere. That is, it is a 2D ellipse that is rotated about its minor axis to form the ellipsoid.

An ellipse is defined by giving the length of **semi-major axis (a)** and the **semi-minor axis (b).**



The ellipsoid in obtained by rotating the ellipse about its semi-minor axis (**polar axis**) through 360 degrees.



Source: GDA Technical Manual

The semi-major axis is also known as the **equatorial axis.**

However rather than giving the value of the semi-minor axis, the value for the **flattening** (**f**) of the ellipsoid is given instead where

flattening = f = (a - b)/ a

or the reciprocal of the flattening **1/f.**

So given the **semi-major axis** (a) and the **flattening** (f) or the **inverse flattering (reciprocal flattening rf** =1/f), the semi-minor axis (b) is given by:

b = a (1-f) = b(rf -1)/rf where **rf = 1/f**

When calculating an ellipsoid for the Earth, the North and South pole of the ellipsoid is approximately aligned with the Earth's axis of rotation and the difference between the semi-major axis (**equatorial axis**) and the semi-minor axis (**polar axis**) is about 21 km, or 0.335%

For the Earth, the polar axis of the ellipse is also referred to as the **True North Pole**.

In the past there have been two approaches to defining the ellipsoid representing the Earth:

(a) calculating the best approximation to the Earth's shape at a **local location.** That is, as a best fit matching the Earth's local geoid over a limited area. For example, Australia

(b) calculating the best approximation to the Earth's shape as a best fit matching the geoid for the whole Earth

In both cases there are many definitions of ellipsoids and some of the commonly used older ones are:

1. ANS

Ellipsoid	**Semi-major axis**	**Reciprocal Flattening**
ANS	6,378,160 metres	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) coordinates.

2. NZ Geodetic 49

Ellipsoid	**Semi-major axis**	**Reciprocal Flattening**
NZ Geodetic 49	6,378,399.065 metres	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.

3. Airy 1830

Ellipsoid	**Semi-major axis**	**Reciprocal Flattening**
Airy 1830	6,377,563.396 metres	299.3249646

This was the ellipsoid used by Ordnance Survey of Great Britain to define the Ordnance Survey National Grid.

Although there are many possible ellipsoids, Global Navigation Satellite Systems (**GNSS** - GPS, GLONAS, Galileo, BeiDou, RNSS-India etc) are now widely used in navigation and GNSS uses satellites which orbit around the **centre of mass** of the Earth. So using an ellipsoid with its centre at the mass centre of the Earth is best when working with GNSS and this ellipsoid has been standardised and is now used around the world. See 27.1.1.1 Mass Centred Ellipsoid.

27.1.1.1 Mass Centred Ellipsoid

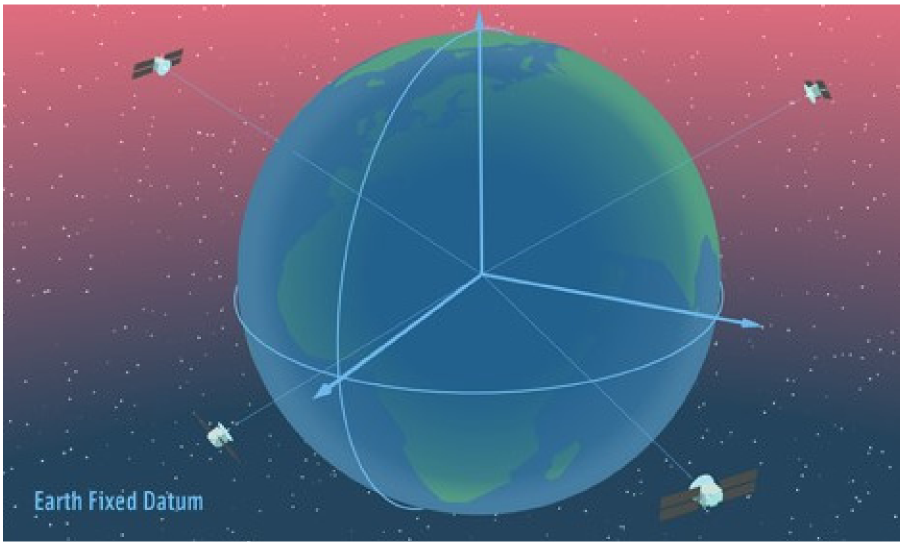
Global Navigation Satellite Systems **GNSS** (GPS, GLONAS, Galileo, BeiDou, RNSS-India etc) are now widely used in navigation, and GNSS uses satellites.

All satellites orbit around the centre of mass of the Earth so using an ellipsoid with its centre at the mass centre of the Earth is best for working with GNSS.

Also because GNSS works around the world, it is more efficient to have one ellipsoid that can be used throughout the world rather than myriad of different locally fitting ellipsoids.

In the **mass centred** ellipsoid (known as the **geocentric** ellipsoid), the North star is used as the true north reference as it's position in the sky causes it to appear almost stationary with the other stars rotating around it.

So the ellipsoid is positioned so that the **polar axis** (the line through the south to the north poles) points to the **North star**.



Such a mass centred ellipsoid was Internationally agreed upon and was defined as the **1980 Geodetic Reference System or GRS80**.

GRS80 is now used by most mapping systems around the world.

1. **GRS80**

Ellipsoid	**Semi-major axis**	**Reciprocal Flattening**
GRS80	6,378,137.0	298.257222101

This ellipsoid is used for Australia's GDA definition (Geocentric Datum of Australia GDA94 and GDA2020) that are used for MGA94 and MGA2020 (Map Grid of Australia) calculations. New Zealand's NZGD2000 datum as well as other geocentric Earth model datums around the world also use GRS80.

Another mass centred ellipsoid that is regularly mentioned **WGS84**. WGS84 is almost the same as GRS80 but most mapping systems use GRS80.

2. **WGS84**

Ellipsoid	**Semi-major axis**	**Reciprocal Flattening**
WGS84	6,378,137.0	298.257223563

Continue to 27.1.2 Geoid or return to 27.1 Shape Of The Earth or 27 Geodetics Summary.

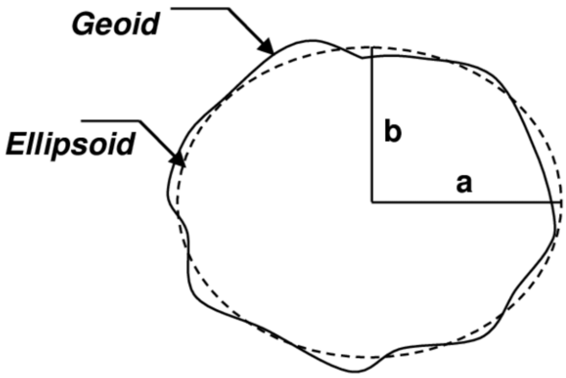
27.1.2 Geoid

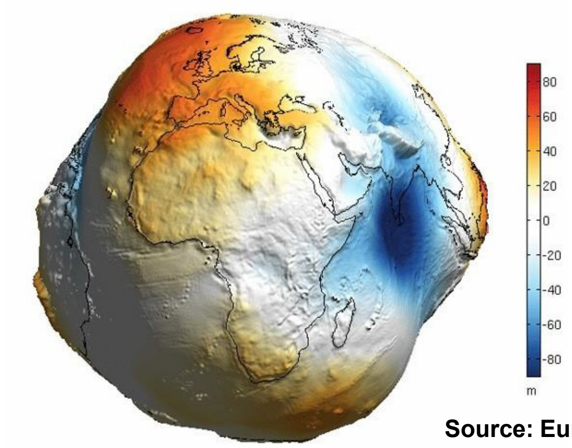
Ellipsoid heights (measured perpendicular to the ellipsoid) are defined at all points on the Earth but ellipsoid heights are not what most people think of as "heights".

The height at two points is usually considered to be the same if water will not flow between them, and one height is greater than the other if water flows from the higher point to the lower point.

Because the gravity definition of height is what makes sense for most applications, most height datums are not based on ellipsoid height but are based on the gravity. These are called **orthometric heights**.

The zero height for orthometric height is called the **geoid** which is defined as the shape of the Earth that the ocean surface would take under the influence of the gravity and rotation of the Earth alone. So orthometric heights are also known as **geoid** or **geoidal heights**.





Source: European Space Agency

The Earth Potato - exaggerated difference between Geoid and the Ellipsoid

For more information on the Geoid, see 27.2.5 Geoids and N Values for Coordinates.

Continue to 27.2 Coordinates and Datums for the Earth or return to 27.1 Shape Of The Earth or 27 Geodetics Summary.

27.2 Coordinates and Datums for the Earth

The Earth can be modelled as an ellipsoid with a given semi-major and semi-minor axis but for a given point p, a coordinate system is required so that the point can be uniquely defined by giving is coordinates.

Coordinate systems can be defined in an infinitely number of ways but the ones commonly used for modelling the Earth will now be discussed.

See

27.2.1 Geodetic Coordinates

27.2.2 Global XYZ Coordinates

27.2.5 Geoids and N Values for Coordinates

27.2.3 Map (Cartographic) Projections and Map Coordinates

27.5.3 True North, Grid North and Magnetic North

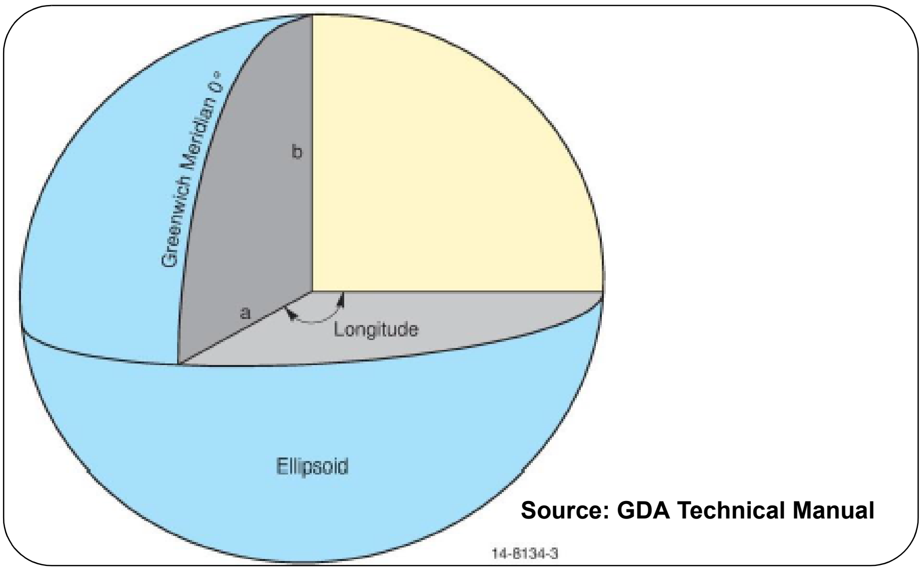
27.2.5 Geoids and N Values for Coordinates

27.2.6.1 Australian Height Datum and Geoid Models

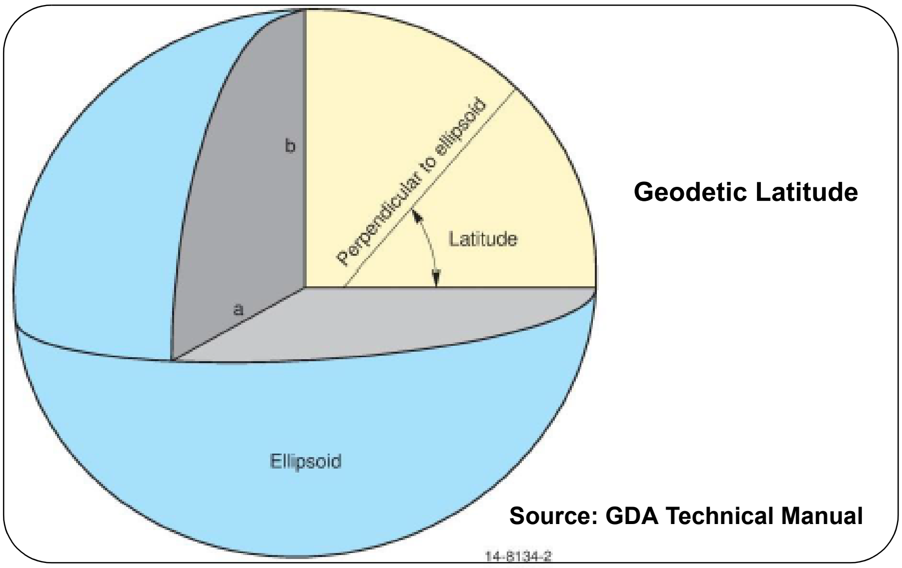
27.2.1 Geodetic Coordinates

Once an ellipsoid is defined, a position on the earths surface can be described in terms of **Longitude**, **Geodetic Latitude** and **Ellipsoid height**. These are called **Geodetic Coordinates** of a point.

Longitude is a 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.



Geodetic 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 of the equator.



The ***ellipsoid height***, h is the height above the reference ellipsoid.

So for any point P, it can be uniquely defined by its Geodetic (Geographic) coordinates of latitude (**phi**), longitude (**lambda**) and ellipsoid height **h**.

And today with GNSS, these values can be easily obtained to a fairly high degree of accuracy.

Continue to 27.2.1.1 Deflection of the Vertical - Three Latitudes or return to 27.2 Coordinates and Datums for the Earth or 27 Geodetics Summary.

27.2.1.1 Deflection of the Vertical - Three Latitudes

Today, what has been defined as geodetic latitude, is usually what is meant by latitude but there are actually three distinct latitudes used in surveying.

When **defining latitude on an ellipsoid**, the **geodetic** angle of **latitude** at a point is calculated by projecting **perpendicularly to the ellipsoid** at that point and intersecting with the equatorial plane. **Geodetic latitude** is the latitude that a GNSS unit returns and it is the main latitude used for points today.

However it is difficult to measure the geodetic latitude with traditional instruments as there is no easy way of measuring perpendicular to the ellipsoid. Instead instruments are traditionally set up using **gravity** to measure "**down**" (**plumb line**) and so are being set up **perpendicular to the geoid**.

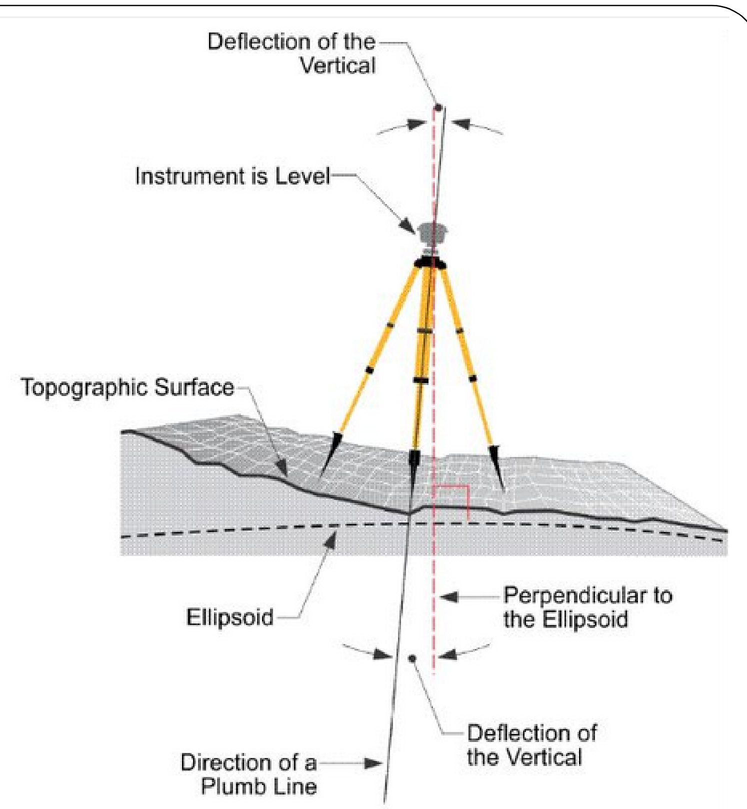
When astronomic observations are used to calculate the longitude and latitude of a point, "down" is perpendicular to the geoid and NOT perpendicular the ellipsoid and so the value obtained for latitude by astronomic observations is not the same as the geodetic latitude. The latitude derived from astronomic observations is called the **astronomic latitude**.

The difference between the astronomic latitude and the geodetic latitude at a point is called the **deflection of the vertical** (**eta**).

That is:

Deflection of the vertical = geodetic latitude - astronomical latitude

Eta = geodetic latitude - astronomical latitude

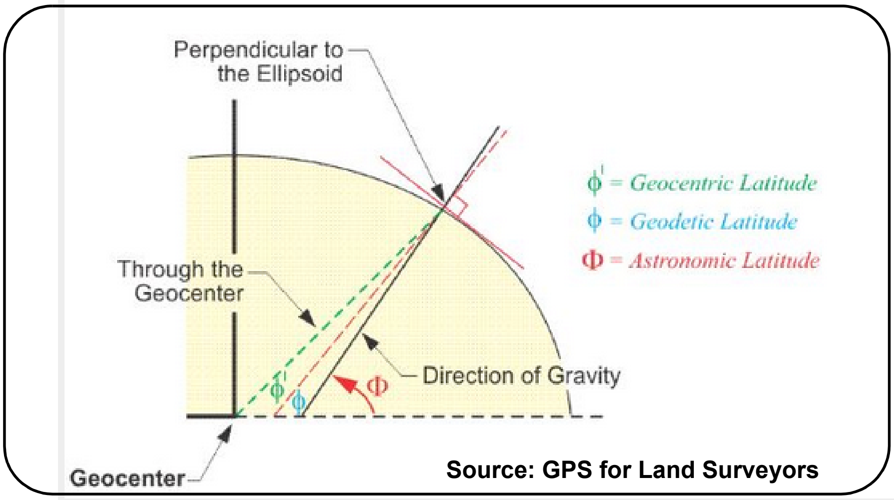


Source: GPS for Land Surveyors

Because they are related to a particular ellipsoid, deflection of the vertical, like geoid-ellipsoid separation, will be different for different datums.

Deflection of the vertical is the reason why the current prime meridian passes more than 100m to the east of the historical astronomical prime meridian in Greenwich.

For completeness. there is another latitude called **geocentric latitude**, and it is defined as the latitude when the point is joined to the **centre** of the **ellipse**.



The **geodetic latitude** is the one that is mainly used today when the word **latitude is used**.

Continue to 27.2.2 Global XYZ Coordinates or return to 27.2 Coordinates and Datums for the Earth or 27 Geodetics Summary.

27.2.2 Global XYZ Coordinates

For an ellipsoid, the **Global XYZ** coordinate system is a cartesian coordinate system defined by:

(a) the origin is at the centre of the ellipsoid

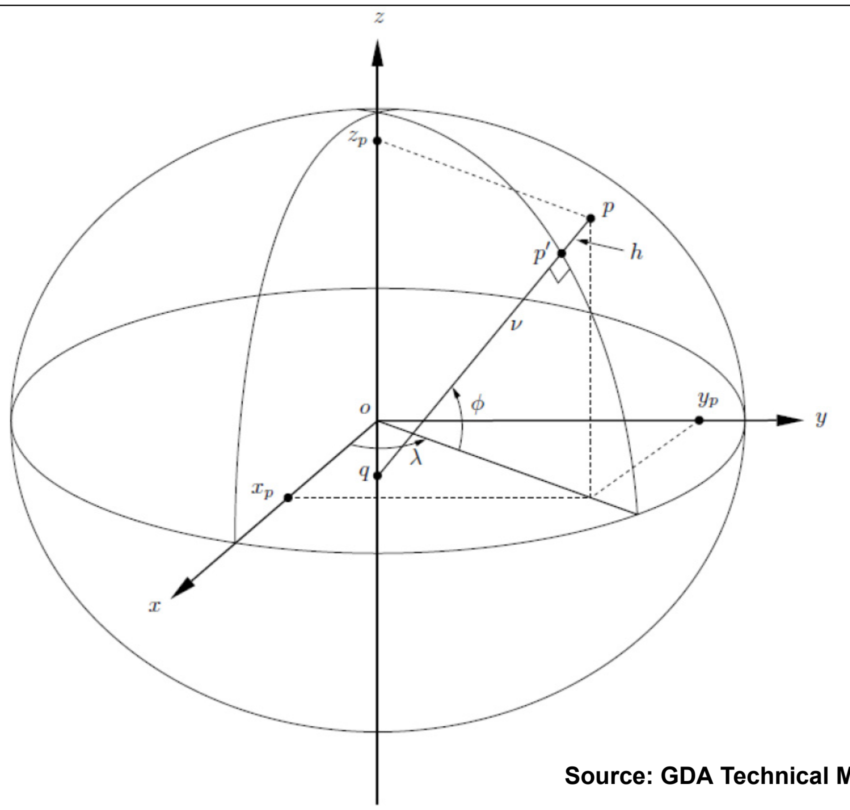
(b) the Z-axis is the direction of the rotational axis of the ellipsoid of revolution. The X-Y plane is the equatorial plane of the ellipsoid and the origin of latitude

(c) the X-Z plane the prime meridian plane. That is, the origin of longitudes.

So for any point P, it can be uniquely defined by its Global XYZ coordinates (xp,yp,zp).

The point P has **Global XYZ coordinates (xp,yp,zp)** and **Geodetic coordinates** of **latitude phi**, **longitude lambda** and **ellipsoid height h** for a given ellipse.

For a given ellipse, there is actually a one-to-one mapping between the Geodetic coordinate system and the Global XYZ coordinate system. That means if the coordinates are known in one system, then the coordinates in the other system can be calculated from the known system (if you know the parameters of the ellipse).



Source: GDA Technical Manual

Figure 2.1: Relationship between Cartesian and geographic coordinate systems.

Global XYZ coordinates are also **often called** Cartesian coordinates or **Global Cartesian coordinates.**

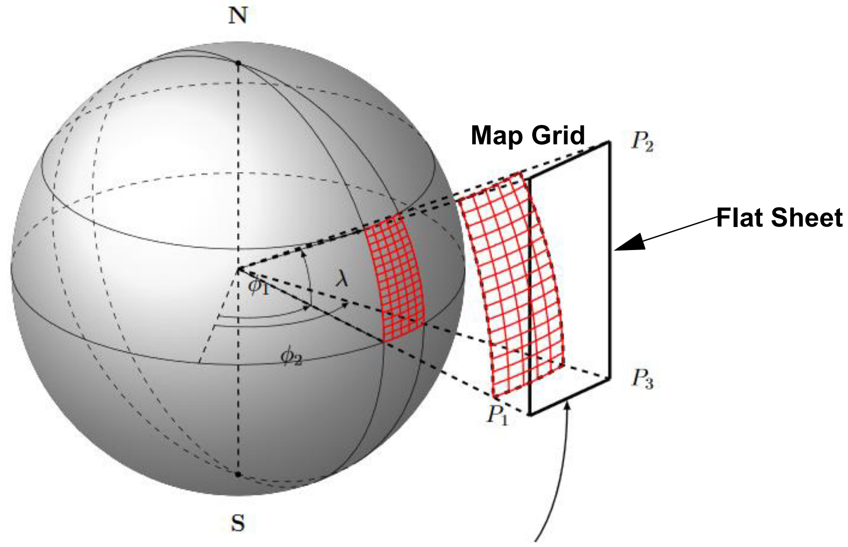
Important Note

The calculations are more difficult than the spheroid case because unlike the spheroid case, the tangent to a point on the ellipsoid does NOT go through the centre.

Continue to 27.2.3 Map (Cartographic) Projections and Map Coordinates or return to 27.2 Coordinates and Datums for the Earth or 27 Geodetics Summary.

27.2.3 Map (Cartographic) Projections and Map Coordinates

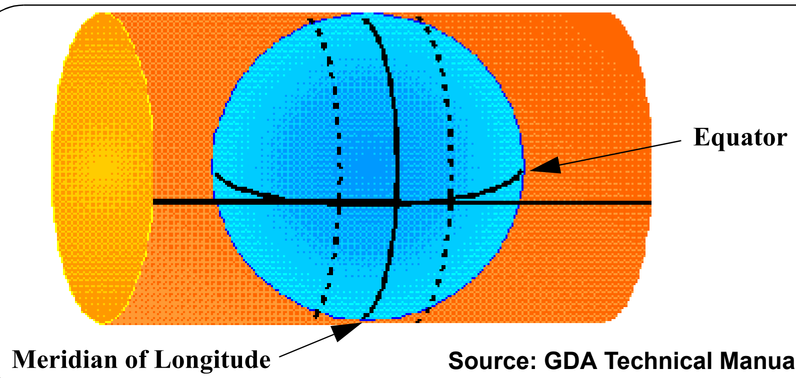
In order to represent ellipsoid data on a flat surface for mapping, it is necessary to use a map projection. A **map projection** enables points on the earths surface to be mathematically projected onto an imaginary developable **surface**. This surface can then be developed or "rolled flat" to draw the images on a flat sheet.



Source: GPS for Land Surveyors

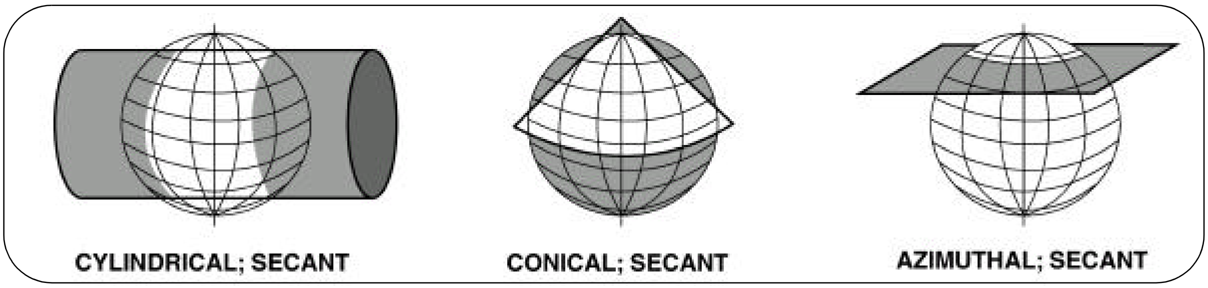
The the surface that the ellipsoid is projected onto is often a cylinder, a cone or a flat plane.

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.

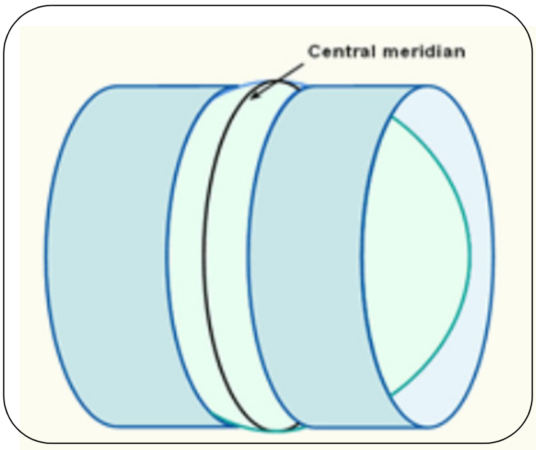


Source: GDA Technical Manual

In practice, the more used versions are the secant versions. That is, the cylinder, cone etc is slightly inside the ellipsoid:

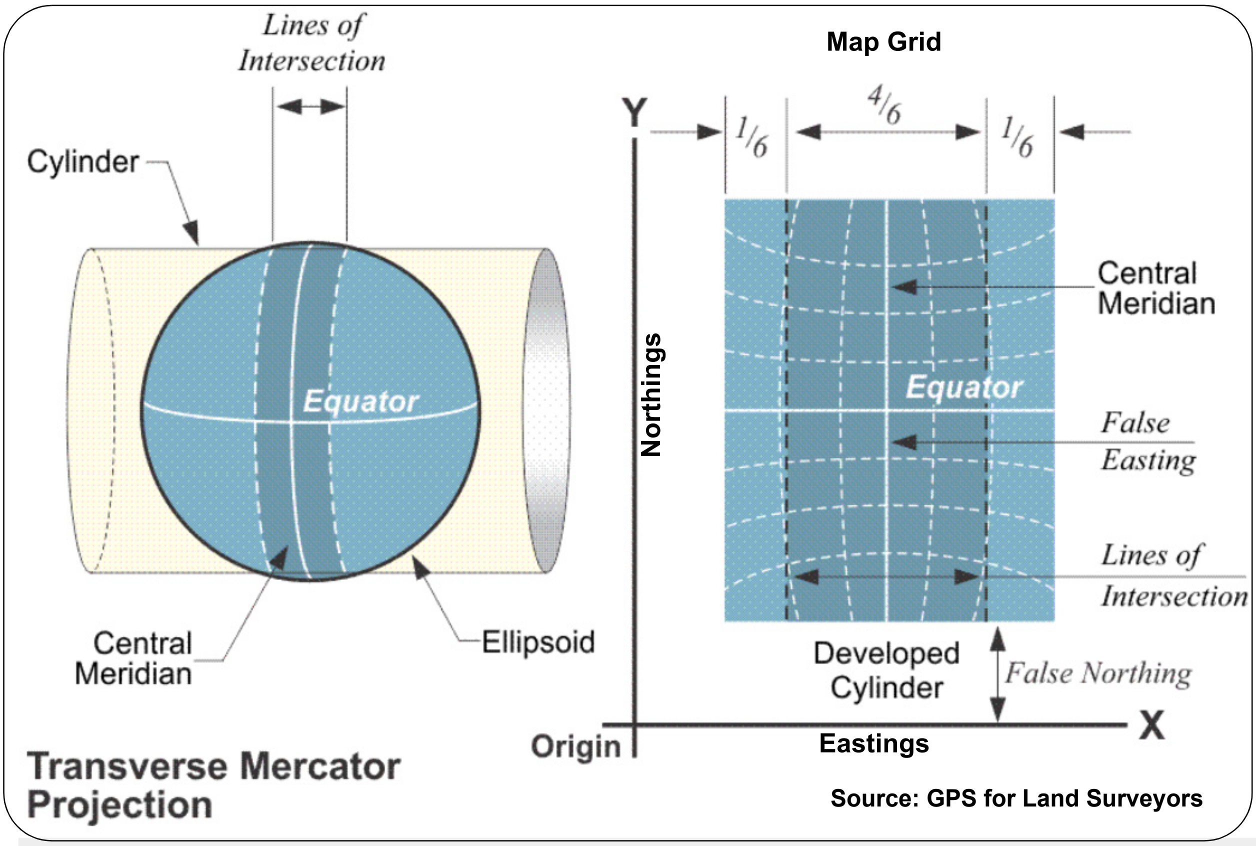


The Transverse Mercator projection used in Universal Transverse Mercator (**UTM**) is a **Secant Transverse Mercator.**



So the cylinder no longer touches the sphere on the central meridian but instead on two lines on either side of the central meridian.

When a map projection is used, the coordinates on the flat sheet are called **Eastings** and **Northings**. This is the map grid and the coordinates are called **grid coordinates** or **map coordinates**.



Important Note

From the above is should be clear that points can not be projected from the ellipsoid onto the developable surfaces (flat sheets) without introducing **distortions** in the lengths of lines or the shapes of areas.

These distortions can be minimised in an area by the selected placement of the cylinder or cone, to the ellipsoid, or by limiting the extent of coverage of the earth's surface for a particular projection. See 27.2.3.1 Map Zones.

Another Important Note

Because the map coordinates are finally projected onto a flat sheet, they are sometimes referred to as plane coordinates, especially in the USA where the projections used for the various Sates are called State Plane Coordinates.

In particular, these should not be confused with what is often refer erred to as "local engineering coordinates", where the earth is considered to be a flat plane at a particular local point and the coordinates and distances are in ground metres and not map metres.

Continue to 27.2.3.1 Map Zones or return to 27.2 Coordinates and Datums for the Earth or 27 Geodetics Summary.

27.2.3.1 Map Zones

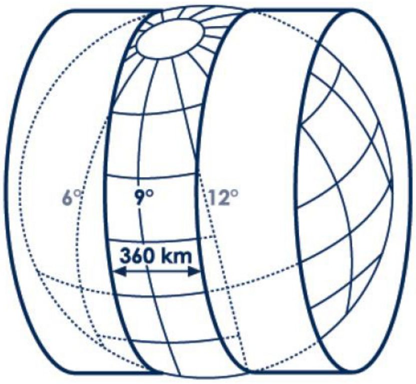
Points can not be projected from the ellipsoid onto a developable surface (flat sheet) without introducing **distortions** in the lengths of lines or the shapes of areas.

This means that distances between points on a map (**map metres**) are NOT the same as the standard metres used for measuring on the ground (**ground metres)**. See 27.4.4 Point Scale Factor and 27.4.5 Line Scale Factor.

These distortions can be minimised in an area by the selected placement of the cylinder or cone, to the ellipsoid, and by limiting the extent of coverage of the earth’s surface for a particular projection.

For a projection, the limiting the of the extent of coverage of the earths surface and having the placement of the cylinder or cone specially for that coverage, is called breaking the projection into **zones**. Each **zone** will have the cylinder or cone positioned so that the distortions are minimised in the area covered by the zone.

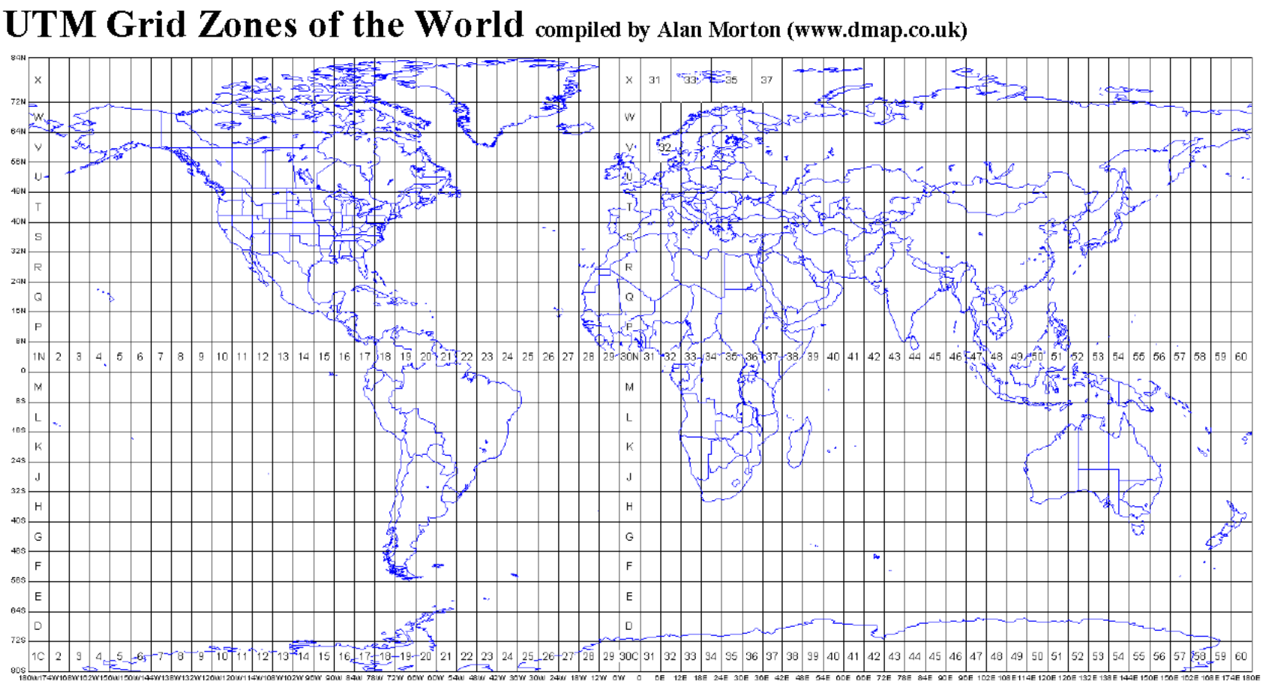
For example, the Universal Transverse projection (UTM) splits the world into **sixty** zones of **six degree** with the **central meridian** of the projection in the **middle of the zone**.



UTM which has 6 degree zones

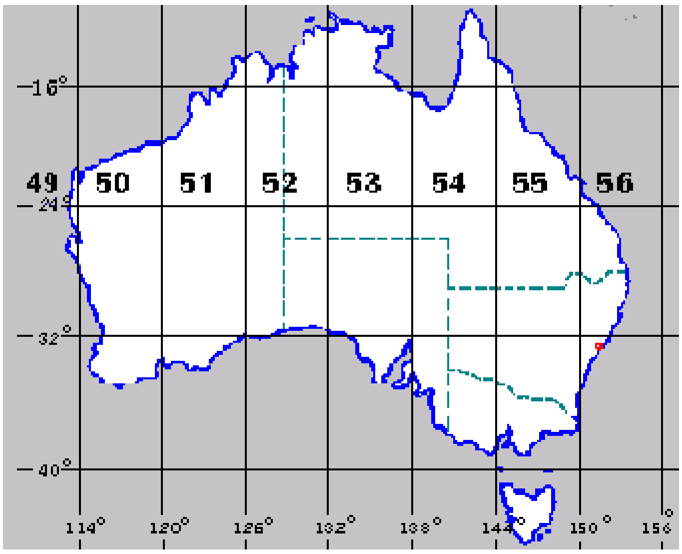
The UTM zones are numbered from 1 to 60, the first zone being 180 degrees West, longitude. So UTM Zone 1 goes from 180 degrees to 186 degrees and the central meridian is along 183 degrees.

So each UTM 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.



This 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.

For example, Australia is covered by the UTM zones 49 to 56.



Important Note:

MGA94 and MGA2020 use the same map projection **BUT** MGA94 refers to the map coordinates using GDA94 which is where all the points in the world are at 1 January 1994, and MGA2020 are the map coordinates when using GDA2020 which is where the points are at 1 January 2020. See 27.6.2.3.2 Transforming Between MGA94 and MGA2020.

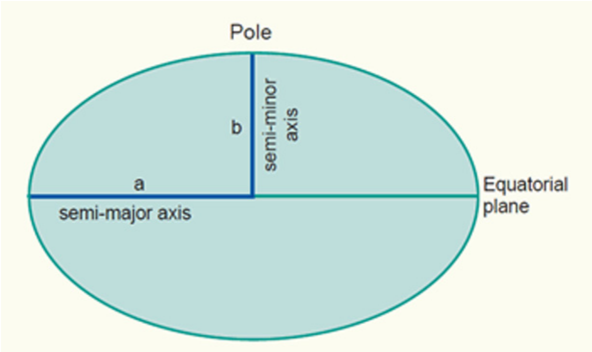
Continue to 27.2.4 Geodetic or Horizontal Datum or return to 27.2 Coordinates and Datums for the Earth or 27 Geodetics Summary.

27.2.4 Geodetic or Horizontal Datum

In simple terms, a horizontal datum is a mathematical model of the Earth which serves as a reference for calculating the longitude, latitude and heights of any point on the surface of the Earth.

However, each of the terms in this definition need to be precisely defined.

As discussed in 27.1.1 Ellipsoid, the most common mathematical model of the Earth is an ellipsoid of revolution and ellipsoid is defined by giving its **semi-major axis** (**a**) and **semi-minor axis** (**b**).



However to **fix the ellipsoid to the Earth** so that a longitude and latitude can be defined for each point on the Earth, we need a **reference frame** defining:

centre of the ellipsoid with respect to the Earth

polar axis of the ellipsoid with respect to the Earth.

zero longitude with respect to the Earth

geodetic latitude

The polar axis of the ellipsoid (north pole) is the International Reference Pole (IRP) as defined by the International Earth Rotation Service (IERS).

Once this connection between the ellipse and the Earth is fully defined, heights for points on the Earths surface can be specified as ellipsoid heights (distance above and below the ellipsoid).

Unfortunately the surface of the Earth is constantly moving (continental drift, earthquakes etc.) so to uniquely define a position on the Earth's surface, the **time** that the position was calculated is also required (**epoch**).

So as defined by Geosciences Australia, a **geodetic datum** or **horizontal datum** is composed of:

(a) an ellipsoid

(b) a reference frame

and

(c) a reference time (epoch).

geodetic datums can be **local geodetic datums** that are based on an ellipsoid that best fits the Earths surface in a particular area of interest, or **global geodetic datums** that best fits the entire Earth.

A **geocentric datum**, or earth-centred datum, uses the Earth's centre of mass as the centre of the ellipsoid.

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. GDA94 refers to the Geocentric Datum of Australia, using the GRS80 ellipsoid as the basis for defining geodetic coordinates for where Australia was at 1st January 1994, and GDA2020 refers to the Geocentric Datum of Australia again using the GRS80 ellipsoid but defining geodetic coordinates for where Australia was at 1st January 2020.

In New Zealand, the NZGD49 datum refers to the NZ Geodetic 49 ellipsoid. The NZGD2000 datum is the New Zealand Geodetic Datum 2000 which again refers to the GRS80 ellipsoid.

Important Note:

Due to continental drift with respect to Greenwich and the equator, about 7 cm per annum for Australia, the longitude and latitude of each point in Australia varies with time. GDA94 is the Geodetic Datum for the position of where Australia was in1994, and GDA2020 is where Australia is in 2020. See 27.6.2.3.2 Transforming Between MGA94 and MGA2020.

Continue to 27.2.5 Geoids and N Values for Coordinates or return to 27.2 Coordinates and Datums for the Earth or 27 Geodetics Summary.

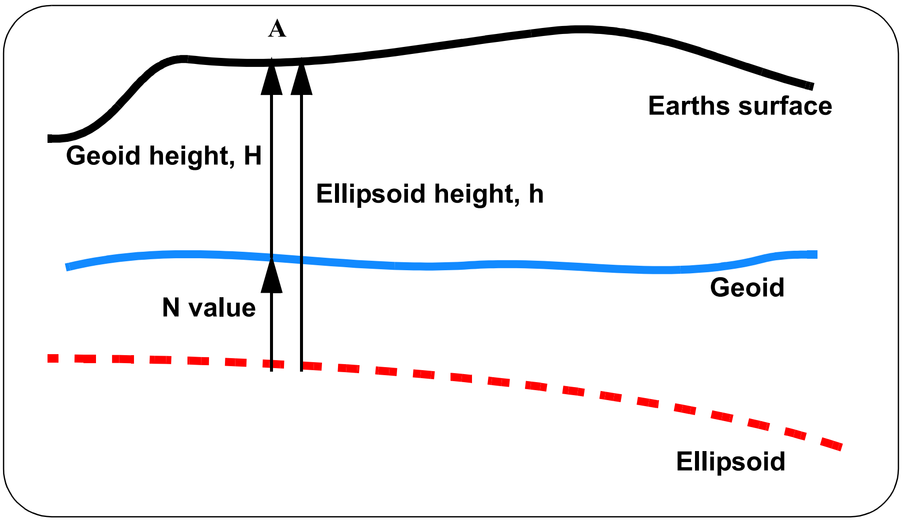
27.2.5 Geoids and N Values for Coordinates

Gravity is what determines how water flows so the normal definition of equal heights is defined by gravity. These are orthometric heights.

The zero height for orthometric height is called the **geoid** which is defined as the shape of the Earth that the ocean surface would take under the influence of the gravity and rotation of the Earth alone. So orthometric heights are also known as **geoid** or **geoidal heights**. The geoid is best approximated by **Mean Sea Level**.

For a given ellipsoid, the geoid can be defined at each point in terms of the difference in height between the ellipsoid and the geoid at that point. This is known as the **undulation of the geoid.**

The difference between the **geoid height (H)** and the **ellipsoid height (h)** at a point is called the **N value (N)** for that point, and **N** is positive when the ellipsoid is above the geoid.



That is:

N value = Ellipsoid Height - Geoid height

N = h - H

or

Ellipsoid height = Geoid height + N value

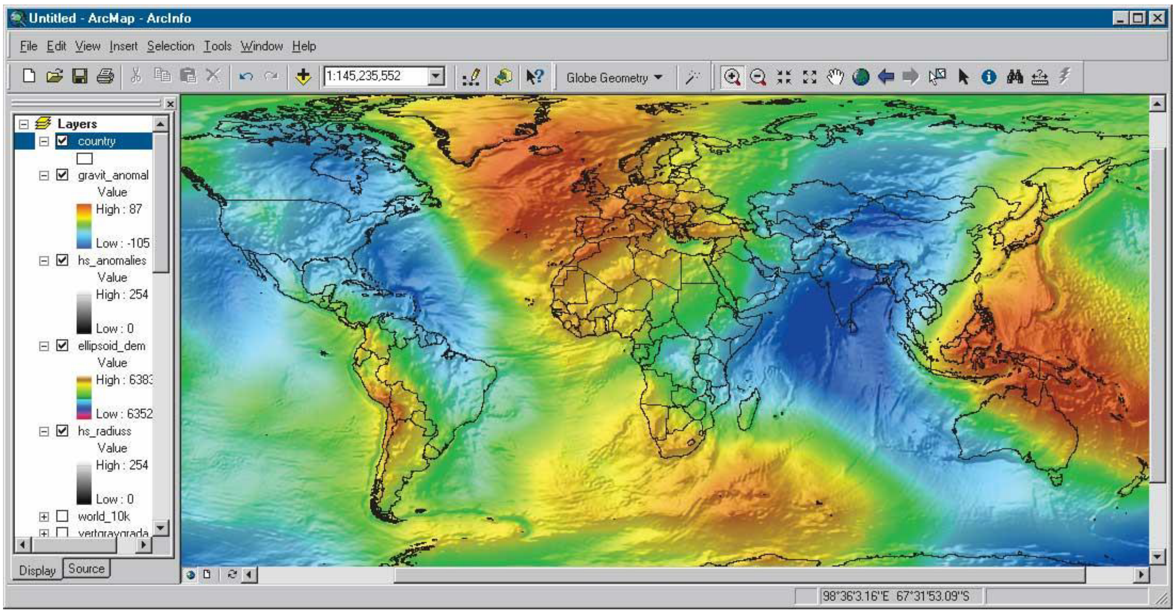
h = H + N

or

Geoid height = Orthometric height = Ellipsoid height - N value

H = h - N

N values can be positive or negative.



Distance between the Geoid and the Ellipsoid GRS80

Even though there is universally accepted definition of the ellipsoid (GRS80), the wide variation in the geoid has meant that local models of the geoid are still the norm today.

For example, in Australia, N values have been defined for the whole of Australia as **Ausgeod98** but the values are only to a certain accuracy and are only given at regular positions on a grid. If more accurate N values are required for an application then additional N values need to be measured. and used.

Consequently there are a variety of methods for providing N values and which one is used will depend on where the project is and what precision is required (see 27.2.6 Vertical Datum).

Since most geodetic calculations are based on the ellipsoid, any observations should be reduced onto the ellipsoid. But before observations can be reduced onto the geoid, the heights must be ellipsoid heights. And this is particularly true for precise calculations.

In GNSS surveys, heights are often given in ellipsoid heights but most other level datums are based on a geoid. and not an ellipsoid.

The difference between an ellipsoid height and a geoid (level datums) is given by N -values. That is, N values are the separation distances between the geoid and the ellipsoid.

The Survey reduction process can take into the consideration the height above the ellipsoid but that means in the reduction process it is necessary to first convert non ellipsoid heights to ellipsoid heights and this is done by adding the geoid-ellipsoid separations (N values).

In ***12d Model*** there are various methods for supplying the N values and which one is used depends the work being done and how precise the calculations need to be.

Also depending on how the values for a method are defined, a particular method may only be used with a particular coordinate system. For example, the N values may be defined for positions given in map coordinates or they may be defined for position given in longitudes and latitudes.

The methods currently available are:

(a) no N values required - N is zero everywhere

(b) constant N value - a constant N value is used everywhere

(c) an N value plane

A plane is of N values is defined in map coordinates and for a particular (x,y) coordinate, the N value is taken from the N value plane at that point.

(d) a N value tin

A tin of N values is used and for a particular (x,y) coordinate, the N value is taken from the N value on the tin at that point.

This is often used for very precise work in a limited area where the N values are known at a number of points in the area.

(e) a grid of N values

A grid of N values at regular coordinate points in either a text file format or as a binary file in NTv2 format (.gsb file) is used.

For a particular (x,y) coordinate, the N value is taken from the grid points surrounding the point.

The Winter bicubic interpolation method (supplied by Auslig) can be used for calculating N values within the grid.

For more information on the Australian Height Datum (AHD) and the available NTv2 grids for converting between ellipsoid heights and AHD go to 27.2.6.1 Australian Height Datum and Geoid Models.

The parameters for particular N value methods can be stored under a unique name using the **Create/Edit N Value Settings** panel (see 7.12.7.2 Create/Edit N-Value Definitions) and a particular method set as the default method to use in a Project (see 7.12.7.1 Set N-Values for Project).

Continue to 27.2.6 Vertical Datum or return to 27.2 Coordinates and Datums for the Earth or 27 Geodetics Summary.

27.2.6 Vertical Datum

Because the gravity definition of height is what makes sense for most applications, most heights are not based on ellipsoid height but are based on the ***geoid height*** (also known as **geoidal** or **orthometric height)**. For example, the Australian Height Datum *(***AHD**).

The definition of heights is the **vertical datum**.

A **Vertical Datum** is the zero surface (geoid) from which all elevations or heights are measured. Generally mean sea level is used as the vertical datum.

Local vertical datums are defined to serve the georeferencing needs of a country or group of adjacent countries.

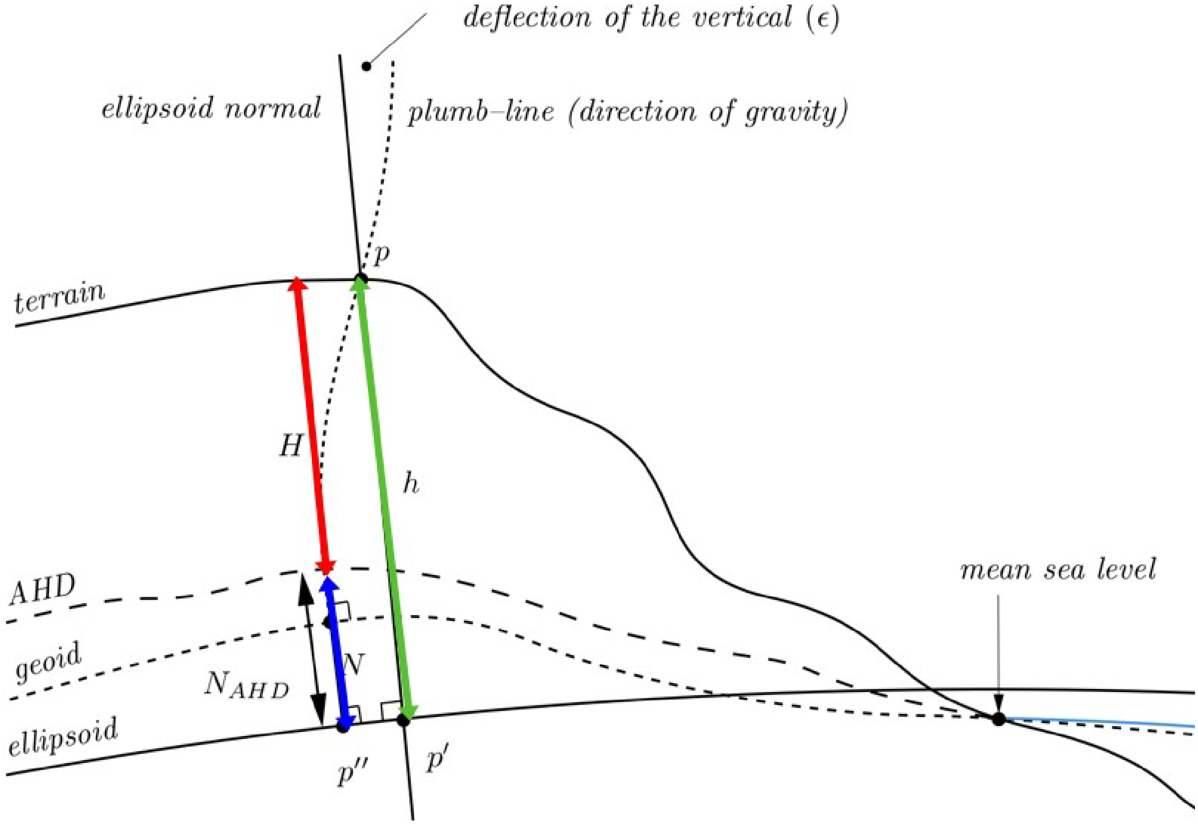
The N-values for the geoid depend on the chosen ellipsoid and now that there is a standardised ellipsoid (**GRS80**) used around the world, the N-values of the geoid can also be standardised by giving the values with respect to **GRS80.**

However the universal Geoid is not normally accurate enough to use everywhere. Consequently local models of the geoid are often still in use today.

For examples of the height datums currently in use in Australia, continue to 27.2.6.1 Australian Height Datum and Geoid Models.

27.2.6.1 Australian Height Datum and Geoid Models

Height determination in Australia requires a level of care due to the number and type of reference and working surfaces to which heights can be referred, including: AHD, MSL, Mean Sea Surface (MSS), ellipsoid and geoid (gravimetric or combined gravimetric and geometric).



See

27.2.6.1.1 Australian Height Datum (AHD)
27.2.6.1.2 AUSGeoid09
27.2.6.1.3 AUSGeoid2020

27.2.6.1.1 Australian Height Datum (AHD)

The **Australian Height Datum** (**AHD**) is the official national vertical datum for Australia and refers to Australian Height Datum 1971. Prior to AHD, many local height datums were used in the states and territories.

When the AHD was established, insufficient gravity observations were available to apply gravimetric height corrections. Instead, a truncated version of the normal-orthometric correction of Rapp (1961) was applied to the spirit levelling observations (Roelse et la., 1975; Featherstone and Kuhn 2006) which has no requirement for observed gravity in the correction. Instead it uses the normal gravity field only to derive all necessary gravity field related quantities.

Continue to 27.2.6.1.2 AUSGeoid09 or return to 27.2.6.1 Australian Height Datum and Geoid Models or 27.2 Coordinates and Datums for the Earth or 27 Geodetics Summary.

27.2.6.1.2 AUSGeoid09

AUSGeoid09 is the Australia-wide gravimetric quasigeoid model that has been a posteriori fitted to the Australian Height Datum (AHD) so as to provide a product that is practically useful for the more direct determination of AHD heights from Global Navigation Satellite Systems (GNSS).

That is, the **AUSGeoid09** model provides the offset between the GDA94 ellipsoid and AHD. The model is only valid onshore.

AUSGeod09 is available as a NTv2 (.gsb) file from https://www.ga.gov.au/scientific-topics/positioning-navigation/australian-geospatial-reference-system/agrstoolsandmodels.

Important Note

Only GDA94 coordinates can be used with AUSGeoid09.

Continue to 27.2.6.1.3 AUSGeoid2020 or return to 27.2.6.1 Australian Height Datum and Geoid Models or 27.2 Coordinates and Datums for the Earth or 27 Geodetics Summary.

27.2.6.1.3 AUSGeoid2020

The **AUSGeoid2020** model provides the offset between the GDA2020 ellipsoid and AHD. The model is only valid onshore.

AUSGeoid2020 is provided in two formats; ASCII text file (.txt) and NTv2 binary grid (.gsb). The NTv2 (.gsb) file is available at https://www.ga.gov.au/scientific-topics/positioning-navigation/australian-geospatial-reference-system/agrstoolsandmodels.

Important Note

The change in the reference frame used for the development of GDA2020 (i.e. ITRF2014 compared to ITRF92 used for GDA94) means the ellipsoidal height of a point in GDA94 is approximately 9 cm higher than GDA2020. As a result, **AUSGeoid2020 is incompatible with GDA94.**

Only GDA2020 coordinates can be used with AUSGeoid2020.

Continue to 27.3 Defining a Projection in 12d Model or return to 27.2.6.1 Australian Height Datum and Geoid Models or 27.2.6 Vertical Datum or 27.2 Coordinates and Datums for the Earth or 27 Geodetics Summary.

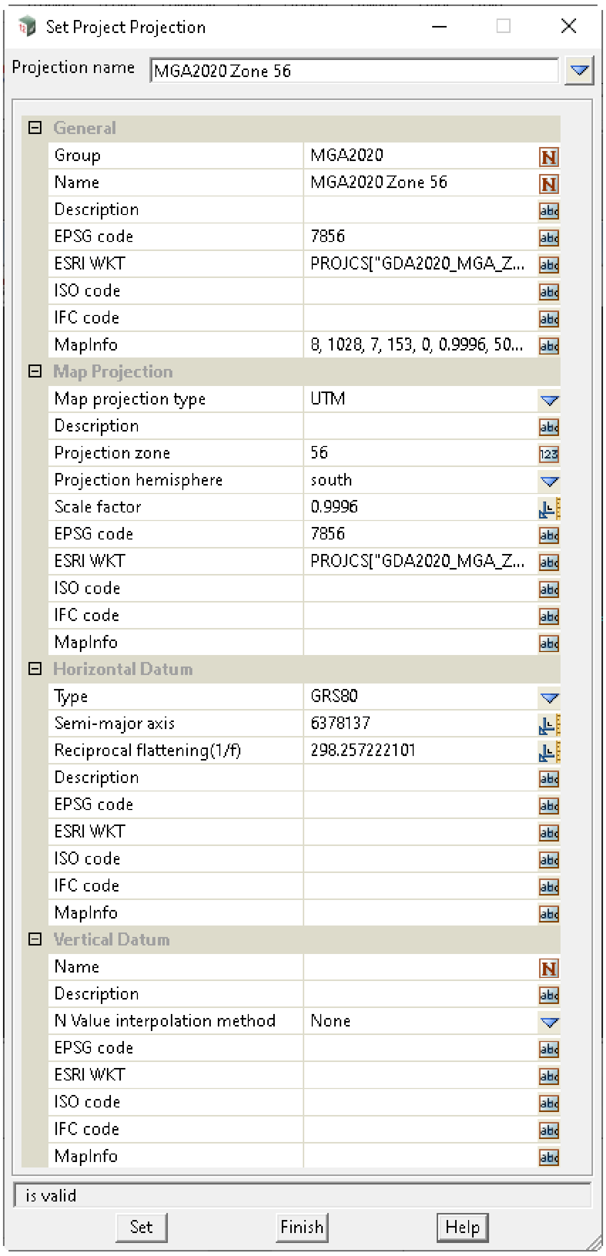
27.3 Defining a Projection in 12d Model

12d Model supports a wide number of projections by name 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 the ***reference ellipsoid*** (the ***Horizontal Datum***), the **Vertical Datum** and the ***Map Projection type***. Hence a projection defined in ***12d Model*** can then be used for geodetic, and other, calculations.

Any projection has specific parameters that define it and in ***12d Model***, each projection is given a unique name and the parameters for the projection entered in the **Projection File Editor** panel (see 7.12.6.1 Projection Editor). The projection can then be used in other options.

For example MGA2020 Zone 56 projection is defined as follows:



Continue to 27.4 Distances or return to 27 Geodetics Summary.

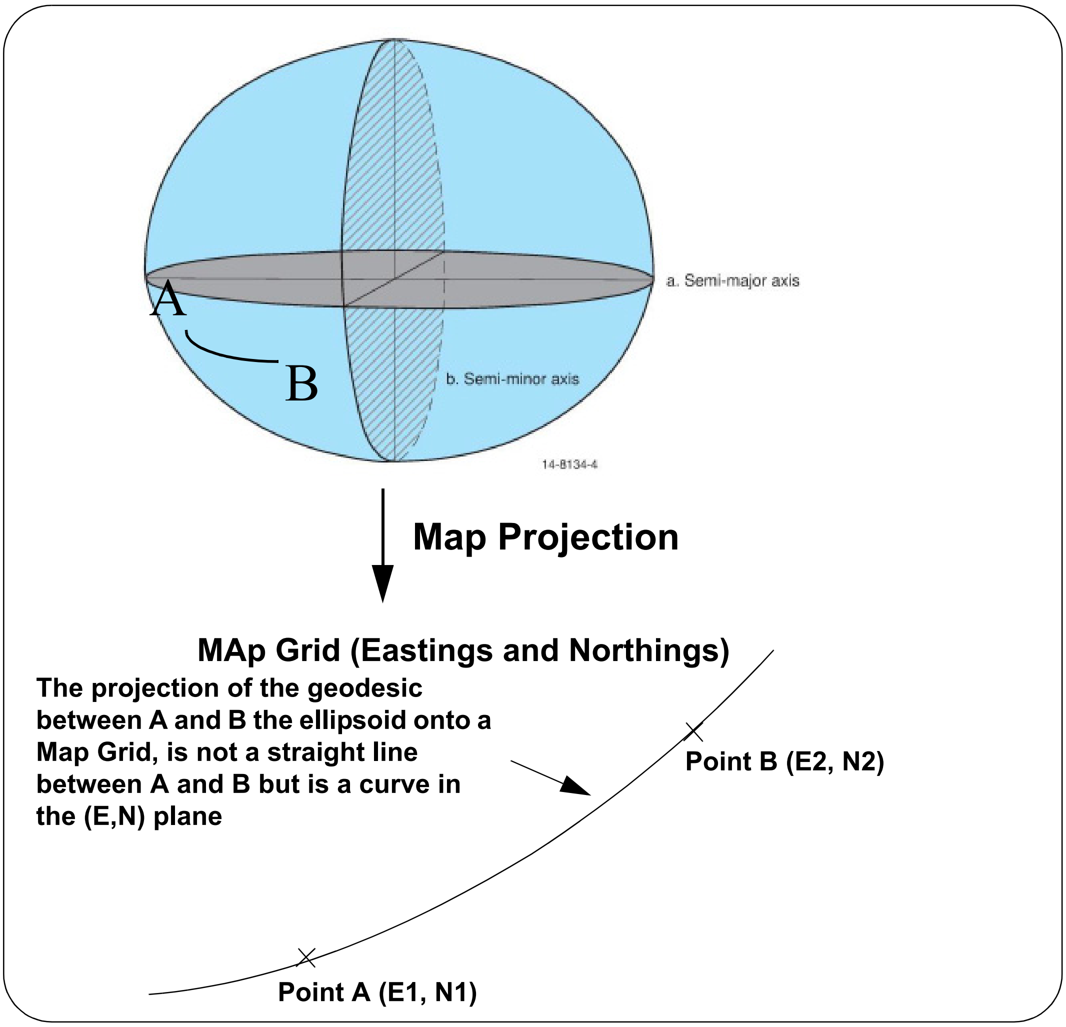
27.4 Distances

If you have a point on an ellipsoid and a Map Projection (such as UTM), the coordinates of the projected point (projection or map coordinates) are called the grid coordinates of the point and are named Easting and Northings (Easting, Northing).

The shortest distance (***"straight line")*** between two points on an ellipsoid is the **geodetic line**, or **geodesic**. The geodetic line on an ellipsoid is analogous to the ***great circle*** on a sphere.

If each point along the geodesic between two points A and B on the ellipsoid, is projected onto a map grid, the path that is traced out in the map grid is a ***curve*** between the points.

That is, a *"straight line"* on an ellipsoid does not project onto the (Easting, Northing) grid as a straight line but is as a curve.



So the *straight line* joining the two points A and B in the **(Easting, Northing) plane** *is different* from the projection of the geodesic ("straight line" on the ellipse) joining the two points on the ellipse.

See

27.4.1 Ellipsoid Distance
27.4.2 Plane Distance
27.4.3 Australian Grid Distance
27.4.4 Point Scale Factor

27.4.1 Ellipsoid Distance

The ***ellipsoid distance*** between two points on a ellipsoid is the length of the geodesic between the two points.

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.*

$$HeightScaleFactor = 1 - \frac{h_M}{R + h_M}$$

Where:

h$_{\mathbf{M}}$ = Mean terrain height (mean of the two ellipsoid heights at either end of the measured line)

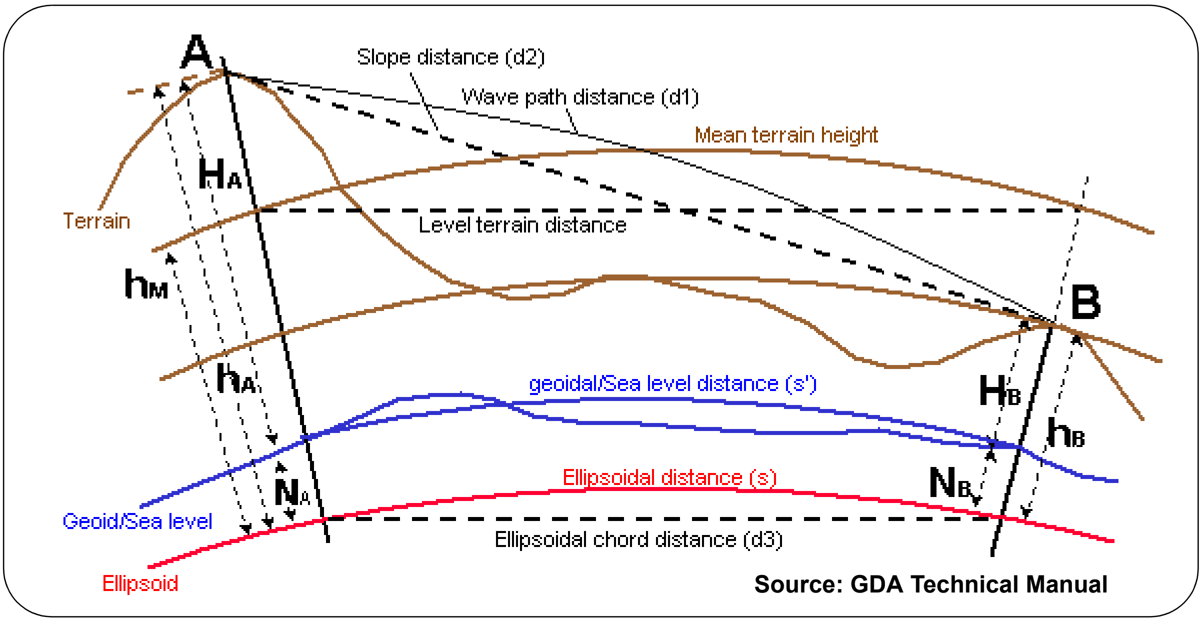
R = Radius of the Earth in the azimuth of the line.

Note: An error of 60 meters in the value of **h**$_{\mathbf{M}}$ 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**.



Continue to 27.4.2 Plane Distance or return to 27 Geodetics Summary.

27.4.2 Plane Distance

The ***plane distance*** between two points A and B 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

plane distance = square root [(E2 - E1)*(E2 - E1) + (N2 - N1)*(N2 - N1)]

Continue to 27.4.3 Australian Grid Distance or return to 27 Geodetics Summary.

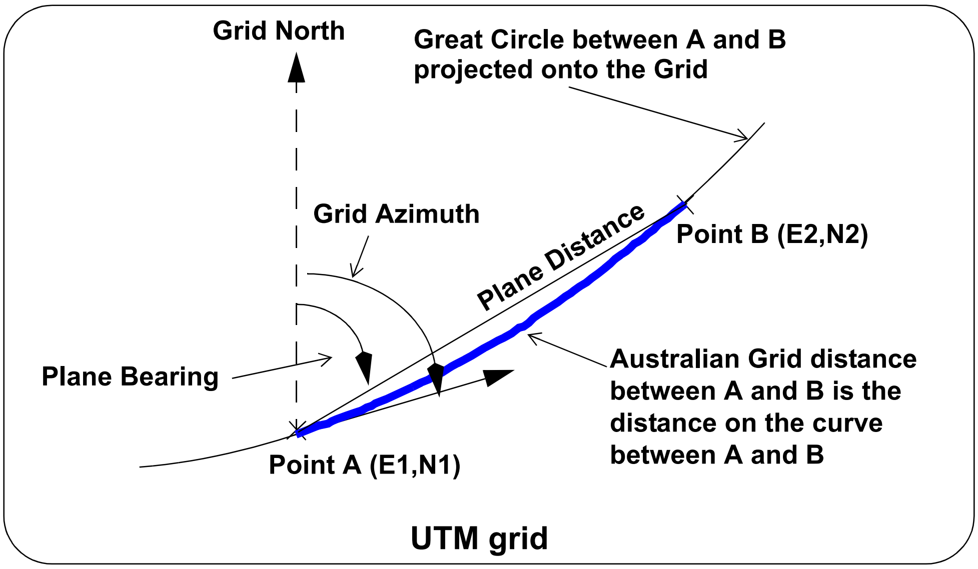
27.4.3 Australian Grid Distance

On an ellipsoid, the *straight line* joining two points on the ellipsoid is the geodesic between the two points.

However a *geodesic* on an ellipsoid projects onto a map grid a a curve.

In the diagram below, the curve shown through points A and B is the projection of the geodesic on the ellipse going through points A and B.

In the **Australian GDA Technical Manual**, the ***grid distance*** is the distance **on this *curve*** from point A to B.



The difference between the plane distance and the Australian grid distance is usually negligible.

Warning: In some countries (e.g. New Zealand), the term *grid distance* is defined to be the plane distance.

Continue to 27.4.4 Point Scale Factor or return to 27 Geodetics Summary.

27.4.4 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.

Continue to 27.4.5 Line Scale Factor or return to 27 Geodetics Summary.

27.4.5 Line Scale Factor

The ***line scale factor*** is the ratio of the plane distance on a grid to a corresponding ellipsoid distance. *i.e.*

$$LineScaleFactor = \frac{PlanDist}{EllipsoidDist}$$

This factor can be used to calculate either the plane or ellipsoid distance given the Line Scale Factor and the other distance. *i.e.*

Plane distance = Ellipsoid distance x Line scale factor,

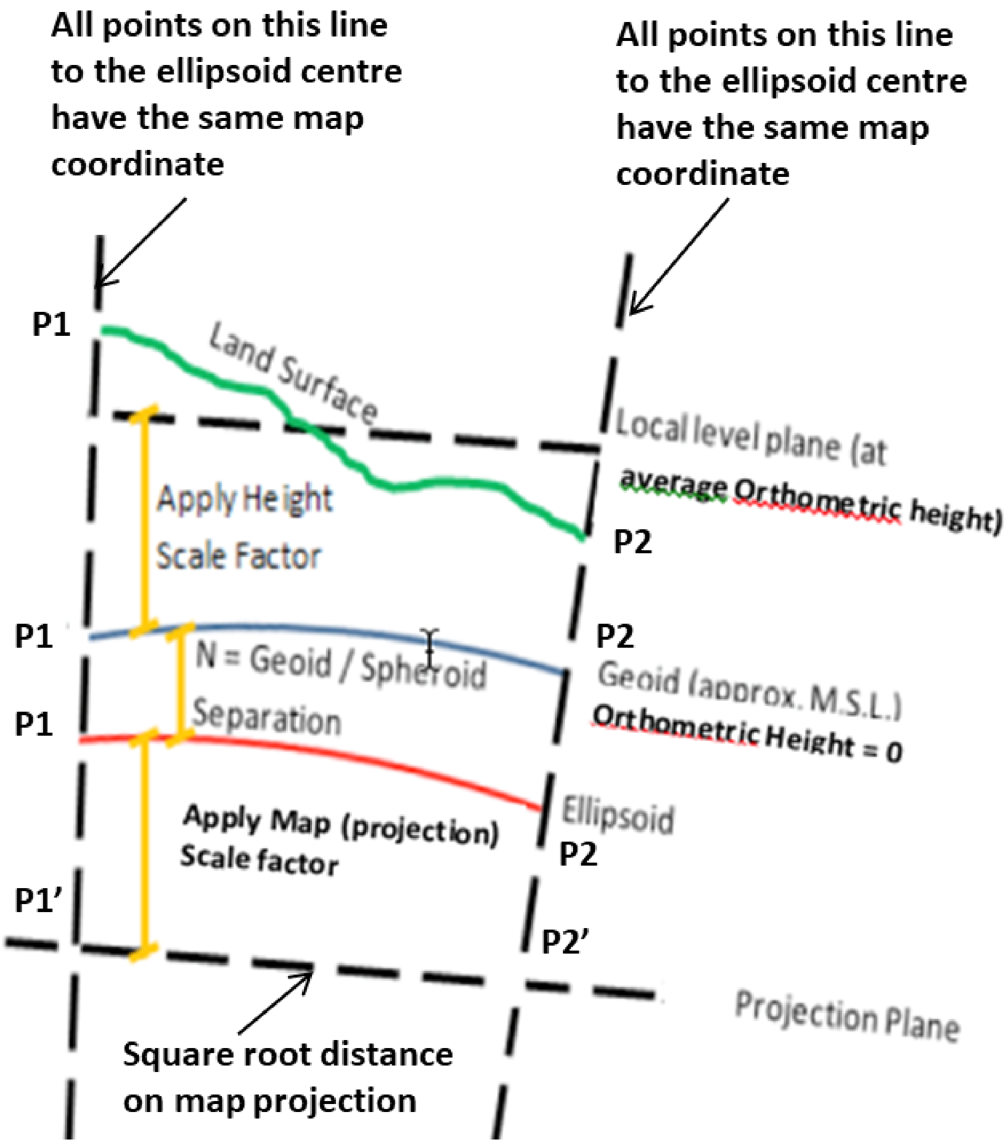
Similarly,

Ellipsoid distance = Plane distance / Line scale factor.

Continue to 27.4.6 Combined Point Scale Factor or return to 27 Geodetics Summary.

27.4.6 Combined Point Scale Factor

The definition of projection coordinates does not take height into account and all the points on the ray to the centre of the ellipsoid will have the same map coordinates.



For a small region around the point and with fairly constant height, a ***Height Scale Factor*** is defined to go from the Geoid distance to the ground distance using the average height for the ground.

The ***combined point scale factor*** is the product of the point scale factor and the height scale factor. *i.e.*

Combined Scale Factor = Point Scale Factor x Height Scale Factor.

The ***combined scale factor*** is used to go from the ***plane distance*** to a ***ground distance*** (ignoring the extra calculations required to account for the N values).

Continue to 27.5 Norths, Azimuths and Bearings or return to 27 Geodetics Summary.

27.5 Norths, Azimuths and Bearings

See

27.5.1 Azimuth

The **azimuth of a line** is its direction as given by the horizontal angle between the meridian and the line measured in a clockwise direction usually from the north branch of the meridian.

Depending on the reference meridian, azimuths maybe geodetic, astronomical, magnetic, plane, or assumed.

The geodetic meridian is the north-south reference line that passes through the ellipsoid's north and south poles.

The plane meridian for a map projection is the direction of the geodesic north for the central meridian of the projection and is held parallel to it over the entire area covered by the plane (grid or map) coordinate system.

The magnetic meridian is defined by a freely suspended magnetic needle that is only influenced by the earths magnetic field.

An assumed meridian can be established by merely assigning any arbitrary direction. The directions of all other lines are then found in relation to it.

27.5.2 Bearing

The ***12d Model*** *d*efinition of the ***bearing of a line*** is the same as the azimuth of a line.

That is, the **bearing of a line** is its direction as given by the horizontal angle between the meridian and the line measured in a clockwise direction usually from the north branch of the meridian.

The **USA bearing of a line** is the acute horizontal angle between a reference meridian and the line. the angle is measured from either the north or south towards either the east of west, to give a reading smaller than 09 degrees. For example, N 70 deg W.

The ***12d Model*** does **NOT** use the **USA bearing of a line**.

WARNING

The term grid bearing is avoided in this manual because it has a different meaning in different parts of the world - see 27.5.5 Grid Azimuth, Australian Grid Bearing.

The term **plane bearing** is used for the angle between two points on a map grid - see 27.5.4 Plane Bearing, Projection Bearing.

27.5.3 True North, Grid North and Magnetic North

Any use of the word North has to be very specific as there are three different Norths used in mapping.

(a) True North

The **True North Pole** is the axis of the rotation of the ellipsoid.

Meridians of longitude converge at the True North and South Pole so the lines or meridians of longitude can also be used as True North reference lines.

(b) Grid North

Grid north is the direction of the constant Easting lines on the Map Grid.

It is the direction of the geodesic north for the central meridian of the projection and is held parallel to it over the entire area covered by the plane (grid or map) coordinate system.

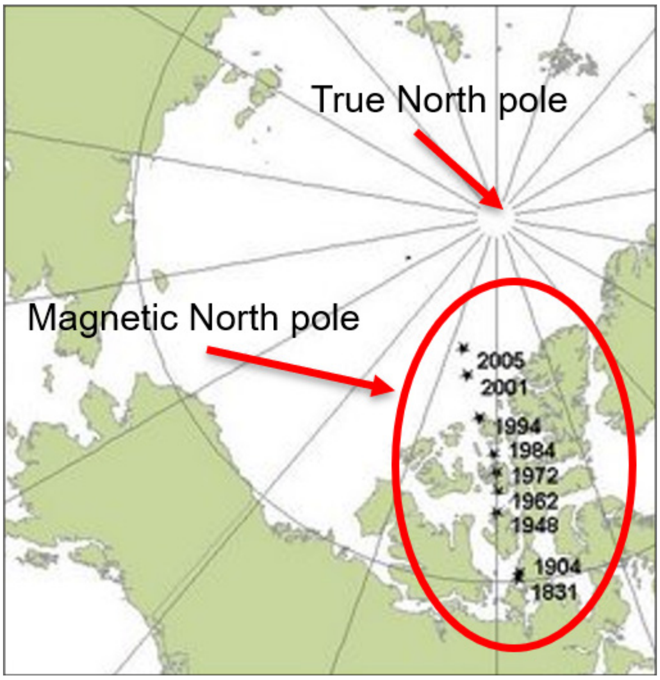
Grid north is useful because it allows the Easting grid lines on the map to be the North reference.

(c) Magnetic North

The magnetic poles are aligned with the Earth's magnetic field.

A free floating magnetic needle in a compass will align itself with the magnetic field and thus points to the magnetic poles.

Unfortunately the magnetic pole moves over time. Consequently the magnetic pole is not very useful for recording directions.



The Magnetic Pole may appear to be either east or west of the True North Pole.

27.5.3.1 Declination Diagram

Declination is the angular difference between **true north** and **magnetic north** for a given location.

Declination changes depending on your position relative to the two poles. Declination also changes over time because the location of the magnetic poles changes with time.

Grid Convergence is the angular difference between the **grid north** and **true north** for a given location (see 27.5.7 True Azimuth and Grid Convergence).

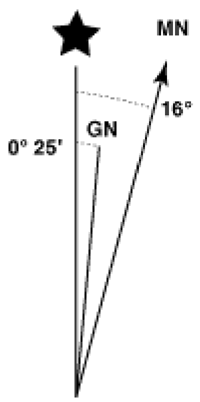
Although the value of the declination and gird convergence varies from location to location, over a small distance, the values can be considered to be constant.

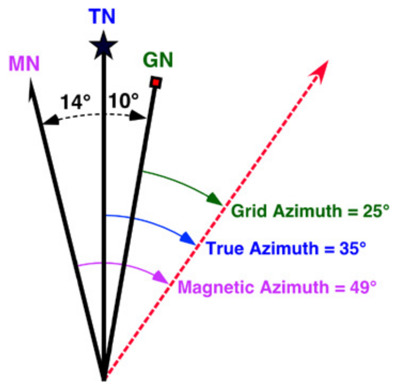
Most paper maps have a printed **declination diagram** to show the **relative direction of the three north references** and it assumed that the values will be the same for any location on the map.

Typically there will be an arrow that points to the top of the map and is parallel to the edges of the map. This is the "top of the map" north reference that was used when the map was printed.

It is usually either Grid North (often designated with the letters GN) or True North (sometimes designated with a star, or the letters TN). The angles between the three north references will be printed on the diagram.

The diagram should also have a date that the angle between True North and Magnetic North was determined. This declination angle changes over time so a current value should be used and not a value from years ago that is printed on an old map.





27.5.4 Plane Bearing, Projection Bearing

If a straight line is drawn in the plane between two points on a map grid, the ***plane bearing*** is the **angle between grid north and the straight line** between the two points.

In other words, if the two point's coordinates are known, standard plane trigonometry can be used to calculate the plane bearing of the line.

tan (plane bearing) = (E2 - E1) / (N2 - N1)

Projection bearing and *plane* bearing is used interchangeably in ***12d Model***.

Warning: Some countries, including New Zealand and the US,A use the term **grid bearing** for what is defined here as **Plane bearing**.

However in this manual, any use of grid bearing will be as defined in the **Australian GDA Technical Manual**. To avoid confusion, the term grid bearing will be avoided in this manual and grid azimuth used instead.

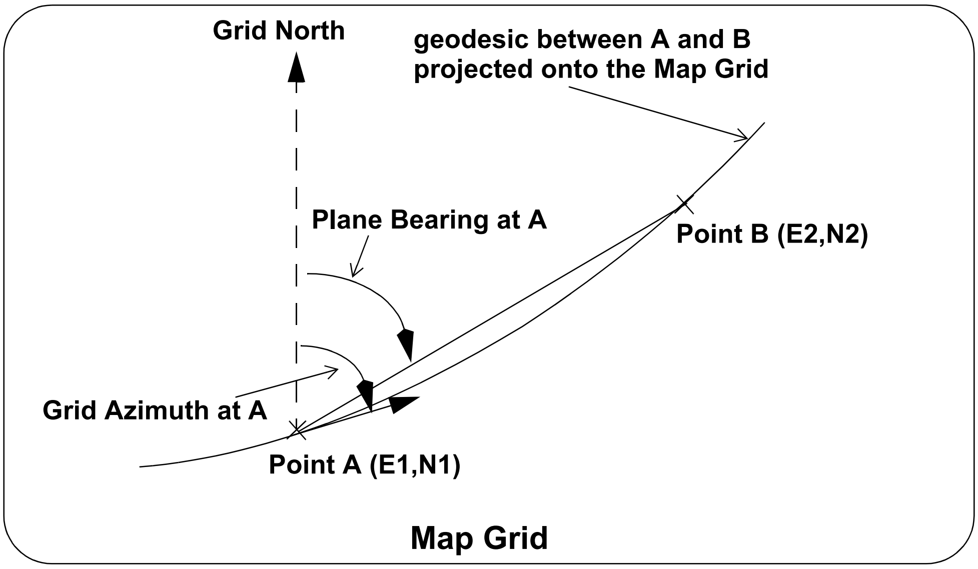
Continue to 27.5.5 Grid Azimuth, Australian Grid Bearing or return 27 Geodetics Summary.

27.5.5 Grid Azimuth, Australian Grid Bearing

The ***grid azimuth*** at the point A for the measure from point A to the point B, is the *clockwise angle* between Grid North and the ***tangent* at A to the curve going from A to B**.

The grid azimuth of A to B, at A, is **not** equal to the reverse grid azimuth B to A, at B.

Warning:
In Australia, the **grid bearing** as defined in the **Australian GDA Technical Manual** is that same as the above definition of grid azimuth. However in some countries, including New Zealand and the USA, the term **grid bearing** is used for the previously defined term **plane bearing**. To avoid confusion, the term grid bearing will be avoided in this manual.



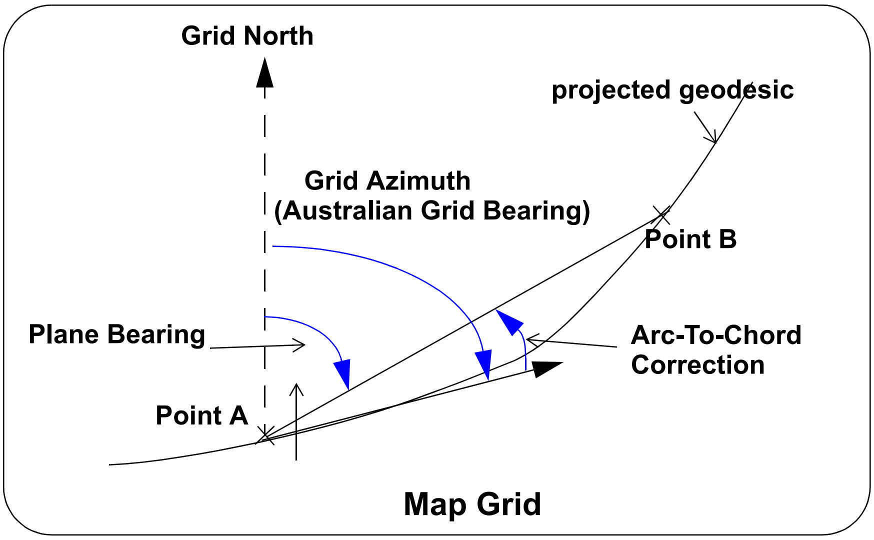
Continue to 27.5.6 Arc to Chord Correction (t-T correction) or return to 27 Geodetics Summary.

27.5.6 Arc to Chord Correction (t-T correction)

The ***arc-to-chord*** correction is the quantity to be added algebraically to a Grid Azimuth (Australian grid bearing) to obtain a Plane bearing.

Plane Bearing = Grid Azimuth + 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.



Continue to 27.5.7 True Azimuth and Grid Convergence or return to 27 Geodetics Summary.

27.5.7 True Azimuth and Grid Convergence

The ***True Azimuth*** between the two points A and B is the horizontal angle measured clockwise from the ***tangent at A of the ellipsoidal meridian that goes through A*** and the ***tangent at A of the great circle*** between the two points A and B.

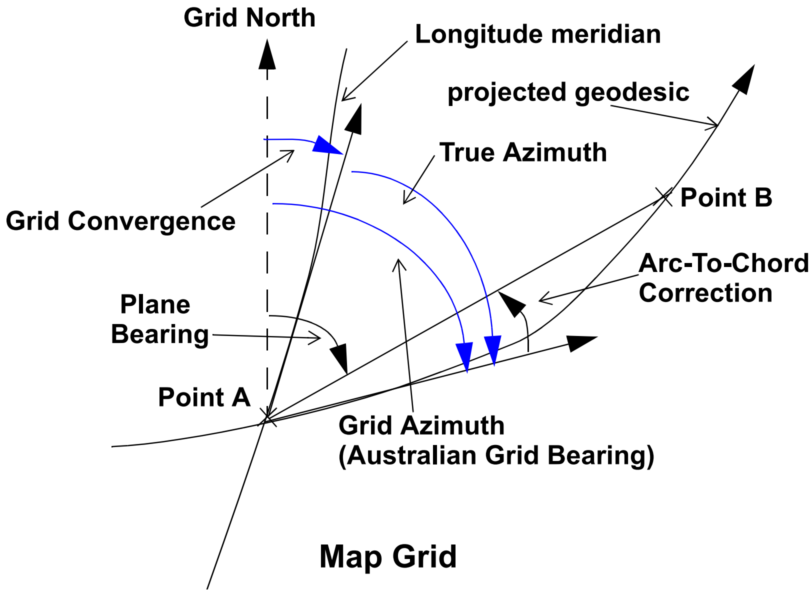
In the **Australian GDA Technical Manual** this is just called the ***Azimuth***. But in this manual the term Grid Azimuth is used so True Azimuth is preferred to avoid confusion.

In general, this value will be calculated internally in ***12d Model***.

Grid Convergence or ***Convergence*** is the angular quantity to be added algebraically to the ***True Azimuth*** to obtain the ***Grid Azimuth*** (Australian grid bearing). *i.e.*

Grid Azimuth = True Azimuth + Grid Convergence

Warning: In some countries, the *Grid Convergence* has the opposite sign.



Combining

Grid Azimuth = True Azimuth + Grid Convergence

and

Plane Bearing = Grid Azimuth + Arc_To_Chord_Correction

produces the equation

Plane Bearing = True Azimuth + Grid Convergence + Arc_To_Chord_Correction

or

True Azimuth = Plane Bearing - Grid Convergence - Arc_To_Chord_Correction

Continue to 27.6 Coordinate Conversions and Transformations or return to 27 Geodetics Summary.

27.6 Coordinate Conversions and Transformations

Coordinate conversion is a conversion of coordinates from one coordinate system to a different coordinate system referenced to the **same datum** (i.e. the same ellipsoid for the earth at a given Epoch). For example Geodetic coordinates (latitude, longitude) to Map coordinates (eastings, Northing) when both are defined using the same ellipsoid for the Earth (e.g. GDA2020). See 27.6.1 Coordinate Conversions.

Coordinate transformation is a process of changing coordinates from one reference frame to another. That is, there are **different datums**. For example, longitude and latitude defined for AGD84 and longitude and latitude defined for GDA94. See 27.6.2 Coordinate Transformations

See

27.6.1 Coordinate Conversions
27.6.2 Coordinate Transformations

27.6.1 Coordinate Conversions

Coordinate conversion is a conversion of coordinates from one coordinate system to a different coordinate system referenced to the **same datum.** That is, the ellipsoid of the Earth remains the same for the two coordinate system.

The most common conversions are between the (Easting, Northing) coordinates in a map projection and longitude and latitude, or between (longitude, latitude, ellipsoid height) and Global XYZ coordinates.

The conversion between the longitude and latitude and map coordinates (Eastings, Northings) is by a unique map projection which can go in both directions. That is,

(E,N) map coordinates in map coordinates $\xleftrightarrow{\text{map projection}}$ (longitude, latitude)

The conversion between the (Eastings, Northings) coordinates for two map projections usually uses latitude and longitude as an intermediate step. That is,

(E,N) map coordinates in original projection $\xleftrightarrow{\text{map projection}}$ (longitude, latitude) $\xleftrightarrow{\text{map projection}}$ (E,N) map coordinates in new projection

Notice that height is not mentioned because the ellipsoid for the Earth is the same for both map coordinates systems so the height remains the same.

In contrast, the mapping between to and from Global XYZ coordinates involves the three dimensions and so (longitude, latitude, ellipsoid height) are required. That is,

(X, Y, Z) coordinates in Global XYZ $\longleftrightarrow$ (longitude, latitude, ellipsoid height)

Continue to 27.6.2 Coordinate Transformations or return to 27.6 Coordinate Conversions and Transformations or 27 Geodetics Summary.

27.6.2 Coordinate Transformations

Coordinate transformation is a process of changing coordinates from one reference frame to another. That is, there are different datums.

For example, transforming the longitude and latitude of a point for AGD84 to the longitude and latitude of the same point for GDA94. In this case, the ellipsoid is different for AGD66 and GDA94 as well as the Epoch.

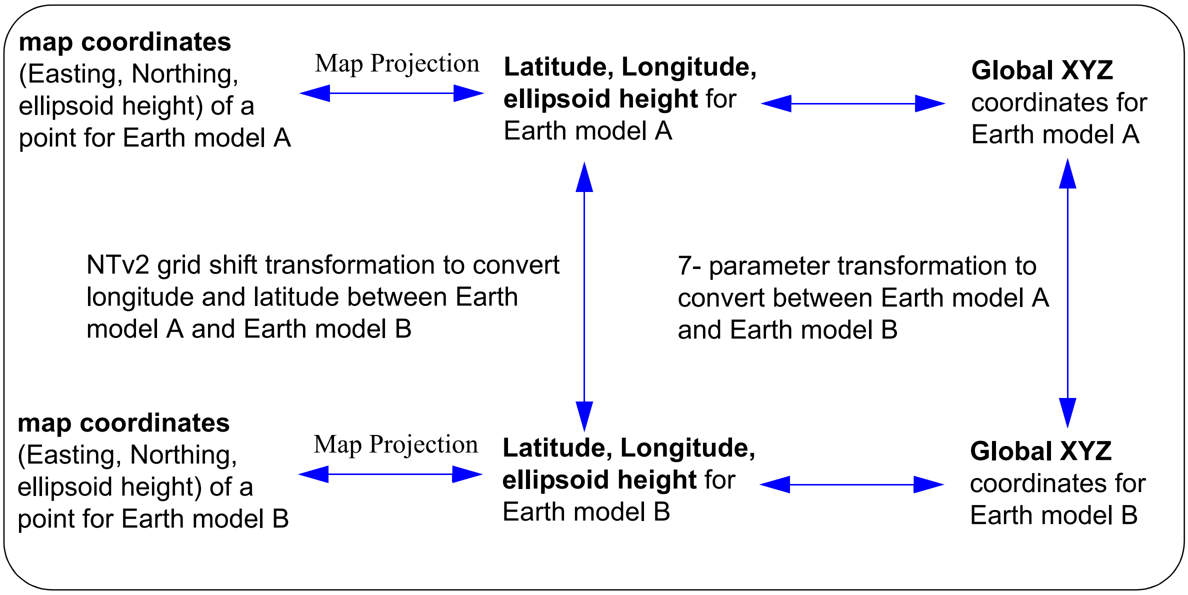
As another example, transforming the longitude and latitude of a point in GDA94 to the longitude and latitude for that point in GDA2020. In this case, the ellipsoid is the same but the Epoch is different. That is, for GDA94, the longitude and latitude of the point is where the point was at 1 January 1994 and for GDA2020, it is the longitude and latitude of where that same point is at 1 January 2020.

There are two major methods used for coordinate transformations:

(a) a seven parameter (7) similarity transformation for converting Global XYZ coordinates.

and

(b) a NTV2 grid shift transformation for latitude and longitudes.



See

27.6.2.1 7-Parameter Similarity Transformation
27.6.2.2 NTv2 Grid Shift Transformation
27.6.2.3.2 Transforming Between MGA94 and MGA2020

27.6.2.1 7-Parameter Similarity Transformation

The 7-Parameter similarity transformation is a transformation between two cartesian coordinates systems (x,y,z) using a 3D translation, rotations about three axis and one scale factor.

For Geodetic work, a 7-parameter transformation is used to transform between two Global XYZ coordinate systems.

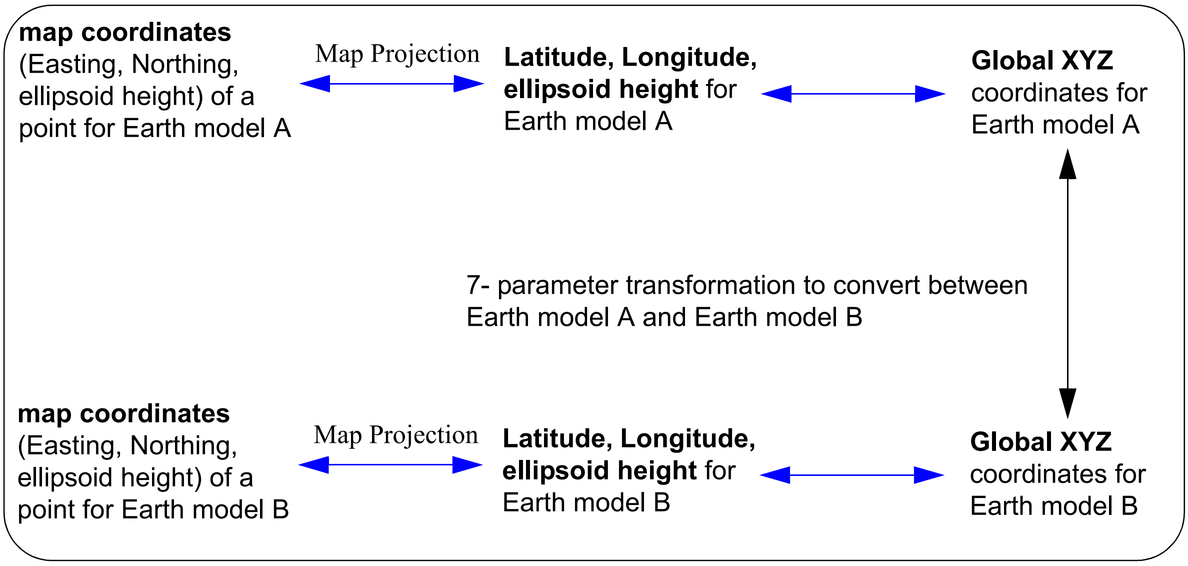
So to use a 7-parameter transformation, if the coordinates are not Global XYZ coordinates then the coordinates must first be converted to Global XYZ coordinates (using the same datum).

The 7-parameter transformation is then used to give the Global XYZ coordinates in the new Global XYZ system (i.e. transform from the old datum to the new datum).

Finally the new Global XYZ coordinates are converted to whatever coordinate system is finally required (on the same new datum).

Important Note

To use a 7-parameter transformation, the ellipsoid height is required.



As an example, in Australia a local-fitting Earth model was used in AGD84 but in 2000 the ellipsoid was changed to the mass-centred ellipsoid GRS80 and a datum defined to be where the points were at 1 January 1994 (GDA94). The 7-parameters for transforming between the two datums were calculated and published.

Also in Australia, because the land mass moves due to continental drift, the longitude and latitude of points in GDA94 were out by about 1.8 metres when compared to where they were at 1 January 2020. So a new datum was defined using the same ellipsoid GRS80 but using the longitude and latitude of where points were at 1 January 2020 (GDA2020). Again the 7-parameters for transforming between the two datums were calculated and published.

27.6.2.2 NTv2 Grid Shift Transformation

Another common method for transforming between the longitude and latitude of two datums is by using a grid of values of the difference between the longitudes and latitudes of point on the two datums. Then to convert a longitude and latitude from one datum to the other, the grid of differences is used - a grid shift transformation.

The accuracy of the results will depend on how fine the grid is. That is, how small the distance is between grid points.

A common format binary used throughout the world for story the grid is the **NTv2** format (**.gsb** files).

Important Note

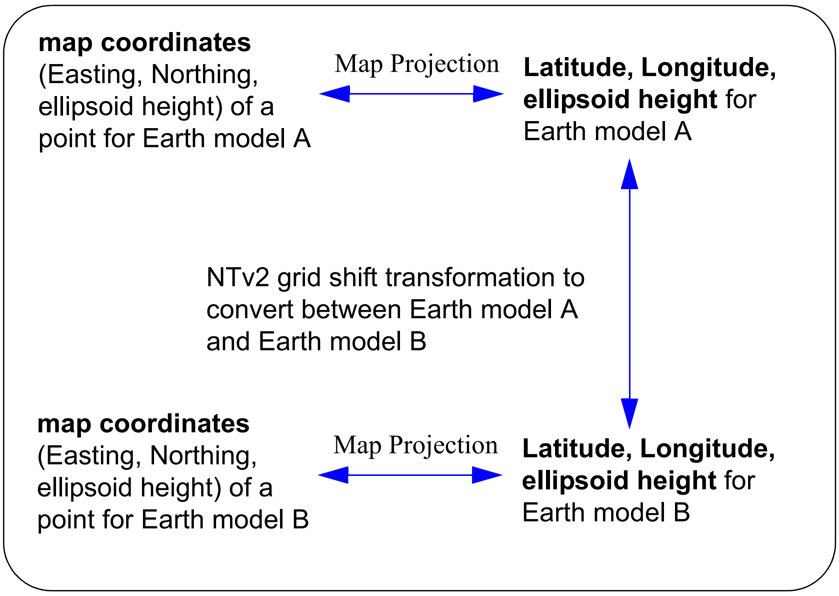
The NTv2 format does not store ellipsoid height information and therefore cannot be used to transform the height of data from one datum to another.

But for many applications, only the longitude and latitude is known or is required to be transformed. Or often the height is NOT an ellipsoid height but a geoid height (e.g. AHD) and so although the longitude and latitude will change, the geoid height will be the same.

To use a NTv2 grid-shift transformation, if the coordinates are not longitude and latitude then the coordinates must first be converted to longitude and latitude (using the same datum).

The NTv2 transformation is then used to give the longitude and latitude in the new datum (i.e. transform from the old datum to the new datum).

Finally the new longitude and latitudes are converted to whatever coordinate system is finally required (on the same new datum).



In Australia an NTv2 file was calculated and published to transform between the local-fitting Earth used in AGD84 to the mass-centres ellipsoid used GDA94.

Also another NTv2 grid was calculated and published to transform between GDA94 and GDA2020.

27.6.2.3 Australian Coordinate Transformations

See

[27.6.2.3.1 Transforming Between AMG, ISG and MGA94]
[27.6.2.3.2 Transforming Between MGA94 and MGA2020]
[27.6.2.3.3 Transforming from AGD66 or AGD84 to MGA2020]

27.6.2.3.1 Transforming Between AMG, ISG and MGA94

In Australia the ellipsoid used to represent the shape of the Earth used to be defined by AGD84 but in 2000, it was changed to an ellipsoid that has its centre at the centre of mass of the Earth (geocentric - GDA94). See 27.1 Shape Of The Earth.

The change was to work efficiently with GNSS (Global Navigation Satellite System - GPS, Glonass, Galileo, BeiDou etc.) because satellites orbits are centred on the centre of mass of the Earth and so an Earth mass centred ellipsoid was the logical choice.

The change of ellipsoid meant that the Latitude and Longitude of every point changed.

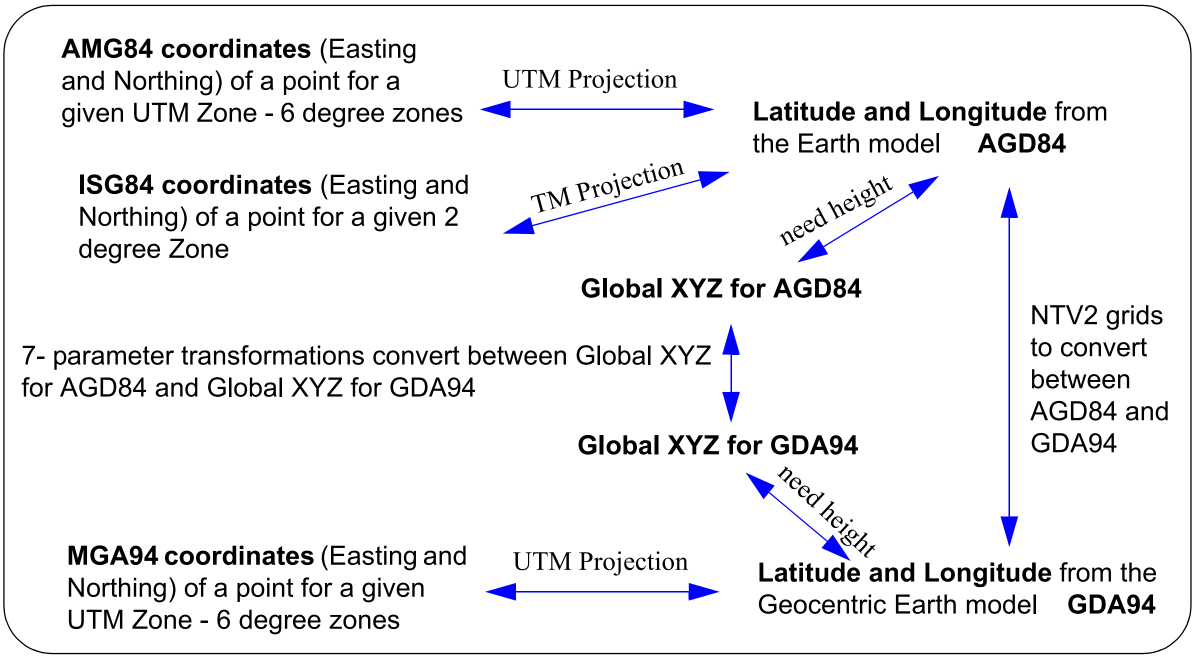
The use of UTM projections (Universal Transverse Mercator - see 27.2.3 Map (Cartographic) Projections and Map Coordinates) and Zones still applied but because the latitude and longitude of each point has changed, the Easting and Northing for a point in a UTM zone has also changed.

AMG84 Zones are the coordinates for the UTM Projections defined for six degree zones using the ellipsoid defined by AGD84.

MGA94 Zones are the coordinates for the UTM Projections defined for six degree zones using ellipsoid define by GDA94.

MGA2020 Zones are the coordinates for the UTM Projections defined for six degree zones using ellipsoid define by GDA2020.

Note - ISG84 Zones are the coordinates for the TM Projections defined for two degree zones using the ellipsoid defined by AGD84.



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 16.8.4 AGD66/84 <---> GDA94 Transformation

For converting between different AMG Zones (AMG <->AMG) or different MGA 94 Zones (MGA<->MGA) use the option

Survey =>Conversions =>Australian conversions. See 16.8.1 Australian Conversions.

For converting between different ISG/AMG Zones (AMG,ISG <->AMG, ISG)

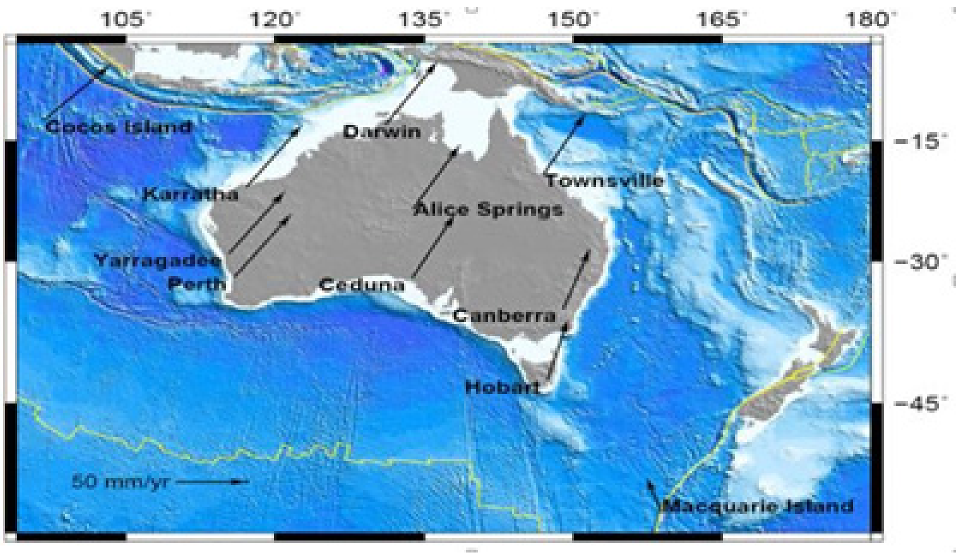
Survey =>Conversions =>Cartographic. See 16.8.2 Cartographic Conversions.

Continue to 27.6.2.3.2 Transforming Between MGA94 and MGA2020 or return to 27 Geodetics Summary.

27.6.2.3.2 Transforming Between MGA94 and MGA2020

GDA94 was the datum introduced in 2000 and the longitude and latitude for a point was defined to be where the point in the Australian continent was at 1 January, 1994.

But due to the continental drift of the plate that Australia is on, Australia moves on the ellipsoid in a North-East direction with respect to Greenwich and hence the longitude and latitude of a point in Australia changes each day. SInce 1994, has moved by about 1.8 metres.



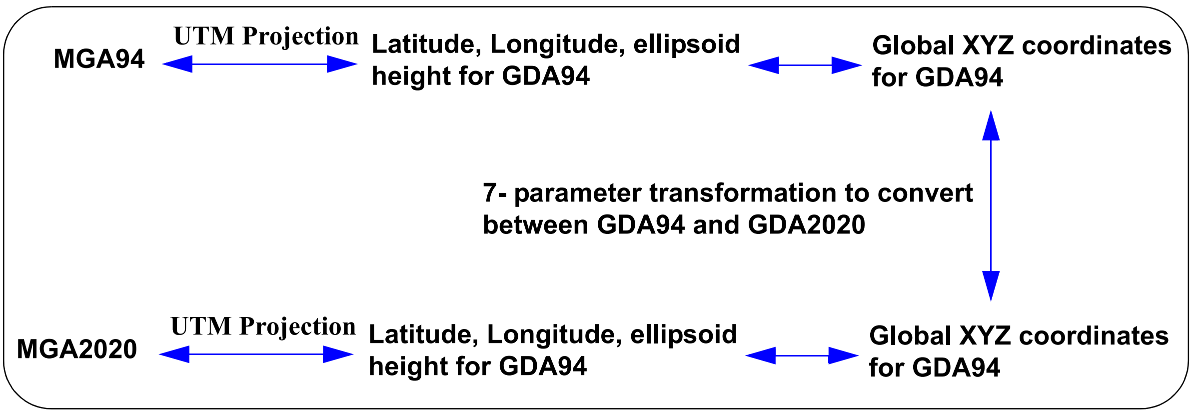
So the Australian Government decide to define a new datum which represented where the Australian Continent is at 1st January 2020.

The new datum is called **GDA2020** and the new map coordinates base on the UTM are **MGA2020**.

The transformation between the two datums GDA94 and GDA2020 can be by either

(a) a 7-parameter similarity transformation

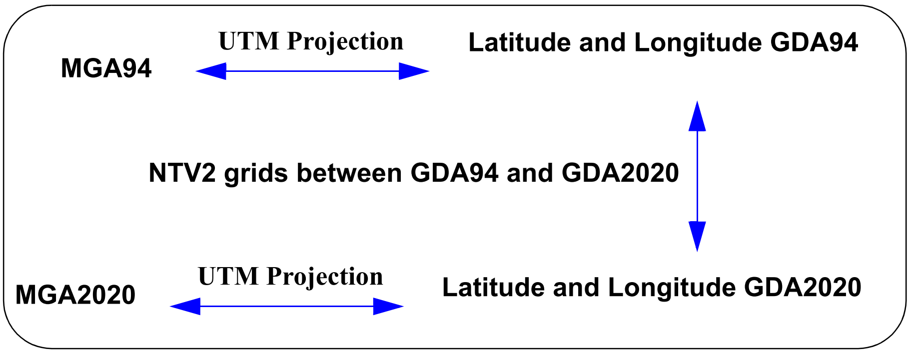
See 27.6.2.3.2.1 7-Parameter Transformation Parameters GDA94 to GDA2020



or

(b) a NTv2 grid.

See 27.6.2.3.2.2 Transformation Grids GDA94 to GDA2020



12d Model is GDA2020 compliant for both the 7 parameter similarity transformations and NTv2 grids.

The **GDA94** data can be either in longitude and latitude, Global XYZ or coordinates in a MGA Zone.

Similarly the **GDA 2020** data can be in either longitude and latitude, Global XYZ or coordinates in a MGA Zone.

The option to transform between the two datums is

Survey =>Conversions =>GDA94 <-> GDA2020

For information on this option, see 16.8.6 GDA94 <---> GDA2020 Transformation.

Return to 27.6.2 Coordinate Transformations or 27.6 Coordinate Conversions and Transformations or 27 Geodetics Summary.

27.6.2.3.2.1 7-Parameter Transformation Parameters GDA94 to GDA2020

This information has been taken from the **Geocentric Datum of Australia 2020 Technical Manual Version 1.5 - 9 Dec 2020**

https://www.icsm.gov.au/gda2020-and-gda94-technical-manuals

The official GDA94 to GDA2020 7 transformation parameters and associated uncertainties (Table 3.2) were computed using 18 GNSS CORS common to both the GDA94 RVS and the GDA2020 RVS. The GDA94 RVS (from 2011) had 21 AFN stations. GNSS CORS located at Cocos Island (COCO), Christmas Island (XMIS) and Macquarie Island (MAC1) were excluded from the computation due to earthquake deformation. Two types of GDA94-GDA2020 transformation grids have been developed:

$$\begin{pmatrix} X'_{GDA2020} \\ Y'_{GDA2020} \\ Z'_{GDA2020} \end{pmatrix} = \begin{pmatrix} t_x \\ t_y \\ t_z \end{pmatrix} + (1 + s_c) \begin{pmatrix} 1 & r_z & -r_y \\ -r_z & 1 & r_x \\ r_y & -r_x & 1 \end{pmatrix} \begin{pmatrix} X_{GDA94} \\ Y_{GDA94} \\ Z_{GDA94} \end{pmatrix} \qquad (18)$$

Table 3.2

Table 3.2: Transformation parameters for GDA94 to GDA2020 along with the one-sigma uncertainties (1σ). Units are in metres for the translation, parts-per-million for scale, and arcseconds for rotations.

	t_x	t_y	t_z	s_c	r_x	r_y	r_z
	0.06155	-0.01087	-0.04019	-0.009994	-0.0394924	-0.0327221	-0.0328979
uncertainty	0.0007	0.0006	0.0007	0.00010	0.000011	0.000010	0.000011

The parameters to transform from GDA2020 to GDA94 can be computed by multiplying the values in the above table (Table 3.2) by **-1**.

27.6.2.3.2.2 Transformation Grids GDA94 to GDA2020

This information has been taken, and slightly rearranged, from the **Geocentric Datum of Australia 2020 Technical Manual Version 1.5 - 9 Dec 2020**

https://www.icsm.gov.au/gda2020-and-gda94-technical-manuals

Two types of GDA94-GDA2020 transformation grids have been developed:

(a) **Conformal:** predominantly plate tectonic motion

The GDA94 - GDA2020 conformal only transformation grid delivers the same result as the 7-parameter similarity transformation. It has been developed at the request of some software providers who are moving towards the use of grids as the preferred method of geodetic transformation in selected software platforms.

(b) **Conformal + Distortion**: includes regional distortion

The combined conformal and distortion grids model both the conformal transformation (i.e. translation, rotation and scale) and distortion components of the differences in the datums. In the case of GDA94 to GDA2020, the distortion component is caused by the different strategies used by state and territories to propagate GDA94 coordinates onto ground survey control mark networks from the AFN and surface movement of parts of the Australian crust. The magnitude of the distortion varies between jurisdictions and can be in the order of decimetres.

If GDA94 coordinates were observed using Global Navigation Satellite System (GNSS) technology, with corrections coming from a network of reference stations (e.g. GPSnet, CORSnet-NSW), it is likely that the coordinates are unaffected by localised distortions and the **conformal only grid would be most suitable**.

However, if survey ground marks were used for referencing / control, localised distortions will likely need to be accounted for and the combined 'conformal and distortion' grid should be used. Some recommendations are shown in Table 3.5, but if in doubt, contact your state / territory land survey authority.

Table 3.5

Table 3.5: Advice on the use of NTv2 transformation grid files across jurisdictions

Jurisdiction	NTv2 transformation grid	Comments
ACT	GDA94_GDA2020_conformal	Recommended for users transforming from GDA94 coordinates derived from CORS
ACT	GDA94_GDA2020_conformal_and_distortion	Recommended for users transforming from GDA94 coordinates derived from survey control marks within ACTmapi
NSW	GDA94_GDA2020_conformal	Appropriate for users transforming GDA94 coordinates derived from unlocalised CORS or AUSPOS control.
NSW	GDA94_GDA2020_conformal_and_distortion	Appropriate for users transforming GDA94 coordinates derived from SCIMS (Survey Control Information Management System) or SCIMS-localised CORS control.
NT	GDA94_GDA2020_conformal	Appropriate for users transforming from GDA94 coordinates determined from CORS.
NT	GDA94_GDA2020_conformal_and_distortion	Recommended for users transforming from GDA94 coordinates determined from the survey ground control network.

Qld	GDA94_GDA2020_conformal	Recommended for transforming all GDA94 data sets in Queensland.
Qld	GDA94_GDA2020_conformal_and_distortion	Not recommended for use on Queensland data sets due to distortions at the state borders.
SA	GDA94_GDA2020_conformal	Appropriate for users transforming from GDA94 coordinates determined from CORS.
SA	GDA94_GDA2020_conformal_and_distortion	Recommended for users transforming from GDA94 coordinates determined from the survey ground control network.
Tas	GDA94_GDA2020_conformal	Appropriate for users transforming from GDA94 coordinates determined solely from unlocalised CORS or AUSPOS observations and recommended where the origin of survey control is unknown or mixed (e.g. aggregated datasets available from LISTdata).
Tas	GDA94_GDA2020_conformal_and_distortion	Recommended for users transforming from GDA94 coordinates determined solely from the survey ground control network.
Vic	GDA94_GDA2020_conformal	Recommended for users transforming from GDA94 coordinates derived directly from GNSS CORS.
Vic	GDA94_GDA2020_conformal_and_distortion	Recommended for users transforming from GDA94 coordinates derived from survey control marks within the Survey Marks Enquiry Service (SMES).
WA	GDA94_GDA2020_conformal	Appropriate for users transforming from GDA94 coordinates determined from CORS.
WA	GDA94_GDA2020_conformal_and_distortion	Recommended for users transforming from GDA94 coordinates determined from the local geodetic network (GOLA).
WA – Christmas and Cocos Island	GDA94_GDA2020_conformal	Recommended for Christmas and Cocos Island when they become available.

IMPORTANT NOTE:

The NTv2 format does not store ellipsoidal height information and therefore cannot be used to transform the heights of data from one datum to the other.

To transform heights it is recommended that you convert your data from latitude, longitude, height LLH (ellipsoid height) to earth-centred Cartesian coordinates XYZ, apply the 7-parameter transformation from GDA94 to GDA2020 and then convert back to LLH using equations 1-3.

27.6.2.3.3 Transforming from AGD66 or AGD84 to MGA2020

ICSM has not defined a set of parameters that directly transform between historical Australian geodetic datums (AGD66 and AGD84) and GDA2020. It is recommended to first transform to GDA94 and then to GDA2020.

For transforming AGD66 or AGD84 coordinates to GDA94 the grid transformation process using the appropriate ICSM transformation grids is the most accurate and preferred transformation method.

28 Moving to 12d Model 15

See

28.1 Hardware Locks for 12d Model 15

Since ***12d Model 11***, ***CodeMeters*** have been the default Hardware locks shipped with ***12d Model*** however the Wibu stand alone and Wibu network dongles that you already have will still work for Perpetual licenses of ***12d Model 15***.

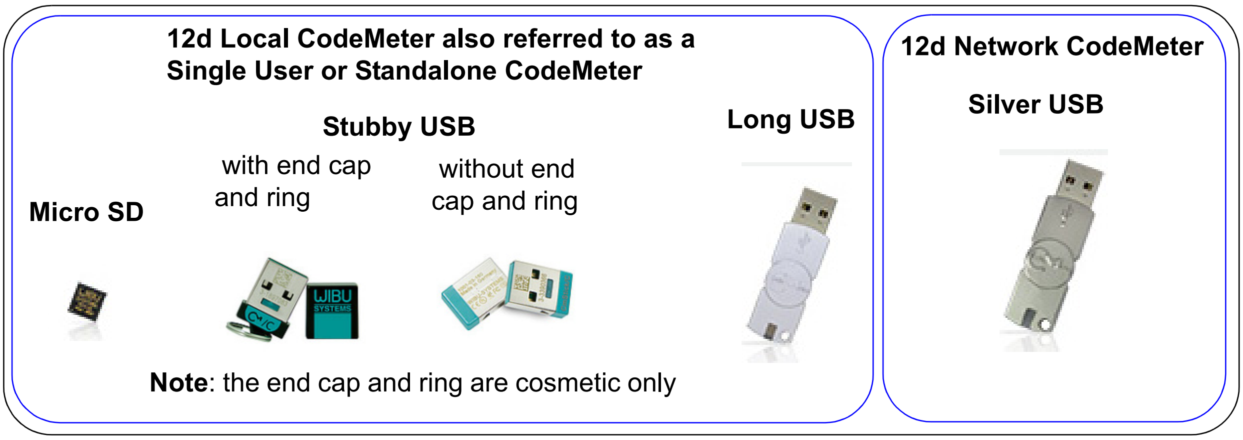
However Subscription licenses of ***12d Model 15*** must have ***CodeMeters***.

12d Model 15 will **NOT WORK** with **Hardlock** dongles. If you have a **Hardlock** dongle, please contact your ***12d Model*** Reseller.

So ***12d Model 15*** will only work with the following physical hardware locks:

(a) Codemeter Containers (from Wibu)

The **Codemeter Containers** (also from Wibu) are similar to the earlier Wibu standalone and network dongles except that they come in a wider variety of hardware shapes some of which will be more suitable for portable and tablet computers



We will refer to the ***Wibu CodeMeter Containers*** as **CodeMeter Containers** or **CodeMeters**.

CodeMeters have ***12d dongle numbers*** starting with **5c2d.**

Codemeters as standalone hardware locks can be used with ***12d Model 10 C1n*** onwards but will not work with earlier versions of ***12d Model***.

As network hardware locks, **Codemeters** can **NOT** be used for***12d Model 10*** but only for ***12d Model 11*** onwards.

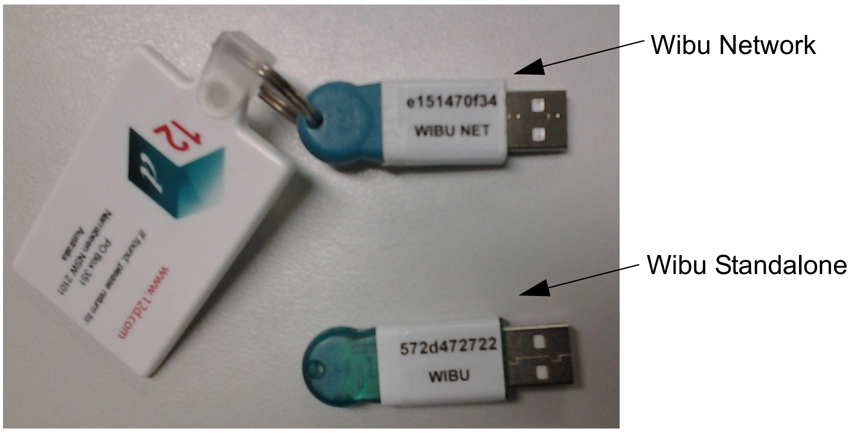
So if you move to a **CodeMeter**, you won't be able to run the ***12d Model 10*** and ***earlier*** 12d.exe's. But of course you can always open projects from those versions in the latest versions of ***12d Model***.

(b) **Older Wibu hardware locks**

Some users have Wibu hardware locks that predated the **CodeMeters**.These are:

Wibu Standalone hardware locks (12d dongle number starting with **572d)** or **Wibu Network hardware locks** (12d dongle number starting with **e151**)

.



The **Wibu drivers** for ***12d Model 15*** must be at least version **6.3**. See 28.2 Installers for Lock Drivers and 12d Model

Important Note for 12d Field users:

In ***12d Model 15***, the ***12d Field modules*** will only work with **CodeMeters**.

If you are a ***12d Field*** user and are still using a ***Wibu*** hardware lock, your ***12d Model*** Reseller will probably have already contacted you but if not, please contact them when you are preparing to upgrade to ***12d Model 15***.

Important Note

DO NOT ATTACH a hardware lock to your computer until after the appropriate driver is installed.

Continue to 28.2 Installers for Lock Drivers and 12d Model or return to 28 Moving to 12d Model 15.

28.2 Installers for Lock Drivers and 12d Model

See

28.2.1 Installing CodeMeter Drivers
28.2.2 Installers for 12d Model

Or return to 28 Moving to 12d Model 15

28.2.1 Installing CodeMeter Drivers

If you have no CodeMeter drivers installed, then the installer for the CodeMeter drivers can be downloaded from:

https://12dmodel.com/Training/V15/12d_Model_15_Tech_Preview/CodeMeterRuntime_7_30a.exe

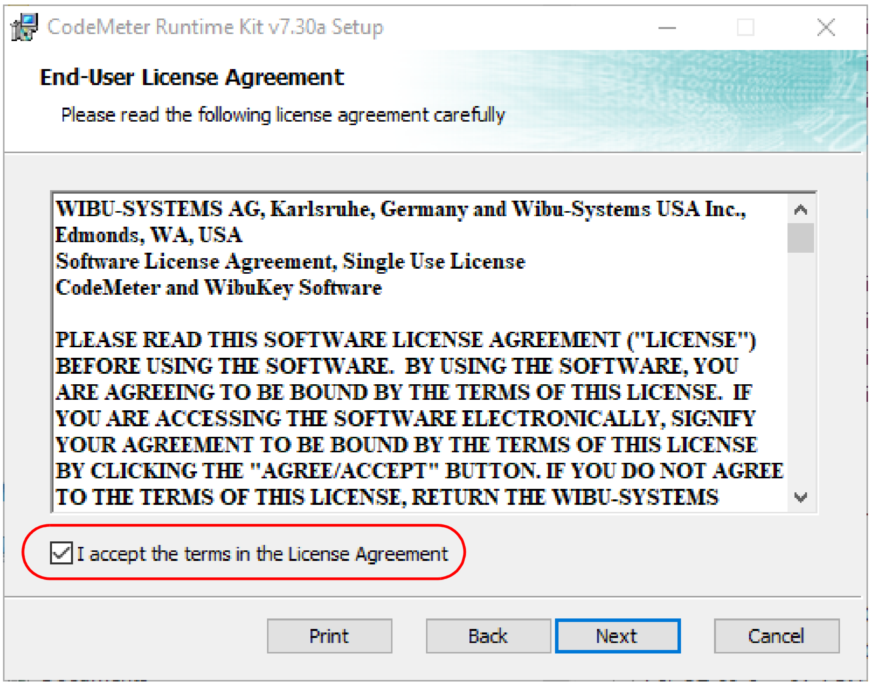
Installing the CodeMeter Drivers:

After clicking on the installer exe, the script to install the **CodeMeter** drivers begins.

CodeMeter Setup *CodeMeter Runtime Kit Setup*

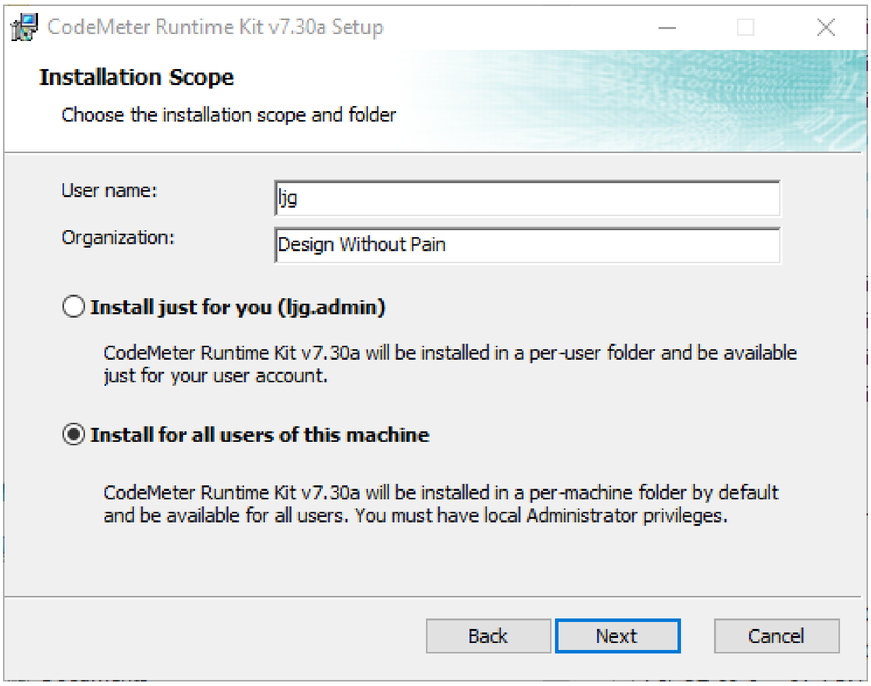
Select ***Next*** to continue.

End-User License Agreement *CodeMeter Runtime Kit Setup*



Read the License Agreement and if you are happy with it,
tick "I accept the terms in the License Agreement" and then select ***Next*** to continue.

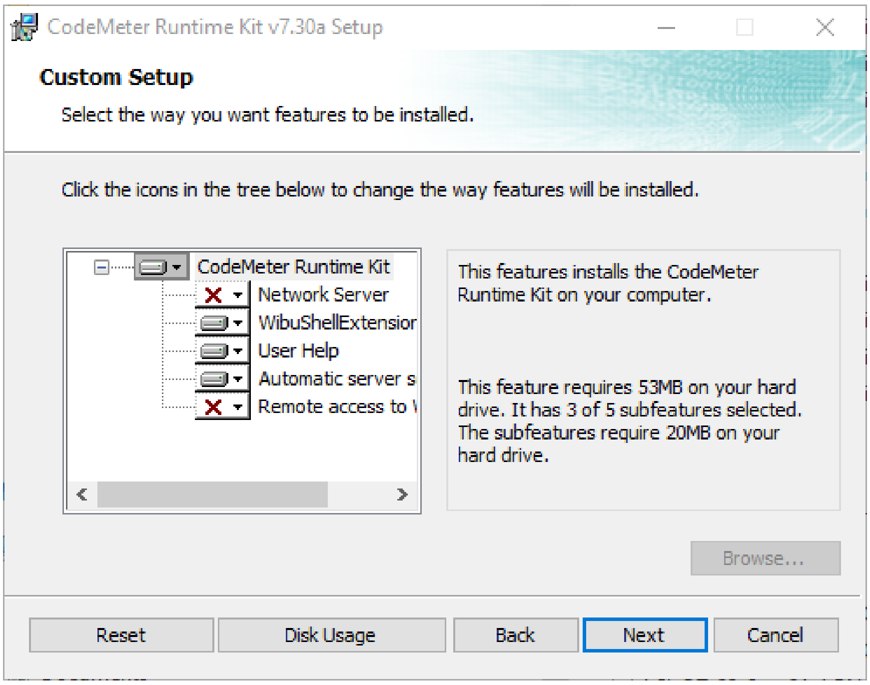
Installation Scope *CodeMeter Runtime Kit Setup*



Enter your **User name** and **Organisation**.

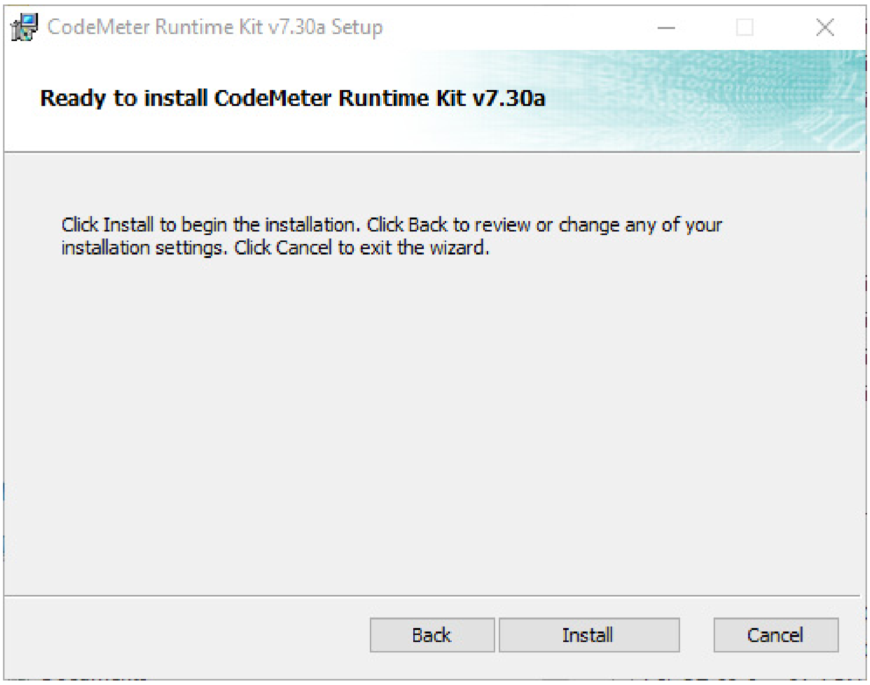
Click on either **Install just for you** or **Install for all users of this machine** and then select ***Next*** to continue.

Custom Setup *CodeMeter Runtime Kit Setup*



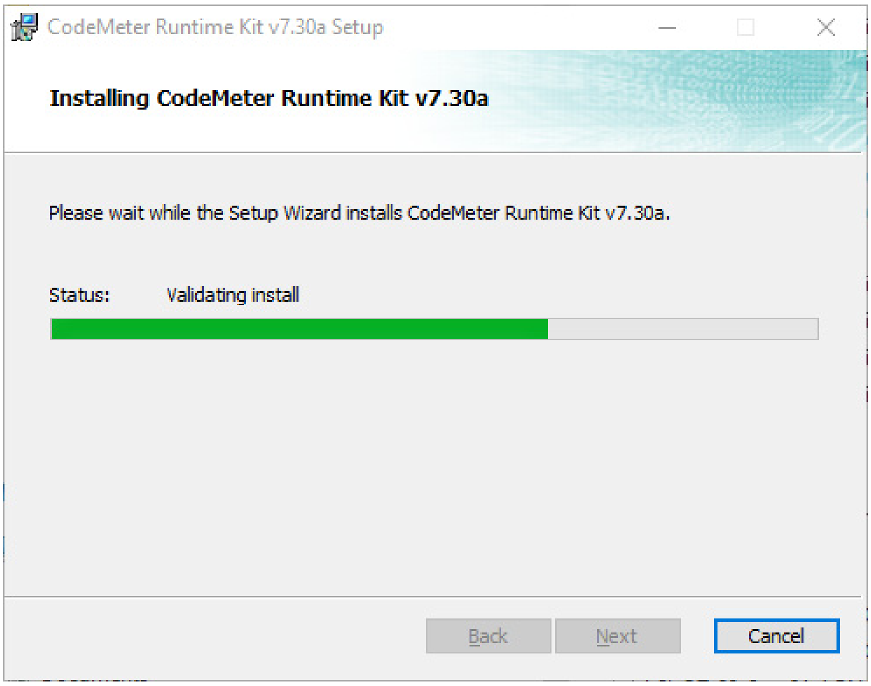
Select ***Next*** to continue.

Ready to Install *CodeMeter Runtime Kit Setup*

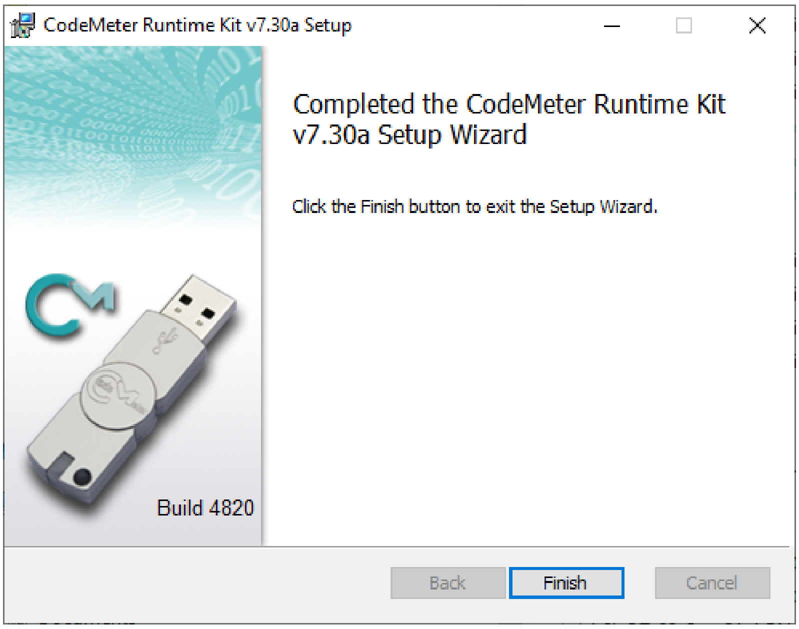


Select ***Install*** to continue.

Installing *CodeMeter Runtime Kit Setup*



Completed *CodeMeter Runtime Kit Setup*



Select ***Finish*** to end.

Note: A **CodeMeter** icon, that is used to bring up the **CodeMeter Control Center**, is also installed on your task bar.

Important Notes

1. Do not attach a hardware lock to your computer until after the appropriate driver is installed

2. The CodeMeter drivers need to be at least version **6.3.**

   If your computer already has drivers installed and they are NOT at least version the version you required, when ***12d Model 15*** is started it will stop and complain that the hardware lock drives are **NOT** up to date**.**

   If that is the case then

   (a) Uninstall the existing drivers

   (b) Install new drivers from the **12d Driver installer**. See 28.2.1 Installing CodeMeter Drivers.

Continue to 28.2.2 Installers for 12d Model or return to 28.2 Installers for Lock Drivers and 12d Model.

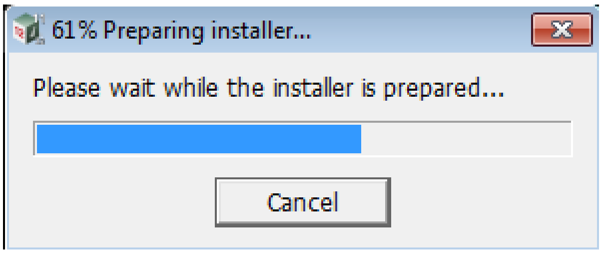
28.2.2 Installers for 12d Model

There different **Installers** for installing the 64-bit or 32-bit ***12d Model 15***.

1. Installer for 64-bit ***12d Model*** exe for Windows 10 and above.
2. Installer for 32-bit ***12d Model*** exe for Windows 10 and above.

After starting the appropriate **Installer**, panels come up to guide you through the process.

The ***12d Model 15*** installation starts by first unpacking the information in the installation exe and then begins the installation.

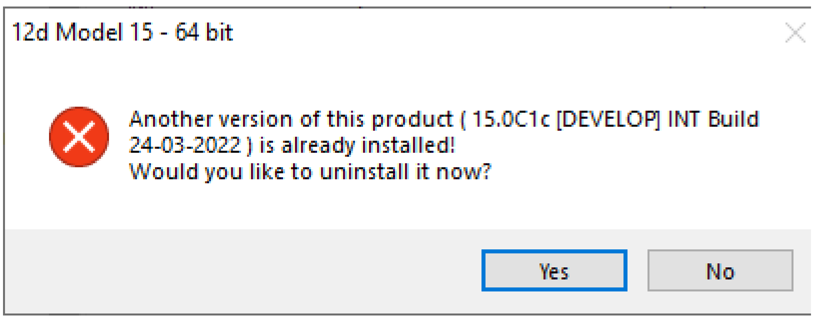


Note - the following screens are for the **64 bit** install but the **32 bit** install is identical except the words **64 bit** are replaced by **32 bit**.

If a ***12d Model 15*** of the same bit type is already installed on your computer, it must be uninstalled before the installation can proceed.

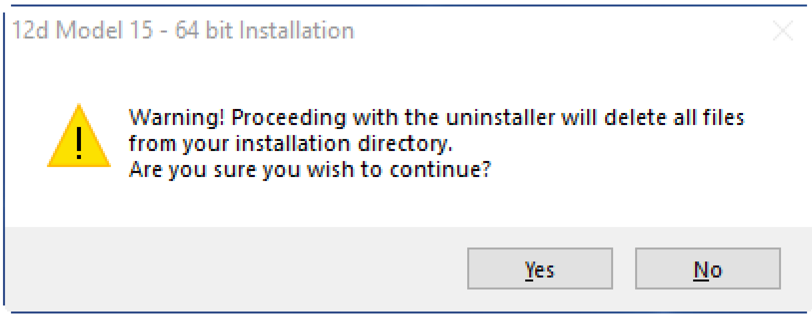
If the Installer detects this case, you will be asked if the Installer can **uninstall the existing version**. Unless this is done, the installation can not proceed.

Note: The uninstall deletes everything in the ***12d\12dmodel\15.00*** folder in ***Program Files*** (or in Program Files (x86) for a 32-bit Install on a 64-bit O/S) so you should never modify any of those files.



Click on **Yes** to continue.

You then receive a **Warning** that the files will be deleted.

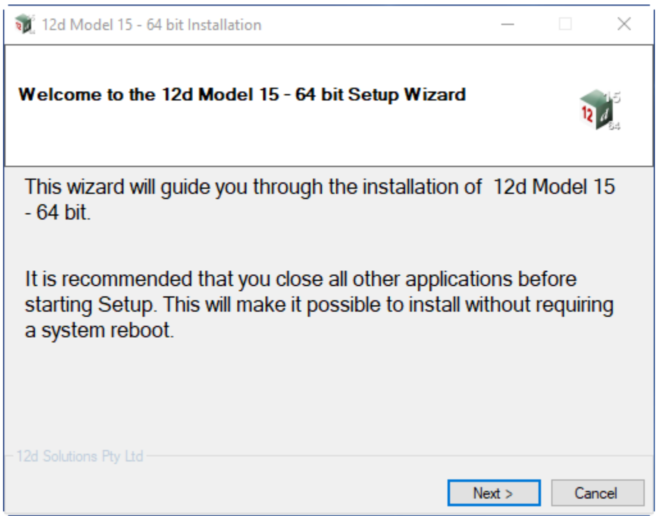


Click on **Yes** to continue.

All the files in the ***12d\12dmodel\15.00*** folder in ***Program Files*** (or in Program Files (x86) for a 32-bit Install on a 64-bit O/S) will then be deleted, and the ***12d Model xx*** entry removed from the Windows Registry.

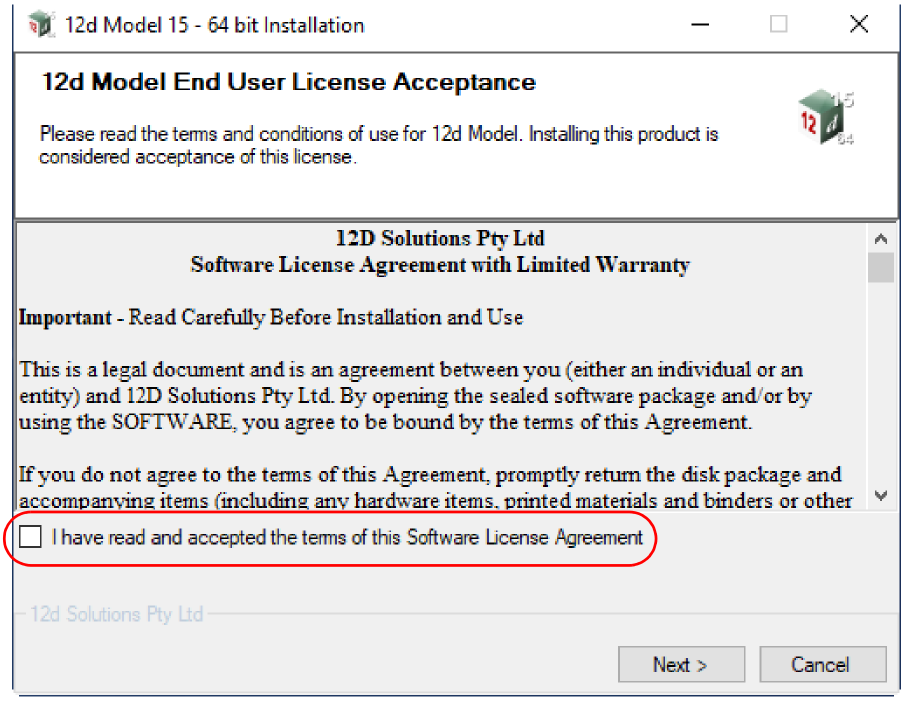
The installation of the new ***12d Model*** can now begin and the **Welcome** screen is displayed.

Welcome *Welcome message*

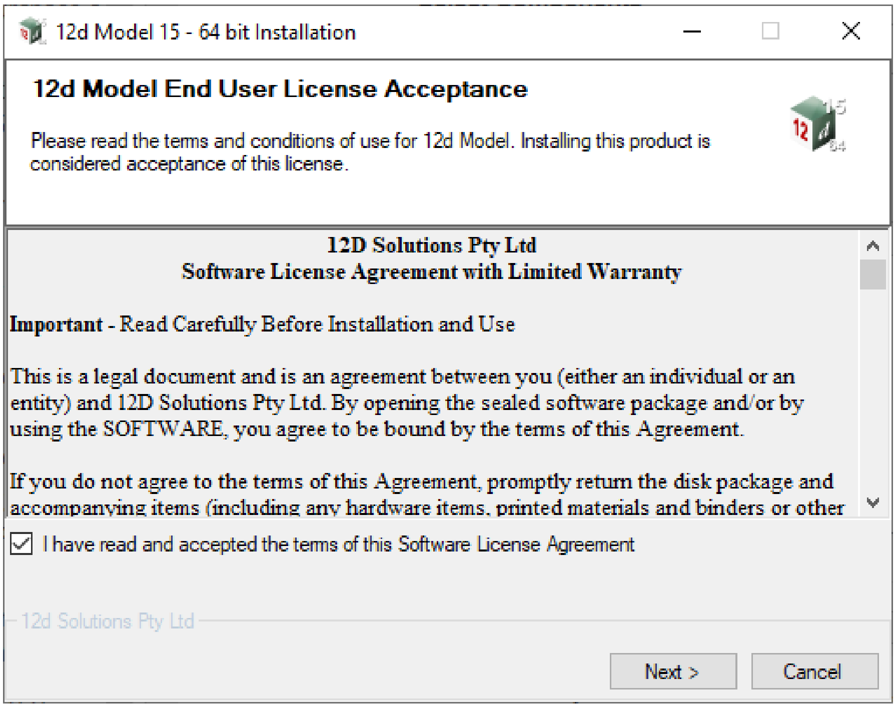


Select ***Next*** to continue with the installation

Software License Agreement *12d Solutions license agreement*

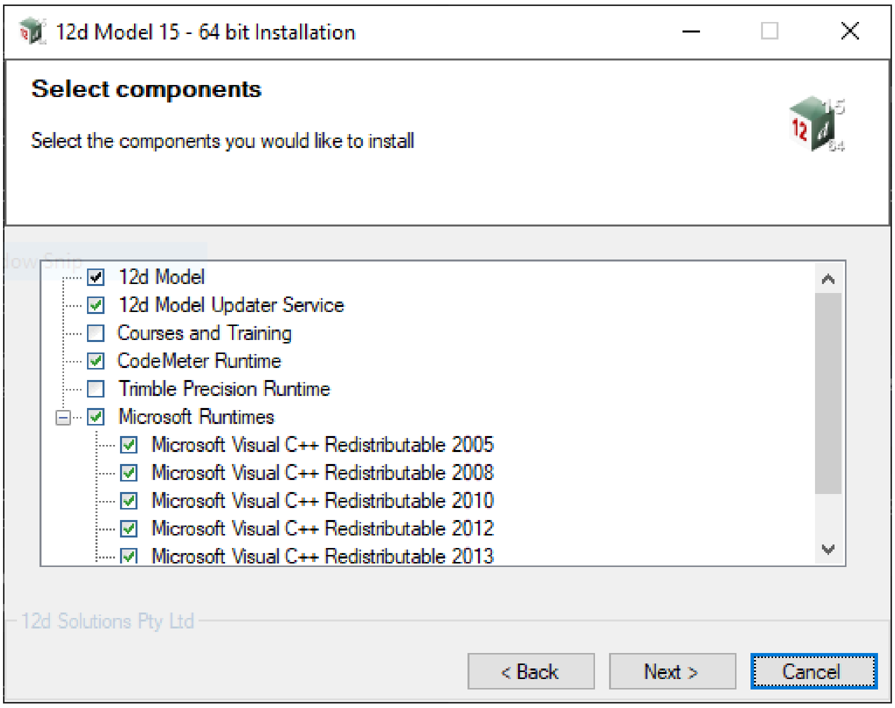


If you agree with the License conditions, **tick** on ***I have read and accept the terms of the Software License Agreement***.



Select ***Next*** to continue with the installation

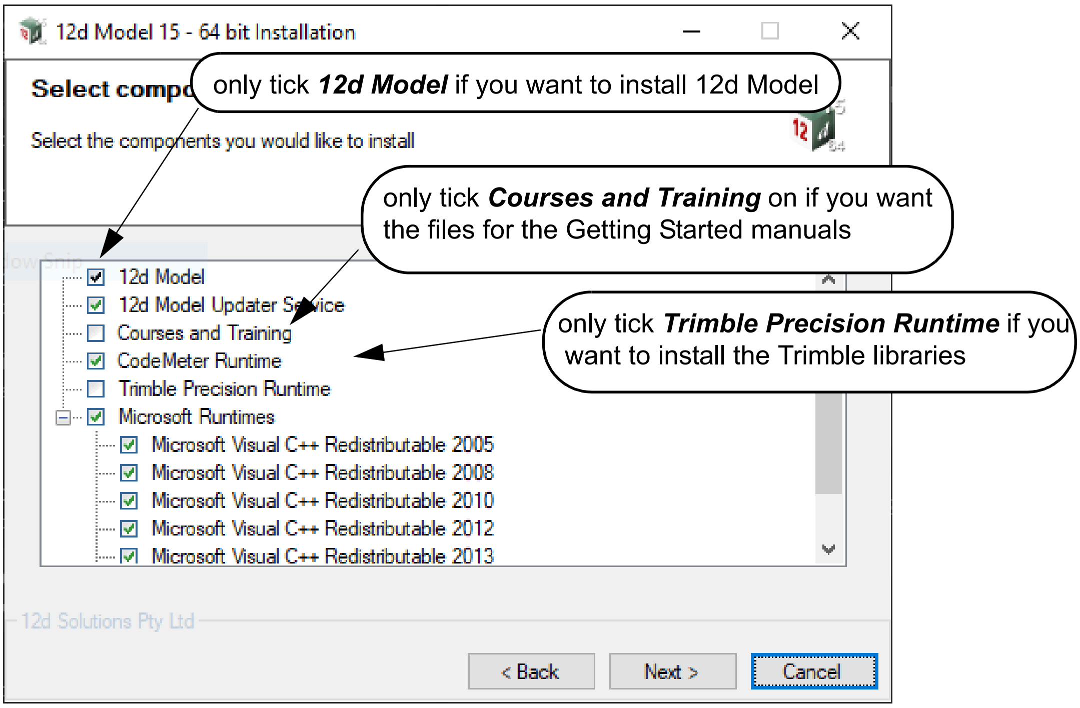
Select Components



Tick on ***12d Model*** to install ***12d Model***.

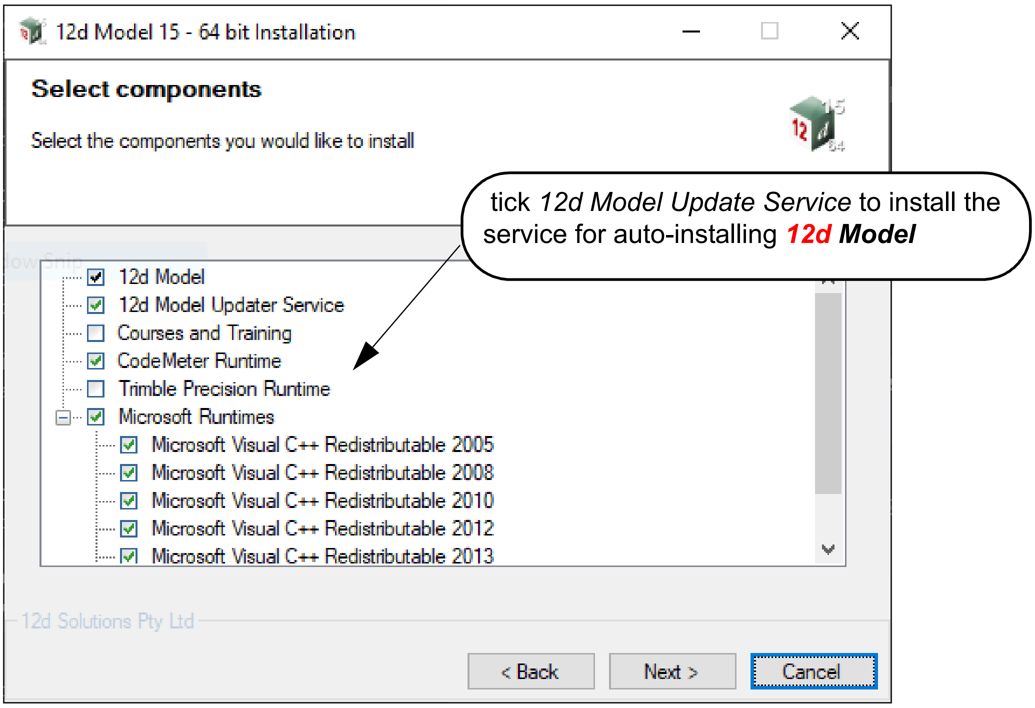
Tick on ***Courses and Training*** if you want to install the files for the ***Getting Started*** manuals.

Tick on ***Trimble Precision Runtime*** if you want to install the Trimble libraries.

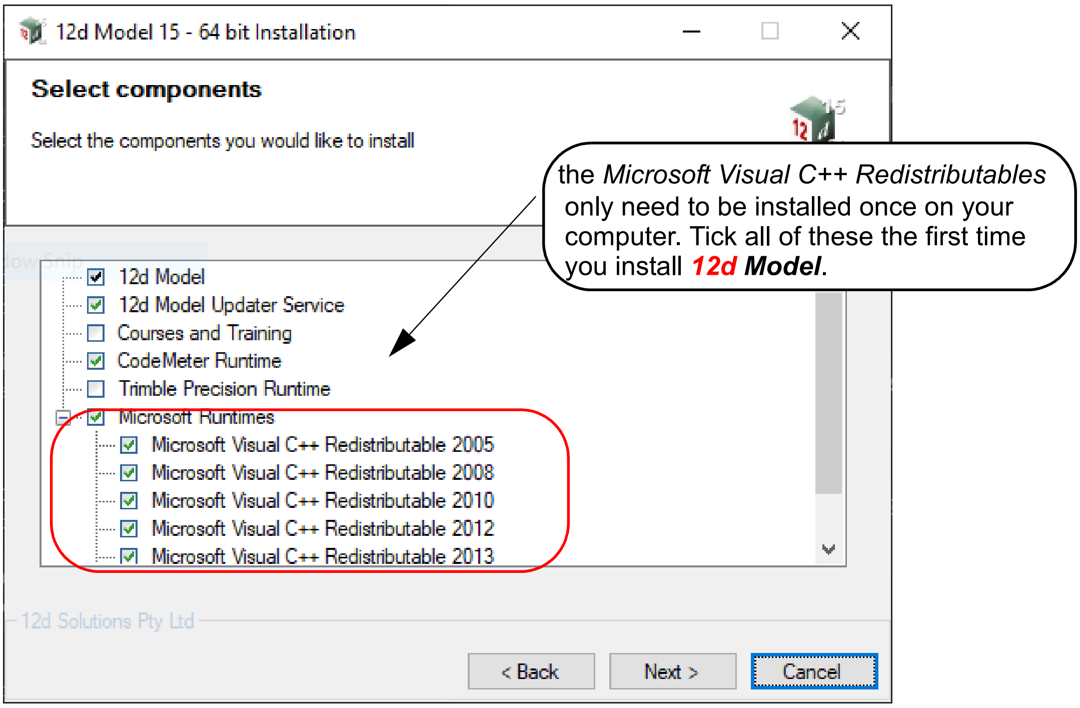


The ***12d Model Updater Service*** creates a **background Service** that is used to install new versions of ***12d Model 15*** without needing Admin privileges.

For information on setting up and using the ***12d Model Updater Service***, see 2.6 AutoUpdater for 12d Model 15.

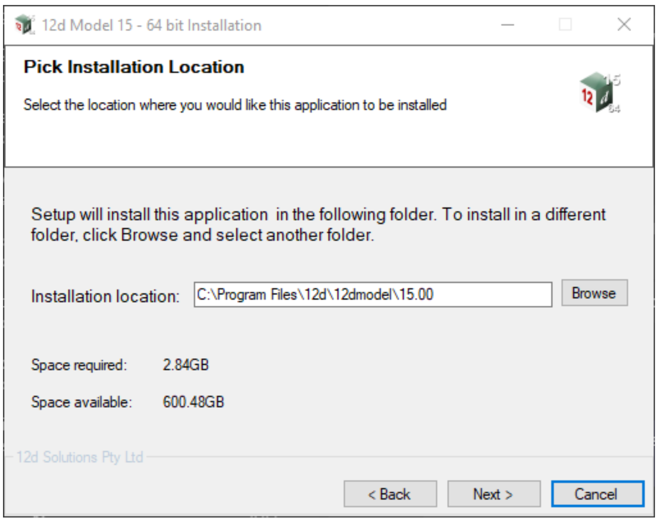


The ***Microsoft Visual C++ Redistributables*** only needs to be installed once on your computer. If you install ***12d Model*** again then you can leave them unticked.



After ticking on the required components, select ***Next*** to continue with the installation

Installation Location



Continue with the default installation folder for the software:

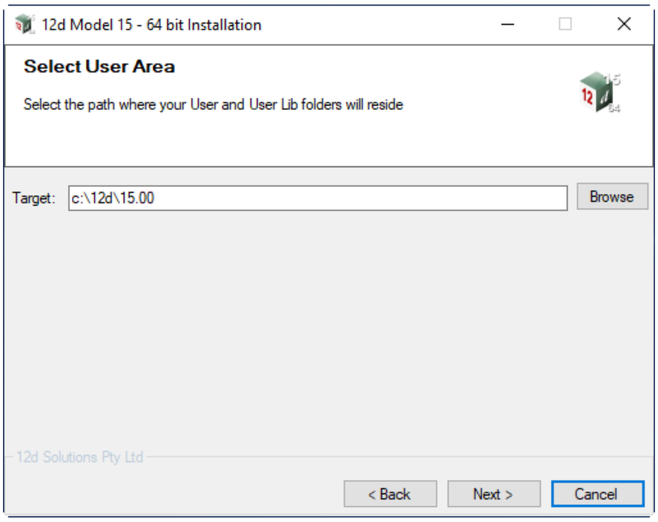
for 64 bit version: c:\Program Files\12d\12dmodel\15.0

for 32 bit version: c:\Program Files (x86)\12d\12dmodel\15.0

or click on ***Browse*** to browse to another folder for the installation

Select ***Next*** to continue with the installation

User Area



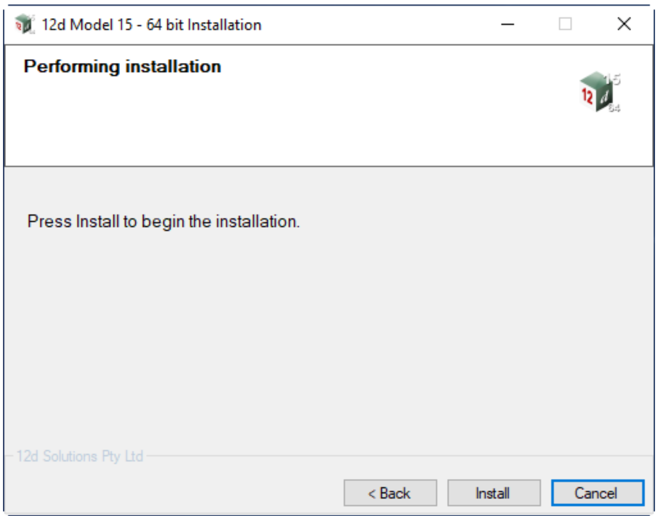
Continue with the default folder for the ***User Area*** for the software:

c:\12d\15.0

or click on ***Browse*** to browse to another folder for the User Area.

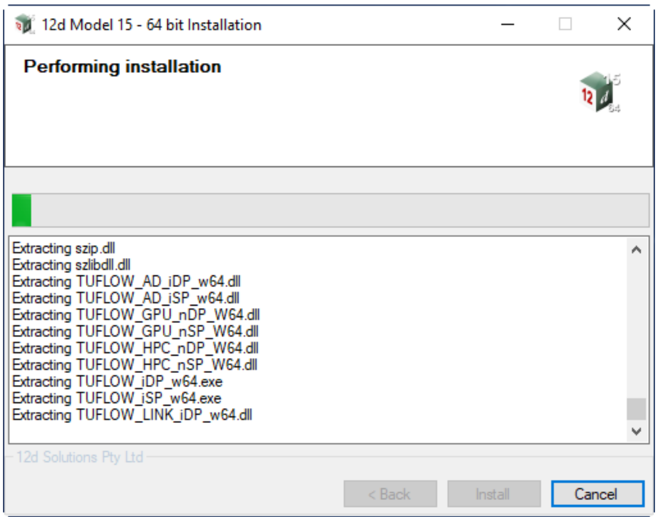
Select ***Next*** to continue with the installation

Ready to Install

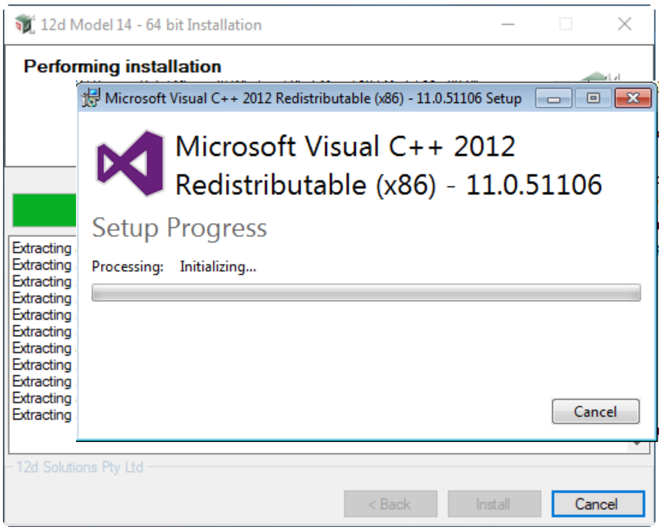


Select ***Install*** to begin the actual installation.

The software will be copied and installed onto the computer.

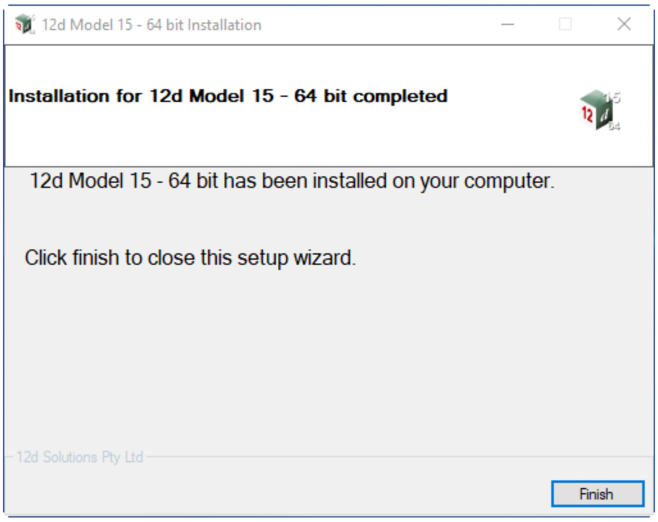


The Microsoft C++ Redistributables will be automatically installed (64 & 32 for 64-bit install)



DO NOT CLICK on anything on the Microsoft Redistributable panels, especially ***Cancel***.
The panels will disappear by itself.

Setup Complete



End of the installation. Select ***Finish*** to complete the installation

This completes the installation of the ***12d Model*** software.

Continue to 28.3 User, User_Lib and env.4d for 12d Model 15 or return to 28.2 Installers for Lock Drivers and 12d Model.

28.3 User, User_Lib and env.4d for *12d Model 15*

See

28.3.1 User
28.3.2 User_Lib
28.3.3 env.4d
28.3.4 nodes.4d

Or continue to 28.4 Network Hardware Locks and 12d Model or return to 28 Moving to 12d Model 15

28.3.1 User

User contains the files that you have modified files and are to be used instead of the files of the same name in **Set_ups** (e.g. names.4d, linestyl.4d).

No **User** folder is created when ***12d Model 15*** is installed but if you had files in your **User** for ***12d Model 14*** then you will probably also want them to be used in ***12d Model 15****.*

If this is the case you will need to create a **User** folder for **V15**.

In **V14**, the default place for **User** is **c:\12d\14.00\User** but it could have an entirely different location and name, and then the pathname to it is given by the V14 environment variable **USER_4D**.

In **V15**, the default place for **User** is **c:\12d\15.00\User** or it could be pointed to by the V15 environment variable **USER_4D**.

So if you require a **User** folder in V15, you need to create the **User** folder in the correct location and copy the files from V14 User that you want to use for V15 to the new V15 **User** location.

A Note on a Problem When NOT Using the Default Location for User.

If you are going to use the environment variable **USER_4D** to point to the location of **User**, then you need to update the value of *USER_4D* in the **env.4d** file to be the pathname to **User**.

Unfortunately a "chicken or the egg" situation exists here because the value for *USER_4D* is usually given inside the file **env.4d** which is in the *User* pointed to by USER_4D.

There are ways around this but if you leave **User** in a default location then you don't have to worry about this conundrum.

Continue to 28.3.2 User_Lib or return to 28.3 User, User_Lib and env.4d for 12d Model 15.

28.3.2 User_Lib

User_Lib contains your own library files.

No **User_Lib** folder is created when ***12d Model 15*** is installed but if you had library files in your **User_Lib** for ***12d Model 14*** then you will probably also want them to be used in ***12d Model 15****.*

If this is the case you will need to create a **User_Lib** folder for **V15**.

In **V14**, the default place for **User_Lib** is **c:\12d\14.00\User_Lib** but it could have an entirely different location and name, and then the pathname to it is given by the V14 environment variable **USER_LIB_4D**.

In **V15**, the default place for **User_Lib** is **c:\12d\15.00\User_Lib,** or it could be pointed to by the V15 environment variable **USER_LIB_4D**.

So if you require a **User_Lib** folder in V15, you need to create the **User_Lib** folder in the correct location and copy the files from V14 User_Lib that you want to use for V15 to the new V15 **User_Lib** location.

If in V15 you are going to use the V15 environment variable **USER_LIB_4D** to point to the location of **User**, then you need to update the value of *USER_LIB_4D* in the **env.4d** file for V15 to be the pathname to **User_Lib**.

Continue to 28.3.3 env.4d or return to 28.3 User, User_Lib and env.4d for 12d Model 15.

28.3.3 env.4d

env.4d is the file that contain the values you want for any of the ***12d Model*** environment variables. The location for a user version of the file **env.4d** is in the **User** folder.

A default *env.4d* file is installed with the V15 **Set_Ups** folder but if you were using your own *env.4d* file in V14 then you will probably want to also use your own env.4d file in V15.

If this is the case you will need to make sure that you have copied your **env.4d** file from your V14 **User** folder to the V15 **User**. See 28.3.1 User.

Continue to 28.3.4 nodes.4d or return to 28.3 User, User_Lib and env.4d for 12d Model 15.

28.3.4 nodes.4d

A new **nodes.4d** for ***12d Model 15*** will be emailed to you by your ***12d Model Reseller*** along with instructions on how to install it.

Note that the ***nodes.4d*** for **V15** is an XML format and so can not be easily edited.

However there is a program installed with ***12d Model 15*** that can:

(a) Install a V15 nodes.4d

and also load an existing nodes.4d and

(b) load another nodes.4d

(c) look at all the entries in the file and display information on each entry (start & end dates, modules authorised etc)

(d) move entries up and down

(e) delete entries

(f) create an html report on the entries

(g) create a new nodes.4d file from selected entries

This program is accessible from inside ***12d Model*** by

(a) the **Nodes.4d** button on the Front screen (the one before you select a ***12d Model*** project)

(b) the option ***Projects =>Management =>Dongles =>Nodes.4d editor***

and also from outside ***12d Model***.

(c) the program is called ***12dNodesUtility.exe*** and is installed as a 32-bit program in

Program Files (x86) \12d\Nodes\15.0

For information on the ***nodes.4d*** editor, see the documentation on the ***Nodes.4d Editor*** in the ***12d Model*** reference manual.

Continue to 28.4 Network Hardware Locks and 12d Model or return to 28.3 User, User_Lib and env.4d for 12d Model 1528.3.4 nodes.4d or 28 Moving to 12d Model 15.

28.4 Network Hardware Locks and ***12d Model***

If you are using a **12d Network hardware lock** with ***12d Model*** then a ***dongles.4d*** will be required to tell the system to use a network hardware lock instead of a stand alone hardware lock, and possibly which computer or IP address the network hardware lock is on.

So if you are wanting to use the network hardware lock after ***12d Model 15*** is installed, you need to copy your ***dongles.4d*** from your V14 **User** to your V15 **User**. See 28.3.1 User.

Otherwise ***12d Model 15*** will not see the network hardware lock and so won't be able to be authorised.

The ***dongles.4d*** file can also be created/edited by

(a) the **Dongles.4d** button on the Front screen (the one before you select a ***12d Model*** project)

(b) the option ***Projects =>Management =>Dongles =>Dongles.4d editor***

For information on the ***dongles.4d*** editor, see the documentation on the ***Dongles.4d Editor*** in the ***12d Model*** reference manual.

Return to 28 Moving to 12d Model 15.

29 12d Programming Language

It is the available functions in the ***12d Model Programming Language*** (macros) that gives the language its power.

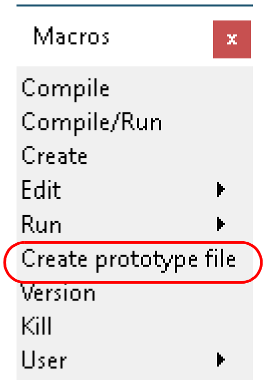
So new functions calls are added to the ***12d Model Programming Language*** (12dPL) with each release of ***12d Model,*** and often in sub-versions.

As each new function is added to 12dPL, it is given an increasing unique number which never changes. This is called the function's ID.

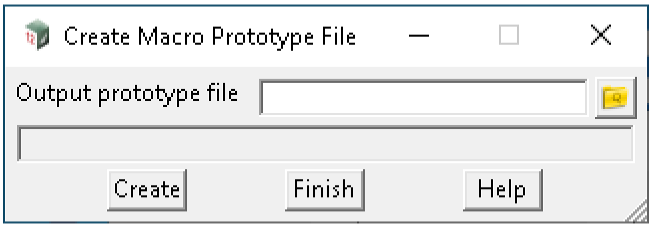
Hence for each version and subversion of ***12d Model***, the last function number is well defined and only function calls with numbers less than that number can be run with that version.

It is possible to generate a list of the available functions with their arguments and their unique number by creating what is called a ***prototype file*** with the option

Utilities =>Macros =>Create prototype file.



Generate a list of the 12dPL function calls



For example, the first 5 lines of any prototype file are:

Real Sin(Real value); // ID = 1
Real Cos(Real value); // ID = 2
Real Tan(Real value); // ID = 3
Real Acos(Real value); // ID = 4
Real Asin(Real value); // ID = 5

For ***12d Model 12 C1t***, the highest ID is 3208:

Integer Trimesh_section(Element trimesh,Real point_x,Real point_y,Real point_z,Real point_direction,Real point_grade,Real width,Real height,Integer &internal_return,Integer &result_closed,Integer &size_section_points,Dynamic_Real &section_xs,Dynamic_Real &section_ys,Dynamic_Real &section_world_xs,Dynamic_Real &section_world_ys,Dynamic_Real &section_world_zs,Dynamic_Integer &section_edge_indexes,Dynamic_Text &section_edge_names,Dynamic_Integer &section_edge_colours,Dynamic_Integer &section_vertex_indexes,Dynamic_Text &section_vertex_names,Dynamic_Integer &section_vertex_colours); // ID = 3208

For ***12d Model 14 C2e***, the highest ID is 3763

Integer Append_log_line(Log_Line line,Log_Line parent); // ID = 3763

So 455 new function calls have been added going from ***12d Model 12 C1t*** to ***12d Model 14 C2e.***

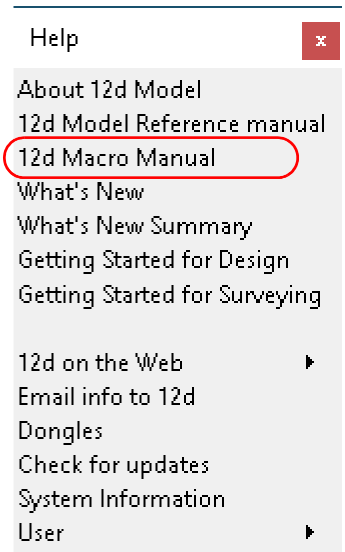
For ***12d Model 15 C1e***, the highest ID is 7746

Integer Convert_to_polymesh(Real deflection,Integer relative_deflection,Dynamic_Element &trimeshes); // ID = 7746

So 3,983 new function calls have been added going from ***12d Model 14 C2e*** to ***12d Model 15 C1e.***

When a function call is documented in the ***12d Model Programming Language*** manual its **ID** is also recorded so that the ID can be used for a search.

The ***12d Model Programming Language*** manual is shipped with each version of ***12d Model,*** and in ***12d Model 15*** is available by clicking on **12d Macro manual** option on the **Help** menu.



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